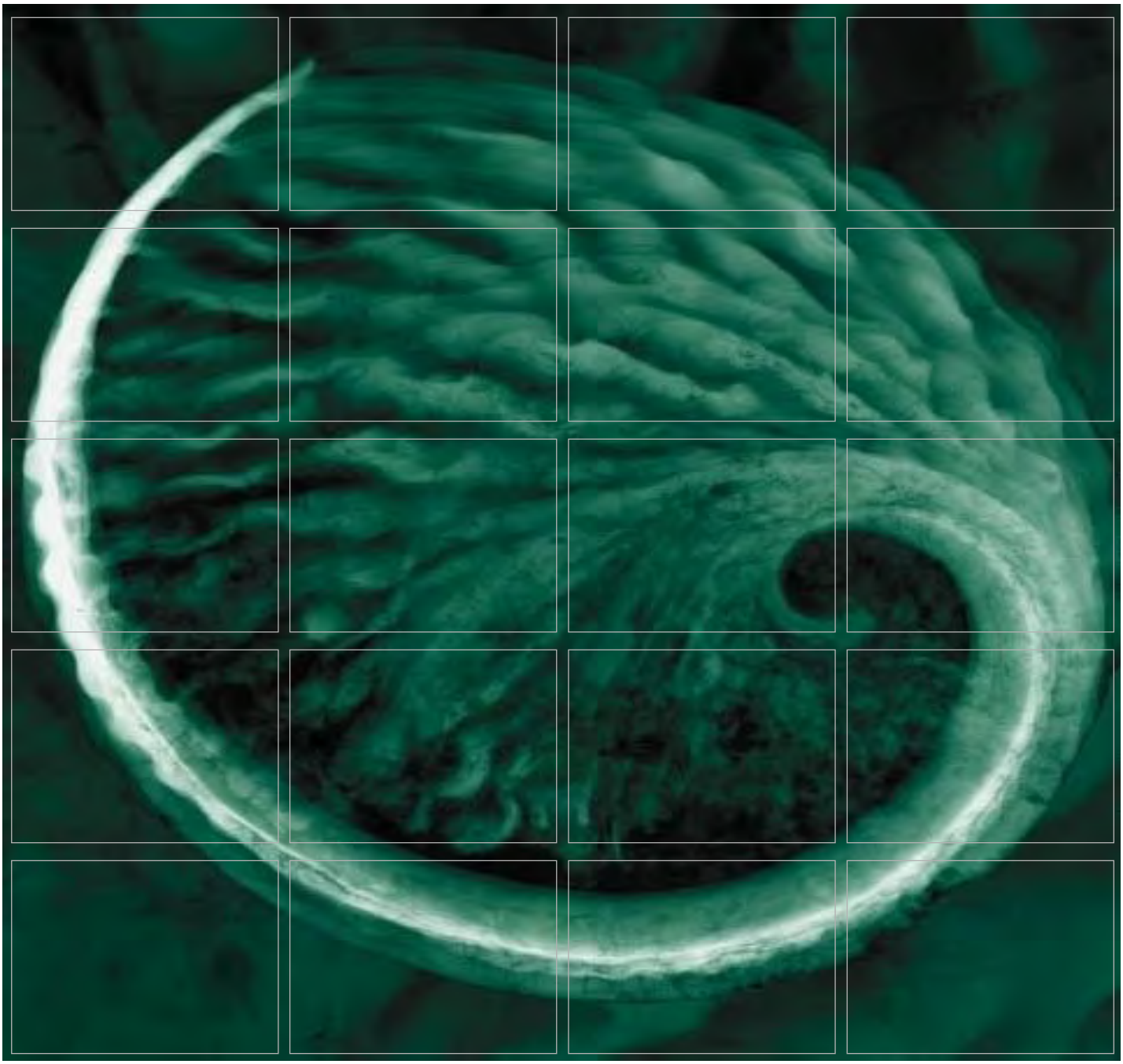

Operable Unit 1
Quality Assurance Project Plan

Fulton Avenue Superfund Site
150 Fulton Avenue
Garden City Park, Nassau County, New York

August 2018

ERM *The business of sustainability*

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INTRODUCTION

This first operable unit (OU1), interim remedial action (RA), remedial design (RD) Quality Assurance Project Plan (QAPP) for the Fulton Avenue Superfund Site (Site) presents the policies, organization, objectives, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the data quality goals associated with the OU1 RD activities, and subsequent implementation of the OU1 RA.

The work to be performed and described herein is in accordance with the OU1 remedy selected in the U.S. Environmental Protection Agency (EPA) 30 September 2015 OU1 Record of Decision Amendment (Amended OU1 ROD) for the Site. The work will be implemented in accordance with the revised OU1 Consent Judgment No. CV–09–3917 (2016 CJ) and revised OU1 Statement of Work (2016 SOW) approved and entered by the United States District Court for the Eastern District of New York on 15 August 2016.

The purpose and objective of the QAPP is to ensure that the analytical results are accurate and representative of field conditions. The analytical methods and QA/QC procedures presented in this QAPP are referenced from and consistent with the guidelines established in the *Uniform Federal Policy for Quality Assurance Project Plans* (UFP-QAPP) and Section 6 (Part B) of *Quality Systems for Environmental Data and Technology Programs - Requirements with guidance for use*, ANSI/ASQ E4 (February 2004).

The *Uniform Federal Policy for Quality Assurance Project Plans* (UFP-QAPP) is a consensus quality systems document prepared by the Intergovernmental Data Quality Task Force (IDQTF), a working group made up of representatives from the EPA, the Department of Defense (DoD), and the Department of Energy (DOE). Originally issued in 2005, the UFP-QAPP was developed to provide procedures and guidance for consistently implementing the national consensus standard ANSI/ASQ E-4, *Quality Systems for Environmental Data and Technology Programs,* for the collection and use of environmental data at Federal facilities.

The UFP-QAPP is a workbook that consists of a collection of templates or worksheets that, once completed, addresses all required elements of a QAPP. While use of the term QAPP has been retained, the information contained in the worksheets captures the elements that would comprise related project-planning documents, such as a Sampling and Analysis Plan (SAP), Work Plan (WP), and Field Sampling Plan (FSP). Hence, this QAPP is designed to be a stand-alone document containing certain background supporting information (Worksheet #10: Conceptual Site Model), specifications, and procedures necessary for project personnel to carry out their assigned responsibilities. For example, the field team should be able to rely on the QAPP for complete sampling instructions/standard operating procedures, including how to sample, where to sample, how many samples to collect, the types of bottles, preservatives, related QC, etc.

This QAPP is an integral part of the OU1 Site Management Plan (SMP) for long-term Site management that is a dynamic document which will be subject to revision from time to time during the course of the OU1 RA. Revisions will likely be required to address changes in regulatory requirements or field conditions to ensure the scope of the QAPP is aligned with the needs of the OU1 RA, and that data goals are met including the accuracy and representativeness of all analytical results.

QAPP Worksheet #1 & 2: Title & Approval Page

SITE NAME/PROJECT NAME:	Fulton Avenue Superfund Site Operable Unit 1
TITLE:	Quality Assurance Project Plan
SITE LOCATION:	150 Fulton Avenue, Garden City Park, New York
PREPARATION DATE:	05 January 2017
REVISION NUMBER:	5.0
REVISION DATE:	21 August 2018
SITE NUMBER/CODE:	CERCLA Site No.: NY0000110247 New York State Registry of Inactive Hazardous Waste Disposal Sites Site Number 130073
OPERABLE UNIT:	1 (OU1)
LEAD ORGANIZATION	ERM Consulting & Engineering, Inc. (ERM)
DOCUMENT TITLE:	Operable Unit 1, Quality Assurance Project Plan Fulton Avenue Superfund Site 150 Fulton Avenue, Garden City Park, New York

PREPARER'S NAME & ORGANIZATIONAL AFFILIATION:

Chris Wenczel, P.G. - ERM
Brice Lynch, P.G. - ERM

PREPARER'S ADDRESS, TELEPHONE NUMBER, AND E-MAIL ADDRESS:

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Project Coordinator/Lead Organization Project Manager (Sign and Date)
Chris Wenczel, P.G. - ERM

United States Environmental Protection Agency (USEPA) (Sign and Date)
Kevin Willis, USEPA Remedial Project Manager

QAPP Worksheet #3 & 5: Project Organization & QAPP Distribution

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address
Kevin Willis	Remedial Project Manager	EPA Region II	212-637-4252	212-637-4279	willis.kevin@epamail.epa.gov
Steven M. Scharf, P.E.	Remedial Project Manager	NYSDEC	518-402-9620	518-402-9022	sxscharf@gw.dec.state.ny.us
John Swartwout	Chief - Section C, Remedial Bureau A	NYSDEC	518-402-9620	518-402-9022	jbswarto@gw.dec.state.ny.us
Douglas Fischer	Assistant Regional Counsel New York/Caribbean Superfund Branch Office of Regional Counsel	USEPA	212-637-3180	212-637-3104	fischer.douglas@epamail.epa.gov
Robert Kambic	Assistant U.S. Attorney U.S. Attorney's Office, EDNY	USDOJ	631-715-7852	631-715-7920	robert.kambic@usdoj.gov
Thor Urness	Partner	Bradley, LLP	615-252-23845	-	turness@bradley.com
Melissa Alexander, Esq.	Partner	Bradley, LLP	615-252-2326	615-252-6326	malexander@babc.com
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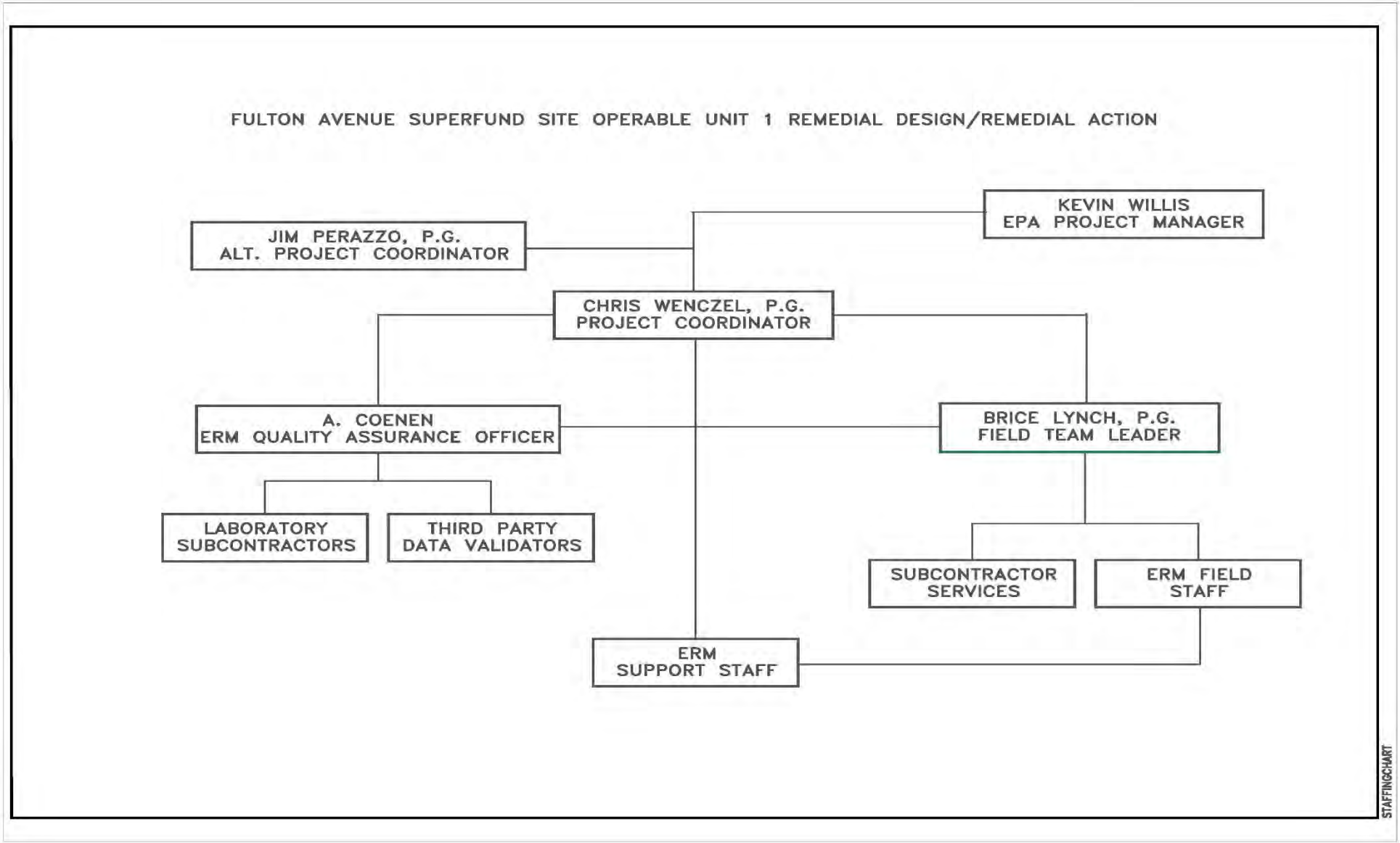
James Perazzo, P.G.	Principal Partner	ERM	631-756-8913	631-756-8901	jim.perazzo@erm.com
Chris Wenczel, P.G.	Principal Consultant	ERM	631-756-8920	631-756-8901	chris.wenczel@erm.com
Andrew Coenen	Senior Chemist	ERM	631-756-8959	631-756-8901	andrew.coenen@erm.com
Brice Lynch, P.G.	Senior Project Geologist	ERM	631-756-8944	631-756-8901	brice.lynch@erm.com
Tammy McCloskey	Laboratory Project Manager	Accutest Laboratories	732-355-4562	732-329-3499	tammym@accutest.com

QAPP Worksheet #5: Project Organization Chart



QAPP Worksheet #4, 7 & 8: Personnel Qualifications, Responsibilities & Sign-off Sheet

Name	Title	Organizational Affiliation	Education, Experience & Specialize Training Qualifications[1]	Responsibilities	Signature*
James Perazzo, P.G.	Alternate Project Coordinator/ERM Principal-In-Charge/ Hydrogeologist	ERM	See Professional Profile In Attachment A	• Provide overall corporate project and technical management, • Ensures professional services provided by ERM are cost effective and of the highest quality, • Ensures all resources of ERM are available on an as-required basis, • Conduct technical discussions for key technical issues with the Respondents, • Managerial and technical guidance to ERM Site manager and other staff, and • Final review of ERM submittals prior to issue, primary support in technical discussions with Agencies.	
Chris Wenczel, P.G.	Project Coordinator/ERM Principal Consultant/ Hydrogeologist	ERM	See Professional Profile In Attachment A	• Provide overall corporate project and technical management, • Ensures professional services provided by ERM are cost effective and of the highest quality, • Ensures all resources of ERM are available on an as-required basis, • Conduct technical discussions for key technical issues with the Respondents, • Managerial and technical guidance to ERM Site manager and other staff, and • Primary review of ERM submittals prior to issue, primary support in technical discussions with Agencies.	
Andrew Coenen	Project QA Officer/ERM Senior Chemist	ERM	See Professional Profile In Attachment A	• Field and laboratory QA/QC oversight. • Provides managerial/technical expertise support function as needed, • Procurement and contracting for analytical laboratory, • Overview of laboratory activities, • Decides laboratory data corrective action, • Performs analytical data assessment and validation, and • Assist in preparation of reporting packages.	
Brice Lynch, P.G.	Project Field Team Leader/ERM Senior Project Geologist	ERM	See Professional Profile In Attachment A	• Field team oversight, • Ensure field adherence to QAPP, • Subcontractor/laboratory coordination, and • Assist in preparation of reporting packages.	

*Signatures indicate personnel have read and agree to implement this QAPP as written.

1. ERM staff and subcontractors who will provide field services at the site will be trained, at a minimum, per the requirements of 29 Code of Federal Regulations (CFR) 1910.120 "Hazardous Waste Operations and Emergency Response" (HAZWOPER), including both the one time 40-hour training and annual 8-hour refreshers. This training includes discussions of potential hazards, exposure limits, and a review of personal protective equipment, emergency procedures, and respirator selection and fit testing. Training has been completed on an individual basis to complete the required project specific functions. See Professional Profiles provided as Attachment A for specific ERM employee training and certifications. ERM training certificates are available upon request.

Special service needs for this project such as drilling, laboratory analytical services, underground utility clearance, investigative-derived waste (IDW) disposal, i.e., well purge water, etc. will be provided by specialty subcontractors for each service area. While many of the aforementioned service disciplines do not necessarily have formal specialized training resulting in some form of a certification, ERM will make diligent inquiry to confirm that only experienced and qualified subcontractor personnel will be performing the work.

QAPP Worksheet #6: Communication Pathways

Communication Drivers	Organization	Name	Contact Information	Procedure (Timing, Pathways, etc.)
Regulatory Agency Interface: Primary Point of Contact with EPA Remedial Project Manager and Genesco Inc.	ERM Project Coordinator/ERM Principal Consultant/ Hydrogeologist	Chris Wenczel, P.G.	See QAPP Worksheet #3 & 5: Project Organization & QAPP Distribution	All documents and information about the project will be forwarded to the Agencies by Mr. Wenczel. Mr. Wenczel will have responsibility for all phases of the OU1 RA at the Site. Mr. Wenczel will delegate project tasks. All materials and information about the project will be forwarded to Genesco by Mr. Wenczel.
3General Project Technical Support and QA/QC Review.	ERM Project Team Members	James Perazzo, P.G. Andrew Coenen Brice Lynch, P.G.		Project team will provide project support and correspondence by e-mail, telephone and personal communications.
Field Team Leader • Daily field progress reports • Stop work due to safety issues • Contact with public and/or media • Changes in field conditions from expected • Field corrective actions	ERM Project Field Team Leader	Brice Lynch, P.G.		Mr. Lynch will be responsible for providing daily and real-time updates from the Site to Mr. Wenczel and EPA as requested by e-mail, telephone and personal communications.
Primary Liaison With Analytical Laboratory • QAPP changes prior to fieldwork and/or during fieldwork execution • Sample receipt variances • Laboratory quality control variances • Analytical corrective action actions • Data verification issues • Data review corrective action	ERM Senior Chemist	Andrew Coenen		Mr. Coenen will serve as the point of contact for the analytical laboratory and will be responsible for all laboratory and analytical data QA/QC review. All correspondence with the laboratory will be conducted by e-mail or telephone communications.

QAPP Worksheet #9: Project Planning Session Summary

Project Name: Fulton Avenue Superfund Site OU1 Remedial Design & Long Term Groundwater Monitoring Projected Date(s) of Sampling: Fall 2017 + 30 Years Project Coordinator: Chris Wenczel	**Site Name:** Fulton Avenue Superfund Site OU1 **Site Location:** 150 Fulton Avenue Garden City Park, New York

Date of Session: 16 May 2016

Scoping Session Purpose: Finalize scope of Remedial Design and Long-Term Groundwater Monitoring Program that was subsequently reflected in the Amended OU1 ROD for the Site, and in accordance with the 2016 CJ and 2016 SOW.

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Nicoletta Diforte	Deputy Director for Enforcement and Homeland Security	USEPA	212-637-3466	DiForte.Nicoletta@epa.gov	USEPA Senior Management
Douglas Fischer	Assistant Regional Counsel New York/Caribbean Superfund Branch Office of Regional Counsel	USEPA	212-637-3180	Fischer.Douglas@epa.gov	USEPA Counsel
Virginia F. Capon	Supervisory General Attorney Section Chief of New York/Caribbean Superfund Section	USEPA	212-637-3163	Capon.Virginia@epamail.epa.gov	Oversight of USEPA Counsel
Robert Kambic	Assistant U.S. Attorney	U.S. Attorney's Office, EDNY	631-715-7852	robert.kambic@usdoj.gov	Represent US Attorney's Office
Doug Garbarini	Branch Chief of the New York Remediation Branch	USEPA	212-637-4288	Garbarini.doug@Epa.gov	Oversight of USEPA Section Chief
Kevin Willis	Remedial Project Manager	USEPA	212-637-4252	Willis.kevin@Epa.gov	USEPA Project Manager
James Periconi	Attorney/Partner	Periconi, LLC	212-213-5500	JPericoni@periconi.com	Counsel For Respondent
Melissa Alexander-Ballengee	Attorney/Partner	Bradley, LLP	307-766-2289	malexander@bradley.com	Counsel For Respondent
Thor Urness	Attorney/Partner	Bradley, LLP	615-252-2384	mailto:turness@bradley.com	Counsel For Respondent

Project Name: Fulton Avenue Superfund Site OU1 Remedial Design & Long Term Groundwater Monitoring Projected Date(s) of Sampling: Fall 2017 + 30 Years Project Coordinator: Chris Wenczel	**Site Name:** Fulton Avenue Superfund Site OU1 **Site Location:** 150 Fulton Avenue Garden City Park, New York

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Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Jim Perazzo, P.G.	Principal Partner/Hydrogeologist	ERM Consulting & Engineering, Inc.	631-756-8913	Jim.perazzo@erm.com	Consultant For Respondent, Oversight of Project Manager
Chris Wenczel, P.G.	Principal Consultant/Hydrogeologist	ERM Consulting & Engineering, Inc.	631-756-8920	Chris.wenczel@erm.com	Project Coordinator/ Manager

Comments/Decisions: See Below

Action Items: See Below

Consensus Decisions: The project scoping was completed by ERM in developing the 14 October 2016 OU1 Remedial Design Work Plan the OU1 remedy based on the Amended OU1 ROD for the Site, and in accordance with the 2016 CJ and 2016 SOW.

QAPP Worksheet #10: Conceptual Site Model

Consistent with EPA UFP-QAPP guidance, the Conceptual Site Model (CSM) presented in this worksheet provides summary information from prior Site documents regarding:

- Background: Site history & key physical aspects (e.g., site geology, hydrology, topography, land use, etc.);
- Sources of known contaminants;
- The primary release mechanism;
- Secondary contaminant migration;
- Fate and transport considerations; and
- Potential receptors and exposure pathways.

BACKGROUND INFORMATION

Site Definition

The property located at 150 Fulton Avenue, Garden City Park, Nassau County, New York (Fulton Property) is owned by Gordon Atlantic Corporation. It is located within the Garden City Park Industrial Area (GCPIA), Village of Garden City Park, Town of North Hempstead (TNH), Nassau County, New York. The Fulton Property is currently occupied by a business machine support company. Figure 1 shows the location of the Fulton Property.

Operations at the Fulton Property from approximately 1 January 1965 through approximately 31 December 1974 are alleged to have included dry-cleaning of fabric with tetrachloroethylene (PCE), a volatile organic compound (VOC). The Fulton Property has been identified as a contributing source of PCE contamination of groundwater beneath the Site creating a plume of PCE-dominant groundwater contamination in the Upper Glacial and Magothy aquifers which extends to the southwest, impacting certain public supply wells owned by the Village of Garden City (VGC).

In 1996, the Fulton Property was listed on the Registry of Inactive Hazardous Waste Disposal Sites in New York State (Registry) as Site Number 130073. EPA also included the Fulton Property on the National Priorities List (NPL) of Federal Superfund Sites as part of EPA's Fulton Avenue Superfund Site in April 1998.

The NYSDEC defines the Site as the 0.8-acre Fulton Property and environmental conditions, including groundwater contamination that has migrated beyond the Fulton Property boundary (the NYSDEC Site).

In contrast, the EPA Amended OU1 ROD states:

The Fulton Avenue Superfund Site (the Site) includes a 0.8-acre property located at 150 Fulton Avenue, Garden City Park, Nassau County, New York (hereinafter, the Fulton Property). In addition, the Site includes all locations impacted by contamination released at the Fulton Property, and all other contamination impacting the groundwater and indoor air in the vicinity of the Fulton Property. The Site also includes an overlapping groundwater plume, primarily contaminated with trichloroethene (TCE) in the Upper Glacial and Magothy aquifers, the origin(s) of which are not fully known but are under study by EPA as part of the second operable unit (OU2) for the Site.

For clarity, it should be noted that EPA views the VOC impacts in groundwater at the VGC public supply wells Nos. 9, 13 & 14 as the result of one regional plume containing contamination from multiple sources, some known and some unknown as reported in the 2005 Remedial Investigation (RI) Report for the Site. The general historical outlines of the PCE- and TCE-dominant portions of the plume are shown in Figure 2.

The EPA is investigating the TCE-dominant portion of the plume as well as possible other sources of PCE and TCE as part of OU2 for the Site. The EPA currently is performing a Remedial Investigation and Feasibility Study (RI/FS) for OU2, and expects to issue a ROD for OU2 that will constitute the final groundwater remedy for the Site and that will serve as a final decision for OU1.

General Site Characteristics

The Site is situated in the glacial outwash plain on Long Island, New York which is relatively flat, with local relief of approximately 12 feet over a distance of 2,600 feet. Nearer to the Fulton Property, the area is slightly sloping with local relief of approximately five feet.

The soil at the Site is classified as urban land (defined as areas where at least 88% of the surface is covered with asphalt, concrete, or other paving material). Approximately 500 feet of interbedded sands and limited clay lenses overlay Precambrian bedrock. Soils underlying the Site are classified as a sandy loam. There are three aquifers that exist beneath the Site, two of which are affected. The Upper Glacial aquifer is the surficial unit which overlies the Magothy aquifer. The Magothy is the primary source for public water in the area. The Upper Glacial and Magothy aquifers are in hydraulic communication, i.e., as groundwater flows southwesterly beneath the Site, it also moves downward into the Magothy aquifer.

The land uses within the Site are a mix of residential, commercial, and industrial. The Fulton Property is located within the GCPIA which is an industrial/commercial area and the area south of the Long Island Railroad tracks is largely residential, i.e., VGC. Approximately 208,000 people live within three miles of the Fulton Property. There are about 20,000 people living within one-mile of the Fulton Property. Residents within the area obtain their drinking water from public supply wells. The vicinity of the Fulton Property is industrial but residential areas are immediately adjacent to the industrial area.

Storm water runoff from the GCPIA and VGC streets is collected into storm drains and recharged to the Upper Glacial aquifer via local recharge basins. The Garden City Country Club lies south of the residential area. Its manicured grassland surrounds a pond which accepts storm water runoff from the VGC streets surrounding the golf course.

Detailed information concerning the Site geology, hydrogeology, and the nature and extent of impacts to soil and groundwater is presented in the 2005 RI Report, Part 2 of the Amended OU1 ROD, as well as numerous technical documents submitted to EPA during 2011 - 2015 listed in the Administrative Record of the Amended OU1 ROD.

SITE INVESTIGATIVE, REMEDIAL & ADMINISTRATIVE HISTORY

An overview of the Site investigative, remedial and administrative history is presented below. Greater detail can be found in the Amended OU1 ROD.

Beginning in 1986, numerous investigations were conducted by the Nassau County Departments of Health and Public Works to identify the source(s) of VOCs impacting public supply wells in Nassau County located downgradient of the GCPIA. Subsequent investigations undertaken by

NYSDEC identified the Fulton Property as one of several contributing sources of PCE contamination of groundwater beneath the NYSDEC Site which led to listing the Fulton Property on the NYS Registry as well as the NPL.

Although NYSDEC initially assumed the role of lead regulatory agency, the NYSDEC and EPA cooperatively oversaw the implementation of an RI/FS and a Soil Interim Remedial Measure (Soil IRM) described below. NYSDEC and EPA agreed that EPA would be designated as the lead agency for the Fulton Avenue Site at the conclusion of the RI/FS process.

The source of PCE contamination at the Fulton Property was identified as a former drywell which was subject to a Soil IRM that involved soil/sediment removal and subsequent remediation by air sparging (AS) of shallow groundwater and soil vapor extraction (SVE). The former dry well was closed as part of the Soil IRM. The SVE/AS system was operated until NYSDEC Technical and Administrative Guidance Memorandum (TAGM) soil cleanup levels were achieved. The Soil IRM removed an estimated 10,000 pounds of PCE during its period of operation (1999 – 2001). The completion of the Soil IRM was approved by NYSDEC and the dismantling of the SVE system was authorized on 2 January 2002. A sub-slab depressurization system was installed beneath the building at the conclusion of the Soil IRM to mitigate the potential for intrusion of soil vapor containing residual PCE into the existing building. This system remains in operation to protect the indoor air quality.

Between 1999 – 2006, an RI/FS that included an Exposure Pathways Analysis and Baseline Risk Assessment was performed under a NYSDEC Administrative Order on Consent (AOC), Index # W1-0707-94-08. The RI/FS focused on environmental conditions at the Fulton Property and contamination that had migrated beyond the property boundary.

The RI and FS Reports were reviewed by NYSDEC and EPA, and approved under the AOC. After approval, lead-agency status changed from NYSDEC to EPA. EPA subsequently developed a Proposed Remedial Action Plan (PRAP) for OU1 which, following a public comment period, was finalized and presented as a selected remedy in a Record of Decision (ROD) issued on 28 September 2007 (2007 ROD). The 2007 ROD described EPA's preferred action to address the PCE-dominant portion of the plume which included among other things:

- In-Situ Chemical Oxidation (ISCO) treatment of source contamination in groundwater at and near the Fulton Property; and
- Construction and operation of a groundwater extraction and treatment system midway along the spine of the PCE-dominant portion of the plume.

Thereafter, EPA issued a Statement of Work (SOW) for the OU1 RA and commenced negotiation with a number of potentially responsible parties (PRPs) to implement the RA set forth in the 2007 ROD. One of the identified PRPs, Genesco Inc. (Respondent) agreed to implement the OU1 RA and executed a Consent Judgment with EPA.

The Consent Judgment (EPA CJ No. CV–09–3917) (2009 CJ) and attached SOW (2009 SOW) were lodged with the United States District Court for the Eastern District of New York on 10 September 2009. Notice of the same inviting public comment was published in the Federal Register /Vol. 74, No. 179, 17 September 2009. On 18 November 2009, EPA issued notice to proceed initiating the OU1 Remedial Design (RD) and subsequent implementation of the OU1 RA. Although EPA never sought Court entry of the 2009 CJ, the Respondent began implementing the OU1 RD.

In March of 2012, while the OU1 RD was underway, the VGC and the Respondent proposed modifications to the 2007 ROD that would, among other things, eliminate the interim groundwater extraction and treatment system while ensuring the continued operation of the wellhead treatment systems on VGC water supply wells 13 and 14.

Following the Respondent's submittal of several technical evaluations prepared at EPA's request, and after EPA's further evaluation of conditions at the Site, EPA determined that it would be appropriate to amend the 2007 ROD. EPA subsequently developed a new PRAP for OU1 which, following a public comment period, was finalized and presented the current selected remedy in the Amended OU1 ROD for the Site. Therein, the EPA concluded that eliminating the groundwater extraction and treatment system from the OU1 remedy would be appropriate because PCE levels in groundwater reaching the intakes of water supply wells 13 and 14, which had been increasing at the time of the 2007 ROD, instead have been declining since the summer of 2007. The lower PCE levels in groundwater suggest that the extraction well system contemplated in the 2007 ROD is not needed to prevent more highly elevated levels of contamination from reaching wells 13 and 14. The existing treatment systems at VGC water supply wells 13 and 14 have been, and are expected to continue to effectively provide a safe drinking water supply. The attenuating nature of the PCE-dominant portion of the plume indicates that the source of the PCE may be depleting and that the highest levels of contamination have already passed through the well head treatment systems at VGC supply wells 13 and 14. A final decision regarding the groundwater contamination will be made following the EPA's completion of additional investigations at the Site.

In addition, RD sampling conducted by the Respondent at, and in the area around the Fulton Property did not identify PCE source material in the shallow aquifer in the immediate vicinity of the former drywell nor immediately downgradient of the Fulton Property. Consequently, the Amended OU1 ROD also eliminated ISCO treatment of the shallow aquifer at or immediately downgradient of the Fulton Property.

PCE concentrations in the PCE-dominant portion of the plume are generally declining while elevated levels of PCE continue to be present in one monitoring well approximately 400 feet downgradient of the Fulton Property, the source(s) of such PCE are believed to be other unrelated properties in the vicinity. The EPA expects to continue the investigation of potential source material.

During 2015-2016, the 2016 CJ and 2016 SOW were negotiated, signed by the Respondent and EPA, and approved and entered by the United States District Court for the Eastern District of New York on 15 August 2016. Further, the VGC and the Respondent have entered into a separate agreement in *Incorporated Village of Garden City v. Genesco Inc. and Gordon Atlantic Corp.*, Civil Action No. 07-cv-5244 (E.D.N.Y.) whereby, in exchange for a lump sum payment, the VGC has agreed to, among other things:

- Operate VGC water supply wells 13 and 14 with the air stripper treatment systems for 30 years at pumping levels consistent with the 2009 operation of those wells;
- Not to take any action that would reduce the volume, level of treatment or hydraulic control at the wells except with the consent of EPA regardless of whether those wells are needed for a potable water supply; and
- Operate, maintain, repair, and replace equipment of, as necessary, the two air strippers on those wells as called for in the Amended OU1 ROD.

The aforementioned agreement will facilitate the Respondent's performance of the Work in accordance with the Amended OU1 ROD, and the 2016 CJ with attached 2016 SOW, including all terms, conditions and schedules set forth herein or developed and approved thereunder.

CONTAMINANT FATE AND TRANSPORT

The greatest potential for transport of VOCs at the Site is via groundwater migration. The PCE-dominant portion of the plume was found to extend approximately 6,500 feet downgradient of the Fulton Property. The average width of the PCE-dominant portion of the plume was estimated in the 2007 ROD to be about 1,000 feet. PCE in the PCE-dominant portion of the plume extends to a depth of approximately 420 feet, exhibiting an average thickness of approximately 250 feet.

POTENTIAL RECEPTORS AND EXPOSURE PATHWAYS;

For there to be an exposure, there must be a completed pathway through which a receptor (e.g., person, animal or receiving media like surface water) comes into contact with one or more of the identified contaminants of concern. The current land use of the Fulton Property is commercial/industrial, and it is not expected that the land use will change in the foreseeable future. The surrounding properties are also expected to retain their current land use, which is commercial/industrial and residential. In addition, based on existing data, there are no potential exposure pathways for ecological receptors at the Site nor is groundwater is likely to affect any surface water bodies.

The area is served by municipal water which is treated to meet EPA drinking water standards, and it is not likely that the groundwater underlying the Fulton Property or the surrounding commercial/industrial or residential areas will be used privately by individuals for potable purposes in the foreseeable future. However, since the groundwater downgradient of the Fulton Property is used and treated for municipal water supplies and the regional groundwater is designated as a drinking water source, potential exposure pathways considered for contaminated groundwater associated with the Site included:

- ingestion of, dermal contact with and inhalation of vapors released from municipal water during showering/bathing by residents;
- ingestion of groundwater by a current/future worker at the Site but off the Fulton Property; and
- inhalation of VOCs released from the nearby irrigation holding pond that receives occasional water supply well bypass discharge during well maintenance activities by golf course employees/landscapers.

The other exposure pathway considered was the potential for inhalation of indoor air via vapor intrusion into buildings by residents and commercial workers on and off the Fulton Property.

QAPP Worksheet #11: Project/Data Quality Objectives

PROBLEM STATEMENT: Pursuant to the the 2016 CJ and 2016 SOW, this QAPP supports long-term groundwater monitoring that is required to be conducted as part for the OU1 Remedial Action for the Site to evaluate whether or not the following objectives are being met:

- Minimize and/or eliminate the potential for future human exposure to Site contaminants via contact with contaminated drinking water; and
- Help reduce migration of contaminated groundwater.

As discussed in Worksheet #10, following the Respondent's submittal of several technical evaluations prepared at EPA's request, and after EPA's further evaluation of conditions at the Site, EPA determined that it would be appropriate to amend the 2007 ROD. EPA subsequently developed a new PRAP for OU1 which, following a public comment period, was finalized and presented the current selected remedy in the Amended OU1 ROD for the Site. Therein, the EPA concluded that eliminating the groundwater extraction and treatment system from the OU1 remedy would be appropriate because PCE levels in groundwater reaching the intakes of water supply wells 13 and 14, which had been increasing at the time of the 2007 ROD, instead have been declining since the summer of 2007. The lower PCE levels in groundwater suggest that the extraction well system contemplated in the 2007 ROD is not needed to prevent more highly elevated levels of contamination from reaching wells 13 and 14. The existing treatment systems at VGC water supply wells 13 and 14 have been, and are expected to continue to effectively provide a safe drinking water supply. The attenuating nature of the PCE-dominant portion of the plume indicates that the source of the PCE may be depleting and that the highest levels of contamination have already passed through the well head treatment systems at VGC supply wells 13 and 14. A final decision regarding the groundwater contamination will be made following the EPA's completion of additional investigations at the Site.

In addition, RD sampling conducted by the Respondent at, and in the area around the Fulton Property did not identify PCE source material in the shallow aquifer in the immediate vicinity of the former drywell nor immediately downgradient of the Fulton Property. Consequently, the Amended OU1 ROD also eliminated ISCO treatment of the shallow aquifer at or immediately downgradient of the Fulton Property.

PCE concentrations in the PCE-dominant portion of the plume are generally declining while elevated levels of PCE continue to be present in one monitoring well approximately 400 feet downgradient of the Fulton Property, the source(s) of such PCE are believed to be other unrelated properties in the vicinity. The EPA expects to continue the investigation of potential source material.

During 2015-2016, the 2016 CJ and 2016 SOW were negotiated, signed by the Respondent and EPA, and approved and entered by the United States District Court for the Eastern District of New York on 15 August 2016. Further, the VGC and the Respondent have entered into a separate agreement in *Incorporated Village of Garden City v. Genesco Inc. and Gordon Atlantic Corp.*, Civil Action No. 07-cv-5244 (E.D.N.Y.) whereby, in exchange for a lump sum payment, the VGC has agreed to, among other things:

- Operate VGC water supply wells 13 and 14 with the air stripper treatment systems for 30 years at pumping levels consistent with the 2009 operation of those wells;
- Not to take any action that would reduce the volume, level of treatment or hydraulic control at the wells except with the consent of EPA regardless of whether those wells are needed for a potable water supply; and
- Operate, maintain, repair, and replace equipment of, as necessary, the two air strippers on those wells as called for in the Amended OU1 ROD.

The aforementioned agreement will facilitate the Respondent's performance of the Work in accordance with the Amended OU1 ROD, and the 2016 CJ with attached 2016 SOW, including all terms, conditions and schedules set forth herein or developed and approved thereunder.

GOALS OF THE WORK: A Long-Term Groundwater Monitoring Plan will be developed to determine the long-term effectiveness of the OU1 remedy. In particular:

- Assessing whether the concentrations and extent of groundwater contaminants related to OU1 are continuing to decrease or whether they pose a risk of exceeding the treatment capacity of the VGC water supply wells 13 and 14 so as to warrant upgrades to the treatment systems; and
- To confirm that the PCE-dominant portion of the plume continues to be captured and treated by VGC water supply wells 13 and 14 and not migrating past those wells toward the Franklin Square wells located further downgradient.

Other monitoring actions will be confirming that the VGC:

- Continues to operate VGC water supply wells 13 and 14 with the air stripper treatment systems for 30 years at pumping levels consistent with the 2009 operation of those wells;
- Does not to take any action that would reduce the volume, level of treatment or hydraulic control at the wells except with the consent of EPA regardless of whether those wells are needed for a potable water supply; and
- Continues to operate, maintain, repair, and replace equipment of, as necessary, the two air strippers on those wells as called for in the Amended OU1 ROD.

KEY INFORMATION INPUTS: The work will primarily rely on groundwater monitoring well data set which will be supplemented by routine VGC water supply well pumpage and sampling results provided by the VGC Department of Public Works. Those data will be used to evaluate the long-term effectiveness of the remedy and VGC conformance to agreed-upon terms as listed above in #2.

BOUNDARIES OF THE WORK: The 2016 SOW prepared by EPA establishes a long-term groundwater monitoring and reporting program. Groundwater samples for VOC analysis will be collected from wells located within the footprint of the PCE-dominant portion of the plume extending from the Garden City Park Industrial Area within which the Fulton Property is located to the multi-level wells on the Garden City Country Club golf course that are located downgradient of VGC water supply wells 13 & 14.

ANALYTIC APPROACH/ DATA ACQUISITION OVERVIEW: The 2016 SOW establishes a long-term groundwater monitoring and reporting program. Groundwater samples will be collected from wells located within the footprint of the PCE-dominant portion of the plume extending from the Garden City Park Industrial Area within which the Fulton Property is located to the multi-level wells on the Garden City Country Club golf course that are located downgradient of VGC water supply wells 13 & 14.

Well sampling frequencies are based on relative position within the groundwater plume and proximity to VGC water supply wells 13 & 14 where the wells have been divided into three groups and will be sampled according to the schedules set forth below. All groundwater samples shall be analyzed for Target Compound List VOCs using EPA Method 8260C or another method as required by EPA. See Worksheet #17: Sample Design & Rationale, for specific details along with Worksheets #18-28 & 30 that specify both sampling and analytical design requirements.

Groundwater monitoring will be performed to determine the long-term effectiveness of the OU1 remedy, including assessing whether the concentrations and extent of groundwater contaminants related to OU1 are continuing to decrease or whether they pose a risk of exceeding the treatment capacity of the VGC water supply wells 13 & 14 so as to warrant upgrades to the existing treatment systems. The groundwater monitoring data set will be supplemented by routine VGC water supply well sampling results provided by the VGC Department of Public Works.

PERFORMANCE/ACCEPTANCE CRITERIA: Field and laboratory performance and data quality acceptance criteria are guided by Data Quality Objectives (DQOs) which are qualitative and quantitative criteria required supporting the decision-making process. DQOs define the uncertainty in a data set

and are expressed in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC). The DQOs apply to both characterization and confirmation samples at the site. These parameters are defined as follows:

- **Precision:** a measure of mutual agreement among measurements of the same property usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist depending upon the "prescribed similar conditions".
- **Accuracy:** the degree of agreement of a measurement (or an average of measurements) with an accepted reference of "true value". Accuracy is one estimate of the bias in a system.
- **Representativeness:** expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.
- **Completeness:** a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions
- **Comparability:** expresses the confidence with which one data set can be compared with another. Comparability is a qualitative, not quantitative measurement, as in the case of accuracy and precision. Comparability is assessed by reviewing results or procedures for data that do not agree with expected results.

It is the responsibility of the field team to collect representative and complete samples. It is the responsibility of the analytical laboratory personnel to analyze these samples using accepted protocols resulting in data that meet PARCC standards.

Field Sampling Quality Objectives: The overall quality of sample results depends on proper sample management. Management of samples begins prior to sample collection and continues throughout the analytical and data validation process. To ensure samples are collected and managed properly and consistently, field procedures for sample collection activities have been developed for the project. The laboratory also has procedures that ensure a proper and consistent analytical process.

Field procedures include descriptions of equipment and procedures required to perform a specific task. The purpose is to increase reproducibility and to document each of the steps required to perform the task. Approved and correctly implemented field procedures should produce data of acceptable quality that meet project DQOs. See Worksheets #14, 16-22, 26, 27, 29 & 30.

Laboratory Data Quality Objectives: Accutest Laboratories of Dayton, New Jersey is the selected project laboratory. This laboratory will demonstrate analytical precision and accuracy by the analysis of laboratory duplicates and by adherence to accepted manufacture and procedural methodologies. See Worksheets #12, 15, 19, 23 – 28 & 30.

Laboratory performance will be evaluated by the Project Coordinator and the Project Quality Assurance Officer during data reduction. The evaluation will include a review of all deliverables for completeness and accuracy when applicable. This evaluation process is outlined in Worksheets #31-37.

DETAILED PLAN FOR OBTAINING DATA: Groundwater monitoring well sampling frequencies are based on relative position within the groundwater plume and proximity to VGC water supply wells 13 & 14 where the wells have been divided into three groups and will be sampled according to the schedules set forth below. All groundwater samples shall be analyzed for Target Compound List VOCs using EPA Method 8260C or another method as required by EPA. See Worksheet #17: Sample Design & Rationale, for specific details along with Worksheets #18-28 & 30 that specify both sampling and analytical design requirements.

QAPP Worksheet #12: Measurement Performance Criteria

Matrix	Aqueous
Analytical Group	Volatile Organic Compounds
Concentration Level	**All**

Sampling Procedure[1]	**Analytical Method/SOP[2]**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S & A)**
All SOPs See Attachment B	8260C/EMS8260C-18 See Attachment C	Laboratory Accuracy/bias-Contamination Control	Concentration of the target analyte must be less than the RL.	Method Blank	A
		Precision	Various per compound; see Worksheet #15	Laboratory Duplicate, Matrix Spike Duplicate (MSD), Field Duplicates	A & S
		Accuracy/bias Matrix effects	Various per compound; see Worksheet #15	Matrix Spike	A & S
		Laboratory Accuracy	The laboratory control sample will be used by the laboratory to assess efficiency of the instrument. Various per compound see Worksheet #15	Laboratory Control Sample	A
		Accuracy/bias	± 30% of true value	Initial Calibration Verification	A
		Accuracy/bias	± 20% of true value	Continuing Calibration Verification	A
		Completeness	90%	Sample Count	S
		Representativeness/ bias (contamination)	<RL; except for methylene chloride, acetone, and 2-butanone, which must be 2 times the RL	Trip Blank Field Blank	A & S

1. See Attachment B & Worksheet #21 for detailed information.
2. See Attachment C & Worksheet #23 for detailed information.
3. Only data undergoing validation may be rejected.

QAPP Worksheet #13: Secondary Data Uses & Limitations

Secondary Data	Data Source	Data Generator(s)	How Data Will Be Used	Limitations on Data Use
VGC Public Supply Well Monthly Sampling, Analytical And Pumpage Data	VGC Department of Public Works - Water Department	VGC Water Department & H2M Laboratories, monthly sampling	Monitoring the long-term effectiveness of the OU1 remedy, including assessing whether the concentrations and extent of groundwater contaminants related to OU1 are continuing to decrease or whether they pose a risk of exceeding the treatment capacity of the VGC water supply wells 13 and 14 so as to warrant upgrades to the treatment systems.	N/A
EPA OU2 Investigative Data	EPA & Various Contractors	EPA & CLP laboratories		
Regional Hydrogeologic Information	United States Geological Survey			

QAPP Worksheet #14/16: Project Tasks & Schedule

Key Project Task	Description
Field Sampling Mobilization/Demobilization	Access arrangements, notifications to Garden City Country Club, VGC Department of Public Works, VGC Police Department, VGC Water Department and owner of Fulton Property for use of the staging area, subcontractor procurement, laboratory coordination for groundwater sample collection, and sampling equipment rental, decontamination, calibration & return.
Environmental Sample Collection	Collection of groundwater monitoring well samples.
Laboratory Analysis	Accutest Laboratories will perform all laboratory analyses. The specific criteria for each project sampling task are detailed in Worksheet #18.
Quality Control	QA/QC sampling requirements are outlined in Worksheet #20. All project personnel are expected to review and comply with the QA/QC protocol and guidance presented in this document.
Secondary Data Acquisition	Secondary Data: See Worksheet #13.
Data Management	After appropriate QA/QC review, data will be compiled in an electronic database and presented in the quarterly progress, letter reports and the RD and RA Reports.
Data Review	QA/QC review and validation of data will be managed by ERM QA officer.
Documentation & Records	All documents will be managed and retained by the ERM Project Coordinator in the central project file.
Assessments/Audits	QA/QC audits will be performed by Project Coordinator, ERM Principal In Charge and ERM QA Officer.
Five-Year Reviews	EPA will perform Site condition reviews on a 5-year frequency.
Institutional/Engineering Control Certifications	Certifications that any institutional and engineering controls are in-place and being complied with will be provided by the Respondent every five years to coincide with the EPA Five-Year Reviews.

The above tasks are primarily related to long-term, recurring groundwater monitoring and reporting. The associated schedules and key deliverables are outlined in the OU1 RA project schedules presented in Figure 3.

QAPP Worksheet #15: Project Action, Laboratory-Specific Detection/Quantitation & Control Limits

Sample Type: Groundwater Monitoring Well Samples
Matrix: Aqueous
Concentration Level: Low
Analytical Group: VOCs

Target Compound List (TCL) [1]	CAS Number [2]	Project Action Limit (µg/l) [3]	Achievable Laboratory Limits [4]		Laboratory Control Limits (%)			
			Reporting Limit (µg/l)	Method Detection Limit (µg/l)	Matrix Spike/Matrix Spike Duplicate	Relative Percent Difference	Blank Spike	Duplicates
1,1,1-Trichloroethane	71-55-6	5	1	0.22	70-147	13	83-134	20
1,1,2,2-Tetrachloroethane	79-34-5	5	1	0.39	70-122	10	74-119	20
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	5	5	1.2	56-179	17	67-159	20
1,1,2-Trichloroethane	79-00-5	1	1	0.28	78-122	10	84-119	20
1,1-Dichloroethane	75-34-3	5	1	0.21	71-131	12	79-124	20
1,1-Dichloroethene	75-35-4	5	1	0.2	57-149	14	69-136	20
1,2,3-Trichlorobenzene	87-61-6	5	1	0.5	68-135	13	73-130	20
1,2,4-Trichlorobenzene	120-82-1	5	1	0.5	73-136	13	79-129	20
1,2-Dibromo-3-chloropropane	96-12-8	0.04	2	0.69	66-128	12	71-124	20
1,2-Dibromoethane	106-93-4	0.0006	1	0.22	77-119	10	79-120	20
1,2-Dichlorobenzene	95-50-1	3	1	0.23	78-122	10	84-117	20
1,2-Dichloroethane	107-06-2	0.6	1	0.39	72-135	11	81-127	20
1,2-Dichloropropane	78-87-5	1	1	0.33	76-122	11	81-118	20
1,3-Dichlorobenzene	541-73-1	3	1	0.19	77-120	10	83-114	20
1,4-Dichlorobenzene	106-46-7	3	1	0.21	75-122	10	83-115	20
2-Butanone	78-93-3	50	10	1.9	57-141	16	71-127	20
2-Hexanone	591-78-6	50	5	1.5	63-135	13	71-125	20
4-Methyl-2-pentanone	108-10-1	5	5	1.2	71-131	12	77-123	20
Acetone	67-64-1	50	10	5	39-143	16	49-137	20
Benzene	71-43-2	1	0.5	0.14	54-138	11	80-118	20
Bromochloromethane	74-97-5	5	1	0.46	79-123	11	84-120	20
Bromodichloromethane	75-27-4	50	1	0.55	78-123	10	83-119	20
Bromoform	75-25-2	50	1	0.34	71-128	11	77-126	20
Bromomethane	74-83-9	5	2	0.46	52-140	16	57-133	20
Carbon disulfide	75-15-0	60	2	0.33	51-156	14	61-144	20

Target Compound List (TCL) [1]	CAS Number [2]	Project Action Limit (µg/l) [3]	Achievable Laboratory Limits [4]		Laboratory Control Limits (%)			
			Reporting Limit (µg/l)	Method Detection Limit (µg/l)	Matrix Spike/Matrix Spike Duplicate	Relative Percent Difference	Blank Spike	Duplicates
Carbon tetrachloride	56-23-5	5	1	0.54	65-148	13	77-134	20
Chlorobenzene	108-90-7	5	1	0.17	76-125	10	85-116	20
Chloroethane	75-00-3	5	1	0.44	55-142	16	62-133	20
Chloroform	67-66-3	7	1	0.23	77-131	11	84-125	20
Chloromethane	74-87-3	5	1	0.96	43-144	17	51-134	20
cis-1,2-Dichloroethene	156-59-2	5	1	0.31	59-134	11	79-118	20
cis-1,3-Dichloropropene	10061-01-5	0.4	1	0.19	80-124	10	86-119	20
Cyclohexane	110-82-7	5	5	0.73	41-160	18	60-134	20
Dibromochloromethane	124-48-1	50	1	0.23	77-124	10	82-121	20
Dichlorodifluoromethane	75-71-8	5	2	0.7	31-155	20	43-135	20
Ethylbenzene	100-41-4	5	1	0.2	48-143	11	84-115	20
Isopropylbenzene	98-82-8	5	1	0.16	70-131	12	80-121	20
m,p-Xylene	179601-23-1	5	1	0.42	50-144	12	85-117	20
Methyl acetate	79-20-9	5	5	1.5	60-127	13	69-126	20
Methyl tert-butyl ether	1634-04-4	10	1	0.34	70-127	11	80-121	20
Methylcyclohexane	108-87-2	5	5	0.78	43-163	17	61-138	20
Methylene chloride	75-09-2	5	2	1	69-127	12	75-122	20
o-Xylene	95-47-6	5	1	0.21	62-137	12	85-119	20
Styrene	100-42-5	5	1	0.27	76-128	11	86-118	20
Tetrachloroethene	127-18-4	5	1	0.23	55-144	12	70-134	20
Toluene	108-88-3	5	1	0.23	61-136	11	84-117	20
trans-1,2-Dichloroethene	156-60-5	5	1	0.36	64-134	12	73-125	20
trans-1,3-Dichloropropene	10061-02-6	0.4	1	0.26	78-124	11	84-121	20
Trichloroethene	79-01-6	5	1	0.26	62-141	11	84-120	20
Trichlorofluoromethane	75-69-4	5	2	0.58	50-152	16	63-133	20
Vinyl chloride	75-01-4	2	1	0.33	44-136	16	55-121	20
Xylene (total)	1330-20-7	5	1	0.21	56-141	11	85-117	20

1. Target Compound List (TCL) from Multi-Media, Multi-Concentration Organics Analysis, SOM01.2, Exhibit C, 1.0.
2. Chemical Abstracts Service (CAS) Registry Number.
3. New York State Ambient Ground Water Quality Standards and Guidance Values (AWGS) as listed in TOGS 1.1.1 (June 1998) and in 6 NYCRR 703.5.
4. As per Accutest Laboratories, 2235 Route 130, Dayton, New Jersey 08810.

QAPP Worksheet #17: Sampling Design & Rationale

This section describes the rationale for, and specific details of the long-term groundwater monitoring and reporting program designed by EPA and specified in the 2016 SOW. Groundwater monitoring will be performed to determine the long-term effectiveness of the OU1 remedy, including assessing whether the concentrations and extent of groundwater contaminants related to OU1 are continuing to decrease or whether they pose a risk of exceeding the treatment capacity of the VGC water supply wells 13 & 14 that could warrant upgrades to the treatment systems. Groundwater samples will be collected from wells located within the footprint of the PCE-dominant portion of the plume extending from the Garden City Park Industrial Area within which the Fulton Property is located to the multi-level wells on the Garden City Country Club Golf Course that are located downgradient of VGC water supply wells 13 & 14. These wells were installed at locations and depths that encompass the PCE-dominant portion of the plume in three dimensions inclusive of wells that are generally aligned with the longitudinal axis of the plume, i.e., biased toward the core of the plume. The groundwater monitoring data set will be supplemented by collection of QA/QC samples to support data review/validation and confirm DQOs are being met, as well as routine VGC water supply well sampling results provided by the VGC Department of Public Works.

In accordance with the requirements set forth in the 2016 SOW, groundwater samples shall be collected and analyzed from the following wells at the Site:

GCP-01S/D, GCP-08, GCP-15S, GCP-18S/D MW15A-B, MW20A-C, MW21A-D, MW22A-C, MW23A-D, MW26A-H, MW27A-H & MW28A-H.

Local groundwater monitoring and public supply well locations and the general historical outline of the PCE- and the known extent of the TCE-dominant portion of the plume are shown in Figure 2. Groundwater monitoring well locations are shown in the figure/photo log in Attachment D. Well sampling frequencies are based on relative position within the groundwater plume and proximity to VGC water supply wells 13 & 14 where the wells have been divided into three groups and will be sampled according to the schedules set forth below. All groundwater samples shall be analyzed for Target Compound List VOCs using EPA Method 8260C or another method as required by EPA.

Group 1 Wells consist of the following 18 wells: GCP-01S/D, GCP-08, GCP-18S/D, GCP-15S, MW15A-B, MW20A-C, MW22A-C & MW23A-D that shall be sampled at the following frequency:

- The first sampling round shall commence within 20 days of EPA approval of the RD Work Plan, and
- Sampling shall be performed every 24 months thereafter.

Group 2 Wells are the following four wells: MW21A-D that shall be sampled and analyzed at the following frequency:

- Year 1 – quarterly, to commence approximately 30 days after completion of construction of MW21D and MW28A-H
- Year 2 – semi-annually (every six months)
- Year 3 – semi-annually (every six months)
- Year 4 – no sampling and analysis
- Year 5 (and beyond) – once in year 5 and every 24 months thereafter.

Group 3 Wells are the following 24 wells: MW26A-H, MW27A-H & MW28A-H that shall be sampled and analyzed at the following frequency:

- Year 1 – quarterly, to commence approximately 30 days after completion of construction of MW21D and MW28A-H
- Year 2 –9 of 24 zones with EPA approval of the specific zones, semi-annually (every six months)
- Year 3 – 9 of 24 zones with EPA approval of the specific zones, semi-annually (every six months)
- Year 4 – no sampling and analysis
- Year 5 (and beyond) – once in year 5 and every 24 months thereafter.

See Tables 1 & 2 and Worksheets #18, 19, 20, 21, 22, 26, 27 & 30 for specific information regarding well construction information, sampling methods/requirements, sample containers, preservation & hold times, field QC requirements, field SOPs, and field equipment calibration, maintenance, testing & inspection requirements.

QAPP Worksheet #18: Sampling Locations & Methods

Sampling Location	Matrix	Sample Depth (feet)	Analytical Group	Analytical Method	Number of Samples [1]	Sampling SOP Reference [2]	Rationale for Sampling Locations
Monitoring Wells		Tables 1 & 2 [3]			**See Preceding Worksheet #17** Number of Samples and Schedule Varies By Group & Year	SOP 1: Water Level Measurement Procedures SOP 2: Groundwater Sampling Procedures SOP 3: Field Blanks SOP 4: Trip Blanks SOP 5: Decontamination Procedures SOP 6: Waste Management & Disposal	Described In Worksheet #17
GCP01	Aqueous	54	TCL VOCs	8260C			
GCP01D	Aqueous	110	TCL VOCs	8260C			
GCP08	Aqueous	55	TCL VOCs	8260C			
GCP15S	Aqueous	49	TCL VOCs	8260C			
MW15A	Aqueous	145	TCL VOCs	8260C			
MW15B	Aqueous	355	TCL VOCs	8260C			
GCP18D	Aqueous	118	TCL VOCs	8260C			
GCP18S	Aqueous	46.5	TCL VOCs	8260C			
MW20A	Aqueous	145	TCL VOCs	8260C			
MW20B	Aqueous	249	TCL VOCs	8260C			
MW20C	Aqueous	405	TCL VOCs	8260C			
MW21A	Aqueous	125	TCL VOCs	8260C			
MW21B	Aqueous	335	TCL VOCs	8260C			
MW21C	Aqueous	395	TCL VOCs	8260C			
MW21D	Aqueous	TBD	TCL VOCs	8260C			
MW22A	Aqueous	125	TCL VOCs	8260C			
MW22B	Aqueous	275	TCL VOCs	8260C			
MW22C	Aqueous	315	TCL VOCs	8260C			
MW23A	Aqueous	265	TCL VOCs	8260C			
MW23B	Aqueous	349	TCL VOCs	8260C			
MW23C	Aqueous	403	TCL VOCs	8260C			
MW23D	Aqueous	447	TCL VOCs	8260C			
MW26A	Aqueous	229	TCL VOCs	8260C			

Sampling Location	Matrix	Sample Depth (feet)	Analytical Group	Analytical Method	Number of Samples [1]	Sampling SOP Reference [2]	Rationale for Sampling Locations
MW26B	Aqueous	271.5	TCL VOCs	8260C	**See Preceding Worksheet #17** Number of Samples and Schedule Varies By Group & Year	SOP 1: Water Level Measurement Procedures SOP 2: Groundwater Sampling Procedures SOP 3: Field Blanks SOP 4: Trip Blanks SOP 5: Decontamination Procedures SOP 6: Waste Management & Disposal	Described In Worksheet #17
MW26C	Aqueous	325	TCL VOCs	8260C			
MW26D	Aqueous	350.5	TCL VOCs	8260C			
MW26E	Aqueous	377	TCL VOCs	8260C			
MW26F	Aqueous	410.5	TCL VOCs	8260C			
MW26G	Aqueous	443	TCL VOCs	8260C			
MW26H	Aqueous	478.5	TCL VOCs	8260C			
MW27A	Aqueous	197	TCL VOCs	8260C			
MW27B	Aqueous	241.5	TCL VOCs	8260C			
MW27C	Aqueous	289	TCL VOCs	8260C			
MW27D	Aqueous	329.5	TCL VOCs	8260C			
MW27E	Aqueous	369	TCL VOCs	8260C			
MW27F	Aqueous	413.5	TCL VOCs	8260C			
MW27G	Aqueous	443	TCL VOCs	8260C			
MW27H	Aqueous	476.5	TCL VOCs	8260C			
MW28A	Aqueous	97	TCL VOCs	8260C			
MW28B	Aqueous	219.5	TCL VOCs	8260C			
MW28C	Aqueous	317	TCL VOCs	8260C			
MW28D	Aqueous	345.5	TCL VOCs	8260C			
MW28E	Aqueous	367	TCL VOCs	8260C			
MW28F	Aqueous	403.5	TCL VOCs	8260C			
MW28G	Aqueous	439	TCL VOCs	8260C			
MW28H	Aqueous	490.5	TCL VOCs	8260C			

1. QA/QC samples collected at the frequency specified on Worksheet #20.
2. See Attachment B & Worksheet #21 for additional information.
3. Detailed well construction and relevant sampling information is provided in Tables 1 & 2.

QAPP Worksheet #19 & 30: Sample Containers, Preservation & Hold Times

Sample Location	Matrix	Analytical Group	Preparation & Analytical Method/SOP Reference [1]	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time [2] (preparation/analysis)
Groundwater Monitoring Samples	Aqueous	TCL VOCs	8260C /EMS8260C-18	3 – 40 ml glass VOA vials	Cool 4°C, pH<2 (HCl)	NA/10 days

1. See Worksheet #23 for additional information.
2. New York State Analytical Services Protocol (NYS ASP) holding times and are from date of sample receipt.

Analytical Services

Matrix	Analytical Group	Concentration Level	Sample Location/ID Numbers	Analytical SOP	Laboratory Data Package Turnaround [1]	Laboratory/Certification/ Organization Contact	Backup Laboratory/ Organization
Aqueous	TCL VOCs	All	As Noted In Preceding Worksheets #17 & #18, The Number of Samples & Sampling Schedule Varies By Group & Year	Accutest SOP EMS8260C-18: Method 8260C Volatile Organic Compounds By Gas Chromatography/ Mass Spectometry (GC/MS) See Attachment C	21 days	Accutest Laboratories 2235 Route 130 Dayton, New Jersey 08810 NY Cert 10983 DoD ELAP (LAB L2248) Current NYSDOH Certificates of Approval For Laboratory Service with expiry of 4/1/19 is provided in Attachment C Tammy McCloskey Accutest Project Manager 732-355-4562	It is not anticipated that a backup laboratory will be required. However Accutest has an extensive laboratory network. The Acutest New England facility follows all QA/QC protocol as the Accutest New Jersey facility. 295 Technology Center West Building One Malborough, MA 01752 508-481-6200 NY Cert 11791

1. Final laboratory deliverable will be a NYSDEC Category B deliverable.

QAPP Worksheet #20: Field QC Summary

Sample Location	Matrix	Analytical Group	Analytical & Preparation SOP Reference [1]	No. of Sampling Locations	Blind Field Duplicate Samples	MS/MSD Pairs	Field Equipment Blanks	Trip Blanks	PT Samples	Total No. of Samples to Lab
Groundwater Monitoring Samples As Listed In Worksheet #18	Aqueous	TCL VOCs	8260C / EMS8260C-18	As Noted In Preceding Worksheets #17 & #18, The Number of Samples & Sampling Schedule Varies By Group & Year	1 minimum frequency of 1 out of every 20 samples.	1 minimum frequency of 1 out of every 20 samples.	Equipment blanks shall be collected daily after the equipment has been deconned.	Each cooler of samples sent to the laboratory for analysis containing VOC samples shall contain a trip blank	None	
				>1,000	>50	>50	>50	>50		>1,200

TBD: To Be Determined

1. Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

BLIND FIELD DUPLICATES

Blind field duplicate samples are two (or more) field samples taken at the same time in the same location. They are intended to represent the same population and are taken through all steps of the analytical procedure in an identical manner. These samples are used to assess precision of the entire data collection activity, including sampling, analysis, and site heterogeneity. One of the samples is given identification such that the laboratory does not know the true location of the sample. Blind field duplicate samples are collected simultaneously or in immediate succession, using identical recovery techniques, and are treated in an identical manner during storage, transportation, and analysis. The Field Team Leader shall assign to the sample containers a unique identification number in the field. Specific locations should be designated for collection of Blind field duplicate samples prior to the beginning of sample collection. A minimum of one Blind field duplicate sample shall be included for every 20 field samples per matrix and evaluated as detailed on Worksheet #28.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE

The matrix spike (MS) and matrix spike duplicate (MSD) is an aliquot of sample spiked with known concentrations of all target analytes. The spiking occurs prior to sample preparation and analysis. Each analyte in the MS and MSD shall be spiked at a level less than or equal to the midpoint of the calibration curve for each analyte. The MS/MSDs are used to document potential matrix effects. A minimum of one MS and one MSD shall be analyzed for every 20 samples. The performance of the MS and MSD is evaluated as detailed on Worksheet #28.

FIELD EQUIPMENT BLANK

The field equipment blank is a sample of American Society for Testing and Materials (ASTM) Type II reagent grade water or organic-free water poured into or over or pumped through the sampling device, collected in a sample container, and transported to the laboratory for analysis. These may also be called rinse blanks or rinsate blanks. In instances where dedicated sampling equipment is used for sample collection, equipment blanks will not be collected. In these instances, field blanks will be used to assess field QC procedures. Equipment blanks are used to assess the effectiveness of equipment decontamination procedures. Equipment blanks shall be collected daily, immediately after the equipment has been decontaminated after each sampling event. The equipment blank samples shall be analyzed for all laboratory analytes requested for the environmental samples collected at the site. Results associated with a contaminated blank shall be qualified accordingly.

TRIP BLANK

The trip blank consists of a VOC sample vial filled in the laboratory by the laboratory with ASTM Type II reagent grade or organic-free water, transported to the sampling site, handled like an environmental sample and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are analyzed for VOCs only. Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. Each cooler of samples sent to the laboratory for analysis containing VOC samples shall contain a trip blank. Trip blanks will be evaluated as detailed on Worksheet #28.

PROFICIENCY TESTING (PT) SAMPLES

PT samples will not be analyzed for this project.

QAPP Worksheet #21: Field SOPs

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Check if yes)	Comments
SOP-1	Water Level Measurement Procedures	ERM	N/A	☐	Attachment B
SOP-2	Groundwater Sampling Procedures	ERM	N/A	☐	Attachment B
SOP-3	Field Blanks	ERM	N/A	☐	Attachment B
SOP-4	Trip Blanks	ERM	N/A	☐	Attachment B
SOP-5	Decontamination Procedures	ERM	N/A	☐	Attachment B
SOP-6	Waste Management and Disposal	ERM	N/A	☐	Attachment B

QAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing & Inspection

Field Equipment	Calibration Activity	Maintenance Activity	Daily Testing Activity	Daily Inspection Activity	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Photo Ionization Detector (PID) MinRAe 2000 or equivalent	2-point calibration with isobutylene & zero gas	Cleaning as required and replacement of consumable filters. All maintenance to be performed by equipment rental facility	Test operation of unit comparable to a known calibration standard gas before each use	Condition & operation of unit will be inspected before each use	0 ppm fresh air; 100 ppm Isobutylene –within ±10% of gas concentration	Contact equipment rental firm	Field Team Leader	N/A, reference manufacturer instructions
Water Quality Instrument: dissolved oxygen, temperature conductivity, pH and oxidation-reduction potential (ORP) Horiba U-52 Flow Cell or equivalent	Calibrate with rental facility supplied standard(s)	All maintenance to be performed by equipment rental facility	Test operation of unit comparable to a known calibration standard	Condition & operation of unit will be inspected before each use	+/- 0.03 mg/l for DO, +/- 0.1 pH unit, +/- 0.03% for conductivity, +/- 0.15 C for temp, +/- 1 mv for ORP +/- 5 NTU for tubdity (assumes low range calibration w/ 100 NTU or less standards)	Contact equipment rental firm	Field Team Leader	N/A, reference manufacturer instructions

FIELD INSTRUMENT PREVENTATIVE MAINTENANCE

Preventative maintenance of field instruments will include cleaning after each use and replacement of consumable components such as used filters. Field instruments will also be examined prior to each mobilization for field activities to identify maintenance issues. If maintenance issues exist, maintenance will be performed by the equipment rental facility. The equipment rental facility will be responsible for providing a timely replacement for any malfunctioning equipment.

CALIBRATION PROCEDURES AND FREQUENCY

Before a field instrument is used, the calibration will be verified using standard reference materials. The calibration verification may range from a single point to multiple points. The concentration of the standard, reference identification number, instrument response, instrument identification number, date, and time will be recorded on the daily instrument calibration log and referenced in the site field book. The calibration verification will be performed at least daily, or more frequently as warranted by field conditions. Instruments which do not meet minimum requirements for calibration will not be used and will be replaced by a properly calibrated instrument. It is anticipated that all field instruments which will require calibration will be provided by an equipment rental vendor. The specific model of the instrument provided may vary and the manufacturer's calibration and maintenance instructions should be referenced.

QAPP Worksheet #23: Analytical SOPs

Analytical Group	Matrix	Analytical SOP Title [1]	Analytical SOP Document Number	Analytical SOP Revision Number	Analytical SOP Revision Date	Organization Performing Analysis	Definitive or Screening Data	Modified for Project Work?
VOCs	Aqueous	Method 8260C, Volatile Organics by gas chromatography/mass spectrometry (GC/MS)	EMS8260C-18	18	04/13/17	Accutest	Definitive	No

1. See Attachment C.

QAPP Worksheet #24: Analytical Instrument Calibration

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA [1]	SOP Reference [2]
GC/MS HP 5890/5970 HP 6890/5973 Agilent 6890/5975	Initial Multi point with verification	As Required	target compounds <20% RSD, or Corr Coeff R ≥ 0.99, meet min.RF	Instrument maintenance, standard, inspection, recalibration	Laboratory Analyst	EMS8260C-18
	Initial calibration verification (ICV)	After every initial calibration	≤ 30% Diff			
	Continuing Calibration Verification (CCV)	Daily	≤ 20 % Diff			

1. Each instrument has a different analyst.
2. See Attachment C & Worksheet #23 for additional information.

QAPP Worksheet #25: Analytical Instrument/Equipment Maintenance, Testing & Inspection

Instrument/ Equipment	Maintenance Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person [1]	SOP Reference[2]
GC/MS HP 5890/5970 HP 6890/5973 Agilent 6890/5975	Bake Purge tube, trap, transfer line, clip column	Leak test, column and injection port inspection, source insulator integrity	Daily or as needed	Passing BFB and CCV, passing internal standards response	Perform maintenance, check standards, recalibrate	Laboratory Analyst	EMS8260C-18

1. Each instrument has a different analyst.
2. See Attachment C & Worksheet #23 for additional information.

QAPP Worksheet #26 & 27: Sample Handling, Custody & Disposal

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Brice Lynch, P.G. / ERM
Sample Packaging (Personnel/Organization): Brice Lynch, P.G. / ERM
Coordination of Shipment (Personnel/Organization): Brice Lynch, P.G. / ERM
Type of Shipment/Carrier: Accutest Laboratories employee/courier or Priority Overnight / Federal Express
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Custodian / Accutest Laboratories (Dayton, New Jersey)
Sample Custody and Storage (Personnel/Organization): Sample Custodian / Accutest Laboratories (Dayton, New Jersey)
Sample Preparation (Personnel/Organization): Individual Department Heads / Accutest Laboratories (Dayton, New Jersey)
Sample Determinative Analysis (Personnel/Organization): Project Manager – Accutest Laboratories (Dayton, New Jersey)
SAMPLE ARCHIVING
Field Sample Storage (# of days from sample collection): Samples collected in the field will be preserved as specified in Worksheet #19 and placed in a chilled cooler for priority overnight shipment to the analytical laboratory. It is the responsibility of the sample collection personnel to maintain appropriate custody of the cooler, ensure samples are packed appropriately to prevent breakage and ensure that the samples are preserved appropriately (e.g., chilled on ice). If special circumstances arise and the samples cannot be shipped the same day of sample collection, it is the sampler's responsibility to maintain appropriate custody and the temperature of the cooler until the samples are shipped the next day. Sample holding times and preservation methods are presented in Table #19.
Sample Extract/Digestate Storage (# of days from extraction/digestion): See Worksheet #19
Biological Sample Storage (No. of days from sample collection): N/A
SAMPLE DISPOSAL
Personnel/Organization: Sample Custodian/Accutest Laboratories (Dayton, New Jersey)
Number of Days from Analysis: 1 month from submission of the hard copy report to ERM unless otherwise requested.

SAMPLE CUSTODY PROCEDURES

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):

The following documentation procedures will be used during sampling and analysis to provide custody control during transfer of samples from collection through storage. A sample is defined as being under a person's custody if any of the following conditions exist: 1) it is in their possession, 2) it is in their view, after being in their possession, 3) it was in their possession and they locked it up, or 4) it is in a designated secure area. Recordkeeping documentation will include the use of the following:

- A field logbook (bound, with numbered pages) to document sampling activities in the field,
- Labels to identify individual samples,
- And- chain-of-custody forms to document the analyses to be performed

In the field the sampler will record in the field logbook the following information for each sample collected:

- Sample identification,
- Sample matrix,
- Name of the sampler,
- Sample location,
- Sample time and date,
- Additional pertinent data,
- Analysis to be conducted,
- Sampling method,
- Sample appearance (e.g., color, turbidity),
- Preservative (if required),
- Number of sample bottles an types, and- weather conditions

Samples will be packaged in a manner to prevent breakage of sample containers in a pre-chilled cooler. Custody of the samples and cooler will be the responsibility of the sampling personnel. Samples will be picked up by an Accutest courier or shipped via Federal Express Priority Overnight service to the analytical laboratory the same day samples are collected.

Laboratory Sample Custody Procedures (receipt of samples, archiving, and disposal): Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number. The laboratory sample custodian will record the client name, number of samples and date of receipt of the samples. The remaining sample aliquots not used by the laboratory for analysis will be archived for a period of 30 days. After the archive period has passed the sample will be disposed of by the laboratory unless a request to hold the sample is made by ERM.

Sample Identification Procedures: Each sample collected will be designated by an alpha-numeric code that will identify the type of sampling location and a specific sample designation (identifier). Location types will be identified by a two-letter code. Groundwater samples collected from various existing and future groundwater monitoring wells. For example sample nomenclature for monitoring well samples will be assigned as indicated in the following example:

MW-1A = Monitoring Well Sample-Well ID

In the case of QC samples such as field blanks, trip blanks and blind field duplicate samples, six digits will follow FB, TB and DUP respectively to represent the date (e.g., FB (050117) would represent a field blank collected on 01 April 2017). For matrix spike/matrix spike duplicate samples, MS/MSD will be added following the applicable sample identification.

Chain-of-Custody Procedures: The sampling crew shall maintain chain-of-custody records for all field and field QC samples. The following information concerning the sample shall be documented on the chain of custody form:

- Unique sample identification for each container,
- Date and time of sample collection,
- Source of sample (including name, location, and sample type),
- Designation of MS/MSD;
- Preservative used;
- Analyses required;
- Name of collector(s);
- Serial numbers of custody seals and transportation cases (if used);
- Custody transfer signatures, dates & times of sample transfer from the field to transporters & to the laboratory or laboratories; and
- Bill of lading or transporter tracking number (if applicable).

QAPP Worksheet #28: Analytical Quality Control & Corrective Action

Matrix Analytical Group	**Aqueous TCL VOCs**		**Sampler's Name**	**To Be Determined**	
Concentration Level	**Low**		**Field Sampling Organization**	**ERM**	
Sampling SOP	**SOPS 1, 2, 3, 4, 5 & 6**		**Analytical Organization**	**Accutest Laboratories**	
Analytical Method/SOP Reference	**8260C/ EMS8260C-18**		**No. of Sample Locations**	**To Be Determined By Specific Sampling Activity**	
QC Sample:	**Frequency/Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**
Method Blank	Each batch not to exceed 20 samples or every 12 hours thereafter	No targets above compound-specific MDLs listed in Worksheet #15	Reanalyze entire batch	Assigned Lab Analyst & Tammy McCloskey (Accutest)	Accuracy/Sensitivity/ Bias-Contamination
Lab Check Sample (Blank Spike)	Each batch not to exceed 20 samples	Recovery must fall within compound-specific in-house QC criteria[1] listed in Worksheet #15	Reanalyze entire batch	Assigned Lab Analyst & Tammy McCloskey (Accutest)	Laboratory Accuracy
Surrogates	Every sample and QC	Recovery must fall within in-house QC criteria[1] listed in Worksheet #15	Re-extract and reanalyze sample in order to determine matrix effect.	Assigned Lab Analyst & Tammy McCloskey (Accutest)	Accuracy/Bias
Internal Standard	Every sample and QC	-50 - + 100% of the midpoint of the ICAL standard	Reanalyze sample	Assigned Lab Analyst & Tammy McCloskey (Accutest)	Accuracy/Bias
Matrix Spike / Matrix Spike Duplicate Pair	1 / 20 samples	Recovery must fall within compound-specific in-house QC criteria[1]	Investigate possible matrix effect. Record in case narrative. Qualify data during validation process.	Assigned Lab Analyst & Andrew Coenen (ERM)	Accuracy/Bias
Blind Field Duplicate	1 / 20 samples	Relative percent difference (RPD) 20%	Qualify data during validation process.	Andrew Coenen (ERM)	Precision / Reproducibility
Field Blank Trip Blank	1 / day 1 / shipment of VOCs	Monitor for detected target compounds<RL; except for methylene chloride, acetone, and 2-butanone, which must be 2 times the RL	Qualify data during validation process.	Andrew Coenen (ERM)	Representativeness/Bias (Contamination)

1. In house QC criteria subject to change throughout the project. Will be monitored during the validation process.

QAPP Worksheet #29: Project Documents & Records

Sample Collection Documents & Records	On-site Analysis Documents & Records	Off-site Analysis Documents & Records	Data Assessment Documents & Records	Other
• Field Notebook • Monitoring Well Construction Logs • Well Development Log sheets • Sampling Equipment Checklists • Groundwater Sampling Log Sheets • Chain-of-Custody Forms • Air Bills	• Daily Instrument Calibration Logs • Field Notebook	• Sample Receipt Custody & Tracking Records • Laboratory Analytical Reports • Raw Data (archived electronically • Correspondence	• Data Validation Reports • Field Audit Checklists • Data Usability Summary Report.	All documents generated during the project will be recompiled and retained in the central project file. At the conclusion of the project an RA Report will be presented which will include as appendices many of the related project documents and records. Any documents not provided in the report will be presented to EPA upon request.

QAPP Worksheet #31 32 & 33: Assessments & Corrective Action

QAPP Worksheet #31: Planned Project Assessments

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title & Organization)	Person(s) Responsible for Responding to Assessment Findings (Title & Organization)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title & Organization)	Person(s) Responsible for Monitoring Effectiveness of CA (Title & Organization)
Field Sampling Protocol	Once at a minimum during sampling activities	Internal	ERM	ERM QA Officer ERM Field Team Leader	ERM Principal In Charge ERM QA Officer	Project Coordinator/ERM Principal Consultant	Project Coordinator/ERM Principal Consultant
Handling and Custody of Samples	Once at a minimum during sampling activities	Internal	ERM	ERM QA Officer ERM Field Team Leader	ERM Principal In Charge ERM Laboratory QA Officer	Project Coordinator/ERM Principal Consultant	Project Coordinator/ERM Principal Consultant
Analytical Laboratory Performance	The data validation process will satisfy the requirements of this audit	External	ERM	ERM Laboratory QA Officer	ERM Principal In Charge ERM Laboratory QA Officer	Project Coordinator/ERM Principal Consultant	Project Coordinator/ERM Principal Consultant

QAPP Worksheet #32: Assessment Findings & Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title & Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Timeframe for Response
Field Sampling Protocol	Electronic mail which documents the results of the audit will be submitted to the Project Coordinator.	Chris Wenczel Project Coordinator/ERM Principal Consultant/ Hydrogeologist	24 hours after audit	Electronic mail	All ERM project personnel listed on Worksheet #4-2	24 hours after notification
Handling and Custody of Samples	Electronic mail which documents the results of the audit will be submitted to the Project Coordinator.	Chris Wenczel Project Coordinator/ERM Principal Consultant/ Hydrogeologist	24 hours after audit	Electronic mail	All ERM project personnel listed on Worksheet #4-2	24 hours after notification
Analytical Laboratory Performance	Electronic mail which documents the results of the audit will be submitted to the Project Coordinator.	Chris Wenczel Project Coordinator/ERM Principal Consultant/ Hydrogeologist	24 hours after audit	Electronic mail	All ERM project personnel listed on Worksheet #4-2	24 hours after notification

QAPP Worksheet #33: QA Management Reports Table

Type of Report	Frequency (Daily Weekly Monthly Quarterly Annually Etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title & Organization)	Report Recipient(s) (Title & Organization)
Data Validation Reports See Worksheets # 35 & #36	Applicable only to groundwater monitoring samples	Three weeks after receipt of the laboratory data deliverable.	Mr. Andrew Coenen Laboratory QA Officer/ERM Senior Chemist	Chris Wenczel Project Coordinator/ERM Principal Consultant/ Hydrogeologist
Data Usability Assessment See Worksheet #37	Once after validated data is reviewed.	End of the Project prior to completion of final project report.	Mr. James Perazzo, P.G. Mr. Chris Wenczel, P.G. Mr. Brice Lynch, P.G. Mr. Andrew Coenen All ERM Personnel	Chris Wenczel Project Coordinator/ERM Principal Consultant/ Hydrogeologist
Final RA Report	Once at the end of the Project.	End of the Project.	Mr. Chris Wenczel Project Coordinator/ERM Principal Consultant/ Hydrogeologist	Distribution List presented on Worksheet # 3 less Mrs. Tammy McCloskey Accutest Laboratories

QAPP Worksheet #34: Data Verification & Validation Inputs

Verification Input	Description	Internal/ External	Responsible for Verification (Name & Organization)
Chain of Custody Forms	Chain of Custody (COC) Forms and FedEx shipping papers will be reviewed after the forms have been completed by the ERM sampler but prior to shipping any laboratory samples off-Site. All elements of the COC (requested analysis bottle qty. project information etc.) will be compared to the analytical criteria specified in the QAPP and to confirm that the labels and qty. of bottles in the cooler match the information specified on the COC. The FedEx shipping form will be reviewed to certify that the address information is correct all requested information is provided and that the appropriate shipping method (e.g. priority overnight Saturday delivery) has been marked so that the samples arrive at the lab according to holding time and temperature preservation requirements specified in the QAPP.	Internal	Brice Lynch, P.G. ERM Field Team Leader
Audit Reports	The results of the audit reports and project assessments presented in Worksheets #31 through #33 will be retained in the project file. As specified the results and findings will be reviewed with the appropriate members of the project team and confirmation that all corrective measures have been completed will be the responsibility of the Project Coordinator. Reference Worksheets #31 through #33 for further details.	Internal	Mr. Chris Wenczel, P.G. Project Coordinator/ERM Principal Consultant/ Hydrogeologist
Field Notes	It is imperative that detailed field notes are recorded real-time in the field to document project field activities. The field notes will be referenced during preparation of the OU1 RD Package and the Final RA Report and will be retained in the project file. A copy of the field notes will be provided as an Appendix to the final RA Report.	Internal	Brice Lynch ERM Field Team Leader Mr. Chris Wenczel, P.G. Project Coordinator/ERM Principal Consultant/ Hydrogeologist
Laboratory Data	All laboratory data will be reviewed internally by the analytical laboratory prior to reporting analytical results to ERM. All analytical laboratory data packages will comply with the 2005 NYSDEC ASP Category B reporting and deliverable requirements presented in Attachment E. Data generated from the Groundwater Monitoring samples will be validated according to the procedures specified in Worksheets # 35 and #36. A Data Usability Assessment will be prepared at the end of the project according to the protocol specified in Worksheet #37.	External Internal	Mrs. Tammy McCloskey Accutest Laboratories Project Manager Mr. Andrew Coenen ERM Laboratory QA Officer

QAPP Worksheet #35: Data Verification Procedures

Validation Input	Description	Responsible for Validation (Name Organization)
Review of Chain of Custodies (COCs)	The validator will review each COC as it is received by the laboratory from the field for accuracy of sample nomenclature and requested analysis. Issues will be brought to the attention of the laboratory contact and corrected immediately.	Mr. Andrew Coenen ERM Laboratory QA Officer
Field documentation	The Project Coordinator will review all field forms for completeness and adherence to the QAPP.	Mr. Chris Wenczel, P.G. ERM Project Coordinator
Review of SOPs	The validator will confirm that samples were collected and analyzed in accordance with applicable SOPs.	Mr. Andrew Coenen ERM Laboratory QA Officer
Documentation of Method QC Results	The validator will confirm that the appropriate number of QA/QC samples were collected by ERM and analyzed by the laboratory.	Mr. Andrew Coenen ERM Laboratory QA Officer
Review Raw Data	The validator will review 10% of the raw laboratory data to confirm the laboratories calculations.	Mr. Andrew Coenen ERM Laboratory QA Officer
Project Quantitation Limits	The validator will confirm that the sample results meet the project quantitation limits specified in the QAPP. If they do not the laboratory will be contacted and possible reanalysis may be required.	Mr. Andrew Coenen ERM Laboratory QA Officer

Groundwater monitoring samples only will undergo data validation. For each laboratory data deliverable the validator will prepare a Data Usability Report (DUSR). The DUSR will be prepared according to the guidelines established by Division of Environmental Remediation Quality Assurance Group and will review the following:

- Is the data package complete as defined under the requirements for the NYSDEC ASP Category B?
- Have all holding times been met?
- Do all the QC data: blanks instrument tunings calibration standards calibration verifications surrogate recoveries spike recoveries replicate analyses laboratory controls and sample data fall within the protocol required limits and specifications?
- Have all of the data been generated using established and agreed upon analytical protocols?
- Does an evaluation of the raw data confirm the results provided in the data summary sheets and qualify control verification forms?
- Have the correct data qualifiers been used?

Once the data package has been reviewed and the above questions asked and answered the DUSR will describe the samples and the analytical parameters data deficiencies analytical protocol deviations and quality control problems and their effect on the data. The DUSR shall also include recommendations on resampling/reanalysis if applicable. All data qualifications will be documented following the NYSDEC ASP '05 Rev. Guidelines.

QAPP Worksheet #36: Data Validation Procedures

Analytical Group/Method:	Volatile Organics – SW-846 8260C
Data Deliverable Requirements:	NYSDEC ASP Category B (pdf)
Analytical Specifications:	**Method 8260C: Accutest SOPEMS8260C-18**
Measurement Performance Criteria:	Provided In Both Worksheets #12 & 28
Percent Of Data Packages To Be Validated:	100%
Percent Of Raw Data Reviewed:	100%
Percent Of Results To Be Recalculated:	10%
Validation Procedure:	USEPA Hazardous Waste Support Section SOP Number HW-24 Revision 4 Validating Volatile Organic Compounds by Gas Chromotagraphy/Mass Spectometry SW-846 Method 8260B & 8260C – Signed October 2014[1,2]
Validation Code (*See Attached Table):	S3VM
Electronic Validation Program/Version:	N/A

1. The order in which the aforementioned guidance documents and/or criteria are listed does not imply a hierarchy of reliance on a particular document for validation.
2. The reviewer's professional judgment is an integral part of the validation process.

QAPP Worksheet #37: Data Usability Assessment

The Data Usability Assessment will revisit the DQOs to ascertain whether the data collected is adequate in quantity and quality to meet the project objectives. Also the usability assessment will be used to determine whether qualified data can be used to make project decisions.

The Data Usability Assessment will be performed by Mr. Chris Wenczel, P.G. **and Mr. Andrew Coenen.** Mr. Wenczel will be responsible for information in the Usability Assessment. He will also be responsible for assigning task work to the individual task members who will be supporting the Data Usability Assessment. Note that the Data Usability Assessment will be conducted on validated data only. The results of the Data Usability Assessment will be presented in the final report.

The following five step process that identifies key items will be used to assess the data set and draw conclusions based on their results:

Step 1	**Review The Project's Objectives And Sampling Design** Key project outputs defined during planning (i.e.,PQOs or DQOs and MPCs) will be reviewed to make sure they are still applicable. The sampling design will be reviewed for consistency with stated objectives to identify any deviations that provide context for interpreting the data in subsequent steps.
Step 2	**Review The Data Verification And Data Validation Outputs** Available QA reports, including the data verification and data validation reports will be reviewed. Basic calculations will be performed and the data will be summarized using graphs, maps, tables, etc. and evaluated to identify patterns, trends, and anomalies (i.e., unexpected results). Review deviations from planned activities (e.g., number and locations of samples, holding time exceedances, damaged samples, non-compliant PT sample results, and SOP deviations) will be reviewed to determine their impacts on the data usability. The implications of unacceptable QC sample results will be considered/evaluated.
Step 3	**Verify The Assumptions Of The Selected Statistical Method** The underlying assumptions for selected statistical methods will be reviewed to verify they are valid. Common assumptions include the distributional form of the data, independence of the data, dispersion characteristics, homogeneity, etc. Depending on the robustness of the statistical method, minor deviations from assumptions usually are not critical to statistical analysis and data interpretation. However, if serious deviations from assumptions are discovered, then another statistical method may need to be selected.
Step 4	**Implement The Statistical Method** The data set will be evaluated using the following statistical/ quantitative methods/criteria: **Precision –** Results of all blind field duplicates will be discussed for each analysis. For each duplicate pair the relative percent difference (RPD) will be calculated for each analyte whose original and duplicate values are either greater than or equal to the quantitation limit. The RPDs will be checked against the measurement performance criteria presented on Worksheets #12 & 15. The RPDs exceeding criteria will be identified. The discussion will summarize the results. Any conclusions about the precision of the analyses will be drawn and any limitations on the use of the data will be described.

If calculated from duplicate measurements:

$$RPD = \frac{(C1 - C2) \times 100\%}{(C1 + C2) / 2}$$

where,
RPD = relative percent difference
C1 = larger of the two observed values
C2 = smaller of the two observed values

Accuracy/Bias Contamination – Results for all laboratory method blanks and instrument blanks will be discussed for each analysis for Confirmatory Post Excavation and Post-Removal Ground water samples only. The results for each analyte will be checked against the measurement performance criteria presented on Worksheet #12. Results for analytes that exceed criteria will be discussed. The discussion will summarize the results of the laboratory accuracy/bias. Any conclusions about the accuracy/bias of the analyses based on contamination will be drawn and any limitations on the use of the data will be described.

For measurements where matrix spikes are used:

$$\%R = 100\% \times \frac{S - U}{Csa}$$

where,
%R = percent recovery
S = measured concentration in spike aliquot
U = measured concentration in unspiked aliquot
Csa = actual concentration of spike added

Completeness – A completeness check will be done on all of the data generated by the laboratory. Completeness criteria are presented on Worksheet #12. Completeness will be calculated for each analyte as follows. For each analyte completeness will be calculated as the number of data points for each analyte that meets the measurement performance criteria for precision accuracy/bias and sensitivity divided by the total number of data points for each analyte. A discussion will follow summarizing the calculation of data completeness. Any conclusions about the completeness of the data for each analyte will be drawn and any limitations on the use of the data will be described.

Defined as follows for all measurements:

$$\%C = 100\% \times \frac{V}{T}$$

where,
%C = percent completeness
V = number of measurements judged valid
T = total number of measurements

Sensitivity – Results for all Lab Check Samples will be presented discussed for each analysis. The results for each analyte will be checked against the measurement performance criteria presented on Worksheet #12 & 15 and cross-checked against the quantitation limits presented on Worksheet #15. Results for analytes that exceed criteria will be discussed. The discussion will summarize the results of the laboratory sensitivity. Any conclusions about the sensitivity of the analyses will be drawn and any limitations on the use of the data will be described.

Comparability - The degree of confidence with which results from two or more data sets, or two or more laboratories, may be compared. To achieve comparability, standard environmental methodologies will be employed in the field and in the laboratory, including:

- Using identified standard procedures/methods for both sampling and analysis phases of the project;
- Ensuring traceability of all analytical standards and/or source materials;
- Verifying all calibrations;
- Using standard reporting units and reporting formats, including the reporting of QA/QC data;
- Validating analytical results, including using data qualifiers in all cases where appropriate;
- Requiring that validation qualifiers be provided at all times (e.g., text, tables, figures, etc.) with the associated analytical result; and
- Requiring that any metadata on the data set (i.e., information for purposes of description, administration, technical functionality and requirements, use and usage, and/or preservation) be documented and provided with the data set at all times.

These steps will ensure all future users of either the data or the conclusions drawn from them will have a basis for establishing the acceptance criteria for its use and will be able to judge the comparability of these data and conclusions.

When a definitive off-site laboratory analysis is performed to verify field screening results (e.g., the soil gas survey samples), the comparability between the two sets of results must be established. This evaluation will determine the acceptability of the screening results for use in meeting PQOs and making project decisions. Acceptability will be based on a Percent Different (%D) criterion of 20 percent, calculated using the following equation:

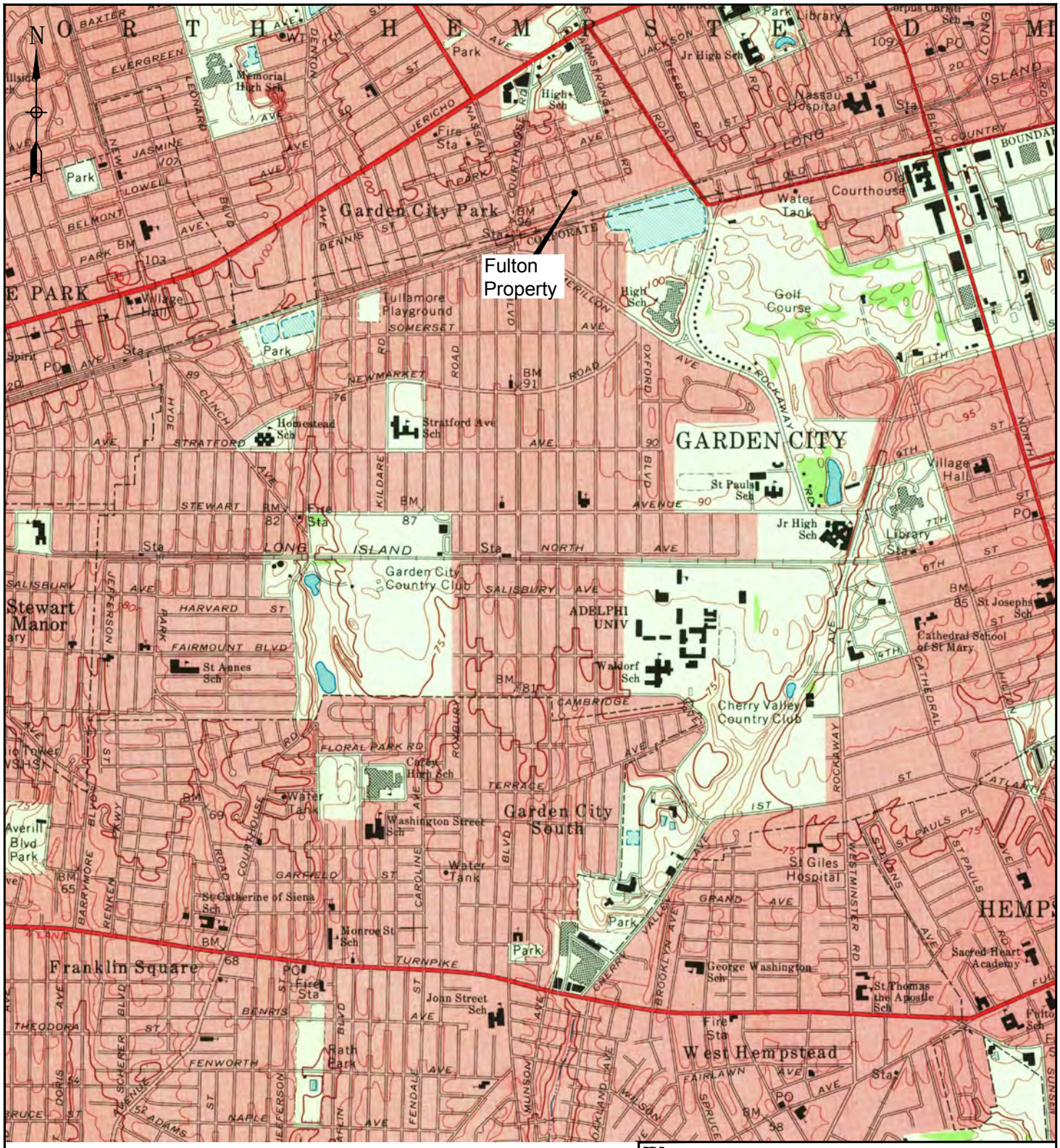
$$\%D = \frac{Vd - Vs}{Vd} \times 100$$

Where,
Vd = the definitive value
Vs = the screening method sample concentration value.

For the overall evaluation of comparability, at least 75 percent of the calculated %Ds must meet the 20 percent acceptance criteria.

Representativeness - The degree to which the results of the analyses accurately and precisely represent a characteristic of a population, a process condition, or an environmental condition. In this case, representativeness is the degree to which the data reflect the contaminants present and their concentration magnitudes in the sampled site areas. Sample homogeneity and sampling/subsampling variability must

	be considered during project planning to obtain a higher degree of representativeness. Representativeness of data will be obtained through the proper selection of sampling locations and implementation of approved sampling and analytical procedures. Results from environmental field duplicate sample analyses can be used to assess representativeness, in addition to precision.
Step 5	**Document data usability and draw conclusions** **Reconciliation –** Important information regarding the Data Quality Objectives (DQOs)/Project Quality Objectives (PQOs) process are provided by Worksheets #11, #12, #15 and # 28. The DQOs/PQO presented on Worksheets #11, #12, #15 and # 28 will be examined to determine if the objective was met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of the major impacts observed from the Data Validation Data Quality Indicators and measurement performance criteria assessments. Based on the results of these assessments the quality of the data will be determined. Based on the quality determined the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective it will be determined if the PQO was met and whether project action limits were exceeded. The final report will include a summary of all the points that went into the reconciliation of each objective. As part of the reconciliation of each objective conclusions will be drawn and any limitations on the usability of any of the data will be described.



Scale (1"=2000")

1000' 0 1000' 2000' 4000'

Graphic Scale in Feet

SOURCE: U.S.G.S. QUADRANGLE MAPS, LYNBROOK, N.Y., 1969

TITLE

Property Location Map
Fulton Avenue Superfund Site
Garden City/Garden City Park, NY

PREPARED FOR

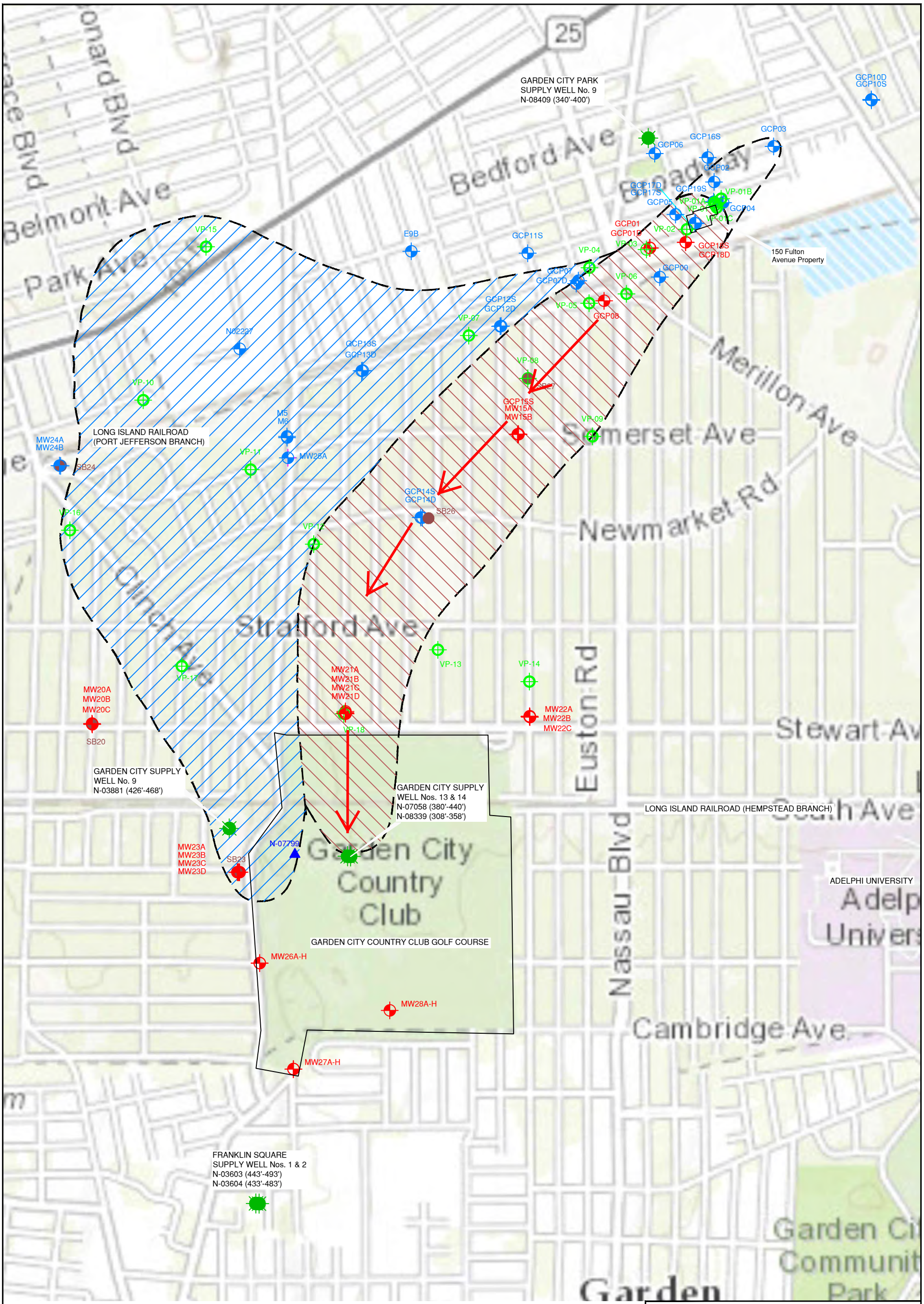
Genesco Inc.

Environmental Resources Management

FIGURE 1

DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	01/05/17	0097881

Z:\Drawings-2012\Genesco\Fulton Ave\CAD Dwgs\30% Submittal\2011-02-10 - Fulton Avenue - 30% Design - Figure 1-1 - v01.dwg (07/13/2016 - 4:42pm Melville)



TITLE

Long-Term Groundwater Monitoring Well Network Locations Fulton Avenue Superfund Site Garden City/Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

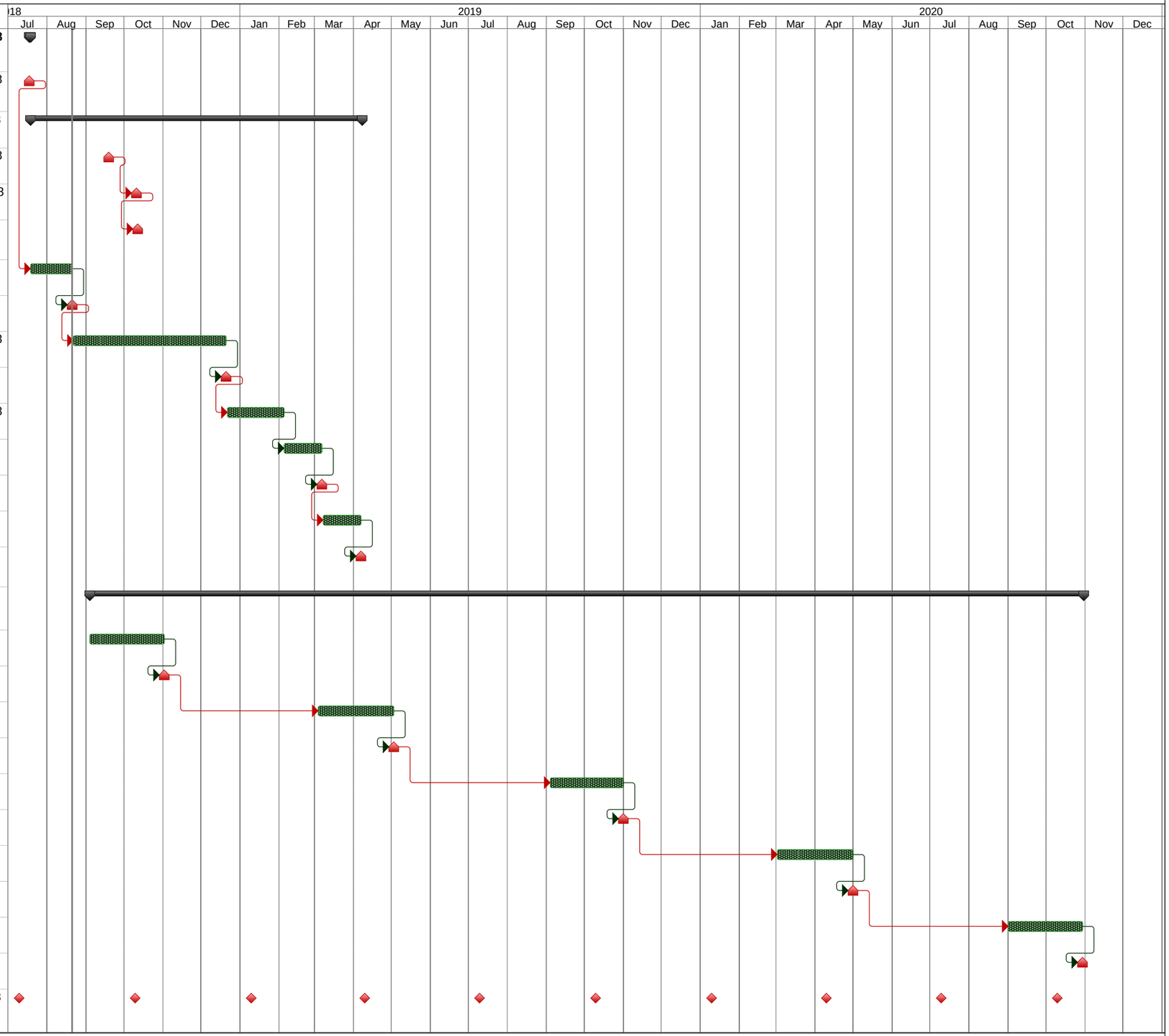
FIGURE 2

DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/04/16	0097881

Y:\GENESCO\150 Fulton Ave\NYCAD\2016\2016-12-29 - Fulton Avenue QAPP Wells.dwg (05/10/2017 - 6:10pm Melville)

FIGURE 3
REMEDIAL ACTION AND MONITORING SCHEDULE
FULTON AVENUE SUPERFUND SITE : OPERABLE UNIT 1
NASSAU COUNTY, NEW YORK

ID	Task Name	Duration	Start
1	**Remedial Action**	**1 day**	**Wed 7/18/18**
2	**EPA Approval of OU1 Remedial Design Report/Package**	1 day	Wed 7/18/18
3	**Inspections and RA Report**	**263 days**	**Thu 7/19/18**
4	Pre-Final Construction Inspection	1 day	Wed 9/19/18
5	Final Construction Inspection	1 day	Thu 10/11/18
6	**EPA Approval of Construction**	1 day	Fri 10/12/18
7	Update Site Management Plan	33 days	Thu 7/19/18
8	Submit Site Management Plan To USEPA	1 day	Tue 8/21/18
9	Preparation of Draft RA Report	121 days	Wed 8/22/18
10	Submit Draft RA Report To USEPA	1 day	Fri 12/21/18
11	USEPA Review of Draft RA Report	45 days	Sat 12/22/18
12	Finalization of Draft RA Report	30 days	Tue 2/5/19
13	Submit Revised RA Report To USEPA	1 day	Thu 3/7/19
14	USEPA Review of Revised RA Report	30 days	Fri 3/8/19
15	**USEPA Approval of Revised RA Report**	1 day	Sun 4/7/19
16	**Groundwater Monitoring**	**788 days**	**Tue 9/4/18**
17	Group 2/3Sampling, Laboratory Analysis, Validation #5	59 days	Tue 9/4/18
18	Submit Group 2/3 Sampling Results To EPA #5	1 day	Fri 11/2/18
19	Group 2/3Sampling, Laboratory Analysis, Validation #6	60 days	Mon 3/4/19
20	Submit Group 2/3 Sampling Results To EPA #6	1 day	Fri 5/3/19
21	Group 1/2/3Sampling, Laboratory Analysis, Validation #7	58 days	Wed 9/4/19
22	Submit Group 1/2/3 Sampling Results To EPA #7	1 day	Fri 11/1/19
23	Group 2/3Sampling, Laboratory Analysis, Validation #8	60 days	Mon 3/2/20
24	Submit Group 2/3 Sampling Results To EPA #8	1 day	Fri 5/1/20
25	Group 2/3Sampling, Laboratory Analysis, Validation #9	59 days	Tue 9/1/20
26	Submit Group 2/3 Sampling Results To EPA #9	1 day	Fri 10/30/20
27	**Quarterly Progress Reports**	**824 days**	**Tue 7/10/18**



Date: Tue 8/21/18 | Task | Milestone | Recurring Task | Summary

TABLE 1
SUMMARY OF LONG-TERM GROUNDWATER MONITORING WELLS
FULTON AVENUE SUPERFUND SITE, GARDEN CITY/GARDEN CITY PARK, NASSAU COUNTY, NEW YORK

Well Local No.	Top of Casing Elevation	Depth to Top of Screen	Depth to Bottom of Screen	Casing Length	Sump Length in Feet	Total Well Depth in Feet	Top of Screen Elevation	Bottom of Screen Elevation	Total Well Bottom Elevation	Well Material	Well Diameter in Feet	Well Construction Start Date	Well Construction End Date	X Coordinate	Y Coordinate
GCP01	89.5	49	59	49	0	59	40.5	30.5	30.5	PVC	0.17	10/24/84	10/24/84	1078541.38	207727.149
GCP01D	89.76	105	115	105	3	118	-15.24	-25.24	-28.24	PVC	0.17	07/27/95	08/03/95	1078543.38	207727.578
GCP08	94.85	50	60	50	0	62	44.85	34.85	32.85	PVC	0.17	09/11/85	09/11/85	1078149.08	207270.878
GCP15S	91.74	36	56	36	5	61	55.74	35.74	30.74	PVC	0.33	10/24/91	10/25/91	1077389.31	206096.642
MW15A	91.46	140	150	140	3	153	-48.54	-58.54	-61.54	STEEL	0.17	06/07/01	06/08/01	1077375.04	206097.32
MW15B	91.14	350	360	350	3	363	-258.86	-268.86	-271.86	STEEL	0.17	06/11/01	06/19/01	1077382.78	206098.236
GCP18D	90.75	113	123	113	3	126	-22.25	-32.25	-35.25	PVC	0.17	06/21/95	07/24/95	1078842.22	207771.984
GCP18S	91.04	39	54	39	0	54	52.04	37.04	37.04	PVC	0.17	06/20/95	06/21/95	1078843.91	207766.63
MW20A	84.53	140	150	140	3	153	-55.47	-65.47	-68.47	STEEL	0.17	04/17/01	04/18/01	1073673.09	203600.03
MW20B	84.13	244	254	244	3	257	-159.87	-169.87	-172.87	STEEL	0.17	04/20/01	04/24/01	1073672.16	203604.324
MW20C	84.14	400	410	400	3	413	-315.86	-325.86	-328.86	STEEL	0.17	04/25/01	04/27/01	1073674.08	203597.067
MW21A	81.95	120	130	120	3	133	-38.05	-48.05	-51.05	STEEL	0.17	05/15/01	05/16/01	1075872.09	203680.567
MW21B	81.86	330	340	330	3	343	-248.14	-258.14	-261.14	STEEL	0.17	05/18/01	05/22/01	1075870.75	203675.325
MW21C	81.66	390	400	390	3	403	-308.34	-318.34	-321.34	STEEL	0.17	06/01/01	06/05/01	1075871.2	203669.66
MW21D	81.73	448	458	448	3	462	-366.27	-376.27	-380.27	STEEL	0.17	9/19/2017	10/6/2017	1075875.1	203622.6
MW22A	86.42	120	130	120	3	133	-33.58	-43.58	-46.58	STEEL	0.17	05/01/01	05/01/01	1077478.84	203653.953
MW22B	86.49	270	280	270	3	283	-183.51	-193.51	-196.51	STEEL	0.17	05/02/01	05/04/01	1077478	203649.45
MW22C	86.56	310	320	310	3	323	-223.44	-233.44	-236.44	STEEL	0.17	05/08/01	05/10/01	1077481.86	203645.556
MW23A	81.58	260	270	260	3	273	-178.42	-188.42	-191.42	STEEL	0.17	03/30/01	04/03/01	1074925.82	202292.348
MW23B	81.72	344	354	344	3	357	-262.28	-272.28	-275.28	STEEL	0.17	04/04/01	04/06/01	1074918.18	202293.054
MW23C	81.7	398	408	398	3	411	-316.3	-326.3	-329.3	STEEL	0.17	06/28/01	07/03/01	1074939.21	202292.236
MW23D	81.74	442	452	442	3	455	-360.26	-370.26	-373.26	STEEL	0.17	06/28/01	07/03/01	1074933.45	202292.653
MW26A	79.01	224	234	224	5	489	-144.99	-154.99	-409.99	STEEL	0.33	02/25/04	02/26/04	1075127.04	201508.808
MW26B	79.01	266	276	266	5	489	-186.99	-196.99	-409.99	STEEL	0.33	02/25/04	02/26/04	1075127.04	201508.808
MW26C	79.01	320	330	320	5	489	-240.99	-250.99	-409.99	STEEL	0.33	02/25/04	02/26/04	1075127.04	201508.808
MW26D	79.01	345	355	345	5	489	-265.99	-275.99	-409.99	STEEL	0.33	02/25/04	02/26/04	1075127.04	201508.808
MW26E	79.01	372	382	372	5	489	-292.99	-302.99	-409.99	STEEL	0.33	02/25/04	02/26/04	1075127.04	201508.808
MW26F	79.01	405	415	405	5	489	-325.99	-335.99	-409.99	STEEL	0.33	02/25/04	02/26/04	1075127.04	201508.808
MW26G	79.01	438	448	438	5	489	-358.99	-368.99	-409.99	STEEL	0.33	02/25/04	02/26/04	1075127.04	201508.808
MW26H	79.01	474	484	474	5	489	-394.99	-404.99	-409.99	STEEL	0.33	02/25/04	02/26/04	1075127.04	201508.808

TABLE 1
SUMMARY OF LONG-TERM GROUNDWATER MONITORING WELLS
FULTON AVENUE SUPERFUND SITE, GARDEN CITY/GARDEN CITY PARK, NASSAU COUNTY, NEW YORK

Well Local No.	Top of Casing Elevation	Depth to Top of Screen	Depth to Bottom of Screen	Casing Length	Sump Length in Feet	Total Well Depth in Feet	Top of Screen Elevation	Bottom of Screen Elevation	Total Well Bottom Elevation	Well Material	Well Diameter in Feet	Well Construction Start Date	Well Construction End Date	X Coordinate	Y Coordinate
MW27A	62.17	192	202	192	5	487	-129.83	-139.83	-424.83	STEEL	0.33	03/17/04	03/18/04	1075414.51	200700.409
MW27B	62.17	236	246	236	5	487	-173.83	-183.83	-424.83	STEEL	0.33	03/17/04	03/18/04	1075414.51	200700.409
MW27C	62.17	284	294	284	5	487	-221.83	-231.83	-424.83	STEEL	0.33	03/17/04	03/18/04	1075414.51	200700.409
MW27D	62.17	324	334	324	5	487	-261.83	-271.83	-424.83	STEEL	0.33	03/17/04	03/18/04	1075414.51	200700.409
MW27E	62.17	364	374	364	5	487	-301.83	-311.83	-424.83	STEEL	0.33	03/17/04	03/18/04	1075414.51	200700.409
MW27F	62.17	408	418	408	5	487	-345.83	-355.83	-424.83	STEEL	0.33	03/17/04	03/18/04	1075414.51	200700.409
MW27G	62.17	438	448	438	5	487	-375.83	-385.83	-424.83	STEEL	0.33	03/17/04	03/18/04	1075414.51	200700.409
MW27H	62.17	472	482	472	5	487	-409.83	-419.83	-424.83	STEEL	0.33	03/17/04	03/18/04	1075414.51	200700.409
MW28A	67	92	102	92	5	500	-25	-35	-433	STEEL	0.33	3/9/17	3/11/17	1076260.3	200974.7
MW28B	67	214	224	214	5	500	-147	-157	-433	STEEL	0.33	3/9/17	3/11/17	1076260.3	200974.7
MW28C	67	312	322	312	5	500	-245	-255	-433	STEEL	0.33	3/9/17	3/11/17	1076260.3	200974.7
MW28D	67	340	350	340	5	500	-273	-283	-433	STEEL	0.33	3/9/17	3/11/17	1076260.3	200974.7
MW28E	67	362	372	362	5	500	-295	-305	-433	STEEL	0.33	3/9/17	3/11/17	1076260.3	200974.7
MW28F	67	398	408	398	5	500	-331	-341	-433	STEEL	0.33	3/9/17	3/11/17	1076260.3	200974.7
MW28G	67	434	444	434	5	500	-367	-377	-433	STEEL	0.33	3/9/17	3/11/17	1076260.3	200974.7
MW28H	67	485	495	485	5	500	-418	-428	-433	STEEL	0.33	3/9/17	3/11/17	1076260.3	200974.7

TABLE 2
DETAILED SAMPLING INFORMATION FOR LONG-TERM GROUNDWATER MONITORING WELLS
FULTON AVENUE SUPERFUND SITE, GARDEN CITY/GARDEN CITY PARK, NASSAU COUNTY, NEW YORK

Well Local No.	Depth to Top of Screen	Depth to Bottom of Screen	Sump Length in Feet	Total Well Depth in Feet	Screen Length	Submerged Screen Midpoint	Top of Pump Depth	Bottom of Pump Depth	Drop Line Length	Pump Set up	Comments	Required Sample Identification	GEOTECH BLADDER PUMP SETTINGS					
													Depth of Pump	PSI Setting	Depth of Pump	PSI Setting	Depth of Pump	PSI Setting
GCP01	49	59	0	59	10	54	51	54	0	Standard Low-Flow (MP-15)		GCP01-52.5	50	35	84	52	118	69
GCP01D	105	115	3	118	10	110	107	110	0	QED Bladder Pump		GCP01D-110	51	35.5	85	52.5	119	69.5
GCP08	50	60	0	60	10	55	52	55	0	Standard Low-Flow (MP-15)		GCP08-54.2	52	36	86	53	120	70
GCP15S	36	56	5	61	20	49	46	49	0	Standard Low-Flow (MP-15)		GCP15S-51	53	36.5	87	53.5	121	70.5
MW15A	140	150	3	153	10	145	142	145	0	QED Bladder Pump		MW15A-145	54	37	88	54	122	71
MW15B	350	360	3	363	10	355	85	88	267	QED Bladder Pump with Drop Line		MW15B-356	55	37.5	89	54.5	123	71.5
GCP18D	113	123	3	126	10	118	115	118	0	QED Bladder Pump		GCP18D-118	56	38	90	55	124	72
GCP18S	39	54	0	54	15	46.5	43.5	46.5	0	Standard Low-Flow (MP-15)		GCP18S-48.5	57	38.5	91	55.5	125	72.5
MW20A	140	150	3	153	10	145	142	145	0	QED Bladder Pump		MW20A-145	58	39	92	56	126	73
MW20B	244	254	3	257	10	249	85	88	161	QED Bladder Pump with Drop Line		MW20B-250	59	39.5	93	56.5	127	73.5
MW20C	400	410	3	413	10	405	85	88	317	QED Bladder Pump with Drop Line		MW20C-405	60	40	94	57	128	74
MW21A	120	130	3	133	10	125	122	125	0	QED Bladder Pump		MW21A-125	61	40.5	95	57.5	129	74.5
MW21B	330	340	3	343	10	335	85	88	247	QED Bladder Pump with Drop Line		MW21B-335	62	41	96	58	130	75
MW21C	390	400	3	403	10	395	85	88	307	QED Bladder Pump with Drop Line		MW21C-395	63	41.5	97	58.5	131	75.5
MW21D	448	458	3	461	10	453	85	88	365	QED Bladder Pump with Drop Line		MW21D-453	64	42	98	59	132	76
MW22A	120	130	3	133	10	125	122	125	0	QED Bladder Pump		MW22A-125	65	42.5	99	59.5	133	76.5
MW22B	270	280	3	283	10	275	272	88	187	QED Bladder Pump with Drop Line		MW22B-275	66	43	100	60	134	77
MW22C	310	320	3	323	10	315	312	88	227	QED Bladder Pump with Drop Line		MW22C-315	67	43.5	101	60.5	135	77.5
MW23A	260	270	3	273	10	265	85	88	177	QED Bladder Pump with Drop Line		MW23A-265	68	44	102	61	136	78
MW23B	344	354	3	357	10	349	NA	NA	300		(Note 1)	MW23B-350	69	44.5	103	61.5	137	78.5
MW23C	398	408	3	411	10	403	85	88	315	QED Bladder Pump with Drop Line		MW23C-403	70	45	104	62	138	79
MW23D	442	452	3	455	10	447	NA	NA	275		(Note 2)	MW23D-447	71	45.5	105	62.5	139	79.5
													72	46	106	63	140	80
													73	46.5	107	63.5	141	80.5
													74	47	108	64	142	81
													75	47.5	109	64.5	143	81.5
													76	48	110	65	144	82
													77	48.5	111	65.5	145	82.5
													78	49	112	66	146	83
													79	49.5	113	66.5	147	83.5
													80	50	114	67	148	84
													81	50.5	115	67.5	149	84.5
													82	51	116	68	150	85
													83	51.5	117	68.5	151	85.5

Well Local No.	Depth to Top of Screen	Depth to Bottom of Screen	Sump Length in Feet	Total Well Depth in Feet	Screen Length	Depth of Sample Port Intake	Field Port ID #	Required Sample Identification
MW26A	224	234	5	489	10	229	Port 8	MW26A-229
MW26B	266	276	5	489	10	271.5	Port 7	MW26B-271.5
MW26C	320	330	5	489	10	325	Port 6	MW26C-325
MW26D	345	355	5	489	10	350.5	Port 5	MW26D-350.5
MW26E	372	382	5	489	10	377	Port 4	MW26E-377
MW26F	405	415	5	489	10	410.5	Port 3	MW26F-410.5
MW26G	438	448	5	489	10	443	Port 2	MW26G-443
MW26H	474	484	5	489	10	478.5	Port 1	MW26H-478.5
MW27A	192	202	5	487	10	197	Port 8	MW27A-197
MW27B	236	246	5	487	10	241.5	Port 7	MW27B-241.5
MW27C	284	294	5	487	10	289	Port 6	MW27C-289
MW27D	324	334	5	487	10	329.5	Port 5	MW27D-329.5
MW27E	364	374	5	487	10	369	Port 4	MW27E-369
MW27F	408	418	5	487	10	413.5	Port 3	MW27F-413.5
MW27G	438	448	5	487	10	443	Port 2	MW27G-443
MW27H	472	482	5	487	10	476.5	Port 1	MW27H-476.5
MW28A	92	102	5	500	10	97	Port 8	MW28A-97
MW28B	214	224	5	500	10	219.5	Port 7	MW28B-219.5
MW28C	312	322	5	500	10	317	Port 6	MW28C-317
MW28D	340	350	5	500	10	345.5	Port 5	MW28D-345.5
MW28E	362	372	5	500	10	367	Port 4	MW28E-367
MW28F	398	408	5	500	10	403.5	Port 3	MW28F-403.5
MW28G	434	444	5	500	10	439	Port 2	MW28G-439
MW28H	485	495	5	500	10	490.5	Port 1	MW28H-490.5

Important Well Notes

(1) MW23B casing bent, use Grundfos Pump only, set pump at 300 feet bgs, purge 3 well volumes and then perform low flow rate purge/sampling.

(2) Obstruction at 300 feet bgs in MW23D, use Grundfos pump only, set pump no deeper than 275 feet bgs, purge 3 well volumes and then perform low flow rate puge/sampling.

Bladder Pump Notes

PSI setting is 0.5 PSI/ft of airline plus 10.

Charge should be 5 seconds (bladder squeeze)

Exhaust should be 15 to 20 seconds (pump refill)

Optional
To lower the flow, turn the brass valve to the right all the way, then turn back a half turn.

If you turn back the brass valve a half turn, increase the exhaust to 30 seconds.

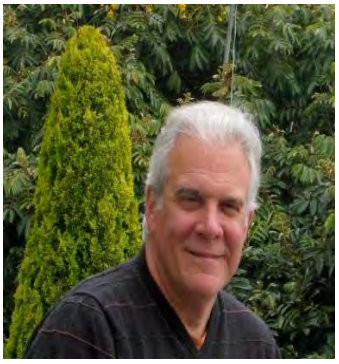
LIST OF ATTACHMENTS

ATTACHMENT A - Professional Profiles

Jim Perazzo

Partner Principal
North America

Mr. Perazzo advises clients in making strategic business decisions regarding legacy environmental liabilities as part of portfolio management including evaluation of practical realistic cash flows and exit strategies. He has provided expert support in cost recovery claims under CERCLA, navigation law and other environmental statues in arbitrations, mediations and litigation. By combining technical and financial analysis, he enables clients to assess short long-term costs of environmental liabilities and obligations for financial reporting. Mr. Perazzo also works with clients, regulators and other stakeholders to assess sediment impacts in urban waterways to facilitating risk management decisions that address resource impacts.



Experience: Over 25 years of experience dealing with legacy environmental problems under CERCLA, RCRA, TSCA and related brownfield environmental programs.

Email: Jim.Perazzo@erm.com

LinkedIn: https://www.linkedin.com/in/jim-perazzo-79a4159/

Education

- M.B.A. , Long Island University (C.W. Post), New York, 2006
- M.S. Earth Science, Adelphi University, New York, 1981
- B.S. Geology, The State University of New York at Stony Brook, 1978

Professional Affiliations and Registrations

- Professional Geologist in Pennsylvania

Languages

- English, native speaker

Fields of Competence

- CERCLA RI/FS and removal actions
- RCRA (RFA, RFI CMS and CMI)
- TSCA (PCBs & lead)
- UST assessment and hydrocarbon remediation
- UST assessment and hydrocarbon remediation
- Soil and ground water investigations
- Hydrogeological assessments
- Regulatory negotiation and strategic guidance
- Financial analysis (legacy environmental and compliance costs)
- Expert witness (CERCLA cost recovery, Navigation Law claims)

Key Industry Sectors

- Mining
- Chemical
- Manufacturing
- Oil & Gas

Publications

- “The Intersection of Governance, Performance, Assurance and Reporting in Asset Retirement Obligations Related to Mine Reclamation & Closure” Perazzo, James, A. & Eddy, Stuart , SME Conference, Seattle, WA February 22, 2012
- “Financial Reporting of Environmental Matters & the Influence on a Company’s Sustainable Business Strategy” AWMA/NYEWA Seminar, Rochester Institute of Technology Conference Center, February 12, 2009.If this list is extensive, relocate this entire sub-section to the end (after Key Projects)
- “Real Estate Transactions & Brownfield’s” NYSBA CLE Program, May 24, 2004
- "CERCLA - The Technical Perspective," Environmental Regulations Course, Executive Enterprises, Inc., June ‘95, October ‘95, and February ‘96.

- “Remedial Investigation and Feasibility Study Process," New York Hazardous Regulation Course, Executive Enterprises, Inc., November 16 17, 1990.
- “Groundwater Remediation; Performance Goals," Haztech International, Cleveland, Ohio, September 20 22, 1988.
- "Remedial Design Needs to Consider in Planning Hazardous Waste Site Investigations," with J. Iannone and J. Mack; Haztech International, St. Louis, Missouri, August 26 27, 1987.
- "Long Term Confidence in Ground Water Monitoring Systems," Groundwater Monitoring Review, Vol. 4, No. 4, all 1984.

Key Projects

Principal-in-Charge involving a major urban waterbody project in the Superfund program in USEPA Region 2.
Coordinates a diverse staff of environmental professionals in support of a contributing PRP. Also, liaison with common consultant, USEPA and NYC to advance PRP group objectives and initiatives with the intent of assuring a comprehensive, technically supported and protective and practical RI/FS and eventual RA.

Project Director to develop environmental liability estimates for the purpose of financial re-statement to facilitate registrant’s filing of an S-1 with the SEC.
The portfolio involved review and assessment of over 2500 properties (historic and current) with projected environmental liabilities and asset retirement obligations in excess of $700MM. Financial estimates were developed in accordance with US GAAP.

Project Director for federal superfund site involving PCE impacts to regional aquifer and allegations of public supply well impacts.
Developed technical strategy and coordinated implementation of a RI/FS leading to a ROD that narrowly defined impacts from client site versus regional impacts from other sources of similar contamination. Direct RD/RA effort to implement the selected remedy and, together with post-ROD information and support from local municipality, resulted in EPA issuing a modified ROD.

Part of a multi-disciplined team providing technical consultation to a city planning board to ensure development of a comprehensive draft and final environmental impact assessment.
Ensured that residual environmental impacts at properties within a project area in both federal and state Superfund programs were addressed and/or incorporated into a 50+ acre regional waterfront redevelopment in the northeast with significant public amenities. The effort led to a successful adoption of a FEIS and issuance of Findings that ensured the integrity of future site plans.

Project Principal for responsible for a former industrial facility requiring completion of an RI/FS at a NYS Superfund site.
Secured a ROD that was used to facilitate transfer of the property into the NYS Brownfield Cleanup Program and, combined with a finite risk insurance policy enabled the responsible party to cap environmental liabilities.

Project Director for Chapter 11 bankruptcy settlement and re-organization involving major mining company.
Lead team to develop environmental liability and asset retirement estimates for a portfolio of formerly owed, non-operating sites. Provided proffer and testimony in support of debtor’s settlement of outstanding liabilities that was affirmed by the court.

Project Director for large Superfund site affected from former lead and copper recovery operations.
Project responsibilities included work plan preparation, RI implementation, coordination of human health risk and ecological assessments, a feasibility study, and remedial design and construction of the remediation action.

Provided Director for conversion of former industrial facility to multi-tenant commercial space.
Successfully completed cleanup obligations at NYC manufacturing site under the Voluntary Cleanup Program involving disassembly of manufacturing lines, and soil/ground water remediation (combined ex-situ and in-situ) beneath a facility adjacent the East River to enable re-development to commercial use.

Developed a tank management program for 36 locations in New York and Connecticut.
Planned site assessments and remedial programs. Formulated monitoring programs for early warning of potential environmental problems. Negotiated financial estimates and justification for outstanding environmental liability allowing owner to divest with protection against future liabilities.

Served as a technical expert for one airline in litigation with multiple airlines over a claim of $100 MM in environmental cleanup costs at JFK airport.
Engaged in mediation on behalf of client setting out technical positions that were used as the basis for cost allocation potions in mediation.

Project Director for three removal actions under CERCLA 106at two separate Superfund sites in receivership.
Performed removal of anhydrous ammonia vessel, ASTs, laboratory chemicals, drums, PCB oils, transformers, and closure of USTs. Also directed a radiological survey with a health physicist to locate and remove materials exhibiting anomalous levels of radiation. These efforts were done on behalf of a Savings and Loan in receivership.

Project Director for development and implementation of remedial system to extract chlorinated VOCs from soil and ground water from a source area at a Superfund site.
Coordinated program involving dewatering and vacuum extraction. Established basis for performance analysis and effectiveness evaluation to determine proper time for system termination.

RI/FS and ROD critiques, in support of petition to amend.
After EPA rejection of the petition a corresponding US claim for cost recovery enabled a client to file a cross-claim that resulted in client recovering one-third of the of the ROD remedy costs via a mixed funding application secured by ERM.

Developed technical approach to ongoing cases for the New York State Environmental Protection Bureau of the Attorney General's office.
Prepared scientific reports and represented the Attorney General in adversarial discussions, public meetings, and court hearings. As part of a multi-disciplined technical team, developed a comprehensive remedial program at a dioxin-contaminated landfill in Western New York.
The program involved collection and treatment of dissolved and non-aqueous phase liquids (NAPLs) in overburden and bedrock.

Technical representative for the AG Office in developing a comprehensive soil and aquifer remediation project in Nassau County, New York.
The project involved a soil and ground water remediation program including installation of a slurry wall via the vibrating beam technique, soil flushing system and staged ground water recovery from a shallow and deep aquifer. Maintained a key role in establishing performance criteria for cleanup and effectiveness monitoring.

Christopher W. Wenczel, P.G.

Principal Consultant/Hydrogeologist
North America

Mr. Wenczel is an ERM Principal Consultant/Hydrogeologist and a New York State-licensed Professional Geologist who has more than 30 years of diversified experience in the environmental consulting/engineering field specializing in hydrogeology, hazardous waste management/remediation, and water supply. Mr. Wenczel's diverse project experience includes planning and directing large complex projects under CERCLA, RCRA, TSCA, NEPA, SEQRA, NJDEP Site Remediation Program, NJPDES, NYSDEC Voluntary Cleanup, State Superfund and Oil Spill Programs. These activities include preparation of regulatory documentation, strategic advice, regulatory interface/negotiations on behalf of clients, site assessments, remedial investigations, remedial design/remedial actions, and long-term monitoring programs at landfills, manufacturing/commercial properties and Federal facilities.

Email: Chris.Wenczel@erm.com

LinkedIn: https://www.linkedin.com/in/chris-wenczel-821a8b10/

Education

- M.S. Earth Sciences/Hydrogeology, Adelphi University, New York, 1990
- B.S. Geology, State University of New York at Oneonta, 1985
- NJDEP UST License Renewal Courses, 1998 - 2013
- State of New Jersey Certified Cleanup Star Program Participant, 2004
- 40-Hour OSHA 1910.120 Health and Safety Training, 1987, and 8-Hour OSHA Annual Refresher Training, 1987 – 2016
- 8-Hour OSHA Supervisory Training For Level B Activities, 1989
- 10-Hour OSHA Construction Safety Training 2008
- ERM Subsurface Clearance/Field Safety Officer Certified
- International Symposium on Environmental Geotechnology, Lehigh University and the International Committee on Environmental Geotechnology, Allentown, PA, 21 -23 April 1986
- Theory and Application of Vadose Zone Monitoring, Sampling and Remediation, NGWA, Somerville, MA, 7-9 April 1992
- Assessment, Control and Remediation of LNAPL Contaminated Sites, API/USEPA, East Brunswick, NJ, 20 October 1994
- Environmental Horizontal Well Symposium, NGWA, Indianapolis, IA, 28-30 October 1995,
- Petroleum Hydrocarbons & Organic Chemicals in Ground Water: Prevention, Detection and Remediation, NGWA, Houston, TX, 13-15 November 1996
- NJDEP Technical Requirements For Site Remediation Seminar, Cook College @ Rutgers, 27 May 1998
- DNAPLs in Fractured Geologic Media: Monitoring, Remediation & Natural Attenuation, Univ. of Waterloo, San Francisco, CA, 8-10 December 1999
- Hydrogeology of Fractured Rock: Characterization, Monitoring, Assessment & Remediation, Fractured Rock Educational Services, Princeton, NJ, 19-22 May 2003
- Systematic Approach To Ground Water Capture Zone Analysis, USEPA Region 2 Headquarters, New York City, New York, 21 August 2007
- Environmental Forensics: Current Methods of Contaminant Age Dating, Cook College @

Rutgers University, New Brunswick, NJ 6 October 2011
- Marcellus Shale: New Regulations and Challenges, New York State Bar Association, Concierge Conference Center, New York City, New York, 22 June 2012
- Emerging Contaminants Summit, Westminster, Colorado, 6-7 March 2018

Professional Affiliations and Registrations

- New York State Professional Geologist, License No. 000744
- Qualified Environmental Professional (New York)
- National Groundwater Association
- New York State Council of Professional Geologists, Outreach Committee Member
- Long Island Association of Professional Geologists, President, 2016-Present

Languages

- English, native speaker

Fields of Competence

- Site Investigation/Remediation Strategy & Implementation
- Ground Water Resource Development
- Multi-Media Sampling & Remediation
- Hydrogeologic Testing, Analyses & Interpretation
- Analysis of Surface & Ground Water Flow Systems
- Surface & Ground Water Quality Monitoring
- Vapor Intrusion Assessment & Mitigation
- Applied Geophysics
- RCRA Closure Planning, Decommissioning, Dismantling, Decontamination & Demolition
- UST Assessment, Removal & Remediation
- Soil Vapor Extraction/Air Sparging
- Ground Water Pumping & Treatment
- Subsurface Clearance
- CPR/First Aid

Key Industry Sectors

- Manufacturing
- Oil & Gas
- Chemical
- Government
- Real Estate & Land Development

Key Projects

USEPA Superfund Program: Participated in Remedial Investigations/Feasibility Studies (RI/FS), Remedial Design (RD) and/or Remedial Operations programs at the following NPL Sites:

- Lipari Landfill
- Lone Pine Landfill
- Vestal Well 1-1
- Robintech Inc./ National Pipe Co.
- Combe Landfill South
- Swope Oil & Chemical Company
- Port Washington Landfill
- Fulton Avenue
- AES/Shore Realty Site
- Sinclair Refinery
- Pfohl Bros. Landfill
- New Cassel/Hicksville Groundwater Contamination Site
- Islip Municipal Sanitary Landfill
- Sarney Farm

Brookhaven National Laboratory: Project Manager responsible for execution of multiple projects at Brookhaven National Laboratory, Upton, NY (BNL), with revenues in excess of $2.8 million. These projects include extensive ground water delineation projects for volatile organic compounds, metals, and radionuclides. These ground water surveys include Operable Unit 3 and Operable Unit 5, the High Flux Beam Reactor emergency response tritium delineation project conducted in March 1997. In a six-week period, ERM's team installed and sampled a total of 72 temporary ground water vertical profile wells to depths ranging between 200 and 300 feet below grade. In addition, these projects have included walk-over radiation surveys for landscape soils across the site and at the former Low-Mass Criticality Facility, and geotechnical studies for BNL's sewage treatment plant.

Long Island Solar Farm (LISF) at BNL: Principal Consultant/Senior ERM Project Team Member assisting ERM's confidential client to develop the Long Island Solar Farm (LISF) in Upton, New York, which is the largest photovoltaic (PV) solar project in the Northeast United States. The facility is located on an approximately 200-acre easement at the US Department of Energy's (DOE) Brookhaven National Laboratory (BNL) on Long Island, New York. The arrays utilized, where possible, areas already cleared (agricultural field, firebreaks, and brownfields) at BNL. Power generated at the 32-MW facility is sold to the Long Island Power Authority (LIPA) under a 20-year power purchase agreement. The project is noteworthy for success in a region that is considered an unlikely geographic location, as large-scale solar farms are more typically located in the Southwest. In addition, the site has had to overcome a number of challenges because of its proximity to World War II artifacts, environmentally sensitive habitat (wetlands), radiological contamination and the presence of the endangered Tiger Salamander.

Mr. Wenczel's involvement included working collaboratively worked with the DOE to prepare a National Environmental Protection Act (NEPA)-required Environmental Assessment (EA) Report, and with LIPA to complete necessary New York State Environmental Quality Review (SEQR) assessments and documents for this private PV Solar Farm demonstration project. Specific studies related to the EA and NYSEQR processes, and due diligence/project financing/investor assurance activities included:

- Analysis of potential:
  - visual impacts (ViewShed/Desktop Visual/field reconnaissance);
  - construction noise impacts (Noise Sound Studies); and
  - impacts to wetlands and ecosystems;
- Assessments for the potential of radiological impacts adjacent to and within easement areas at BNL.

- Phase I and Phase IA site investigations in order to determine if any chemical constituent and/or radiological contamination resulting from past practices at the property, which had long been in use both as a military base and a US Atomic Energy Commission/DOE research facility, might be detrimental to the construction and operation of a PV solar facility at BNL;
- Third-party oversight of radiological impact ("hotspot") remedial actions undertaken by DOE within the 200-acre project footprint, and review/comment on resultant post-remedial action reports.

RCRA Closure/Corrective Action (NYS Part 373) or TSCA (40 CFR Part 761) Cleanup Projects: that were successfully, safely and profitably implemented. These projects involved provision of turn-key DDD services for our clients which were completed in advance of lease exits, property divestures, structure demolition and/or commercial redevelopment. Services provided spanning the entire project life cycle included: regulatory/health/safety planning, competitive procurement and contract management of the remedial subcontractors, implementation/oversight/effectiveness verification sampling, resultant waste disposal, and reporting for regulatory approval and closeouts.

Brooklyn Navy Yard, Brooklyn, New York: A TSCA Interim Remedial Measure (IRM) conducted on former electrical substation that had suffered a major fire to mitigate PCB contamination resulting from releases of electrical transformer dielectric fluids. The IRM included characterizing the extent of PCB contamination on concrete surfaces and soils/sediments associated with the former transformers. The IRM included the removal, containment and disposal of soils/sediments containing high levels of PCBs from a subsurface vault, cleaning, scarification, and final encapsulation of all effected concrete surfaces within the vault and other concrete surfaces associated with the former transformers. A Final Remediation Report was prepared and submitted to NYSDEC for review and official acknowledgment that "no further action" is required at this electrical substation.

Konica Minolta Graphic Imaging USA, Inc., Glen Cove, New York: RCRA Closure of five separate areas. The planning phase of this work involved an appropriate survey and development of project specific Health & Safety Plan, and a RCRA Closure Plan that was approved by the NYSDEC. All tanks, remaining equipment, trenches, pits, floors, walls and appurtenances were accessed, cleaned, and dismantled. The areas included:

- 1,000-Gallon Fiberglass Hazardous Waste Photographic Fixer Tank;
- 750-Gallon Fiberglass Hazardous Waste Photographic Fixer Tank;
- Spill Area Surrounding the Hazardous Waste (Silver) Photographic Fixer Drainpipe located in the Fixer-Developer Lab;
- Hazardous Waste (Silver) Emulsion Spill Area in the Basement; and
- Flammable Hazardous Waste Storage Pad/Shed.

Time Equities, Westbury, New York: A pre-demolition RCRA Closure of a former wastewater treatment (WWT) building. The planning phase of this work involved an appropriate survey and development of project specific Health & Safety Plan, and a RCRA Closure Plan that was approved by the NYSDEC. All tanks, remaining equipment, trenches, pits, floors, walls and appurtenances were accessed, cleaned, and dismantled. The areas included:

- The former 4-inch diameter wastewater line running from the Main Building to the concrete receiving vault of the WWT Building;
- The concrete receiving vault of the WWT Building;
- The three 10,000-gallon steel ASTs in the WWT Building;
- The 1,000-gallon fiberglass process sludge tank in the vault within the WWT Building;

- All secondary containment structures that may have come into contact with wastewater including the concrete and tiled floors, the concrete block walls of the WWT Building, the concrete piping trenches and associated protective steel grating, concrete sludge tank vault; and
- All associated polyvinyl chloride (PVC) and steel piping systems within the WWT Building.
- Residual wastes, sludges and washwaters were handled for disposal as scrap or containerized, characterized and disposed of at properly permitted waste disposal facilities. The decontamination procedures were then followed by visual inspection to confirm the absence of, and finally confirmation sampling and analysis. Some minor soil excavation and disposal was performed. The final report was reviewed and approved by the NYSDEC with a no further action letter allowing subsequent demolition to proceed.

Stewart Stamping EFI, Yonkers, New York: A pre-demolition RCRA Closure of a former metals stamping facility. The planning phase of this work involved an appropriate survey to identify areas requiring closure and development of project specific Health & Safety Plan, and a RCRA Closure Plan. Applicable areas and the basic work scope for each area included:

- Tumbling Room
- Chemical Storage Areas
- Plating Areas
- Drum Cleaning Area
- Waste Oil Collection/Storage Areas
- Compressor Room
- Wastewater Treatment Areas
- PVC Piping (1000'+)

Residual wastes, sludges and washwaters were handled for disposal as scrap or containerized, characterized and disposed of at properly permitted waste disposal facilities. The decontamination procedures were followed by visual inspection to confirm the absence of, and finally confirmation sampling and analysis. Some minor soil excavation and disposal was performed.

Former Pall Corporation Facility, East Hills, New York: Supported due diligence activities for a major New York area commercial developer client - Steel Equities whom was purchasing this facility for commercial redevelopment. Retained to review and opine the adequacy of extensive RCRA Closure/Corrective Action work performed by others. Xerox Corporation, Rochester, New York – Developed a RCRA Partial Closure Plan for a wastewater treatment facility in Building 208. The document was approved by the NYSDEC but ERM RCM was not the successful bidder to implement the DDD work.

Involved in due diligence/site investigation (Phase I & II Environmental Site Assessments), and DDD services throughout my career. Developed good experience in recognition of potential ACM, lead (lead-based paint {LBP}, PCBs, radiation, hazardous materials and universal wastes, and can perform these surveys. Also know the requirements for sampling, testing, abatement/abatement monitoring (ACM), and disposal thereof.

Radionuclides: Extensive experience in leading various types of radiation surveys at multiple sites including Brookhaven National Laboratory, Upton, NY, the Phohl Brothers Inactive Hazardous Waste Site in Williamsville, NY, and multiple commercial property acquisitions for a major developer in the New York City area.

Land Disturbance/Subsurface Structure/Soil Remediation Projects: Extensive experience managing or providing senior technical support on land disturbance/subsurface structure/soil remediation projects. These projects have involved excavation and disposal of large quantities of soil/sediments impacted with VOCs, SVOCS, PCBs, and metals related to discharges from chemical and

petroleum bulk storage (ASTs/USTs), manufacturing process areas, vapor degreasing operations, roof ventilation, septic tanks, septic system leaching pools, stormwater drywell and drains, and recharge basins.
Examples of larger projects that resulted in 500+ tons of material for disposal include:

- **Former Parker Hannifin Facility, Dayton, New Jersey:** Septic systems, stormwater systems (15+ structures), USTs (petroleum), and an AST (TCE).
- **Anderol (fka Royal Lubricants) East Hanover, New Jersey:** Fuel Oil UST that was subsequently used for storage of waste oil, spent solvents, PCBs and mercury.
- **Becton Dickenson, East Rutherford, New Jersey:** Remedial excavation of petroleum, chlorinated solvent and mercury-impacted soil, some of which originated from USTs.
- **Brooklyn Navy Yard, Brooklyn, New York:** Petroleum (10+USTs) and PCB impacts (electrical substation transformer releases).
- **Genesco Inc., 150 Fulton Avenue Superfund Site, Garden City Park, New York:** Significant quantities of PCE discharged to a stormwater drywell
- **Steel Equities, Emjay Boulevard, Brentwood, New York:** Facility-wide stormwater drywell and on-site septic system structure cleanouts (40+ structures) plus a stormwater recharge basin cleanout. Sediments and soils were impacted with VOCs, SVOCs, and metals.
- **Steel Equities, Alkier Street, Brentwood, New York:** Facility-wide stormwater drywell and on-site septic system structure cleanouts (10+ structures). Sediments and soils were impacted with VOCs, SVOCs, and metals.
- **Steel Equities, 2200 Northern Boulevard, East Hills, New York:** Facility-wide stormwater drywell and on-site septic system structure cleanouts (50+ structures) plus a large stormwater recharge basin cleanout. Sediments and soils were impacted with VOCs, SVOCs, and metals.
- **Northrop Grumman, Melville Park Road, Melville, New York:** Facility-wide stormwater drywell and on-site septic system structure cleanouts (10+ structures). Sediments and soils were impacted with VOCs, SVOCs, and metals.

Chemical & Petroleum Bulk Storage: Maintained a New Jersey UST License Since 1993. Provided turn-key services and managed those projects primarily in New York and New Jersey that involved the cleaning and proper removal of ASTs, and cleaning and removal or abandonment in-place of several dozen USTs. ERM's turnkey approach provided the clients with a single entity to properly investigate and close the USTs/ASTs in a safe and environmentally responsible manner meeting the substantive requirements of Federal, State and County regulations. All work was completed in a manner to cause the least disruption to facility client operations. ERM met with, and facilitated inspections by the Federal, State, County agencies and Fire Departments, and prepared final comprehensive closure reports for submittal to, and approval by the lead agencies. These services included:

- Pre-closure site investigations at each UST location using geophysical methods such as cable avoidance tools, terrain conductivity and ground penetrating radar, installation of soil borings with the collection of soil and ground water samples for laboratory analyses to assess pre-closure conditions;
- Preparation of UST Closure Work Plans; Sampling and Analysis/Quality Assurance Project Plans, and a Health and Safety Plans;
- Notification of interested regulatory agencies (Federal, State, County (Health), and Fire Departments);
- Procurement of all necessary permits;
- Procurement and contract management of the remedial subcontractors;
- Engineering support services for the implementation of the on-site closure activities;
- Closure by in-place abandonment, excavation and removal of the USTs and effected soils;
- On-site health and safety oversight;
- All end-point soil sampling;

- Complete restoration of each former UST location; and
- Preparation of a final comprehensive UST Closure Report for submittal to regulatory agency.

UST/AST Project Examples:

- 6,000-gallon heating/waste oil USTs - Anderol (fka Royal Lubricants) East Hanover New Jersey
- 10+ Gasoline/Heating Oil USTs up to 20,000-gallons capacity - Brooklyn Navy Yard – Brooklyn NY
- 1,000-gallon and 750-gallon Fiberglass Hazardous Waste Photographic Fixer ASTs - Konica Minolta Graphic Imaging USA, Inc., Glen Cove, New York
- 5,000-gallon heating oil USTs - Commercial Property - Oceanside, NY
- 8,000-gallon heating oil USTs - Elmsford Associates (Commercial Property), Elmsford NY
- 1,000-gallon heating oil USTs- Workman's Benefit Fund, Hicksville, NY
- 500-gallon gasoline and heating oil USTs - Steel Equities - Little Neck, NY
- 10,000-gallon & 5,000-gallon heating oil, 1,000-gallon gasoline Former Parker Hannifin facility – Dayton, NJ
- 3 10,000-gallon wastewater ASTs -Time Equities, Westbury, NY

Delta Airlines, John F. Kennedy International Airport (JFK) in Jamaica, NY: Directed all phases of multiple petroleum spill investigations on behalf of Delta Airlines. Coordinated the regulatory approval and execution of detailed investigative work plans. Obtained approvals from the Port Authority of NY & NJ (PA) for Tenant Alteration Applications (TAA), for soil and groundwater investigations along several hundred feet of subsurface aircraft fuel piping and hydrants on the airside of the aircraft terminal. Coordinated PA and subcontractors to perform, subsurface clearance, multi-phase extraction, soil borings, groundwater sampling, and disposal of investigative derived waste. All work to date has been successfully and safely completed in concert with the PA and local client operations teams.

TRW Aeronautical Systems, Utica, New York: Project Manager responsible for execution of multiple projects at this major aeronautical systems manufacturing facility in Utica, New York. These projects include a NYSDEC RCRA Corrective Action program, facility relocation support and permitting, and implementation of multiple Interim Remedial Measures (IRM). The RCRA Corrective Action included the regulatory negotiation, development, and implementation of key program documents including the RCRA Facility Assessment and the RCRA Facility Investigation Work Plan. Both on-site and off-site investigations were required to characterize impacted media including soils, ground water, storm water, surface water, and building materials such as concrete and metals. Contaminants of concern at the facility included volatile organic compounds, semi-volatile organic compounds, polychlorinated biphenyls (PCBs), metals, and cyanide. IRMs included removal and disposal of structures, vent stacks, stormwater conveyance systems, soil, and concrete. Facility relocation support included procurement of permits/registrations for sanitary wastewater discharges, air discharges, petroleum bulk storage tanks, waste management, development of a spill control, containment and countermeasures plan (SPCC), and revisions to both waste management and emergency control procedure plans.

Fulton Avenue Superfund Site, Garden City Park, New York: Designated Project Coordinator/Manager responsible for the implementation of an extensive RI/FS, Soil IRM, Remedial Design and Remedial Action at the Fulton Avenue Superfund Site. The Fulton Avenue site is listed on both the NYSDEC Registry of Inactive Hazardous Waste Sites and the USEPA NPL. Past discharges of chlorinated solvents (tetrachloroethene) have caused extensive ground water contamination in the Upper Glacial and

Magothy aquifers. The ground water contaminant plume has allegedly migrated a distance of 2 miles from the site to depths of up to 500 feet to affect up to 5 public supply wells encompassing an area of approximately 5 square miles within Nassau County. The RI/FS focuses on a ground water vertical profiling task using temporary wells to further define the extent of ground water contamination within the upper glacial aquifer and the Magothy aquifer, and to select permanent ground water monitoring well locations and screen settings; installation of permanent conventional and multi-level ground water monitoring wells to act as permanent monitoring and/or compliance points within the upper glacial aquifer and the Magothy aquifer; collection of ground water samples from over 60 ground water monitoring wells; collection of several rounds of synoptic ground water level data; a three-dimensional ground water flow computer model; a risk assessment for ground water; and a feasibility study for ground water. The soil IRM is comprised of a source area soil removal action, and the installation of a soil vapor extraction (SVE) and air sparging (AS) to remove contaminants from the vadose zone soils and the shallow ground water table. Since the SVE/as system went online in October 1998, approximately 10,000 pounds of tetrachloroethene has been removed from the ground. The post-IRM Site closure included indoor air sampling and installation of a sub-slab venting system beneath the building at the Site.

Former Parker Hannifin Facility, Dayton, New Jersey: Project Manager/Senior Hydrogeologist responsible for the coordination and performance of a major off-site hydrogeologic investigation for a manufacturing facility and ISRA site (NJDEP Site Remediation) in South Brunswick, NJ. Conducted an extensive volatile organic compound plume delineation task in a dual aquifer ground water system which utilized the terrain conductivity, resistivity and VLF geophysical mapping techniques and the Hydropunch ground water sampling technique. Other site investigative activities have included: the phased installation of an extensive ground water monitoring well network, performance of multiple aquifer tests, characterization of the subsurface geologic and hydrogeologic regime, test pitting, soil sampling, an UST investigation, ground water sampling, performance of a soil vapor extraction pilot study, design/installation/testing of a ground water recovery well, data analyses, interpretation, and preparation of an Site Assessment Report, an extensive Pump Test Report, Soil and Ground Water Remedial Action Work Plans, a Comprehensive Hydrogeologic Report, a SVE Pilot Study Report. Remedial Action Work Plans proposed the use of SVE, biosparging, and pump and treat technologies. All three systems are currently in operation and effectively remediating soil and ground water contamination at the site.

Ashland Chemical, Fords, New Jersey: Management and supervision of hydrogeologic investigation at an Ashland Drum Landfill Site, Fords, New Jersey (NJDEP Site Remediation). The investigation included: the installation of a ground water monitoring well network, characterization of the subsurface geologic and hydrogeologic regime, a study of tidal influence on ground water flow, test pitting, soil sampling, ground water sampling, drum sampling, data analyses and preparation of an RI Report.

NYSDEC Pfohl Brothers State Superfund, Williamsville, NY: Senior Hydrogeologist responsible for the coordination and supervision of a comprehensive RI at the Pfohl Brothers NYSDEC State Superfund site (120 acres) located in Williamsville, NY. The site investigation of Pfohl Brothers Landfill included: preparation of a RI work plan, Health and Safety Plan (HASP), a Quality Assurance Plan (QAPP), geophysical surveys using terrain conductivity, magnetometry and ground penetrating radar, soil borings, ground water monitoring well installation in both bedrock and overburden aquifers, soil sampling, sludge sampling,

hydrologic monitoring of surface water bodies, surface water sampling, ground water sampling, landfill leachate sampling, test pitting and drum sampling. In addition to the overall site characterization, evaluated the presence of low-level radionuclide contamination on the site, delineated, and mapped over 450 radioactive "hot- spots" using scintillometers. Radionuclides found at the site included radium-226, thorium-232, cesium-132 and uranium-238 in the form of discarded machine parts, radioluminescent badges, and ore rocks.

Port Washington Municipal Landfill Superfund Site, Port Washington, New York: Installation of ground water and landfill gas monitoring wells as part of an RI. Additionally, participated in the development and implementation of a landfill gas sampling program using flux boxes, landfill gas monitoring wells and summa canisters.

Wickland Oil, San Nicholas, Aruba: Senior Hydrogeologist responsible for the coordination and performance of a comprehensive environmental assessment at the former ESSO petroleum refinery, San Nicholas, Aruba, N.V. The investigation included: the installation of a ground water monitoring well network, characterization of the subsurface geologic and hydrogeologic regime, test pitting, soil sampling, an above ground storage tank investigation, ground water sampling, mapping of extensive LNAPL bodies, data analyses/interpretation, and preparation of an Site Assessment Report.

Participated in two NPL site RD programs, Vestal Well 1-1, Vestal, New York and the Lipari Landfill, Pitman, New Jersey. Activities for the Vestal Well 1-1 site included the preparation of a Remedial Design work plan, HASP and QAPP, performance of a soil boring program and design of a 1,000-gpm air stripper. Activities for the Lipari Landfill included the design of an automated extraction/injection well network and a 300-gpm production well.

Brooklyn Navy Yard, Brooklyn, New York: Project Manager responsible for execution several major environmental investigative/cleanup tasks at the former Brooklyn Navy Yard (Brooklyn Navy Yard Industrial Park {BNYIP}), that have included: Phase I & II Site Assessment/Investigation Services Related To a NYSDEC Voluntary Cleanup Agreement, Implementation of Interim Remedial Measures, and Investigation/Closure of Underground Storage Tanks

ERM performed a Phase I Preliminary Site Assessment data gathering and evaluation process in conjunction with a Phase II Site Investigation to address key data gaps for potential area and activity-specific sources of hazardous substances. The Phase I Preliminary Site Assessment included site inspections, review of all historic data/records, previous investigations performed at the BNYIP to date, inspection of BNYIP facilities, interviews of facility personnel regarding current and past operations.

The Phase II investigation included the sampling and characterization of environmental conditions at electrical substations/transformer areas, drum storage areas, dry docks, and facility-wide ground water characterization. The Phase II Investigative findings were then integrated with the Phase I Site Assessment information to prepare a Comprehensive Environmental Assessment Report (CEAR) for the BNYIP.

ERM provided complete turnkey services for investigation and closure of 10 underground petroleum storage tanks located in seven separate areas at the BNYIP. These services included pre-closure site investigations at each tank locations, preparation of all regulatory required work plan documents, notification of interested regulatory agencies (NYSDEC, NYCFD), procurement of necessary permits, closure by excavation and

removal of the USTs and effected soils, complete restoration of each former tank location, and preparation of a final comprehensive UST Closure Report for submittal to NYSDEC.

ERM performed an Interim Remedial Measure (IRM) at former electrical substation to mitigate PCB contamination resulting from releases of electrical transformer dielectric fluids. The IRM included characterizing the extent of PCB contamination on concrete surfaces and soils/sediments associated with the former transformers. The IRM included the removal, containment and disposal of soils/sediments containing high levels of PCBs from a subsurface vault, cleaning, scarification, and final encapsulation of all effected concrete surfaces within the vault and other concrete surfaces associated with the former transformers. A Final Remediation Report was prepared and submitted to NYSDEC for review and official acknowledgment that "no further action" is required at this electrical substation.

NYSDEC Utility Manufacturing State Superfund Site, New Cassel, New York: Project Manager responsible for the implementation of an off-Site RI/FS at the NYSDEC Utility Manufacturing State Superfund Site. The Utility Manufacturing Site is listed on the NYSDEC Registry of Inactive Hazardous Waste Sites. Past discharges of chlorinated solvents have caused extensive ground water contamination in the Upper Glacial and Magothy aquifers affecting several deep public supply wells in the Bowling Green Water District. The RI features the off-site installation of soil borings to collect both lithologic samples to characterize off-site stratigraphic conditions, and groundwater samples using a Hydropunch to characterize off-site groundwater quality/impacts (i.e. determine if site-related contaminants have migrated off-site); installation of groundwater monitoring wells to confirm the results of the Hydropunch sampling; and the collection of soil gas samples to evaluate potential risks from soil vapor migration.

Project Manager responsible for third-party oversight on behalf of ERM's client to ensure responsible parties (former owners) comply with all applicable NJDEP soil and ground water remediation standards and the NJDEP-approved Remedial Action Plan for an NJDEP ISRA site in Paramus, New Jersey. Additional activities include oversight of an asbestos removal action at the same site.

AES/Shore Realty NPL & State Superfund Site, Glenwood Landing, New York: Project Coordinator/Principal Consultant/Hydrogeologist responsible for the continued operation and assessment of remedial systems Applied Environmental Services/Shore Realty Site (Site) in Glenwood Landing, New York. The Site, a 3.2 acre parcel located adjacent to Hempstead Harbor, is listed on both the NYSDEC Registry of Inactive Hazardous Waste Sites and the USEPA NPL. Past discharges of petroleum have caused extensive shallow soil and ground water contamination in the Upper Glacial aquifers where groundwater discharges to the adjacent Hempstead Harbor. Remedial systems consist of air sparge/soil vapor extraction (AS/SVE), groundwater pump and treat with bioremediation facilitated by adding nutrient amendments to treated groundwater that is reinjected on-Site up at an upgradient infiltration gallery. The remedial systems have operated since 1995 and the NYSDEC/USEPA required a subsurface site investigation to evaluate remedial progress, the occurrence and distribution of remaining contaminants, concurrent groundwater movement and interaction with the adjacent surface water body. Responsible for planning and negotiating the investigative scope of work that included a tidal influence study using remote pressure transducer/data loggers to evaluate hydrodynamic response to tidal flux in shallow, intermediate and deep aquifer zones beneath the Site, and Site-wide comprehensive groundwater

sampling. The tidal influence study results were analyzed to confirm significant tidal influence in the intermediate and deep zones. The tidal influence study results and the groundwater results were used to develop and updated conceptual site model, identify recalcitrant pockets of contamination (hotspots) and develop a plan for remedial systems optimization that was presented in a Remedial Effectiveness Report that was review and approved by NYSDEC and USEPA. The optimization plan included soil borings for stratigraphic definition at the locations of two new groundwater recovery wells, collection of soil samples for geotechnical analyses to design the new recovery wells intended to collect groundwater as well as depress the water table to enhance the efficacy of the AS/SVE systems, installation of the new recovery wells, pulsed-remedial operations and continued groundwater and remedial system monitoring.

Confidential Client, Hoosick Falls, New York: Principal Consultant/Hydrogeologist embedded into a team of senior scientists as a senior hydrogeologist/technical resource responsible for the planning, implementation of characterization/remedial investigations for perfluorinated compounds and chlorinated VOCs at multiple sites listed or under consideration for list on the New York State Registry of Inactive Hazardous Waste Sites in a complex regional bedrock, post-glacial and fluvial depositional geologic environment. Responsible for a regional bedrock lineament analyses using topographic maps, aerial photographs and high resolution LIDAR imagery, oversight of geophysical subcontractor for multi-site seismic, resistivity and VLF surveys – interpretation of the results thereof, stratigraphic correlation/hydrogeologic interpretation, preparation of geologic cross-sections/isoconcentration plots, speciation analysis, a conceptual site model to understand the distribution and movement of groundwater and contaminants. Responsible for development of multiple site investigation scopes/work plans that include surface geophysical methods for subsurface clearance, the installation of soil borings to collect lithologic samples to characterize off-site stratigraphic conditions, installation of groundwater monitoring wells, and multi-media via sampling of soil, groundwater, sediment, surface water and soil vapor. Use of geoprobe direct push rigs, Waterloo APS (groundwater and estimate hydraulic conductivity), hollow-stem auger and rotosonic drilling methods.

Andrew Coenen

Senior Project Manager
North America

Mr. Coenen has knowledge of numerous analytical methodologies and experience in data validation of analytical data package deliverables for adherence to USEPA CLP and non-CLP, NYSDEC ASP, and NJDEP protocols. He is proficient with GIS/Key environmental management software and has operated a mobile gas chromatograph laboratory used to test soil and water samples for quick-turn volatile analysis.

Experience Mr. Coenen has 19 years of general analytical chemistry experience, 6 years of analytical laboratory experience, and 13 years of environmental consulting experience, including analytical data validation, sampling and analysis programs, quality assurance programs, technical support, laboratory audits, and QA oversight for fixed laboratory and field analysis. Mr. Coenen is an expert in GIS Solutions GIS\Key software. GIS\Key is a comprehensive, environmental data management and reporting tool. The software suite includes specific modules for storing and presenting Chemistry, Geology, Hydrology, NPDES, and Radiology data and has implemented the system's cutting edge data management protocols and processes for numerous large and small scale site investigation and remediation projects throughout the United States.

Email: Andrew.Coenen@erm.com

Education

- Rutgers University/Cook College - NJDEP Using GIS for Environmental Evaluations, October 1999
- 8-Hour OSHA Annual Refresher Training, 1999 current
- 40-Hour OSHA [29 CFR 1910.120 (e) (2)] Health and Safety Training, 1998
- Computer Aided Drafting, 50-Hour Course, Island Drafting and Technical Institute, 1998
- Immunoassay Testing Training Program, Strategic Diagnostics Inc., 1998
- B.S. Chemistry, University of Michigan, 1991

Languages

- English, native speaker
- Knowledge of German and Spanish

Fields of Competence

- Analytical data review and validation
- Environmental Database Management (GIS/Key)
- Laboratory Subcontractor Management
- Analytical protocols for pollutants by USEPA methodologies
- Methods of analysis of organic and inorganic parameters
- Review and preparation of QA/QC plans
- Field analytical techniques
- Multi-Media Sampling
- Briefly list areas of specialization

Key Projects

Environmental Data Management: Contaminated Site Management.
Data validation for numerous projects located in New York, New Jersey, California, Connecticut, Illinois, Iowa, Indiana, Maryland, Massachusetts, Michigan, Pennsylvania, Rhode Island, and Wisconsin, involving evaluation of aqueous, soil, sediment, leachate, and air samples analyzed by USEPA Contract Laboratory Protocols, State Protocols and numerous methodologies for organic, inorganic, wet chemistry parameters, TPH, and various other analyses.
Reviewed sampling and laboratory chemical data for adherence to New Jersey Department of Environmental Protection protocols and New York State Department of Environmental Conservation on numerous projects. Constructed electronic deliverables for submission to NJDEP and NYSDEC in required electronic formats.

Database construction & management for numerous investigations utilizing GIS/Key software.
Compiled field and laboratory data and generated result summary tables, contours, isopleths, contaminant plume maps, cross-sections, and boring logs.

Project Manager responsible for the coordination and performance of a major hydrogeologic investigation for an ISRA site (NJDEP Site Remediation) in East Rutherford, NJ.
Conducted an extensive volatile organic compound plume delineation, a vapor intrusion investigation, installation of an extensive ground water monitoring well network, ground water sampling.

Quality Assurance Officer.
responsible for review of all data collected at several sites including the former Brooklyn Navy Yard Industrial Park, several NYSDEC Standby Contract Projects, Sherwin Williams Superfund Site, Hydrite Chemical Company in Waterloo, Iowa.

Project management and technical support.
Special Analytical Services required to delineate low-level PAH contamination at a Superfund Site. This included method development and validation of a Selected Ion Monitoring (SIM) GC/MS technique.

Utilized Immunoassay test kits for field measurement of PCB contamination at the former Brooklyn Navy Yard, Brooklyn, New York.
Performed data validation of all field analytical samples and off-site laboratory samples and compared off-site results to test kits.

Prepared numerous Sampling and Analysis Plans (SAPs) and Quality Assurance Project Plans (QAPPs) for adherence to state and federal guidelines.

Conducted subsurface investigations with a Geoprobe. Performed various field tests.

Supervision of tank removal and subsequent soils evaluation for contamination.

Brice Lynch

Mr. Brice Lynch is a consultant within ERM based in Melville, NY. He has eight years of experience in the field of environmental consulting industry specializing in Geology and site remediation services.

His experience has dealt with groundwater, soil and air sampling events at spill and superfund sites, field parameter measurements, monitoring well installation, multi-level well installation, installation of vertical profile wells, soil logging, air rotary drilling, mud rotary drilling, bedrock coring and logging, construction oversight, brownfield site remediation oversight and CAMP, underground storage tank removal oversight and operations and maintenance of remediation systems. He has conducted multiple Phase II Environmental Assessments for multiple private entities.

Professional Affiliations & Registrations

- 40-hour Health and Safety Certification (OSHA)
- New York State Professional Geologist License

Fields of Competence

- Site assessment and remediation
- Geologic and hydrogeologic correlation, analysis, interpretation and assessments
- Groundwater investigations
- Soil investigations
- Air quality investigations and monitoring
- Remediation system design, construction, maintenance and oversight
- Health and safety site officer
- Field Management and Team Leader

Education

- Bachelor of Science, Geology, Stony Brook University, United States, 2010

Languages

- English, native speaker
- Spanish, beginner

Key Projects

Remediation System Operation and Maintenance, Groundwater and Air Sampling, Uniondale, NY
Performed regular operation and maintenance on SVE/AS-Air Sparge System, Ozone System, quarterly groundwater and air sampling.

Municipality, Nassau County, NY
Prepared and conducted groundwater sampling events at various sites. Field parameter measurements and product recovery of hydraulic oil and gasoline at contaminated site.

New Castle, Westbury, NY
Prepared and conducted quarterly groundwater sampling events and remediation system operations and maintenance.

Data management, Uniondale, NY
Inputted data using EQuIS software in order to develop and interpret trend plots of contamination over time.

Steel Equities, Little Neck, NY
Health and Safety Officer for Remedial Investigation. Performed oversight of mud rotary drilling and sampled and logged soils throughout the site.

Beckton Dickenson, East Rutherford, NJ
Field Team Leader for Becton Dickinson ISRA project. Prepared and conducted groundwater sampling events.

BICC, New Brunswick, NJ
Prepared and conducted groundwater sampling events. Mud rotary and Air rotary bedrock coring and FLUTe FACT liner installation oversight and sampling.

Genesco, Garden City Park, NY
Field Team Leader for groundwater sampling event at superfund site. Developed sampling schedule, prepared and executed all field activities and communicated effectively and efficiently with project managers and field staff.

Northwell Health, Lake Succes, NY
Conducted soil sampling for an active superfund site. Managed community air monitoring program (CAMP) and soil stockpiles to be transported off site.

Ultraflex, Brooklyn, NY
Conducted interior soil borings throughout an active printing facility. Installed sub slab vapor points and collected sub slab and indoor air samples. Installed tempororay monitoring wells and collected groundwater samples. Collected active and passive indoor air samples for OSHA compliance.

Borinquen Court, Bronx, NY
Installed temporary monitoring wells for an injection program at a Brownfield Site in the south Bronx in order to reduce soil and groundwater contamination on site. Responsible for implementing the CAMP for the entire site. Conducted groundwater sampling events in order to analyze effectiveness of the injection program.

Bluestone Organization, Jamaica, NY
Conducted groundwater and soil sampling event. Oversight of hazardous waste mass excavation at a Brownfield Site. Managed the removal of a UST that leaked and delineated the impacted soil. Collected end point samples to verify spill closure. Responsible for implementing the CAMP for the entire site.

Northrop Grumman, Bethpage, NY
Field Team Leader for Hydrualic Effectiveness project at a superfund site. Contaminants of concern at the site included chlorinated volatile organic compounds (VOCs). Installed monitoring wells and collected groundwater samples. Installed vertical profiles, collected groundwater samples and logged the soils throughout the site. With the soil and groundwater data composed geologic cross sections with the soil classification data and analytical results and discussed findings in the RIR.

ATTACHMENT B - Standard Operating Procedures

Section	Standard Operating Procedure
C.1	SOP 1 Water Level Measurement Procedures
C.2	SOP 2 Groundwater Sampling Procedures
C.3	SOP 3 Field Blanks
C.4	SOP 4 Trip Blanks
C.5	SOP 5 Decontamination Procedures
C.6	SOP 6 Waste Management and Disposal

C.1 WATER LEVEL MEASUREMENT PROCEDURES

The following procedure shall be used for water level measurements:

- Clean all water-level measuring equipment using appropriate decontamination procedures.
- Wear appropriate health and safety equipment as outlined in the Health and Safety Plan. In addition, samplers shall don new sampling gloves at each individual well prior to sampling.
- Visually examine the exterior of the monitoring well for signs of damage or tampering and record in the field logbook.
- Unlock well cap.
- Take and record in field logbook PID and/or OVA readings.
- Measure the static water level in the well with an electronic water level indicator. The water level indicator shall be rinsed with deionized water in between individual wells to prevent cross-contamination. Synoptic round of water level measurements shall all be completed on the same day.
- For wells located within the GCPIA, an interface probe will be used to check the bottom well sump for the presence of DNAPL. If it appears that DNAPL is present, an attempt will be made to collect a sample of the DNAPL using a discrete depth-sampling device such as a Bacon Bomb sampler. Groundwater samples will not be collected from any well containing DNAPL. Attach a pre-cleaned decontaminated discrete depth-sampling device to a new, dedicated length of polypropylene string. Set the sampler in the open position, and slowly lower the device to the bottom of the well. Upon reaching the well bottom, close the sampler using the wire-line or bottom actuated release mechanism to collect a sample. Slowly retrieve the sampler from the well, and collect a sample of the fluids into a sample jar for analysis and characterization.
- If DNAPL is not detected in the well, continue with the procedures described below.

C.2 SOP 2: GROUNDWATER SAMPLING PROCEDURES

Groundwater sampling will be performed using USEPA low-flow well purging/sample collection techniques. The following subsections present general preliminary well sampling procedures common to both techniques followed by low-flow sampling procedures, and if for some reason it is not possible to perform low-flow sampling, conventional procedures are also presented for reference.

The low-flow groundwater purging/sampling technique employs the use of a flow-through cell equipped with probes and a meter for measuring groundwater quality parameters such as pH, temperature, specific conductivity, dissolved oxygen and oxidation/reduction potential. One example of this equipment is the Horiba U-22 Flow-Through Cell and the specific manufacturer's calibration and operation instructions should be followed.

C.2.1 General Procedures

The following procedure will be used for all monitoring well groundwater sampling:

- Clean all water-level measuring equipment using appropriate decontamination procedures.
- Wear appropriate health and safety equipment as outlined in the HASP. In addition, samplers will don new sampling gloves at each individual well prior to sampling.
- Visually examine the exterior of the monitoring well for signs of damage or tampering and record in the field logbook.
- Unlock well cap.
- Take and record in field logbook PID and/or Organic Vapor Analyzer (OVA) readings.
- Measure the static water level in the well with a decontaminated steel tape or electronic water level indicator. The tape or water level indicator will be rinsed with deionized water in between individual wells to prevent cross-contamination. Synoptic round of water level measurements will all be completed on the same day.
- All wells will also be checked for the presence and thickness of Light or Dense Non Aqueous Phase Liquids (LNAPL/DNAPL).
- If LNAPL or DNAPL is encountered on the top of the water table at the time of sampling, a sample of the LNAPL or DNAPL will be collected for analysis if accumulations are sufficient. Measurement of the thickness of this layer will be taken using an interface probe. A sample of the LNAPL or DNAPL may be obtained using a dedicated bottom-loading bailer. The sample will be sent to the laboratory for analysis of its chemical composition and physical properties (e.g., specific

gravity, and gas chromatograph (GC) fingerprint). Initially, no groundwater sample will be collected from wells that contain LNAPL or DNAPL.

- If LNAPL or DNAPL is not detected in the well, continue with the low-flow sampling procedures described below.

C.2.2 Low-Flow Sampling

The low-flow sampling procedure is intended to reduce the amount of purge water generated during groundwater monitoring well sampling.

Sample Equipment

- Adjustable-rate, positive displacement pumps (e.g., centrifugal or bladder pumps constructed of stainless-steel or Teflon®). The selected pump must be specifically designed for low-flow rates (i.e., use of a high volume pump that is adjusted down to a low flow setting is not permitted).
- Tubing used in purging and sampling each well must be dedicated to that well. Once properly located, moving the pump in the well should be avoided. Consequently, the same tubing should be used for purging and sampling. Teflon® and Teflon®-lined polyethylene tubing must be used to collect samples for organic analysis.
- Electronic water level measuring device, 0.01-foot accuracy.
- Flow measurement supplies (e.g., graduated cylinder and stop watch).
- Interface probe.
- Power or air source (generator, compressed air tank, etc.).
- In-line purge criteria parameter monitoring instruments - pH, turbidity, specific conductance, temperature, ORP, and dissolved oxygen.
- Decontamination supplies.
- Logbook and field forms.
- Sample bottles.
- Sample preservation supplies (as specified by the analytical methods).
- Sample tags or labels, chain of custody forms.
- Well construction data, location map, field data from last sampling event.

Sample Procedure

1) Lower pump, safety cable, tubing, and electrical lines very slowly into the well to a depth corresponding to the center of the saturated screen section of the well. The pump intake must be kept at least two feet above the bottom of the well to prevent

mobilization of any sediment. Lowering the pump quickly, or even at a moderate rate, will result in disturbing sediment in the well. This is one of the most important steps in low flow sampling at the Site.

2) Measure the water level again with the pump in well before starting the pump. Start pumping the well at 100 to 500 milliliters per minute. Ideally, the pump rate should cause little or no water level drawdown in the well (less than 0.3 foot and the water level should stabilize).

- Measure and record the depth to water and pumping rate every 3 to 5 minutes (or as appropriate) during pumping. If purging continues for more than 30 minutes, readings will be recorded at approximately 10-minute intervals. However, once stabilization is indicated, a minimum of 3 consecutive readings at 3 to 5 minute intervals will be recorded prior to sample collection.
- Care should be taken not to cause pump suction to be broken or entrainment of air in the sample. Do not allow the groundwater level to go below the pump intake.
- Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to minimize drawdown and/or to ensure stabilization of indicator parameters.

3) During purging, measure and record the field indicator parameters using the in-line meter (turbidity, temperature, specific conductance, pH, Eh, and dissolved oxygen) every 3 to 5 minutes (or as appropriate). If purging continues for more than 30 minutes, readings will be recorded at approximately 10-minute intervals. However, once stabilization is indicated, a minimum of 3 consecutive readings at 3 to 5 minute intervals will be recorded prior to sample collection.

- The well is considered stabilized and ready for sample collection once all the field indicator parameter values remain within 10 percent for 3 consecutive readings.
- If drawdown in the well is measured at 1 foot or more, continue to low flow purge until a minimum of the equivalent volume of 1 well casing volume is removed. Using the flow equation to calculate the volume of purge water. Then collect the ground water sample.

4) Before sampling, either disconnect the in-line cell or use a by pass assembly to collect groundwater samples before the in-line cell. All sample containers should be filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

5) Label the samples using waterproof labels, or apply clear tape over the paper labels. Place all samples in a cooler as described in the QAPP with bagged ice or frozen cold packs and maintain at 4°C for delivery to the laboratory.

6) Do not use ice for packing material; melting will cause bottle contact and possible breakage.

7) Measure and record well depth. Take final water quality reading using low flow cell.

8) Secure the well.

C.2.3 Standard Purging and Sampling Procedure

1) Calculate the volume of water in the well as follows:

$$\text{Volume (in gallons)} = 3.14r^2(h) \times 7.48 \text{ gal/ft}^3$$

Where

h - well depth (feet) - static water level (feet)

r = well radius (feet)

2) Lower the decontaminated submersible pump with new, dedicated lengths of polyethylene tubing into the well so the pump is set at the screen interval. Purge 3 to 5 volumes of water from the well, using the submersible pump.

3) Measure and record time, temperature, pH, turbidity, and specific conductance as each volume of well water is purged. Once the temperature, pH, and specific conductance have stabilized to within 10% for two successive well volumes and the turbidity is less than 50 NTUs, a groundwater sample may be collected. Measure DO and remove the submersible pump from the well.

4) After purging, allow static water level to recover to approximate original level.

5) Place polyethylene sheeting around well casing to prevent contamination of sampling equipment in the event equipment is dropped.

6) Obtain sample from well with a dedicated, factory pre-cleaned polyethylene Voss ™ bailer. The bailer will be suspended on a new, dedicated length of polypropylene string. The maximum time between purging and sampling will be three (3) hours. All the bailers for one day of sampling will be pre-cleaned and dedicated to each individual wells.

   Sample for VOCs first by lowering the bailer slowly to avoid degassing, then collect any other organic and inorganic samples by pouring directly into sample bottles from bailers.

   The sample preservation procedure will be to immediately place analytical samples in the cooler and chill to 4°C. Samples will be delivered to the appropriate laboratory within 24 hours. Samples will be maintained at 4°C until time of analysis.

7) Decontaminate the submersible pump and discard the pump discharge line.

8) Re-lock well cap.

Fill out field notebook, Well Sample Log Sheet, labels, Custody Seals and Chain-of-Custody forms.

C.3 SOP 3: FIELD BLANKS

Field blanks shall be taken to evaluate the cleanliness of groundwater sampling equipment, sample bottles and the potential for cross-contamination of samples due to airborne contaminants present in the air at the site and handling of equipment and sample bottles. Field blank samples shall be performed on the groundwater sample bailers and any filtering equipment. The frequency of field blanks taken shall be one per decontamination event for each type of sampling equipment, and each media being sampled (e.g., a groundwater bailer for groundwater, and a hand auger for soil sampling), at a minimum of one per equipment type and/or media per day.

Where required, field blanks shall be obtained prior to the occurrence of any analytical field sampling event by pouring deionized or potable water over a particular piece of sampling equipment and into a sample container. The analytical laboratory shall provide field blank water and sample jars with preservatives for the collection of all field blanks. Glass jars shall be used for organic blanks. The field blanks as well as the trip blanks shall accompany field personnel to the sampling location. The field blanks shall be analyzed for the same analytes as the environmental samples being collected that day and shall be shipped with the samples taken subsequently that day.

Field blanks shall be taken in accordance with the procedure described below:

(1) Decontaminate sampler using the procedures specified in this plan.

(2) Pour distilled/deionized water over the sampling equipment and collect the rinsate water in the appropriate sample bottles.

(3) The sample shall be immediately placed in a sample cooler and maintained at a temperature of 4°C until receipt by the laboratory.

(4) Fill out sample log, labels and chain-of-custody forms, and record in field notebook.

C.4 SOP 4: TRIP BLANKS

A laboratory supplied trip blank shall be an aliquot of distilled, deionized water which shall be sealed in a sample bottle prior to initiation of each day of field work. The trip blank shall be used to determine if any cross-contamination occurs between aqueous samples during shipment. Trip blanks are analyzed for aqueous VOCs only. Glass vials (40 ml) with teflon-lined lids shall be used for VOC blanks. A trip blank shall be prepared by the laboratory prior to each day of field sampling for aqueous volatiles. The sealed trip blank bottles shall be placed in a cooler with the empty sample bottles and shall be brought to the site by the laboratory personnel. If multiple coolers are required to store and transport aqueous VOC samples, then each cooler must contain an individual trip blank.

C.5 SOP 5: DECONTAMINATION PROCEDURES

The submersible sampling pumps that are placed in the borehole shall be decontaminated with an Alconox detergent rinse and by pumping approximately 20 gallons of potable water through the pump. Since dedicated new lengths of polyethylene tubing shall be used for sampling each well, the tubing shall not be decontaminated. Unless otherwise specified, the submersible pumps shall be decontaminated prior to the sampling the first well and between each subsequent well as follows:

- Potable water rinse.
- Alconox detergent and potable water scrub.
- Potable water rinse.
- Distilled/deionized water rinse.
- Wrap in aluminum foil, shiny side facing out.

Unless otherwise specified, all non-detect sampling equipment utilized to obtain groundwater environmental samples for chemical analyses (e.g., stainless steel bailers) shall be decontaminated between sampling points as follows:

- Potable water rinse.
- Alconox and water detergent and potable water scrub.
- Potable water rinse.
- Methanol (at least pesticide grade) rinse: Light spray to minimize material used. Segregate and store rinsate separately.
- Distilled/deionized water rinse.
- Air dry.
- Wrap or cover in aluminum foil shiny side facing out.

C.6 SOP 6: WASTE MANAGEMENT AND DISPOSAL

The following section describes the handling and ultimate disposal of solid and liquid wastes generated during the field activities. Waste generated is expected to consist of trash (boxes, paper, etc.), decontamination wash water, purge water, and used protective clothing.

The PCE in ground water at the Fulton Avenue site is a listed hazardous waste. Accordingly, its derived-from wastes are considered hazardous for handling and disposal purposes. In regards to disposal, disposal options for generated wastes will depend on contaminant levels in the waste. The following standards and regulations have been identified as being applicable, relevant and appropriate to any removal, management, and off-site or on-site disposal of Fulton Avenue-generated waste materials:

NYSDEC's RCRA TAGM #3028 on "Contained-In Criteria for Environmental Media" {November 30, 1992};

- 40 C. F.R. Part 262 (Standards Applicable to Generators of Hazardous Waste);
- 40 C. F. R. Part 263 (Standards Applicable to Transporters of Hazardous Waste;
- 40 C. F. R. Part 264 (Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities); and
- 40 C. F. R. Part 268 (Land Disposal Restrictions)

Accordingly, handling and disposal will be as follows:

- Non-contaminated trash and debris will be placed in a trash dumpster and disposed of by a local garbage hauler.
- Non-contaminated protective clothing will be packed in plastic bags and placed in a trash dumpster for disposal by a local garbage hauler.
- Liquids generated from equipment decontamination and permanent ground water monitoring well purging will be collected in drums at the point of generation, transported to the Fulton Property, and staged for off-Site disposal at a properly permitted/licensed disposal facility. It is intended that these liquids will not be staged for more than 90 days in order to comply with applicable RCRA storage regulations.
- Used protective clothing and equipment that is suspected to be contaminated with hazardous waste will be placed in plastic bags, packed in 55-gallon ring-top drums, and disposed of in accordance with any applicable federal and state regulation in addition to those referenced above by a waste subcontractor.

ATTACHMENT C - Laboratory Certification & Operating Procedures

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

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Revised August 02, 2018

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PAUL IOANNIDIS
SGS NORTH AMERICA INC. - DAYTON
2235 ROUTE 130
DAYTON, NJ 08810

NY Lab Id No: 10983

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260C
	EPA 624.1
Acrylonitrile	EPA 8260C
	EPA 624.1
Ethyl methacrylate	EPA 8260C
Methyl acrylonitrile	EPA 8260C
Methyl methacrylate	EPA 8260C
Amines	
1,2-Diphenylhydrazine	EPA 8270D
1,4-Phenylenediamine	EPA 8270D
1-Naphthylamine	EPA 8270D
2,3-Dichloroaniline	EPA 625.1
2-Naphthylamine	EPA 8270D
2-Nitroaniline	EPA 8270D
3-Nitroaniline	EPA 8270D
4-Chloroaniline	EPA 8270D
4-Nitroaniline	EPA 8270D
5-Nitro-o-toluidine	EPA 8270D
a,a-Dimethylphenethylamine	EPA 8270D
Aniline	EPA 625.1
	EPA 8270D
Carbazole	EPA 625.1
	EPA 8270D
Diphenylamine	EPA 8270D
Methapyrilene	EPA 8270D

Amines	
Pronamide	EPA 8270D
Propionitrile	EPA 8260C
Pyridine	EPA 625.1
	EPA 8270D
Bacteriology	
Coliform, Fecal	SM 9222D-2006
Coliform, Total	SM 9222B-2006
Heterotrophic Plate Count	SM 18-21 9215B
Benzidines	
3,3'-Dichlorobenzidine	EPA 625.1
	EPA 8270D
3,3'-Dimethylbenzidine	EPA 8270D
Benzidine	EPA 625.1
	EPA 8270D
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
	EPA 608.3
4,4'-DDE	EPA 8081B
	EPA 608.3
4,4'-DDT	EPA 8081B
	EPA 608.3
Aldrin	EPA 8081B
	EPA 608.3
alpha-BHC	EPA 8081B

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Chlorinated Hydrocarbon Pesticides	
alpha-BHC	EPA 608.3
alpha-Chlordane	EPA 8081B
beta-BHC	EPA 8081B
	EPA 608.3
Chlordane Total	EPA 8081B
	EPA 608.3
Chlorobenzilate	EPA 8270D
delta-BHC	EPA 8081B
	EPA 608.3
Diallate	EPA 8270D
Dieldrin	EPA 8081B
	EPA 608.3
Endosulfan I	EPA 8081B
	EPA 608.3
Endosulfan II	EPA 8081B
	EPA 608.3
Endosulfan sulfate	EPA 8081B
	EPA 608.3
Endrin	EPA 8081B
	EPA 608.3
Endrin aldehyde	EPA 8081B
	EPA 608.3
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
	EPA 608.3

Chlorinated Hydrocarbon Pesticides	
Heptachlor epoxide	EPA 8081B
	EPA 608.3
Isodrin	EPA 8270D
Kepone	EPA 8270D
Lindane	EPA 8081B
	EPA 608.3
Methoxychlor	EPA 8081B
	EPA 608.3
Mirex	EPA 8081B
PCNB	EPA 8270D
Toxaphene	EPA 8081B
	EPA 608.3
Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
1,2,4-Trichlorobenzene	EPA 625.1
	EPA 8270D
2-Chloronaphthalene	EPA 625.1
	EPA 8270D
Hexachlorobenzene	EPA 625.1
	EPA 8270D
Hexachlorobutadiene	EPA 625.1
	EPA 8270D
Hexachlorocyclopentadiene	EPA 625.1
	EPA 8270D

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Chlorinated Hydrocarbons	
Hexachloroethane	EPA 8260C
	EPA 625.1
	EPA 8270D
Hexachloropropene	EPA 8270D
Pentachlorobenzene	EPA 8270D
Chlorophenoxy Acid Pesticides	
2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A
	EPA 8270D
Pentachlorophenol	EPA 8151A
Demand	
Biochemical Oxygen Demand	SM 5210B-2011
Carbonaceous BOD	SM 5210B-2011
Chemical Oxygen Demand	SM 5220C-2011
Dissolved Gases	
Ethane	RSK-175
Ethene (Ethylene)	RSK-175
Methane	RSK-175
Dissolved Gases	
Propane	RSK-175
Fuel Oxygenates	
Di-isopropyl ether	EPA 8260C
Ethanol	EPA 8260C
	EPA 8015C
Methyl tert-butyl ether	EPA 8260C
	EPA 624.1
tert-amyl methyl ether (TAME)	EPA 8260C
tert-butyl alcohol	EPA 8260C
	EPA 8015C
tert-butyl ethyl ether (ETBE)	EPA 8260C
Haloethers	
2,2'-Oxybis(1-chloropropane)	EPA 625.1
	EPA 8270D
4-Bromophenylphenyl ether	EPA 625.1
	EPA 8270D
4-Chlorophenylphenyl ether	EPA 625.1
	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 625.1
	EPA 8270D
Bis(2-chloroethyl)ether	EPA 625.1
	EPA 8270D
Low Level Halocarbons	
1,2,3-Trichloropropane, Low Level	EPA 8011

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Low Level Halocarbons	
1,2-Dibromo-3-chloropropane, Low Level	EPA 8011
1,2-Dibromoethane, Low Level	EPA 8011
Low Level Polynuclear Aromatics	
Acenaphthene Low Level	EPA 8270D SIM
Acenaphthylene Low Level	EPA 8270D SIM
Anthracene Low Level	EPA 8270D SIM
Benzo(a)anthracene Low Level	EPA 8270D SIM
Benzo(a)pyrene Low Level	EPA 8270D SIM
Benzo(b)fluoranthene Low Level	EPA 8270D SIM
Benzo(g,h,i)perylene Low Level	EPA 8270D SIM
Benzo(k)fluoranthene Low Level	EPA 8270D SIM
Chrysene Low Level	EPA 8270D SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270D SIM
Fluoranthene Low Level	EPA 8270D SIM
Fluorene Low Level	EPA 8270D SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270D SIM
Naphthalene Low Level	EPA 8270D SIM
Phenanthrene Low Level	EPA 8270D SIM
Pyrene Low Level	EPA 8270D SIM
Metals I	
Barium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B

Metals I	
Barium, Total	EPA 200.8, Rev. 5.4 (1994)
Cadmium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Calcium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Chromium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Copper, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Iron, Total	EPA 200.7, Rev. 4.4 (1994)

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Metals I	
Iron, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Lead, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Magnesium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Manganese, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Nickel, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D

Metals I	
Nickel, Total	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Potassium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Silver, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Sodium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Strontium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B

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Metals II		**Metals II**	
Aluminum, Total	EPA 200.7, Rev. 4.4 (1994)	Chromium VI	SM 3500-Cr B-2011
	EPA 6010C	Mercury, Low Level	EPA 245.7, Rev. 2.0 (2005)
	EPA 6010D		EPA 1631E
	EPA 6020A	Mercury, Total	EPA 245.1, Rev. 3.0 (1994)
	EPA 6020B		EPA 7470A
	EPA 200.8, Rev. 5.4 (1994)	Selenium, Total	EPA 200.7, Rev. 4.4 (1994)
Antimony, Total	EPA 200.7, Rev. 4.4 (1994)		EPA 6010C
	EPA 6010C		EPA 6010D
	EPA 6010D		EPA 6020A
	EPA 6020A		EPA 6020B
	EPA 6020B		EPA 200.8, Rev. 5.4 (1994)
	EPA 200.8, Rev. 5.4 (1994)	Vanadium, Total	EPA 200.7, Rev. 4.4 (1994)
Arsenic, Total	EPA 200.7, Rev. 4.4 (1994)		EPA 6010C
	EPA 6010C		EPA 6010D
	EPA 6010D		EPA 6020A
	EPA 6020A		EPA 6020B
	EPA 6020B		EPA 200.8, Rev. 5.4 (1994)
	EPA 200.8, Rev. 5.4 (1994)	Zinc, Total	EPA 200.7, Rev. 4.4 (1994)
Beryllium, Total	EPA 200.7, Rev. 4.4 (1994)		EPA 6010C
	EPA 6010C		EPA 6010D
	EPA 6010D		EPA 6020A
	EPA 6020A		EPA 6020B
	EPA 6020B		EPA 200.8, Rev. 5.4 (1994)
	EPA 200.8, Rev. 5.4 (1994)	**Metals III**	
Chromium VI	EPA 7196A	Cobalt, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 7199		

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Metals III		
Cobalt, Total	EPA 6010C	
	EPA 6010D	
	EPA 6020A	
	EPA 6020B	
	EPA 200.8, Rev. 5.4 (1994)	
Molybdenum, Total	EPA 200.7, Rev. 4.4 (1994)	
	EPA 6010C	
	EPA 6010D	
	EPA 6020A	
	EPA 6020B	
	EPA 200.8, Rev. 5.4 (1994)	
Thallium, Total	EPA 200.7, Rev. 4.4 (1994)	
	EPA 6010C	
	EPA 6010D	
	EPA 6020A	
	EPA 6020B	
	EPA 200.8, Rev. 5.4 (1994)	
Tin, Total	EPA 200.7, Rev. 4.4 (1994)	
	EPA 6010C	
	EPA 6010D	
	EPA 6020A	
	EPA 6020B	
	EPA 200.8, Rev. 5.4 (1994)	
Titanium, Total	EPA 200.7, Rev. 4.4 (1994)	
	EPA 6010C	
	EPA 6010D	

Metals III		
Titanium, Total	EPA 6020A	
	EPA 6020B	
	EPA 200.8, Rev. 5.4 (1994)	
Mineral		
Acidity	SM 2310B-2011	
Alkalinity	SM 2320B-2011	
Chloride	EPA 300.0, Rev. 2.1 (1993)	
	SM 4500-Cl- C-2011	
	EPA 9056A	
Fluoride, Total	EPA 300.0, Rev. 2.1 (1993)	
	EPA 9056A	
Hardness, Total	SM 2340C-2011	
	EPA 200.7, Rev. 4.4 (1994)	
Sulfate (as SO4)	EPA 300.0, Rev. 2.1 (1993)	
	EPA 9056A	
Miscellaneous		
Boron, Total	EPA 200.7, Rev. 4.4 (1994)	
	EPA 6010C	
	EPA 6020A	
	EPA 200.8, Rev. 5.4 (1994)	
Bromide	EPA 300.0, Rev. 2.1 (1993)	
	EPA 9056A	
Color	SM 2120B-2011	
Cyanide, Total	EPA 335.4, Rev. 1.0 (1993)	
	EPA 9012B	

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Miscellaneous

Oil and Grease Total Recoverable (HEM)	EPA 1664A
Organic Carbon, Total	SM 5310B-2011
	EPA 9060A
Perchlorate	EPA 314.0
Phenols	EPA 420.4, Rev. 1.0 (1993)
Silica, Dissolved	EPA 200.7, Rev. 4.4 (1994)
	SM 4500-SiO2 C-2011
Specific Conductance	SM 2510B-2011
	EPA 9050A
Sulfide (as S)	SM 4500-S2- F-2011
	EPA 9034
Surfactant (MBAS)	SM 5540C-2011
Total Organic Halides	EPA 9020B
Total Recoverable Petroleum Hydrocarbor	EPA 1664A
Turbidity	EPA 180.1, Rev. 2.0 (1993)

Nitroaromatics and Isophorone

1,3,5-Trinitrobenzene	EPA 8270D
1,3-Dinitrobenzene	EPA 8270D
1,4-Naphthoquinone	EPA 8270D
2,4-Dinitrotoluene	EPA 625.1
	EPA 8270D
2,6-Dinitrotoluene	EPA 625.1
	EPA 8270D
4-Nitroquinoline-1-oxide	EPA 8270D
Isophorone	EPA 625.1

Nitroaromatics and Isophorone

Isophorone	EPA 8270D
Nitrobenzene	EPA 625.1
	EPA 8270D

Nitrosoamines

N-Nitrosodiethylamine	EPA 8270D
N-Nitrosodimethylamine	EPA 625.1
	EPA 8270D
N-Nitrosodi-n-butylamine	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 625.1
	EPA 8270D
N-Nitrosodiphenylamine	EPA 625.1
	EPA 8270D
N-nitrosomethylethylamine	EPA 8270D
N-nitrosomorpholine	EPA 8270D
N-nitrosopiperidine	EPA 8270D
N-Nitrosopyrrolidine	EPA 8270D

Nutrient

Ammonia (as N)	SM 4500-NH3 H-2011
Kjeldahl Nitrogen, Total	EPA 351.2, Rev. 2.0 (1993)
Nitrate (as N)	EPA 353.2, Rev. 2.0 (1993)
Nitrate-Nitrite (as N)	EPA 353.2, Rev. 2.0 (1993)
Nitrite (as N)	SM 4500-NO2 B-2011
Orthophosphate (as P)	EPA 365.3 (Issued 1978)
Phosphorus, Total	EPA 365.3 (Issued 1978)

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Organophosphate Pesticides	
Atrazine	EPA 8270D
Dimethoate	EPA 8270D
Disulfoton	EPA 8270D
Famphur	EPA 8270D
Parathion ethyl	EPA 8270D
Parathion methyl	EPA 8270D
Phorate	EPA 8270D
Thionazin	EPA 8270D
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015C
Gasoline Range Organics	EPA 8015C
Phthalate Esters	
Benzyl butyl phthalate	EPA 625.1
	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 625.1
	EPA 8270D
Diethyl phthalate	EPA 625.1
	EPA 8270D
Dimethyl phthalate	EPA 625.1
	EPA 8270D
Di-n-butyl phthalate	EPA 625.1
	EPA 8270D
Di-n-octyl phthalate	EPA 625.1
	EPA 8270D
Polychlorinated Biphenyls	
PCB-1016	EPA 8082A
	EPA 608.3
PCB-1221	EPA 8082A
	EPA 608.3
PCB-1232	EPA 8082A
	EPA 608.3
PCB-1242	EPA 8082A
	EPA 608.3
PCB-1248	EPA 8082A
	EPA 608.3
PCB-1254	EPA 8082A
	EPA 608.3
PCB-1260	EPA 8082A
	EPA 608.3
PCB-1262	EPA 8082A
PCB-1268	EPA 8082A
Polynuclear Aromatics	
2-Acetylaminofluorene	EPA 8270D
3-Methylcholanthrene	EPA 8270D
7,12-Dimethylbenzyl (a) anthracene	EPA 8270D
Acenaphthene	EPA 625.1
	EPA 8270D
Acenaphthylene	EPA 625.1
	EPA 8270D
Anthracene	EPA 625.1

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Polynuclear Aromatics	
Anthracene	EPA 8270D
Benzo(a)anthracene	EPA 625.1
	EPA 8270D
Benzo(a)pyrene	EPA 625.1
	EPA 8270D
Benzo(b)fluoranthene	EPA 625.1
	EPA 8270D
Benzo(ghi)perylene	EPA 625.1
	EPA 8270D
Benzo(k)fluoranthene	EPA 625.1
	EPA 8270D
Chrysene	EPA 625.1
	EPA 8270D
Dibenzo(a,h)anthracene	EPA 625.1
	EPA 8270D
Fluoranthene	EPA 625.1
	EPA 8270D
Fluorene	EPA 625.1
	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 625.1
	EPA 8270D
Naphthalene	EPA 625.1
	EPA 8270D
Phenanthrene	EPA 625.1
	EPA 8270D
Pyrene	EPA 625.1

Polynuclear Aromatics	
Pyrene	EPA 8270D
Priority Pollutant Phenols	
2,3,4,6 Tetrachlorophenol	EPA 8270D
2,4,5-Trichlorophenol	EPA 625.1
	EPA 8270D
2,4,6-Trichlorophenol	EPA 625.1
	EPA 8270D
2,4-Dichlorophenol	EPA 625.1
	EPA 8270D
2,4-Dimethylphenol	EPA 625.1
	EPA 8270D
2,4-Dinitrophenol	EPA 625.1
	EPA 8270D
2,6-Dichlorophenol	EPA 8270D
2-Chlorophenol	EPA 625.1
	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 625.1
	EPA 8270D
2-Methylphenol	EPA 625.1
	EPA 8270D
2-Nitrophenol	EPA 625.1
	EPA 8270D
3-Methylphenol	EPA 625.1
	EPA 8270D
4-Chloro-3-methylphenol	EPA 625.1

Serial No.: 58533

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

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Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PAUL IOANNIDIS
SGS NORTH AMERICA INC. - DAYTON
2235 ROUTE 130
DAYTON, NJ 08810

NY Lab Id No: 10983

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Priority Pollutant Phenols	
4-Chloro-3-methylphenol	EPA 8270D
4-Methylphenol	EPA 625.1
	EPA 8270D
4-Nitrophenol	EPA 625.1
	EPA 8270D
Pentachlorophenol	EPA 625.1
	EPA 8270D
Phenol	EPA 625.1
	EPA 8270D
Residue	
Settleable Solids	SM 2540 F-2011
Solids, Total	SM 2540 B-2011
Solids, Total Dissolved	SM 2540 C-2011
Solids, Total Suspended	SM 2540 D-2011
Solids, Volatile	EPA 160.4 (Issued 1971)
Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270D
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270D
2-Picoline	EPA 8270D
4-Amino biphenyl	EPA 8270D
Acetophenone	EPA 625.1
	EPA 8270D

Semi-Volatile Organics	
alpha-Terpineol	EPA 625.1
Aramite	EPA 8270D
Benzaldehyde	EPA 8270D
Benzoic Acid	EPA 8270D
Benzyl alcohol	EPA 8270D
Caprolactam	EPA 8270D
Dibenzofuran	EPA 8270D
Ethyl methanesulfonate	EPA 8270D
Isosafrole	EPA 8270D
Methyl methanesulfonate	EPA 8270D
n-Decane	EPA 625.1
n-Octadecane	EPA 625.1
O,O,O-Triethyl phosphorothioate	EPA 8270D
p-Dimethylaminoazobenzene	EPA 8270D
Phenacetin	EPA 8270D
Safrole	EPA 8270D
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260C
1,2-Dichlorobenzene	EPA 8260C
	EPA 624.1
1,3,5-Trimethylbenzene	EPA 8260C
1,3-Dichlorobenzene	EPA 8260C
	EPA 624.1
1,4-Dichlorobenzene	EPA 8260C

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All approved analytes are listed below:

Volatile Aromatics	
1,4-Dichlorobenzene	EPA 624.1
2-Chlorotoluene	EPA 8260C
4-Chlorotoluene	EPA 8260C
Benzene	EPA 8260C
	EPA 624.1
Bromobenzene	EPA 8260C
Chlorobenzene	EPA 8260C
	EPA 624.1
Ethyl benzene	EPA 8260C
	EPA 624.1
Isopropylbenzene	EPA 8260C
m/p-Xylenes	EPA 8260C
	EPA 624.1
Naphthalene, Volatile	EPA 8260C
n-Butylbenzene	EPA 8260C
n-Propylbenzene	EPA 8260C
o-Xylene	EPA 8260C
	EPA 624.1
p-Isopropyltoluene (P-Cymene)	EPA 8260C
sec-Butylbenzene	EPA 8260C
Styrene	EPA 8260C
	EPA 624.1
tert-Butylbenzene	EPA 8260C
Toluene	EPA 8260C
	EPA 624.1
Total Xylenes	EPA 8260C
Volatile Aromatics	
Total Xylenes	EPA 624.1
Volatile Chlorinated Organics	
Benzyl chloride	EPA 8260C
Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260C
1,1,1-Trichloroethane	EPA 8260C
	EPA 624.1
1,1,2,2-Tetrachloroethane	EPA 8260C
	EPA 624.1
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260C
1,1,2-Trichloroethane	EPA 8260C
	EPA 624.1
1,1-Dichloroethane	EPA 8260C
	EPA 624.1
1,1-Dichloroethene	EPA 8260C
	EPA 624.1
1,1-Dichloropropene	EPA 8260C
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260C
1,2-Dibromoethane	EPA 8260C
1,2-Dichloroethane	EPA 8260C
	EPA 624.1
1,2-Dichloropropane	EPA 8260C
	EPA 624.1
1,3-Dichloropropane	EPA 8260C

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All approved analytes are listed below:

Volatile Halocarbons	
2,2-Dichloropropane	EPA 8260C
2-Chloro-1,3-butadiene (Chloroprene)	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260C
	EPA 624.1
3-Chloropropene (Allyl chloride)	EPA 8260C
Bromochloromethane	EPA 8260C
Bromodichloromethane	EPA 8260C
	EPA 624.1
Bromoform	EPA 8260C
	EPA 624.1
Bromomethane	EPA 8260C
	EPA 624.1
Carbon tetrachloride	EPA 8260C
	EPA 624.1
Chloroethane	EPA 8260C
	EPA 624.1
Chloroform	EPA 8260C
	EPA 624.1
Chloromethane	EPA 8260C
	EPA 624.1
cis-1,2-Dichloroethene	EPA 8260C
	EPA 624.1
cis-1,3-Dichloropropene	EPA 8260C
	EPA 624.1
Dibromochloromethane	EPA 8260C
	EPA 624.1

Volatile Halocarbons	
Dibromomethane	EPA 8260C
Dichlorodifluoromethane	EPA 8260C
	EPA 624.1
Hexachlorobutadiene, Volatile	EPA 8260C
Methyl iodide	EPA 8260C
Methylene chloride	EPA 8260C
	EPA 624.1
Tetrachloroethene	EPA 8260C
	EPA 624.1
trans-1,2-Dichloroethene	EPA 8260C
	EPA 624.1
trans-1,3-Dichloropropene	EPA 8260C
	EPA 624.1
trans-1,4-Dichloro-2-butene	EPA 8260C
Trichloroethene	EPA 8260C
	EPA 624.1
Trichlorofluoromethane	EPA 8260C
	EPA 624.1
Vinyl chloride	EPA 8260C
	EPA 624.1
Volatiles Organics	
1,4-Dioxane	EPA 8260C
	EPA 8270D
2-Butanone (Methylethyl ketone)	EPA 8260C
2-Hexanone	EPA 8260C

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Volatiles Organics

2-Nitropropane	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260C
Acetone	EPA 8260C
	EPA 624.1
Acetonitrile	EPA 8260C
Carbon Disulfide	EPA 8260C
Cyclohexane	EPA 8260C
Di-ethyl ether	EPA 8260C
Ethyl Acetate	EPA 8260C
Isobutyl alcohol	EPA 8260C
	EPA 8015C
Methanol	EPA 8015C
Methyl acetate	EPA 8260C
Methyl cyclohexane	EPA 8260C
n-Butanol	EPA 8260C
o-Toluidine	EPA 8270D
Vinyl acetate	EPA 8260C
	EPA 624.1

Sample Preparation Methods

SM 4500-CN B-2011 and C-2011
EPA 3010A
EPA 3005A
EPA 3510C
EPA 3520C
SM 4500-NH3 B-2011

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Bacteriology	
Coliform, Total / E. coli (Qualitative)	SM 18-22 9223B (-97, -04) (Colilert)
Heterotrophic Plate Count	SM 18-22 9215B (-04)
Fuel Additives	
Methyl tert-butyl ether	EPA 524.2
Naphthalene	EPA 524.2
Metals I	
Arsenic, Total	EPA 200.8 Rev. 5.4
Barium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Cadmium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Chromium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Copper, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Iron, Total	EPA 200.7 Rev. 4.4
Lead, Total	EPA 200.8 Rev. 5.4
Manganese, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Mercury, Total	EPA 245.1 Rev. 3.0
Selenium, Total	EPA 200.8 Rev. 5.4
Silver, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Zinc, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Metals II	
Aluminum, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Antimony, Total	EPA 200.8 Rev. 5.4
Beryllium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Molybdenum, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Nickel, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Thallium, Total	EPA 200.8 Rev. 5.4
Vanadium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Metals III	
Boron, Total	EPA 200.7 Rev. 4.4
Calcium, Total	EPA 200.7 Rev. 4.4
Magnesium, Total	EPA 200.7 Rev. 4.4
Potassium, Total	EPA 200.7 Rev. 4.4
Sodium, Total	EPA 200.7 Rev. 4.4
Microextractibles	
1,2-Dibromo-3-chloropropane	EPA 504.1
1,2-Dibromoethane	EPA 504.1
Miscellaneous	
Methyl iodide	EPA 524.2
Odor	SM 18-22 2150B (-97)

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All approved analytes are listed below:

Miscellaneous	
Organic Carbon, Dissolved	SM 21-22 5310B (-00)
Organic Carbon, Total	SM 21-22 5310B (-00)
Perchlorate	EPA 314.0
Surfactant (MBAS)	SM 18-22 5540C (-00)
Turbidity	EPA 180.1 Rev. 2.0
Non-Metals	
Alkalinity	SM 18-22 2320B (-97)
Calcium Hardness	EPA 200.7 Rev. 4.4
Chloride	EPA 300.0 Rev. 2.1
Color	SM 18-22 2120B (-01)
Cyanide	EPA 335.4 Rev. 1.0
Fluoride, Total	EPA 300.0 Rev. 2.1
Nitrate (as N)	EPA 353.2 Rev. 2.0
Nitrite (as N)	SM 18-22 4500-NO2 B (-00)
Orthophosphate (as P)	SM 18-22 4500-P E (-99)
Silica, Dissolved	EPA 200.7 Rev. 4.4
	SM 18-19 4500-Si D
Solids, Total Dissolved	SM 18-22 2540C (-97)
Specific Conductance	SM 18-22 2510B (-97)
Sulfate (as SO4)	EPA 300.0 Rev. 2.1
Trihalomethanes	
Bromodichloromethane	EPA 524.2
Bromoform	EPA 524.2
Chloroform	EPA 524.2
Dibromochloromethane	EPA 524.2
Trihalomethanes	
Total Trihalomethanes	EPA 524.2
Volatile Aromatics	
1,2,3-Trichlorobenzene	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2
1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2
1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2
2-Chlorotoluene	EPA 524.2
4-Chlorotoluene	EPA 524.2
Benzene	EPA 524.2
Bromobenzene	EPA 524.2
Chlorobenzene	EPA 524.2
Ethyl benzene	EPA 524.2
Hexachlorobutadiene	EPA 524.2
Isopropylbenzene	EPA 524.2
n-Butylbenzene	EPA 524.2
n-Propylbenzene	EPA 524.2
p-Isopropyltoluene (P-Cymene)	EPA 524.2
sec-Butylbenzene	EPA 524.2
Styrene	EPA 524.2
tert-Butylbenzene	EPA 524.2
Toluene	EPA 524.2
Total Xylenes	EPA 524.2

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NELAP RECOGNIZED TNI ACCREDITATION BODY

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All approved analytes are listed below:

Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 524.2
1,1,1-Trichloroethane	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2
1,1-Dichloropropene	EPA 524.2
1,2,3-Trichloropropane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3-Dichloropropane	EPA 524.2
2,2-Dichloropropane	EPA 524.2
Bromochloromethane	EPA 524.2
Bromomethane	EPA 524.2
Carbon tetrachloride	EPA 524.2
Chloroethane	EPA 524.2
Chloromethane	EPA 524.2
cis-1,2-Dichloroethene	EPA 524.2
cis-1,3-Dichloropropene	EPA 524.2
Dibromomethane	EPA 524.2
Dichlorodifluoromethane	EPA 524.2
Methylene chloride	EPA 524.2
Tetrachloroethene	EPA 524.2
trans-1,2-Dichloroethene	EPA 524.2
trans-1,3-Dichloropropene	EPA 524.2
Trichloroethene	EPA 524.2

Volatile Halocarbons	
Trichlorofluoromethane	EPA 524.2
Vinyl chloride	EPA 524.2

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All approved analytes are listed below:

Acrylates	
Acetonitrile	EPA TO-15
Acrylonitrile	EPA TO-15
Ethyl acrylate	EPA TO-15
Methyl methacrylate	EPA TO-15
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	EPA TO-15
Hexachlorobutadiene	EPA TO-15
Hexachloroethane	EPA TO-15
Polynuclear Aromatics	
Naphthalene	EPA TO-15
Priority Pollutant Phenols	
Phenol	EPA TO-15
Purgeable Aromatics	
1,2,4-Trimethylbenzene	EPA TO-15
1,2-Dichlorobenzene	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-15
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
2-Chlorotoluene	EPA TO-15
Benzene	EPA TO-15
	EPA TO-3
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
Isopropylbenzene	EPA TO-15

Purgeable Aromatics	
m/p-Xylenes	EPA TO-15
o-Xylene	EPA TO-15
Styrene	EPA TO-15
Toluene	EPA TO-15
Total Xylenes	EPA TO-15
Purgeable Halocarbons	
1,1,1-Trichloroethane	EPA TO-15
1,1,2,2-Tetrachloroethane	EPA TO-15
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA TO-15
1,1,2-Trichloroethane	EPA TO-15
1,1-Dichloroethane	EPA TO-15
1,1-Dichloroethene	EPA TO-15
1,2-Dibromo-3-chloropropane	EPA TO-15
1,2-Dibromoethane	EPA TO-15
1,2-Dichloroethane	EPA TO-15
1,2-Dichloropropane	EPA TO-15
3-Chloropropene (Allyl chloride)	EPA TO-15
Bromodichloromethane	EPA TO-15
Bromoform	EPA TO-15
Bromomethane	EPA TO-15
Carbon tetrachloride	EPA TO-15
Chloroethane	EPA TO-15
Chloroform	EPA TO-15
Chloromethane	EPA TO-15
cis-1,2-Dichloroethene	EPA TO-15

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260C
Acrylonitrile	EPA 8260C
Ethyl methacrylate	EPA 8260C
Methyl acrylonitrile	EPA 8260C
Methyl methacrylate	EPA 8260C
Amines	
1,2-Diphenylhydrazine	EPA 8270D
1,4-Phenylenediamine	EPA 8270D
1-Naphthylamine	EPA 8270D
2-Naphthylamine	EPA 8270D
2-Nitroaniline	EPA 8270D
3-Nitroaniline	EPA 8270D
4-Chloroaniline	EPA 8270D
4-Nitroaniline	EPA 8270D
5-Nitro-o-toluidine	EPA 8270D
a,a-Dimethylphenethylamine	EPA 8270D
Aniline	EPA 8270D
Carbazole	EPA 8270D
Diphenylamine	EPA 8270D
Methapyrilene	EPA 8270D
Pronamide	EPA 8270D
Benzidines	
3,3'-Dichlorobenzidine	EPA 8270D
Benzidine	EPA 8270D

Characteristic Testing	
Corrosivity	EPA 9040C
	EPA 9045D
Free Liquids	EPA 9095B
Ignitability	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270D
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
Chlorobenzilate	EPA 8270D
delta-BHC	EPA 8081B
Diallate	EPA 8270D
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B

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WADSWORTH CENTER

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Revised August 02, 2018

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MR. PAUL IOANNIDIS
SGS NORTH AMERICA INC. - DAYTON
2235 ROUTE 130
DAYTON, NJ 08810

NY Lab Id No: 10983

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All approved analytes are listed below:

Chlorinated Hydrocarbon Pesticides

Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Isodrin	EPA 8270D
Kepone	EPA 8270D
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Mirex	EPA 8081B
Pentachloronitrobenzene	EPA 8270D
Toxaphene	EPA 8081B

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
1,2,4-Trichlorobenzene	EPA 8270D
2-Chloronaphthalene	EPA 8270D
Hexachlorobenzene	EPA 8270D
Hexachlorobutadiene	EPA 8270D
Hexachlorocyclopentadiene	EPA 8270D
Hexachloroethane	EPA 8260C
	EPA 8270D
Hexachloropropene	EPA 8270D
Pentachlorobenzene	EPA 8270D

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A

Chlorophenoxy Acid Pesticides

2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A
	EPA 8270D
MCPA	EPA 8151A
MCPP	EPA 8151A
Pentachlorophenol	EPA 8151A

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270D
4-Bromophenylphenyl ether	EPA 8270D
4-Chlorophenylphenyl ether	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 8270D
Bis(2-chloroethyl)ether	EPA 8270D

Low Level Polynuclear Aromatic Hydrocarbons

Acenaphthene Low Level	EPA 8270D SIM
Acenaphthylene Low Level	EPA 8270D SIM
Anthracene Low Level	EPA 8270D SIM
Benzo(a)anthracene Low Level	EPA 8270D SIM
Benzo(a)pyrene Low Level	EPA 8270D SIM
Benzo(b)fluoranthene Low Level	EPA 8270D SIM
Benzo(g,h,i)perylene Low Level	EPA 8270D SIM

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Low Level Polynuclear Aromatic Hydrocarbons

Benzo(k)fluoranthene Low Level	EPA 8270D SIM
Chrysene Low Level	EPA 8270D SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270D SIM
Fluoranthene Low Level	EPA 8270D SIM
Fluorene Low Level	EPA 8270D SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270D SIM
Naphthalene Low Level	EPA 8270D SIM
Phenanthrene Low Level	EPA 8270D SIM
Pyrene Low Level	EPA 8270D SIM

Metals I

Barium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Cadmium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Calcium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Chromium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A

Metals I

Chromium, Total	EPA 6020B
Copper, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Iron, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Lead, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Magnesium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Manganese, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Nickel, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Potassium, Total	EPA 6010C

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Metals I

Potassium, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
Silver, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Sodium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Strontium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B

Metals II

Aluminum, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Antimony, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Arsenic, Total	EPA 6010C

Metals II

Arsenic, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
Beryllium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Chromium VI	EPA 7196A
	EPA 7199
Lithium, Total	EPA 6010C
Mercury, Total	EPA 7471B
Selenium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Vanadium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Zinc, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B

Metals III

Cobalt, Total	EPA 6010C

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Metals III	
Cobalt, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
Molybdenum, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Thallium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Tin, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Titanium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Minerals	
Bromide	EPA 9056A
Chloride	EPA 9056A
Fluoride, Total	EPA 9056A
Sulfate (as SO4)	EPA 9056A

Miscellaneous	
Boron, Total	EPA 6010C
	EPA 6020A
Cyanide, Total	EPA 9012B
Extractable Organic Halides	EPA 9023
Organic Carbon, Total	Lloyd Kahn Method
	EPA 9060A
Phenols	EPA 9065
Sulfide (as S)	EPA 9034
Nitroaromatics and Isophorone	
1,3,5-Trinitrobenzene	EPA 8270D
1,3-Dinitrobenzene	EPA 8270D
1,4-Naphthoquinone	EPA 8270D
2,4-Dinitrotoluene	EPA 8270D
2,6-Dinitrotoluene	EPA 8270D
4-Dimethylaminoazobenzene	EPA 8270D
4-Nitroquinoline-1-oxide	EPA 8270D
Hydroquinone	EPA 8270D
Isophorone	EPA 8270D
Nitrobenzene	EPA 8270D
Pyridine	EPA 8270D
Nitrosoamines	
N-Nitrosodiethylamine	EPA 8270D
N-Nitrosodimethylamine	EPA 8270D
N-Nitrosodi-n-butylamine	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 8270D

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Nitrosoamines	
N-Nitrosodiphenylamine	EPA 8270D
N-nitrosomethylethylamine	EPA 8270D
N-nitrosomorpholine	EPA 8270D
N-nitrosopiperidine	EPA 8270D
N-Nitrosopyrrolidine	EPA 8270D
Organophosphate Pesticides	
Dimethoate	EPA 8270D
Disulfoton	EPA 8270D
Famphur	EPA 8270D
Parathion ethyl	EPA 8270D
Parathion methyl	EPA 8270D
Phorate	EPA 8270D
Thionazin	EPA 8270D
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015C
Gasoline Range Organics	EPA 8015C
Oil and Grease Total Recoverable (HEM)	EPA 9071B (Solvent:Hexane)
Phthalate Esters	
Benzyl butyl phthalate	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 8270D
Diethyl phthalate	EPA 8270D
Dimethyl phthalate	EPA 8270D
Di-n-butyl phthalate	EPA 8270D
Di-n-octyl phthalate	EPA 8270D

Polychlorinated Biphenyls	
PCB-1016	EPA 8082A
PCB-1221	EPA 8082A
PCB-1232	EPA 8082A
PCB-1242	EPA 8082A
PCB-1248	EPA 8082A
PCB-1254	EPA 8082A
PCB-1260	EPA 8082A
PCB-1262	EPA 8082A
PCB-1268	EPA 8082A
Polynuclear Aromatic Hydrocarbons	
2-Acetylaminofluorene	EPA 8270D
3-Methylcholanthrene	EPA 8270D
7,12-Dimethylbenzyl (a) anthracene	EPA 8270D
Acenaphthene	EPA 8270D
Acenaphthylene	EPA 8270D
Anthracene	EPA 8270D
Benzo(a)anthracene	EPA 8270D
Benzo(a)pyrene	EPA 8270D
Benzo(b)fluoranthene	EPA 8270D
Benzo(ghi)perylene	EPA 8270D
Benzo(k)fluoranthene	EPA 8270D
Chrysene	EPA 8270D
Dibenzo(a,h)anthracene	EPA 8270D
Fluoranthene	EPA 8270D
Fluorene	EPA 8270D

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Polynuclear Aromatic Hydrocarbons	
Indeno(1,2,3-cd)pyrene	EPA 8270D
Naphthalene	EPA 8270D
Phenanthrene	EPA 8270D
Pyrene	EPA 8270D
Priority Pollutant Phenols	
2,3,4,6 Tetrachlorophenol	EPA 8270D
2,4,5-Trichlorophenol	EPA 8270D
2,4,6-Trichlorophenol	EPA 8270D
2,4-Dichlorophenol	EPA 8270D
2,4-Dimethylphenol	EPA 8270D
2,4-Dinitrophenol	EPA 8270D
2,6-Dichlorophenol	EPA 8270D
2-Chlorophenol	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 8270D
2-Methylphenol	EPA 8270D
2-Nitrophenol	EPA 8270D
3-Methylphenol	EPA 8270D
4-Chloro-3-methylphenol	EPA 8270D
4-Methylphenol	EPA 8270D
4-Nitrophenol	EPA 8270D
Pentachlorophenol	EPA 8270D
Phenol	EPA 8270D
Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270D
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
Semi-Volatile Organics	
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270D
2-Picoline	EPA 8270D
4-Amino biphenyl	EPA 8270D
Acetophenone	EPA 8270D
Aramite	EPA 8270D
Benzaldehyde	EPA 8270D
Benzoic Acid	EPA 8270D
Benzyl alcohol	EPA 8270D
Caprolactam	EPA 8270D
Dibenzofuran	EPA 8270D
Ethyl methanesulfonate	EPA 8270D
Isosafrole	EPA 8270D
Methyl methanesulfonate	EPA 8270D
O,O,O-Triethyl phosphorothioate	EPA 8270D
Phenacetin	EPA 8270D
Safrole	EPA 8270D
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260C
1,2-Dichlorobenzene	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260C
1,3-Dichlorobenzene	EPA 8260C
1,4-Dichlorobenzene	EPA 8260C

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Volatile Aromatics	
2-Chlorotoluene	EPA 8260C
4-Chlorotoluene	EPA 8260C
Benzene	EPA 8260C
Bromobenzene	EPA 8260C
Chlorobenzene	EPA 8260C
Ethyl benzene	EPA 8260C
Isopropylbenzene	EPA 8260C
m/p-Xylenes	EPA 8260C
Naphthalene, Volatile	EPA 8260C
n-Butylbenzene	EPA 8260C
n-Propylbenzene	EPA 8260C
o-Xylene	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260C
sec-Butylbenzene	EPA 8260C
Styrene	EPA 8260C
tert-Butylbenzene	EPA 8260C
Toluene	EPA 8260C
Total Xylenes	EPA 8260C
Volatile Chlorinated Organics	
Benzyl chloride	EPA 8260C
Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260C
1,1,1-Trichloroethane	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260C

Volatile Halocarbons	
1,1,2-Trichloroethane	EPA 8260C
1,1-Dichloroethane	EPA 8260C
1,1-Dichloroethene	EPA 8260C
1,1-Dichloropropene	EPA 8260C
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260C
1,2-Dibromoethane	EPA 8260C
1,2-Dichloroethane	EPA 8260C
1,2-Dichloropropane	EPA 8260C
1,3-Dichloropropane	EPA 8260C
2,2-Dichloropropane	EPA 8260C
2-Chloro-1,3-butadiene (Chloroprene)	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260C
3-Chloropropene (Allyl chloride)	EPA 8260C
Bromochloromethane	EPA 8260C
Bromodichloromethane	EPA 8260C
Bromoform	EPA 8260C
Bromomethane	EPA 8260C
Carbon tetrachloride	EPA 8260C
Chloroethane	EPA 8260C
Chloroform	EPA 8260C
Chloromethane	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260C
Dibromochloromethane	EPA 8260C
Dibromomethane	EPA 8260C

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Volatile Halocarbons	
Dichlorodifluoromethane	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260C
Methyl iodide	EPA 8260C
Methylene chloride	EPA 8260C
Tetrachloroethene	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260C
trans-1,4-Dichloro-2-butene	EPA 8260C
Trichloroethene	EPA 8260C
Trichlorofluoromethane	EPA 8260C
Vinyl chloride	EPA 8260C

Volatile Organics	
1,4-Dioxane	EPA 8260C
	EPA 8270D
2-Butanone (Methylethyl ketone)	EPA 8260C
2-Hexanone	EPA 8260C
2-Nitropropane	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260C
Acetone	EPA 8260C
Acetonitrile	EPA 8260C
Carbon Disulfide	EPA 8260C
Cyclohexane	EPA 8260C
Di-ethyl ether	EPA 8260C
Ethyl Acetate	EPA 8260C
Ethylene Glycol	EPA 8015C

Volatile Organics	
Isobutyl alcohol	EPA 8260C
	EPA 8015C
Methyl acetate	EPA 8260C
Methyl cyclohexane	EPA 8260C
Methyl tert-butyl ether	EPA 8260C
n-Butanol	EPA 8260C
o-Toluidine	EPA 8270D
Propionitrile	EPA 8260C
tert-butyl alcohol	EPA 8260C
	EPA 8015C
Vinyl acetate	EPA 8260C

Sample Preparation Methods	
	EPA 5035A-L
	EPA 5035A-H
	EPA 3580A
	EPA 3010A
	EPA 3005A
	EPA 3050B
	EPA 3550C
	EPA 3540C
	EPA 3546
	EPA 3060A

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All approved analytes are listed below:

Purgeable Halocarbons

cis-1,3-Dichloropropene	EPA TO-15
Dibromochloromethane	EPA TO-15
Dichlorodifluoromethane	EPA TO-15
Methylene chloride	EPA TO-15
Tetrachloroethene	EPA TO-15
trans-1,2-Dichloroethene	EPA TO-15
trans-1,3-Dichloropropene	EPA TO-15
Trichloroethene	EPA TO-15
Trichlorofluoromethane	EPA TO-15
Vinyl bromide	EPA TO-15
Vinyl chloride	EPA TO-15

Volatile Chlorinated Organics

Benzyl chloride	EPA TO-15
Epichlorohydrin	EPA TO-15

Volatile Organics

1,2-Dichlorotetrafluoroethane	EPA TO-15
1,3-Butadiene	EPA TO-15
1,4-Dioxane	EPA TO-15
2,2,4-Trimethylpentane	EPA TO-15
2-Butanone (Methylethyl ketone)	EPA TO-15
4-Methyl-2-Pentanone	EPA TO-15
Acetaldehyde	EPA TO-15
Acetone	EPA TO-15
Acrolein (Propenal)	EPA TO-15
Carbon Disulfide	EPA TO-15

Volatile Organics

Cyclohexane	EPA TO-15
Hexane	EPA TO-15
Isopropanol	EPA TO-15
Methyl iodide	EPA TO-15
Methyl tert-butyl ether	EPA TO-15
n-Heptane	EPA TO-15
Nitrobenzene	EPA TO-15
Propionaldehyde	EPA TO-15
tert-butyl alcohol	EPA TO-15
Vinyl acetate	EPA TO-15

Serial No.: 58535

LAB MANAGER: _____

QA MANAGER: Olga Agaiova

EFFECTIVE DATE: 4-18-2017

TITLE: METHOD 8260C, VOLATILE ORGANIC COMPOUNDS BY GAS CHROMATOGRAPHY/ MASS SPECTROMETRY (GC/MS)
REFERENCES: SW846 8260C (Revision 3, August 2006)
REVISED SECTIONS: 11.6.2, 11.7.11, Table 2

1.0 SCOPE AND APPLICATION

1.1 This SOP describes the analytical procedures, which are utilized by Accutest to acquire samples for analysis of volatile organic compounds by gas chromatographic/mass spectrometric (GC/MS) following purge and trap utilizing the internal standard technique. The compounds in Table 1 may be determined by this method. An option has been included for the analysis of 1,4-Dioxane by selected ion monitoring GC/MS (GC/SIM-SIM).

1.2 This analytical method is designed for nearly all types of samples, regardless of water content, including ground water, aqueous sludges, liquors, waste solvents, oily wastes, tars, filter cakes, sediments and soils.

1.3 The applicable concentration range of this method is compound, matrix, and instrument dependent. Volatile water-soluble compounds can be included in this analytical technique. However, for some low-molecular weight halogenated hydrocarbons, aromatics, ketones, nitriles, acetates, acrylates, ethers, and sulfides, quantitation limits are approximately ten times higher because of poor purging efficiency. Determination of some structural isomers (i.e. xylenes) may also be hampered by coelution.

2.0 SUMMARY OF METHOD

2.1 Volatile compounds are introduced into the gas chromatograph by purge-and-trap (Method 5030/5035). Method 5030 may be used directly on ground water samples. Method 5035 is used for low-concentration and medium-concentration soils, sediments, and wastes. Medium concentration samples are preserved and stored in methanol prior to purge-and-trap analysis.

2.2 An inert gas is bubbled through a 5 ml sample contained in a specifically designed purging chamber at ambient temperature. The purgeables are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and backflushed with the inert gas to desorb the purgeables onto a gas chromatographic (GC) column.

2.3 The volatile compounds are separated by the temperature programmed GC column and detected using a mass spectrometer, which is used to provide both qualitative and quantitative information.

2.4 The peaks detected are qualitated by comparison to characteristic ions and retention times specific to the known target list of compounds.

2.5 Once identified the compound is quantitated by comparing the response of major (quantitation) ion relative to an internal standard technique with an average response factor generated from a calibration curve.

2.6 Additional unknown peaks with a response > 10 % of the closest internal standard may be processed through a library search with comparison to a database of approximately 75,000 spectra. An estimated concentration is quantitated by assuming a response factor of 1.

2.7 Water soluble volatile organic and other poor purging compounds maybe analyzed using this methodology, however this method is not the method of choice for these compounds and the laboratory's ability to achieve all calibration and quality control criteria for this method cannot be guaranteed. These compounds are noted as (pp) in Table 7.

2.8 The method includes an analytical option for the analysis of 1,4-Dioxane by GC/MS-SIM. The selected ions that are characteristic of the analytes of interest are analyzed using lower concentrations of calibration standards under the same MS conditions. SIM analysis is performed upon client request and is documented in the report.

3.0 REPORTING LIMIT AND METHOD DETECTION LIMIT

3.1 Reporting Limit. The reporting limit for this method is established at the lowest concentration standard in the calibration curve and may vary depending on matrix interferences, sample volume or weight and percent moisture. Detected concentrations below this concentration cannot be reported without qualification. See Table 10.

3.1.1 Compounds detected at concentrations between the reporting limit and MDL are quantitated and qualified as "J", estimated value. Program or project specifications may dictate that "J" qualified compounds are not to be reported.

3.2 Method Detection Limit. Experimentally determine MDLs using the procedure specified in 40 CFR, Part 136, Appendix B, revision 2. This value represents the lowest reportable concentration of an individual compound that meets the method qualitative identification criteria.

3.2.1 Experimental MDLs must be determined annually for this method.

3.2.2 Process all raw data for the replicate analysis in each MDL study. Forward the processed data to the QA group for archiving.

3.2.3 Calculated MDLs may not be feasible in the analysis of samples, particularly in regards to compounds in table 11 and common laboratory solvents (methylene chloride and acetone). In these cases the MDLs may be raised from the calculated value to a maximum of half the LOQ to avoid false positives being reported.

4.0 DEFINITIONS

BLANK - an analytical sample designed to assess specific sources of laboratory contamination. See individual types of Blanks: Method Blank, Instrument Blank, Storage Blank, Cleanup Blank and Sulfur Blank.

4-BROMOFLUOROBENZENE (BFB) - the compound chosen to establish mass spectral instrument performance for volatile (VOA) analyses.

CALIBRATION FACTOR (CF) - a measure of the gas chromatographic response of a target analyte to the mass injected. The calibration factor is analogous to the Relative Response Factor (RRF) used in the Volatile and Semivolatile fractions.

CONTINUING CALIBRATION - analytical standard run every 12 hours to verify the initial calibration of the system.

CONTINUOUS LIQUID-LIQUID EXTRACTION - used herein synonymously with the terms continuous extraction, continuous liquid extraction, and liquid extraction. This extraction technique involves boiling the extraction solvent in a flask and condensing the solvent above the aqueous sample. The condensed solvent drips through the sample, extracting the compounds of interest from the aqueous phase.

EXTRACTED ION CURRENT PROFILE (EICP) - a plot of ion abundance versus time (or scan number) for ion(s) of specified mass (Es).

INITIAL CALIBRATION - analysis of analytical standards for a series of different specified concentrations; used to define the linearity and dynamic range of the response of the mass spectrometer to the target compounds.

INTERNAL STANDARDS - compounds added to every standard, blank, matrix spike, matrix spike duplicate, sample (for volatiles), and sample extract (for semivolatiles) at a known concentration, prior to analysis. Internal standards are used as the basis for quantitation of the target compounds.

MATRIX - the predominant material of which the sample to be analyzed is composed. For the purpose of this SOP, a sample matrix is either water or soil/sediment. Matrix is not synonymous with phase (liquid or solid).

MATRIX SPIKE - aliquot of a matrix (water or soil) fortified (spiked) with known quantities of specific compounds and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery.

MATRIX SPIKE DUPLICATE - a second aliquot of the same matrix as the matrix spike (above) that is spiked in order to determine the precision of the method.

METHOD BLANK - an analytical control consisting of all reagents, internal standards and surrogate standards that is carried throughout the entire analytical procedure. The method blank is used to define the level of laboratory, background and reagent contamination.

METHOD DETECTION LIMITS (MDLs) - The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. MDLs must be determined approximately once per year for frequently analyzed parameters.

PERCENT DIFFERENCE (%D) - As used in this SOP and elsewhere to compare two values, the percent difference indicates both the direction and the magnitude of the comparison, i.e., the percent difference may be either negative, positive, or zero. (In contrast, see relative percent difference.)

PERCENT MOISTURE - an approximation of the amount of water in a soil/sediment sample made by drying an aliquot of the sample at 105^{o}C. The percent moisture determined in this manner also includes contributions from all compounds that may volatilize at or below 105 ^{o}C, including water. Percent moisture may be determined from decanted samples and from samples that are not decanted.

PRIMARY QUANTITATION ION - a contract specified ion used to quantitate a target analyte.

REAGENT WATER - water in which an interferant is not observed at or above the minimum detection limit of the parameters of interest.

RECONSTRUCTED ION CHROMATOGRAM (RIC) - a mass spectral graphical representation of the separation achieved by a gas chromatograph: a plot of total ion current versus retention time.

RELATIVE PERCENT DIFFERENCE (RPD) - As used in this SOP and elsewhere to compare two values, the relative percent difference is based on the mean of the two values, and is reported as an absolute value, i.e., always expressed as a positive number or zero. (In contrast, see percent difference.)

RELATIVE RESPONSE FACTOR (RRF) - a measure of the relative mass spectral response of an analyte compared to its internal standard. Relative Response Factors are determined by analysis of standards and are used in the calculation of concentrations of analytes in samples.

RELATIVE RETENTION TIME (RRT) - the ratio of the retention time of a compound to that of a standard (such as an internal standard).

INSTRUMENT BLANK – a system evaluation sample containing lab reagent grade water with internal standards and surrogate standards added. An instrument blank is used to remove and/or evaluate residual carryover from high level standards, spike samples and field samples.

5.0 HEALTH & SAFETY

5.1 The analyst must follow normal safety procedures as outlined in the Accutest Health and Safety Plan and Personal Protection Policy, which include the use of safety glasses and lab coats. In addition, all acids are corrosive and must be handled with care. Flush spills with plenty of water. If acids contact any part of the body, flush with water and contact the supervisor.

5.2 The toxicity or carcinogenicity of each reagent used in this method has not been precisely determined; however, each chemical must be treated as a potential health hazard. Exposure to these reagents must be reduced to the lowest possible level. The laboratory is responsible for maintaining a current awareness file of OSHA regulations regarding the safe handling of the chemicals specified in this method. A reference file of data handling sheets must be made available to all personnel involved in these analyses.

5.3 The following analytes covered by this method have been tentatively classified as known or suspected, human or mammalian carcinogens: benzene, carbon tetrachloride, 1,4-dichlorobenzene, 1,2-dichlorethane, hexachlorobutadiene, 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, chloroform, 1,2-dibromoethane, tetrachloroethene, trichloroethene, and vinyl chloride. Primary standards of these toxic compounds must be prepared in a hood. A NIOSH/Mass approved toxic gas respirator must be worn when the analyst handles high concentrations of these toxic compounds.

6.0 INTERFERENCES

6.1 The data from all blanks, samples, and spikes must be evaluated for interferences.

6.2 Impurities in the purge gas, organic compounds out-gassing from the plumbing ahead of the trap, and solvent vapors in the laboratory account for the majority of contamination problems. The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running laboratory reagent blanks. The use of non-TFE tubing, non-TFE thread sealants, or flow controllers with rubber components in the purging device must be avoided.

6.3 Samples can be contaminated by diffusion of volatile organics (particularly methylene chloride and fluorocarbons) through the septum seal into the sample during shipment and storage. A trip blank prepared from reagent water and carried through the sampling and handling protocol can serve as a check on such contamination.

6.4 Contamination by carry-over can occur whenever high level and low-level samples are sequentially analyzed.

6.4.1 Whenever an unusually concentrated sample is encountered, it must be followed by an analysis of an instrument blank to check for cross contamination. Refer to Table 11 for compounds that may cause carryover for this method.

6.4.2 It may be necessary to wash the purging device with methanol, rinse it with organic-free water, and then dry the purging device in an oven at 105^0 C. Follow the instrument manual for instructions on cleaning. Document the occurrence in the maintenance log and notify the manager/supervisor.

6.4.2.1 Clean and bake purging tube.

6.4.2.2 Clean or replace purge needle.

6.4.2.3 Clean and bake sample filter or sparge filter.

6.4.2.4 Clean and bake sample loop.

6.4.2.5 Replace trap if necessary.

6.4.2.6 Replace water management module if necessary.

6.4.2.7 Rinse transfer line with methanol. Caution: disconnect the trap before rinsing.

6.4.3 In extreme situations, the entire purge-and trap device may require dismantling and cleaning. Follow the instrument's manual for instructions on disassembly. Document the occurrence in the maintenance log and notify the manager/supervisor. Screening of the samples prior to purge-and-trap GC/MS analysis is highly recommended to prevent contamination of the system. This is especially true for soil and waste samples.

6.4.4 If the contamination has been transferred to gas chromatograph, any of the following approaches may be used to cleanup the instrument.

6.4.4.1 Baking out the column between analyses.

6.4.4.2 Change the injector liner to reduce the potential for cross-contamination.

6.4.4.3 Remove a portion of the analytical column in the case of extreme contamination.

6.4.5 The oven temperature program must include a post-analysis bake out period to ensure that semivolatile hydrocarbons are stripped from the chromatographic column.

6.5 Special precautions must be taken during the analysis to avoid contamination from methylene chloride and other common laboratory solvents.

6.5.1 The sample storage and analytical area must be isolated from all atmospheric sources of methylene chloride or other common solvents.

6.5.2 Laboratory clothing worn by the analyst must be clean and used in designated areas only. Clothing previously exposed to solvent vapors in the organics sample preparation laboratory can contribute to sample contamination.

6.6 Samples with suspected or known permanganate levels should be preserved with ascorbic acid at collection. The purpose of the ascorbic acid is to remove the permanganate which is an oxidizer. There is potential that the analytes of concern will undergo an oxidative transformation which would no longer be representative of the concentrations as the site.

7.0 SAMPLE HANDLING AND PRESERVATION AND HOLDING TIME

7.1 HANDLING and PRESERVATION

7.1.1 Water samples

7.1.1.1 Container - 40 ml glass screw-cap VOA vial with Teflon-faced silicone septum. The 40-ml glass VOA vials are pre-cleaned and certified.

7.1.1.2 Acrolein & Acrylonitrile

7.1.1.2.1 If acrolein and acrylonitrile are to be analyzed, collect 3, 40 mL VO vials of sample unpreserved. Samples for acrolein and acrylonitrile analysis receiving no pH adjustment must be analyzed within 7 days of sampling. All samples must be footnoted stating samples were unpreserved and analyzed within 7 days.

7.1.1.3 Collect all samples in triplicate. Test all samples for residual chlorine using test paper for free and total chlorine. If samples contain residual chlorine, three milligrams of sodium thiosulfate must be added for each 40 ml of water sample.

7.1.1.4 Fill sample bottles to overflowing, but do not flush out the dechlorinating agent. Sample must be taken with care so as to prevent any air or bubbles entering vials creating headspace.

7.1.1.5 Adjust the pH of all samples to ≤ 2 at the time of collection, but after dechlorination, by carefully adding two drops of 1:1 HCl for each 40 ml of sample. Seal the sample bottles, Teflon face down, and mix for one minute. Or VOA vials containing the preservative (HCL) may be used.

Note: Do not mix the sodium thiosulfate with the HCl in the sample bottle prior to sampling.

7.1.1.6 The samples must be protected from light and refrigerated at 0 - ≤ 6 °C from the time of receipt until analysis.

7.1.1.7 An alternate preservative that may be used when suspected or known levels of permanganate exist in a sample is 25 mg of ascorbic acid per 40 ml vial.

7.1.1.7.1 Ascorbic acid is added to remove the permanganate which is an oxidizer.

7.1.1.7.2 Fill the sample bottles to overflowing, but do not flush out the ascorbic acid.

7.1.1.7.3 The samples must be protected from light and refrigerated at 0 - ≤ 6 °C from the time of receipt until analysis.

7.1.2 Soil Samples

7.1.2.1 Refer to the SOP for SW846 Method 5035 for preservation requirement of non-aqueous solids.

7.2 HOLDING TIME

7.2.1 Water Samples.

7.2.1.1 All samples are to be analyzed within 14 days of sampling (HCl preserved for aqueous sample) unless otherwise specified by the contract. The sample preservation deficiency is noted in the analytical run logbook when the analyst checks the pH at the bench. If the pH is not <2, the analyst notifies the supervisor, who then notifies Client Service Dept. A comment is added to the result page and Non-Conformance Summary.

7.2.1.2 Acrolein & Acrylonitrile

7.2.1.2.1 Samples for acrolein and acrylonitrile analysis receiving no pH adjustment must be analyzed within 7 days of sampling.

7.2.2 Soil Samples

7.2.2.1 Refer to the SOP for SW846 Method 5035 for holding time requirement of non-aqueous solids.

7.2.2.2 All samples are analyzed within 14 days of sampling unless otherwise specified.

8.0 APPARATUS AND MATERIALS

8.1 SYRINGE

8.1.1 10, 25, 50, 100, 500 and 5000 µl graduated syringes, manually held (Hamilton/equiv.).

8.1.2 5 ml and 50 ml glass gas tight syringes with Luerlok end, if appropriate for the purging device.

8.2 BALANCE

8.2.1 Analytical balance capable of weighing 0.0001 gram.

8.2.2 Top loading balance capable of weighing 0.1 gram.

8.3 PURGE AND TRAP DEVICES

8.3.1 The autosampler models are used for purging, trapping and desorbing the sample into GC column.

- O.I. Model 4560 sample concentrator with 4551 vial multi-sampler
- O.I. Model 4560 sample concentrator with 4552 Water/Soil multi-sampler

8.3.2 The sample purge vial must be designed to accept 5 ml of sample with a water column at least 3 cm deep.

8.3.3 The auto-sampler is equipped with a heater capable of maintaining the purge chamber at 40 °C to improve purging efficiency. The heater is to be used for low level soil/sediment analysis, but not for water or medium level soil/sediment analysis.

8.3.4 The OI #10 trap is 42 cm with an inside diameter of 0.105 inches. The trap must be packed to contain the following absorbents (3-ring) and must be conditioned at 180 °C for 30 minutes by backflushing with a Helium gas flow at least 20 ml/min before initial use.

- Tenax (2,6-Diphenylene oxide polymer).
- Silica gel.
- Carbon Molecule Sieve (CMS).

8.3.5 The desorber must be capable of rapidly heating the trap to 190^0 C for desorption. Do not exceed $210\ ^0$C during bake-out mode. Alternatively, follow manufacturer's instructions.

8.4 GAS CHROMATOGRAPH/MASS SPECTROMETER SYSTEM

8.4.1 Gas Chromatograph.

8.4.1.1 An analytical system complete with a temperature programmable gas chromatograph and all required accessories including syringes, analytical columns, and gases.

8.4.1.2 The injection port must be suitable for split or splitless with appropriate interface.

8.4.1.3 The narrow bore capillary column is directly coupled to the source for HP-6890 or Agilent 6890 model.

8.4.1.4 The wide bore capillary column is interfaced through a jet separator to the source for HP-5890 model.

8.4.2 Column.

- 75 m x 0.53mm ID x 3 μm film thickness capillary column coated with DB-624 (J&W Scientific), or equivalent. Condition as per manufactures directions.

- 105 m x 0.53mm ID x 3 μm film thickness capillary column coated with HP-VOA, or equivalent. Condition as per manufactures directions.

- 60 m x 0.25mm ID x 1.4 μm film thickness capillary column coated with DB-624 (J&W Scientific), or equivalent. Condition as per manufactures directions.

- 60 m x 0.45mm ID x 1.7 μm film thickness capillary column coated with DB-VRX (J&W Scientific), or equivalent. Condition as per manufactures directions.

8.4.3 Mass Spectrometer.

8.4.3.1 HP5973, HP5970 Agilent 5973, or Agilent 5975 is capable of scanning from 35 to 300 amu every 2 seconds or less, utilizing 70 volt (nominal) electron energy in the electron impact ionization mode.

8.4.3.2 The mass spectrometer must be capable of producing a mass spectrum which meets all the criteria in Table 3 when injecting or purging 50 ng of the GC/MS tuning standard - Bromofluorobenzene (BFB).

8.4.3.3 SIM Mode – Capable of selective ion grouping at specified retention times for increased compound sensitivity (Table 2a).

8.5 DATA SYSTEM

8.5.1 Data Acquisition and Instrument Control (HP Chemstation) **-** A computer system is interfaced to the mass spectrometer, which allows the continuous acquisition and storage on a machine-readable media (disc) of all mass spectra obtained throughout the duration of the chromatographic program.

8.5.2 Data Processing (HP Enviroquant) - The software accommodates searching of GC/MS data file for target analytes which display specific fragmentation patterns. The software also allows integrating the abundance of an EICP between specified time or scan number limits. The data system includes the recent version of the EPA/NBS or NIST98 mass spectral library for qualitative searches of non-target compounds present in the chromatogram. The data system flags all data files that have been edited manually by laboratory personnel.

8.5.3 Off line Magnetic Tape Storage Device (Lagato Networker) - The magnetic tape storage device copies data for long-term, off-line storage.

9.0 REAGENTS AND STANDARDS

9.1 Solvent

9.1.1 Methanol: purge-and-trap grade quality or equivalent. Store separately, away from the other solvents.

9.2 Reagent Water

9.2.1 Reagent water is defined as water in which an interferant is not observed at the method detection limit of the parameters of interest.

9.2.2 Reagent water is generated by either passing tap water through a bed of approximately one pound of activated carbon or by using the water purification system at Accutest that is a series of deionizers and carbon cartridges.

9.3 Stock Standard Solutions

9.3.1 Commercially prepared standards used.

9.3.1.1 EPA Method 524.2 Volatiles (78 components): Absolute (or equivalent) at 200 μg/ml or 2,000 μg/ml concentration.

9.3.1.2 Custom Volatiles Mix A: Restek (or equivalent) at 2,000 μg/ml concentration.

9.3.1.3 Custom Volatiles Mix B: Restek (or equivalent) at 2,000 - 100,000 μg/ml concentration.

9.3.1.4 VOC Gas Mixture: Ultra (or equivalent) contains 200 μg/ml or 2,000 μg/ml of the following compounds in methanol.

- Bromomethane
- Chloroethane
- Chloromethane
- Dichlorodifluoromethane
- Trichlorofluoromethane
- Vinyl Chloride

9.3.1.5 Multiple neat compounds.

9.3.1.6 Surrogate standard mixture: Ultra (or equivalent) at a concentration of 2,500 μg/ml each surrogate compound.

- 1,2-Dichloroethane-d_4
- Dibromofluoromethane
- Toluene-d_8
- 4-Bromofluorobenzene

9.3.1.7 Internal standard mixture: Ultra (or equivalent) at a concentration of 2,000 μg/ml for all the compounds except Tert Butyl Alcohol-d_9, which is from Absolute (or equivalent) at a concentration of 50,000 μg/ml. The following five internal standards are used that exhibit similar analytical behavior to the compounds of interest.

- 1,4-Dichlorobenzene-d_4
- 1,4-Difluorobenzene
- Chlorobenzene-d_5
- Pentafluorobenzene
- Tert Butyl Alcohol-d_9

9.3.1.8 1,4-Dioxane Solution for SIM : Ultra (or equivalent) at 100 μg/ml in methanol.

9.3.1.9 Ketones mixture: Acros (or equivalent) neat standards for Acetone, 2-Butanone, 4-methyl-2-pentanone (MIBK), and 2-hexanone prepared at concentrations 300 ug/ml for soil matrix and 400 ug/ml for aqueous matrix.

9.3.2 Unopened stock standard (ampoules) must be stored according to manufacturer's documented holding time and storage temperature recommendations (usually placed on the ampoule).

9.3.3 After opened, stock standards, internal standards, and surrogate solutions must be replaced after 6 months (one month for purgeable gases standard) or sooner if

manufacture expiration date come first or comparison with quality control check samples indicates degradation.

9.3.4 Store all stock standards in vials with minimal headspace and Teflon lid liners after open, protect from light, and refrigerate to –10°C or colder or as recommended by the standard manufacturer.

9.3.5 Return the standards to the freezer as soon as the analyst has completed mixing or diluting the standards to prevent the evaporation of volatile target compounds.

9.4 Internal Standard and Surrogate Solution

9.4.1 Five internal standard and surrogate spiking solutions are prepared in methanol per Table 8.A.

9.4.1.1 25 μg /ml internal standard and surrogate mixture.

9.4.1.2 250 μg /ml internal standard and surrogate mixture.

9.4.1.3 100 μg/ml surrogate mixture.

9.4.1.4 25 μg /ml internal standard mixture.

9.4.1.5 250 μg /ml internal standard mixture.

9.4.2 A calibration range must be constructed for the surrogate compounds. Accordingly, appropriate amounts of surrogates are mixed with each calibration solution to define a range similar to the target compounds.

9.4.3 Each 5 ml sample, QC sample, and blank undergoing analysis must be spiked with any one of the above spiking solutions (depending upon the type of standards addition modules used), resulting in a concentration of 50 μg/l of each compound.

9.4.4 Prepare fresh internal standard and surrogate spiking solutions every six months, or sooner, if manufacturer's expiration dates come first or if the solution has degraded or evaporated.

9.5 Secondary Dilution Standards

9.5.1 Using stock standard solutions prepare secondary dilution standards in methanol containing the compounds of interest, either singly or mixed together.

9.5.1.1 100 μg /ml V8260 mixture: prepared from 2,000 μg /ml stock solution. (see Table 8-C)

9.5.1.2 100 μg /ml V8260 custom mixture: prepared from 2,000 μg /ml stock solution. (see Table 8-C)

9.5.1.3 100 μg /ml Gas mixture: prepared from 2,000 μg /ml stock solution. (see Table 8-C)

9.5.2 Replace after one month for non-gas mixtures (one week for gas mixtures) or sooner if manufacture expiration date come first or comparison with quality control check samples indicates degradation.

9.5.3 Store all secondary dilution standards in vials with no headspace and Teflon lid liners, protect from light, and refrigerate to – 10°C or colder or according to manufacturer's storage temperature recommendation.

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9.5.4 Return the standards to the freezer as soon as preparation is finished to prevent the evaporation of volatile compounds.

9.6 Aqueous Calibration Standard Solutions

9.6.1 Initial Calibration Standards

9.6.1.1 Prepare a minimum of five aqueous calibration standard solutions containing the surrogate compounds as Table 8-D.1 or 8-D.2.

9.6.1.2 To prepare a calibration standard, add a measured volume of secondary dilution standard solutions and the surrogate spiking solution to an aliquot of reagent water in the flask. Use a micro-syringe and rapidly inject the methanol standard into the expanded area of the filled volumetric flask. Remove the needle as quickly as possible after injection. Bring to volume. Mix by inverting the flask three times only. Discard the contents contained in the neck of the flask.

9.6.1.2.1 1,4-Dioxane for SIM analysis is prepared from primary stock standard (100ppm).

9.6.2 Continuing Calibration Standard

9.6.2.1 A continuing calibration standard at a concentration of 50 μg/l is prepared as the scheme outlined in Table 8-E.

9.6.3 Aqueous standards are not stable and may be stored up to 24 hours if held in Teflon sealed screw-cap vials with zero headspace at 4^0C (± 2^0C). Protect the standards from light. If not so stored, they must be discarded after use, unless they are set up to be purged by an autosampler.

9.6.4 When using an autosampler, standards may be retained up to 12 hours if they are in purge tubes connected via the autosampler to the purge and trap device.

9.7 Second Source Calibration Check Standard (ICV)

9.7.1 Prepare the second source calibration check standards from separate sources of stock standards from the calibration curve following the procedures in Section 9.6. At a minimum, an ICV must be analyzed with every initial calibration.

9.7.2 For 1,4-Dioxane via SIM: Prepare the second source calibration check standard using 5 µl of a 100ppm (Absolute or equivalent) to 10 mL of reagent water which yields a 50 ppb standard.

9.8 4-Bromofluorobenzene (BFB) Standard

9.8.1 Two BFB solutions are prepared in methanol per Table 8-B.

9.8.1.1 25 µg /ml solution for direct injection.

9.8.1.2 250 µg /ml solution for purging.

9.8.2 The solution must be replaced after 6 months or sooner if mass spectrum indicates degradation or if manufacture expiration date comes first.

9.9 Ascorbic Acid

10.0 CALIBRATION

10.1 Daily Maintenance. Routine Daily maintenance must be performed before any tuning, calibration or sample analysis activities are initiated. These include checks of the following items:

Purge and Trap Device:

Clean & bake purge tube
Bake trap and transfer lines
Check or refill internal/surrogate spike solution on SIM/SAM vials
Clean/replace syringe (if necessary)
Change and refill rinse bottle
Empty and rinse waste bottle

GC Oven: (if necessary)

Change septum
Change liner
Clip column, indicated by carbon build-up

10.2 Initial Calibration

10.2.1 The calibration range covered for routine analysis under RCRA, and SIM, employs standards of 0.2, 0.5, 1(specified compounds only), (2)*, 5, 10, 20, 50, 100, 200,(300 or 400)* µg/l. (*instrument dependent). Optionally 4 and 8 ug/l standards may replace the 5 and 10 ug/l standards. A minimum of five standards must be run sequentially. The low calibration standard defines the reporting limit. Lower concentration standards (0.2, 0.5, 1.0 or 2.0 µg/l) may be needed to meet the reporting limit requirements of state specific

regulatory programs. Refer to Table 8-D-1 and 8-D-2 for calibration standard preparation.

10.2.2 The surrogates are introduced to the calibration standards automatically by the autosampler. For this calibration option the surrogate linear response is less important, since multiple concentrations of surrogates are not being measured. Instead, the surrogate concentration remains constant throughout and the recovery of this known concentration can easily be attained without demonstrating if the response is linear.

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10.2.2.1 Optional: The surrogates can be added manually. In order to compensate for the difference between the automatic and manual surrogate additions a correction factor must be applied to the amount of surrogate added in Table 8-D. To determine the correction factor divide the surrogate concentration from an automatic injection by the surrogate concentration from a manual injection for each of the surrogates. Average the result for each of the surrogates to determine the correction factor. Finally multiply the correction factor by the appropriate amount of surrogate from Table 8-D and add this amount to the standard.

10.2.3 For water and medium-level soil calibration: Transfer and fill up (no air space) each standard to labeled 40 ml vial and cap with Teflon septum, then place the vial into O.I. sample tray.

10.2.4 For low-level soil calibration: Transfer 5 ml of each standard to labeled 40 ml vial and cap with Teflon septum, then place the vial into O.I. sample tray.

10.2.4.1 When calibrating for Method 5035 low-level samples, if the sodium bisulfate option was used, add 1g of sodium bisulfate to the 40-ml vial before aliquot 5 ml of each standard into vial otherwise do not add sodium bisulfate. This is equivalent to the amount of sodium bisulfate added to the samples and will maintain a consistent purging efficiency of the compounds. Cap the vial with Teflon septum and place it into O.I sample tray.

10.2.5 The linear range covered by this calibration is the highest concentration standard.

10.2.6 Program the autosampler to add internal standard mixture (and optionally surrogate) to each standard. This results in a concentration of 50 μg/l for each internal standard (and surrogate).

10.2.6.1 For O.I. SIM spiker: Automatically adds 10 μl of 25 μg/ml internal standard solution **(**Section 9.4.1.4) or Internal Standard/Surrogate solution (Section 9.4.1.1) to each standard.

10.2.6.2 For O.I. SAM spiker: Automatically adds 1 μl of 250 μg/ml internal standard solution (Section 9.4.1.5) or Internal Standard/Surrogate solution Section 9.4.1.2) to each standard.

10.2.7 Analyze the standard solutions using the conditions established in Section 11.0. Whenever the highest concentration standard is analyzed, it is usually followed by the analyses of two reagent water blanks. Further analysis may not proceed until the blank analysis is demonstrated to be free of interferences.

10.2.8 Each analyte is quantitatively determined by internal standard technique using the closest eluting internal standard and the corresponding area of the major ion. See Table 7.

10.2.9 The Response Factor (RF) is defined in Section 13.1. Calculate the mean RF for each target analyte using minimum of five RF values calculated from the initial calibration curve.

10.2.10 For the initial calibration to be valid, the following criteria must be met.

10.2.10.1 The percent relative standard deviation (% RSD) (see Section 13.2) of all target analytes must be less than or equal to 20%.

10.2.10.2 If the average response factor criteria cannot be achieved, and if the problem is associated with one or more of the standards, reanalyze the standards and recalculate the RSD. The instrument logbook must have clear documentation as to what the suspected problem was.

10.2.10.2.1 A calibration standard is allowed to be repeated only once; if the second trial fails, a new initial calibration must be performed. Notify the team leader/manager. Document this occurrence in the instrument log.

10.2.10.3 Alternately, if the average response factor criteria cannot be achieved, the calibration range can be narrowed by dropping the low or high point of the curve.

10.2.10.3.1 The changes to the upper end of the calibration range will affect the need to dilute samples above the range, while changes to the lower end will affect the overall sensitivity of the method. Consider the regulatory limits or action levels associated with the target analytes when adjusting the lower end.

10.2.10.4 If the average response factor criteria still cannot be achieved, employ an alternative calibration linearity model. Specifically, linear regression using a least squares approach may be employed.

10.2.10.4.1 If linear regression is employed select the linear regression calibration option of the mass spectrometer data system. Do not force the regression line through the origin and do not employ 0,0 as a sixth calibration standard.

10.2.10.4.2 The correlation coefficient (r value) must be ≥ 0.99 for each compound to be acceptable.

10.2.10.4.2.1 When calculating the calibration curves using the linear regression model, a minimum quantitation check on the viability of the lowest calibration point must be performed by re-fitting the response from the low concentration calibration standard back into the curve.

10.2.10.4.2.2 The recalculated concentration of the low calibration point must be within ± 30% of the standard's true concentration

10.2.10.5 The initial calibration criteria for this method apply to all additional compounds of concern specified by the client.

10.2.10.6 If more than 10% of the compounds included with the initial calibration exceed the 20% RSD limit and do not meet the minimum correlation coefficient for the linear calibration option, then the chromatographic system is considered too reactive for the analysis to begin. Perform corrective action and recalibrate if the calibration criteria cannot be achieved.

10.2.10.7 A quadratic calibration model is allowed if the linear regression fails.

10.2.10.7.1 This may only be used for historically poor performing compounds (e.g. ketones).

10.2.10.7.2 A minimum of six calibration points are required. Do not employ 0,0 as a calibration point.

10.2.10.7.3 Quadratic calibration models cannot be used to extend the calibration range.

10.2.10.8 It is recommended that the minimum response factor for the most common target analytes in table 12 must be demonstrated for each individual calibration level as a means to ensure that these compounds are behaving as expected. In addition, meeting the minimum response factor criteria for the lowest calibration standard is critical in establishing and demonstrating the desired sensitivity.

10.2.10.9 The relative retention times of each target analyte in each calibration standard must agree within 0.06 relative retention time units.

10.3 Initial Calibration Verification (ICV) - Second Source Calibration Check Standard

10.3.1 The calibration is verified with a calibration check standard at 50 µg/l from an external source (Section 9.7). It must be analyzed immediately following the initial calibration.

10.3.2 The percent difference (% D) (Section 13.3) for this standard must meet the criteria of 30% for all the target compounds.

10.3.2.1 If % D is greater than 30%, reanalyze the second source check. If the criteria cannot be met upon re-injection, re-prepare the second source solution using a fresh ampoule and repeat the process.

10.3.2.2 If the %D criteria cannot be achieved after re-preparation of the second source, prepare a third source and repeat the process. Make fresh calibration standards using one of the two standard sources that match each other and repeat the initial calibration.

10.4 Continuing Calibration Verification Standard(CCV)

10.4.1 A continuing calibration verification standard at a concentration near mid-level of the initial calibration range (50 μg/l) must be acquired every 12 hrs or at the beginning of each analytical batch.

10.4.1.1 For water and medium level soil analysis: Transfer and fill up (no air space) the calibration verification standard to labeled 40 ml vial and cap with Teflon septum, then place the vial into O.I. sample tray. Analyze as per Section 11.7.

10.4.1.1.1 Vary the concentration of the continuing calibration verification standard on alternate verifications (i.e. every other calibration verification) using an alternative concentration standard. The standard selected must be lower than the midpoint calibration standard.

10.4.1.2 For low-level soil analysis: Transfer 5 ml of the calibration verification standard to labeled 40 ml vial and cap with Teflon septum, then place the vial into O.I. sample tray. Analyze as per Section 11.7.

10.4.1.2.1 When calibrating for Method 5035 low-level samples, if the sodium bisulfate option was used add 1g of sodium bisulfate to the 40-ml vial before aliquot 5 ml of the calibration verification standard into vial, otherwise do not use sodium bisulfate. This is equivalent to the amount of sodium bisulfate added to the samples and will maintain a consistent purging efficiency of the compounds. Analyze as per Section 11.7.

10.4.1.3 A continuing calibration standard is analyzed whenever the analyst suspects that the analytical system is out of calibration. If the calibration cannot be verified, corrective action is performed to bring the system into control. Analysis may not continue until the system is under control.

10.4.2 For the continuing calibration to be valid, all of the following specified criteria must be met.

10.4.2.1 Each of the most common target analytes in the calibration verification standard must meet the minimum response factors as noted in Table 12. This criterion is particularly important when the common target analytes are also critical project-required compounds. This is the same check that is applied during the initial calibration.

10.4.2.1.1 If the minimum response factors are not met, the system must be evaluated, and corrective action must be taken before sample analysis begins.

10.4.2.2 All target compounds of interest must be evaluated using a 20%variability criterion. Use percent difference when performing the average response factor model calibration. Use percent drift when calibrating using a regression fit model. If the percent difference or percent drift for a compound is less than or equal to 20%, then the initial calibration for that compound is assumed to be valid.

10.4.2.3 Due to the large numbers of compounds that may be analyzed by this method, some compounds will fail to meet the criteria. If the criterion is not met (i.e., greater than 20% difference or drift) for more than 20% of the compounds included in the initial calibration, then corrective action must be taken prior to the analysis of samples.

10.4.2.4 In cases where compounds fail, they may still be reported as non-detects if it can demonstrated that there was adequate sensitivity to detect the compound at the applicable quantitation limit. For situations when the failed compound is present, the concentrations must be reported as estimated values.

10.4.2.4.1 Compounds with response factors that exceed the 20% D in the CCV compared to the initial calibration with high bias may only be reported as an estimated value.

10.4.2.4.2 Compounds that do not meet the 20% D in the CCV compared to the initial calibration due to low response factors can only be reported if the low sensitivity of the instrument is still achieved. This sensitivity must be verified by running a low level standard check at the RL. If a positive result for the compound is found then adequate sensitivity has been demonstrated and the run can proceed. Non-detect results for samples may be reported, positive results, if reported, must be done as an estimated value.

10.4.3 If the first continuing calibration verification (CCV) does not meet criteria, a second standard can be analyzed immediately or after the corrective action was performed. If the second CCV fails to meet criteria then corrective actions must be performed. Such as: auto-tuning, routine system cleaning and routine system maintenance. Notify the team leader/manager.

10.4.3.1 If the second CCV trial fails, the lab must demonstrate acceptable performance <u>after</u> corrective action with two consecutive passing calibration verifications (CCVs) OR a new initial calibration. The Instrument Logbook and Maintenance Logbook must have clear documented notations as to what the problem was and what corrective action was implemented.

10.4.3.1.1 If the lab has not verified calibration, samples cannot be analyzed.

10.4.3.1.2 However, in the case where samples are analyzed on the system where the CCV does not meet the criteria the data must be flagged.

10.4.3.1.2.1 The data may be usable if the response for the verification exceed high (high bias) and the associated samples are non-detects.

10.4.3.1.2.2 If the criteria for the CCV is low (low bias), those sample results may be reported only if they exceed a maximum regulatory limit/decision level.

10.4.3.2 If the calibration verification is being performed using an auto sampler for night batch, two (2) vials of standard solution are placed in the device for analysis. The second standard must meet continuing calibration criteria and is used for calibration verification. The second check may be discarded only if there is a purge failure or incorrect spike concentration provided the first calibration standard meets the requirement. In this case, the first calibration standard is used as calibration verification following team leader/manager approval. Document this occurrence on instrument log.

10.4.3.2.1 Both CCVs must be evaluated. If vial 1 fails and vial 2 passes this meets the criteria of 10.4.3 of consecutive and immediate passing CCV.

10.4.3.2.2 If CCV number 2 fails, the analysis cannot continue unless it was determined that there was an isolated mechanical failure.

10.4.4 If any of the internal standard areas change by a factor of two (- 50% to + 100%) or the retention time changes by more than 30 seconds from the midpoint standard of the last initial calibration, the mass spectrometer must be inspected for malfunctions and corrections must be made, as appropriate.

10.4.4.1 Reanalyze the continuing calibration standard. New initial calibration is required if reanalyzed standard continues to fail the internal standard requirements.

10.4.4.2 All samples analyzed while the system was out of control must be reanalyzed following corrective action.

10.5 Corrective Action Maintenance For Failed Tuning and Calibration Procedures

10.5.1 Inability to achieve criteria for instrument tuning or calibration may indicate the need for instrument maintenance. Maintenance may include routine system cleaning and replacement of worn expendables or the need for outside service if the scope of the repair exceeds the capability of the staff.

10.5.2 If maintenance is performed on an instrument, return to control must be demonstrated before analysis can continue. Return to control is demonstrated as follows:

10.5.2.1 Successful instrument tune using PFTBA.

10.5.2.2 Successful tune verification by the analysis of 4-bromofluorobenzene.

10.5.2.3 Successful initial calibration or continuing calibration.

11.0 PROCEDURE

11.1 Instrument conditions.

11.1.1 Recommended instrument conditions are listed in Table 2 and 2a (SIM only). Modifications of parameters specified with an asterisk are allowed as long as criteria of calibration are met. Any modification must be approved by team leader/manger.

11.1.2 Optimize GC conditions for analyte separation and sensitivity. Once optimized, use the same GC conditions for the analysis of all standards, blanks, samples, and QC samples.

11.2 Purge and Trap Device conditions.

11.2.1 See Table 2.

11.2.2 Daily Maintenance. Routine Daily maintenance must be performed before any tuning, calibration or sample analysis activities are initiated. These include checks of the following items:

Purge and Trap Device:

- Clean & bake purge tube.
- Bake trap and transfer lines.
- Check or refill internal/surrogate spike solution on SIM/SAM vials.
- Clean/replace syringe (if necessary).
- Change and refill rinse bottle.
- Empty and rinse waste bottle.

11.3 Step 1: Daily GC/MS performance check.

11.3.1 Every 12 hours, either

- Inject 2 μl (50 ng) of BFB solution directly on column or
- Purge 10 μg/l of 5ml (50ng) to GC column.

11.3.2 The GC/MS system must be checked to verify acceptable performance criteria are achieved (see Table 3).

11.3.3 This performance test must be passed before any samples, blanks or standards are analyzed. Evaluate the tune spectrum using three mass scans from the chromatographic peak and a subtraction of instrument background.

11.3.3.1 Select the scans at the peak apex and one to each side of the apex.

11.3.3.2 Calculate an average of the mass abundances from the three scans.

11.3.3.3 Background subtraction is required. Select a single scan in the chromatogram that is absent of any interfering compound peaks and no more than 20 scans prior to the elution of BFB. The background subtraction must be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the tuning compound peak.

11.3.4 If all the criteria are not achieved, the analyst must retune the mass spectrometer with team leader/manager and repeat the test until all criteria are met.

11.3.4.1 Alternatively, an additional scan on each side of the peak apex may be selected and included in the averaging of the mass scans. This will provide a mass spectrum of five averaged scans centered on the peak apex. NOTE: The selection of additional mass scans for tuning may only be performed with supervisory approval on a case by case basis.

11.3.4.2 Note: All subsequent standards, samples, MS/MSDs, BS, and blanks associated with a BFB analysis must use identical mass spectrometer conditions.

11.3.4.3 The injection time of the acceptable tune analysis is considered the start of the 12-hour clock.

11.3.5 The BFB must meet the criteria before sample analysis begins. The BFB and calibration verification standard may be combined into a single standard as long as both tuning and calibration verification acceptance criteria for the project can be met without interferences.

11.3 Step 2 : Daily calibration check

11.4.1 Initial calibration

11.4.1.1 Refer to Section 10.2.

11.4.1.2 An initial calibration must be established (or reestablished) on each instrument:

- Prior to any sample analyses;
- Whenever a new column is installed;
- Whenever instrument adjustments that affect sensitivity are made; and
- Whenever a continuing calibration standard fails to meet the specified acceptance criteria, on the second trial.

11.4.2 Initial Calibration Verification - Second Source Calibration Check Standard

11.4.2.1 This standard is only analyzed when initial calibration provided. Refer to Section 10.3.

11.4.3 Continuing Calibration verification standard

11.4.3.1 Refer to Section 10.4.

11.4.4 The method blank (step 3) cannot be analyzed until the continuing calibration verification meets the criteria.

11.5 Step 3 : Method blank

11.5.1 The acceptable method blank must be analyzed for every 12-hour time period or sooner.

11.5.1.1 Water and medium-level soil samples - Place a 40 ml vial, filled with DI water onto the autosampler.

11.5.1.2 Low-level soil samples without sodium bisulfate - Transfer 5 ml of DI water to a 40 ml vial and cap with Teflon septum, then place the vial into O.I. sample tray.

11.5.1.2.1 Low-level soil samples with sodium bisulfate (Method 5035) - Add 1g of sodium bisulfate into a 40 ml vial before adding 5 ml of DI water. Cap the vial with a Teflon septum, then place the vial onto the autosampler.

11.5.2 Program the autosampler to add internal standard and surrogate solution to the method blank for a concentration of 50 μg/l for each internal standard and surrogate.

11.5.2.1 For O.I. SIM spiker: Automatically adds 10 μl of 25 μg/ml internal standard and surrogate solution (Section 9.4.1.1) to the method blank.

11.5.2.2 For O.I. SAM spiker: Automatically adds 1 μl of 250 μg/ml internal standard and surrogate solution (Section 9.4.1.2) to the method blank.

11.5.3 No compound can be present above the laboratory's MDL. If common laboratory solvents (i.e. methylene chloride, acetone) are present in the sample at >1/2 RL, the analyst must determine if the contamination will negatively impact data quality. If the contamination impacts data quality, all affected samples must be re-analyzed.

11.5.4 Surrogates must meet recovery criteria specified in house limits.

11.5.5 If the method blank does not meet surrogate criteria or contains target analytes above the MDL, then

11.5.5.1 All samples analyzed following an out of control method blank must be reanalyzed.

11.5.5.2 Check for the potential of contamination interference from the following areas. Make sure all items are free contamination.

- the analytical system,
- dust and vapor in the air,
- glassware and
- Reagents.

11.5.5.3 Re-analyze the method blank following the system evaluation. In this situation, the instrument logbook must have clear documented notations as to what the problem was and what corrective action was implemented to enable the second blank to pass.

11.5.5.4 If re-analyzed method blank remains out of control, notify team leader or manager.

11.5.6 If two consecutive method blanks are analyzed during unattended operations, the second analysis must meet criteria for the subsequent sample analysis to be valid. Always report the second method blank. The second analysis can only be discarded because of a purge failure provided that the first blank meets the requirement. In this case, the first blank is reported following team leader/manager approval. Document this occurrence on the instrument log.

11.5.7 The blank spike (BS) (step 4) cannot be analyzed until the method blank meets criteria.

11.6 Step 4: Blank spike (BS)

11.6.1 An acceptable blank spike must be analyzed with every analytical batch. The maximum number of samples per analytical batch is twenty.

11.6.2 Spike 50 ml of reagent water with appropriate amount of the standards to prepare a blank spike containing 50 μg/L of each analyte. In situations where lower detection limits are required, a blank spike at 20 μg/L may be prepared. The stock solution for the BS must be from the same source as the initial calibration solution. Refer to Table 8-F for the preparations of the blank spikes.

11.6.2.1 Water and medium-level soil samples - Place a 40 ml vial, filled with DI water onto the autosampler.

11.6.2.2 Low-level soil samples without sodium bisulfate - Aliquot 5 ml of the blank spike into vial and cap with Teflon septum, then place the vial into O.I. sample tray.

11.6.2.2.1 Low-level soil samples with sodium bisulfate for Method 5035 - Add 1g of sodium bisulfate to labeled 40 ml vial before aliquot 5 ml of the blank spike into vial and cap with Teflon septum, then place the vial into O.I. sample tray.

11.6.3 Initiate auto addition of internal standard and surrogate into the syringe per 11.5.2.

11.6.4 Compare the percent recoveries (% R) (see Section 13.5) to the in house limits acceptance criteria. If a blank spike is out of control, all the associated samples must be reanalyzed. The exception is if the blank spike recovery is high and no hits reported in associated samples and QC batch. In that case, the sample results can be reported with footnote (remark) and no further action is required. Or if the blank spike recovery is low and the hits in the samples are above regulatory levels.

11.6.5 Do not analyze samples and MS/MSD (step 5) unless the BS meets acceptance criteria.

11.6.6 The blank spike and matrix spike must be the same source and concentration.

11.7 Step 5: Samples /MS/MSD analysis

11.7.1 All samples and standard solutions must be allowed to warm to ambient temperature before analysis.

11.7.2 Select the sample dilution factor to assure the highest concentration analyte is above the calibration range midpoint, but below the upper limit of the range depend on project requirements. See Table 9 for dilution guideline.

- Utilize FID screen data.
- Utilize acquired sample data.
- Utilize the history program.
- Sample characteristics (appearance, odor).

11.7.3 Water samples.

11.7.3.1 Using O.I.Model 4560 sample concentrator with 4551 or 4552 vial multisampler,

- Place the 40 ml vial in the tray, or
- Load 5ml sample into purge tube if sample volume limited.

11.7.3.2 A matrix spike and matrix spike duplicate are performed by spiking 20ul of the appropriate standards into the 40ml sample vial. If there are not enough vials for this procedure, a matrix spike and a sample duplicate are performed in place of an MS/MSD.

11.7.4 Sediment/ soil sample

11.7.4.1 Low-level soil method

11.7.4.1.1 Collect the sample using the procedures detailed in the SOP for SW846 Method 5035 low - level soil samples.

11.7.4.1.2 Weigh out 5 g of each sample into a labeled, tared vial filled with 5 ml DI water. Add the matrix spike by manually puncturing the septum with a small-gauge needle. Transfer the 40ml vial to the autosampler tray. Stir and heat the sample at the time of analysis.

11.7.4.2 Medium-level soil method

11.7.4.2.1 Collect the sample using the procedures detailed in the SOP for SW846 Method 5035 medium - level soil samples.

11.7.4.2.2 Select a methanol aliquot of appropriate volume (see Table 9) determined via screening and transfer to 40 ml of reagent water.

11.7.8 Program the autosampler to inject the internal standard and surrogate solution into the robotic syringe used to withdraw sample from the 40 ml vial. This addition to 5 ml of sample is equivalent to a concentration of 50 μg/L of each internal standard and surrogate.

11.7.8.1 For O.I. SIM spiker: Automatically adds 10 μl of 25 μg/ml internal standard and surrogate solution (Section 9.4.1.1) to each sample.

11.7.8.2 For O.I. SAM spiker: Automatically adds 1 μl of 250 μg/ml internal standard and surrogate solution (Section 9.4.1.2) to each sample.

11.7.9 Purge the sample for 9 minutes with Helium.

11.7.9.1 Low-level soil sample must be performed at 40 °C while the sample is being agitated with the magnetic stirring bar or other mechanical means.

11.7.9.2 To improve the purging efficiency of water-soluble compounds, aqueous samples may also be purged at 40 °C as long as all calibration standards (for 1,4-Dioxane SIM option, purge temperature is 80°C), samples and QC samples are purged at the same temperature and acceptable method performance is demonstrated.

11.7.10 One sample is randomly selected from each analytical batch of similar matrix types and spiked in duplicate to determine whether the sample matrix contributes bias to the analytical results. A matrix spike and matrix spike duplicate are performed by spiking the sample for a concentration of 50 μg/l or 50 μg/kg based on 5 g dry weight. In situations where lower detection limits are required, a blank spike at lower concentration may be prepared.

11.7.11 Desorb the sample for a maximum of 4 minutes by rapidly heating the trap to 190 °C while backflushing with Helium. Desorb time may require performance optimization between 0.5 and 4.0 minutes as dictated by trap manufacturers specifications or instrument characteristics.

11.7.12 Program the purge and trap system to automatically rinse purge tube at least twice with heated organic-free water (reagent water) between analyses to avoid carryover of target compounds. For samples containing large amounts of water-soluble materials, suspended solids, high-boiling compounds, or high purgeable levels, it may be necessary to wash out the purging device with methanol solution between analyses, rinse it with distilled water.

11.7.13 Bake the trap at least 10 minutes at 210 °C to remove any residual purgeable compounds.

11.7.14 If the initial analysis of the sample or a dilution of the sample has a response for any ion of interest that exceeds the working range of the GC/MS system, the sample must be reanalyzed at a higher dilution.

11.7.14.1 When ions from a compound in the sample saturate the detector, this analysis must be followed by the analysis of reagent water blank. If the blank analysis is not free of interferences, then the system must be decontaminated. Sample analysis may not resume until the blank analysis is demonstrated to be free of interferences.

11.8 Sample dilutions

11.8.1 Using Screening Data to Determine Dilution Factors

11.8.1.1 Dilution for High Concentration Analytes Exceeding The Calibration Range

11.8.1.1.1 The highest concentration target compound detected in the screen data is compared to the highest concentration calibration standard used for determinative volatile organics analysis.

11.8.1.1.1.1 Divide the calibration concentration of the screen concentration by the highest concentration calibration standard.

11.8.1.1.1.2 If the result is >1, sample dilution is considered.

11.8.1.1.2 The result from step 11.8.1.1.1 determines the dilution factor. The dilution factor is targeted to assure that the highest concentration diluted analyte is at the mid-range concentration of the calibration curve for the determinative analysis.

11.8.1.1.3 In all cases a conservative approach to dilution is applied to minimize the increase of detection and reporting limits

11.8.1.2 Dilution for High Concentration Matrix Interferences

11.8.1.2.1 The peak height of the background is compared to the peak height of the later eluting calibration standards from the screening analysis.

11.8.1.2.1.1 A rough estimate of background concentration is calculated by dividing the background peak height by the peak height of the selected screening standard and multiplying by its concentration.

11.8.1.2.2 If the result is >1, sample dilution is considered.

11.8.1.2.3 The result from step 11.8.1.2.1 determines the dilution factor. The dilution factor is targeted to avoid Carry-over contamination between samples and facilitate qualitative and quantitative analysis of target compounds present in the sample.

11.8.1.2.4 In all cases a conservative approach to dilution is applied to minimize the increase of detection and reporting limits

11.8.2 If the concentration of any target compound in any sample exceeds the initial calibration range, a new aliquot of that sample must be diluted and re-analyzed. Until the diluted sample is in a sealed sample vial, all steps in the dilution procedure must be performed without delay.

11.8.3 Water Samples.

11.8.3.1 Prepare all dilutions of water samples in volumetric flasks or Class A graduated cylinder. Intermediate dilutions may be necessary for extremely large dilutions.

11.8.3.2 Calculate the approximate volume of reagent water, which will be added to the volumetric flask or graduated cylinder, and add slightly less than this quantity to the flask. Refer to Table 9 for dilution guideline.

11.8.3.3 Inject the proper sample aliquot from a syringe into the volumetric flask or graduated cylinder. It is also permissible to pour the sample directly into a graduated cylinder for some dilutions. Dilute the flask to the volume mark with reagent water. Cap the flask and invert the flask three times.

11.8.3.4 Fill a 40 ml sample vial and seal with a Teflon baked silicon septa, load the diluted sample into the autosampler and analyze according to Section 11.7.

11.8.4 Low-level Soil Samples.

11.8.3.1 Screen data is used to determine the appropriate sample preparation procedure for a particular sample, the low-level soil method or the medium-level soil method.

11.8.3.2 If any target compound exceeds the initial calibration range from the analysis of 5 g sample, a smaller sample size must be analyzed. However, the smallest sample size permitted is 0.5 g. If smaller than 0.5 g sample size is needed to prevent any target compounds from exceeding the initial calibration range, the medium level method must be used.

11.9 Data interpretation

11.9.1 Qualitative identification.

11.9.1.1 The targeted compounds shall be identified by analyst with competent knowledge in the interpretation of mass spectra by comparison of the sample mass spectrum to the mass spectrum of a standard of the suspected compound.

11.9.1.2 The characteristic ions for target compounds that can be determined are listed in Table 7. Table 4 and Table 5 list the characteristic ions for internal standards and surrogate compounds respectively.

11.9.1.3 The criteria required for a positive identification are listed below.

11.9.1.3.1 The sample component must elute at the same relative retention time (RRT) as the daily standard. Criteria are the RRT of sample component must be within ± 0.06 RRT units of the standard component.

11.9.1.3.2 The relative intensities of these ions must agree within ± 30 % between the daily standard and sample spectra. (Example: For an ion with an abundance of 50 % in the standard spectra, the corresponding sample abundance must be between 20 and 80 %.)

11.9.1.3.2.1 Compounds can have secondary ions outside criteria from co-eluting compounds and/or matrix effect that can contribute to ion abundances. The interference on ion ratios can't always be subtracted out by software programs resulting in qualified compound identification.

11.9.1.3.2.2 Quantitation reports display compounds that have secondary ions outside the ratio criteria with a "#" flag.

11.9.1.3.3 Structural isomers that produce very similar mass spectra must be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is less than 50 % of sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.

11.9.2 Quantitative analysis

11.9.2.1 Once a target compound has been identified, its concentration (Section 13.4) will be based on the integrated area of the quantitation ion, normally the base peak (Table 7). The compound is quantitated by internal standard technique with an average response factor generated from the initial calibration curve.

11.9.2.2 If the sample produces interference for the primary ion, use a secondary ion to quantitate (see Table 7). This is characterized by an excessive background signal of the same ion, which distorts the peak shape beyond a definitive integration. Also interference could severely inhibit the response of the internal standard ion. This secondary ion must also be used to generate new calibration response factors.

11.10 Library search for tentatively identified compounds.

11.10.1 If a library search is requested, the analyst must perform a forward library search of NBS or NIST98 mass spectral library to tentatively identify 15 non-reported compounds.

11.10.2 Guidelines for making tentative identification are listed below.

11.10.2.1 These compounds must have a response greater than 10 % of the nearest internal standard. The response is obtained from the integration for peak area of the Total Ion Chromatogram (TIC).

11.10.2.2 The search is to include a spectral printout of the 3 best library matches for a particular substance. The results are to be interpreted by analyst.

11.10.2.3 Molecular ions present in the reference spectrum must be present in the sample spectrum.

11.10.2.4 Relative intensities of major ions in the reference spectrum (ions > 10 % of the most abundant ion) must be present in the sample spectrum.

11.10.2.5 The relative intensities of the major ions must agree within ± 20 %. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must between 30 and 70%).

11.10.2.6 Ions present in the sample spectrum but not in the reference spectrum must be reviewed for possible background contamination or presence of coeluting compounds.

11.10.2.7 Ions present in the reference spectrum but not in the sample spectrum must be verified by performing further manual background subtraction to eliminate the interference created by coeluting peaks and/or matrix interference.

11.10.2.8 Quantitation of the tentatively identified compounds is obtained from the total ion chromatogram based on a response factor of 1 and is to be tabulated on the library search summary data sheet.

11.10.2.9 The resulting concentration must be reported indicating: (1) that the value is estimate, and (2) which internal standard was used to determine concentration. Quantitation is performed on the nearest internal standard.

11.11 An instrument blank is a system evaluation sample containing lab reagent grade water with internal standards and surrogates. An instrument blank is used to remove and or evaluate residual carryover from high level standards, spike samples and field samples. Since target compound lists have expanded to overlap some volatile and semi-volatile compounds, instrument blanks are necessary to remove carryover contamination.

11.11.1 The compounds that may exhibit carryover for this method are listed in Table 11.

11.11.2 If instrument blanks following a standard or spike sample exhibits carry-over effect, then any samples that show the same carryover profile, after a comparable concentration must be considered suspect and rerun for confirmation. For example, if an instrument blank has 1ppb detected after a 200ppb standard, then any sample following a sample containing 200ppb or above of the same compound must be confirmed for possible carryover.

11.11.3 If an Instrument Blank(s) was run following suspect high concentration samples and it exhibits the same carryover profile after a comparable concentration must be considered suspect and rerun for confirmation.

11.11.4 In some cases, several instrument blanks may have to be run to eliminate contamination from over loaded samples.

11.11.5 The analytical system is considered free of carryover, when no target analytes can be detected above the MDL.

11.12 Selected Ion Monitoring (SIM) Option

11.12.1 Instrument Set-Up: Modify the method for SIM analysis and define ion groups with retention times, ions and dwell times to include base peak ion for the target compounds of interest, surrogates, and internal standards (Table 2a.) Select a mass dwell time of 50 milliseconds for all compounds.

11.12.2 Calibration: Calibrate the mass spectrometer in the selected ion monitoring mode using 9 calibration standards of 0.2, 0.3, 0.4, 1, 2, 5, 10, 20, and 50 ug/l. Spike each standard with the SIM specific internal standard solution at 4ug/ml. Calculate individual response factors and response factor RSDs. The initial calibration must meet the criteria in section 10.2.10.

11.12.3 Initial Calibration Verification. Verify the initial calibration after its completion using a 50 ug/l calibration standard purchased or prepared from a second standards reference materials source. The initial calibration verification must meet the criteria of Section 10.3.

11.12.4 Continuing Calibration Verification. Verify the initial calibration every 12 hours using a 50 ug/l calibration. The continuing calibration verification must meet the criteria of Section 10.4.

11.12.5 Surrogate Standard Calculation. Report surrogate spike accuracy for the surrogates spiked for the full scan GC/MS analysis.

12.0 QUALITY CONTROL

12.1 QC Requirements Summary

BFB	Beginning of the analytical shift and every 12 hours
ICV - Second Source Calibration Check Standard	Following initial calibration
Calibration Verification Standard	Every 12 hours
Method Blank	Every 12 hours
Blank Spike	One per analytical batch*
Matrix Spike	One per analytical batch*
Matrix Spike Duplicate	One per analytical batch*
Surrogate	Every sample and standard
Internal Standard	Every sample and standard

*The maximum number of samples per analytical batch is twenty.

12.2 Daily GC/MS Performance Check - BFB

12.2.1 Refer to Section 11.3.

12.3 Second Source Calibration Check Standard

12.3.1 Refer to Section 10.3.

12.3.2 Calibration Verification Standard

12.3.3 Refer to Section 10.4.

12.4 Method Blank

12.4.1 Refer to Section 11.5

12.5 Blank Spike

12.5.1 Refer to Section 11.6

12.6 Matrix Spike (MS)/Matrix Spike Duplicate (MSD)

12.6.1 One sample is selected at random from each analytical batch of similar matrix types and spiked in duplicate to check precision and accuracy.

12.6.2 Assess the matrix spike recoveries (Section 13.5) and relative percent difference (RPD) (Section 13.6) against the control limits.

12.6.3 If the matrix spike recoveries do not meet the criteria, check the blank spike recovery to verify that the method is in control. If the blank spike did not meet criteria, the method is out of control for the parameter in question and must be reanalyzed or qualified with an estimate of potential bias. Otherwise, matrix interference is assumed and the data is reportable. No further corrective action is required.

12.7 Surrogates

12.7.1 All standards, blanks, samples, and matrix spikes contain surrogate compounds, which are used to monitor method performance. If the recovery of any surrogate compound does not meet the control limits, the result must be flagged and:

12.7.1.1 The calculation must be checked.

12.7.1.2 The sample must be reanalyzed if the recovery of any one surrogate is out of control limit.

12.7.2 If the sample exhibits matrix interference, defined as excessive signal levels from target or non-target interfering peaks. In this case, reanalysis may not be required following team leader/manager approval.

12.7.3 If surrogate recoveries are acceptable upon reanalysis, the data from the reanalysis is reported. If the reanalysis date did not meet the hold time, then both sets of data must be submitted with the reanalysis reported.

12.7.4 If surrogates are still outside control limits upon reanalysis, then both sets of data must be submitted with the first analysis reported.

12.8 Internal Standard

12.8.1 Retention time for all internal standards must be within ± 30 seconds of the corresponding internal standard in the latest continuing calibration or 50 μg/l standard of initial calibration

12.8.2 The area (Extracted Ion Current Profile) of the internal standard in all analyses must be within 50 to 200 % of the corresponding area in the latest calibration standard (12 hr. time period).

12.8.3 If area of internal standard does not meet control limits, the calculations must be checked. If a problem is not discovered, the sample must be reanalyzed.

12.8.4 If areas are acceptable upon reanalysis, the reanalysis data is reported.

12.8.5 If areas are unacceptable upon reanalysis, then both sets of data are submitted with the original analysis reported.

13.0 CALCULATION

13.1 Response Factor (RF)

$$RF = \frac{As \times Cis}{Ais \times Cs}$$

where:
As = Area of the characteristic ion for the compound being measured.
Ais = Area of the characteristic ion for the specific internal standard.
Cs = Concentration of the compound being measured (ug/l).
Cis = Concentration of the specific internal standard (ug/l).

13.2 Percent Relative Standard Deviation (% RSD)

$$\%RSD = \frac{SD}{RFav} \times 100$$

where:
SD = Standard Deviation
RFav = Average response factor from initial calibration.

13.3 Percent Difference (%D)

$$\%D = \frac{(RFav - RFcv)}{RFav} \times 100$$

where:
RFcv = Response factor from Calibration Verification standard.
RFav = Average response factor from initial calibration.

13.4 Concentration (Conc.)

For water:

$$\text{Conc. } (\mu g/l) = \frac{Ac \times Cis \times Vp}{Ais \times RF \times Vi}$$

For soil/sediment low level (on a dry weight basis):

$$\text{Conc. } (\mu g/kg) = \frac{Ac \times Cis \times Vp}{Ais \times RF \times Ws \times M}$$

For soil/ sediment medium level (on a dry weight basis)

$$\text{Conc. } (\mu g/kg) = \frac{Ac \times Cis \times Vp \times Vt}{Ais \times RF \times Vme \times Ws \times M}$$

Where:
Ac = Area of characteristic ion for compound being measured.
Ais = Area of characteristic ion for internal standard.
Cis = Concentration of internal standard
RF = Response factor of compound being measured(from initial calibration)
Vi = Initial volume of water purged (ml)
Vp = 5 ml (Total Purge Volume)
Vme = Volume of Methanol aliquot
Vt = Ml Solvent + ((100-% solid)/100 x Ws)
Ws = Weight of sample extracted (g).
M = (100 - % moisture in sample) / 100 or % solids / 100

13.5 Percent Recovery (% R)

$$\%\ R = \frac{\text{Concentration found}}{\text{Concentration spiked}} \times 100$$

13.6 Relative Percent Difference (RPD)

$$RPD = \frac{|MSC - MSDC|}{(1/2)(MSC+MSDC)} \times 100$$

Where:
MSC = Matrix Spike Concentration
MSDC = Matrix Spike Duplicate Concentration

13.7 Linear regression by the internal standard technique.

$$C_s = \left(\frac{\frac{A_s}{A_{is}} - b}{a} \right) \times C_{is}$$

Where:
Cs = concentration of target analyte
As = Area of target analyte
Cis = concentration of the internal standard
b = Intercept
a = slope of the line

$$a = \frac{N \Sigma xy - \Sigma x \Sigma y}{N \Sigma x^2 - (\Sigma x)^2}$$

$$b = \frac{\Sigma y - a \Sigma x}{N}$$

N = number of points
x = amount of analyte
y = response of instrument

13.8 Correlation Coefficient

$$r = \frac{\Sigma(x - \bar{x})(y - \bar{y})}{\sqrt{\Sigma(x - \bar{x})^2 \Sigma(y - \bar{y})^2}}$$

Where r = correlation coefficient
x = amount of analyte
y = response of instrument

$\bar{x}$ = average of x values

$\bar{y}$ = average of y values

13.9 Quadratic curve with internal standard technique

$$Cs = \frac{-b \pm \sqrt{b^2 - 4a\left(c - \frac{A_s \times C_{is}}{A_{is}}\right)}}{2a}$$

Where:
Cs = concentration of target analyte

As = Area of target analyte
Cis = concentration of the internal standard
b = Intercept
a = slope of the line

14.0 DOCUMENTATION

14.1 The Analytical Logbook. The logbook must be completed by the analyst daily. Each instrument will have a separate logbook. The daily sequence must be recorded in the logbook by giving a file number to every instrument standard, QC, and samples in appropriate spaces. The files must be never overwritten or skipped intentionally. In case where the file is skipped or overwritten, a thorough explanation must be documented in the notes section. Upon completion, every analytical batch must be reviewed and signed by a supervisor/team lead. Supervisor signature indicates all documentation was performed correctly.

14.1.1 If samples or blank spike require reanalysis, a brief explanation of the reason and corrective action must be documented in the Comments section.
14.1.2 If maintenance was done on the instrument in order to pass the CCV or any other reason, the analyst must document it in the logbook.

14.2 Standards Preparation Logbook must be completed for all standard preparations. All information must be completed; the page must be signed and dated by the appropriate person.

14.2.1 The Accutest lot number must be cross-referenced on the standard vial.

14.3 Instrument Maintenance Logbook must be completed when any type of maintenance is performed on the instrument. Each instrument has a separate log.

14.4 Any corrections to laboratory data must be done using a single line through the error. The initials of the person and date of correction must appear next to the correction.

14.5 Supervisory personnel must review and sign all laboratory logbooks monthly to ensure that information was recorded properly. Additionally, the instrument maintenance logbooks and the accuracy of the recorded information must also be verified and signed off on the first page of the logbook quarterly by a supervisor/team lead.

14.6 Acrolein and Acrylonitrile data reported from a preserved sample must be footnoted: “Results reported from the HCl preserved sample. This reported result can only be used for screening purposes for Acrolein and Acrylonitrile.” Any samples analyzed form an unpreserved vial must be footnoted stating samples were unpreserved and analyzed within 7 days.

15.0 POLLUTION PREVENTION & WASTE MANAGEMENT

15.1 Users of this method must perform all procedural steps in a manner that controls the creation and/or escape of wastes or hazardous materials to the environment. The amounts of standards, reagents, and solvents must be limited to the amounts specified in this SOP. All safety practices designed to limit the escape of vapors, liquids or solids to the environment

must be followed. All method users must be familiar with the waste management practices described in section 15.2.

15.2 Waste Management. Individuals performing this method must follow established waste management procedures as described in the waste management SOP, EHS004. This document describes the proper disposal of all waste materials generated during the testing of samples as follows:

15.2.1 Non hazardous aqueous wastes

15.2.2 Hazardous aqueous wastes

15.2.3 Chlorinated organic solvents

15.2.4 Non-chlorinated organic solvents

15.2.5 Hazardous solid wastes

15.2.6 Non-hazardous solid wastes

Table 1 TARGET COMPOUNDS		
Acetone	1,4-Dichlorobenzene	Methylene Bromide
Acetonitrile	Dichlorodifluoromethane	Methylene Chloride
Acrolein	1,1-Dichloroethane	1-Methylnaphthalene
Acrylonitrile	1,2-Dichloroethane	2-Methylnaphthalene
Allyl Chloride	1,1-Dichloroethene	Naphthalene
Benzene	cis-1,2-Dichloroethene	2-Nitropropane
Benzyl chloride	trans-1,2-Dichloroethene	Pentachloroethane
Bromobenzene	1,2-Dichloropropane	Propionitrile
Bromochloromethane	1,3-Dichloropropane	Propyl Acetate
Bromodichloromethane	2,2-Dichloropropane	n-Propylbenzene
Bromoform	1,1-Dichloropropene	Styrene
Bromomethane	cis-1,3-Dichloropropene	Tert Butyl Alcohol
2-Butanone (MEK)	trans-1,3-Dichloropropene	tert-Amyl Methyl Ether
Butyl Acetate	1,4-Dioxane	tert-Butyl Ethyl Ether
n-Butyl Alcohol	Epichlorohydrin	1,1,1,2-Tetrachloroethane
n-Butylbenzene	Ethyl Acetate	1,1,2,2-Tetrachloroethane
sec-Butylbenzene	Ethyl Ether	Tetrachloroethene
tert-Butylbenzene	Ethyl Methacrylate	Tetrahydrofuran
Carbon Disulfide	Ethylbenzene	Toluene
Carbon Tetrachloride	p-Ethyltoluene	trans-1,4-Dichloro-2-Butene
Chlorobenzene	Freon 113	1,2,3-Trichlorobenzene
Chlorodifluoromethane	Heptane	1,2,4-Trichlorobenzene
Chloroethane	Hexachlorobutadine	1,1,1-Trichloroethane
2-Chloroethyl Vinyl Ether	Hexachloroethane	1,1,2-Trichloroethane
Chloroform	Hexane	Trichloroethene
Chloromethane	2-Hexanone	Trichlorofluoromethane
Chloroprene (2-chloro-1,3-butadiene)	Iodomethane (Methy iodide)	1,2,3-Trichloropropane
o-Chlorotoluene	IsoAmyl Alcohol	1,2,4-Trimethlylbenzene
p-Chlorotoluene	Isobutyl Alcohol	1,3,5-Trimethylbenzene
Cyclohexane	Isopropyl Acetate	2,2,4 Trimethylpentane
Cyclohexanone	Isopropylbenzene	Vinyl Acetate
di-Isobutylene	p-Isopropyltoluene	Vinyl Chloride
di-Isopropyl Ether	Methacrylonitrile	Vinyltoluene
1,2-Dibromo-3-Chloropropane	Methyl Acetate	m,p-Xylene
Dibromochloromethane	3 Methyl-1-Butanol	o-Xylene
1,2-Dibromoethane	Methyl Tert Butyl Ether	Ethanol
Dibromomethane	Methylcyclohexane	Methyl Acrylate
1,2-Dichlorobenzene	Methyl Methacrylate	1-chloro-1,1-difluoroethane
1,3-Dichlorobenzene	4-Methyl-2-pentanone (MIBK)	1,1,1-trifluoroethane
1,1-dichloro-1-fluroethane	2,2-Dichloropropane	1,3-Butadiene
3,3-Dimethyl-1-Butanol	Tert-Butyl Formate	Tert-amyl alcohol
2-methylnaphthalene		

Table 2 RECOMMENDED OPERATING CONDITION	
Gas Chromatograph/ Mass Spectrometer	
Carrier Gas (linear velocity)	Helium at *30 cm/sec
Mass range	35 – 300 amu
Electron Energy	70 volts (nominal)
Scan time	not to exceed 2 sec. per scan
Injection port temperature	200 - 225 °C
Source temperature	200 - 250 °C
Transfer line temperature	220 - 280 °C
Analyzer temperature	220 - 250 °C
Gas Chromatograph temperature program*	
Initial temperature	*40 °C
Time 1	*3 minutes
Column temperature rate	*8 degrees/min.
Final temperature	*220 °C.- 240 °C
Total run time	*25 – 50 mins
Purge and Trap Device	
Purge time	9 min. (at 40 °C for low-level soil) SIM – 6 min @ 80 °C
Desorb**	1 min. at 190 °C
Bake	>10 min. at 210 °C
Transfer line	100 - 130 °C
Valve temperature	approx. transfer line temperature

* Parameter modification allowed for performance optimization provided operational and QC criteria is achieved.(must be approved by team leader/manager)

** Desorb time may require performance optimum between 0.5 and 4.0 minutes as dictated by trap manufacturers specifications or instrument characteristics

Table 2a SIM Group Parameters		
Group No.	**Retention Time (minutes)**	**Ions**
1	0 – 10.8	58, 65, 66, 88
2	10.8 – 16.0	95, 174, 176, 96,64

Table 3 BFB KEY IONS AND ION ABUNDANCE CRITERIA	
Mass	**Ion Abundance Criteria**
50	15-40% of mass 95
75	30-60% of mass 95
95	Base peak, 100% relative abundance
96	5-9% of mass 95
173	< 2% of mass 174
174	> 50% of mass 95
175	5-9% of mass 174
176	>95% and <101% of mass 174
177	5-9% of mass 176

Table 4 INTERNAL STANDARD QUANTITION IONS	
Internal Standard	**Primary/Secondary Ions**
1,4-Difluorobenzene	114 / 63,88
Chlorobenzene-d5	117 / 82, 119
Pentafluorobenzene	168
1,4-Dichlorobenzene-d4	152 / 115, 150
Tert Butyl Alcohol-d9	65/66
Internal Standard (SIM)	
4-BFB	95/174,176

Table 5 SURROGATE QUANTITION IONS	
Surrogate Compound	**Primary/Secondary Ions**
1,2 Dichloroethane – d_4	102
Dibromofluoromethane	113
Toluene-d8	98
4-Bromofluorobenzene	95 / 174, 176
1,4-dioxane-d8	96, 64

Table 6 - Intentionally removed.

Table 7 Volatile Internal Standards with Corresponding Analytes Assigned for Quantitation					
Analyte	**Primary Characteristic Ion**	**Secondary Characteristic Ion (s)**	**Analyte**	**Primary Characteristic Ion**	**Secondary Characteristic Ion (s)**
Tert Butyl Alcohol-d9	65		Dibromomethane	93	95, 174
Tert Butyl alcohol	59	57	Di-isobutylene	57	
Ethanol	45	46	Epichlorohydrin (pp)	57	57, 49, 62, 51
1,4-Dioxane (pp)	88	58,43,57	Heptane	57	
Pentafluorobenzene	168		Methyl cyclohexane	83	
1,1,1-Trichloroethane	97	99, 61	Methyl methacrylate	100	69, 41, 39
1,1-Dichlorethane	63	65, 83	n-Butanol (pp)	56	41
1,1-Dichloroethene	96	61, 63	Propyl Acetate	43	
2,2-Dichloropropane	77	97	tert Amyl Methyl Ether	73	
2-Butanone (pp)	72	43, 72	Trichloroethene	95	97, 130, 132
Acetone (pp)	58	43	**Chlorobenzene-d5**	117	82,119
Acetonitrile (pp)	41	41, 40, 39	1,1,1,2-Tetrachloroethane	131	133, 119
Acrolein (pp)	56	55,58	1,3-Dichloropropane	76	78
Acrylonitrile (pp)	53	52, 51	Bromoform	173	175, 254
Allyl Chloride	76	41	Butyl Acetate	56	
Bromochloromethane	128	49, 130	Chlorobenzene	112	77, 114
Bromomethane	94	96	Dibromochloromethane	129	127
Carbon disulfide	76	78	Ethylbenzene	91	106
Carbon tetrachloride	117	119	m-Xylene	106	91
Chlorodifluouromethane	51	86	o-Xylene	91	106
Chloroethane	64	66	3,3-Dimethyl-1-Butanol	57	69
Chloroform	83	85	p-Xylene	106	91
Chloromethane	50	52	Styrene	104	78
Chloroprene	53	53, 88, 90, 51	Ethyl methacrylate	69	69, 41, 99, 86, 114
cis-1,2-Dichloroethene	96	61, 98	Toluene	92	91
Cyclohexane	84		**Toluene-d_8 (S)**	98	
Dibromofluoromethane (S)	113		Tetrachloroethene	164	129,131,166
Dichlorodifluoromethane	85	87	Cyclohexanone	55	
1,1-Dichloropropene	75	110, 77	2-Hexanone (pp)	58	43, 57, 100
Diethyl ether	74	45, 59	trans-1,3-Dichloropropene	75	77, 39
1,3-Butadiene	54		**1,4 Dichlorobenzene-d4**	152	115,150
Diisopropyl ether	45	102	1,1,2,2-Tetrachloroethane	83	131, 85
Ethyl acetate (pp)	45	43, 88, 61	1,2,3-Trichlorobenzene	180	182, 145

Table 7 Volatile Internal Standards with Corresponding Analytes Assigned for Quantitation

Analyte	Primary Characteristic Ion	Secondary Characteristic Ion (s)	Analyte	Primary Characteristic Ion	Secondary Characteristic Ion (s)
Ethyl tert Butyl Ether	59		1,2,3-Trichloropropane	110	77,75
Hexane	56		1,2,4-Trichlorobenzene	180	182, 145
Isopropyl acetate	87	43	1,2,4-Trimethylbenzene	105	120
Tert-Amyl alcohol	59	73,55	1,2-Dibromo-3-chloropropane(pp)	157	155, 75
Freon 113	151		1,2-Dichlorobenzene	146	111,148
Iodomethane	142	127, 141	1,3,5-Trimethylbenzene	105	120
Isobutyl alcohol (pp)	43	43, 41, 42, 74	1,3-Dichlorobenzene	146	111, 148
Methacrylonitrile (pp)	67	41, 39, 52, 66	1,4-Dichlorobenzene	146	111, 148
Methyl Acetate	43	74	2-Chlorotoluene	126	91
Methylene chloride	84	86, 49	**4-Bromofluorobenzene (S)**	95	174, 176
Methyl-t-butyl ether	73	57	2-methylnaphthalene	142	141,115,143
Propionitrile (ethyl cyanide)(pp)	54	54, 52, 55, 40	Dibromofluoromethane		
Tetrahydrofuran	71	42	4-Chlorotoluene	91	126
trans-1,2-Dichloroethene	96	61, 98	Benzyl chloride	91	91, 126, 65, 128
Trichlorofluoromethane	101	151, 153	Bromobenzene	156	77, 158
Vinyl acetate	86	43	Hexachlorobutadiene	225	223, 227
Vinyl chloride	62	64	Hexachloroethane (pp)	201	166, 199, 203
Methyl Acrylate	85	55	Isopropylbenzene	105	120
Tert-Butyl Formate	59	57, 41	Naphthalene	128	-
1-chloro-1, 1-difluoroethane	65	45,85	n-Butylbenzene	92	91, 134
1,1,1-trifluoroethane	69	69,45	n-Propylbenzene	91	120
1,1-dichloro-1-fluroethane	81	45,61	Pentachloroethane (pp)	167	167,130,132,165,169
2,2-Dichloropropane	77	97,79	p-isopropyltoluene	119	134,91
1,4 Difluorobenzene	114	63, 88	sec-Butylbenzene	105	134
1,1,2-Trichloroethane	83	97, 85	tert-Buytlbenzene	119	91, 134
1,2-Dibromoethane	107	109, 188	trans-1,4-Dichloro-2-butene (pp)	53	88, 75
1,2 Dichloroethane	62	98			
1,2 Dichloropropane	63	112	**(pp) = Poor Purging Efficiency**		
2,2,4 Trimethylpentane	57		(S)=Surrogate		
2-Chloroethyl-vinylether (pp)	63	65, 106			
Dichloroethane-d_4 (S)	65	102			
2-Nitropropane	46	-			
3 Methyl –1 butanol	70	55			
4-Methyl-2-pentanone (pp)	58	43, 85, 100			
Benzene	78	-			
Bromodichloromethane	83	85, 127			
cis-1,3-Dichloropropene	75	77, 39			
Methylcyclohexane	83				

Table 7-1 SIM - Volatile Internal Standards with Corresponding Analytes Assigned for Quantitation

Analyte	Primary Characteristic Ion	Secondary Characteristic Ion (s)
4-BFB	95	174, 176
1,4-Dioxane	88	58
1,4-dioxane-d8	96	64

Table 8 STANDARDS PREPARATION

A) Internal standard and Surrogate mixtures:

	a) 25/250 μg/ml	b) 250/2,500 μg/ml
Internal Standard Mixture (2,000 μg/ml)	1.25 ml	1 .25 ml
Tert Butyl Alcohol-d_9 (50,000 μg/ml)	0.5 ml	0.5 ml
Surrogate Mixture (2,500 μg/ml)	1 ml	1 ml
Methanol	97.25 ml	7.25 ml
Total	100 ml	10 ml

- 25/250 μg /ml internal standard and surrogate mixture: The mixture is prepared by measuring 1.25ml of 2,000 μg /ml Internal Standard Mixture (Ultra or equivalent), 0.5 ml of 50,000 μg/ml TBA-d_9 (Absolute or equivalent), 1 ml of 2,500 μg /ml Method 8260A Surrogate Standard Mixture (Ultra or equivalent) and bringing to 100 ml with methanol.

- 250/2,500 μg /ml internal standard and surrogate mixture: The mixture is prepared by measuring 1.25 ml of 2,000 μg /ml Internal Standard Mixture (Ultra or equivalent), 0.5 ml of 50,000 μg/ml TBA-d_9 (Absolute or equivalent), 1 ml of 2,500 μg /ml Method 8260A Surrogate Standard Mixture (Ultra or equivalent) and bringing to 10 ml with methanol.

- 100 μg/ml surrogate mixture: The solution is prepared at 100 μg/ml by measuring 0.4 ml of 2,500 μg/ml Method 8260A Surrogate Standard Mixture (Ultra or equivalent) and bringing to 10 ml with methanol.

- 25/250 μg /ml internal standard mixture: The solution is prepared by measuring 1.25 ml of 2,000 μg /ml Internal Standard Mixture (Ultra or equivalent), 0.5 ml of 50,000 μg/ml TBA-d_9 (Absolute or equivalent), and bringing to 100 ml with methanol.

- 250/2,500 μg /ml internal standard mixture: The solution is prepared by measuring 1.25 ml of 2,000 μg /ml Internal Standard Mixture (Ultra or equivalent), 0.5 ml of 50,000 μg/ml TBA-d_9 (Absolute or equivalent), and bringing to 10 ml with methanol.

B) Bromofluorobenzene (BFB):

	a) 25 μg/ml	b)) 250 μg/ml
BFB (25,000 μg/ml)	0.1 ml	0.1 ml
Methanol	99.9 ml	9.9 ml
Total	100 ml	10 ml

- 25 μg /ml solution for direct injection: The BFB is prepared at 25 μg /ml by measuring 0.1 ml of 25,000 μg /ml (Absolute Stock or equivalent) and diluting to 100 ml with methanol.

- 250 μg /ml solution for purging: The BFB is prepared at 250 μg /ml by measuring 0.1 ml of 25,000 μg /ml (Absolute Stock or equivalent) and diluting to 10 ml with methanol.

Table 8 STANDARD PREPARATION (Continued)
C) Secondary dilution standards:

2nd Dilution Standards	Stock Solution	Concentration (µg/ml)	Volume Added (µl)	Final Volume in Methanol (ml)	Final Concentration (µg/ml)
V8260 Mixture	EPA Method 524.2 Volatiles	2,000	2,500	50	100
	Acrolein	Neat (90%)	66.2		1,000
	Acrylonitrile*	Neat	25		500+
	Propionitrile**	Neat	58.9		1,000++
	Di-iso Butylene	Neat	7.1		100
	Cyclohexane	Neat	6.5		100
	Cyclohexanone	Neat	52.9		1,000
V8260 Custom Mixture	Custom Volatiles Mix A	2,000	2,500	50	100
	Custom Volatiles Mix B	2,000 -100,000	2,500		100 - 5,000
	Epichlorohydrin	Neat	21.4		500
	Iso-Amyl alcohol	Neat	125		2,000
	2-Chloroethyl vinyl ether	Neat	20.1		500
	Ethyl tert-butyl ether	Neat	6.8		100
	Tert-Amyl methyl ether	Neat	6.56		100
	Benzyl chloride	Neat	4.6		100
Gas Mixture	VOC Gas Mixture	2,000	1,000	20	100
Ketones Mixture (water samples)	Acetone, 2-Butanone, MIBK, 2-Hexanone	Neat	23.5 ml	50	400
Ketones Mixture (soil samples)	Acetone, 2-Butanone, MIBK, 2-Hexanone	Neat	7.6 ml	20	300

- 100 µg /ml V8260 mixture: The mixture is prepared at 100 µg /ml by measuring 2 ml of 2,000 µg /ml EPA Method 524.2 Volatiles stock standard, appropriate amount of some neat compounds, and bringing to 50 ml with methanol.
  * Acrylonitrile = 400 µg /ml (Neat) + 100 µg /ml (EPA Method 524.2 Volatiles)
  ** Propionitrile = 900 µg /ml (Neat) + 100 µg /ml (EPA Method 524.2 Volatiles)

- 100 µg /ml V8260 custom mixture: The mixture is prepared at 100 - 5,000 µg /ml by measuring 2.5ml of 2,000 µg /ml Custom Volatiles Mix A, 2.5 ml of 2,000 - 100,000 µg/ml Custom Volatiles Mix B, appropriate amount of some neat compounds, and bringing to 50 ml with methanol.

- 100 µg /ml gas mixture ***: The mixture is prepared at 100 µg /ml by measuring 1 ml of 2,000 µg /ml stock standard and bring to 20 ml with methanol.
  ******* Gas mixture must be prepared weekly.

Table 8 STANDARD PREPARATION (Continued)

D).1 Initial Calibration Standards: using DI water bring to 50 ml final volume for the 1 -400 ppb standards and 500 ml for the 0.2 and 0.5 ppb standards: All mixtures used must be **secondary dilution** standards at **100 ppm**. Note: Larger volumes may be prepared if needed i.e. if 100 ml final volume is used the volume of the standard added would be doubled.

Standard and Surrogate Concentration	V8260 Mix (100 ppm)	V8260 Custom Mix (100 ppm)	Gas compound Mix (100 ppm)	Surrogate Mix when added manually (100ppm)	Ketones Mix for soil matrix (300 ppm)	Ketones Mix for water matrix (400 ppm)
0.2 ppb	1.0 µl	1.0 µl	1.0 µl	1.0 µl#	1.0 µl	1.0 µl
0. 5 ppb	2.5 µl	2.5 µl	2.5 µl	2.5 µl#	2.5 µl	2.5 µl
1 ppb	0.5 µl	0.5 µl	0.5 µl	0.5 µl#	0.5 µl	0.5 µl
2 ppb *	1.0 µl	1.0 µl	1.0 µl	1.0 µl#	1.0 µl	1.0 µl
4 ppb *	2.0 µl	2.0 µl	2.0 µl	2.0 µl#	2.0 µl	2.0 µl
5 ppb	2.5 µl	2.5 µl	2.5 µl	2.5 µl#	2.5 µl	2.5 µl
8 ppb *	4.0 µl	4.0 µl	4.0 µl	4.0 µl#	4.0 µl	4.0 µl
10 ppb *	5 µl	5 µl	5 µl	5 µl#	5 µl	5 µl
20 ppb	10 µl	10 µl	10 µl	10 µl#	10 µl	10 µl
50 ppb	25 µl	25 µl	25 µl	25 µl#	25 µl	25 µl
100 ppb	50 µl	50 µl	50 µl	50 µl#	50 µl	50 µl
200 ppb	100 µl	100 µl	100 µl	100 µl#	100 µl	100 µl
300 ppb *	150 µl	150 µl	150 µl	150 µl#	150 µl	150 µl
400 ppb *	200 µl	200 µl	200 µl	200 µl#	200 µl	200 µl

* depending upon the instrument.
\# See Section 10.2.2.1 for correction factor.

- When calibrating for Method 5035 low-level soil samples, add 1g of sodium bisulfate to the 40-ml vial before aliquot 5 ml of each standard into vial if applicable. This is equivalent to the amount of sodium bisulfate added to the samples and will maintain a consistent purging efficiency of the compounds.

D).2 Initial Calibration Standards for 1,4-Dioxane using SIM

Standard / Surrogate Concentration (ppb)	1,4-Dioxane Solution (100ppm)	DI Water – Final Volume (ml)
0.4	0.4 µl	100
2	2 µl	100
5	5 µl	100
25	25 µl	100
50	25 µl	50
100	50 µl	50
200	100 µl	50
400	200 µl	50

Table 8 STANDARD PREPARATION (Continued)

E) Continuing Calibration Standard: using DI water bring to 50 ml final volume: All mixtures used are secondary dilution standards at 100 ppm.

Concentration	V8260 Mix (100 ppm)	V8260 Custom Mix (100 ppm)	Gas compound Mix (100 ppm)	Ketones Mix for water matrix(400 ppm)	Ketones Mix for soil matrix (300 ppm)
50 ppb	25 µl	25 µl	25 µl	25 µl	25 µl

- When calibrating for Method 5035 low-level soil samples, add 1g of sodium bisulfate to the 40-ml vial before aliquot 5 ml of the continuing calibration standard into vial if applicable. This is equivalent to the amount of sodium bisulfate added to the samples and will maintain a consistent purging efficiency of the compounds.

F) Blank Spike (BS): using DI water bring to 50 ml final volume: All mixtures used are 100 ppm secondary dilution standards.

Concentration	V8260 Mix (100 ppm)	V8260 Custom Mix (100 ppm)	Gas compound Mix (100 ppm)	Ketones Mix for water matrix(400 ppm	Ketones Mix for soil matrix (300 ppm)
50 ppb	25 ul	25 ul	25 ul	25 µl	25 µl

For lower detection level required (test code: V8260LL)

Concentration	V8260 Mix (100 ppm)	V8260 Custom Mix (100 ppm)	Gas compound Mix (100 ppm)	Ketones Mix for water matrix(400 ppm	Ketones Mix for soil matrix (300 ppm)
20 ppb	10 ul	10 ul	10 ul	10 µl	10 µl

- When calibrating for Method 5035 low-level soil samples, add 1g of sodium bisulfate to the 40-ml vial before aliquot 5 ml of the blank spike into vial if applicable. This is equivalent to the amount of sodium bisulfate added to the samples and will maintain a consistent purging efficiency of the compounds.

Table 9 GUIDELINE FOR DILUTION PREPARATION
Water Sample

Dilution	Sample amount taken	Final volume A (volumetric)	Take from final volume A	Final volume B (volumetric)
1:2	25 ml	50 ml		
1:5	10 ml	50 ml		
1:10	5 ml	50 ml		
1:20	2.5 ml	50 ml		
1: 25	2 ml	50 ml		
1:50	1 ml	50 ml		
1:100	0.5 ml	50 ml		
1:200	250 µl	50 ml		
1:250	200 µl	50 ml		
1:500	100 µl	50 ml		
1:1000	50 µl	50 ml		
1:2000	25 µl	50 ml		
1:2500	20 µl	50 ml		
1:5000	10 µl	50 ml		
1:10000	0.5 ml	50 ml	0.5 ml	50 ml
1:20000	0.5 ml	50 ml	250 µl	50 ml
1:25000	0.5 ml	50 ml	200 µl	50 ml
1:50000	0.5 ml	50 ml	100 µl	50 ml
1:100000	0.5 ml	50 ml	50 µl	50 ml

Soil-Low level (Non-Encore sample)

Dilution	Sample amount taken	Final volume
1:2	2.5 gram	5 ml
1:5	1 gram	5 ml
1:10	0.5 gram	5 ml

Soil-medium level

Additional Dilution	Sample in Methanol amount taken	Final volume (volumetric)
1:1	1 ml	50 ml
1:2	0.5 ml	50 ml
1:5	200 µl	50 ml
1:10	100 µl	50 ml
1:20	50 µl	50 ml
1: 25	40 µl	50 ml
1:50	20 µl	50 ml
1:100	10 µl	50 ml
1:200	5 µl	50 ml
1:250	4 µl	50 ml
1:500	2 µl	50 ml

Table 10 REPORTING LIMITS

Compound	Water	Soil	Compound	Water	Soil
	µg/l	µg/kg		µg/l	µg/kg
Chlorodifluoromethane	5	5	Chloroform	1	5
Dichlorodifluoromethane	5	5	Freon 113	5	5
Chloromethane	1	5	Methacrylonitrile	10	10
Vinyl chloride	1	5	Butyl Acetate	5	5
Bromomethane	2	5	1,1,1-Trichloroethane	1	5
Chloroethane	1	5	Heptane	5	5
Trichlorofluoromethane	5	5	n-Propyl acetate	5	5
Ethyl ether	5	5	2-Nitropropane	10	10
Acrolein	50	50	Tetrahydrofuran	10	10
1,1-Dichloroethene	1	5	2-Chloroethyl Vinyl Ether	10	25
Tertiary butyl alcohol	25	25	n-Butyl alcohol	250	250
Acetone	10	10	Cyclohexane	5	5
Methyl acetate	5	5	Carbon Tetrachloride	1	5
Allyl chloride	5	5	1,1-Dichloropropene	5	5
Acetonitrile	100	100	Isopropyl Acetate	5	5
Iodomethane	2	5	Benzene	0.5	0.5
Iso-butyl alcohol	50	50	1,2-Dichloroethane	1	1
Carbon disulfide	2	5	Trichloroethene	1	5
Methylene chloride	2	5	Methyl methacrylate	10	10
Methyl tert butyl ether	1	1	1,2 Dichloropropane	1	5
Trans-1,2-Dichloroethene	1	5	Di-isobutylene	5	5
Di-isopropyl ether	5	5	Dibromomethane	5	5
2-Butanone	10	10	1,4 Dioxane	125	125
1,1-Dichloroethane	1	5	Bromodichloromethane	1	5
Hexane	5	5	cis-1,3-Dichloropropene	1	5
Chloroprene	5	5	4-Methyl-2-pentanone	5	5
Acrylonitrile	50	50	Toluene	1	1
Vinyl acetate	10	10	trans-1,3-Dichloropropene	1	5
Ethyl acetate	5	5	Ethyl methacrylate	10	10
2,2-Dichloropropane	5	5	1,1,2-Trichloroethane	1	5
Cis-1,2-Dichloroethene	1	5	2-Hexanone	5	5
Bromochloromethane	5	5	Cyclohexanone	50	200

Table 10 REPORTING LIMITS (Continued)

Compound	Water	Soil	Compound	Water	Soil
	µg/l	µg/kg		µg/l	µg/kg
Tetrachloroethene	1	5	4-Chlorotoluene	5	5
1,3-Dichloropropane	5	5	1,3,5-Trimethylbenzene	2	5
Dibromchloromethane	1	5	tert-Butylbenzene	5	5
1,2-Dibromoethane	1	1	1,2,4 Trimethylbenzene	2	5
Chlorobenzene	1	5	sec-Butylbenzene	5	5
1,1,1,2-Tetrachloroethane	5	5	1,3-Dichlorobenzene	1	5
Ethylbenzene	1	1	p-Isopropyltoluene	5	5
M,p-Xylene	1	1	1,4-Dichlorobenzene	1	5
o-Xylene	1	1	1,2-Dichlorobenzene	1	5
Styrene	5	5	n-Butylbenzene	5	5
Bromoform	4	4	1,2-Dibromo-3-choropropane	10	10
Isopropylbenzene	2	5	1,2,4-Trichlorobenzene	2	5
Bromobenzene	5	5	Hexachlorobutadiene	5	5
1,1,2,2-Tetrachloroethane	1	5	Naphthalene	5	5
Trans-1,4-Dichloro-2-butene	5	5	1,2,3-Trichlorobenzene	5	5
1,2,3-Trichloropropane	5	5	Epichlorohydrin	100	100
n-Proplybenzene	5	5	3-Methyl-1-butanol	5	5
2-Chlorotoluene	5	5	Hexachloroethane	5	5
Ethanol	100	200	Methyl Acrylate	5	--
Benzyl Chloride	5	5	Methylcyclohexane	5	5
2,2,4 Trimethylpentane	5	5	1,1,1 trifluoroethane Freon 143a	5	10
1-chloro-1,1-difluoroethane Freon 142b	5	10	1,1-dichloro-1-fluoroethane Freon 141b	5	5
1,3-Butadiene	5	5	3,3-Dimethyl-1-butanol	20	20
1.4-Dioxane (SIM)	2	5	2-methylnaphthalene	5	5
Tert-Butyl Formate	5	5	Tert-amyl alcohol	25	25

Table 11 COMPOUNDS THAT MAY EXHIBIT CARRYOVER

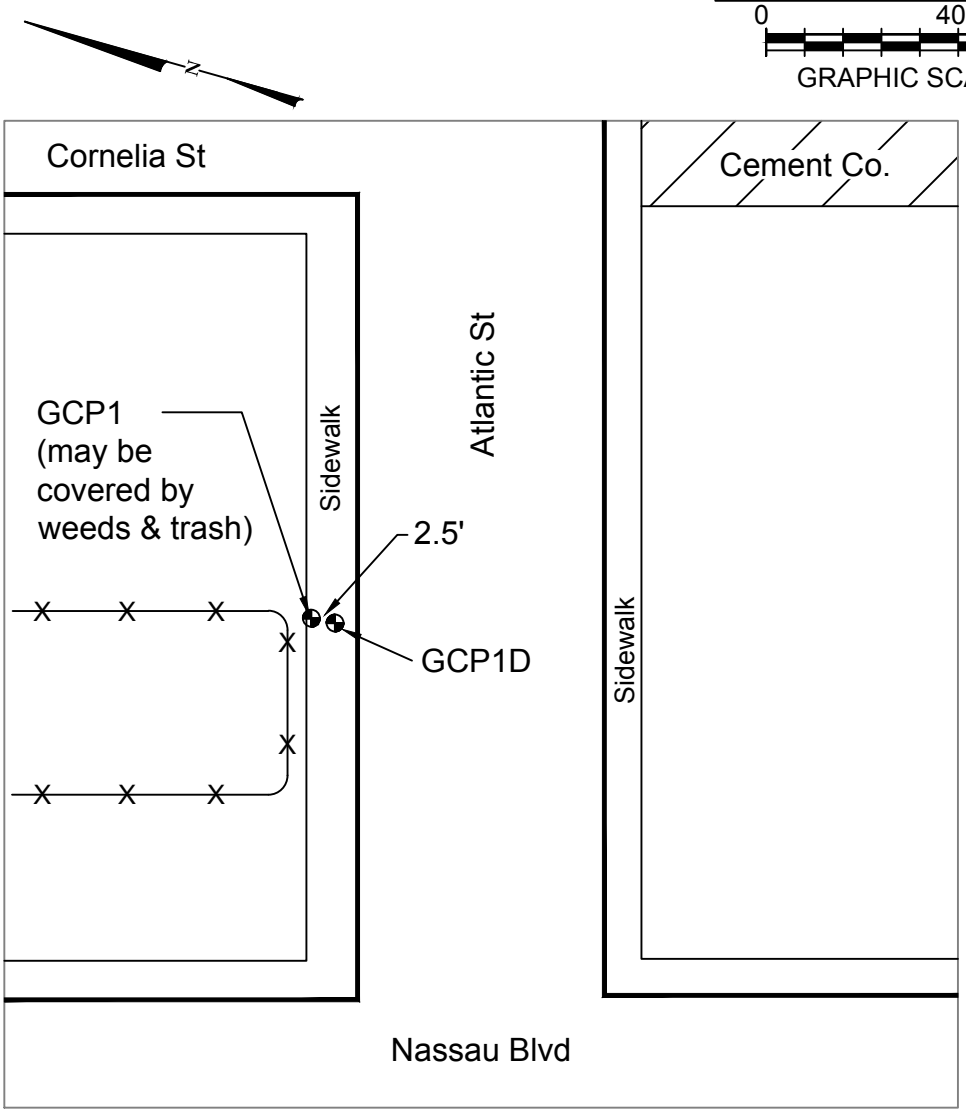
Compound
1,2,4-Trichlorobenzene
Hexachlorobutadiene
Naphthalene
1,2,3-Trichlorobenzene

Table 12 RECOMMENDED MINIMUM RELATIVE RESPONSE FACTOR CRITERIA FOR INITIAL AND CONTINUING CALIBRATION VERIFICATION

Compound	Minimum Response Factor	Typical Response Factor
Dichlorofluoromethane	0.100	0.327
Chloromethane	0.100	0.537
Vinyl chloride	0.100	0.451
Bromomethane	0.100	0.255
Chloroethane	0.100	0.254
Trichlorofuoromethane	0.100	0.426
1,1 Dichloroethene	0.100	0.313
Freon 113	0.100	0.302
Acetone	0.100	0.151
Carbon Disulfide	0.100	1.163
Methyl Acetate	0.100	0.302
Methylene chloride	0.100	0.380
trans-1,2 Dichloroethene	0.100	0.351
cis-1,2 Dichloroethene	0.100	0.376
Methyl tert-butyl Ether	0.100	0.847
1,1 Dichloroethane	0.200	0.655
2-Butanone	0.100	0.216
Chloroform	0.200	0.557
1,1,1 Trichloroethane	0.100	0.442
Cyclohexane	0.100	0.579
Carbon Tetrachloride	0.100	0.353
Benzene	.0.500	1.368
1,2 Dichloroethane	0.100	0.443
Trichloroethene	0.200	0.338
Methylcyclohexane	0.100	0.501
1,2-Dichloropropane	0.100	0.382
Bromodichloromethane	0.200	0.424
cis-1,3-Dichloropropene	0.200	0.537
trans-1,3 - Dichloropropene	0.100	0.515
4-Methyl-2-Pentanone	0.100	0.363
Toluene	0.400	1.577
1,1,2-Trichloroethane	0.100	0.518

Compound	Minimum Response Factor	Typical Response Factor
Tetrachloroethene	0.200	0.606
2-Hexanone	0.100	0.536
Dibromochloromethane	0.100	0.652
1,2 Dibromoethane	0.100	0.634
Chlorobenzene	0.500	1.733
Ethyl benzene	0.100	2.827
m,p-Xylene	0.100	1.080
o-Xylene	0.300	1.073
Styrene	0.300	1.916
Bromoform	0.100	0.413
Isopropylbenzene	0.100	2.271
1,1,2,2-Tetrachloroethane	0.300	0.782
1,3-Dichlorobenzene	0.600	1.408
1,4-Dichlorobenzene	0.500	1.427
1,2-Dichlorobenzene	0.400	1.332
1,2-Dibromom-3-chloropropane	0.050	0.129
1,2,4-Trichlorobenzene	0.200	0.806
1,3-Butadiene	0.100	0.250
3,3-Dimethyl-1-butanol	0.010	0.020
1,4-Dioxane (SIM)	0.010	0.286

ATTACHMENT D – Well Location Figures & Photos



Not To Scale

Wells GCP1 (N-10330) & GCP1D (no NYSDEC Well No.) are located North Side of Atlantic Ave in Garden City Park between Cornelia St and Nassau Blvd

TITLE

Groundwater Monitoring
Well Locations
GCP1 & GCP1D
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 1

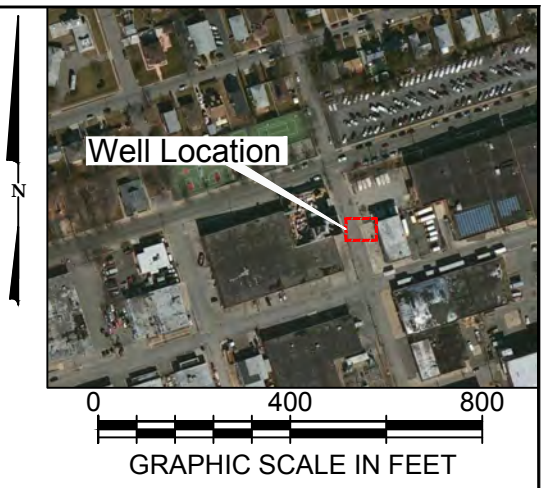
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/11/17	0097881.11

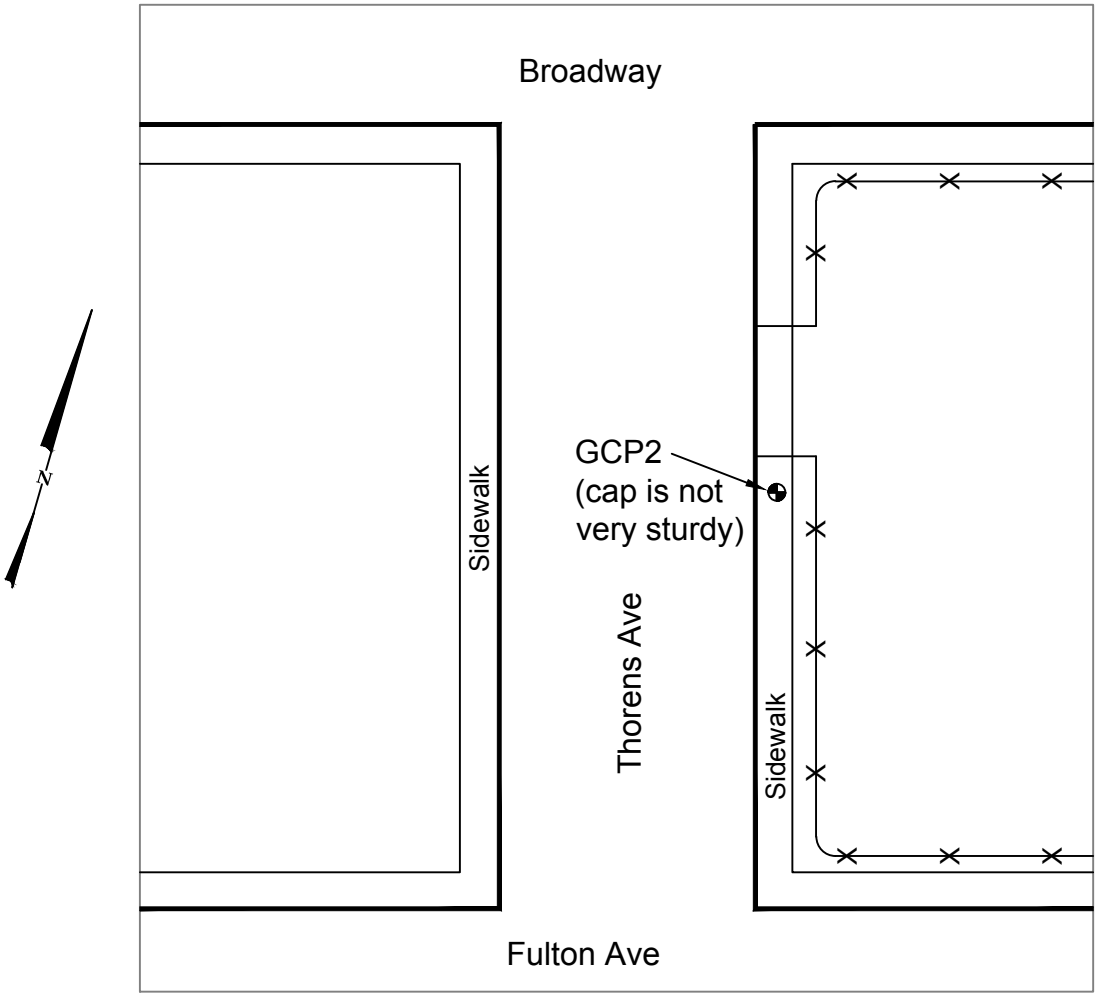
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP1 (N-10330) & GCPD1D.dwg (12/11/2017 - 3:20pm Melville)

← North

GCP-1 (left) & GCP-1D (right)

Located on the north side of Atlantic Ave. between Cornelia and Nassau Blvd in Garden City Park.





Not To Scale

Well GCP2 (N-10331) is located at the East Side of Thorens Ave between Broadway and Fulton Ave in Garden City Park

TITLE

Groundwater Monitoring
Well Location
GCP2
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 2

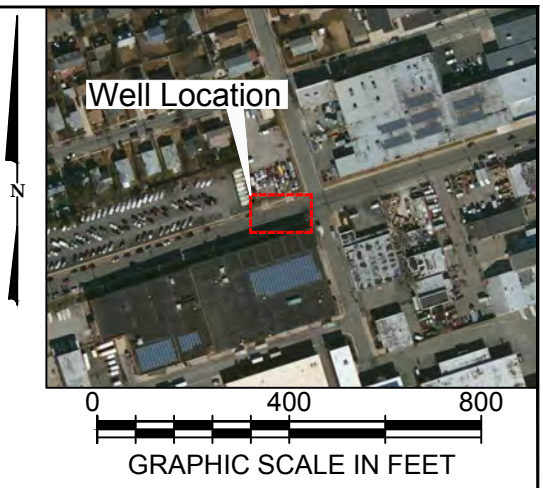
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/11/17	0097881.11

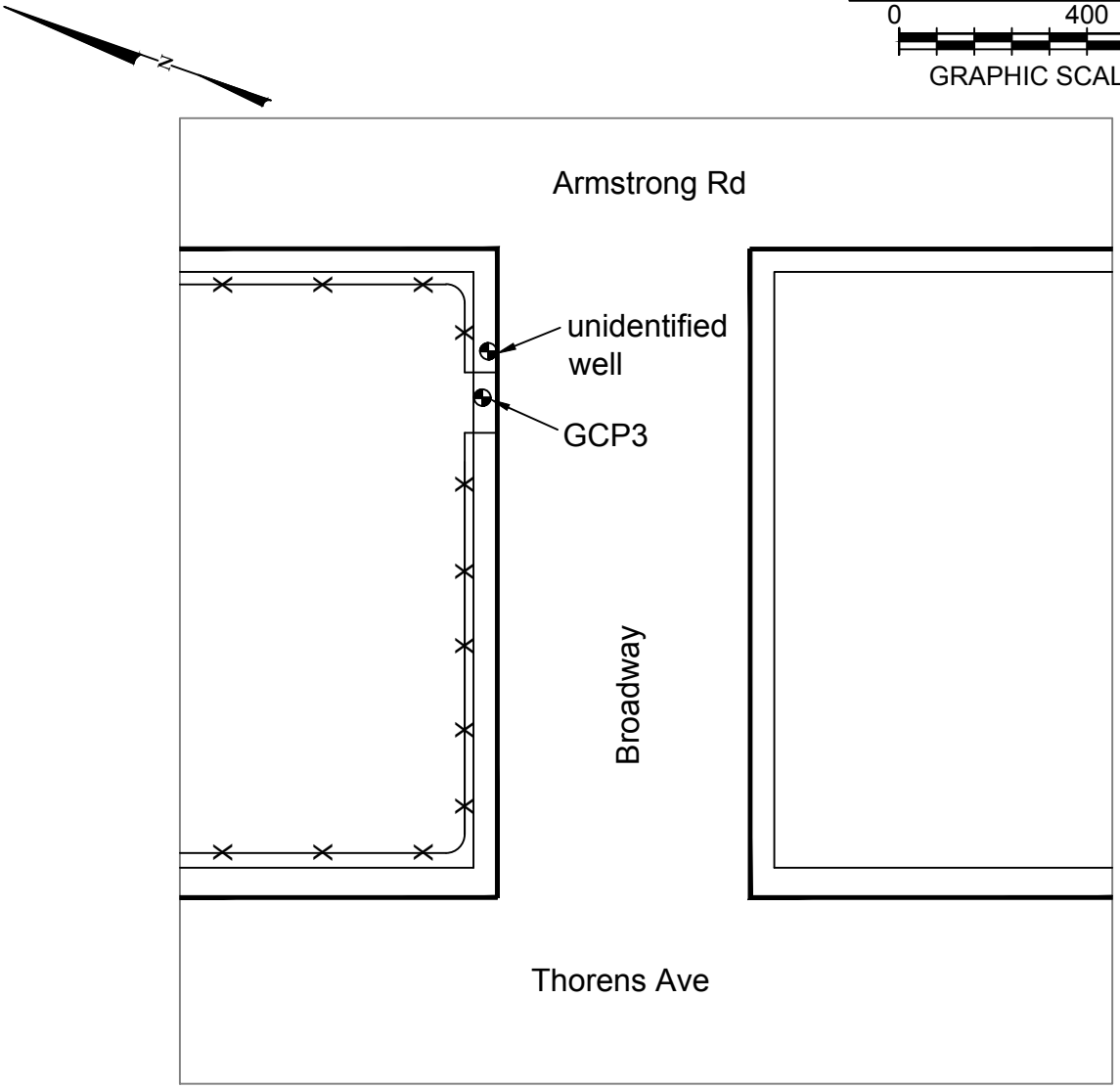
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP2 (N-10331).dwg (10/17/2017 - 11:40am Melville)

← North

GCP-2

East Side of Thorens Ave. between Broadway and Fulton Ave. in Garden City Park.





Not To Scale

Well GCP3 (N-10481) is located close to the Northwest corner of Broadway and Armstrong Rd in Garden City Park

(there are two wells at this location, GCP3 is shallow. The other well has never been identified and is over 100 ft deep)

TITLE

Groundwater Monitoring
Well Location
GCP3
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 3

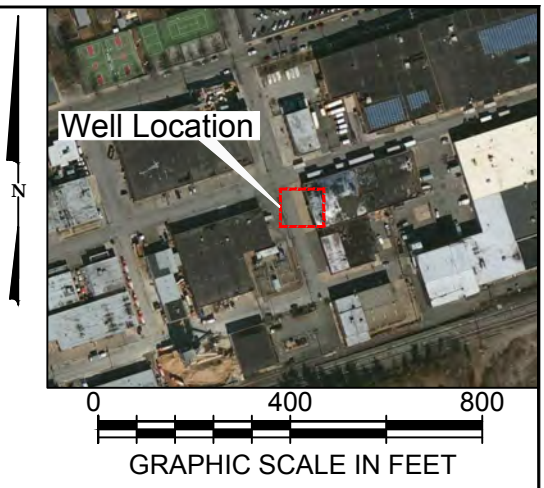
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/12/17	0097881.11

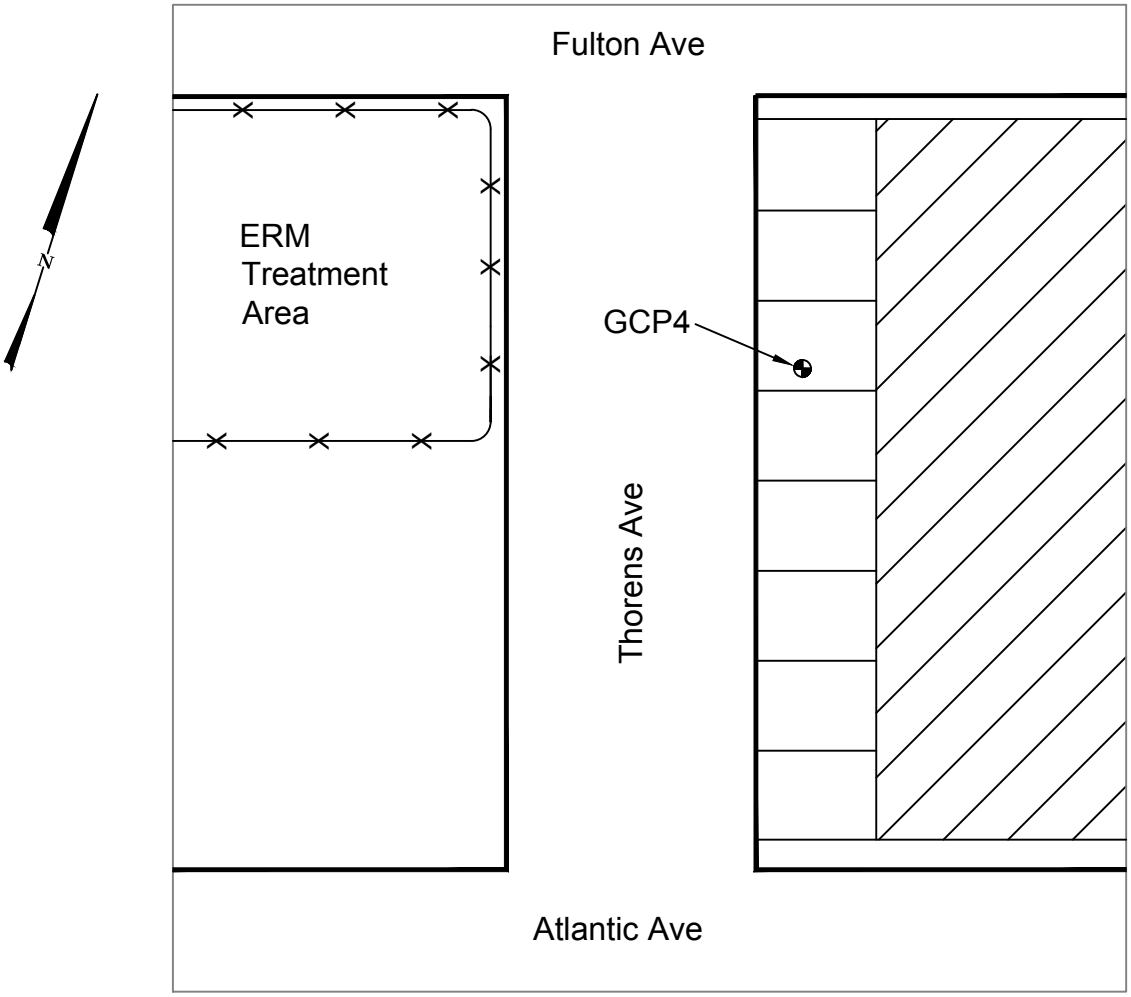
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP3 (N-10481).dwg (10/17/2017 - 11:39am Melville)

← North

GCP-3

Close to the northwest corner of Broadway and Armstrong in Garden City Park.





Not To Scale

Well GCP4 (N-10482) is located on the East Side of Thorens Ave between Fulton Ave and Atlantic Ave in Garden City Park

TITLE

Groundwater Monitoring
Well Location
GCP4
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

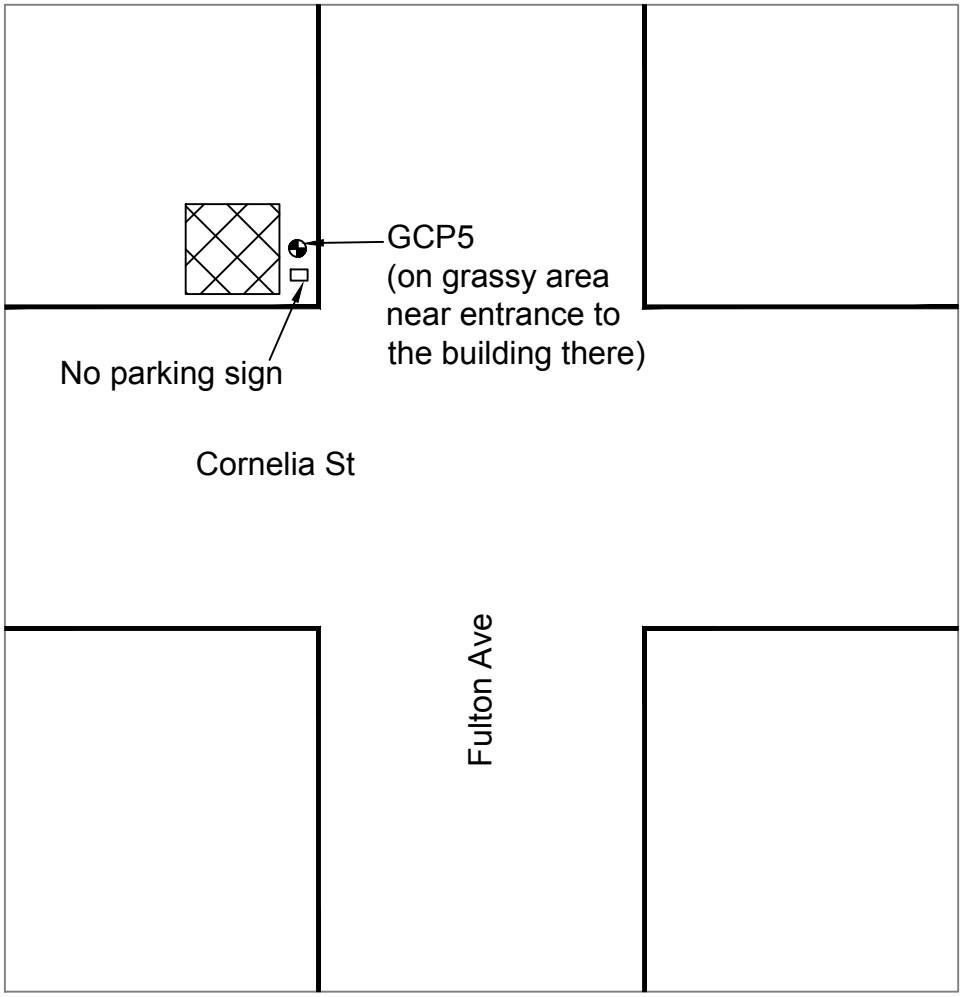
FIGURE 4

DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/12/17	0097881.11

M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP4 (N-10482).dwg (10/17/2017 - 11:32am Melville)

← North

GCP-4
On the east side of Thorens Ave. between Fulton and Atlantic Ave. in Garden City Park.
(Approximately 1 foot to the right of the cone, under the car)



Not To Scale

Well GCP5 (N-10483) is located at the Southwest corner of Fulton Ave and Cornelia Ave in Garden City Park

TITLE

Groundwater Monitoring
Well Location
GCP5
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

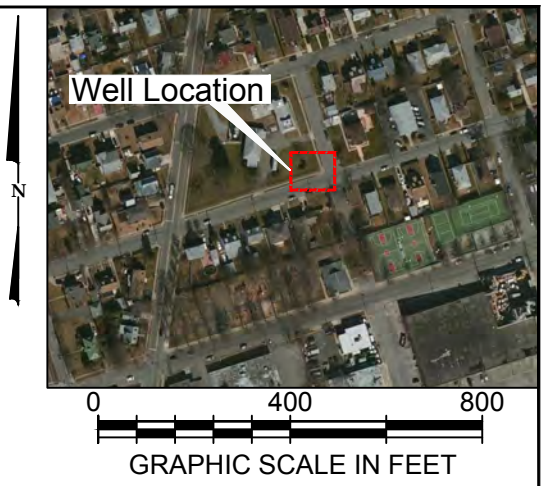
FIGURE 5

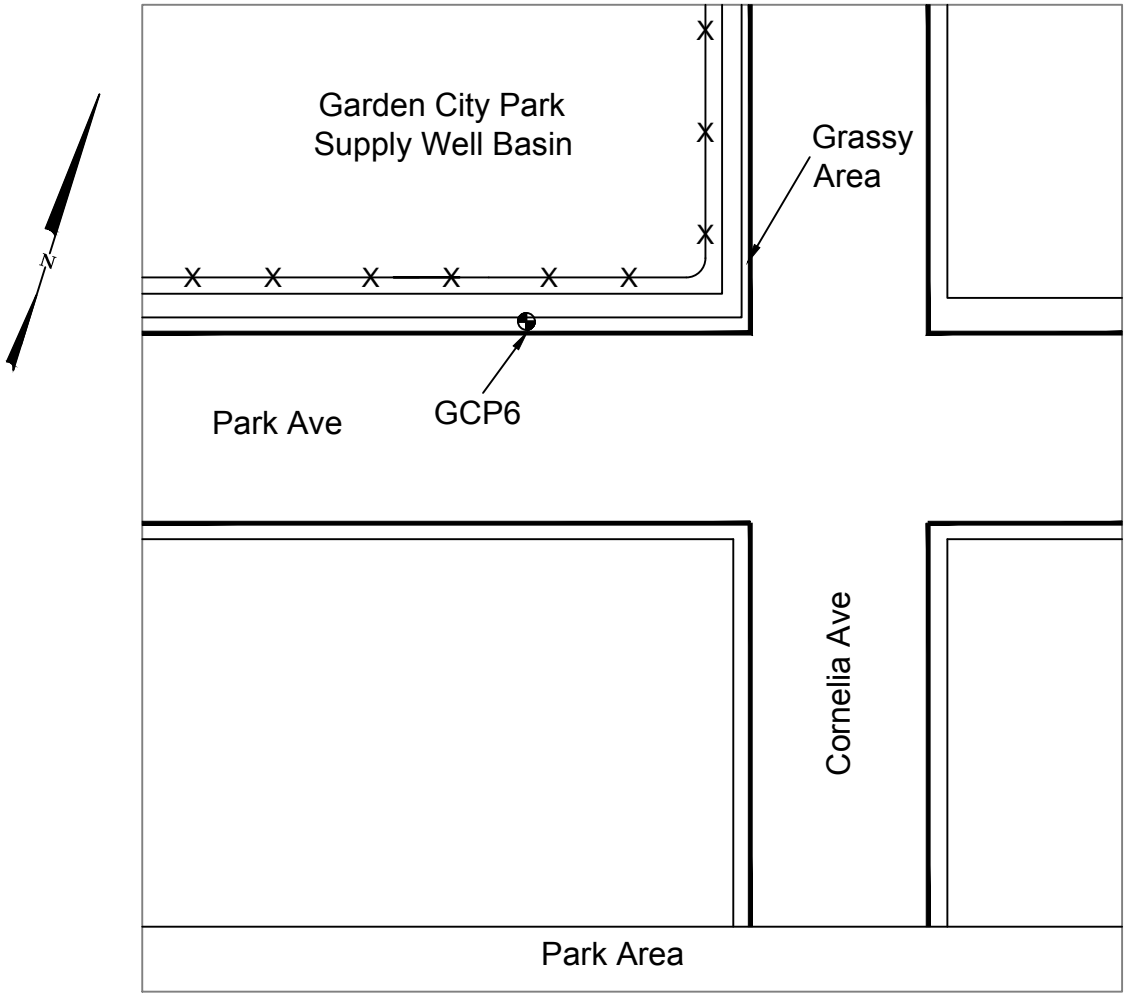
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/12/17	0097881.11

M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP5 (N-10483).dwg (10/17/2017 - 11:30am Melville)

N

GCP-5
Southwest corner of Fulton and Cornelia in Garden City Park.





Not To Scale

Well GCP6 (N-10484) is located at the Northwest corner of Park Ave and Cornelia Ave in Garden City Park

TITLE

Groundwater Monitoring
Well Location
GCP6
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 6

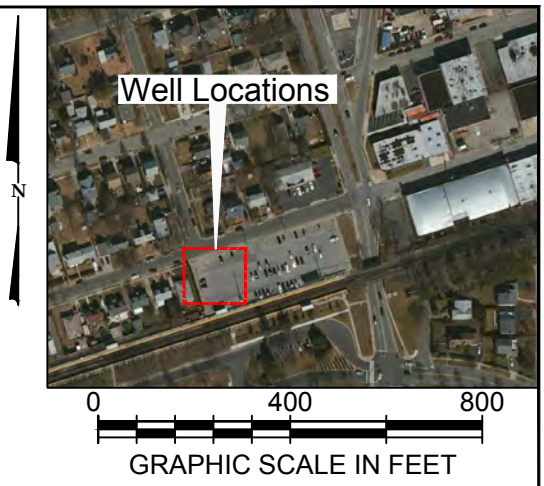
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/12/17	0097881.11

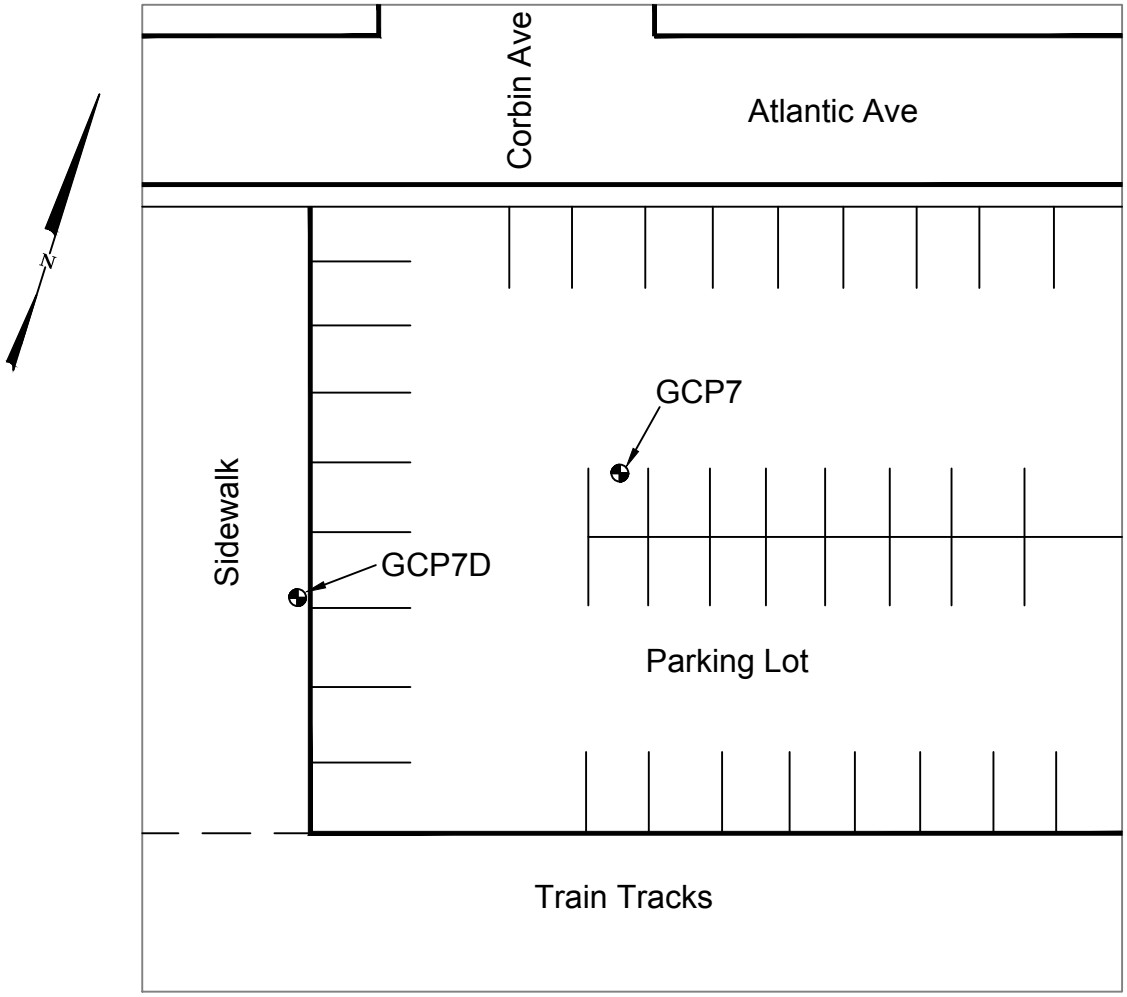
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP6 (N-10484).dwg (10/17/2017 - 11:28am Melville)

← North

GCP-6

Northwest Corner of Park Ave. and Cornelia in Garden City Park.





Not To Scale

Well GCP7 (N-10485) and GCP7D (N-11733) are located in the Merillion Ave Train Station Parking Lot (west side of parking lot) in Garden City Park

TITLE

Groundwater Monitoring
Well Locations
GCP7 and GCP7D
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 7

DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/12/17	0097881.11

M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP7 (N-10485) & 7D (N-11733).dwg (10/17/2017 - 11:26am Melville)

North

GCP-7

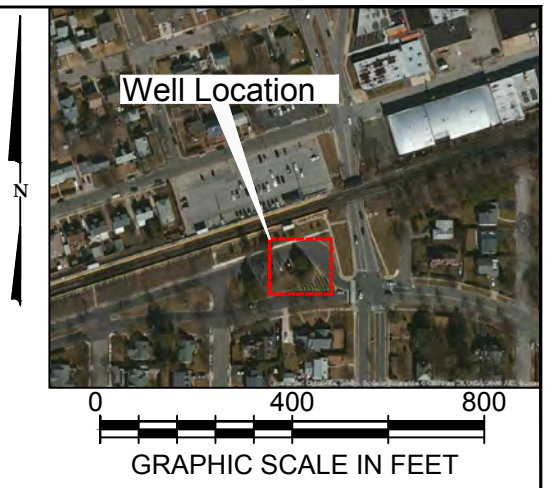
Located on the west side of the Merillion Ave. Train Station Parking Lot off of Atlantic Ave in Garden City Park.

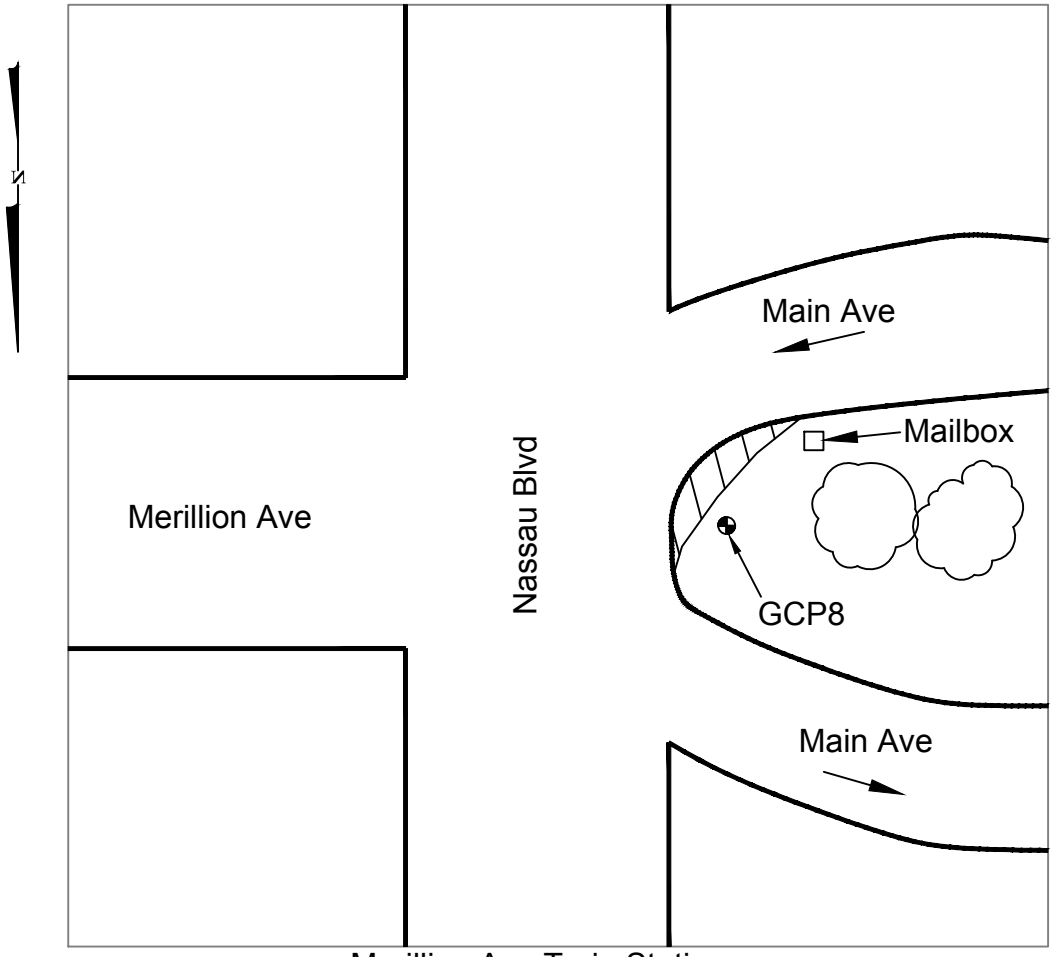
.

North

GCP-7 D

Located in the west side of the Merillion Ave. Train Station Parking Lot off of Atlantic Ave in Garden City Park





Merillion Ave Train Station

Not To Scale

Well GCP8 (N-10486) is located on the divide of Main Ave at the Main Ave and Nassau Blvd intersection

TITLE

Groundwater Monitoring
Well Location GCP8
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 8

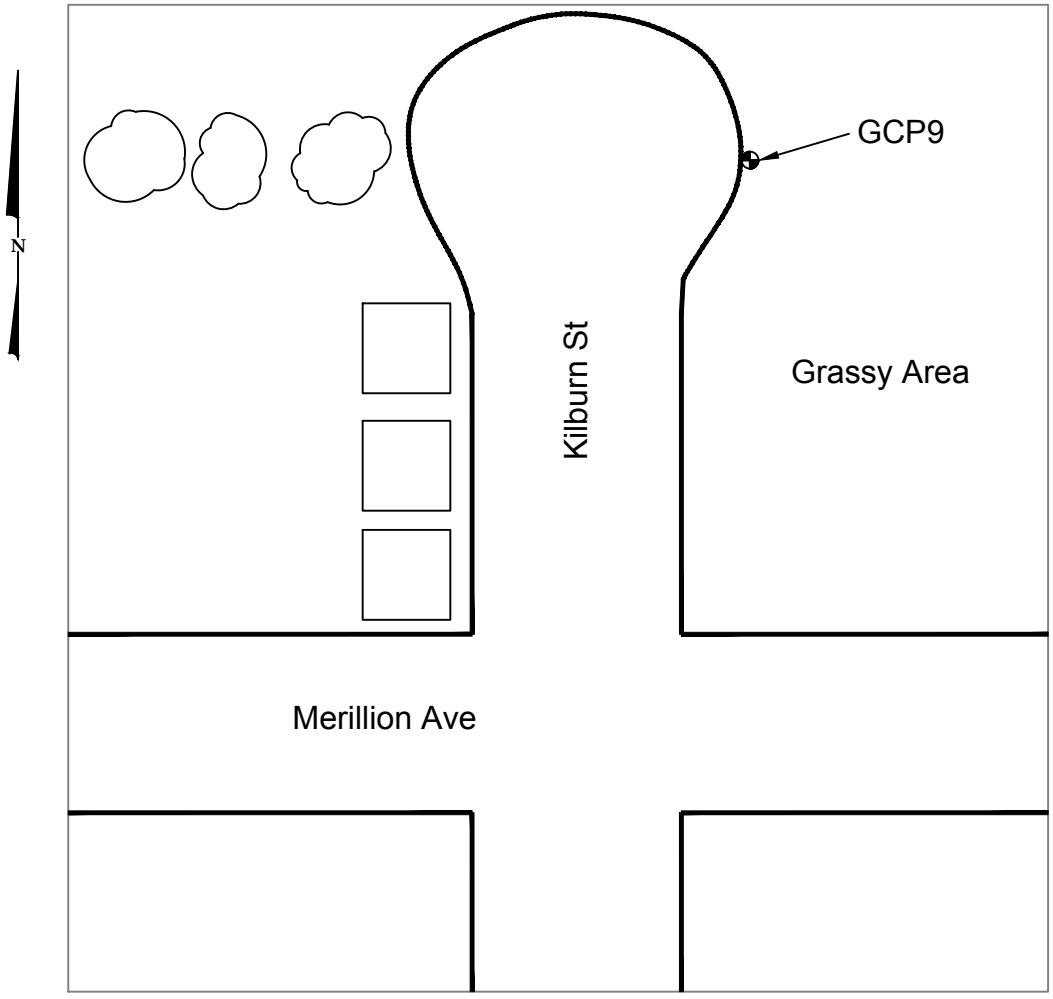
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/12/17	0097881.11

M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP8 (N-10486).dwg (12/11/2017 - 3:28pm Melville)

← North

GCP-8

Located on the divide of Main Ave. at the Main Ave. and Nassau Blvd. Intersection.



Not To Scale

Well GCP9 (N-10487) is located at the side of the Kilburn St dead end in Garden City

TITLE

Groundwater Monitoring
Well Location GCP9
Garden City, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 9

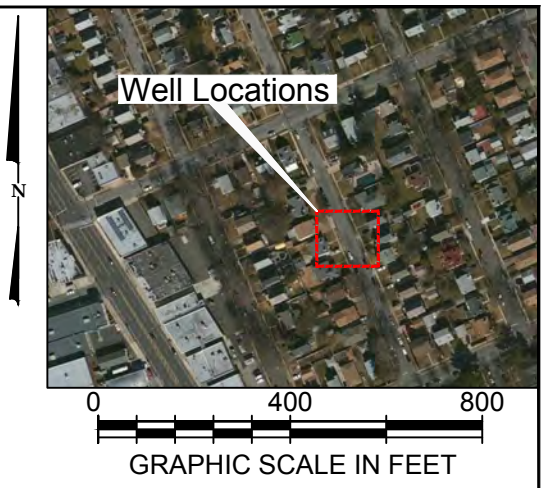
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/12/17	0097881.11

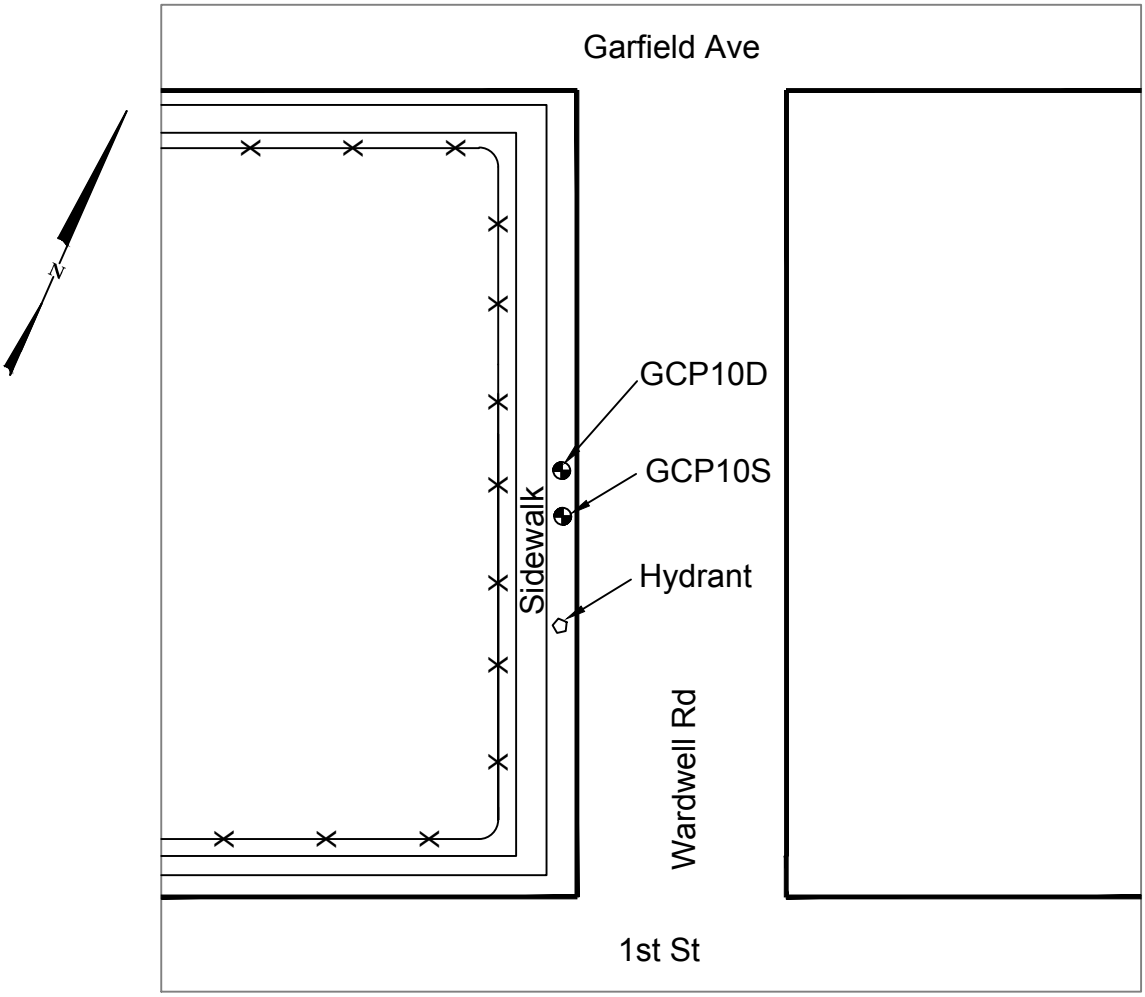
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP9 (N-10487).dwg (10/17/2017 - 11:17am Melville)

North

GCP-9

Located on the east side of the Kilburne St. dead end in Garden City.





Not To Scale

Wells GCP10S (N-11737) and GCP10D (N-11729) are located on the North Side of Wardwell St between Garfield Ave and 1st Ave in Mineola

TITLE

Groundwater Monitoring
Well Locations GCP10S & GCP10D
Mineola, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 10

DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/12/17	0097881.11

M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP10S (N-11737) & GCP10D (N-11729).dwg (10/17/2017 - 11:14am Melville)

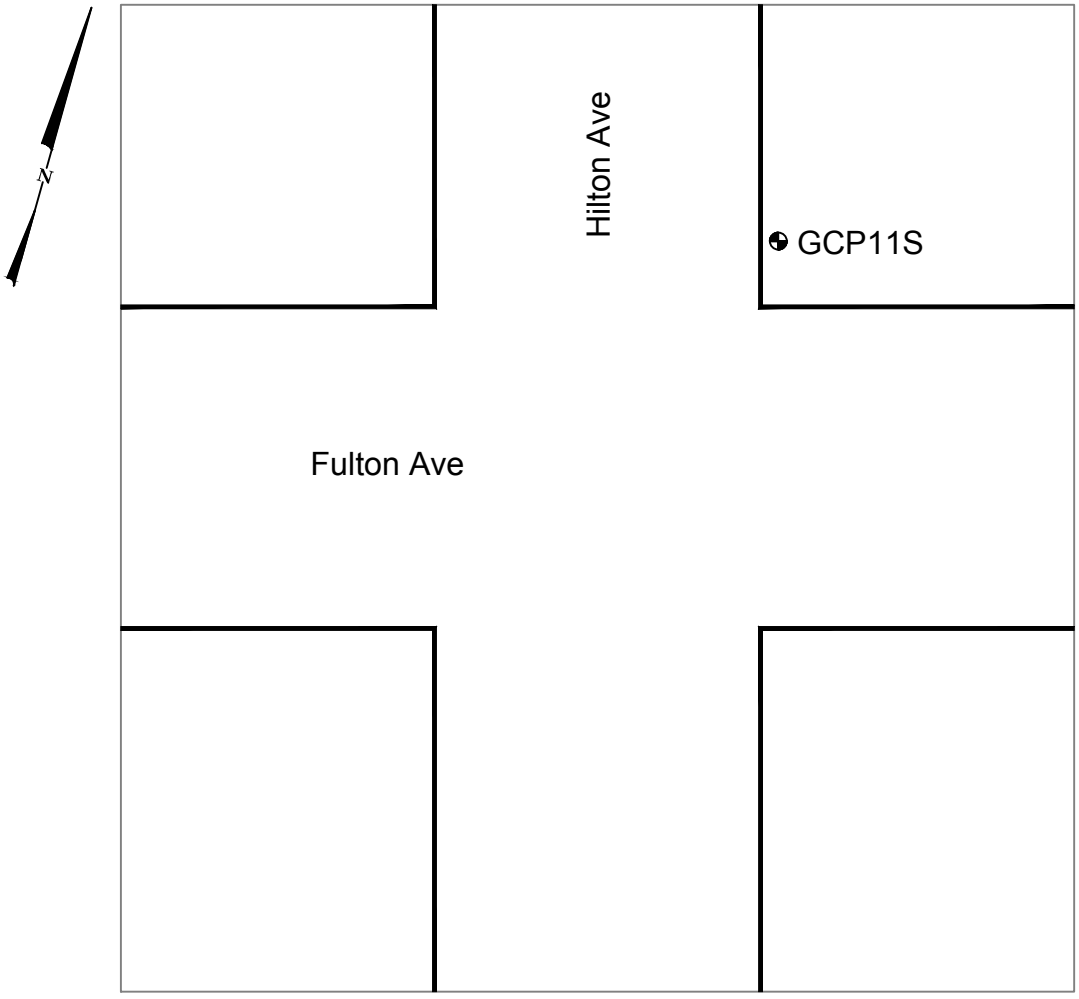
← North

GCP-10S and GCP-10D

Located on the north side of Wardwell St. between Garfield Ave and 1st Ave in Mineola.

0 400 800

GRAPHIC SCALE IN FEET



Not To Scale

Well GCP11S (N-11738) is located on the North East corner of Hilton Ave and Fulton Ave in Garden City Park

TITLE

Groundwater Monitoring
Well Location
GCP11S
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 11

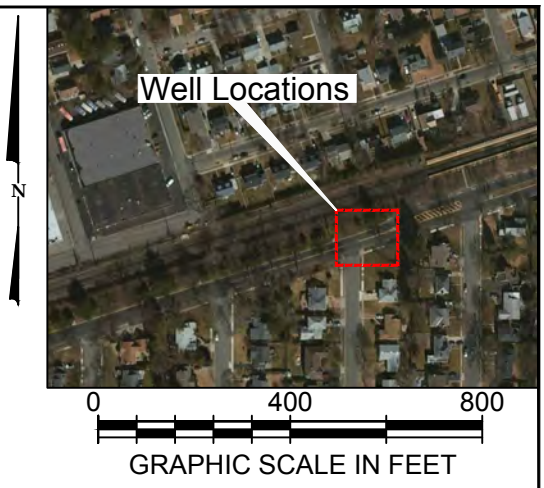
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/13/17	0097881.11

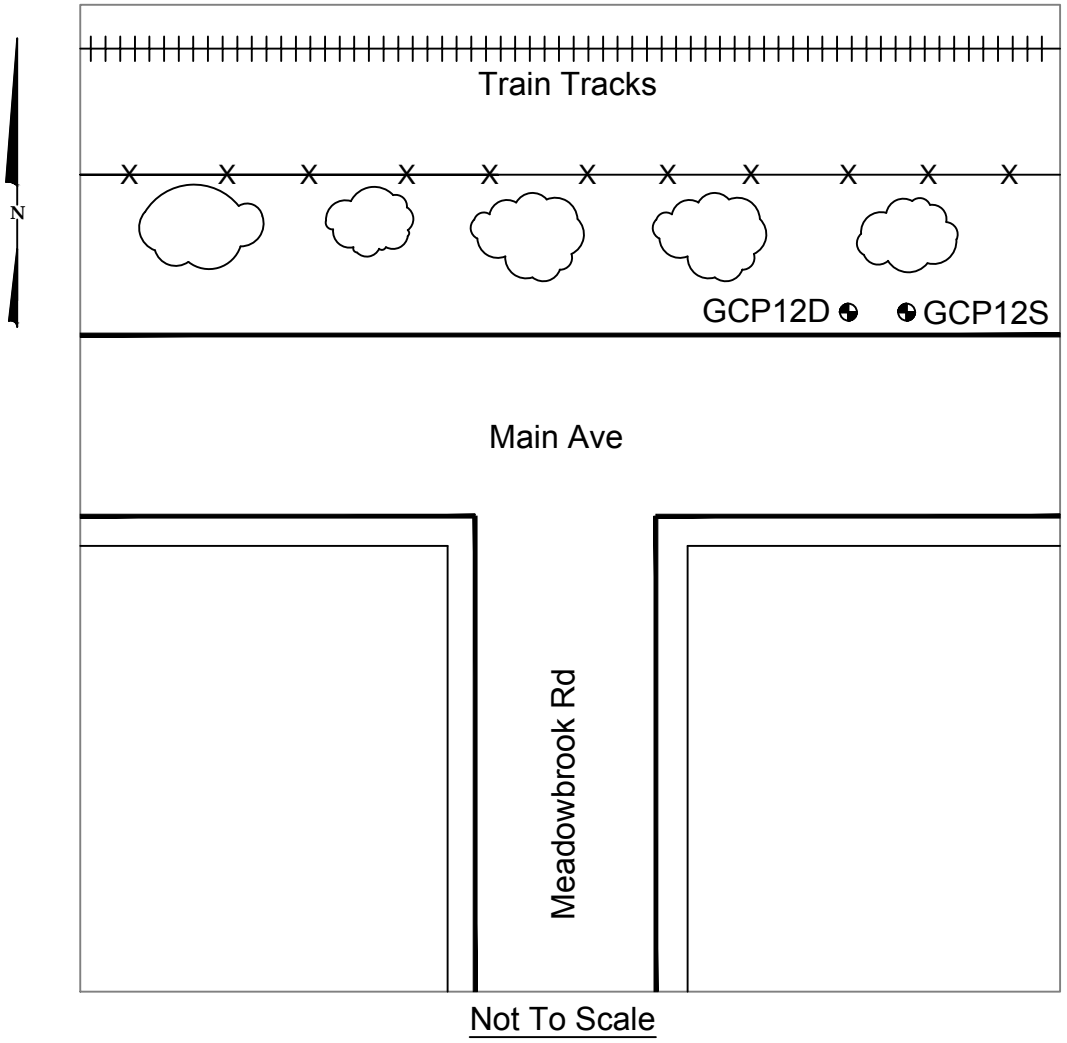
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP11S (N-11738).dwg (10/17/2017 - 11:08am Melville)

North

GCP-11S

Located on the northeast corner of Hilton and Fulton Ave. in Garden City Park.





Not To Scale

Wells GCP12S (N-11739) and GCP12D (N-11734) are located on the North Side of Main Ave between Meadowbrook Rd and Roxbury St in Garden City

TITLE

Groundwater Monitoring
Well Locations GCP12S & GCP12D
Garden City, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 12

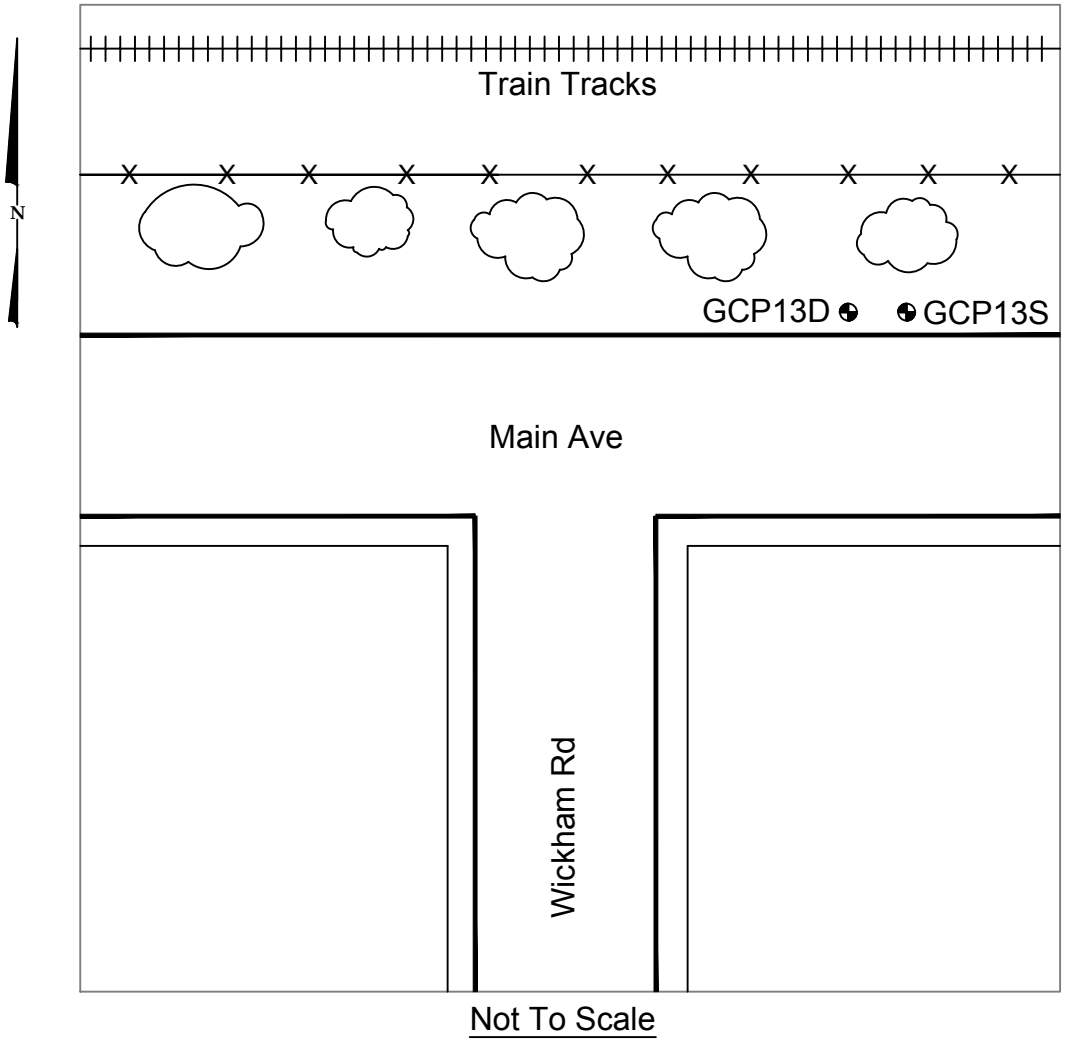
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/13/17	0097881.11

M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP12S (N-11739) & GCP12D (N-11734).dwg (10/17/2017 - 11:04am Melville)

North

GCP-12 S and GCP-12D

Located on the north side of Main Ave between Meadowbrook Rd. and Roxbury St. in Garden City.



Not To Scale

Wells GCP13S (N-11956) and GCP13D (N-11735) are located on the North Side of Main Ave between Wickham Rd and Tullamore Rd in Garden City

TITLE

Groundwater Monitoring
Well Locations GCP13S & GCP13D
Garden City, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 13

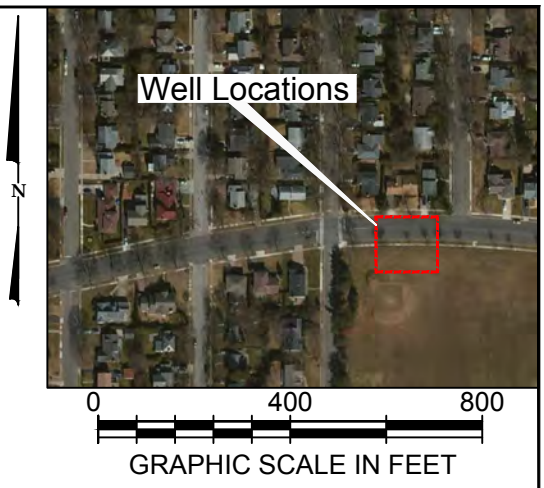
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/13/17	0097881.11

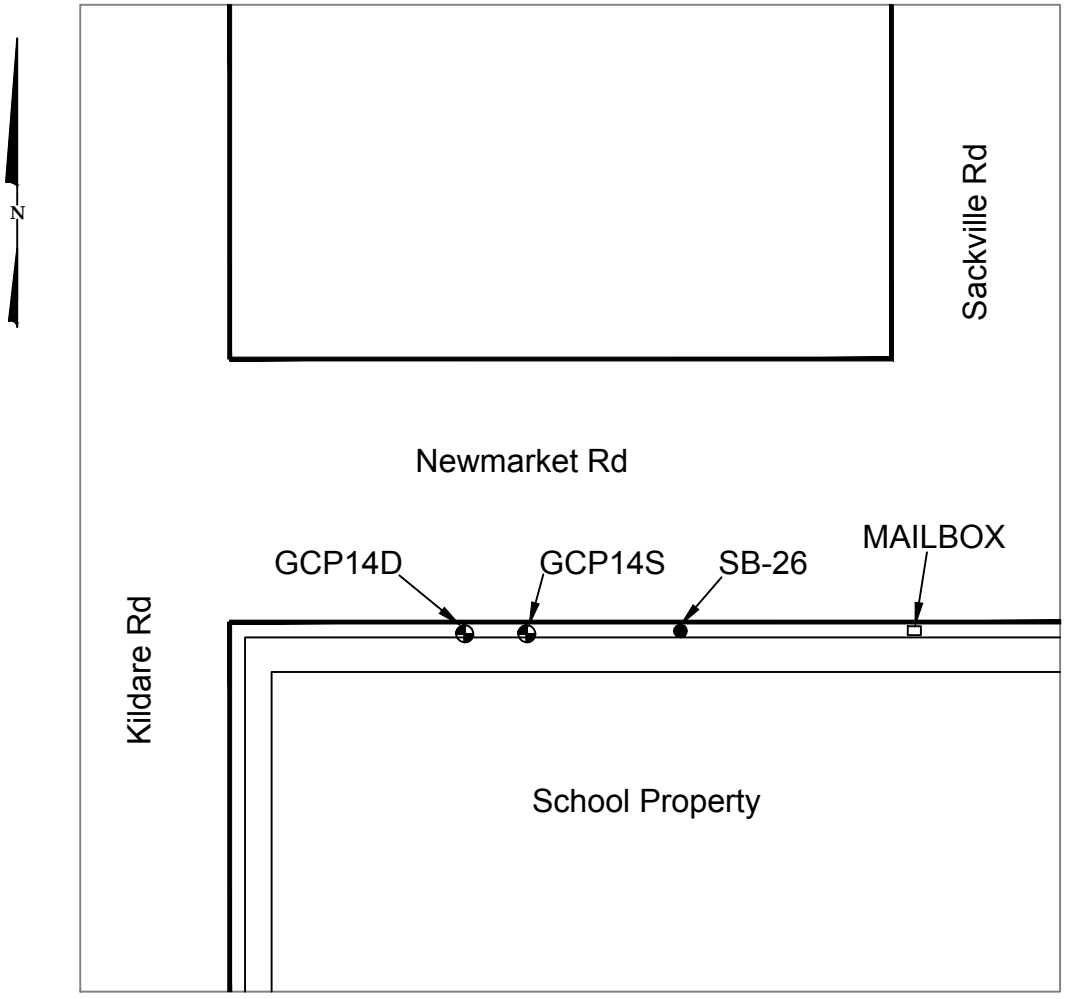
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP13S (N-11956) & GCP13D (N-11735).dwg (10/17/2017 - 11:00am Melville)

North

GCP-13S (left) and GCP-13D (right)

Located on the north side of Main Ave. between Wickham Rd. and Tullamore Rd. in Garden City.





Not To Scale

Wells GCP14S (N-11957) and GCP14D (N-11736) are located on the South Side of Newmarket Rd between Kildare Rd and Sackville Rd in Garden City

TITLE

Groundwater Monitoring
Well Locations GCP14S & GCP14D
Garden City, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 14

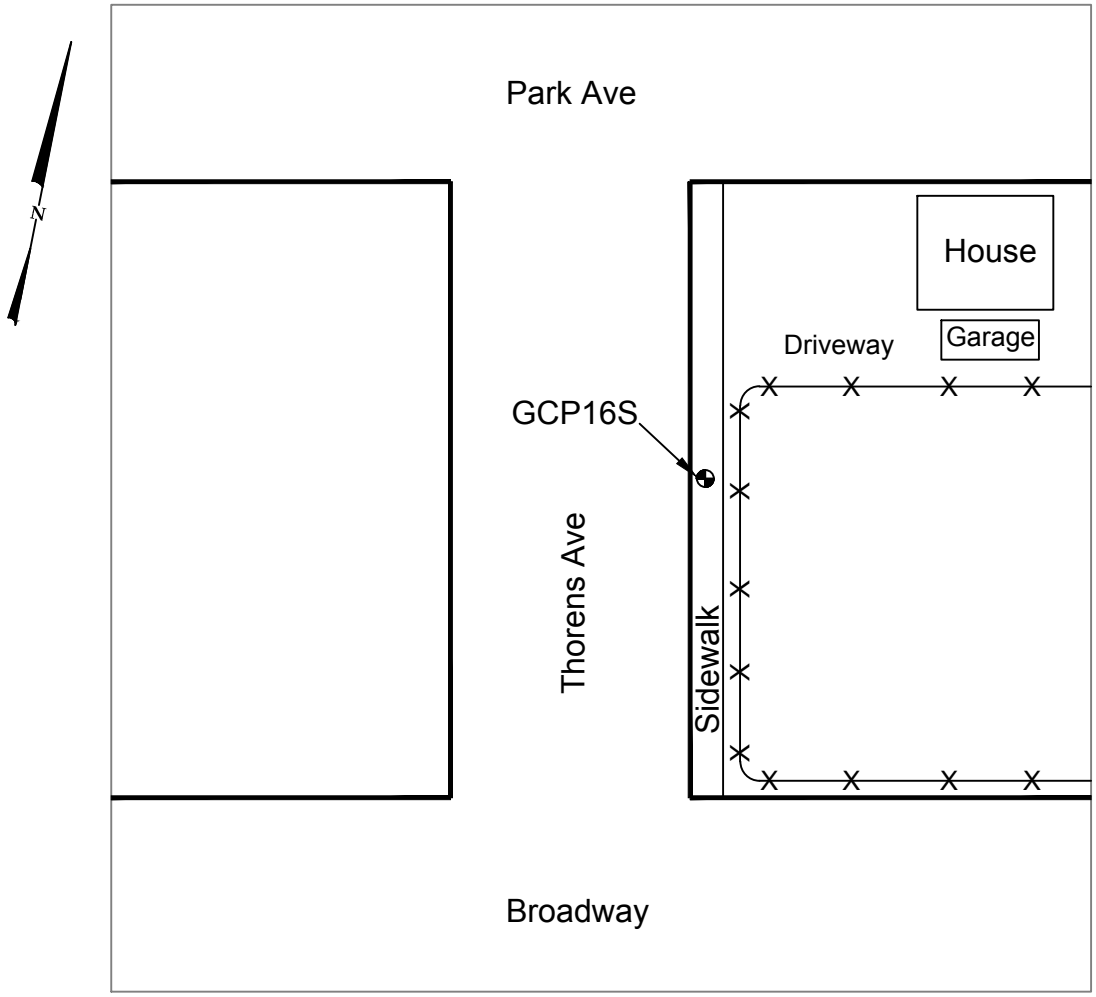
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/13/17	0097881.11

M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP14S (N-11957) & GCP14D (N-11736).dwg (10/17/2017 - 10:57am Melville)

North

GCP-14S and GCP-14D

Located on south side of Newmarket Rd. between Kildare and Sackville Rd. in Garden City.



Not To Scale

Well GCP-16S (N-12005) is located on the East Side of Thorens Ave between Park Ave and Broadway in Garden City Park

TITLE

Groundwater Monitoring
Well Location GCP16S
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 15

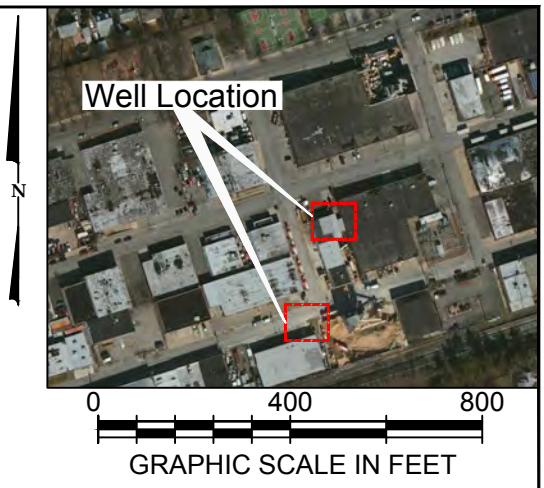
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/13/17	0097881.11

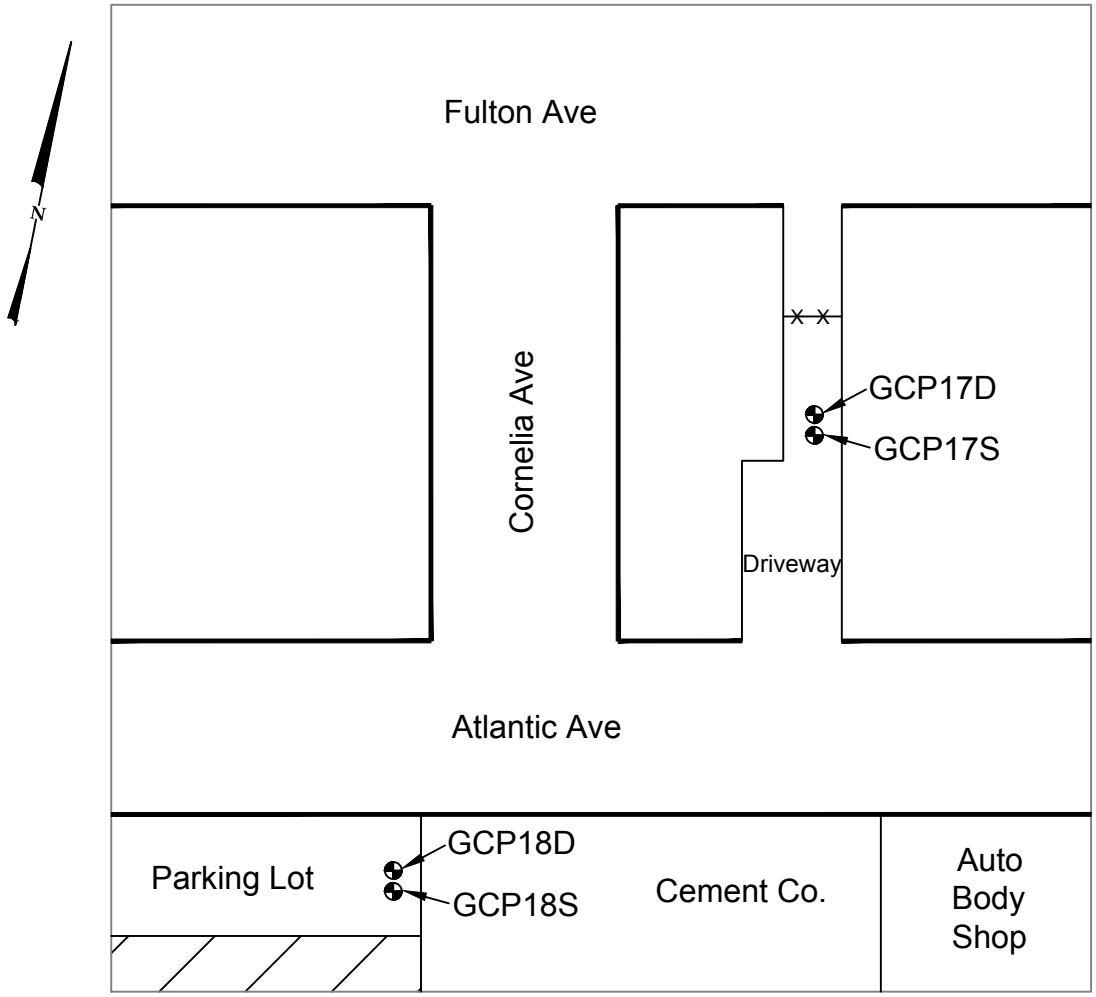
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP16S (N-12005).dwg (10/17/2017 - 10:51am Melville)

North

GCP-16S

Located on the east side of Thorens Ave. between Park Ave. and Broadway in Garden City Park.





Not To Scale

Wells GCP17S and GCP17D (no NYSDEC Well Nos.) are located in the alley off of Atlantic Ave behind the cement company office building, large trucks often parked on the top of the wells.

Wells GCP18S and GCP18D (no NYSDEC Well Nos.) are located on the South Side of Atlantic Ave across from Cornelia Ave.

TITLE

Groundwater Monitoring
Well Locations GCP17S & 17D,
GCP18S & 18D
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 16

DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/13/17	0097881.11

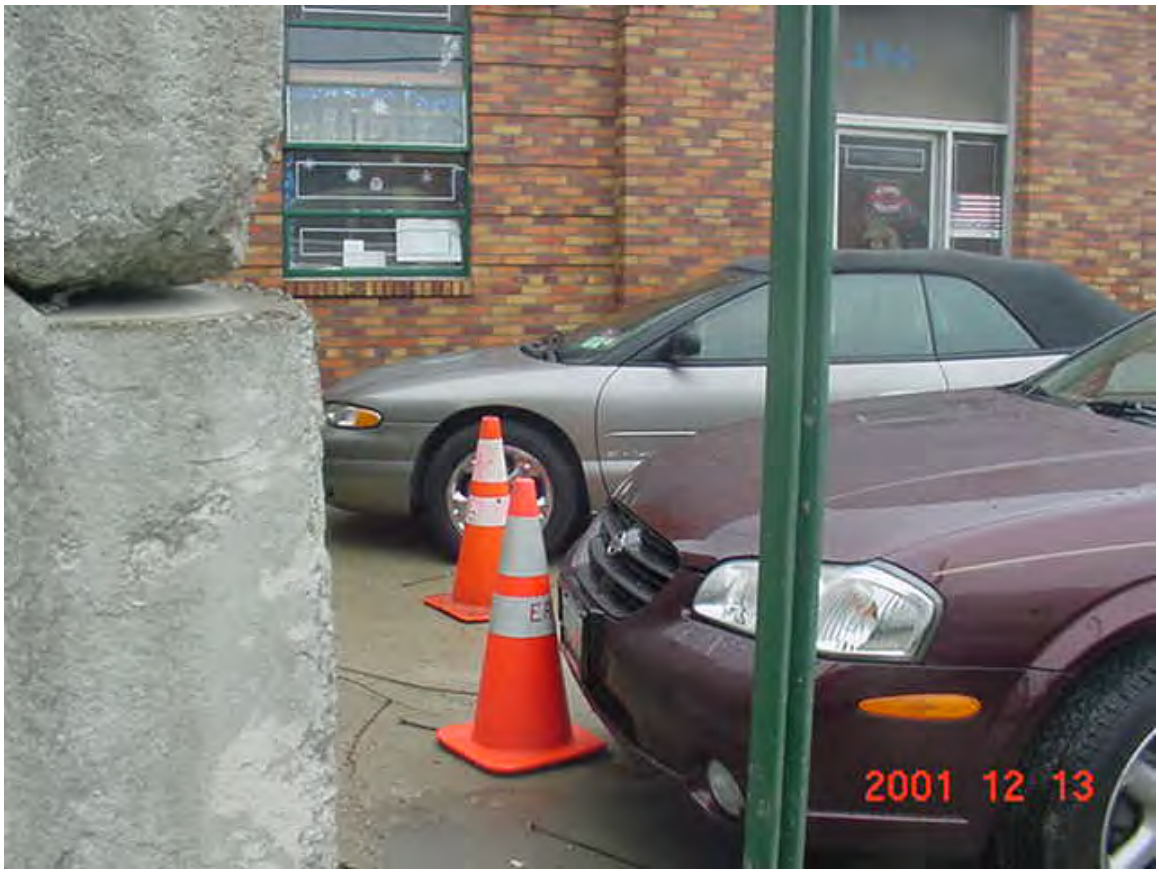
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP17S & D - GCP18S & D.dwg (10/17/2017 - 10:46am Melville)

North

GCP-17S (bottom) and GCP-17D (top)

Located in the alley off of Atlantic Ave. behind the cement company office building large trucks often parked on top of the wells

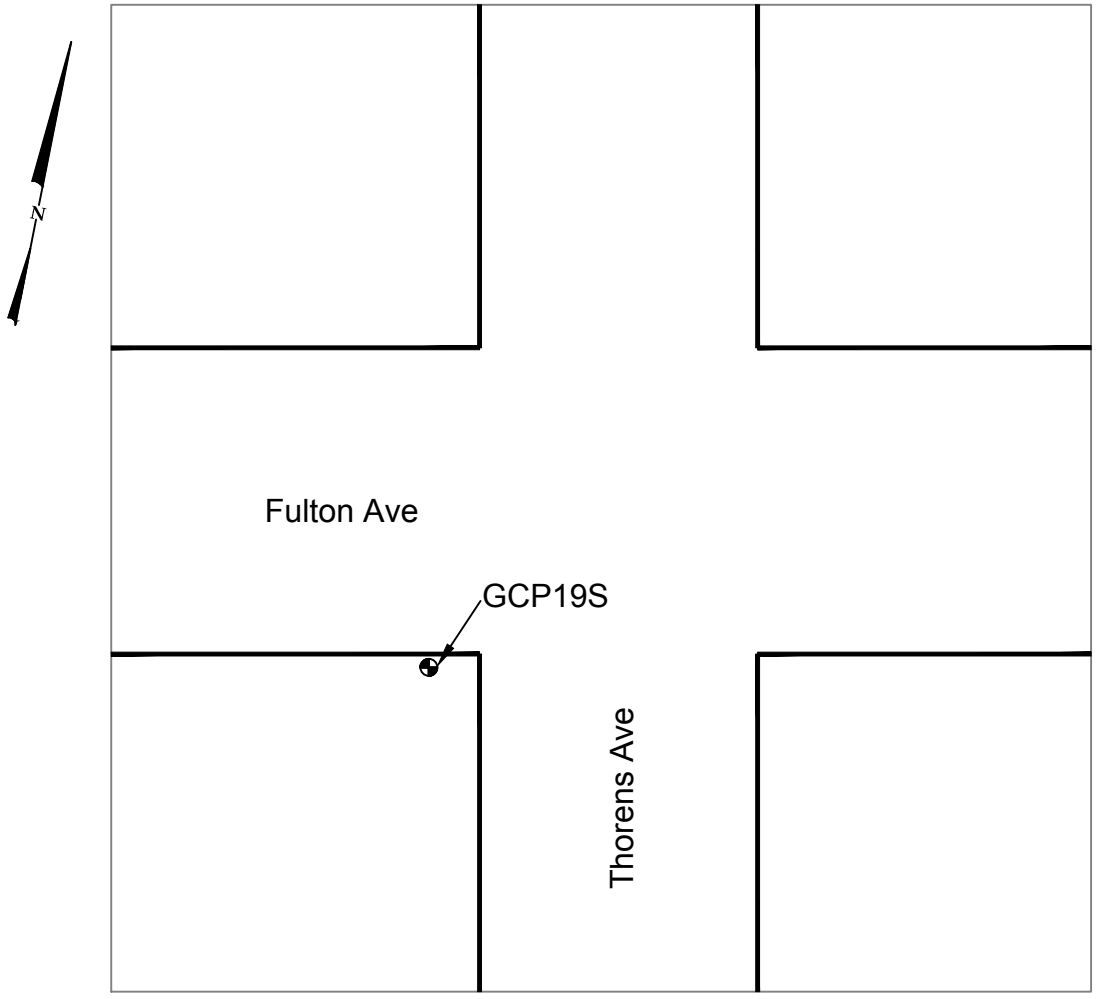
Cones pointing towards wells under large truck. They are located approximately 1 to 2 feet to the right of the cones.



North

GCP-18S (top) and GCP-18D (bottom)

Located on the south side of Atlantic Ave. across from Cornelia in Garden City Park.



Not To Scale

Well GCP19S (no NYSDEC Well No.) is located on the Southwest corner of Fulton Ave and Thorens Ave in Garden City Park

TITLE

Groundwater Monitoring
Well Location GCP19S
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 17

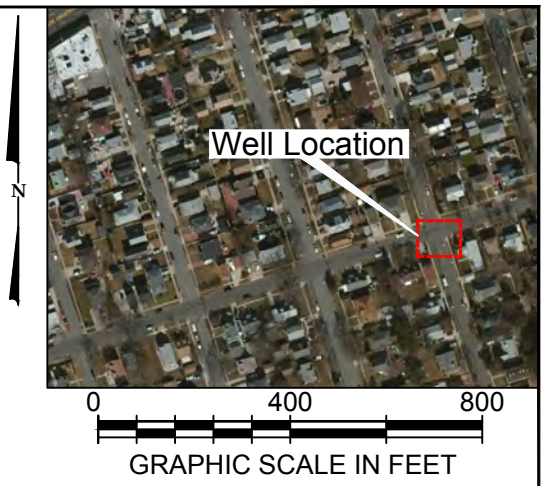
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/13/17	0097881.11

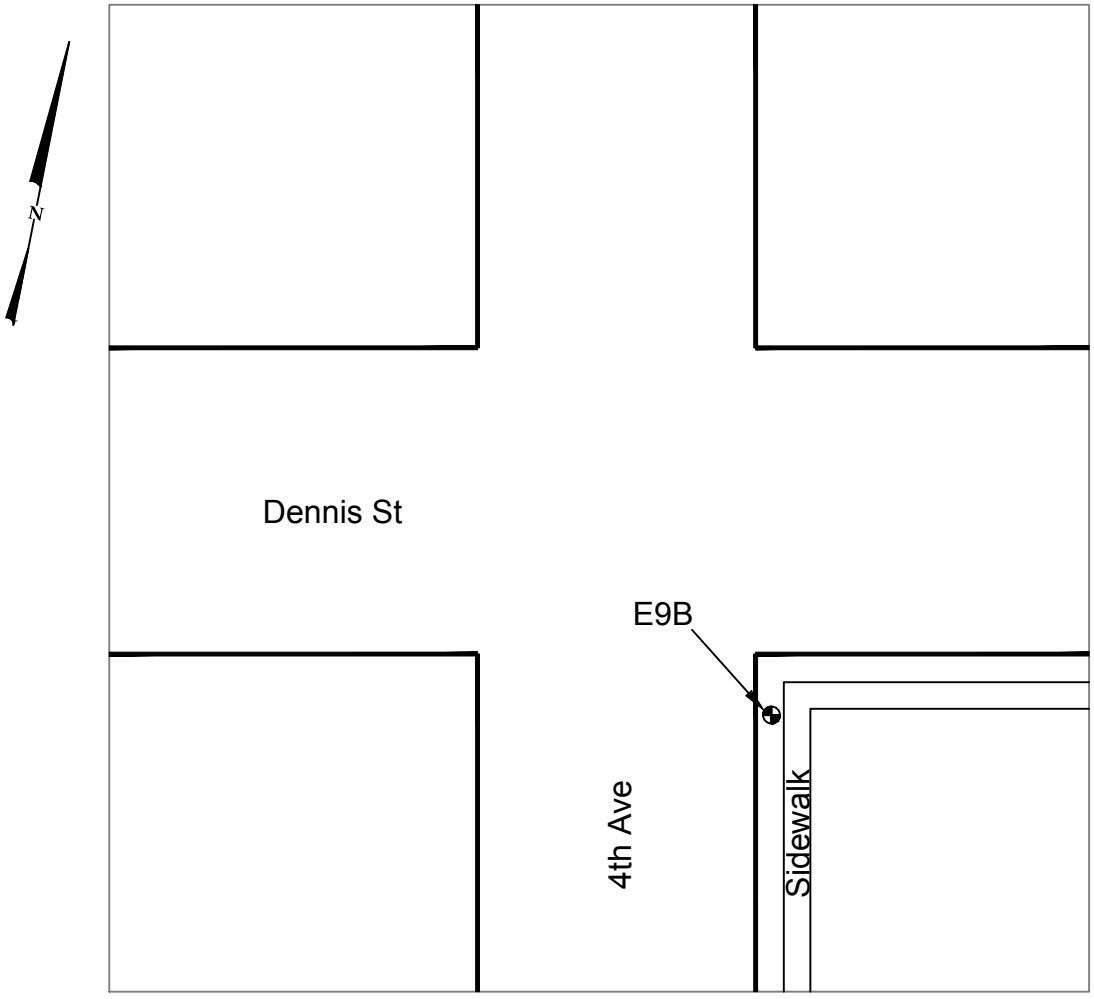
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW GCP19S.dwg (10/17/2017 - 10:43am Melville)

North

GCP-19S

Located on the southwest corner of Fulton Ave. and Thorens Ave. in Garden City Park.





Not To Scale

Well E9B (N-09944) is located on the Southeast corner of 4th Ave and Dennis St

TITLE

Groundwater Monitoring
Well Location E9B
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 18

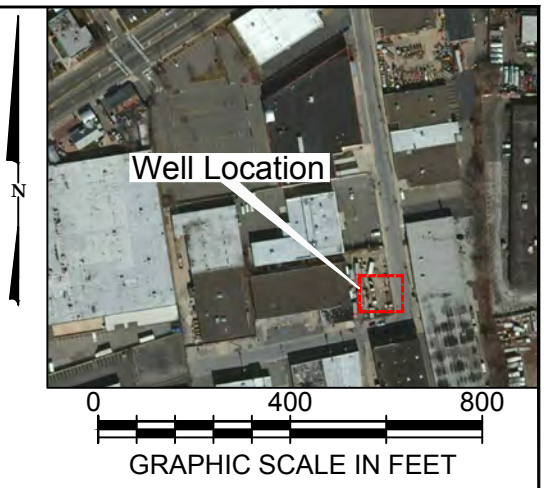
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/13/17	0097881.11

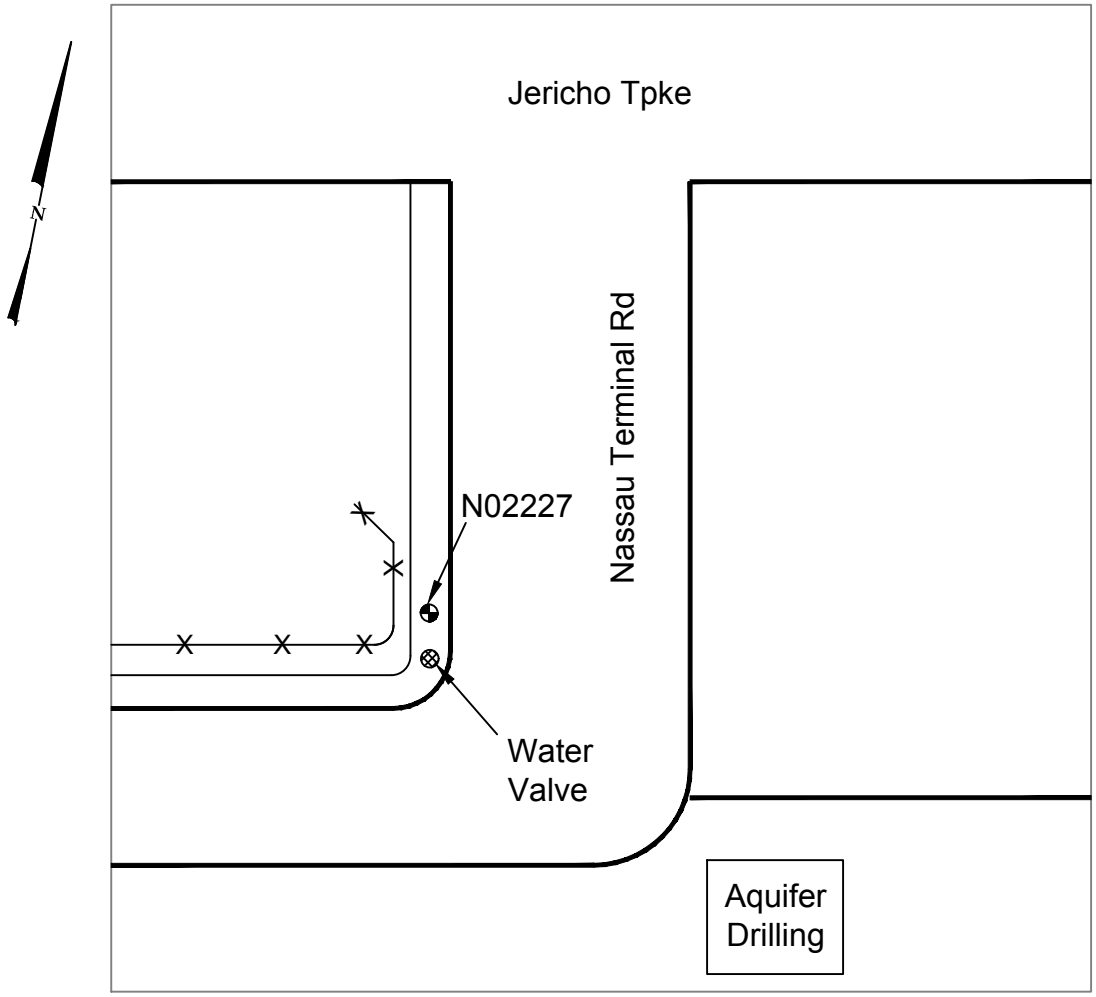
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - E9B (N-09944).dwg (10/17/2017 - 10:41am Melville)

North

E9B

Located on the southeat corner of southeast corner of 4th Ave. and Dennis St.





Not To Scale

Well N-02227 is located on the West Side of Nassau Terminal Rd right before the road bends

TITLE

Groundwater Monitoring
Well Location N-02227
Garden City Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 19

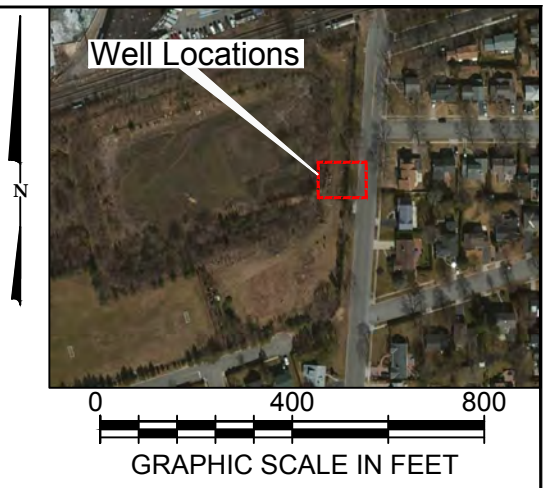
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/16/17	0097881.11

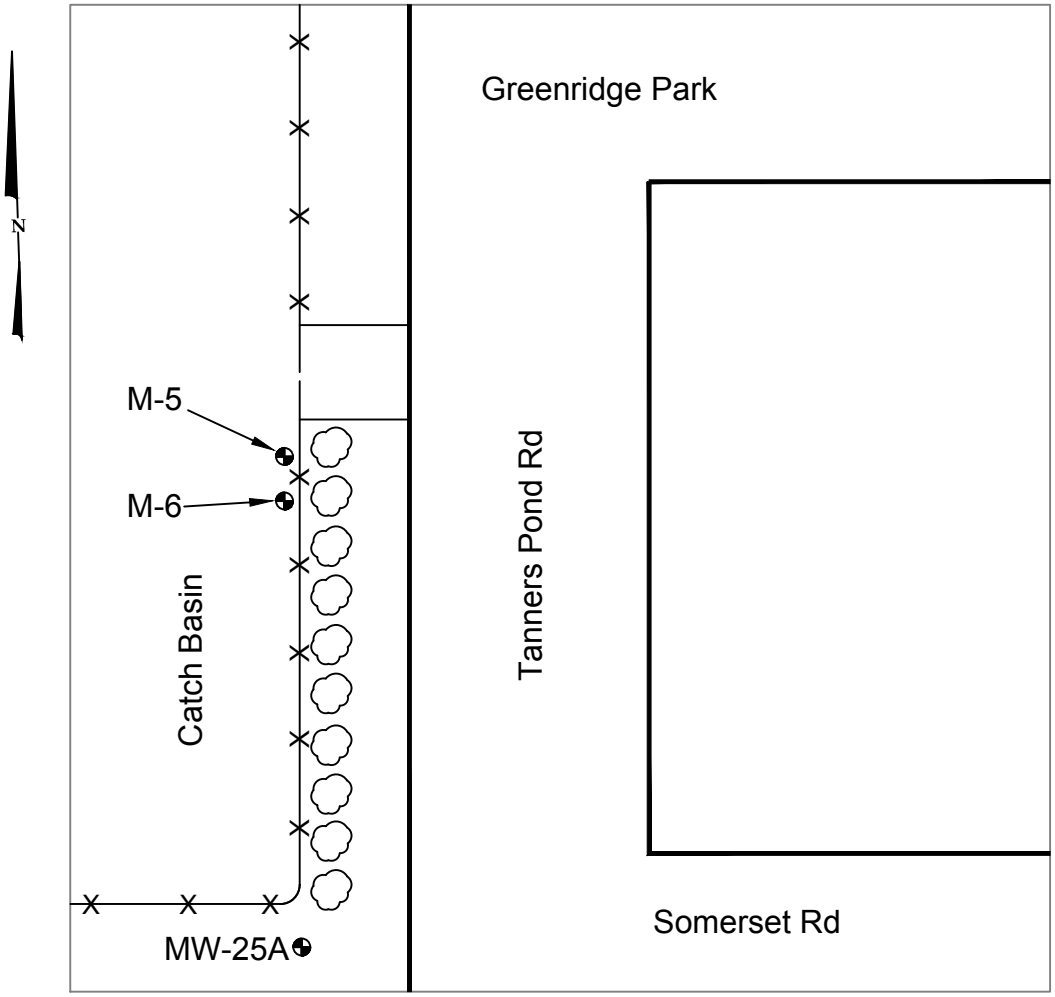
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - (N-02227).dwg (10/17/2017 - 10:38am Melville)

North

N-02227

Located on the west side of Nassau Terminal Rd. right before the road bends.





Not To Scale

Well M-5 (N-11172) and M-6 (N-11171) are located within the Catch Basin on Tanners Pond Rd between Greenridge Park and Somerset Rd in Garden City

TITLE

Groundwater Monitoring
Well Locations M-5 and M-6
Garden City, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 20

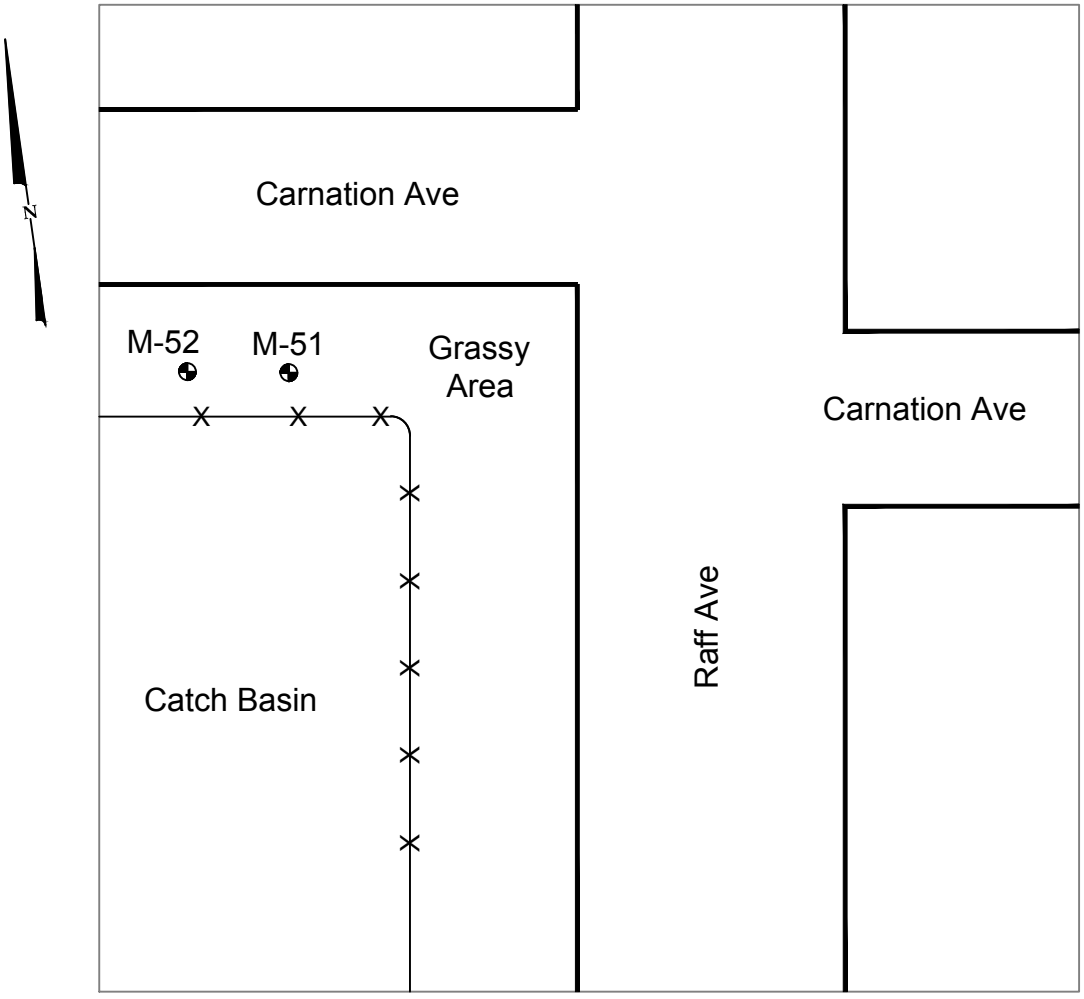
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/16/17	0097881.11

M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - M5 (N-11172) & M6 (N11171).dwg (10/17/2017 - 10:37am Melville)

North

M-5 (left) and M-6 (right)

Located within the catch basin on Tanners Pond Rd. between Greenridge Park and Somerset Rd. in Garden City.



Not To Scale

Wells M-51 (N-12114) and M-52 (N-12113) are located on the Southwest corner of Carnation Ave and Raff Ave in Floral Park

TITLE

Groundwater Monitoring
Well Locations M-51 and M-52
Floral Park, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 21

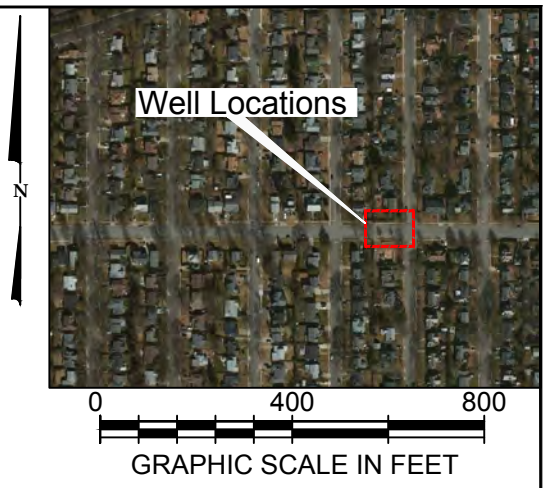
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/16/17	0097881.11

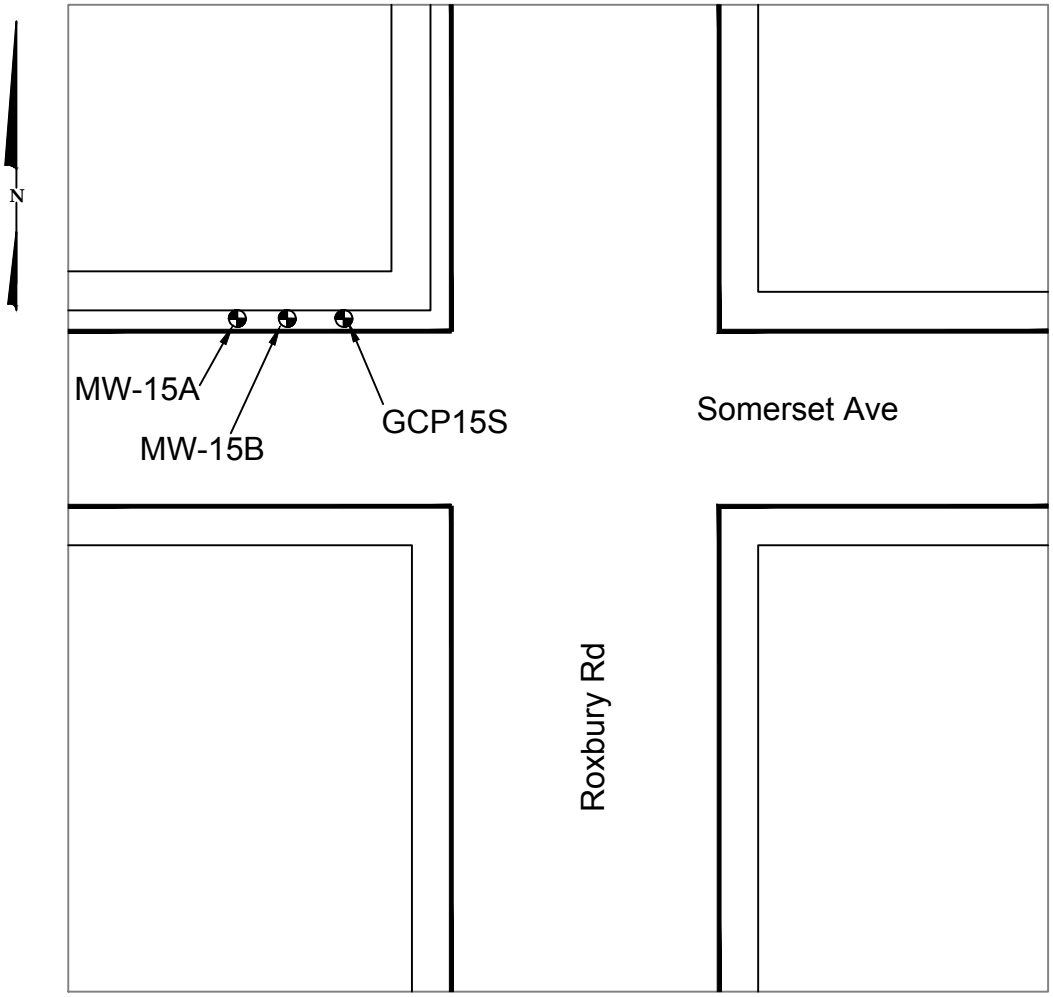
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - M51 (N-12114) & M52 (N2113).dwg (10/17/2017 - 10:34am Melville)

← North

M-51 and M-52 (not shown)

Located on the southwest corner of Carnation and Raff in Floral Park





Not To Scale

Wells GCP15S (N-11958), MW-15A (no NYSDEC Well No.) and MW-15B (no NYSDEC Well No.) are located at the Northwest corner Somerset Ave and Roxbury Rd in Garden City

TITLE

Groundwater Monitoring
Well Locations GCP15S and
MW-15S and MW-15B
Garden City, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 22

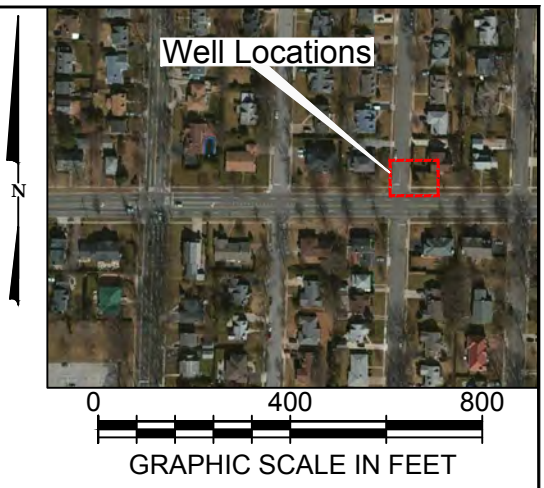
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/16/17	0097881.11

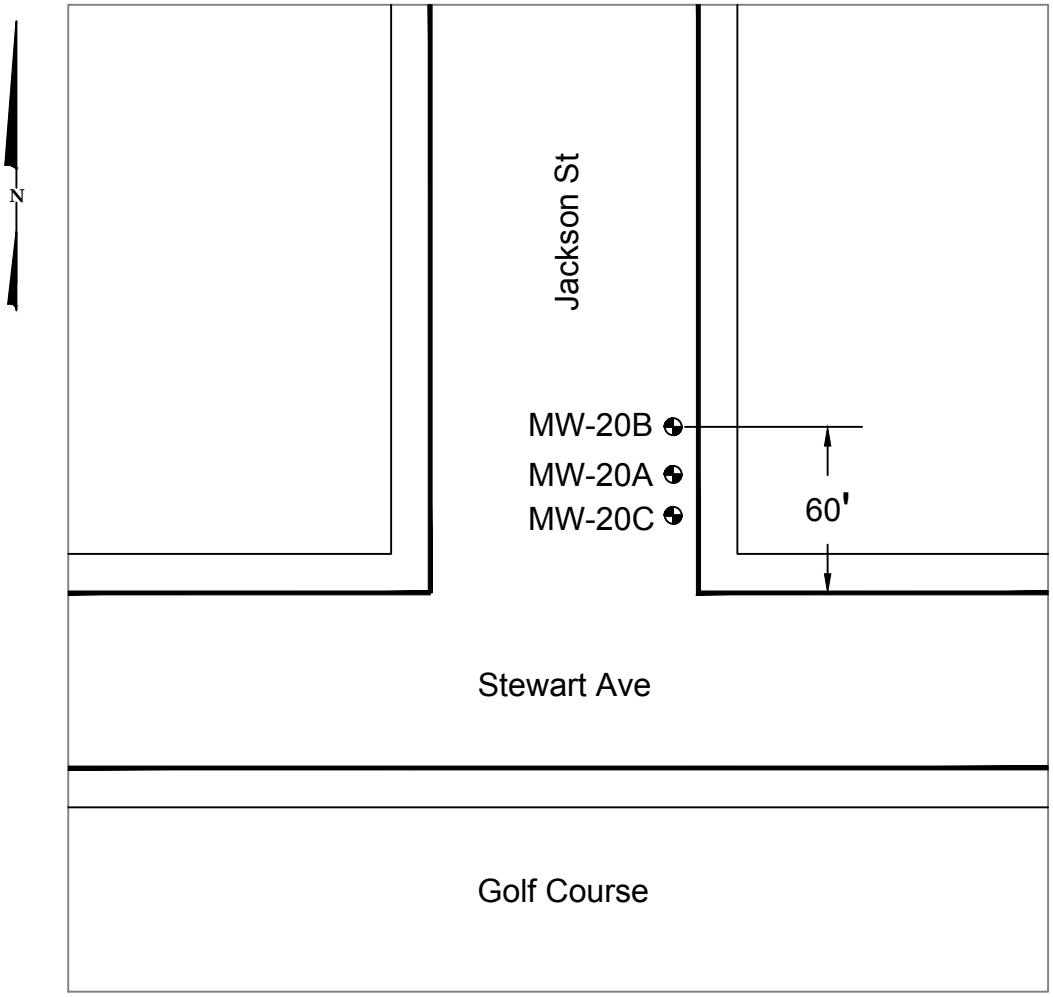
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - GCP15S (N-111958) & MW15A - MW-15B.dwg (10/17/2017 - 10:32am Melville)

North

MW-15A (left), MW-15B (right) and GCP-15S (not shown)

NW Corner of Somerset and Roxbury in Garden City.





Not To Scale

Wells MW-20A, B and C (no NYSDEC Well No.) are located at the Northeast corner of Jackson St and Stewart Ave in Garden City

(wells are 3 ft west of curb on Jackson St)

TITLE

Groundwater Monitoring
Well Locations MW-20A, B and C
Garden City, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 23

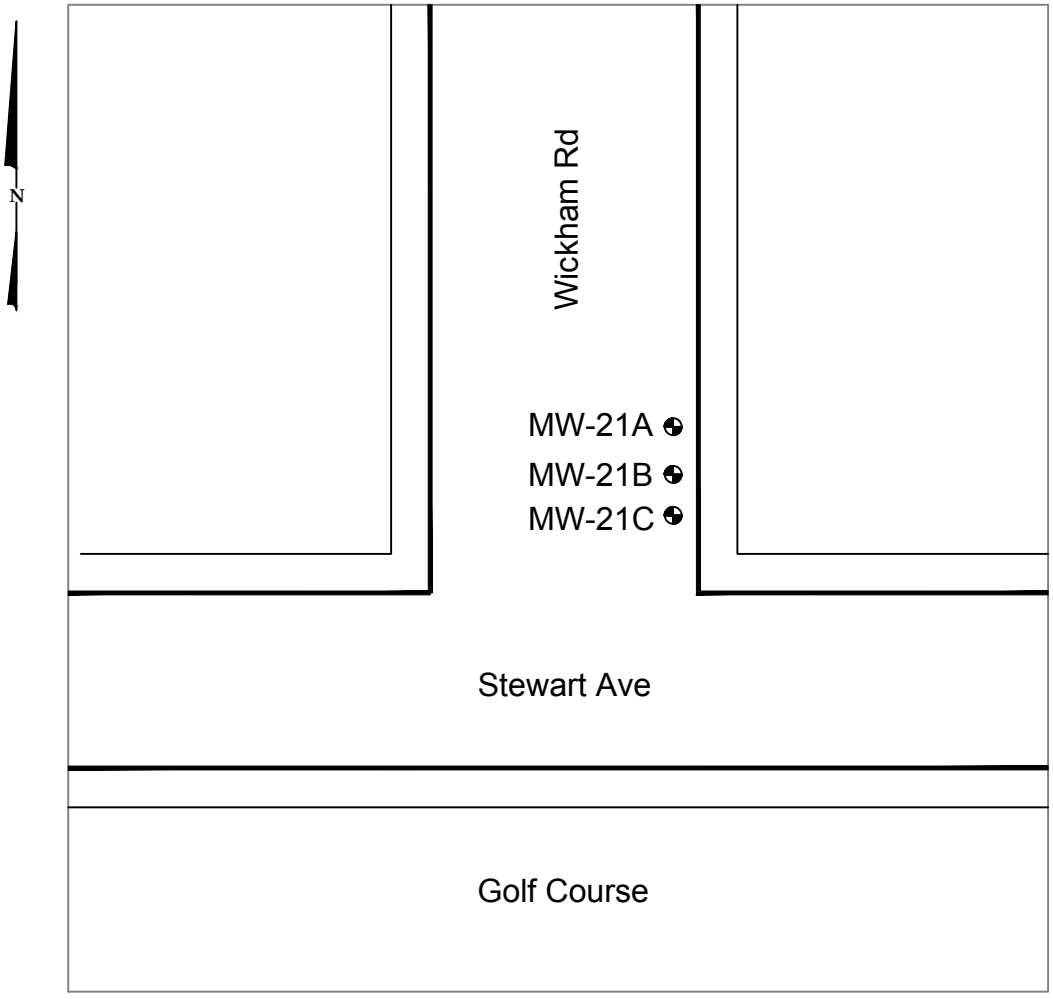
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/16/17	0097881.11

M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW-20A, B & C.dwg (10/17/2017 - 10:30am Melville)

North

MW-20A (middle), MW-20B (left) and MW-20C (right)

Located on the northeast corner of Jackson St. and Stewart Ave in Garden City.



Not To Scale

Wells MW-21A, B and C (no NYSDEC Well No.) are located at the Northeast corner of Wickham Rd and Stewart Ave in Garden City

TITLE

Groundwater Monitoring
Well Locations MW-21A, B and C
Garden City, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 24

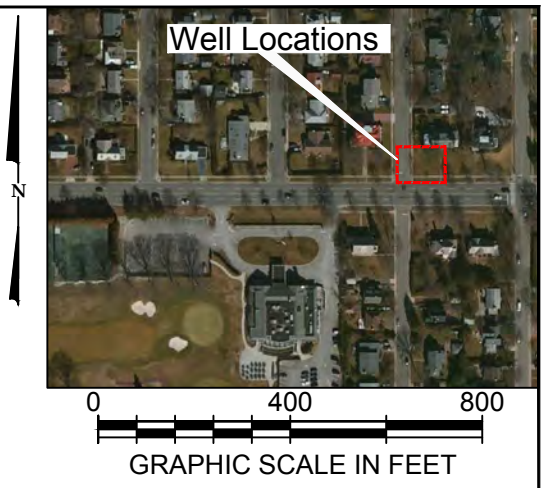
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/16/17	0097881.11

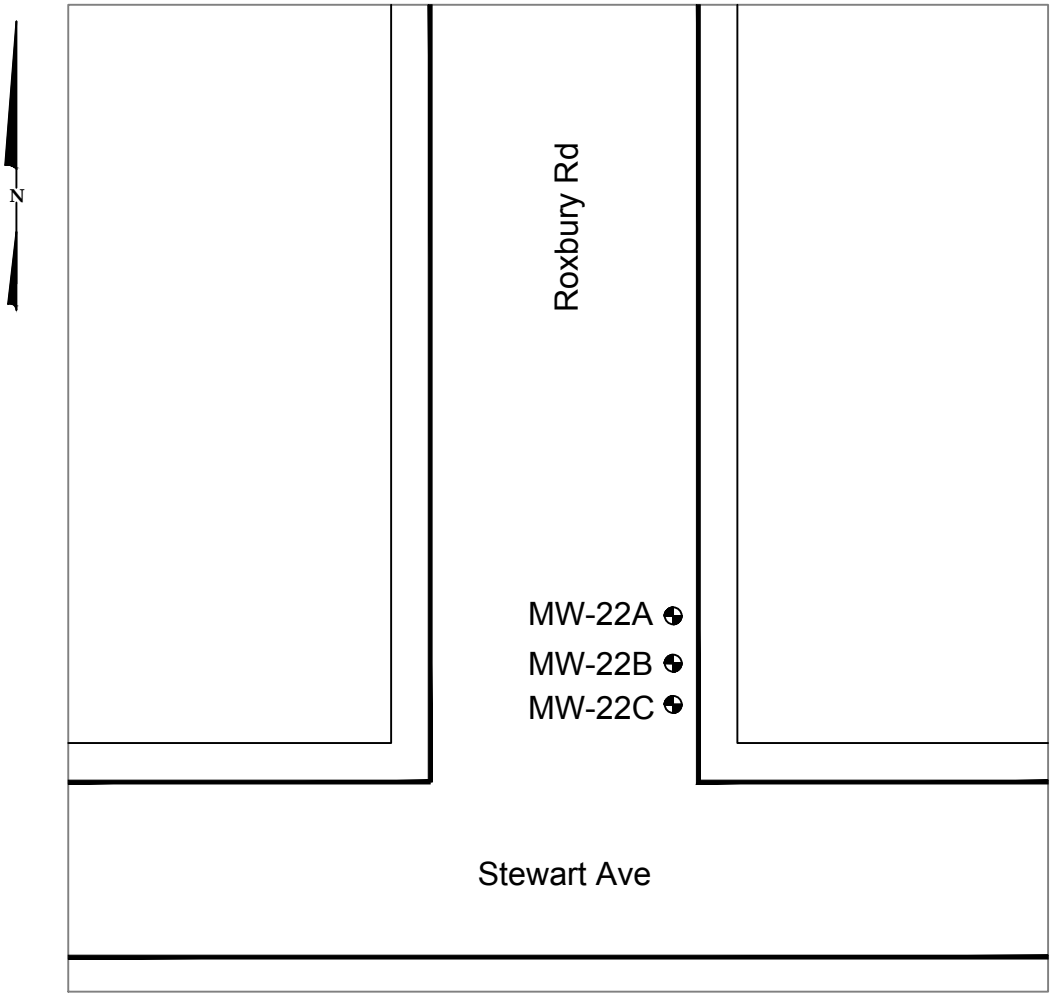
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW-21A, B & C.dwg (10/17/2017 - 10:30am Melville)

North

MW-21A (left) MW-21B (middle) and MW-21C (right)

Located on the northeast corner of Wickham Rd. and Stewart Ave. in Garden City.





Not To Scale

Wells MW-22A, B AND C (no NYSDEC Well No.) are located at the Northeast corner of Roxbury Rd and Stewart Ave in Garden City

TITLE

Groundwater Monitoring
Well Locations MW-22A, B and C
Garden City, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 25

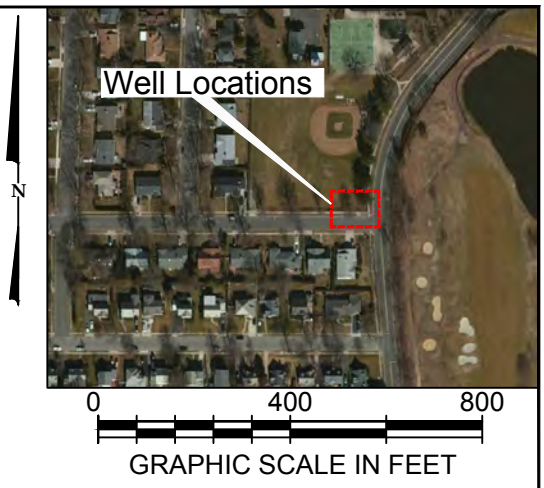
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/16/17	0097881.11

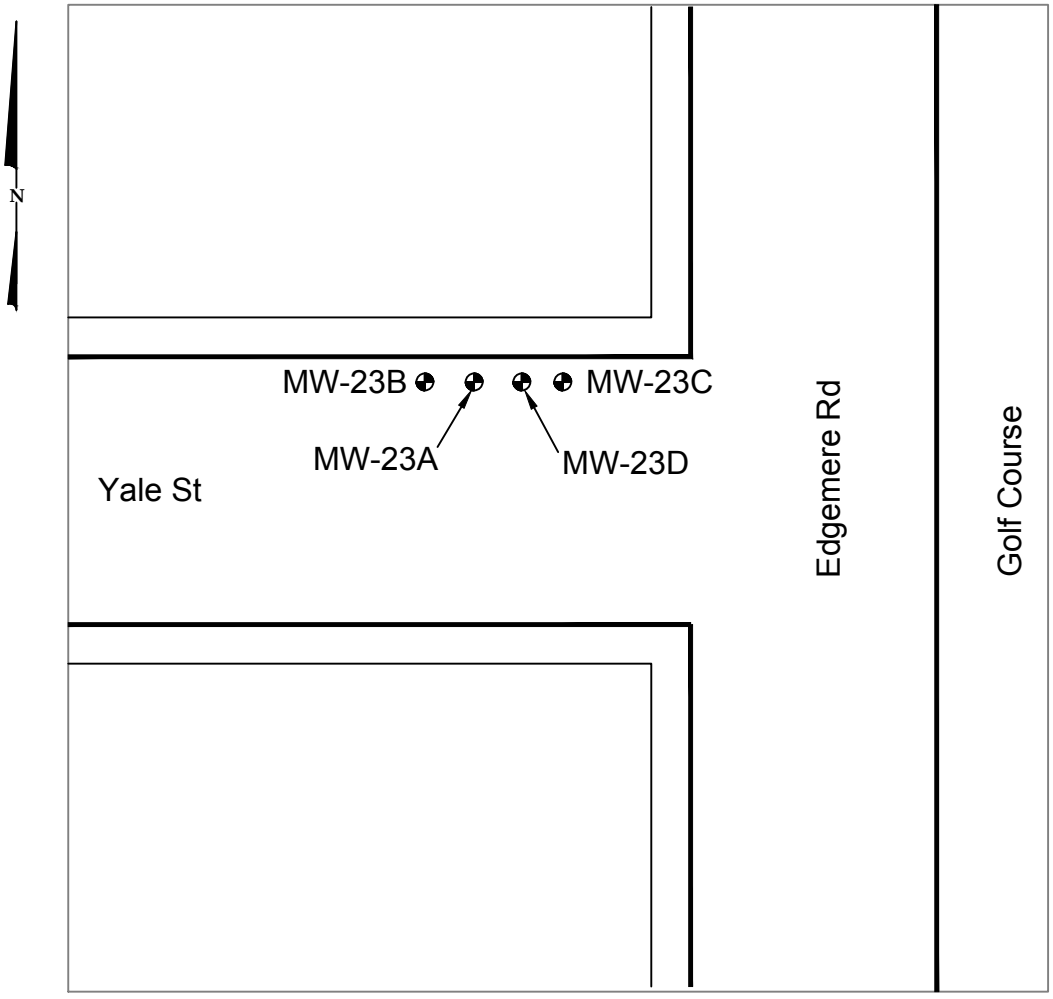
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW-22A, B & C.dwg (10/17/2017 - 10:29am Melville)

North

MW-22A (left) MW-22B (middle) and MW-22C (right)

Located on the northeast corner of Roxbury and Stewart Ave. in Garden City





Not To Scale

Wells MW-23A, B, C and D (no NYSDEC Well No.) are located at the Northwest corner of Yale St and Edgemere Rd in Garden City

TITLE

Groundwater Monitoring
Well Locations MW-23A, B, C and D
Garden City, NY

PREPARED FOR

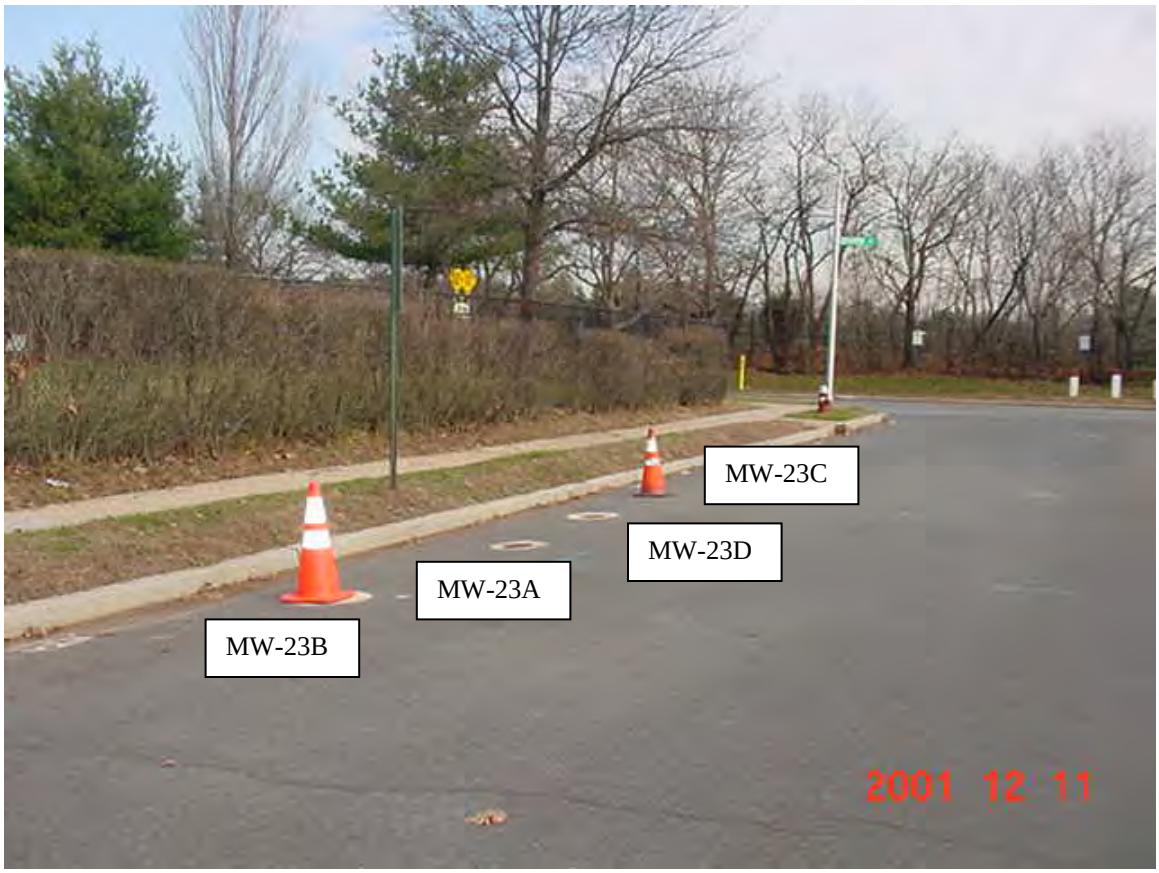
Genesco Inc.

Environmental Resources Management

FIGURE 26

DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/16/17	0097881.11

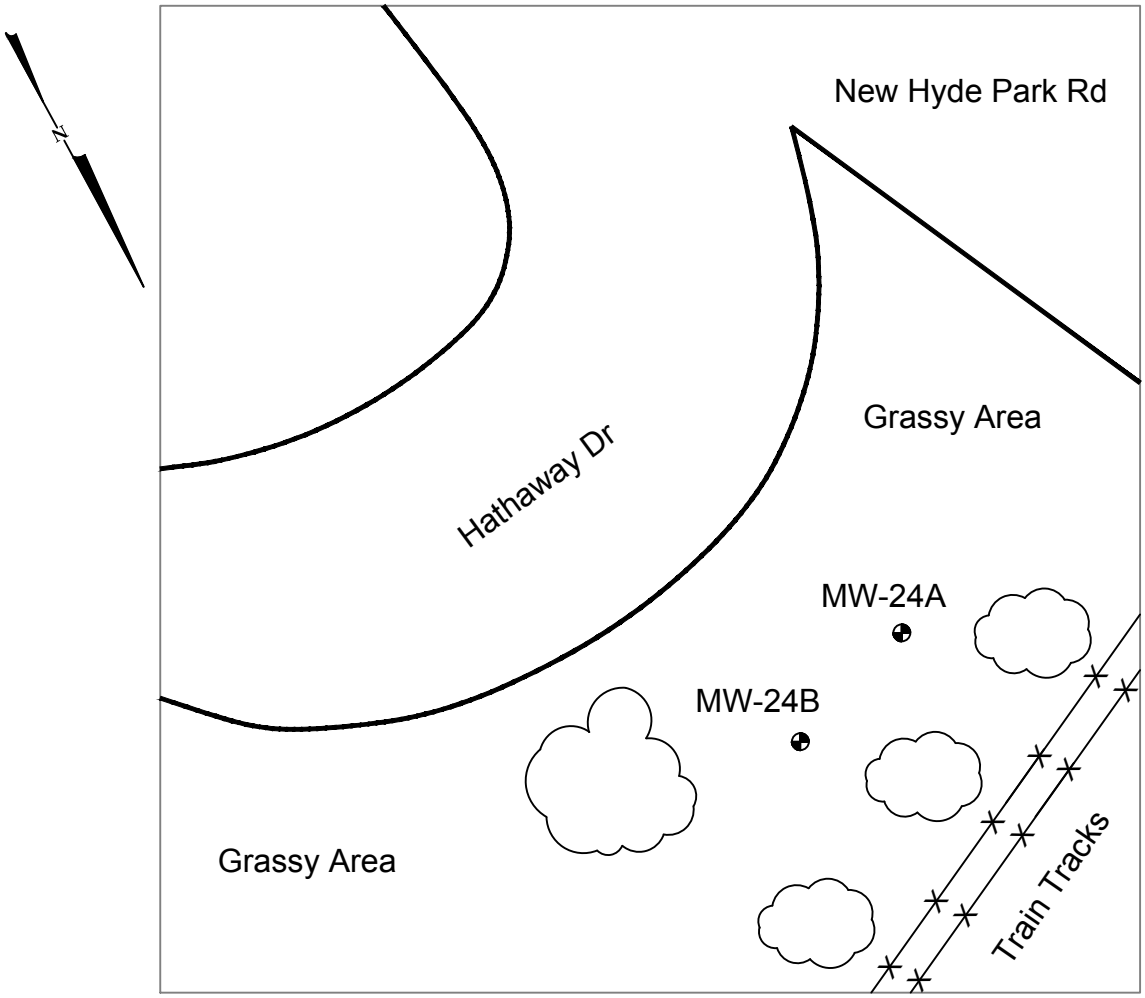
M:\Scout\Projects\GENESCO\150 Fulton Ave\NYCAD\2017\2017-10 - Genesco - MW-23A, B, C & D.dwg (10/17/2017 - 10:28am Melville)



North

MW-23A, MW-23B, MW-23C and MW-23D

Northwest corner of Yale and Edgemere in Garden City.



Not To Scale

Wells MW-24A and MW-24B (no NYSDEC Well No.) are located at the Northeast corner of Hathaway Dr and New Hyde Park Rd in Garden City

(three way intersection of Clinch Ave which mergesinto New Hyde Park Rd and Hathaway Dr)

TITLE

Groundwater Monitoring
Well Locations MW-24A and MW-24B
Garden City, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 27

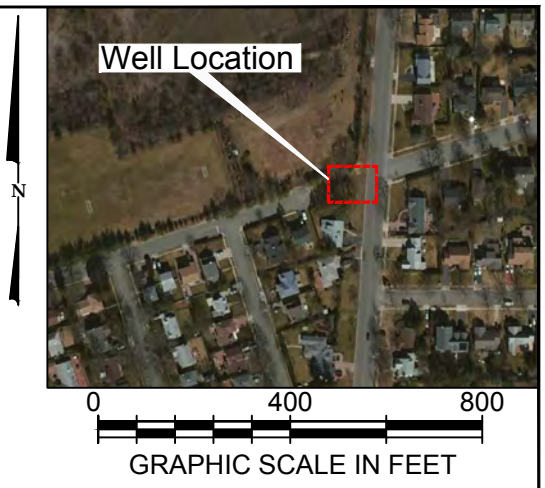
DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/16/17	0097881.11

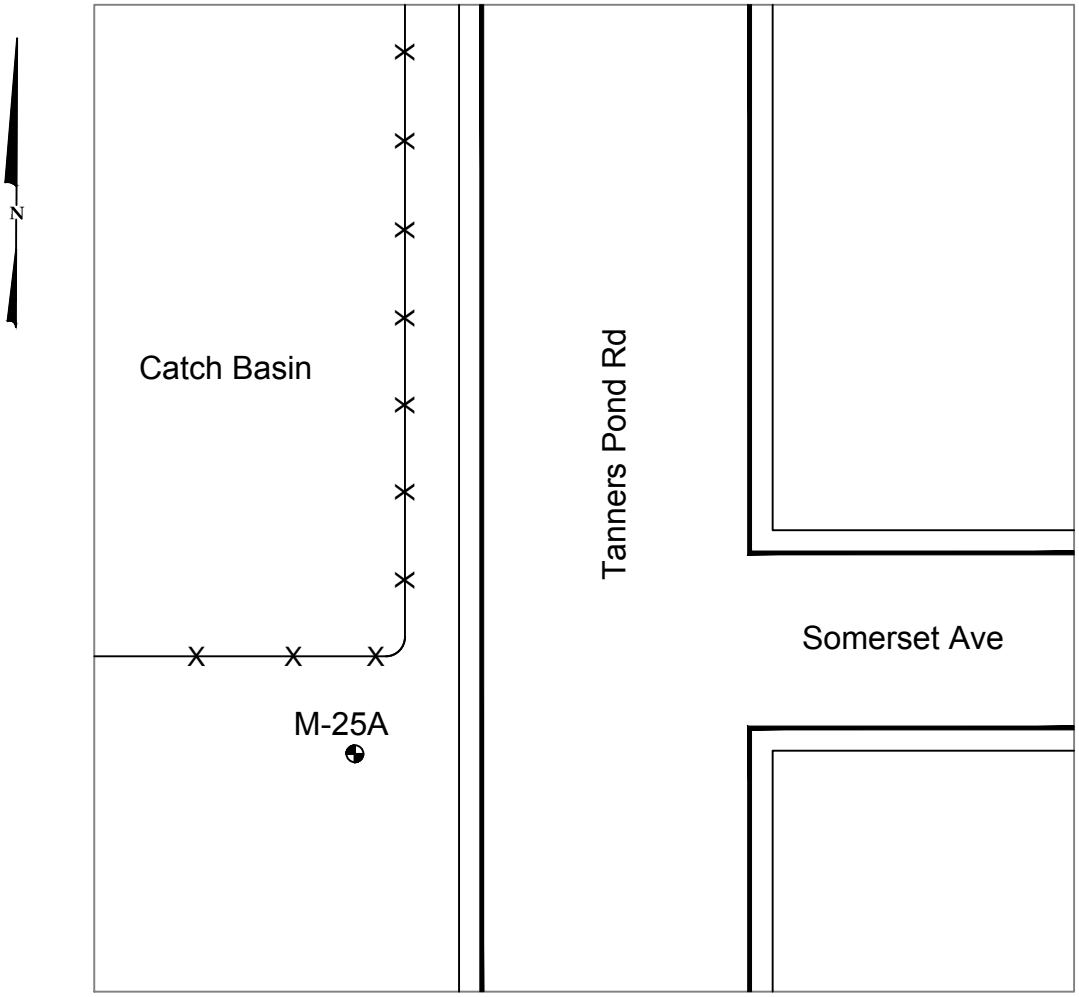
M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW-24A & B.dwg (10/17/2017 - 10:28am Melville)

North ↘

MW-24A and MW-24B

Located on the northeast corner of Hathaway and New Hyde Park Rd.





Not To Scale

Well MW-25A is located on the South Side of the Tanners Pond Rd Catch Basin across from Somerset Ave

(located on grassy public area)

TITLE

Groundwater Monitoring
Well Location MW-25A
Garden City, NY

PREPARED FOR

Genesco Inc.

Environmental Resources Management

FIGURE 28

DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	10/16/17	0097881.11

M:\Scout\Projects\GENESCO\150 Fulton Ave\NY\CAD\2017\2017-10 - Genesco - MW-25A.dwg (10/17/2017 - 10:27am Melville)

North

MW-25A

Located on the south side of the Tanners Pond Rd. Catch Basin across from Somerset Ave. in Garden City.

ATTACHMENT E - New York State Department Of Environmental Conservation
Analytical Service Protocol

NEW YORK STATE

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

ANALYTICAL SERVICE PROTOCOL

EXHIBIT B

REPORTING AND DELIVERABLES REQUIREMENTS

July 2005

EXHIBIT B

TABLE OF CONTENTS

PART I -- CONTRACT REPORTS/DELIVERABLES SCHEDULE AND DISTRIBUTION

1.0 Summary Table

The following table details the Protocol reporting and deliverable requirements, their schedule, and the distribution that is required for each. Detailed requirements for each lettered "Item" listed in the chart are given in Part II of this Exhibit.

ITEM	DESCRIPTION	# of COPIES[1]	DELIVERY SCHEDULE	DISTRIBUTION		
				1	2	3
A	Standard Operating Procedures (SOPs)	1	60 days after notification of contract award, and as required in Exhibit E.	X		
B	Quality Assurance Management Plan (QAMP)	1	60 days after notification of contract award, and as required in Exhibit E.	X		
C	Weekly Sample Receipt Summary	1	The Wednesday following the calender week samples are received.	X		
D[2]	Sample Data Summary Package	2	30 days after the VTSR[3] of the last sample in the Sample Delivery Group (SDG[4]).	As Directed		
E[2]	Sample Data Package (.PDF)	1	30 days after the VTSR[3] of the last sample in the SDG[4].	X		X
F[2]	Electronic Data Deliverables (EDD)	1	30 days after the VTSR[3] of the last sample in the SDG[4].	X		X
G	Electronic Instrument Data	1	Retain for 3 years after data submission, submit within 7 days of receipt of written request from BWAM.	As Directed		
H	Samples and Extracts[5]	N/A	Retain for 365 days after data submission, submit within 7 days of receipt of written request from BWAM.	As Directed		
I	Full Verification of Instrument Parameters	1	Retain for 3 years after data submission, submit within 7 days of receipt of written request from BWAM.	As Directed		
J	Preliminary Results[6,7]	2	When requested, within 72 hours after receipt of designated samples.		X	X
K	Results of PE sample(s)	1	30 days after receipt of such Performance Evaluation (PE) sample(s).	X		

Notes (for Summary Table)

[1] The number of copies specified is the number of copies required to be delivered to each recipient, for that item.

[2] Deliverables for Items D, E, and F are to be reported total and complete. Concurrent delivery is required. Delivery shall be made such that all designated recipients receive all the items they are scheduled to receive on the same calendar day. If a deliverable item due on the same date as other deliverable items is late, all items scheduled to be due on that day shall be considered late as well. If the deliverables are due on a Saturday, Sunday, or State holiday, then they shall be delivered on the next business day.

[3] Validated Time of Sample Receipt (VTSR) is the date of sample receipt at the Contractor's facility, as recorded on the shipper's delivery receipt and sample Traffic Report/Chain of Custody Record. Sample Delivery Group (SDG) is a group of samples within a Case, received over a period of 7 days or less with the same laboratory turnaround and not exceeding 20 samples [excluding performance Evaluation (PE) Samples]. Data for all samples in the SDG are due concurrently. The date of delivery of the SDG or any samples within the SDG is the date that the last sample in the SDG is received. See Exhibit A for further description.

[4] Sample Delivery Group (SDG) is a group of samples within a Case, received over a period of 7 days or less and not exceeding 20 samples [excluding Performance Evaluation (PE) samples]. Note that preliminary results have no impact on defining the SDG. Data for all samples in the SDG are due concurrently, unless specified otherwise in a project work plan. The date of delivery of the SDG or any samples within the SDG is the date that the last sample in the SDG is received.

[5] Actual unused samples and extracts are not considered a reportable item, and their return to NYSDEC, if requested, is not billable. Unused portions or samples and extracts are considered to be a deliverable only when their return is requested in writing by NYSDEC. As specified in the Protocol, and unless otherwise instructed by the BWAM, the Laboratory shall dispose of unused sample/extract volume and used sample bottles/containers no earlier than ninety (90) days following submission of analytical data in the form of the Sample Data Package. Until these ninety days have expired, NYSDEC samples and sample extracts are the exclusive property of NYSDEC and cannot be experimented upon, disposed of, or relinquished to third parties without written permission from NYSDEC.

[6] If requested at the time of sample scheduling the contractor shall provide preliminary results, consisting of Form I and Form I TIC analytical results, by fraction, for field and quality control (QC) sample analysis via telefacsimile (fax) or electronic mail, and Form X for Pesticides and Form X for Aroclors. The Contractor will be notified of the fax number or email address at the time of the sample scheduling. Chain of Custody (COC) Records and SDG Cover Sheets shall be submitted with the Preliminary Results. The contractor shall contact the Project Officer after confirming transmission. The Contractor shall document all communication in a telephone contact log.

[7] If a sample requiring Preliminary Results arrives before 5 p.m. (Contractor's local time), the Preliminary Results are due within the required turnaround time. If a sample requiring Preliminary Results is received after 5 p.m., the Preliminary Results are due within the required turnaround time beginning at 8 a.m. the following day.

Distribution Addresses:

1. Quality Standards and Analytical Management Section
The Bureau of Watershed Assessment and Management
Division of Water
NYS Department of Environmental Conservation
625 Broadway, 4th Floor
Albany, New York 12233-3502

2. NYSDEC Sample Submitters

3. NYSDEC Project Officers

The BWAM acting on behalf of the Project Officer will provide the Laboratory with the list of addressees for the nine NYSDEC Regions. BWAM will provide the Laboratory with updated Regional address/name lists as necessary throughout the period of the contract and identify other client recipients on a case-by-case basis.

***NOTE**: Specific recipient names and addresses are subject to change during the term of the contract. The Bureau of Watershed Assessment and Management (BWAM) will notify the Laboratory in writing of such changes when they occur.*

PART II -- REPORT DESCRIPTIONS AND ORDER OF DATA DELIVERABLES

1.0 Overview

The Laboratory shall provide reports and other deliverables as specified by the schedule in Part I of this Exhibit. The required content and assembly of each deliverable is described in Part II of this Exhibit.

Descriptions of the requirements for each deliverable "Item" listed in the chart in Part I, are specified in sections A-G of this Part. Items submitted concurrently MUST BE arranged in the order listed. Additionally, the components of each item MUST BE arranged in the order presented in this Section when the item is submitted.

Examples of specific data deliverables not included herein may be obtained by submitting a written request to The Bureau of Watershed Assessment and Management clearly stating the information requested and signed and dated by the Laboratory Manager.

1.1 All deliverables MUST BE as follows:

- Legible, as specified in Section V,
- Clearly labeled and completed in accordance with instructions in this Exhibit,
- Arranged in the order specified in this Exhibit, and
- Paginated sequentially according to instructions in this Exhibit, starting from the SDG Narrative.
- Information reported on the CLP Forms or CLP-type Forms listed in this exhibit must either be typewritten or computer-generated. Handwritten corrections to the information on the CLP Forms and CLP-type Forms are not permitted. Notes or handwritten corrections on the hardcopy instrument output files must be legible, signed, and dated. Raw data consisting of handwritten worksheets should be completed in a legible fashion.
- Extraneous information should be kept to a minimum. Raw data pages, which contain no information pertaining to NYSDEC samples or QC relating to NYSDEC samples, should be excluded from the sample data package.
- Do not include redundant copies of the same supporting data in the data package. For example, if different sets of raw data reference the same standard prep log pages, include only one copy of the pages and link to it from the appropriate sections.

1.2 The contractor shall use NYSDEC Case Numbers, SDG Numbers, and NYSDEC Sample Numbers to identify samples received under this

contract, both verbally and in reports and correspondence. The Contract number shall be specified in all correspondence.

1.3 Sections III and IV of this Exhibit contain instruction for the required data reporting forms in CLP-specified formats, along with examples and templates for certain NYSDEC specific forms. Section V of this Exhibit contains the specifications for the .PDF file created for the data package. The format for electronic data deliverables (EDD) or other database compatible files are contained in Exhibit H.

1.4 In subsequent Sections of this document the words "copy" and "copies" are used when describing elements used to construct the Sample Data Package and Sample Data Summary Package. The terms "copy" and "copies", when used in this context, refer to Adobe .PDF pages produced from the original documents and included in the main .PDF file for the Package.

1.5 In all instances where a method detection limit (MDL), practical quantitation limit (PQL), or other detection limit (DL) must be reported along with the sample result, the appropriate limit should be adjusted based on the individual sample amount (mass or volume), dilution, and any additional factors they influence the limit being reported. This is referred to as the "sample specific detection limit". A sample specific detection limit should be reported along with all NYSDEC sample results, for all NYSDEC requested analytes to which a MDL, PQL, or DL applies. The only instance where the Laboratory may omit reporting of the sample specific detection limit is when a positive result is being reported for a specific analyte and the CLP/ASP Form I being used does not allow space for reporting of both a positive result and the sample specific detection limit.

1.6 Where applicable, the Laboratory shall include examples of the calculations used to arrive at the reported results. These sample calculations shall use the raw numbers from an actual sample (non-U flagged) in the data package, and show how the final reported result was arrived at for a randomly selected analyte. One sample calculation shall be included for each method used for reporting data in the SDG.

2.0 Resubmission of Data

2.1 If submitted documentation does not conform to the above criteria Section 1.1-1.4), the Laboratory will be required to resubmit such documentation with the deficiencies corrected within 6 business days, at no additional cost to NYSDEC.

2.2 Whenever the Laboratory is required to submit or resubmit data as a result of an on-site laboratory evaluation or through a Bureau of Watershed Assessment and Management (BWAM) action, or through a Project Officer's request, the data must be clearly marked as "ADDITIONAL DATA" and distributed to the specified data recipients. A cover letter must be included which describes what data is being delivered, to which NYSDEC sample(s) it pertains, and who requested the data.

2.3 Whenever the Contractor is required to submit or resubmit data as a result of Contact Compliance Screening (CCS) review by BWAM, the data shall be sent to the two contractual data recipients (BWAM and Region) and to NYSDEC's designated recipient when a written request for Sample Data Package has been made. In all instances the Contractor shall include a color-coded cover sheet (Laboratory Response to Results of Contract Compliance Screening) provided by BWAM. Electronic deliverable should be submitted or resubmitted to BWAM and the Region.

A. – Standard Operating Procedures

See Exhibits E and F for requirements

B. – Quality Assurance Management Plan

See Exhibits E and F for requirements

C. – Weekly Sample Receipt Summary

1.0 Weekly Sample Receipt Summaries shall be submitted by the Wednesday following the calender week (Sunday through Saturday) for which samples are submitted. This information must be transmitted electronically (emailed) as a Microsoft Excel compatible file. NYSDEC will provide the Excel file structure and all appropriate fields in the Excel file should be completed prior to submission.

1.1 The Weekly Sample Receipt Summary shall contain the following items:

- Lab name
- Contract number
- NYSDEC Case #
- NYSDEC SDG #
- NYSDEC Sample ID #
- Lab ID #
- Name of NYSDEC Sample Submitter
- Code numbers for requested analyses from Contract Laboratory Sample Information Sheet
- Sample Analysis Price – full sample price from contract for each sample # reported.
- List of NYSDEC sample numbers of all samples in the SDG, identifying the first and last samples received, and their dates of receipt.

***Note**: When more than one sample is received in the first or last SDG shipment, the "first" sample received would be the lowest sample number (considering both alpha and numeric designations); the "last" sample received would be the highest sample number (considering both alpha and numeric designations).*

1.2 The NYSDEC SDG# is found on the Contract Laboratory Sample Information Sheet. The SDG number is also reported on all data reporting forms.

D. – Sample Data Summary Package

As specified in the Delivery Schedule, one Sample Data Summary Package CD-ROM each shall be delivered to the project officer and the sample collector concurrently with delivery of other required sample data. The Sample Data Summary Package consists of Adobe .PDF copies of specified items from the Sample Data Package. These items are listed below and described in detail under part E, Sample Data Package.

The Sample Data Summary Package shall be ordered as follows and shall be submitted separately either as a separate .PDF file or clearly separated by a bookmark in the Sample Data Package .PDF directly preceding the Sample Data Package. Sample data forms shall be arranged by fraction, in increasing NYSDEC sample number order, considering both letters and numbers. E400 is a lower sample number than RH100, as E precedes R in the alphabet.

Specifications for the book marking of electronic (.PDF) data packages are given in Section V of this Exhibit. Sections that must be bookmarked are annotated with **"<B-*X*>**", where *X* is the numeric level of the bookmark required for the given Section or subsection. For further information on bookmarking requirements see Part V, Section 1.3.6.

The Sample Data Summary Package shall contain all data for all samples within one Sample Delivery Group of the Case as follows:

1. NYSDEC Data Package Summary Forms **<B-1>**

2. SDG Narrative **<B-1>**

3. By fraction (VOA, SV, PEST, ARO, IN, WC) and by sample within each fraction – tabulated target compound results (FORM I-*XXXX*) and tentatively identified compounds (FORM I-*XXXX*-TIC) (VOA and BNA only). (**<B-1>** for the "Sample Results" section of the Sample Data Package Summary, **<B-2>** to separate and mark the beginning of the results for each separate fraction and/or analysis method)

   ***Note:** "XXXX" represents the code for the appropriate organic data reporting form.*

4. By fraction (VOA, SV, PEST, and ARO) – surrogate spike analysis results (FORM II-*XXXX*) by matrix (water and/or soil) and for soil, by concentration (low or medium). (**<B-1>** for the "Surrogate Results" section of the Sample Data Package Summary, **<B-2>** to separate and mark the beginning of the surrogate results for each separate fraction and/or analysis method)

5. By fraction (VOA, SV, PEST, and ARO) – matrix spike/matrix spike duplicate/matrix spike blank results (FORM III-*XXXX*) – as required by method. (**<B-1>** for the "MS/MSD Results" section of the Sample Data Package Summary, **<B-2>** to separate and mark the beginning of the MS/MSD results for each separate fraction and/or analysis method)

6. By fraction (VOA, SV, PEST, and ARO) – QC Check Sample/Standard Recovery Summary – If required by method. (**<B-1>** for the "Check Sample/Standard Recovery" section of the Sample Data Package Summary, **<B-2>** to separate and mark the beginning of the check standard results for each separate fraction and/or analysis method)

7. By fraction (IN and WC only) – duplicate sample results (FORM VI-IN). (**<B-1>** for the "Duplicate Results" section of the Sample Data Package Summary, **<B-2>** to separate and mark the beginning of the duplicate results for each separate fraction and/or analysis method)

8. By fraction (IN and WC only) – spike sample results (FORM V-IN). (**<B-1>** for the "Spike Sample Results" section of the Sample Data Package Summary, **<B-2>** to separate and mark the beginning of the spike results for each separate fraction and/or analysis method)

9. By fraction (VOA, SV, PEST, ARO, IN, WC) – blank data (FORM IV-*XXXX* (for organics) and Form III-IN) and tabulated results (FORM I-*XXXX* (for organics) and FORM I-IN) including tentatively identified compounds (FORM I-*XXXX*-TIC)(VOA and BNA only). (**<B-1>** for the "Blank Results" section of the Sample Data Package Summary, **<B-2>** to separate and mark the beginning of the blank results for each separate fraction and/or analysis method)

10. By fraction (VOA and SV only) – internal standard area data (FORM VIII-*XXXX*). (**<B-1>** for the "Internal Standard Recovery" section of the Sample Data Package Summary, **<B-2>** to separate and mark the beginning of the internal standard recovery for each separate fraction and/or analysis method)

E. – Sample Data Package

The Sample Data Package is divided into the eight major units described below. The last six units are each specific to an analytical fraction (volatiles, semivolatiles, pesticides/Aroclors, GC organics, inorganics, and conventional wet-chemistry). If the analysis of a fraction is not required, then that fraction-specific unit is not required as a deliverable.

The Sample Data Package shall include data for analyses of all samples in one Sample Delivery Group, including field samples, re-analyses, blanks, duplicates, control spikes, matrix spikes, matrix spike duplicates, and matrix spike blanks. In addition, the package will also include the results of Method Detection Limit studies and reports establishing interelement correction factors for ICP-AES.

All data produced in support of Superfund investigation/remediation as identified by checked boxes under the Contract Laboratory Section of the Contract Laboratory Sample Information Sheet (CLSIS) (See Exhibit A) shall be reported as specified for the Superfund Category/CLP (Section 1.0 below). All data generated in support of the

SPDES program as identified by a CASE # beginning with the letter "E" shall be reported using ASP Category B (Section 3.0 below). All other samples shall be reported using either ASP Category A or ASP Category B described in Section 2.0 and 3.0 below. The specific reporting level to be used shall be specified by the CLSIS, unless otherwise specified in a project work plan.

The Laboratory shall retain a CD-ROM/.PDF copy of the Sample Data Package for 3 years after final acceptance of data. See Section V for a detailed explanation of these requirements. After this time, the Laboratory may dispose of/delete the package.

Specifications for the book marking of electronic (.PDF) data packages are given in Section V of this Exhibit. Sections that must be bookmarked are annotated with **"<B-*X*>**", where *X* is the numeric level of the bookmark required for the given Section.

1.0 Superfund Category/CLP

1.1 Cover Documentation **<B-1>**

Cover Page for the Data Package shall include: laboratory name; laboratory code; contract number; Case number; SDG number; and NYSDEC sample numbers in alphanumeric order.

1.2 SDG Narrative **<B-1>**

1.2.1 This document shall be clearly labeled "SDG Narrative" and shall contain: Laboratory name; Case number; Sample Delivery Group number (SDG); NYSDEC sample numbers in the SDG, differentiating between initial analyses and re-analyses; Contract number; and detailed documentation of any quality control, sample, shipment and/or analytical problems encountered in processing the samples reported in the data package. For soil samples collected and pre-weighed in the field the laboratory shall document all discrepancies between sample weights determined in the field and in the laboratory in the SDG Narrative. A statement on the use of background and interelement corrections performed for the samples should be included for inorganic analysis, if applicable.

1.2.2 The Laboratory shall document, in the SDG Narrative, the alternative technique used to determine cooler temperature if a temperature indicator bottle is not present in the cooler. The Laboratory shall also provide, in the SDG Narrative, sufficient information, including equations or curves (at least on equation or curve per method), to allow the recalculation of sample results from raw instrument output. The Laboratory shall also include a discussion of any performance-based modifications performed on the Protocol requirements or on published methods. If modifications are reoccurring, the laboratory may provide separate documentation of the modifications and reference such modifications in the SDG Narrative. Additionally, the Laboratory shall also identify and explain any differences that exist between the Form Is and the supporting documentation provided in the

data package and those previously provided as preliminary results.

1.2.3 The Contractor shall also provide, in the SDG Narrative or as attachments referenced in the SDG narrative, sufficient information, including copies of equations and definitions of variables (at least one equation per method), to allow the recalculation of sample results from raw instrument output.

1.2.4 All Gas Chromatography (GC) columns used for analysis should be documented in the SDG Narrative, by fraction. List the GC column identification—brand name, the internal diameter (in millimeters), and the length (in meters), packing/coating material, and film thickness. The trap used for volatile analysis shall be described here. List trap name, when denoted by the manufacturer, its composition (packing material/brand name, amount of packing material, in length). The Laboratory shall include any technical and administrative problems encountered, the corrective action taken, the resolution, and an explanation for all flagged edits (e.g. manual edits) on quantitation lists. The Laboratory shall document in the SDG Narrative all instances of manual integration.

1.2.5 Whenever data from sample re-analysis are submitted, the Laboratory shall state in the SDG Narrative for each re-analysis, whether it considers the re-analysis to be billable, and if so, why.

1.2.6 The Laboratory shall list the pH determined for each water sample submitted for volatile analysis. This information may appear as a simple list or table in the SDG Narrative. The purpose of this pH determination is to ensure that all water volatiles samples were acidified in the field. No pH adjustment is to be performed by the Laboratory on water samples for volatiles analysis. The SDG Narrative shall conclude with the following statement, verbatim: *"I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this Sample Data Package and in the electronic data deliverables has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature."* This statement shall be directly followed by signature of the Laboratory Manager or his designee with a typed line below it containing the signer's name and title, and the date of signature.

1.3 Sample Log-In Sheet [FORM DC-1] **<B-1>**

NOTE: *Example copies of the DC-1 form can be found in CLP Exhibit B. Use the DC-1 Form in OLM04.2 for organic samples and the DC-1 Form in ILM05.3 for inorganics/conventional samples.*

In addition to the DC-1 Form, the contractor must include a listing showing NYSDEC sample numbers, in alphanumeric order, cross-referenced with laboratory Sample ID numbers.

1.4 Contract Lab Sample Information Sheets **<B-1>**

A copy of the Contract Lab Sample Information Sheets (CLSIS) for all of the samples in the SDG. The CLSIS shall be arranged in increasing NYSDEC sample number order, considering both letters and numbering in ordering samples.

1.5 Chain-of-Custody Forms **<B-1>**

Copies of both the external and internal chain-of-custody sheets for all samples within the SDG.

1.6 Superfund-CLP Volatiles Data **<B-1>**

1.6.1 QC Summary **<B-2>**

1.6.1.1 System Monitoring Compound or Deuterated Monitoring Compound Recovery Reports (FORM II VOA-1, VOA-2, VOA-3, VOA-4, VOA-SIM, VOA-SIM1, VOA-SIM2).

1.6.1.2 Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank Recovery Reports (FORM III VOA-1, VOA-2, VOA-SIM) – Provided when an MS/MSD analysis is requested by NYSDEC.

1.6.1.3 Method Blank Summary (FORM IV VOA, VOS-SIM) – If more than a single form is necessary, forms must be arranged in chronological order by date of analysis of the blank, by instrument.

1.6.1.4 GC/MS Instrument Performance Check (FORM V VOA) – If more than a single form is necessary, the forms must be arranged in chronological order, by instrument.

***Note**: This form is not required for the optical analysis when submitting data using the Selected Ion Monitoring (SIM) technique.*

1.6.1.5 Internal Standard Area and RT Summary (FORM VIII VOA, VOA-SIM) – If more than a single form is necessary, the forms must be arranged in chronological order, by instrument.

1.6.2 Volatiles Sample Data (**<B-2>** to mark Section heading, **<B-3>** to mark the beginning of each data "packet")

Sample data shall be arranged in packets with the Organic Analysis Data Sheet (FORM I VOA-1, VOA-2, including FORM I VOA-TIC), followed by the raw data for volatile samples. The sample data shall be placed in order of increasing NYSDEC sample number, considering both letters and numbers. Volatile sample data for SIM analysis must be arranged

together with the rest of the SIM Volatiles data at the end of the sub-Section.

1.6.2.1 Target Compound Results – Volatile Organics Analysis Data Sheet (FORM I VOA-1, VOA-2) – Tabulated results (identification and quantitation) of the specified Superfund-CLP target compounds (Exhibit C – Volatiles) shall be included. The validation and release of these results are authorized by a specific, signed statement in the SDG Narrative (see Section 1.2). In the event that the Laboratory Manager cannot verify all data reported for each sample, the Laboratory Manager shall provide a detailed description of the problems associated with the sample in the SDG Narrative.

1.6.2.2 Target Compound Results – Volatile Organics Analysis Data Sheet (FORM I VOA-1, VOA-2) – Tabulated results (identification and quantitation) of the specified Superfund-CLP target compounds (Exhibit C – Volatiles) shall be included. The validation and release of the results are authorized by a specific, signed statement in the SDG Narrative (see Section 1.2). In the event that the Laboratory Manager cannot verify all data reported for each sample, the Laboratory Manager shall provide a detailed description of the problems associated with the sample in the SDG Narrative.

1.6.2.3 Tentatively Identified Compounds (FORM I VOA-TIC) – FORM I VOA-TIC is the tabulated list of the highest probable match for up to 10 organic compounds not system monitoring compounds and are not target compounds, system monitoring compounds, internal standard compounds, or unsubstituted alkanes, or any other compound not listed in Exhibit C – Volatiles. It including the CAS (Chemical Abstracts Registry) number, tentative identification and estimated concentrations. For estimating concentration, assume a response factor of 1, and estimate the concentration by comparison of the compound peak height or total area count to the peak height or total area count of the nearest internal standard free of interferences on the reconstructed ion chromatogram. This form must be included even if no compounds are found. If this occurs, enter a "0" in the field for "Number found" on the form.

Note: *The Laboratory must be consistent, i.e., use peak height for all comparisons or use total area count for all comparisons.*

1.6.2.4 Reconstructed Total Ion Chromatograms (RIC) (for each sample including dilutions and reanalyzes) – RICs must be normalized to the largest non-solvent component and contain the following header information:

- NYSDEC sample number;
- Date and time of analysis;
- GC/MS instrument ID;
- Lab file ID;
- Analyst ID.

Note: *Each Selected Ion Current Profile (SICP) for samples taken through the optional analysis using the SIM technique shall be labeled as in this Section.*

1.6.2.4.1 Internal standard and system monitoring compounds should be labeled with the names of compounds, either directly out from the peak, or are to be included on a printout of retention times when the retention times are directly located over the peak. Labeling of the compounds is not required and should not detract from the legibility of the required labels.

1.6.2.4.2 If automated system procedures are used for preliminary identification and/or quantification of the Superfund Target Compound List (Superfund-TCL) compounds, the complete data system report must be included in all Sample Data Packages, in addition to the reconstructed ion chromatogram. The complete data system report shall include all of the information listed below. For laboratories that do not use the automated data system procedures, a laboratory "raw data sheet", which contains the following information, must be included in the sample data package in addition to the chromatogram.

- NYSDEC sample number;
- Date and time of analysis;
- RT or scan number of identified target compounds;
- Ion used for quantitation with measured area;
- Copy of area table from data system;
- On column concentration/amount, including units;
- GC/MS instrument ID;

- Lab file ID;
- Analyst ID.

1.6.2.4.3 In all instances where the data system report has been edited, or where manual integration or manual quantitation has been performed, the GC/MS operator must identify such edits or manual procedures by initialing and dating the changes made to the report, and shall include the integration scan range. The GC/MS Operator shall also mark each integrated area with the letter "m" on the quantitation report. In addition, a hardcopy printout of the Extracted Ion Current Profile (EICP) of the quantitation ion displaying the manual integration shall be included in the raw data. This applies to all compounds listed in Exhibit C – Volatiles, internal standards, and system monitoring compounds.

1.6.2.5 Other required Information. For each sample, by each compound identified, the following shall be included in the data package:

1.6.2.5.1 Copies of raw spectra and copies of background-subtracted mass spectra of target compounds listed in Exhibit C – Volatiles that are identified in the sample and corresponding background-subtracted TCL standard mass spectra. Spectra must be labeled with NYSDEC sample number, lab file ID, date, and time of analysis, and GC/MS instrument ID. Compound names must be clearly marked on all spectra.

1.6.2.5.2 Copies of mass spectra of organic compounds not listed in Exhibit C (Superfund-TCL) (Tentatively Identified Compounds), with associated best-match spectra (the three best matches), as labeled in 1.6.2.4 above.

1.6.3 Standards Data **<B-2>**

1.6.3.1 Initial Calibration Data (FORM VI VOA-1, VOA-2, VOA-3, VOA-SIM) – shall be included in order by instrument, if more than one instrument used. **<B-3>**

1.6.3.1.1 Volatile standard(s) reconstructed ion chromatograms and quantitation reports for the initial (five-point) calibration, as labeled in 1.6.2.4 above. Spectra are not required.

1.6.3.1.2 All initial calibration data that pertain to samples in the data package must be included, regardless of when it was performed and for which Case. When more than one initial calibration is performed, the data must be put in chronological order, by instrument.

1.6.3.1.3 Labels for standards shall be descriptive of the concentrations of the non-ketone (majority) analytes in µg/L.

1.6.3.1.4 EICPs displaying each manual integration.

1.6.3.2 Continuing Calibration (FORM VII VOA-1, VOA-2, VOA-3, VOA-SIM) – shall be included in order by instrument, if more than one instrument used. **<B-3>**

1.6.3.2.1 Volatile standard(s) reconstructed ion chromatograms and quantitation reports for all continuing (12-hour) calibration verifications, as labeled in 1.6.2.4. Spectra are not required.

1.6.3.2.2 When more than one Continuing Calibration Verification is performed, forms must be in chronological order, by instrument.

1.6.3.2.3 EICPs displaying each manual integration.

1.6.3.3 In all instances where the data system report has been edited, or where manual integration or quantitation has been performed, the GC/MS Operator shall identify such edits or manual procedures by initializing and dating the changes made to the report, and shall include the integration scan range. The GC/MS Operator shall also mark each integration area with the letter "m" on the quantitation report. In addition a hardcopy printout of the EICP of the quantitation ion displaying the manual integration shall be included in the raw data. This applies to all compounds listed in Exhibit C – Volatiles, internal standards, and system monitoring compounds.

1.6.4 Volatiles Raw QC Data **<B-2>**

1.6.4.1 4-Bromofluorobenzene (BFB) shall be arranged in chronological order by instrument for each 12-hour period, for each GC/MS system utilized. **<B-3>**

1.6.4.1.1 Bar graph spectrum, as labeled in 1.6.2.4.

1.6.4.1.2 Mass listing, as labeled in 1.6.2.4.

1.6.4.1.3 Reconstructed total ion chromatogram (RIC), labeled as in 1.6.2.4.

1.6.4.2 Blank Data shall be arranged by type of blank (method, storage, instrument) and shall be in chronological order, by instrument. **<B-3>**

***Note**: This order is different from that used for sample data (Section 1.6.2).*

1.6.4.2.1 Tabulated results (FORM I VOA-1, VOA-2, VOA-SIM).

1.6.4.2.2 Tentatively Identified Compounds (FORM I-TIC) – even if none are found.

1.6.4.2.3 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), as labeled as in 1.6.2.4.

1.6.4.2.4 Target compound spectra with laboratory-generated standard, labeled as in 1.6.2.4. Data systems that are incapable of dual display shall provide spectra in the following order:

- Raw target compound spectra;
- Enhanced or background-subtracted spectra;
- Laboratory generated standard spectra.

1.6.4.2.5 GC/MS library search spectra for Tentatively Identified Compounds (TIC), labeled as in 1.6.2.4.

1.6.4.2.6 Quantitation/calculation of TIC concentrations.

1.6.4.3 Matrix Spike Blank Data **<B-3>**

1.6.4.3.1 Tabulated results (FORM I VOA-1, VOA-2, VOA-SIM) of all target compounds. Form I VOA-TIC is <u>not</u> required.

1.6.4.3.2 Reconstructed ion chromatogram(s) and quantitation report(s), as labeled in 1.6.2.4. Spectra are <u>not</u> required.

1.6.4.4 Matrix Spike Data **<B-3>**

1.6.4.4.1 Tabulated results (FORM I VOA-1, VOA-2) of all target compounds. FORM I VOA-TIC is <u>not</u> required.

1.6.4.4.2 Reconstructed ion chromatogram(s) and quantitation report(s), as labeled in 1.6.2.4. Spectra are not required.

1.6.4.5 Matrix Spike Duplicate Data **<B-3>**

1.6.4.5.1 Tabulated results (FORM I VOA) of all target compounds. FORM I VOA-TIC is not required.

1.6.4.5.2 Reconstructed ion chromatogram(s) and quantitation report(s), as labeled in 1.6.2.4. Spectra are not required.

1.6.5 Copy of Calculations **<B-2>**

The Laboratory must provide a copy of the calculations work sheet showing how final results are obtained from values printed on the quantitation report. If manipulations are performed by a software package, a copy of the formula used must be supplied, as well as, values for all terms in the formula.

Note: *All correction factors and equations utilized must be indicated on the work sheet.*

1.6.6 Copy of Extraction Logs **<B-2>**

These logs must be legible and include: (1) date, (2) sample weights and volumes, (3) sufficient information to unequivocally identify which QC samples (i.e. matrix spike, matrix spike duplicate, matrix spike blank) correspond to each batch extracted, (4) comments describing any significant sample changes or reactions which occur during preparation, and (5) final volumes and vial identification numbers.

1.7 Semivolatiles Data **<B-1>**

1.7.1 Semivolatiles QC Summary **<B-2>**

1.7.1.1 System Monitoring Compound Percent Recovery Summary (FORM II SV-1, SV-2, SV-3, SV-4, SV-SIM).

1.7.1.2 Matrix Spike/Matrix Spike Duplicate Summary (FORM III SV-1, SV-2, SV-SIM) - Provided when an MS/MSD analysis is requested by NYS DEC.

1.7.1.3 Method Blank Summary (FORM IV SV, SV-SIM) – If more than a single form is necessary, forms shall be arranged in chronological order by date of analysis of the blank, by instrument.

1.7.1.4 GC/MS Instrument Performance Check (FORM V SV) – If more than a single form is necessary, forms shall be arranged in chronological order, by instrument.

Note: *This form is not required when submitting data for the analysis of Polynuclear Aromatic Hydrocarbons (PAHs)/phenols using the SIM technique.*

1.7.1.5 Internal Standard Area and RT Summary (FORM VIII SV-1, SV-2) – If more than a single form is necessary, the forms shall be arranged in chronological order, by instrument.

1.7.1.6 Instrument Detection Limits.

1.7.2 Semivolatile Sample Data (**<B-2>** to mark Section heading, **<B-3>** to mark the beginning of each data "packet")

Sample data shall be arranged in packets with the Semivolatile Organics Analysis Data Sheet (FORM I SV-1, SV-2, including FORM I SV-TIC), followed by the raw data for semivolatile samples. These sample packets should then be placed in increasing DEC sample number, considering both letters and numbers in ordering samples.

1.7.2.1 Target Compound Results, Semivolatiles Organics Analysis Data Sheet (FORM I SV-1, SV-2) – Tabulated results (identification and quantitation) of the specified target compounds (Exhibit C – CLP Semivolatiles) shall be included. The validation and release of these results are authorized by a specific, signed statement in the SDG Narrative (see Section 1.2). In the event that the Laboratory Manager cannot verify all data reported for each sample, the Laboratory Manager shall provide a detailed description of the problems associated with the sample in the SDG Narrative.

1.7.2.2 Semivolatile Tentatively Identified Compounds (FORM I SV-TIC) – Form I SV-TIC is the tabulated list of the highest probable match for up to 20 organic compounds that are not target compounds, system monitoring compound, internal standard compounds, and are not listed in Exhibit C – CLP Volatiles and Semivolatiles. It includes the CAS number (if applicable), tentative identification, and estimated concentration. For estimating concentration, assume a response factor of 1, and estimate the concentration by comparison of the compound peak height or total area count to the peak height or total area count of the nearest internal standard free of interferences on the reconstructed ion chromatogram. This form must be included even if no compounds are found. If this occurs, enter a "0" in the field for "Number found" on the form.

Note: *This form is not required when submitting data for the optional analysis of PAHs/phenols using the SIM technique.*

Note*: The Laboratory must be consistent, i.e., use peak height for all comparisons or use total area count for all comparisons.*

1.7.2.3 PAHs/Phenols Analysis Data Sheet (FORM I SV-SIM) – This data form shall be submitted upon the NYS DEC's request for optional analysis of PAHs/phenols using the SIM technique. The specific target PAHs/phenols listed in Exhibit C – CLP Semivolatiles shall be included. The validation and release of these results are authorized by a specific, signed statement in the SDG Narrative (see Section 1.2). In the event that the Laboratory Manager cannot verify all data reported for each sample, the Laboratory Manager shall provide a detailed description of the problems associated with the sample in the SDG Narrative.

1.7.2.4 Reconstructed Total Ion Chromatograms (RICs) (for each sample, including dilutions and reanalyzes). RICs must be normalized to the largest non-solvent component, and must contain the following header information:

- NYSDEC sample number;
- Date and time of analysis;
- GC/MS instrument ID;
- Lab file ID; and
- Analyst ID.

1.7.2.4.1 Internal standards and system monitoring compounds are to be labeled on RICs or SICPs with the names of compounds, either directly out from the peak, or are to be included on a printout of retention times if the retention times are printed directly over the peak.

1.7.2.4.2 If automated data system procedures are used for preliminary identification and/or quantification of the target compound, the complete data system report shall be included in all Sample Data Packages, in addition to the reconstructed ion chromatogram or SICP for optional PAHs/phenols analysis. The complete data system report shall include all of the information listed below. For laboratories that do not use the automated data system procedures, a laboratory "raw data sheet," containing the following information, shall be included in the Sample Data Package, in addition to the chromatogram.

- NYSDEC sample number

- Date and time of analysis
- RT or scan number of identified Superfund-TCL compounds
- Ion used for quantitation with measured area
- Copy of area table from data system
- GC/MS instrument ID
- Lab file ID

1.7.2.4.3 In all instances where the data system report has been edited, or where manual integration or quantitation has been performed, the GC/MS operator shall identify such edits or manual procedures by initialing and dating the changes made to the report, and shall include the integration scan range. The GC/MS operator shall also mark each integrated area with the letter "m" on the quantitation report. In addition, a hardcopy printout of the EICP of the quantitation ion displaying the manual integration shall be included in the raw data. This applies to all compounds listed in Exhibit C – CLP Semivolatiles, internal standards, and system monitoring compounds.

1.7.2.5 Other Required Information – For each sample, by each compound identified, the following shall be included in the data package:

1.7.2.5.1 Copies of raw spectra and copies of background-subtracted mass spectra of target compounds listed in Exhibit C – CLP Semivolatiles that are identified in the sample and corresponding background-subtracted target compound standard mass spectra. This includes PAH/phenol target compounds that are identified during the optional analysis using the SIM technique. Spectra shall be labeled with NYS DEC sample number, laboratory file ID, date, and time of analysis, and GC/MS instrument ID. Compound names must be clearly marked on all spectra.

1.7.2.5.2 Copies of mass spectra of non-system monitoring/non-internal standard organic compounds not listed in Exhibit C – CLP Semivolatiles with associated best-match spectra (maximum of three best matches). This

includes the mass spectra for tentatively identified alkanes. Spectra shall be labeled with NYS DEC Sample Number, laboratory file ID, date and time of analysis, and GC/MS instrument ID. Compound names shall be clearly marked on all spectra.

1.7.3 Semivolatiles Standards Data **<B-2>**

1.7.3.1 Initial Calibration Data (FORM VI SV-1, SV-2, SV-3) or FORM VI SV-SIM (when optional analysis of PAHs/phenols is performed) shall be included in order by instrument, if more than one instrument used. **<B-3>**

1.7.3.1.1 Semivolatile standard(s) reconstructed ion chromatograms and quantitation reports (or legible facsimile) for the initial (five-point) calibration, labeled in 1.7.2.4. Spectra are not required.

1.7.3.1.2 When optional analysis of PAHs/phenols is requested, then SICPs and quantitation reports for the initial calibration standards (five-point), labeled as in Section 1.7.2.4, shall be submitted. Spectra are not required.

1.7.3.1.3 All initial calibration data that pertain to samples in the data package shall be included, regardless of when it was performed and for which SDG. When more than one initial calibration is performed, the data must be put in chronological order, by instrument.

1.7.3.1.4 Labels for standards shall reflect the concentrations of the majority of the analytes in µg/L.

1.7.3.1.5 EICPs displaying each manual integration.

1.7.3.2 Continuing Calibration Verification Data (FORM VII SV-1, SV-2, SV-3) or FORM VII SV-SIM (when optional analysis of PAHs/phenols is performed) shall be included in order by instrument, if more than one instrument used. **<B-3>**

1.7.3.2.1 Semivolatile standard(s) reconstructed ion chromatograms and quantitation reports for all opening, closing, and continuing calibrations verifications, as labeled in Section 1.7.2.4. Spectra are not required.

1.7.3.2.2 When optional analysis of PAHs/phenols is requested, then SICPs and quantitation reports

for all opening, closing, and CCVs, labeled as in Section 1.7.2.4. Spectra are not required.

1.7.3.2.3 When more than one continuing calibration is performed, forms must be in chronological order, by instrument.

1.7.3.2.4 EICPs displaying each manual integration.

1.7.3.3 In all instances where the data system report has been edited, or where the manual integration or quantitation has been performed, the GC/MS Operator shall identify such edits or manual procedures by initialing and dating the changes made to the report, and shall include the integration scan range. The GC/MS Operator shall also mark each integration area with the letter "m" on the quantitation report. In addition, a hardcopy printout of the EICP of the quantitation ion displaying the manual integration shall be included in the raw data. This applies to all compounds listed in Exhibit C – CLP Semivolatiles, internal standards, and system monitoring compounds.

1.7.4 Semivolatiles Raw Quality Control (QC) Data **<B-2>**

1.7.4.1 Decafluorotriphenylphosphine (DFTPP) data shall be arranged in chronological order by instrument for each 12-hour period, for each GC/MS system utilized. **<B-3>**

1.7.4.1.1 Bar graph spectrum, as labeled in 1.7.2.4.

1.7.4.1.2 Mass listing, as labeled in 1.7.2.4.

1.7.4.1.3 Reconstructed total ion chromatogram (RIC), labeled as in 1.7.2.4.

1.7.4.2 Blank Data shall be in chronological order by extraction date. **<B-3>**

Note: *This order is different from that used for samples.*

1.7.4.2.1 Tabulated results (FORM I SV-1, SV-2, SV-SIM).

1.7.4.2.2 Tentatively Identified Compounds (FORM I SV-TIC) – even if none found.

1.7.4.2.3 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), as labeled in 1.7.2.4.

1.7.4.2.4 Target compound spectra with laboratory-generated standard, as labeled in 1.7.2.4. Data

systems that are incapable of dual display shall provide spectra in the following order:

- Raw target compound spectra;
- Enhanced or background-subtracted spectra;
- Laboratory-generated standard spectra.

1.7.4.2.5 GC/MS library search spectra for Tentatively Identified Compounds (TICs), as labeled in 1.7.2.4.

1.7.4.2.6 Quantitation/Calculation of TIC concentrations.

1.7.4.3 Semivolatiles Matrix Spike Blank Data **<B-3>**

1.7.4.3.1 Tabulated results (FORM I SV) of all target compounds. Form I SV-TIC not required.

1.7.4.3.2 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), as labeled in 1.7.2.4. Spectra are required.

1.7.4.4 Semivolatiles Matrix Spike Duplicate Data **<B-3>**

1.7.4.4.1 Tabulated results (FORM I SV-1, SV-2) of all target compounds. FORM I SV-TIC is not required.

1.7.4.4.2 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), as labeled in 1.7.2.4. Spectra are not required.

1.7.4.5 Semivolatile Gel Permeation Chromatography (GPC) Data – The two most recent Ultra Violet (UV) traces of the (GPC) calibration solution, and the reconstructed ion chromatogram and data system reports for the GPC blank shall be arranged in chronological order by GPC for the GPC calibration. **<B-3>**

1.7.4.5.1 Traces must be labeled with GPC column identifier, date of calibration, and with compound names labeled either directly out from the peak, or on a printout of retention times, if retention times are printed over the peak.

1.7.4.5.2 Reconstructed ion chromatogram and data system report(s) labeled as specified in Section 1.7.2.4 for the GPC blank analysis.

1.7.4.5.3 Reconstructed ion chromatogram and data system report(s) for all standards used to quantify compounds in the GPC blank, labeled, as specified in section 1.7.2.4.

1.7.5 Copy of Calculations **<B-2>**

The Laboratory must provide a copy of the calculations work sheet showing how final results are obtained from values printed on the quantitation report. If manipulations are performed by a software package, a copy of the formula used must be supplied as well as values for all terms in the formula.

Note: *All correction factors and equations utilized must be indicated on the work sheet.*

1.7.6 Copy of Extraction Logs **<B-2>**

These logs must be legible and include: (1) date, (2) sample weights and volumes, (3) sufficient information to unequivocally identify which QC samples (i.e. matrix spike, matrix spike duplicate, matrix spike blank) correspond to each batch extracted, (4) comments describing any significant sample changes or reactions which occur during preparation, and (5) final volumes and vial identification numbers.

1.8 Pesticide Data **<B-1>**

1.8.1 Pesticide QC Summary **<B-2>**

1.8.1.1 Surrogate Recovery (FORM II PEST-1, PEST-2)

1.8.1.2 Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank Recovery (FORM III PEST-1, PEST-2): MS/MSD is required for the Pesticide fraction of an SDG, unless otherwise specified by the NYS DEC.

1.8.1.3 Laboratory Control Sample Recovery (FORM III PEST-1, PEST-2).

1.8.1.4 Method Blank Summary (FORM IV PEST): If more than a single form is necessary, forms shall be arranged in chronological order by date of analysis of the blank.

1.8.2 Pesticide Sample Data (**<B-2>** to mark Section heading, **<B-3>** to mark the beginning of each data "packet")

Sample data shall be arranged in packets with the Pesticide Organic Analysis Data Sheet (FORM I PEST), followed by the raw data for pesticide samples. These sample packets should then be

placed in increasing NYSDEC sample number order, considering both letters and numbers in ordering samples.

1.8.2.1 Target Compound Results, Pesticide Organics Analysis Data Sheet (FORM I PEST). Tabulated results (identification and quantitation) of the specified target compounds (Exhibit C – CLP Pesticides) shall be included. The validation and release of these results is authorized by a specific, signed statement in the SDG Narrative (see Section 1.2). In the event that the Laboratory Manager cannot verify all data reported for each sample, the Laboratory Manager shall provide a detailed description of the problems associated with the sample in the SDG Narrative.

1.8.2.2 Copies of Pesticide Chromatograms. Positively identified compounds shall be labeled with the names of compounds, either directly out from the peak on the chromatogram, or on a printout of RTs on the data system printout if RTs are printed over the peak on the chromatogram. All chromatograms shall meet the acceptance criteria in Exhibit D, and shall be labeled with the following information:

- NYSDEC sample number;
- Volume injected (µL);
- Date and time of injection;
- On column concentration/ amount including units;
- GC column identifier (by stationary phase and internal diameter);
- GC instrument identifier; and
- Scaling factor (label the x and y axes using a numerical scale).

1.8.2.3 Copies of pesticide chromatograms from second GC column shall be included and labeled as in Section 1.8.2.2.

1.8.2.4 Data System Printout. A printout of RT, corresponding peak height or peak area, and on the column amount shall accompany each chromatogram. The printout shall be labeled with the NYS DEC sample number. In all instances where the data system report has been edited, or where manual integration or quantitation has been performed, the Gas Chromatograph/Electron Capture Detector (GC/ECD) Operator shall identify all such edits or manual procedures by initialing and dating the

changes made to the report, and shall include the integration time range. The GC/MS Operator shall also mark each integration area with the letter "m" on the quantitation report.

1.8.2.5 All manual worksheets shall be included in the Sample Data Package.

1.8.2.6 Other Required Information. If pesticides are confirmed by GC/MS, the Laboratory shall submit copies of reconstructed ion chromatograms, raw spectra, and background-subtracted mass spectra of target compounds listed in Exhibit C – CLP Pesticides that are identified in the sample and corresponding background-subtracted target compound standard mass spectra. Compound names shall be clearly marked on all spectra. For Toxaphene confirmed by GC/MS, the Laboratory shall submit mass spectra of 3 major peaks from samples and standards.

1.8.3 Pesticides Standards Data **<B-2>**

1.8.3.1 Initial Calibration of Single Component Analytes (FORM VI PEST-1, PEST-2): For all GC columns and instruments, in chronological order by GC column and instrument. **<B-3>**

1.8.3.2 Initial Calibration of Multicomponent Analytes (Toxaphene, etc.) (FORM VI PEST-3, PEST-4): For all GC columns and instruments, in chronological order by GC column and instrument. **<B-3>**

1.8.3.3 Analyte Resolution Check Summary (FORM VI PEST-5): For all GC columns and instruments, in chronological order by GC column and instrument. **<B-3>**

1.8.3.4 Performance Evaluation Mixture (PEM) (FORM VI PEST-6): For all GC columns and instruments, in chronological order by GC column and instrument. **<B-3>**

1.8.3.5 Individual Standard Mixture A (FORM VI PEST-7): For all GC columns and instruments, in chronological order by GC column and instrument. **<B-3>**

1.8.3.6 Individual Standard Mixture B (FORM VI PEST-8): For all GC columns and instruments, in chronological order by GC column and instrument. **<B-3>**

1.8.3.7 Individual Standard Mixture C (FORM VI PEST-9, PEST-10): For all GC columns and instruments, in chronological order by GC column and instrument. **<B-3>**

1.8.3.8 Calibration Verification Summary (FORM VII PEST-1): For all mid-point concentrations of Individual Standard Mixtures A and B or C and instrument blanks used for calibration verification, on all GC columns and instruments, in chronological order by GC column and instruments. **<B-3>**

1.8.3.9 Calibration Verification Summary (FORM VII Pest-2, Pest-3): For all mid-point concentrations of Individual Standard Mixtures A and B or C and instrument blanks used for calibration verification, on all GC columns and instruments, in chronological order by GC column and instrument. **<B-3>**

1.8.3.10 Analytical Sequence (FORM VIII PEST): For all GC columns and instruments, in chronological order by GC column and instrument. **<B-3>**

1.8.3.11 Florisil Cartridge Check (FORM IX PEST-1): For all lots of cartridges used to process samples in the SDG, using Individual Standard Mixtures A or C. **<B-3>**

1.8.3.12 GPC Calibration Verification (FORM IX PEST-2): For all GPC columns, in chronological order by calibration verification date. **<B-3>**

1.8.3.13 Identification Summary for Single Component Analytes (FORM X PEST): For all samples with positively identified single component analytes, in order by increasing NYSDEC Sample Number. **<B-3>**

1.8.3.14 Chromatograms and data system printouts are required for all standards including the following: **<B-3>**

- Resolution Check Mixture.
- Performance Evaluation (PE) mixtures, all.
- Individual Standard Mixture A and B, both at five concentrations, for each initial calibration and Individual Standard Mixture B, at five concentrations, for each initial calibration.

Or

- Individual Standard Mixture C, at five concentrations, each initial calibration.
- Toxaphene, at five concentrations, each initial calibration.

- All mid-point concentrations of Individual Standard Mixtures A and B or C used for calibration verification.
- All toxaphene standards analyzed for confirmation.
- All lots of Florisil cartridge check solution
- Pesticide GPC Calibration Check Solution, all calibrations relating to samples in the SDG.
- All multicomponent analyte standards analyzed for confirmation.

1.8.3.15 A printout of RT and corresponding peak height or peak areas shall accompany each chromatogram. The printout shall be labeled with the NYSDEC Sample Number. In addition, all chromatograms shall meet the acceptance criteria in Exhibit D, and shall be labeled with the following: **<B-3>**

- NYSDEC Sample Number for the standard (e.g., INDA10K, INDA20K, etc., See Forms Instructions for details);
- Label all standard peaks for all individual compounds either directly out from the peak or on the printout of retention times if retention times are labeled over the peak;
- Total nanograms injected for each standard. When total nanograms injected appear on the printout, it is not necessary to include them on the chromatogram;
- Date and time of injection;
- GC column identifier (by stationary phase and internal diameter);
- GC instrument identifier; and
- Scaling factor (label the x and y axes using a numerical scale).

Note: *In all instances where the data system report has been edited, or where manual integration or quantitation has been performed, the GC/ECD Operator shall identify such edits or manual procedures by initialing and changes made to the report, shall include the integration time range. The GC/MS Operator shall also mark each integrated area with the letter "m" on the quantitation report.*

1.8.4 Pesticides Raw Quality Control (QC) Data **<B-2>**

1.8.4.1 Blank Data shall be arranged by type of blank (method, instrument, sulfur cleanup) and shall be in chronological order by instrument. **<B-3>**

1.8.4.1.1 Tabulated results (FORM I PEST).

1.8.4.1.2 Chromatogram(s) and data system printout(s) (GC) for each GC column and instrument used for analysis, as labeled in 1.8.2.2 and 1.8.2.4 above.

1.8.4.2 Pesticide LCS Data **<B-3>**

1.8.4.2.1 Tabulated results (FORM I PEST) of target compounds for both GC columns.

1.8.4.2.2 Chromatogram(s) and data system printout(s) (GC) for each GC column and instrument used for analysis, as labeled in 1.8.2.2 and 1.8.2.4 above.

1.8.4.3 Pesticides Matrix Spike Data **<B-3>**

1.8.4.3.1 Tabulated results (FORM I PEST) of target compounds for both GC columns.

1.8.4.3.2 Chromatogram(s) and data system printout(s) (GC) for each GC column and instrument used for analysis, as labeled in 1.8.2.2 and 1.8.2.4 above.

1.8.4.4 Pesticides Matrix Spike Duplicate Data **<B-3>**

1.8.4.4.1 Tabulated results (FORM I PEST) of target compounds for both GC columns.

1.8.4.4.2 Chromatogram(s) and data system printout(s) (GC) for each GC column and instrument used for analysis, as labeled in 1.8.2.2 and 1.8.2.4 above.

1.8.4.5 Matrix Spike Blank Data **<B-3>**

1.8.4.5.1 Tabulated results (FORM I-CLP-PEST) of all Superfund-TCL compounds.

1.8.4.5.1.1 Chromatogram(s) and data system printout(s) (GC), as labeled in 1.8.2.2 and 1.8.2.4 above.

1.8.5 Raw Gel Permeation Chromatograph (GPC) Data **<B-2>**

1.8.5.1 GPC Calibration. The UV traces for the GPC calibration solution, chromatograms, and the data system reports for the GPC blank shall be arranged in chronological order for the GPC calibration.

1.8.5.1.1 UV traces labeled with the GPC column identifier, date of calibration, and compound names. Compound names shall be placed directly out from the peak, or on the printout of the RTs when the RTs are printed directly over the peak.

1.8.5.1.2 Chromatograms and data system report(s) labeled as specified in Sections 1.8.2.2 and 1.8.2.4 above.

1.8.5.1.3 Chromatograms and data system report(s) for all standards used to identify compounds in the GPC blank labeled as specified in Section 1.8.3.14 and 1.8.3.15 (i.e., Individual Standard Mixture A, Individual Standard Mixture B, Individual Standard Mixture C, and the Toxaphene standards).

1.8.5.2 GPC Calibration Verification. The Chromatogram and the data system report(s) shall be arranged in chronological order for the GPC calibration check.

1.8.5.2.1 Chromatograms and data system printouts labeled as specified in Sections 1.8.2.2 and 1.8.2.4 for the GPC calibration verification solution analyses.

1.8.5.2.2 Chromatogram and the data system report(s) for the standards used to quantify compounds in the GPC calibration verification solution labeled as specified in Section 1.8.3.14 and 1.8.3.15 (i.e., Individual Standard Mixtures A and B or C from the initial calibration sequence).

1.8.6 Raw Florisil Data **<B-2>**

1.8.6.1 The chromatogram and the data system report(s) shall be arranged in chronological order by Florisil cartridge performance check analysis.

1.8.6.1.1 Chromatograms and data system reports, labeled as specified in Sections 1.8.2.2 and 1.8.2.4 for the Florisil cartridge performance check analysis.

1.8.6.1.2 Chromatograms and data system reports for standard analyses used to quantify compounds in the Florisil cartridge performance check analysis, labeled as specified in Section 1.8.3.14 and 1.8.3.15 (i.e., Individual Standard Mixture A, Individual Standard Mixture B, Individual Standard Mixture C, and the 2,4,5-Trichlorophenol solution).

1.8.7 Copy of Calculations **<B-2>**

The Laboratory must provide a copy of the calculations work sheet showing how final results are obtained from values printed on the quantitation report. If manipulations are performed by a software package, a copy of the formula used must be supplied as well as values for all terms in the formula.

Note: *All correction factors and equations utilized must be indicated on the work sheet.*

1.8.8 Copy of Extraction Logs **<B-2>**

These logs must be legible and include: (1) date, (2) sample weights and volumes, (3) sufficient information to unequivocally identify which QC samples (i.e. matrix spike, matrix spike duplicate, matrix spike blank) correspond to each batch extracted, (4) comments describing any significant sample changes or reactions which occur during preparation, and (5) final volumes and vial identification numbers.

1.9 Aroclor Data **<B-1>**

1.9.1 Aroclor QC Summary **<B-2>**

1.9.1.1 Surrogate Recovery (FORM II ARO-1, ARO-2).

1.9.1.2 Matrix Spike/Matrix Spike Duplicate Recovery (FORM III ARO-1, ARO-2): MS/MSD is required for the Aroclor fraction, unless otherwise specified by NYSDEC. One MS/MSD set is required per SDG.

1.9.1.3 LCS Recovery (FORM III ARO-3, ARO-4).

1.9.1.4 Method Blank Summary (FORM IV ARO): If more than a single form is necessary, forms shall be arranged in chronological order by date of analysis of the blank.

1.9.2 Aroclor Sample Data (**<B-2>** to mark Section heading, **<B-3>** to mark the beginning of each data "packet")

Sample data shall be arranged in packets with Aroclors Organics Analysis Data Sheet (FORM 1 ARO), followed by the raw data for Aroclor samples. These sample packets should then be placed in

order of increasing NYSDEC Sample Number, considering both letters and numbers.

Note: *For a Sample analysis in which "S" flags are reported a FORM I ARO is required for the original analysis (NYSDEC Sample Number = XXXXX) in which the "S" flags are reported, and a FORM I ARO is required for the billable reanalysis (NYSDEC Sample Number = XXXXXRE) of the sample performed after a valid 5-point calibration of the detected Aroclor. An additional FORM I ARO is required for any necessary dilutions (NYSDEC Sample Number = XXXXXDL).*

1.9.2.1 Target Compound Results, Aroclors Organics Analysis Data Sheet (FORM I ARO). Tabulated results (identification and quantification) of the specified target compounds (Exhibit C – Aroclors) shall be included. The validation and release of these results is authorized by a specific, signed statement in the SDG Narrative (Section 1.2). In the event that the Laboratory Manager shall provide a detailed description of the problems associated with the sample in the SDG Narrative.

1.9.2.2 Copies of Aroclor Chromatograms. Positively identified compounds shall be labeled with the names of compounds, either directly out from the peak on the chromatogram, or on a printout of the RTs on the data system printout if the RTs are printed over the peak on the chromatogram. All chromatograms shall meet the acceptance criteria in Exhibit D, and shall be labeled with the following information:

- EPA Sample Number;
- Volume injected (µL);
- Date and time of injections;
- On column concentration/amount including units;
- GC column identifier (by stationary phase and internal diameter);
- GC instrument identifier; and
- Scaling factor (label the x and y axes using a numerical scale).

1.9.2.3 Copies of Aroclor chromatograms for the second GC column shall be included and labeled as in Section 1.9.2.2.

1.9.2.4 Data System Printout

A printout of RT, corresponding peak height or peak area, and the on column amount shall accompany each

chromatogram. The printout shall be labeled with the EPA Sample Number and standard concentration level. In all instances where the data system report has been edited, or where manual integration or quantitation has been performed, the GC/ECD Operator must identify such edits or manual procedures by initialing and dating the changes made to the report, and shall include the integration time range. The GC/MS Operator shall also mark each integrated area with the letter "m" in the quantitation report.

1.9.2.5 All manual worksheets shall be included in the Sample Data Package.

1.9.2.6 Other Required Information. If Aroclors are confirmed by GC/MS, the Contractor shall submit copies of reconstructed ion chromatograms. Raw spectra and background-subtracted mass spectra must be submitted for at least three major peaks of Aroclor target compounds (see Exhibit C – Aroclors) that are identified in the sample and corresponding standard mass spectra. Compound names shall be clearly marked on all spectra.

1.9.3 Aroclor Standard Data **<B-2>**

1.9.3.1 Initial Calibration of Aroclors (FORM VI ARO-1, ARO-2, and ARO-3): For all GC columns, all instruments, in chronological order by GC column and instrument. **<B-3>**

1.9.3.2 Calibration Verification Summary (FORM VII ARO): For all calibration verification standards on all GC columns and instruments, in chronological order by GC column and instruments. **<B-3>**

1.9.3.3 Analytical Sequence (FORM VIII ARO): For all GC columns and instruments, in chronological order by GC column and instrument. **<B-3>**

1.9.3.4 Identification Summary for Multicomponent Analytes (FORM X ARO): For all samples with positively identified Aroclors, in order by increasing EPA Sample Number. **<B-3>**

1.9.3.5 Chromatograms and data system printouts shall be included for all standards, including the following:

- All Aroclor standards used for initial calibration on each column and instrument.
- All Aroclor standards used for calibration verification on each GC column and instrument.

- All Aroclor standards analyzed for confirmation.

1.9.3.6 A printout of RT and corresponding peak height or peak area shall accompany each chromatogram. The printout shall be labeled with the EPA Sample Number. In addition, all chromatograms shall meet the acceptance criteria in Exhibit D, and shall be labeled with the following:

- NYSDEC Sample Number for the standard (e.g., AR10161OK, AR12601OK).
- Label all standard peaks with the compound name, either directly out from the peak on the chromatogram, or on the printout of RTs on the data system printout, if RTs are printed over the peak on the chromatogram.
- Total nanograms injected for each standard. When total nanograms injected appear on the printout, it is not necessary to include them on the chromatogram.
- Date and time of injection.
- GC column identifier (by stationary phase and internal diameter).
- GC instrument identifier.
- Scaling factor (label the x and y axes using a numerical scale).

Note: *In all instances where the data system report has been edited, or where manual integration or quantitation has been performed, the GC/ECD Operator shall identify such edits or manual procedures by initialing and dating the changes made to the report, and shall include the integration time range. The GC/MS Operator shall also mark each integrated area with the letter "m" on the quantitation report.*

1.9.4 Aroclor Raw Quality Control (QC) Data **<B-2>**

1.9.4.1 Blank data shall be arranged in chronological order by extraction data. **<B-3>**

Note: *This order is different from that used for samples.*

- Tabulated results (FORM I ARO).
- Chromatogram(s) and data system printout(s) for each GC column and instrument used for analysis, labeled as in Sections 1.9.2.2 and 1.9.2.4.

1.9.4.2 Aroclor Laboratory Control Sample (LCS) Data **<B-3>**

- Tabulated results (FORM I ARO) of target compounds for both GC columns.

- Chromatograms and data system printouts for both GC columns, labeled as in Sections 1.9.2.2 and 1.9.2.4.

1.9.4.3 Aroclors Matrix Spike Data **<B-3>**

- Tabulated results (FORM I ARO) of target compounds for both GC columns.

- Chromatograms and data system printouts for both GC columns, labeled as in Sections 1.9.2.2 and 1.9.2.4.

1.9.4.4 Aroclors Matrix Spike Duplicate Data **<B-3>**

- Tabulated results (FORM I ARO) of target compounds for both GC columns.

- Chromatograms and data system printouts for both GC columns, labeled as in Sections 1.9.2.2 and 1.9.2.4.

1.9.5 Raw Gel Permeation Chromatography (GPC) Data **<B-2>**

1.9.5.1 GPC Calibration. The UV traces for the GPC calibration solution, chromatograms, and the data system reports for the GPC blank shall be arranged in chronological order for the GPC calibration.

- UV traces labeled with the GPC column identifier, date of calibration, and compound names. Compound names shall be placed directly out from the peak, or on the printout of RTs when the RTs are printed directly over the peak.

- Chromatograms and data system report(s) labeled as specified in Sections 1.9.2.2 and 1.9.2.4 for the GPC blank analyses.

- Chromatogram and data system report(s) for all standards used to assess the Aroclor pattern, labeled as specified in Section 1.9.2.2 and 1.9.2.4 (i.e., AR10161OK, AR12601OK from the initial calibration).

1.9.5.2 GPC Calibration Verification. The chromatogram and the data system reports(s) shall be arranged in chronological order for the GPC calibration check.

- Chromatograms and data system report(s) for standards used to assess the Aroclor pattern, labeled as specified in Sections 1.9.2.2 and 1.9.2.4 (i.e., Aroclor Standard Mixture 1016/1260 from the initial calibration sequence).

1.9.6 Copy of Calculations **<B-2>**

The Laboratory must provide a copy of the calculations work sheet showing how final results are obtained from values printed on the quantitation report. If manipulations are performed by a software package, a copy of the formula used must be supplied as well as values for all terms in the formula.

Note: *All correction factors and equations utilized must be indicated on the work sheet.*

1.9.7 Copy of Extraction Logs **<B-2>**

These logs must be legible and include: (1) date, (2) sample weights and volumes, (3) sufficient information to unequivocally identify which QC samples (i.e. matrix spike, matrix spike duplicate, matrix spike blank) correspond to each batch extracted, (4) comments describing any significant sample changes or reactions which occur during preparation, and (5) final volumes and vial identification numbers.

1.10 Inorganic Data **<B-1>**

Sample data shall be submitted with the Inorganic Analysis Data Reporting Forms for all samples in the SDG, arranged in increasing alphanumeric NYSDEC sample number order, followed by the QC analyses data, quarterly and annual verification of method and instrument parameter forms, raw data, and copies of the digestion and distillation logs.

1.10.1 Results – Inorganic Analysis Data Sheet [FORM IA-IN and FORM IB-IN] – Tabulated analytical results (identification and quantitation) of the requested analytes (Exhibit C) must be accompanied by a signed statement in the SDG narrative. This signature validates and allows for the release the results. If the Laboratory Manager cannot validate all data reported for each sample, he/she must provide a detailed description of the problems associated with the sample(s) on the Cover Page. (**<B-2>** marking the beginning of results from each new fraction and/or analysis method)

1.10.1.1 Appropriate concentration units must be specified and entered on FORM IA-IN and FORM IB-IN. The quantitative values shall be reported in units of micrograms per liter (µg/L) for aqueous samples and milligrams per kilogram (mg/kg) for solid samples. Other units are acceptable only for trace level analyses. Results for solid sample must be reported

on a dry weight basis. Analytical results must be reported to two significant figures if the result value is less than 10 and to three significant figures if the value is greater than or equal to 10. Results for percent solids must be reported to one decimal place. The preceding discussion concerning significant numbers applies to FORM IA-IN, IB-IN, and IX-IN only. For the other forms, follow the Reporting Requirements and Order of Data Deliverables (Con't) instructions specific to those forms as discussed in this exhibit.

1.10.2 Quality Control (QC) Data **<B-2>**

1.10.2.1 The QC Summary for inorganic analysis shall contain the forms listed below.

Note: *If more than one form is necessary, duplicate forms must be arranged in chronological order.*

1.10.2.1.1 Initial and Continuing Calibration Verification [FORM IIA-IN] **<B-3>**

1.10.2.1.2 CRQL Check Standard [FORM IIB-IN]

1.10.2.1.3 Blanks [Form III-IN] **<B-3>**

1.10.2.1.4 ICP-AES Interference Check Sample [FORM IVA-IN] **<B-3>**

1.10.2.1.5 ICP-MS Interference Check Sample [FORM IVB-IN] **<B-3>**

1.10.2.1.6 Matrix Spike Sample Recovery [FORM VA-IN] **<B-3>**

1.10.2.1.7 Post-Digestion Spike Sample Recovery [FORM VB-IN] **<B-3>**

1.10.2.1.8 Duplicates [FORM VI-IN] **<B-3>**

1.10.2.1.9 Laboratory Control Sample [FORM VII-IN] **<B-3>**

1.10.2.1.10 ICP-AES and ICP-MS Serial Dilutions [FORM VIII-IN] **<B-3>**

1.10.2.1.11 Method Detection Limits (Annually) [FORM IX-IN] **<B-3>**

1.10.2.1.12 ICP-AES Interelement Correction Factors (Quarterly) [FORM XA-IN] **<B-3>**

1.10.2.1.13 ICP-AES Interelement Correction Factors (Quarterly) [FORM XB-IN] **<B-3>**

1.10.2.1.14 ICP-AES and ICP-MS Linear Ranges (Quarterly) [FORM XI-IN] **<B-3>**

1.10.2.1.15 Preparation Log [FORM XII-IN] **<B-3>**

1.10.2.1.16 Analysis Run Log [FORM XIII-IN] **<B-3>**

1.10.2.1.17 ICP-MS Tune [FORM XIV-IN] **<B-3>**

1.10.2.1.18 ICP-MS Internal Standards Relative Intensity Summary [FORM XV-IN] **<B-3>**

***Note**: Copies of Verification of Instrument Parameters forms for the current quarter must be submitted with each data package*.

1.10.3 Raw Data **<B-2>**

For each reported value, the Laboratory shall include in the Sample Data Package all raw data from the instrument used to obtain that value. This applies to all required QA/QC measurements, instrument standardization, as well as all sample results. This statement does not apply to the quarterly and annual Verifications of Instrument Parameters submitted as part of each Sample Data Package. When analysis of the ICP-AES or ICP-MS target analytes listed in Exhibit C (or any subset or additional analytes) is requested, the raw data shall include, for all samples, not only the results for the requested analytes(s), but also those for all the interferents. The raw data shall also contain the results of any other analyte(s), which have been determined to interfere with the requested analyte(s).

1.10.3.1 Raw data must contain all instrument readouts and data pertinent to the reconstruction of the analysis and results (e.g., Batch Sheets) used for the sample results. Each exposure or instrumental reading shall be provided, including those readouts that may fall below the Method Detection Limit (MDL). Raw data shall not be corrected for dilutions or volume adjustments. All Atomic Absorption (AA), Inductively Coupled Plasma – Atomic Emission Spectrometry (ICP-AES), and Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) instruments shall provide a legible hardcopy of the direct real-time instrument readout (i.e., strip charts, printer tapes, etc.) or a printout of the unedited instrument data output file. A photocopy of the instrument's direct sequential readout shall be included. A hardcopy of the instrument's direct sequential readout shall be included for cyanide if the instrument has the capability.

1.10.3.2 The order of raw data in the Sample Data Package for inorganic analyses shall be: ICP-AES, Graphite Furnace Atomic Adsorption (GFAA), ICP-MS, Mercury, and Cyanide. All raw data shall include concentration units for ICP and absorbance or concentration units for AA, Mercury, and Cyanide. (**<B-3>** marking the beginning of raw data for each separate method)

1.10.3.3 The ICP-MS raw data shall also contain the turbidity measurement results [in Nephelometric Turbidity Units (NTU)] for the field samples.

1.10.3.4 Corrections to the laboratory data reporting forms and raw data shall be made by drawing single lines through the errors and entering the correct information. Information shall not be obliterated or rendered unreadable. Corrections and additions to information shall be signed (or initialed) and dated.

1.10.3.5 Raw data shall be labeled with NYSDEC sample number and appropriate codes, as shown in Exhibit B, "Table 2 – Codes for Labeling Data", to unequivocally identify:

- Calibration standards, including source and preparation date. Standard preparation logbooks can be submitted if they contain this information;
- Initial and Continuing Calibration Blanks (ICBs/CCBs) and Preparation Blanks (PBs).
- Initial and Continuing Calibration Verification (ICV/CCV) standards, Interference Check Samples, serial dilution samples, Contract Required Quantitation Limit (CRQL), Check Standard (CRI), Laboratory Control Sample (LCS), and Post Digestion Spike;
- Diluted and undiluted samples (by NYSDEC sample number) and all weights, dilutions, and volumes used to obtain the reported values (if the volumes, weights and dilutions are consistent for all samples in a given SDG, a general statement outlining these parameters is sufficient);
- Duplicates;
- Spikes (indicating standard solutions used, final spike concentrations, and volumes involved). If spike information (source, concentration, volume) is consistent for a given SDG, a general statement outlining these parameters is sufficient;

- Instrument used, any instrument adjustments, data corrections or other apparent anomalies on the measurement record, including all data voided or data not used to obtain reported values and a brief written explanation; and

- Time and date of each analysis. Instrument run logs can also be submitted if they contain time and date of analysis. If the instrument does not automatically provide times of analysis, these shall be manually entered on all raw data (e.g., ICV/CCV, blanks, and the CRQL check standard.

- All information for furnace analysis clearly and sequentially identified on the raw data, including DEC sample number, sample and analytical spike data, percent recovery, coefficient of variation, full MSA data, MSA correlation coefficient, slope and intercepts of linear fit, final sample concentration (standard addition concentration), and type of background correction used (BS for Smith-Heiftje, BD for deuterium Arc, or BZ for Zeeman).

- Integration times for AA analyses.

1.10.3.6 Digestion and Distillation Logs. The following logs shall be submitted as appropriate for each preparation procedure: digestion logs for ICP-AES, ICP-MS, mercury preparations, and cyanide. These logs shall include: (1) date; (2) sample weights and volumes, with initial sample weight/volume and final volume clearly indicated; (3) sufficient information to unequivocally identify which QC samples (i.e., LCS, PB) correspond to each batch digested; (4) comments describing any sufficient sample changes or reactions which occur during preparation shall be entered in the log and noted in the SDG Narrative; (5) indication of pH less than 2 or greater than 12, as applicable; and (6) identification of the sample preparer(s) [signature(s)]. **<B-3>**

1.10.4 Copy of Calculations – The Laboratory must provide a copy of the calculations work sheet showing how final results are obtained from values printed on the instrument output report. If manipulations are performed by a software package, a copy of the formula used must be supplied, as well as, values for all terms in the formula. **<B-2>**

Note: *All correction factors and equations utilized must be indicated on the work sheet.*

2.0 ASP Category A

2.1 Cover Documentation **<B-1>** - See Requirements listed in Section 1.1 above.

2.2 SDG Narrative **<B-1>** - See Requirements listed in Section 1.2 above.

2.2.1 In addition to the requirements listed in Section 1.2, the Laboratory shall also document any out of range QC parameters associated with the data. Indicate what QC parameters were out of control, the limit that was exceeded, the result of the QC in exceedance, what samples are associated with that QC item, and how the results of those samples may be affected by the out of range QC.

2.3 Contract Lab Sample Information Sheets **<B-2>** - See Requirements listed in Section 1.4 above.

2.4 Chain-of-Custody Forms **<B-1>** - See Requirements listed in Section 1.5 above.

2.5 NYSDEC Data Package Summary Forms **<B-1>** - Requirements and Instructions for these forms are listed in Section IV of this Exhibit.

2.6 GC/MS Volatiles Data **<B-1>**

2.6.1 Sample Data

Sample data shall be arranged in packets consisting of the respective "Organic Analysis Data Sheet" (FORM I VOA-1, VOA-2) followed by the FORM I VOA-TIC for that sample. These packets shall be arranged in order of increasing NYSDEC sample number, considering both numbers and letters. For a detailed explanation of the Volatile FORM I requirements, see Sections 1.6.2.1 and 1.6.2.2 above.

2.7 GC/MS Semivolatiles Data **<B-1>**

2.7.1 Sample Data

Sample data shall be arranged in packets consisting of the respective "Organic Analysis Data Sheet" (FORM I SV-1, SV-2, SV-SIM) followed by the FORM I SV-TIC for that sample. These packets shall be arranged in order of increasing NYSDEC sample number, considering both numbers and letters. For a detailed explanation of the Semivolatile FORM I requirements, see Sections 1.7.2.1, 1.7.2.2, and 1.7.2.3 above.

2.8 Pesticide Data **<B-1>**

2.8.1 Sample Data

Sample data shall be reported on individual "Organic Analysis Data Sheet(s)" (FORM I PEST). These forms shall be arranged in order of increasing NYSDEC sample number, considering both

numbers and letters. For a detailed explanation of the Pesticide FORM I requirements, see Sections 1.8.2.1, above.

2.9 Aroclor Data **<B-1>**

2.9.1 Sample Data

Sample data shall be reported on individual "Organic Analysis Data Sheet(s)" (FORM I ARO). These forms shall be arranged in order of increasing NYSDEC sample number, considering both numbers and letters. For a detailed explanation of the Aroclor FORM I requirements, see Sections 1.9.2.1, above.

2.10 GC Organic Data (Includes all Organic data generated using a GC or GC-type instrument that does not fit into any of the categories listed in Sections 2.6-2.9.) **<B-1>**

2.10.1 Sample Data

Sample data should be reported using modified versions of the "FORM I" used in the above organic categories. Questions regarding the modification of the FORM I's for this data should be directed to the NYSDEC Quality Standards and Analytical Management Section. See also Section 3.10 for further explanation.

2.11 Inorganic Data **<B-1>**

2.11.1 Sample Data

Sample data shall be submitted with the "Inorganic Analysis Data Reporting Forms" (FORM IA-IN and FORM IB-IN) for all samples in the SDG, arranged in increasing alphanumeric NYSDEC sample number order. For a detailed explanation of the Inorganic FORM I requirements, see Sections 1.10.2, above.

2.12 Toxicity Characteristic Leaching Procedure (TCLP) Data **<B-1>**

2.12.1 Sample Data (**<B-2>** the beginning of data for each unique analysis fraction)

Sample data shall be submitted on modified reporting forms based on the reporting forms used in Sections 2.6-2.11. The analysis specific FORM I's should be modified to include the following TCLP specific information, either in the footer or the header of the form:

- Matrix of Original Sample
- % Solid content of the sample, if the sample was a filterable liquid please fill this field with "<0.5%".
- Start date/time of TCLP extraction

- End date/time of TCLP extraction
- Start Temperature of TCLP extraction room
- End Temperature of TCLP extraction room.
- TCLP Fluid used (#1 or #2)
- Sample pH
- Ending extract pH

3.0 ASP Category B

3.1 Cover Documentation **<B-1>** - See Requirements listed in Section 1.1 above.

3.2 SDG Narrative **<B-1>** - See Requirements listed in Section 1.2 above.

3.3 Contract Lab Sample Information Sheets **<B-1>** - See Requirements listed in Section 1.4 above.

3.4 Chain-of-Custody Forms **<B-1>** - See Requirements listed in Section 1.5 above.

3.5 NYSDEC Data Package Summary Forms **<B-1>** - Requirements and Instructions for these forms are listed in Section IV of this Exhibit.

3.6 GC/MS Volatiles Data **<B-1>**

3.6.1 Volatiles QC Summary **<B-2>**

3.6.1.1 System Monitoring Compound Summary – See requirements listed in Section 1.6.1.1.

3.6.1.2 Matrix Spike/Matrix Spike Duplicate Summary – See requirements listed in Section 1.6.1.2.

3.6.1.3 QC Check Sample/Standard – (If Applicable) Reported on a modified version of FORM I VOA-1, VOA-2. The form should be modified in such a way that the header clearly states that the results being reported are from a "QC Check Sample/Standard".

3.6.1.4 Method Blank Summary – See requirements listed in Section 1.6.1.3.

3.6.1.5 GC/MS Instrument Performance Check – See requirements listed in Section 1.6.1.4.

3.6.1.6 Internal Standard Area and RT Summary – See requirements listed in Section 1.6.1.5.

3.6.1.7 Instrument Detection Limits – Reported on a modified version of FORM I VOA-1, VOA-2. The form should be modified in such a way that the header clearly states that the results being reported are the statistically determined detection limits for a given instrument using a given method. Detection limits should be determined annually. The "Q" column on the FORM I's should not be used.

3.6.2 Sample Data **<B-2>**

Sample Data should be reported in the same format and order as detailed in Section 1.6.2.

3.6.3 Standards Data **<B-2>**

Standard Data should be reported in the same format and order as detailed in Section 1.6.3.

3.6.4 Raw QC Data **<B-2>**

Raw QC Data should be reported in the same format and order as detailed in Section 1.6.4. In addition to the requirements listed in Section 1.6.4, the raw data for "QC Check Sample/Standard" should be reported following the raw data for "Matrix Spike Duplicate Data" as follows:

3.6.4.1 QC Check Sample/Standard **<B-3>**

3.6.4.1.1 Tabulated results (FORM I-VOA) of <u>all</u> target compounds. FORM I-VOA-TIC is <u>not</u> required.

3.6.4.1.2 Reconstructed ion chromatograms(s) and quantitation reports(s) or legible (GC/MS), labeled as in Section 1.6.2.4. Spectra are <u>not</u> required.

3.6.5 Copy of Calculations **<B-2>**

Please provide copies of calculations as specified in Section 1.6.5.

3.6.6 Copy of Extraction Logs **<B-2>**

Please provide copies of extraction logs as specified in Section 1.6.6.

3.7 GC/MS Semivolatiles Data **<B-1>**

3.7.1 QC Summary **<B-2>**

3.7.1.1 System Monitoring Compound Summary – See requirements listed in Section 1.7.1.1.

3.7.1.2 Matrix Spike/Matrix Spike Duplicate Summary – See requirements listed in Section 1.7.1.2.

3.7.1.3 QC Check Sample/Standard – (If Applicable) Reported on a modified version of FORM I SV-1, SV-2. The form should be modified in such a way that the header clearly states that the results being reported are from a QC Check Sample/Standard.

3.7.1.4 Method Blank Summary – See requirements listed in Section 1.7.1.3.

3.7.1.5 GC/MS Instrument Performance Check – See requirements listed in Section 1.7.1.4.

3.7.1.6 Internal Standard Area and RT Summary – See requirements listed in Section 1.7.1.5.

3.7.1.7 Instrument Detection Limits – Reported on a modified version of FORM I SV-1, SV-2. The form should be modified in such a way that the header clearly states that the results being reported are the statistically determined detection limits for a given instrument using a given method. Detection limits should be determined annually. The "Q" column on the Form Is should not be used.

3.7.2 Sample Data **<B-2>**

Sample Data should be reported in the same format and order as detailed in Section 1.7.2. In addition to all the requirements listed under Section 1.7.2, any GPC Chromatograms produced during the analysis of the samples should be included at the end of Section 3.7.2.

3.7.3 Standards Data **<B-2>**

Standard Data should be reported in the same format and order as detailed in Section 1.7.3. In addition to all the requirements listed under Section 1.7.3, data for "Semivolatile GPC Calibration Data" should be listed as follows:

3.7.3.1 Semivolatile GPC Calibration Data – UV detector traces showing peaks that correspond to the compounds in the semivolatile GPC calibration mixture. Traces must be labeled with GPC column identifier, date of calibration, and with compound names labeled either directly out from the peak, or on a printout of retention times, if retention times are printed over the peak. Do not include FORM IX Pest-2, as the compounds used on that form

are not appropriate for semivolatile sample extracts. **<B-3>**

3.7.4 Raw QC Data **<B-2>**

Raw QC Data should be reported in the same format and order as detailed in Section 1.7.4. In addition to the requirements listed in Section 1.7.4, the following should be added directly after the raw data for "Matrix Spike Duplicate Data" but before the GPC Raw QC data:

3.7.4.1 QC Check Sample/Standard **<B-3>**

3.7.4.1.1 Tabulated results (FORM I-SV) of all target compounds. FORM I-SV-TIC is not required.

3.7.4.1.2 Reconstructed ion chromatograms(s) and quantitation reports(s) or legible (GC/MS), labeled as in Section 1.7.2.4. Spectra are not required.

3.7.5 Copy of Calculations **<B-2>**

Please provide copies of calculations as specified in Section 1.7.5.

3.7.6 Copy of Extraction Logs **<B-2>**

Please provide copies of extraction logs as specified in Section 1.7.6.

3.8 GC/ECD and GC/MS Pesticide Data **<B-1>**

3.8.1 QC Summary **<B-2>**

3.8.1.1 System Monitoring Compound Summary – See requirements listed in Section 1.8.1.1.

3.8.1.2 Matrix Spike/Matrix Spike Duplicate Summary – See requirements listed in Section 1.8.1.2.

3.8.1.3 Laboratory Control Sample Recovery – See requirements listed in Section 1.8.1.3.

3.8.1.4 QC Check Sample/Standard – (If Applicable) Reported on a modified version of FORM I PEST-1. The form should be modified in such a way that the header clearly states that the results being reported are from a QC Check Sample/Standard.

3.8.1.5 Method Blank Summary – See requirements listed in Section 1.8.1.4.

3.8.1.6 GC/MS Instrument Performance Check – (if Applicable) No Form exists for this requirement. A Narrative statement should be included for GC/MS pesticide data. The narrative should document the following.

- Frequency at which instrument performance checks were performed. Include the date and time the check was run and the sample runs (file IDs) associated with the check.
- The results of the Instrument Performance Check (Pass or Fail).
- The criteria used to evaluate the acceptance of the check.

3.8.1.7 Instrument Detection Limits – Reported on a modified version of FORM I PEST-1. The form should be modified in such a way that the header clearly states that the results being reported are the statistically determined detection limits for a given instrument using a given method. Detection limits should be determined annually. The "Q" column on the Form Is should not be used.

3.8.2 Sample Data **<B-2>**

Sample Data should be reported in the same format and order as detailed in Section 1.8.2, up to and including Section 1.8.2.5 (omit 1.8.2.6). In addition to all the requirements listed under Section 1.8.2, please include the following:

3.8.2.1 UV traces from GPC (if GPC performed).

3.8.2.2 If pesticides are confirmed by GC/MS or run solely via GC/MS, the Laboratory shall submit copies of reconstructed ion chromatograms, raw spectra and copies of background-subtracted mass spectra of Pesticide target compounds listed in Exhibit C that are identified in the sample and corresponding background-subtracted Superfund-TCL standard mass spectra. Compound names must be clearly marked on all spectra. For multi-component pesticides/Aroclors confirmed by GC/MS, the Laboratory shall submit mass spectra of 3 major peaks of multi-component compounds from samples and standards.

3.8.3 Standards Data **<B-2>**

Standard Data should be reported in the same format and order as detailed in Section 1.8.3. For the purposes of NYSDEC ASP Category B reporting the requirements of Section 1.8.3.4-7 may be omitted. In addition to the requirements of Section 1.8.3, please include the following:

3.8.3.1 Pesticide GPC Calibration Data – UV detector traces showing peaks that correspond to the compounds in the pesticide GPC calibration mixture. Traces must be labeled with GPC column identifier, date of calibration, and with compound names labeled either directly out from the peak, or on a printout of retention times, if retention times are printed over the peak. **<B-3>**

3.8.4 Raw QC Data **<B-2>**

Raw QC Data should be reported in the same format and order as detailed in Section 1.8.4. In addition to the requirements listed in Section 1.8.4, the following should be added directly after the raw data for "Matrix Spike Duplicate Data":

3.8.4.1 QC Check Sample/Standard **<B-3>**

3.8.4.1.1 Tabulated results (FORM I-PEST) of all target compounds.

3.8.4.1.2 Chromatogram(s) and data system printout(s) (GC), as labeled in Section 1.8.2.2.

3.8.5 Copy of Calculations **<B-2>**

Please provide copies of calculations as specified in Section 1.8.5.

3.8.6 Copy of Extraction Logs **<B-2>**

Please provide copies of extraction logs as specified in Section 1.8.6.

3.9 GC/ECD and GC/MS Aroclor Data **<B-1>**

3.9.1 QC Summary **<B-2>**

3.9.1.1 System Monitoring Compound Summary – See requirements listed in Section 1.9.1.1.

3.9.1.2 Matrix Spike/Matrix Spike Duplicate Summary – See requirements listed in Section 1.9.1.2.

3.9.1.3 Laboratory Control Sample Recovery – See requirements listed in Section 1.9.1.3.

3.9.1.4 QC Check Sample/Standard – (If applicable) Reported on a modified version of FORM I ARO. The form should be modified in such a way that the header clearly states that the results being reported are from a QC Check Sample/Standard.

3.9.1.5 Method Blank Summary – See requirements listed in Section 1.9.1.4.

3.9.1.6 GC/MS Instrument Performance Check – (if Applicable) No Form exists for this requirement. A Narrative statement should be included for GC/MS Aroclor data. The narrative should document the following.

- Frequency at which instrument performance checks were performed. Include the date and time the check was run and the sample runs (file IDs) associated with the check.
- The results of the Instrument Performance Check (Pass or Fail)
- The criteria used to evaluate the acceptance of the check.

3.9.1.7 Instrument Detection Limits – Reported on a modified version of FORM I ARO. The form should be modified in such a way that the header clearly states that the results being reported are the statistically determined detection limits for a given instrument using a given method. Detection limits should be determined annually. The "Q" column on the Form Is should not be used.

3.9.2 Sample Data **<B-2>**

Sample Data should be reported in the same format and order as detailed in Section 1.9.2. In addition to all the requirements listed under Section 1.9.2, please include the following:

3.9.2.1 UV traces from GPC (if GPC performed).

3.9.2.2 If pesticides are confirmed by GC/MS or run solely via GC/MS, the Laboratory shall submit copies of reconstructed ion chromatograms, raw spectra and copies of background-subtracted mass spectra of Pesticide target compounds listed in Exhibit C that are identified in the sample and corresponding background-subtracted Superfund-TCL standard mass spectra. Compound names must be clearly marked on all spectra. For multi-component pesticides/Aroclors confirmed by GC/MS, the Laboratory shall submit mass spectra of 3 major peaks of multi-component compounds from samples and standards.

3.9.3 Standards Data **<B-2>**

Standard Data should be reported in the same format and order as detailed in Section 1.9.3. In addition to the requirements of Section 1.9.3, please include the following:

3.9.3.1 Pesticide GPC Calibration Data – UV detector traces showing peaks that correspond to the compounds in the pesticide GPC calibration mixture. Traces must be labeled with GPC column identifier, date of calibration, and with compound names labeled either directly out from the peak, or on a printout of retention times, if retention times are printed over the peak. **<B-3>**

3.9.4 Raw QC Data **<B-2>**

Raw QC Data should be reported in the same format and order as detailed in Section 1.9.4. In addition to the requirements listed in Section 1.9.4, the following should be added directly after the raw data for "Matrix Spike Duplicate Data":

3.9.4.1 QC Check Sample/Standard **<B-3>**

3.9.4.1.1 Tabulated results (FORM I ARO) of all target compounds.

3.9.4.1.2 Chromatogram(s) and data system printout(s) (GC), as labeled in Section 1.9.2.2.

3.9.5 Copy of Calculations **<B-2>**

Please provide copies of calculations as specified in Section 1.9.5.

3.9.6 Copy of Extraction Logs **<B-2>**

Please provide copies of extraction logs as specified in Section 1.9.6.

3.10 GC Organic Data **<B-1>**

On occasion NYSDEC may require samples to be analyzed by various GC methods for organic analytes. The reporting of these analytes represents a challenge because no EPA CLP forms exist to report this data. Since most environmental reporting software packages are very rigid in their output formats, it is prohibitive for NYSDEC to develop specialized reporting forms for GC organic data. NYSDEC recognizes that some software venders have created "CLP-like" reporting for GC organic data, and when feasible NYSDEC recommends the use of such software for this data. If such software is not available or unobtainable to the laboratory, the laboratory should modify and use the reporting formats and reports specified in Sections 1.6, 1.7, 1.8, and 1.9. The order of the reporting elements should be unaltered from the original Section being modified. If the reporting software package allows, the identifier for the Forms should be changed to "GC" (i.e. FORM I GC, FORM II GC, etc.). The basic structure of this reporting section should be as follows:

3.10.1 QC Summary **<B-2>**

3.10.1.1 Surrogate/System Monitoring Compounds Recovery Reports (FORM II GC)

3.10.1.2 Matrix Spike/Matrix Spike Duplicate Summary (FORM III GC)

3.10.1.3 QC Check Sample/Standard (FORM I GC + Raw Data)

3.10.1.4 Method Blank Summary (FORM IV GC)

3.10.1.5 Instrument Detection Limits (Performed annually)

3.10.2 Sample Data **<B-2>**

3.10.2.1 Results and raw data for each individual sample should be assembled in packets as follows, and placed in order according to NYSDEC Sample ID, from lowest to highest:

3.10.2.1.1 Target Compound Results (FORM I GC)

3.10.2.1.2 Manual calculation worksheets, if applicable,

3.10.2.1.3 Appropriate raw instrument data**,**

3.10.2.1.4 GPC chromatograms or other qualitative sample specific clean-up data, if applicable.

3.10.3 Standards Data **<B-2>**

3.10.3.1 Initial Calibration Data

3.10.3.2 Continuing Calibration Data

3.10.3.3 Standard chromatograms and data system printouts for all standards.

3.10.4 Copy of Calculations **<B-2>**

3.10.5 Copy of Extraction Logs **<B-2>**

3.11 Inorganic Data **<B-1>**

Sample data shall be submitted with the Inorganic Analysis Data Reporting Forms for all samples in the SDG, arranged in increasing alphanumeric DEC sample number order, followed by the QC analysis data, Quarterly Verification of Instrument Parameter forms, raw data, and copies of the digestion and distillation logs.

3.11.1 Results – Should be reported on FORM IA-IN and FORM IB-IN, and reported according to the specifications in Section 1.10.1. **<B-2>**

3.11.2 Quality Control Data – Should be reported and ordered per the specifications listed above in Section 1.10.2. Verification of Instrument Parameters should also be reported in this Section. Frequency of verifications is unmodified from the CLP requirements. **<B-2>**

3.11.3 Raw Data – Should be reported and ordered per the specifications listed above in Section 1.10.3. **<B-2>**

3.11.4 Digestion and Prep Logs – Should be reported and ordered per the specifications listed above in Section 1.10.4. **<B-2>**

3.12 Wet Chemistry Data **<B-1>**

On occasion NYSDEC may require samples to be analyzed by wet chemistry methods for "conventional" analytes. The reporting of these analytes represents a challenge because no EPA CLP forms exist to report such data. Since most environmental reporting software packages are very rigid in their output formats, it is prohibitive for NYSDEC to develop specialized reporting forms for wet chemistry analysis data. NYSDEC recognizes that some software venders have created "CLP-like" reporting for wet chemistry parameters, and when feasible NYSDEC recommends the use of such software for this data. If such software is not available or unobtainable to the laboratory, the laboratory should modify and use the reporting formats and reports specified in Sections 1.10 (Inorganics). The order of the reporting elements should be unaltered from the original Section being modified. If the reporting software package allows, the identifier for the Forms should be changed to "WC" (i.e. FORM I-WC, FORM II-WC, etc.). The basic structure of this reporting section should be as follows:

3.12.1 Results – Modified Inorganic Analysis Data Sheet **<B-2>**

Tabulated analytical results (identification and quantitation) of the specified analytes (Exhibit C) must be accompanied by a specific, signed statement in the SDG Narrative, which authorizes the validation and release of analytical results (Section 1.2). If the Laboratory Manager cannot validate all data reported for each sample, he/she must provide a detailed description of the problems associated with the sample(s) on the Cover Page.

Appropriate concentration units must be specified and entered on FORM I-WC. The quantitative values shall be reported in units of micrograms per liter (µg/L) for aqueous samples and milligrams per kilogram (mg/kg) for solid samples. Units may be adjusted in order to make excessively large or small concentration numbers more manageable. Results for solid samples must be reported on a dry weight basis. Analytical results must be reported to two significant figures if the result value is less than 10; to three significant figures if the value is greater than or equal to 10. Results for percent solids must be

reported to one decimal place. Data qualifiers should be added according to Table 2.

3.12.2 Quality Control Data – include each only when applicable to the parameter being analyzed. **<B-2>**

3.12.2.1 Initial and Continuing Calibration Verification

3.12.2.2 CRQL Standard for Wet-Chemistry Analysis

3.12.2.3 Blanks

3.12.2.4 Spike Sample Recovery

3.12.2.5 Post Digest Spike Sample Recovery

3.12.2.6 Duplicates

3.12.2.7 Laboratory Control Sample

3.12.2.8 Holding Times

3.12.3 Raw Data **<B-2>**

For each reported value, the Laboratory shall include in the data package all raw data from the instrument used to obtain that value and the QA/QC values reported (except for raw data for Verifications of Instrument Parameters). Raw data must contain all instrument readouts used for the sample results, including those readouts that may fall below the IDG. ALL instruments must provide a legible hard copy of the direct real-time instrument readout (i.e., stripcharts, printer tapes, etc.). A photocopy of the direct sequential instrument readout must be included. A hardcopy of the direct instrument readout for cyanide must be included if the instrumentation has the capability. All raw data shall include absorbance values with concentration units (unless instrument direct readout is in concentration units). A photocopy of manual worksheets used must be included for all non-instrumental parameters. Raw data must be labeled with NYSDEC sample number or be associated to a group of NYSDEC sample numbers for the following:

3.12.3.1 Calibration standards, including source and prep date.

3.12.3.2 Initial and continuing calibration blanks and preparation blanks.

3.12.3.3 Initial and continuing calibration verification standards.

3.12.3.4 Diluted and undiluted samples (by NYSDEC sample number) and all weights, dilutions and volumes used to obtain the reported values. (If the volumes, weights, and dilutions are consistent for all samples in a given

SDG, a general statement outlining these parameters is sufficient).

3.12.3.5 Duplicates.

3.12.3.6 Spikes (indicating standard solutions used, final spike concentrations, volumes involved). If spike information (source, concentration, volume) is consistent for a given SDG, a general statement outlining these parameters is sufficient.

3.12.3.7 Instrument used, any instrument adjustments, data corrections, or other apparent anomalies on the measurement record, including all data voided or data not used to obtain reported values and a brief written explanation.

3.12.3.8 Time and date of each analysis. Instrument run logs can be submitted if they contain this information. If the instrument does not automatically provide times of analysis, these must be manually entered on all raw data for initial and continuing calibration verification and blanks, as well as, interference check samples and linear range analysis.

3.12.4 Digestion and Distillation Logs **<B-2>**

These logs must include: (1) date, (2) sample weights and volumes, (3) sufficient information to unequivocally identify which QC samples (i.e., laboratory control sample, preparation blank) correspond to each batch digested, (4) comments describing any significant sample changes or reactions which occur during preparation, and (5) indication of pH <2 or >12, as applicable.

3.13 Toxicity Characteristic Leaching Procedure (TCLP) Data **<B-1>**

Sample data shall be submitted with the Toxicity Characteristic Leaching Procedure Analysis Data Reporting Forms for all samples in the SDG, arranged in packets by analysis fraction. The packets shall consist of the sample results in increasing alphanumeric DEC sample number order, followed by the QC analyses data, Verification of Instrument Parameters forms, raw data, and copies of the digestion and distillation logs pertaining to that analysis fraction. The logbook page or pages dedicated to the TCLP extraction procedure should be included at the end of all the packets for the applicable analysis fractions.

Neither NYSDEC nor EPA CLP have created specific forms for reporting the results of TCLP extracted analytes. Due to the lack of any standardized forms for this data, it is unlikely that any commercial software would be or will be available to report TCLP analysis data. NYSDEC requests that the laboratory report TCLP analysis results on the analogous FORM *X* reports for each analysis and/or QC procedure

performed on the TCLP extraction fluid. The only modification to the traditional CLP-type Forms specified for use in the NYSDEC ASP is that these forms clearly be marked either in the header or in the footer comments that the results being reported on the form are from the analysis of a TCLP extract. If feasible the codes for the forms should be modified and a final suffix of "-TCLP" should be added. For example a "FORM 1 VOA-1" reported for the analysis of a TCLP extract would be "FORM 1 VOA-1-TCLP".

Note: *Data for every separate analysis performed on a TCLP extract should be separated and marked with a second level bookmark* ***(<B-2>)****.*

3.13.1 Results – Toxicity Characteristic Leaching Procedure (TCLP) Analysis Data Sheet (TCLP Modified FORM Is) **<B-3>**

Tabulated analytical results (identification and quantitation) of the specified analytes (Exhibit C) must be accompanied by a specific, signed statement in the SDG Narrative, which authorizes the validation and release of analytical results (Section 3.1). If the Laboratory Manager cannot validate all data reported for each sample, he/she must provide a detailed description of the problems associated with the sample(s) on the Cover Page.

Appropriate concentration units must be specified and entered on TCLP Modified FORM Is. The quantitative values shall be reported in units of milligrams per liter (mg/L). No other units are acceptable. Analytical results must be reported to two significant figures if the result value is less than 10; to three significant figures if the value is greater than or equal to 10. Results for percent solids must be reported to one decimal place. Qualifiers are to be added according to Table 1 and Table 2.

3.13.1.1 Organic Data Results – Should be reported in order by NYSDEC Sample ID, with the raw data and TIC's (if applicable) directly following the modified FORM I from the sample. See specifications in Sections 1.6.2, 1.7.2, 1.8.2, and 1.9.2 for instructions of reporting sample result for TCLP Organics

3.13.1.2 Inorganic Data Results – Should be reported according to the specifications listed in Section 1.10.1. Raw data will not be assembled directly after the sample data, but included later in Section 3.14.4.

3.13.2 TCLP Quality Control Data – quality control reporting should be accomplished in a manner similar to that used to report sample data on the modified FORM I's above. The key features of all CLP or CLP-like reporting forms should be retained, while notation should be added to denote that the results being reported are from the analysis of a TCLP extract. **<B-3>**

3.13.2.1 Organic Analysis of TCLP Extracts

3.13.2.1.1 Report all QC data according to the specifications listed in Sections 1.6.1, 1.7.1, 1.8.1, and 1.9.1.

3.13.2.2 Inorganic analysis of TCLP Extracts

3.13.2.2.1 Report all QC data according to the specifications listed in Section 1.10.2.

3.13.3 Verification of Instrument Parameters **<B-3>**

3.13.3.1 Organic Analysis of TCLP Extracts – Not required to be included in data package.

3.13.3.2 Inorganic analysis of TCLP Extracts – Data pertaining to the verification of inorganic instrument parameters relative to TCLP extract analysis should be reported according to the specifications in Section 1.10.3.

Note: *Copies of Verification of Instrument Parameters forms for the current quarter must be submitted with each data package.*

3.13.4 Raw Data **<B-3>**

3.13.4.1 Organic Raw Data – Raw data supporting sample results should be included in Section 3.13.1.

3.13.4.1.1 Standards Data – This section should include the raw data for calibration and calibration verifications run to support the analysis of the TCLP extract. See Sections 1.6.3, 1.7.3, 1.8.3, and 1.9.3 for instructions and specifications.

3.13.4.1.2 Raw QC Data – This section should include the raw data need to support the QC results reported in Section 3.13.2.1. The data should be presented and arranged according to the specifications in Sections 1.6.5, 1.7.5, 1.8.5, and 1.9.5.

3.13.4.2 Inorganic Raw Data – Raw data supporting the results reported in Section 3.13.1 and Section 3.13.2 should be included in this section. The raw data should follow the order and format specified in section 1.10.3.

3.13.5 Prep/Digestion Logs (Analysis Specific) – Directly following the Forms and raw data for a fraction packet, all applicable preparation and digestion logs should be included that are relevant to that analysis fraction. **<B-3>**

3.13.6 Prep Logs (TCLP Specific) – A report or copy of the logbook for the TCLP extraction process is required. If multiple TCLP extraction batches were performed within the SDG, a report or logbook page per TCLP batch is required. This report should include the following information: **<B-2>**

- NYSDEC Sample IDs
- Laboratory Sample IDs
- Sample Matrix
- % Total Solids for Sample
- Extract Filterable or Non-filterable
- Average Particle Size in Sample
    - Was Sample Particle Size Reduced?
- Data on Extraction Fluid Determination
    - Initial pH of Sample
    - pH of Sample after Addition of Acid
    - Extraction Fluid Used (Type 1 or Type 2)
- Data on the Extraction Fluid
    - Extraction Fluid Type
    - Extraction Fluid Batch ID
    - Initial pH of Fluid
- Amount (grams) of Sample Extracted
- TCLP Extraction Start Date and Time
- Temperature of TCLP Extraction Room at Start Time
- TCLP Extraction End Date and Time
- Temperature of TCLP Extraction Room at End Time
- pH of TCLP Extract at End Time

F. – Data In Computer Readable Form

Exhibit H details the requirements for electronic data deliverables (EDDs) and any other sample data submissions required to comply with NYSDEC database requirements.

For the purposes of this Protocol, and specifically Exhibit H, Sample Data Packages and Sample Summary Data Packages in the form of .PDF files are not considered “Data In

Computer Readable Form". Requirements for .PDF files are given in this Exhibit, under Section V.

G. – Electronic Instrument Data

The Laboratory must archive all raw and processed instrument data on portable electronic storage media, in the format specified by the instrument manufacturer. Portable electronic storage media can be any of the following: magnetic tapes, CD-ROM, DVD-ROM, DAT, ZIP Disks, or any other portable storage media meeting the following requirements: must be "locked, read only" after the initial "write" to the media, stable over time, easily stored on site. Data may be archived to a non-portable media such as an auxiliary hard drive, but the capability must exist to extract data upon request from NYSDEC. Data archived to an auxiliary hard drive must meet the following criteria: (a) the capability must exist to migrate the files back into the instruments data system in order to generate/regenerate appropriate analysis data and (b) the capability must exist to transfer archived files to portable storage media in order to ship the raw data to NYSDEC. This storage media must contain all instrument files used directly or indirectly to construct the NYSDEC Sample Data Packages. NYSDEC related instrument files do not need to be archived separately if the lab uses an all-inclusive archive technique for instrument data. Output files subject to this archive requirement include, but are not limited to, samples, blanks, spikes, matrix spikes, matrix spike duplicates, calibration standards, continuing calibrations, instrument tunes, as well as all laboratory-generated spectral libraries and quantitation reports required to generate the data package. The Laboratory shall maintain a written reference logbook of stored files to NYSDEC sample number, calibration data, standards, blanks, matrix spikes, and matrix spike duplicates. The logbook should include NYSDEC sample numbers and standard and blank ID's, identified by Case and Sample Delivery Group.

The Laboratory is required to retain the stored files for 3 years after data submission. During that time, the Laboratory shall submit copies of archived files and associated logbook pages within seven days after receipt of a written request from the Bureau of Watershed Assessment and Management.

H. – Samples and Extracts

1.0 Unused and Excess Sample Amounts

After the required sample aliquot has been successfully analyzed and reported, the Laboratory shall preserve any unused and excess sample amounts at the required storage temperature and conditions as specified in Exhibit I. Samples should be stored in their original containers, clearly lableled with their NYSDEC Sample Numbers and associated Case and SDG numbers. The Laboratory is required to retain samples for 365 days following data submission. During that time, the Laboratory shall submit samples and associated custody documents within seven days following receipt of a written request from the Bureau Watershed Assessment and Management or the Project Officer.

2.0 Sample Extracts (Organincs only)

The Laboratory shall preserve sample extracts at a temperature less than 4°C in bottles/vials with Teflon-lined septa. Extract bottles/vials shall be labeled with

NYSDEC sample number, Case number, and Sample Delivery Group (SDG) number. The Contractor shall maintain a logbook of stored extracts, listing NYSDEC Sample Numbers and associated Case and SDG numbers. The Laboratory is required to retain extracts for 365 days following data submission. During that time, the Laboratory shall submit extracts and associated logbook pages within seven days following receipt of a written request from the Bureau Watershed Assessment and Management or the Project Officer.

I. – Verification of Instrument Parameters

1.0 Organic Verifications

The contractor shall perform and report annual verification of MDLs by the technique specified in 40 CFR Part 136 using the analytical methods specified in Exhibit D (by type, matrix, and model for each instrument used on the contract) to the Bureau of Watershed Assessment and Management. All the MDLs shall meet the CRQLs specified in Exhibit C.

2.0 Inorganic Verifications

The Laboratory shall perform verification of instrument detection limits, method detection limits, correction factors, and linear ranges for those instrument-types specified in Exhibit E. The methods and frequency for such verifications are detailed in Exhibit E. For the ICP instrumentation and methods, the Laboratory shall also report annually interelement correction factors (including method of determination), wavelengths used, and integration times. Verification of Instrument Parameters forms for the current period shall be submitted in each Sample Delivery Group data package, using Forms X, XI, and XII. Submission of Full Verification of Instrument Parameters shall include the raw data used to determine those values reported.

3.0 All Analyses

Method Detection Limit (MDL) Study is to be performed at minimum annually, or for each new instrument brought into service, whichever is more frequent. Some analyses and methods may require more frequent running of the MDL study. If a method requires more frequent running of the MDL study, that requirement supercedes the annual requirement set herein. The information on current and past MDL studies should be maintained on file at the laboratory. The Laboratory shall maintain records for any and all instrument performance verifications performed for a period of 3 years. During that time, the Laboratory shall submit copies of such records within seven days following receipt of a written request from the Bureau Watershed Assessment and Management or the Project Officer.

J. – Preliminary Results

1.0 Organic Preliminary Results

The FORM I data results shall be submitted for all samples in one SDG of a Case. This includes tabulated target compound results (FORM I *XXXX-X*) for the volatile, semivolatile, pesticide, and Aroclor fractions, and Tentatively Identified

Compounds (FORM I *XXXX*-TIC) for the volatile and semivolatile fractions. The contractor shall clearly identify the Preliminary Results by labeling each FORM I and FORM I TIC as "Preliminary Results" under each form title (e.g., under "Volatile Organics Analysis Data Sheet", "Volatile Organics Analysis Data Sheet Tentatively Identified Compounds").

2.0 Inorganic Preliminary Results

The FORM I IN data results (including all appropriate qualifiers and flags) shall be submitted for all samples in one SDG of a Case. Sample analysis shall follow all requirements stipulated in the Method, Exhibit D. The Contractor shall clearly identify the Preliminary Results by labeling each FORM I as "Preliminary Results" under the form title (e.g., under "Inorganic Analysis Data Sheet"). The Contractor shall also include a disclaimer in the "Comments" field on all Form Is stating that the "Data results contained on the Form I are for scanning purposes only, and may not have been validated for CLP/ASP criteria." Copies of Sample Traffic Reports/Chain of Custody Records shall be submitted with the Preliminary Results.

3.0 All Preliminary Results (Organic and Inorganic)

Copies of Sample Traffic Reports/Chain of Custody Records shall be submitted with the Preliminary Results. The Contractor shall also submit a Cover Page following the specifications in Exhibit B, Part E, Section 1.1. In addition, the Cover Page shall be clearly labeled to indicate that the data being reported are Preliminary Results. The Cover Page shall contain the following statement, (usually included in the SDG Narrative) verbatim: **"I certify that these Preliminary Results are in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or the Manager's designee, as a verified by the following signature."** This statement shall be directly followed by the signature of the Laboratory Manager or designee with typed lines containing the signer's name and title, and the date of signature.

K. – Results of PE Samples

Results of Performance Evaluation (PE) Samples should be reported similar to a standard environmental sample with deliverables as specified in Items E and F (Sample Data Package (.PDF) and Electronic Data Deliverables (EDD)).

Table 1

List of Organic Method Qualifiers

Qualifier (Q)	Description
B	Entered if the analyte is found in the associated blank as well as the sample.
C	Applied to pesticide results when the identification has been confirmed by GC/MS.
D	Included when the all identified compounds in the analysis are at the secondary dilution factor.
E	Identified compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.
J	Indicates an estimated value, may indicate one of the following, depending on the situation: (1) The reported value is estimated and below the MDL. (2) Used when estimating a concentration for TIC where a 1:1 response is assumed or when the result indicates the presence of a compound that meets the identification criteria, but the results is less than the quantitation limit, but greater than zero. (3) QC associated with this analyte is within warning limits.
N	Included for TIC that indicate presumptive evidence of a compound.
U	Entered if the analyte was analyzed for, but not detected.
P	Used for a pesticide/Aroclor target analyte when the concentration difference between 2 GC columns is greater than 25%; the lower value is flagged with a "P".
EMPC	"Estimated Maximum Possible Concentration" – The amount of analyte cannot be accurately quantified, so a maximum concentration has been estimated for the compound.
"XYZ"	"Wildcard" or Laboratory defined qualifier.

Note: *Form I allows only one character in each qualifier column. If multiple qualifiers are applicable, please assess qualifier priority in the following order: U, E, J, B, D, C, P, N. Reporting done in the EDD may include multiple qualifiers when applicable, separated by a single space.*

Table 2

List of Inorganic Method Qualifiers

Qualifier	Column[1]	Description
Concentration qualifiers		
B	C	Entered if the reported value was less than the CRDL, but greater than the IDL.
U	C	Entered if the analyte was analyzed for, but not detected.
J	C	Entered if the reported value is estimated and below the MDL.
*	C	Duplicate precision exceeds RPD limit.
M	C	Replicate precision exceeds RPD limit.
"XYZ"	C	"Wildcard" or Laboratory defined qualifier.
Qualifier specific entries		
E	Q	Entered if the reported value is estimated because of the presence of interferences.
Method qualifiers		
A	M	Flame atomic absorption
AS	M	Semi-automated spectrophotometric
AV	M	Automated cold vapor atomic absorption
C	M	Manual spectrophotometric
F	M	Furnace atomic absorption
MS	M	Mass spectrometry (ICP-MS)
NR	M	Analyte is not required to be analyzed
P	M	Inductively coupled plasma (ICP)
" "	M	No data have been entered

[1] The term "Column" is used to indicate under which column heading in the reporting forms that the qualifier will be found under.

Note: *Form I allows only one character in each qualifier column. If multiple qualifiers are applicable to column C, please assess qualifier priority in the following order: U, J, B. Reporting done in the EDD may include multiple qualifiers when applicable, separated by a single space.*

PART III -- CLP REPORTING FORMS AND INSTRUCTION GUIDE

1.0 NYSDEC has not created any specific reporting forms for the purpose of ASP reporting. Since most data is now reported using software formatted to produce data in the EPA CLP or EPA CLP-Like Forms, the ASP relies on the forms and instructions specified by the EPA in the CLP. Copies of the CLP SOWs, containing the required Organic and Inorganic Reporting forms and their instructions, can be found in ASP Exhibit D, in the CLP folder.

2.0 The Exhibit B forms and instructions contained in the CLP SOWs can be followed verbatim in most cases. Please note that the following exceptions and modifications to the CLP Forms and Form Instructions should be made.

2.1 Substitutions, General

- All references to "USEPA" or "EPA" should be substituted with "NYSDEC".
- All references to "EPA Sample Number" should be substituted with "NYSDEC Sample Number".
- All references to the "CLP SOW" or "SOW" should be substituted with "NYSDEC ASP" or "ASP", respectively.
- All references to "USEPA Regional Contract Laboratory Program Project Officer (CLP PO)", "USEPA OERR Analytical Operations/Data Quality Center (AOC)" and "Inorganic Program Manager (AOC PM)" should be substituted with "NYSDEC Bureau of Watershed Assessment and Management".
- The "Laboratory Code" to be used on all reporting documents should be the NYSDOH ELAP code assigned to the laboratory.

2.2 All references to the following can be disregarded:

- Non-Routine Analytical Services (NRAS)
- Sample Traffic Reports

2.3 The Forms and Instructions for Organic Data Reporting should follow CLP, Draft SOM01.X, Exhibit B with the following exceptions:

- References to "Modification Reference Number" or "Mod. Ref. Num." can be omitted or ignored in ASP reporting.

2.4 The Forms and Instructions for Inorganic Data Reporting should follow CLP, ILM05.3, Exhibit B, Section 3 with the following exceptions (All Section Numbers refer to directly to the CLP documents):

- The items under Section 3.3.5 may be disregarded.

- The requirement listed in Section 3.4.1.2.1 requiring the entry of the Statement of Work as “ILM05.3” should be modified and the label “ASP2004” should be inserted in the field for the SOW.

- Section 3.6 (CSF Instructions) may be disregarded.

PART IV -- NYSDEC DATA PACKAGE SUMMARY FORMS

The completion of Data Package Summary Forms is no longer a standard requirement for NYSDEC sample data or sample data packages. However for a small portion of NYSDEC Projects, completion of summary forms will be requested and required. These requests will be dependent upon the needs of the data users at NYSDEC. NYSDEC may also request changes in the style and content of the summary forms from those given herein.

The Data Package Summary Forms provided in this Exhibit are similar to the summary forms requested by NYSDEC in the past. If summary forms are requested and no specific template or blank forms have been provided to the laboratory, the following forms should be considered the default format. If custom forms are requested, the laboratory must report the summary data in the format requested. When summary data is requested in a non-standard format, the Laboratory should anticipate that the amount of information required in the summary forms would be similar to the amount of data required to complete the standard summary forms.

Instructions for NYSDEC Data Package Summary Forms

I. Sample Identification and Analytical Requirement Summary (Form S-I)

A. NYSDEC Sample ID/Code

Sample code number or ID assigned to the sample by NYSDEC personnel.

B. Laboratory Sample ID/Code

Code number given to respective sample by the laboratory and used for identification throughout analysis.

C. Analytical Requirements

This column is broken down into 6 sub-columns. The heading of each sub-column is an analytical parameter group. If the sample listed in a row is being analyzed for the parameter group listed at the top of the sub-column, complete the box below with the method number being used to analyze that sample for that parameter group. If no analysis is being performed in that parameter group, the space should be left blank.

II. Sample Preparation and Analysis Summary - Semivolatile (BNA), Volatile (VOA), and Pesticides/PCB's (Form S-IIa/b/c)

A. Laboratory Sample ID

The sample code number that the laboratory will use throughout the analysis for a specific sample.

B. Matrix

Label the sample with matrix indicated as water, soil, oil, grease, or drum solvent, etc.

C. Date Collected

Record the date that sample was collected on site.

D. Date Received at Laboratory

Record the date the Laboratory received the sample. (Validated Time of Sample Receipt - VTSR)

E. Date Extracted

Record the date the sample was extracted. This field should be left blank for aqueous VOA samples.

F. Date Analyzed

Record the date the sample was analyzed.

III. Sample Preparation and Analysis Summary – Miscellaneous Organics (Form S-III)

A. Laboratory Sample ID

The sample code number that the laboratory will use throughout analysis for a specific sample.

B. Matrix

Label the sample with matrix indicated as water, soil, oil, grease, or drum solvent, etc.

C. Analytical Protocol

Record the number of the method used to analyze the sample.

D. Extraction Method

Write the method used for sample extraction.

E. Auxiliary Clean-Up

If cleanup was done on sample, record the method or methods used.

F. Dil/Con Factor

If sample was diluted, record the final (just prior to analysis) dilution factor, or if concentrated, record also.

IV. Sample Preparation and Analysis Summary - Inorganics Analysis

A. Laboratory Sample ID

The sample code number that the laboratory will use throughout analysis for a specific sample.

B. Matrix

Label the sample with matrix indicated as water, soil, oil, grease, or drum solvent, etc.

C. Metals Requested

List metals that are to be analyzed. If for NYSDEC ASP, write full TCL in column, or more individual metals required.

C. Date Received at Laboratory

Record the date the Laboratory received the sample. (Validated Time of Sample Receipt - VTSR).

D. Date Digested

Date the sample was digested or otherwise prepared for analysis.

E. Date Analyzed

Date sample was analyzed on instrument.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORM S-I

SAMPLE IDENTIFICATION AND ANALYTICAL REQUIREMENT SUMMARY

NYSDEC Sample ID/Code	Laboratory Sample ID/Code	Analytical Requirements					
		VOA GC/MS (Method #)	BNA GC/MS (Method #)	VOA GC (Method #)	Pest PCBs (Method #)	Metals (Method #)	Other (Method #)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORM S-IIa

SAMPLE PREPARATION AND ANALYSIS SUMMARY
SEMIVOLATILE (BNA)
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORM S-IIb

SAMPLE PREPARATION AND ANALYSIS SUMMARY
VOLATILE (VOA)
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORM S-IIc

SAMPLE PREPARATION AND ANALYSIS SUMMARY
PESTICIDE/PCB
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORM S-III

SAMPLE PREPARATION AND ANALYSIS SUMMARY
MISCELLANEOUS ORGANIC
ANALYSES

Laboratory Sample ID	Matrix	Analytical Protocol	Extraction Method	Auxiliary Cleanup	Dil/Conc Factor

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORM S-IV

SAMPLE PREPARATION AND ANALYSIS SUMMARY
INORGANIC ANALYSES

Laboratory Sample ID	Matrix	Metals Requested	Date Rec'd at Lab	Date Digested	Date Analyzed

PART V – NYSDEC ACROBAT DOCUMNENT REQUIREMENTS

1.0 Sample Data Package .PDF File

In order to comply with the Paperless Office requirements being implemented by various New York State government organization, the Department of Environmental Conservation requires that all data packages be submited as Adobe Acrobat .PDF files on a CD-ROM. The following steps must be followed for the submission of Sample Data Packages and other related documents in .PDF format to insure that all data received by NYS DEC can be easily read, understood, and used for Department decision making.

1.1 CD-ROM Requirements

1.1.1 The CD-ROM containing the sample data package must be of the CD-R media type. Use of CD-RW media type is strictly prohibited for the submittal of NYSDEC Sample Data Packages.

1.1.2 The Laboratory is required to produce an additional copy of the Data Package CD-ROM submitted to NYSDEC and retain it for their records, stored for a minimum period of 3 years. This archive copy of the Sample Data Package and accociated SDG submitted files should be stored on CD-R type media. Use of CD-RW media is not permitted.

1.2 Sample Data Package Hardcopy Requirements

1.2.1 Generation of a hardcopy original Sample Data Package for storage at the Laboratory facility is no longer required.

1.2.1.1 Two (2) hardcopies of the SDG Cover Page and SDG Narrative from the Sample Data Package must be generated and signed by the appropriate Laboratory representative. One set of copies must be submitted to NYSDEC with the Sample Data Package CD-ROM. The second set of copies must be kept on file at the laboratory for a minimum period of 3 years from the date of sample receipt.

1.2.2 At the request of NYSDEC the lab should be prepared to generate a hardcopy of the full Sample Data Package, certifiy the newly generated hardcopy with the appropriate signatures, and submit the entire certified Sample Data Package to NYSDEC within 7 business days.

1.2.2.1 The associated computer files required to produce a hardcopy data package should be archived and stored at the laboratory for a minimum of 3 years from the date of sample receipt.

1.3 .PDF File Requirements

Sample Data Packages submitted to NYS DEC in .PDF file format should be of the "Formatted Text and Graphics" .PDF-type. Sample Data Package .PDFs should not be "Image Based" documents. This format allows .PDF documents to be searched for specific text strings within the data package. It also prevents poor integrity of original documents and poor scan qaulity from affecting the overall legibility of the data package.

1.3.1 File to .PDF Conversion – Whenever possible data packages should be constructed from instrument output files and report generator output files converted to .PDF format by processing the files through Adobe Acrobat Writer. When output files are converted into .PDF, the .PDF files created are searchable and the characters/fonts tend to be more legible. Care must be taken to insure that the fonts contained in output files are recognized by Acrobat and are properly converted. Converted files should also be checked to insure formatting (spacing, margins, etc.) and graphics are preserved from the original.

1.3.2 Hardcopy to .PDF Conversion - In some cases output files cannot be used and hard copy data must be scanned to create an image file (non-.PDF) and then converted into .PDF format. In these cases the integrity of the scanned document and the quality of the scan must be closely monitored to insure to overall legibility of the data package. The following requirements should be adhered to when creating .PDF files from hardcopy data.

1.3.2.1 The document should be scanned at 300 dpi or greater.

1.3.2.2 The document should be scanned at a speed slow enough not to distort the fonts or images in the rusultant image file.

1.3.2.3 NYS DEC requires that all scanned image files be processed through the Adobe Acrobat Capture Utility to convert the image file into a Formatted Text and Graphics .PDF. Whenever possible, original hardcopy documents should have no smaller than an 8 pt. font.

Note: *All text of 8 pt. size and greater, orientated along the horizontal axis of the page, should be recognizeable and convertable when processed through ScanSoft OmniPage or a similar Optical Charact Recognition (OCR) software engine. The OCR conversion should produce a .rtf document with an accuracy of 99% or greater when compared to the .PDF original. Text smaller than 8 pt. size or text not oriented along the horizontal axis of the document is not subjuect to the 99% accuracy requirement.*

1.3.3 Cropping of Pages - The pages in the .PDF file should be completely viewable to the reader, with a minimum margin width, on the left, right, top, and bottom of the document, of 0.5 inches when printed on a standard 8.5 by 11 inch piece of paper,. No part of an original image "page" shall be cropped in order to fit the document into a single .PDF "page". If necessary an original document may be proportionally reduced in size by 78%. If a document requires reduction greater than 78% in order to fit on a

single page, the document should be cafefully divided into equally sized parts and a .PDF page created for each part. An 8.5 by 14 inch legal sized document reduced by 78% will fit into a standard page by this requirement.

1.3.4 Page Orientation – Every effort should be made to have pages in the .PDF pages oriented in a consistant manner. NYS DEC prefers all pages to be in the portrait orientation when feasible. If the data system allows for the format of instrument output to be programmed between portrait and landscape, the output should be set to the portrait mode. If landscape is the only output mode possible, or in the case of the NYS Sample Summarry Forms, .PDF pages with landscape orientation should be inserted into the .PDF rotated counter-clockwise 90°. Landscape pages setup with this orientation would be displayed normally after a 90° clockwise rotation by the reader. If, due to the unprogrammable format of instrument data systems or report generation software, the majority of the pages are converted into .PDF in landscape orientation, they may remain in landscape orientation. If landscape is the majority orientation of the pages, portrait pages should be rotated counter-clockwise 90°, so that a clockwise rotation of 90° by the reader will orientate the image properly.

1.3.5 Linked Table of Contents – NYS DEC requuires that all Sample Data Packages include a Table of Content. The Table of Contents in the .PDF file should provide clickable links to the various sections and sub-sections listed in the Table.

1.3.6 Bookmarks – The Sample Dat Package shall contain bookmarks within the Adobe Acrobat file, arranged in the following manner:

1.3.6.1 The Sample Data Package .PDF should contain bookmarks to separate individual sections and the subsections within. All sections and subsections requiring bookmarks are marked in this Exhibit with a "**<B-*X*>**".

1.3.6.1.1 Sections marked with "**<B-1>**" should be bookmarked with a level one bookmark. Level one is the hightest level of bookmarking in the data package.

1.3.6.1.2 Sections marked with "**<B-2>**" should be bookmarked with a level two bookmark. Level two bookmarks are sub-bookmarkes to the parent level one bookmarks.

1.3.6.1.3 Sections marked with "**<B-3>**" should be bookmarked with a level three bookmark. Level three bookmarks are sub-bookmarkes to the parent level two bookmarks.

1.3.6.2 All items listed in the table of contents should be bookmarked within the .PDF and accessable from the bookmark navigation panel in Acrobat Reader.

1.3.6.3 Sample Data Packages should be further bookmarked when either one of the following conditions are met.

1.3.6.3.1 In cases when sample data exceeds more than 5 pages per sample data "packet", in either a "Sample Results" Section or a "Raw Data" Section, the beginning of each data "packet" must be bookmarked with the appropriate level bookmark **<B-(*X*+1)>**. Where *X* is the level of the parent bookmark for the Section in which the data is being placed in.

1.3.6.3.2 In cases when the total amount of data in any of the Sample Data Package sections designated for either a "Sample Results" or "Raw Data" exceeds 40 pages, the beginning of each data "packet" must be bookmarked with the appropriate level bookmark **<B-(*X*+1)>**. Where *X* is the level of the parent bookmark for the Section in which the data is being placed in.