MAYOR
MICHAEL A. PAVIA

CITY OF STAMFORD
OFFICE OF THE MAYOR

STAMFORD GOVERNMENT CENTER
888 WASHINGTON BOULEVARD
P.O. BOX 10152
STAMFORD, CT 06904-2152

Tel: (203) 977-4150
Fax: (203) 977-5845
Email: mpavia@ci.stamford.ct.us

WATER PROTECTION AND LAND REUSE

MAR 09 2011

REMEDIATION DIVISION

March 8, 2011

Ms. Amanda Flad
Remediation Division
Bureau of Water Protection and Land Reuse
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

RE: Scofieldtown Landfill (Stamford) Closure Project
Consent Order Number SRD-205

On September 10, 2010, the Connecticut Department of Environmental Protection (CTDEP) and the City of Stamford (City) entered into a Consent Order (SRD-205) that stipulated the requirements of immediate actions to be taken by the City with respect to the Scofieldtown former landfill.

As required in the Consent Order, Section B, Number 1, on December 9, 2010 the City retained a Professional Engineer (PE) and a Licensed Environmental Professional (LEP) from TRC Companies, Inc. to complete a Closure Plan as identified in the Consent Order, Section B, Number 2.

The closure plan, as defined in CGS §22-a-207 (26), for the Site, in accordance with RCSA §22a-209-13, is being provided to you for review on March 9, 2011.

In accordance with Section B, Number 10 of the Consent Order, the information submitted in this document and all attachments hereto, based on reasonable investigation by the City of Stamford Engineering Bureau, that the submitted information is true, accurate and complete to the best of our knowledge and belief. We have made no independent review of the submitted information and are relying upon the expertise of the professional engineers employed by the City of Stamford.

If you have any comments or questions please contact me at (203) 977-4150 or the City Engineer, Mr. Lou Casolo, P.E. at 203-977-5796.

Very truly yours,

Michael A. Pavia
Mayor, City of Stamford

Michael D. Larobina
Director of Legal Affairs and Corporate Counsel
City of Stamford

Cc: Ernie Orgera, Director of Operations (memo only)
Lou Casolo, P.E., City Engineer
Jean Perry Phillips, McElroy, Deutsch, Mulvaney & Carpenter/PH, LLP
Keith Ainsworth, NSCCE's attorney
Carl N. Stopper, TRC Companies, Inc. (memo only)
Sarah J. Trombetta, TRC Companies, Inc. (memo only)

Reg# 83

TRC

Results you can rely on

LANDFILL CLOSURE PLAN
FOR SCOFIELDTOWN PARK, STAMFORD, CT

Submitted to:

City of Stamford
Stamford, Connecticut

Submitted by:

TRC Environmental Corporation
Windsor, Connecticut

March 2011

LANDFILL CLOSURE PLAN
For
SCOFIELDTOWN PARK
STAMFORD, CONNECTICUT

Prepared for
City of Stamford
Stamford, Connecticut

Prepared by
TRC
Windsor, Connecticut

Carl N. Stopper, PE
Vice President

Sarah J. Trombetta, LEP, CPG, CHMM
Senior Project Manager

STATE OF CONNECTICUT
CARL N. STOPPER
No. 13255
LICENSED
PROFESSIONAL ENGINEER

TRC Project No. 180554.0000.00000
March 2011

TRC
21 Griffin Road North
Windsor, Connecticut 06095
Telephone 860-298-9692
Facsimile 860-298-6399

LANDFILL CLOSURE PLAN

For

SCOFIELDTOWN PARK
STAMFORD, CONNECTICUT

Prepared for

City of Stamford
Stamford, Connecticut

Prepared by

TRC
Windsor, Connecticut

March 2011

TABLE OF CONTENTS

SECTION PAGE

1.0 INTRODUCTION 1-1
1.1 Objective 1-1
1.2 Scope 1-2
1.3 Project Organization 1-2
1.4 Proposed Schedule 1-2

2.0 BACKGROUND INFORMATION 2-1
2.1 Site Location and Description 2-1
2.2 Geologic and Hydrogeologic Setting 2-2
2.3 Landfill History Summary 2-3
2.4 Previous Site Investigations and Regulatory History 2-5
2.4.1 Discussion of USEPA Reassessment Results 2-7
2.4.1 Discussion of TRC Results 2-11
2.4.2 Summary of All Results 2-13

3.0 OFF-SITE IMPACT EVALUATION 3-1
3.1 Task 1 - Site Health and Safety 3-2
3.2 Task 2 - Groundwater Monitoring Locations 3-2
3.2.1 Shallow Overburden Monitoring Well Installation 3-4
3.2.2 Bedrock Coring and Monitoring Well Installation 3-6
3.2.3 Groundwater Sampling 3-8
3.2.4 Groundwater Sampling Parameters and Frequency 3-9
3.3 Task 3 - Sediment and Surface Water Sampling and Stream Gauge Installation 3-10
3.3.1 Sediment Sampling 3-11
3.3.2 Surface Water Sampling 3-12
3.3.3 Sediment and Surface Water Sampling Parameters and Frequency 3-12
3.4 Task 4 - Flow Monitoring 3-13
3.5 Task 5 - Hydraulic Conductivity Testing 3-13
3.6 Task 6 - Surveying 3-13
3.7 Task 7 – Leachate Modeling 3-14
3.8 Task 8 - Report 3-14

4.0 LEACHATE SEEP INVESTIGATION 4-1
4.1 Visual Leachate Seep Inspection 4-1
4.2 Additional Inspections 4-2
4.3 Seep Characterization 4-2
4.4 Seep Evaluation 4-3

TABLE OF CONTENTS
(Continued)

5.0 LANDFILL CLOSURE ENGINEERING APPROACH 5-1
5.1 Goals 5-1
5.2 Environmental Issues Evaluation 5-2
5.3 Site Grading and Cap Selection Overview 5-5
5.4 Membrane Drainage System Overview 5-8
5.5 Stormwater Management Overview 5-10
5.6 Stormwater Water Quality Management Basin 5-11
5.7 Construction Stormwater Management 5-12
5.8 Construction Fugitive Dust Management 5-14
5.9 Landfill Gas Management 5-15
5.10 Cap Stability Requirements 5-15
5.11 Construction Quality Assurance/Quality Control (QA/QC) 5-17
5.12 Materials Requirements and Testing 5-18
5.13 Engineering Design Plans 5-18
5.14 Landfill Leachate Management 5-21
5.15 Post-Closure Care 5-22
5.16 Post Closure Groundwater and Surface Water Monitoring Plan 5-23
5.16.1 Overview 5-23
5.17 Groundwater Monitoring Program 5-23
5.17.1 Background/Upgradient Wells 5-23
5.17.2 Plume Characterization Wells 5-23
5.17.3 Fringe/Compliance Wells 5-24
5.17.4 Analytical Parameters and Sampling Frequency 5-24
5.17.5 Groundwater Sampling Procedures 5-24
5.18 Surface Water Monitoring Program 5-24
5.18.1 Monitoring Locations 5-25
5.18.2 Analytical Parameters 5-25
5.19 Reporting 5-26

6.0 FUTURE USE 6-1

7.0 REFERENCES 7-1

TABLE OF CONTENTS
(Continued)

TABLES

1 Schedule of Activities 1-3
2 Analytical Parameter Summary 3-9

FIGURES

A Area Location Map
B Site Location Map
C Landfill Cap Existing Conditions Plan
D Proposed Monitoring Well and Sample Locations
E Preliminary Landfill Cap Surface Grading Plan
F Landfill Cap Details
G Future Use Plan

APPENDICES

A Consent Order SRD-205, September 10, 2010
B Aerial Photographs
C Chronology of Events
D Figures and Tables from EPA 2008 Report
E Figures and Tables from TRC 2010 Report
F Quality Assurance/Quality Control Procedures
G Sample Technical Specifications
H Draft Construction Quality Assurance Plan (QAP)

1.0 INTRODUCTION

On September 10, 2010, the Connecticut Department of Environmental Protection (CTDEP) and the City of Stamford (City) entered into a Consent Order (SRD-205) (Appendix A) that stipulated the requirements of immediate actions to be taken by the City with respect to a former landfill (site) located between Scofieldtown Road and Rock Rimmon Road in the northern part of the City (see Figure A). The site currently contains City Public Works operations that will continue until closure construction commences. TRC Environmental Corporation (TRC) was retained to provide a Professional Engineer (PE), licensed to practice in the state of Connecticut, to oversee the development and submittal of all required documents pursuant to this order as prescribed in Section B, Number 1a of the Consent Order, as well as a Licensed Environmental Professional (LEP) to assess existing leachate quality and propose a long-term water quality monitoring program and implement the requirements of the approved plan as prescribed in Section B, Number 1b.

This document presents actions necessary to complete the Closure and meets the requirements of Section B, Number 2 of the Consent Order. This Closure Plan (CP) has been prepared in accordance with Connecticut General Statutes (CGS) §22a-207(26) and Regulations of Connecticut State Agencies (RCSA) §22a–209–13 and addresses the following items:

- A detailed plan to immediately evaluate the potential impact of the landfill to off-site areas, including leachate seeps and impacts to surface water and groundwater;
- A plan to evaluate leachate quality;
- The installation of a landfill cap covering the entire former landfill site;
- Plans for post-closure monitoring and maintenance of the cap;
- Plans for post-closure monitoring of leachate, surface water and groundwater; and
- A plan for post-closure use of the site.

1.1 Objective

This CP describes investigation procedures and methodologies that will be used to obtain data and information necessary to complete the above tasks at and near the site. The investigations that are required for the site and the surrounding area will be used in conjunction with previous landfill studies to determine the geology and hydrogeology of the site area as it affects soil and groundwater contaminant concentrations and leachate fate and transport. Landfill closure planning will incorporate current site conditions, surrounding site conditions and

land use, final end use of the capped landfill site and any impact to off-site areas discovered during the off-site impact evaluation.

1.2 Scope

The approach used for each task will be to provide as much information as possible to meet the requirements of the landfill closure regulations and achieve compliance with the remediation standards regulations (RCSA §22a-133k 1 through 3). This plan will present the recommended actions to meet those requirements and satisfy the stipulations of the Consent Order.

This CP provides introductory information in Section 1.0, including the overall project objective and scope. Section 2.0 describes relevant background information, including site location and description, as well as information regarding the previous investigations and what is known about the geologic and hydrogeologic setting of the site. Section 3.0 provides the evaluation, approach, and procedures necessary to complete the off-site impact evaluation and evaluates the need for any potential corrective action. Section 4.0 describes the leachate seep investigation. Section 5.0 presents the preliminary design of the selected closure remedy, materials management, and the long-term, post-closure groundwater and surface water monitoring. Lastly, Section 6.0 describes the proposed future use of the site.

1.3 Project Organization

The Project Director for the landfill closure will be the City Engineer. The Project Manager for the landfill closure activities will be a member of the Engineering Bureau. Investigation and closure design services will be completed under the supervision of a PE and LEP under contract to the City. All work activities will be closely coordinated with representatives of the City, as the City and/or their appropriate representatives will determine property access protocols.

1.4 Proposed Schedule

The closure activities will be completed in the following stages;

- Mobilization Activities,
- Field Activities, including area of concern review, groundwater monitoring well installation, surface water and leachate seep sampling and groundwater sampling;

- Corrective Action Evaluation
- Impact Evaluation/Leachate Seep Data Analysis/Report Preparation
- Landfill Closure Design
- Permitting
- Construction
- Post-closure monitoring

The field activities portion of the CP at the site will include the off-site impact evaluation field work and the leachate evaluation field work. These activities will generally consist of the drilling of boreholes to allow for geologic logging of the subsurface materials, the installation of both shallow overburden and bedrock wells, the collection of groundwater samples from the newly installed wells as well as the previously installed wells, the collection of sediment and surface water samples from the unnamed stream and Poorhouse Brook, the collection of leachate samples from identified seep locations and the on-going seasonal monitoring of groundwater, surface water and leachate seeps at the site. Probes will also be installed within the landfill waste to sample landfill gas and assess methane gas production.

The projected schedule for each of the above stages is presented on Table 1.

Table 1: Scofieldtown Landfill Closure Activities Preliminary Schedule

Closure Activities	Approximate Schedule
Mobilization Activities	Immediate upon approval of Landfill Closure Plan
Field activities – Off-Site Impact Evaluation And Seep Analysis*	Summer 2011 through Summer 2012 with well drilling first
Corrective Action Evaluation	At completion of first round of groundwater sampling, Fall 2011
Impact Evaluation and Seep Analysis Report	Fall 2012
Landfill Closure Design	Fall 2011 through Fall 2012. Final design to be completed after completion of Impact Evaluation.
Permitting	Fall and Winter 2012/2013
Project Bidding	Winter 2012//2013
Construction	Spring through Fall 2013
Post Closure Monitoring	Beginning Winter 2013/2014. Ending date to be determined.

* Pending off-site access approval from private property owners.

2.0 BACKGROUND INFORMATION

2.1 Site Location and Description

The site is located in the City of Stamford, Connecticut in an area of land between the intersection of Scofieldtown and Rock Rimmon Roads in the northern portion of the City. A general view of the area is presented in Figure A and an aerial view is shown on Figure B. The now-closed Scofieldtown Park, the City of Stamford's Recycling/Composting Center and Public Works Department salt shed comprise the top surface area that was a former municipal landfill (See Figure C and Photographs 1, 2 and 3). The top of the landfill has soil cover and grass vegetation except in the active recycling, compost and salt shed areas where asphalt is present at some locations on the surface. In all, the former landfill area, which reportedly ceased operation in the early 1970s, covers approximately 17 acres in a roughly triangular shape. The landfill property is bounded by Rock Rimmon Road to the west, Scofieldtown Road to the south and east, the Diocese of Bridgeport owned cemetery property to the north and the Connecticut Light and Power Property (CL&P) to the northeast.

The northerly property edge along the cemetery has a small unnamed perennial brook and inland wetlands. A 24-inch concrete storm drainage pipe crossing Rock Rimmon Road at the northwest corner of the property discharges in a steep drainage swale leading to the unnamed perennial stream (see Photograph 4). There is also a manmade narrow soil berm that is off the landfill property that crosses the unnamed stream/wetland connecting the cemetery to the toe of the landfill. On the upstream side of the berm is a concrete weir structure that creates a shallow pool of water in the stream/wetland on the upstream side (see Photograph 5). The weir structure has a concrete pipe that passes through the soil berm and discharges on the opposite side. Along the easterly CL&P property boundary the northerly perennial stream converges with another larger perennial stream/wetland system that becomes Poorhouse Brook as it crosses Scofieldtown Road through a double culvert (see Photograph 6).

The immediate area surrounding the site consists primarily of residential neighborhoods to the south and east of Poorhouse Brook, a cemetery directly to the north across the unnamed stream with wetlands to the east of the cemetery, and woodlands to the west across Rock Rimmon Road. In addition to the residential developments, the Scofield Magnet school is located to the east of Scofieldtown Park between Scofieldtown Road and Poorhouse Brook as the brook flows to the south in this area. There are also two residential facilities, Scofield Manor, an

assisted-living retirement facility and Smith House, a municipal nursing home located along the western sides of Scofieldtown and Rock Rimmon Roads, respectively, south and west of the former landfill.

A portion of the site that was used as a public park, which was closed to the public in May 2009 after the discovery of drums along the northerly slope requiring removal and disposal, covers approximately four acres directly north of the intersection (See Photograph 7). The park, which slopes up from the south to north, is primarily grass covered with a small maintenance building, a picnic shelter/pavilion, a paved tennis court and a former play scape. A stream that flows from the Scofield Manor property to the south enters the site in the southwest corner via a pipe beneath Rock Rimmon Road and empties into a small man-made pond on the property (see Photograph 8). The pond has an overflow weir concrete structure that discharges via a concrete pipe which runs beneath the landfill to the northeast (see Photograph 9). The pipe discharges to the unnamed stream on the east side of the landfill approximately 350 feet upstream from the Scofieldtown Road twin culverts (see Photograph 10). The City-run recycling/composting center (see Photograph 11), along with a salt storage shed located in the extreme northwest portion of the site, encompasses the remaining top area of the former landfill. There are three separate driveway access points to the site all located along Rock Rimmon Road.

The park portion of the site is located at the lowest elevation over the site. The composting area and public works area are situated approximately 10 feet higher than the park. Both the composting and recycling facilities are paved or milling-covered surfaces and extend to the top of the heavily vegetated slopes on the north and east side of the site. From the top of the slope to the landfill toe adjacent to the stream/wetlands the grade drops approximately 30 feet with some terracing and varying degrees of steepness. The landfill slope along Scofieldtown Road varies in height and is generally lees steep than the north and east slopes. The vegetation on all of the slopes is moderately dense trees and understory brush.

2.2 Geologic and Hydrogeologic Setting

According to the information presented on the Bedrock Map of Connecticut (Rogers, 1985), the former landfill and surrounding area are underlain by the Trap Falls Formation and Ordovician granitic gneiss undivided which consists of a gray to silvery, partly rusty-weathering, medium grained schist and light colored, foliated granitic gneiss. Although information

regarding the bedrock surface is limited, based on measurements made during the TRC well installation program, the bedrock surface appears to be relatively consistent across the landfill site with a slight depression located in the north central portion of the site.

According to the Quaternary Geologic Map of Connecticut and Long Island Sound Basin (Stone, et al, 2005), the unconsolidated materials at the site are identified as thin till deposits over bedrock. The till is generally non-stratified with variable amounts of sand, silt, clay and larger-grained materials. Subsurface investigation completed previously by TRC encountered till thickness ranging from approximately 10 to 15 feet around the property of the landfill along Rock Rimmon Road to Scofieldtown Road and approximately 20 to 30 feet along the central portion of the landfill. The residential area to the east of site was identified as a drumlin or till hill. While drumlins typically contain thicker deposits of till, a monitoring well installed during TRC's prior investigation (well MW-7R) encountered bedrock at approximately ten feet below grade indicating that the drumlin is supported by bedrock.

2.3 Landfill History Summary

According to the December 23, 2008 USEPA report entitled "Final Site Reassessment Report (FSRR) for Scofieldtown Road Park" (2008 FSRR), the landfill was estimated to have covered between 10 to 18 acres with an estimated thickness of materials of 10 to 40 feet. The area was originally opened in the 1930's as a household waste dump. Waste generated by the City began to be taken to the site in 1949. Information regarding waste operations was provided by the Chief of Solid Waste Disposal for the City and reported in the 2008 FSRR.

To supplement the information provided by the USEPA and to better understand the current configuration and history of the landfill and the surrounding area, during a prior investigation, TRC reviewed a series of available aerial photographs dating back to 1934 (see Appendix B). A review of the photographs shows the gradual progression of filling after the 1930's, as well as the change in the surrounding area land use from agricultural in the 1930's and 1940's to residential in the 1950's and 1960's. Specific details regarding the aerial photographs are provided below:

- 1934 - The area of the landfill footprint appears primarily vacant and vegetated. The area in the immediate vicinity of the intersection of Rock Rimmon and Scofieldtown Roads appears more open. There appear to be several limited pathways/roadways in this area of the site. Although the photo quality precludes a more exact identification,

there appears to be a small pond near the roadway intersection. The surrounding area appears to be primarily agricultural although there are several structures, including the building which currently houses Scofield Manor, located to the south of the Rock Rimmon and Scofieldtown Road intersection. There is no clear indication of dumping on the site in this photograph.

- 1951 – The area of the landfill footprint appears to be primarily open space with numerous pathways/ roadways extending through the site originating from Rock Rimmon Road near the intersection with Scofieldtown Road. Based on the shading of the photograph it appears that there are significant areas of soil disturbance located along the northern portion of the site. There is a more clear appearance of a small pond near the roadway intersection. The surrounding area appears to be much the same as in the 1934 photograph.

- 1960 - The area of the landfill footprint appears as an area of disturbance based on the shading of the photograph. A distinct line of disturbance extends from east-west along the northern limits of the landfill. Based on the pattern of disturbance, it appears that fill was deposited from northwest to southeast across the site. The small pond is still present near the roadway intersection. The surrounding area appears to be transitioning from primarily agricultural to more residential with the appearance of several new roadways with what appear to be residential structures along them, particularly to the northeast of the landfill.

- 1963 – The area of the landfill footprint and surrounding area appear much the same as the 1960 photograph. The building that currently houses Smith House is present to the west of the landfill. In addition, the property across Scofieldtown Road which is the current site of the middle school is developed.

- 1979 - The area of the landfill footprint appears to be consistent with the extent of the recycling facility, compost operation and park as they are currently laid out. There appears to be some re-establishment of vegetation over some portions of the site, particularly the northern portion. The pond located on the southern portion of the site appears consistent with the current size and shape. There are no indications of any site development beyond the use as a landfill. The surrounding area appears to be similar to the 1963 photograph with regards to the nature and density of development.

- 1985 – The area of the landfill footprint appears similar to the current configuration. The city's salt shed is apparent in the northwest corner of the site while park facilities are apparent on the southern portion of the site. The compost operation is apparent near the salt shed, but does not appear to extend as far to the east as the current operation. The park area appears consistent with the current layout with tennis courts and playground area located to the northwest of the small pond. The roadway access and parking area also appear consistent with the current configuration. The surrounding area appears to be similar with regards to nature and density as shown in previous photographs. The cemetery located to the north of the landfill is apparent.

- 1989 - The area of the landfill footprint and surrounding area appear much the same as the 1985 photograph.

- 1991 - The area of the landfill footprint and surrounding area appear much the same as the 1985 photograph.

- 1994 - The area of the landfill footprint and surrounding area appear much the same as the 1985 photograph with the exception that the compost operation appears to have been extended to current limits.

- 2006 -The area of the landfill footprint and surrounding area appear much the same as the 1994 photograph.

Although the landfill was closed in 1968, the 2008 FSRR report documented that waste material may have been brought to the landfill. Information from the City indicates that the landfill may have been in poor condition from 1968 through 1970 as multiple complaints had been filed by residents complaining of vermin, uncontained refuse and a dump fire. After the landfill was permanently closed in the early 1970's, the landfill area was graded and reportedly covered with clean fill. The current uses of the site were developed in the 1970s shortly after the closure.

2.4 Previous Site Investigations and Regulatory History

A significant amount of inspection and investigation has taken place at the site since 1980 when a complaint regarding the closed landfill was filed by a resident. A chronology of events from available records, as compiled by the City of Stamford, is presented in Appendix C, listing most of the actions of the CTDEP, the United States Environmental Protection Agency (USEPA) and the City.

The following is a brief synopsis of the activities conducted by the various regulatory agencies and the City of Stamford since 1986. Detailed descriptions of the activities and data are contained in the December 2008 USEPA report.

After the site was listed in the Comprehensive Environmental Response Compensation Liability Information System (CERCLIS) database in 1986, the USEPA began a series of assessments to determine if the site should be placed on the National Priority List (Superfund sites). The first investigation, the Preliminary Assessment (PA), was completed in August 1986 and included a site inspection and a thorough background investigation as well as review of potential contaminant pathways. Available records were reviewed, the site was inspected and

areas of concern were documented. After the EPA PA was complete, these data were supplemented by the City with its own records review of the landfill and its operation.

In November 1987, five drums containing resin and resin powder, two drums containing heavy metal (copper, zinc and lead) sludge and ten empty drums containing similar residues were removed from the site by the City. The Final Site Inspection Report was completed in March 1988 at which time the USEPA recommended that groundwater and surface water sampling be conducted but none were performed as part of that investigation. Between 1988 and 1994, surface water samples were collected by the Connecticut Department of Health Services (now known at the Department of Public Health), soil samples were collected by the City and 12 drinking water samples were collected by the CTDEP. Between 1994 and 2004, the USEPA completed Site Inspection Prioritization (SIP), a drum removal evaluation and a Remedial Program Preliminary Site Assessment. Soil, sediment and drum samples collected during these assessments indicated the presence of volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), pesticides, and metals in site soils/sediments and metals in the drum samples. The EPA concluded that a Time Critical Removal Action was not appropriate at that time.

During this same period, the CTDEP collected one additional drinking water sample from a residential property along Hannah's Road to the east of the site. The pesticides dieldin and chlordane were detected above state drinking water action levels. In 2004, the USEPA initiated the Site Reassessment process.

In January 2007, the Superfund Technical Assessment and Response Team (START) completed another site reconnaissance of the site. Later in 2007, START, on behalf of the USEPA, performed a Preliminary Assessment/Site Inspection during which time samples were collected from two drums located on the site. Through the spring of 2008, START collected 20 surface soil samples from multiple areas on the site, 20 sediment samples from within the unnamed stream north of the former landfill area and Poorhouse Brook, and 18 drinking water samples from residential wells in an area generally east of the site. The results of this sampling were documented in the 2008 FSRR completed by the USEPA in December 2008. Subsequent to the completion of this report, the USEPA issued a Site Investigation Closure Memorandum in August 2009. The memorandum stated that a removal action completed by the USEPA would

not be appropriate and that the City was providing an appropriate response and would be completing a comprehensive investigation.

In the fall of 2009, TRC was commissioned to perform a limited environmental investigation in the former landfill and the surrounding area to determine if the landfill was impacting the groundwater in the area used by private residences for potable water supply (TRC, 2010). The investigation included a ground penetrating radar survey of the landfill area, surface water sampling along the unnamed stream, and groundwater sampling of monitoring wells. The primary investigation activity during this project was the installation of eight groundwater monitoring wells within the footprint of the landfill and an additional five wells in the surrounding area. At three locations within the landfill, nested overburden and bedrock monitoring wells were installed; at two other locations in the landfill, only bedrock monitoring wells were installed. Another nested well pair was installed on the Scofield Magnet School property to the east in one of the presumed downgradient directions of groundwater flow from the landfill. The remaining wells included a bedrock well to the southwest of the landfill along Rock Rimmon Road and two bedrock wells in the residential neighborhood east of Poorhouse Brook. TRC utilized the data collected by the City during the well testing program to locate the two monitoring wells within the residential areas impacted by pesticides. As the water main work was completed and homeowner's wells were abandoned, the City also provided TRC with general data with respect to well and groundwater table elevations in these areas. TRC used this information in the 2010 investigation to augment information on the hydrogeologic system within the general vicinity of the landfill site. TRC issued a report entitled 'Environmental Investigation Report" in April 2010.

The following sections present summaries of the results of the 2008 FSRR and the 2009 TRC investigation. Relevant tables and figures from the 2008 FSRR and TRC 2009 reports are presented in Appendices D and E, respectively.

2.4.1 Discussion of USEPA Reassessment Results

Surface Soil Samples

In March of 2008, the USEPA collected 20 surface soil samples from 19 locations across the site, including 11 samples from the northern and eastern slope area of the former landfill, seven from within the Scofieldtown Park portion of the site and two samples from an area across

Rock Rimmon Road. These final two samples were collected as background samples. The laboratory analysis of the 18 samples collected on the former landfill site identified several different types of contaminants. The USEPA compared the results of their soil sampling to the CTDEP's Remediation Standards Regulation (RSRs) criteria (CT RCSA 22a-133K-1 through 3) for direct human exposure to the soil including both the residential (RDEC) and industrial/commercial (I/CDEC) standards.

- Volatile organic compounds (VOCs) were reported in eight samples with a majority of those samples present within the park area. These VOCs included low levels of both aromatic hydrocarbons and chlorinated hydrocarbons.

- Twelve of the samples contained reported concentrations of semi-volatile organic compounds (SVOCs). These samples were located in both the park area and at several locations along the former landfill slope. The majority of the SVOCs reported to be present were those known as polynuclear aromatic hydrocarbons (PAHs).

- Fifteen of the samples were reported to contain concentrations of pesticides, including 4,4-DDT, 4,4-DDD, 4,4-DDE, alpha and gamma chlordane, and technical chlordane. Fourteen of the fifteen samples contained 4,4-DDT or one of its breakdown products, 4,4-DDD or 4,4-DDE. Concentrations of alpha, gamma or technical chlordane were reported in 11 of the samples.

- PCBs were reported to be present in eight samples with the majority of these samples located within the park area.

- Concentrations of a variety of inorganic compounds (metals and cyanide) were reported in all the samples.

The results of the USEPA's surface soil sampling indicated that compounds that exceeded their respective RDEC include: several PAHs in five samples along the northern and eastern slopes of the former landfill and within the park area; PCBs in four samples (one on the northern slope and three within the park); technical chlordane from one sample from within the park area and lead in one sample from the northern slope.

The earlier surface soil sampling performed by the City in June 1989, the USEPA in February/March 1986 and the CTDEP in October 1997 are described in the 2008 FSRR. The information on the locations of the samples and corresponding analytical results are not provided as the actual reports on those sampling events were not available. The March 2008 USEPA

surface soil samples generally found the same constituents that were detected in these earlier sampling events.

Sediment Samples

In April of 2008, START collected 20 sediment samples from various locations including seven from the unnamed stream north of the former landfill, four from within the wetlands north of the former landfill, five samples from Poorhouse Brook on the east side of Scofieldtown Road, two samples from the bottom of the unnamed pond within the park area and two from wetlands on the west side of Rock Rimmon Road (background samples). Within the 20 samples collected on or near the former landfill site, several different types of contaminants were identified from the laboratory analysis.

The USEPA compared the results of their sediment sampling to the National Oceanic and Atmospheric Administration's (NOAA) Screening Quick Reference Tables (SQuiRTs) Threshold Effects Levels (TEL) and Probable Effects Level (PEL) values in freshwater sediment. These values represent the levels at which adverse effects to benthic organisms are expected. These values are generally used for screening purposes only and are considered very conservative. As such, many reported concentrations of analytes were identified as exceeding SQuiRTs TELs and PELs. To obtain a more accurate comparison with regard to direct human exposure to the sediment, TRC reviewed the sediment results and compared them to RDEC and I/CDEC standards.

- VOCs were reported in four samples; three from within the unnamed stream and one within Poorhouse Brook. These VOCs included low levels of aromatic hydrocarbons.

- Twelve of the samples contained reported concentrations of SVOCs. These samples were located in the unnamed stream, the wetlands to the north, Poorhouse Brook and the on-site pond. As with the surface soil samples, the majority of the SVOCs reported to be present were PAHs.

- Sixteen of the samples were reported to contain concentrations of pesticides, including 4,4-DDT, 4,4-DDD, 4,4-DDE, alpha and gamma chlordane, and dieldrin. All sixteen of the samples contained 4,4-DDT or one of its breakdown products, 4,4-DDD or 4,4-DDE. Concentrations of chlordane were reported in six of the samples and dieldrin was reported to be present in one sample.

- PCBs were reported to be present in four samples with three of these samples collected from the unnamed stream and one sample from within the unnamed pond in the park area.

- Concentrations of a variety of inorganic compounds (metals and cyanide) were reported in eleven of the samples.

The results of the USEPA's sediment sampling indicated that compounds that exceeded their respective RDEC include: several PAHs in two samples within the unnamed stream and arsenic in three samples within the unnamed stream.

The earlier sediment sampling performed by the CTDHS in March 1987 and the USEPA in May 1995 are described in the surface water pathway section of the 2008 FSRR. All nine samples were collected from the unnamed stream, but the locations are not provided. The 2008 FSRR provides the maximum concentration of each constituent detected. The dynamic nature of stream environments and the degradation of many constituents will cause the earlier results to differ from the current conditions. TRC, therefore, only relied on the older data as an indication of expected constituents and for comparison to TRC surface water sample analytical constituents detected. The April 2008 USEPA sediment sample results generally found the same constituents that were detected in the earlier sampling events.

Homeowner Wells Sampling

Sampling of the private drinking water wells east of the site began in 1989 with the CTDEP collecting 12 drinking water samples along Scofieldtown Road, Hannah's Road, Brookdale Road and Brookdale Drive. The CTDEP concluded that, based on the data collected, it did not appear that the Scofieldtown Road Park property was impacting the surrounding drinking water supply. Additional samples from homes at 24, 27, 37 and 63 Hannah's Road were obtained by the CTDEP in September of 1992 and the CTDEP concluded that none of the wells were unsafe for consumption. The CTDEP collected a sample from 29 Hannah's Road in February 1997 and found chlordane and dieldrin exceeding state drinking water action levels.

During the March 2008 reassessment completed by the USEPA, 13 wells were sampled along Hannah's and Brookdale Roads and tested for VOCs, SVOCs, pesticides, PCBs, TAL metals and cyanide. It was noted that wells at 27 and 29 Hannah's Road had water filtration systems. Dieldrin was found exceeding CTDPH drinking water standards pre-treatment at 27

and 29 Hannah's Road and at 24 Hannah's Road. Dieldrin was not detected in post-treatment samples at 27 and 29 Hannah's Road. Chlordane was detected in one well, but below the CTDPH drinking water standards.

The City began a well testing program of the area in August of 2009 to determine the extent of the chlordane and dieldrin while TRC performed an assessment of potential migration of contaminants from the landfill site. Sampling of the area expanded and continued as this site investigation was commenced and as the City began a water main installation program bringing water supplied by the Aquarion Water Company to the homes east of the landfill site.

2.4.1 Discussion of TRC Results

Soil

Three soil samples (SB-1, SB-2 and SB-3 corresponding with the overburden wells MW-1, MW-2 and MW-3) (see maps and tables from 2009 TRC report located in Appendix E) were collected in October 2009 from the former landfill area at both shallow and deeper depths. The results indicated that two of the borings (SB-1 and SB-3) contained varying concentrations of VOCs, SVOCs (generally PAHs), ETPH, and metals with some exceedances of both the RDEC and the Pollutant Mobility Criteria (GA PMC) for areas where the groundwater classification is identified as GA (presumed suitable for human consumption). Concentrations of PCBs were detected in the sample from SB-1 and a concentration (below regulatory criteria) of 4,4-DDD was detected in the sample from SB-3.

Surface Water

Five surface water samples were collected in October 2009. These locations of the samples included: three areas in the unnamed stream that flows along the northern edge of the landfill (SW-1, SW-2 and SW-3), one within the small unnamed pond located in Scofieldtown Park (SW-4) and one from the unnamed pond located south of Alma Rock Road (SW-5). Sample SW-2 was collected from the culverted stream that enters the unnamed stream after flowing beneath the landfill. Sample SW-5 was obtained based on concern for contaminants to be present in a pond that has been used for swimming and that is located within the residential area where pesticides had been detected in the groundwater. Concentrations of benzene, chlorobenzene and barium were reported to be present in sample SW-2, concentrations of barium

and zinc were reported in sample SW-1 and barium only was reported in sample SW-3. No other analytes were reported above laboratory method detection limits. The concentration of benzene (1.5 parts per billion (ppb)) in sample SW-2 exceeds the Human Health Criteria for consumption of water and organisms as defined in the CT Water Quality Standards.

Groundwater

The thirteen groundwater monitoring wells were sampled in November (eleven wells) and December 2009 (two wells). The results of the groundwater sampling were compared to CTDEP RSR groundwater remediation criteria including: the Ground Water Protection Criteria (GWPC), the Surface Water Protection Criteria (SWPC) and the Residential Volatilization Criteria (RVC). Samples from the well located within the northwest of the former landfill area (MW-1(OB)) contained VOCs and ETPH generally related to petroleum hydrocarbons with the reported concentrations of benzene and ETPH exceeding the GWPC. The sample from well MW-1(OB) also contained concentrations of arsenic exceeding the SWPC and concentrations of barium exceeding the GWPC. The samples from the other wells, including MW-1(R), within the former landfill contained lower concentrations of VOCs and one SVOC with the exception of the sample from well MW-2(R) which contained a concentration of vinyl chloride over both the GWPC and the RVC. It should also be noted that both wells MW-1(OB) and MW-1(R) located near the salt shed contained elevated levels of sodium. There is no RSR standard for sodium.

The samples from the wells (MW-4(OB) and MW-4(R)) at the Scofield Magnet School contained concentrations of metals and one VOC, toluene, however, none of the concentrations of the analytes was reported to be over regulatory criteria. These results were similar to the well located off of Rock Rimmon Road (well MW-5(R)).

The sample from the well located in the Very Merry Road cul-de-sac (MW-7(R)) contained concentrations of 1,1,1,2 tetrachloroethane over the GWPC and the RVC, chlordane over the GWPC and the SWPC and dieldrin also over both the GWPC and the SWPC. The sample collected from well MW-8(R) located in the Alma Rock Road cul-de-sac also contained the same three compounds. The concentrations of 1,1,1,2 tetrachloroethane and chlordane exceeded both their GWPC and SWPC, while the concentration of dieldrin exceeded the GWPC.

There were no concentrations of PCBs or cyanide reported in any of the well samples. Concentrations of several metals not considered “heavy metals” (including aluminum, calcium,

iron, magnesium, manganese, potassium and sodium) were also reported for the all of the well samples. These metals are typically found in groundwater and the concentrations of these metals were generally higher in the wells located within the landfill area than in those outside the site. The concentrations of some of these constituents exceed Secondary Maximum Contaminant Levels set by the USEPA, based on aesthetic considerations only and constituents that exceed these levels are not considered to present a risk to human health.

The analytical results and figures from the TRC report are presented in Appendix E.

2.4.2 Summary of All Results

Results of a review of the previous site investigations conducted by the CTDEP and the USEPA as well as preliminary soil, surface water and groundwater testing conducted by TRC in 2009 in the landfill area indicate the following:

- A review of the topography of the areas to the north, west and south indicate that the ground elevation increases to the north within and beyond the cemetery. The topography to the west remains generally the same as the site. To the south there is also a gradual increase in elevation along Scofieldtown Road. As identified on the Natural Drainage Basins Map of Stamford, Connecticut (CTDEP January 2010), the drainage basin in which the landfill is located (7405-05) extends from an area just north of Ingleside pond to the general location of the Northeast School to the south. To the east, the drainage basin extends to the topographic high (Very Merry Road) to Hunting Ridge wetland area to the west. In the vicinity of the site, the drainage basin western boundary is close to the northwest corner of the landfill area.

- The surveyed elevations of all the wells indicated that the groundwater flow for both the overburden and bedrock aquifers in the vicinity of the landfill is toward the east/northeast with surface discharge occurring along the unnamed stream and Poorhouse Brook. The four nested well pairs present in the general area show good correlation between the overburden and bedrock aquifer systems associated with the site. Both overburden and bedrock pieziometric surfaces mirror each other closely in both elevation and flow direction. The presence of the man-made pond in the southern section of the landfill area appears to be creating a mounding effect is this area.

- Groundwater contours east of Poorhouse Brook (based on the groundwater elevation in the Very Merry cul-de-sac monitoring well (MW-7(R)) indicate that groundwater in this area flows to the west, also toward Poorhouse Brook. The groundwater elevation in the Alma Rock Road cul-de-sac well (MW-8(R)) is lower than the Very Merry Road groundwater elevation. The well and groundwater elevation data provided by the City for private wells abandoned during the water main installation also correlate with what was known about the hydrogeology for the Hannah's Road,

Very Merry Road and Alma Rock Road area. All of the data indicates that the groundwater table appears to generally parallel the ground topography with the Very Merry Road area representing both a topographic and groundwater table elevation high point.

- Contaminants found in the soil and sediment across the site and wetland areas are consistent with the use of the site as a former municipal solid waste landfill and its current use as an asphalt covered leaf composting/recycling facility. The concentrations of contaminants do not indicate the presence of a significant hazardous material. Based on the age and depositional history of the landfill, as well as the results of the limited soil sampling that has been conducted, contaminant concentrations within the soil in the landfill will likely vary, but PAHs and metals will likely be prevalent.

- Groundwater quality within the footprint of the landfill is consistent with the soil data. No significant contaminants were reported to be present in the limited number of wells located within the landfill area or in adjacent locations. However, petroleum compounds were reported to be present in the overburden and bedrock groundwater samples collected from the monitoring wells near the salt shed. In addition, relatively high concentrations of sodium were also reported in the same wells nearest the salt shed.

- The cessation of landfill operations nearly 40 years ago suggests that groundwater conditions associated with the former landfill have likely reached equilibrium with respect to contaminant concentration. As the current soil cover and grading of the site was not designed to minimize infiltration of rainfall, it is expected that low levels of constituents will continue to leach into the groundwater before proper closure is completed.

3.0 OFF-SITE IMPACT EVALUATION

In order to meet the stipulations of the Consent Order, the following issues were considered in the development of the off-site impact evaluation. These items reflect not only the requirements of the Consent Order and CP, but other regulatory issues that will be part of the construction that will be completed during the closure of the landfill. It should be noted that results of the off-site impact evaluation will likely not affect the design of the landfill cap. If results indicate impact to off-site areas that require immediate action, a plan for that corrective action will be developed.

Off-Site Impact Considerations

- The installation and monitoring of additional overburden and bedrock monitoring wells will be used to refine the landfill leachate plume delineation and ensure surface discharge location. Some of these wells may be incorporated into post-closure groundwater monitoring.

- Hydrogeologic investigation of overburden and bedrock will be used to estimate hydraulic conductivity of the landfill materials, overburden and bedrock for use in evaluating contaminant flow and transport.

- Evaluation of the groundwater and surface water quality with respect to seasonal trends will be conducted.

- Areas where leachate seeps or outbreaks are occurring will be delineated and leachate quality will be evaluated.

- The area of surface discharge of the landfill leachate plume will be determined to ensure that the City can obtain control of and restrict groundwater use in this area.

This section discusses the objectives, procedures and methodologies to complete a thorough impact evaluation of the area surrounding the landfill site. The impact evaluation will consist of investigation of the groundwater, surface water and sediment as pathways that may have resulted in the migration or deposition of contaminants emanating from the landfill in off-site areas.

The impact evaluation, as described in the following sections, will focus on determining developing and validating a conceptual site model of the site and surrounding area in relation to the hydrogeology to determine migration pathways in the both the overburden and the bedrock aquifers. An investigation of the surface water flow, the discharge of groundwater into the

surface water and the interaction of leachate seeps with the surface water will also be conducted. An evaluation of contaminant concentrations will be completed for groundwater, surface water and sediment to focus on the potential of off-site migration and impact.

The objectives of the impact evaluation will be to:

- Determine the nature and extent of migration of contaminants from the landfill primarily through groundwater and surface water flow using a conceptual site model to identify the hydraulic relationships between the landfill and the receptors at potential risk;
- Determine if any off-site impacts require the need for immediate corrective action and recommend such actions; and
- Provide data to allow for the optimum design of a post-closure groundwater monitoring system.

In addition to the off-site impact, the data collected during this investigation will be used to determine the hydrologic system of the landfill and the immediate surrounding area using rainfall, drainage areas, stormwater drainage infrastructure, proposed end use needs, leachate composition, groundwater and surface water quality to support the modeling of leachate flow both pre- and post-closure. Since the landfill closure approach is to construct a cap that covers the entire area of waste, no delineation of soil contaminants within the footprint of the landfill is proposed.

3.1 Task 1 - Site Health and Safety

A detailed Health and Safety Plan (HASP) will be prepared in accordance with the applicable OSHA standards and the USEPA Office of Emergency and Remedial Response Standard Operating and Safety Guides (Publication 9285.1-03, June 1992) prior to mobilization to the field.

3.2 Task 2 - Groundwater Monitoring Locations

In order to evaluate off-site groundwater quality and to aid in establishing groundwater flow conditions across the site and the adjacent areas, thirty-six groundwater monitoring wells are proposed to be installed both on and around the periphery of the site (see Figure D). As

stated above, the monitoring wells will be installed in nested pairs with a shallow unconsolidated overburden well and a cased bedrock well comprising each pair where groundwater is present in both aquifers. In addition, two overburden wells will be installed adjacent to bedrock wells previously drilled within the landfill (MW-6(R) and MW-9(R)) to complete as nested pairs. The following identifies the proposed monitoring wells locations:

Within the Landfill

A - Located on the western perimeter of the landfill (Rock Rimmon Road) near the current office trailer to determine groundwater conditions at a potentially upgradient position.

B – Also located along the western perimeter to the south in the current recycling area to monitor groundwater also potentially upgradient.

C – Located on the southeastern perimeter of the landfill near the man-made pond and the intersection of Scofieldtown and Rock Rimmon Roads to determine the groundwater quality at a down or cross-gradient location.

D - Located in the southeastern portion of the landfill in the former park area east of wells MW-3(OB) and MW-3(R) and the man-made pond. This well pair will be used to evaluate groundwater quality at this location and assist with determining the effect that the man- made pond currently has on the groundwater table elevation.

E – Located in the central portion of the site in the leaf composting area to evaluate groundwater conditions with this area of the site.

F – Located along the eastern perimeter of the landfill (Scofieldtown Road) toward the north in a presumed downgradient location.

G – Located in the northwest corner of the landfill between the toe of the landfill slope and the drainage swale/stream. This well will be used to evaluate the extent of groundwater flow and quality in this location near the salt shed.

H – Located along the northern perimeter of the landfill between the toe of the landfill slope and the unnamed stream near the western edge of the known leachate seepage area.

I – Also located along the northern perimeter of the landfill between the toe of the slope and the stream near the present outfall location of the drainage culvert that is present under the landfill.

J – Located at the northeastern corner of the landfill near the location where the unnamed stream passes into the double culvert at Scofieldtown Road at a downgradient position.

Outside the Landfill

K - Located on the grounds of the Smith House assisted living facility to the west/northwest of the landfill in a presumed upgradient position. The exact location of this well pair may depend on the results of Task 2.

L - Located on the grounds of the Scofield Manor assisted living facility to the south of the landfill in an up- or cross-gradient position. The exact location of this well pair may depend on the results of Task 2.

M – Also located on the grounds of Scofield Manor near the community garden and close to the southern side of Rock Rimmon Road in a cross- or down-gradient position.

N - Located on the grounds of the Scofield Magnet School further downgradient from the locations of wells MW-4(OB) and MW-4(R).

O – Also located on the grounds of the Magnet School to the north but remaining south of Poorhouse Brook in a downgradient position.

P – Located on the property owned by Connecticut Light and Power to the northeast of the landfill. This well pair will be used to determine if a plume may be migrating beneath the unnamed stream.

Q – Located on the undeveloped grounds of the cemetery to the north of the landfill and will also be used to evaluate for plume migration beyond the unnamed stream.

The locations of the wells are presented on Figure D. It should be noted that all proposed monitoring wells, surface water and sediment samples are subject to adjustment in location, depth and laboratory analyses based on observations, field screening and site conditions encountered during investigation activities.

The following sections describe the procedures to be followed during the investigation, including the collection of any necessary soil and groundwater samples. Should it be required, any subsequent sampling will also be conducted following these procedures. The basic procedures associated with the completion of a sensitive receptor survey are also outlined below.

3.2.1 Shallow Overburden Monitoring Well Installation

These wells will be installed using a hollow-stem auger drilling rig and will be used to assess shallow groundwater flow conditions and groundwater quality. As split-spoon sampling will be conducted during the installation of the bedrock well, no split-spoon sampling will be completed during the overburden well installation. The collection of soil samples from these

borings for laboratory analysis will be discretionary and will be based on the location of the boring, field conditions, and field observations and screening encountered during the drilling of the deeper boring.

Monitoring well construction specifications for this project include the following:

- Six-inch diameter borehole (minimum);
- Two-inch, inside diameter PVC riser and screen;
- Threaded joints only on PVC pipe (no glued joints);
- Clean silica (quartz) sand backfill to two feet above the screened interval (size to be determined);
- Two-foot–thick bentonite seal (minimum) above the sand pack; Portland cement/bentonite slurry (about 6:1 ratio) in the well annulus from the top of the bentonite seal to approximately 40" below the ground surface (for any wells screened below the water table, the grout will be placed with a tremie pipe);
- Concrete surface seal;
- Casing sealant and drilling fluids mixed only with potable water;
- Vented well cap; and
- Stick-up, steel protective casings (locking).

The well screen slot size will be selected to retain at least 90% of the filter pack and the filter pack will be selected so that the 70% retained grain size of the gravel pack is approximately four times that of the formation. A bottom cap will be installed. The ground surface seal will extend to a minimum of 40 inches below the land surface and will be flared such that the diameter at the top is greater than the diameter at the bottom. The top of the ground surface seal will be flush with grade and shall be imprinted with the designation of the monitoring well.

Screen lengths for wells intercepting the water table will be 10 feet, with no more than 8 feet extending below the water table at the time of drilling. The length of screen above the water table is intended to maintain the water table within the screened interval during seasonal and/or diurnal groundwater fluctuations. Well riser lengths will be field-determined so the top of the casing extends to an appropriate height to accommodate installation of protective steel casing, while still allowing for adequate access for sampling and monitoring water levels. Accurate written logs of the well construction details will be maintained.

Once completed, the wells will be developed using a surge block and pump. Fine-grained material around the well screen will be drawn into the well and removed by agitating the well water with a surge block and simultaneously pumping water from the well using a centrifugal suction pump at a low discharge rate. A centrifugal pump outfitted with ASTM

drinking water grade polyethylene tubing will be used for removing the water from the well. The polyethylene tubing will be replaced between each well. The dedicated new tubing will be rinsed with deionized water prior to its use. Water produced during well development will be handled in accordance with the guidelines outlined in Appendix F.

Should the depth of the well or depth to groundwater prohibit the use of the surge block and suction pumping technique, an alternative method will be used to develop the well. A suitable pumping device (e.g., submersible pump, WaTerra™ pump) will be placed in the well and used for development. That pumping will be augmented with surging using a surge block, if possible.

The volume of groundwater extracted from each monitoring well during development will be recorded and the progress of development will be determined by periodically monitoring turbidity. Development will continue until the turbidity is sustained at 30 turbidity units (NTUs). If the 30 NTU criterion is not achievable, a goal of 10% of the turbidity value on successive well volumes will be used.

3.2.2 Bedrock Coring and Monitoring Well Installation

Bedrock coring and monitoring well installation will take place using hollow-stem auger drilling methods. During drilling, split spoon soil samples of the overburden material will be collected continuously to the water table surface to log the samples for the presence of fill, lithology, evidence of contamination, etc. As with the shallow borings, the collection of soil samples from these borings for laboratory analysis will be also discretionary.

Advancement of the hollow-stem augers will cease when bedrock is encountered. The borehole will be cleaned to the surface of the bedrock. Should highly weathered bedrock be encountered, the drill bit may be advanced to a depth such that more competent bedrock is found. A smaller diameter (relative to the hollow-stem auger) PVC or steel casing will then be advanced to the bedrock and grouted (cement and bentonite mixture) in place to prevent mixing of the shallow (overburden) and deep (bedrock) aquifers. Grout will be placed using the tremie method (both inside the smaller-diameter casing and in the void space between the two casings) to ensure a proper seal and the augers will be removed as soon as the grout is in place. The grout will be allowed to set for a minimum of 24 hours to allow for proper sealing against the bedrock.

Once the grout is set, excess cement will be cleaned out of the casing using a drill bit and wash fluids, with care taken not to advance to depths beyond the grout seal. A minimum 3-inch diameter diamond bit and core barrel will be used to advance into the bedrock. The core bit and core barrel will be inspected prior to drilling for signs of excessive wear and general cleanliness. With the aid of the minimum drill fluids needed to bring cuttings to the surface, the bedrock will be cored in continuous 5-foot length intervals (runs) until the required depth is reached (approximately fifteen feet into the bedrock to support a ten-foot well screen and associated sand pack and seal). Drilling will be conducted with minimal vertical pressure (downhole pressure) and rotation. Both the downhole pressure and rotation (revolutions per minute) will be noted throughout drilling, particularly when adjustments are required. As the core barrel is advanced, the drilling time per foot and any loss or gain of water will be noted. In addition, the relative smoothness of core barrel advancement will be noted throughout each run as an indication of change in the type of material and the competency of the bedrock.

Upon completion of each 5-foot run, the core barrel will be removed and the core will be labeled and stored in an appropriate core box. All cores will be carefully handled to ensure their proper identification and placement in proper order within the core box. Core runs will be placed in the core box with the top of the first run in the upper left corner of the box and with successive runs placed from left to right. Wooden partitions will be placed between each run, with the appropriate depths labeled at the top and bottom of each run. Spacers will also be labeled and placed when cavities or large discontinuities are encountered. Each core box will contain cores from only one boring. The core box will be marked on the top and two ends with the site identification, boring number, depth range, date and core box number.

Each core will be geologically logged for physical factors including mineralogy, color, grain size, alterations, cementation, hardness and weathered state. In addition, features and structures (e.g., clay seams, bedding, fissility, etc.) will be noted. Core run lengths and recovery (as a percent) will be noted, as well as any loss zones. Discontinuity information will also be recorded in the field notebook including tightness, smoothness, number of fractures per foot, any filling and/or weathering of fractures, fracture orientation, and staining. The rock quality designation (RQD) will be recorded (as a percent). The RQD is the sum of inches of all naturally fractured rock core pieces larger than four inches over the total number of inches in the run, with the length of the piece determined by the distance between naturally occurring

fractures. Finally, a photographic log of all bedrock cores will be kept. Photographs will be taken from well above the core boxes (to include the entire core in the view) and will include a ruler for scale and identification of the core box number, core number, date and depths.

Upon completion of the bedrock core, a monitoring well will be installed. Screens for the bedrock wells will be 10 feet in length (0.010-inch screen slot) and will consist of 2-inch diameter Schedule 40 PVC. The well screen will be flush–threaded to 2-inch diameter PVC riser, which will extend above the ground surface (to accommodate the installation of protective steel outer casing). A gravel pack of #0 Morie sand or equivalent will be placed in the annular space to a depth of 2 to 3 feet above the top of the well screen. A 2- to 3-foot layer of cement/bentonite grout mixture will then be placed above the gravel pack to ensure a proper seal. Sand and/or native materials will be used to fill the remaining annular space to the surface. Each well will be completed with a locking protective outer casing.

Once completed, the wells will be developed using a surge block and pump. Fine-grained material around the well screen will be drawn into the well and removed by agitating the well water with a surge block and simultaneously pumping water from the well using a centrifugal suction pump or submersible pump (depending on the total well depth) with a low discharge rate. The pump will be outfitted with new, clean polyethylene tubing which will be replaced between each well. The dedicated tubing will be rinsed with deionized water prior to its use. The volume of groundwater extracted during development will be recorded, with a goal of removing at least five well volumes to account for the evacuation of water lost during bedrock coring, plus additional volumes. The progress of the development will also be determined by periodically monitoring turbidity. A turbidity meter will be used to measure NTUs, with the goal of sustained development water with a turbidity measurement of less than or equal to 30 NTUs. If the 30 NTU criterion is not achievable, then a goal of 10% of the turbidity value on successive well volumes will be used. Water produced during well development will be handled in accordance with the guidelines outlined in Appendix F.

3.2.3 Groundwater Sampling

A period of at least two weeks will elapse between well development and groundwater sampling. Prior to the initiation of sampling activities and immediately upon opening each well, the vapor headspace in the casing will be screened with a PID and FID to evaluate for the presence of methane and volatile organic vapors. The water level of each monitoring well will

then be measured to the nearest 0.01 ft. with an electronic water sensing device and recorded in a field notebook. In accordance with low-flow purging and sampling protocols, this will allow for a determination to be made regarding the placement of the intake tubing. The water level indicator will be decontaminated with deionized water prior to each use unless visual observations (e.g., oil, odors) indicate additional decontamination is necessary.

The wells will be purged using a bladder pump outfitted with new tubing (the tubing will be dedicated to each location to eliminate the potential for cross-contamination between wells). In accordance with low-flow sampling protocols, indicator parameters, including pH, specific conductivity, turbidity, dissolved oxygen, temperature and oxidation-reduction potential, will be monitored and recorded throughout the purging process to determine when the groundwater chemistry has stabilized. In addition, a purge rate ranging between 100 and 500 milliliters per minute will be maintained to prevent the effects of well water drawdown. Groundwater samples will be collected once the indicator parameters stabilize to within the prescribed tolerances for three consecutive readings recorded at three to five minute intervals. All samples will be collected directly from the pump and the pump will be decontaminated between wells.

3.2.4 Groundwater Sampling Parameters and Frequency

Each groundwater sample will initially be analyzed according to the parameters shown in Table 2.

Table 2: Analytical Parameter Summary

Analytical Parameter (Analytical Method)	Leachate	Ground Water	Surface Water	Sediment
Volatile Organic Compounds (EPA Method 8260)	√	√	√	√
Semivolatile Organic Compounds (EPA Method 8270)	√	√	√	√
Extractable Total Petroleum Hydrocarbons (CTDEP-Approved Method)	√	√	√	√
Polychlorinated Biphenyls (EPA Method 8082)	√	√	√	√
Pesticides (EPA Method 8081)	√	√	√	√
Herbicides (EPA Method 8151)	√	√	√	√
Priority Pollutant Metals (Total for groundwater and total and dissolved for surface water samples) (EPA Methods 6020/7471)	√	√	√	√
Total Organic Carbon (EPA Method 9060)				√
Hardness (EPA Method 200.7)	√	√	√	
Total Dissolved Solids (Standard Method 2540C)	√	√	√	
Total Suspended Solids (Standard Method 2540D)	√	√	√	

Analytical Parameter (Analytical Method)	Leachate	Ground Water	Surface Water	Sediment
Alkalinity (Standard Method 2320B)	√	√	√	
Total Dissolved Iron (EPA Method 200.7)	√	√	√	
Total Dissolved Manganese (EPA Method 200.7)	√	√	√	
Ammonia (as Nitrogen) (Standard Method 4500-NH3D)	√	√	√	
Nitrate (as Nitrogen) (EPA Method 300.0)	√	√	√	
Sodium (EPA Method 200.7)	√	√	√	
Potassium (EPA Method 200.7)	√	√	√	
Chlorides (EPA Method 300.0)	√	√	√	
Sulfates (EPA Method 300.0)	√	√	√	
Biological Oxygen Demand (5-day)	√	√	√	
pH (Standard Method 4500 H+B for Soils/Field Measurement for water)	√	√	√	
Oxidation Reduction Potential (Field Measurement)	√	√	√	

* - If it is determined during the course of the field work that the analysis of soil samples is warranted (based on field observations/screening), the samples will be analyzed for the same parameters as the sediment samples.

The wells will be sampled once per season over the course of one year with subsequent sampling events occurring consecutively with one each in the spring, summer, winter and fall.

3.3 Task 3 - Sediment and Surface Water Sampling and Stream Gauge Installation

The locations of the sediment and surface water sampling locations are shown on Figure D. These locations are identified as follows:

Sample ID	Location
1	Located at the northwest corner of the landfill site where the culverted drainage enters the site.
2	Located further downstream where the unnamed stream becomes permanent.
3	Located on the upstream side of the bermed area to the north of the landfill.
4	Located at the southerly jog of the unnamed stream but upstream of the outfall of the discharge pipe that extends from beneath the landfill.
5	Located at the intersection of the leachate drainage outfall and the unnamed stream.

6	Located immediately upstream of the double culvert that brings the unnamed stream under Scofieldtown Road.
7	Located further downstream within Poorhouse Brook.
8	Located at the outfall of the drainage pipe that enters the man-made pond from beneath Rock Rimmon Road.
9	Located on the northern end of the man- made pond.

Prior to the first surface water sampling event, a graduated stream gauge will be driven into the subsurface at three sampling locations (2, 4, 6, and 7) for recording surface water levels during the surface water sampling and groundwater monitoring portions of the investigation. The elevation and location of the graduated gauges will be surveyed during the land surveying activities. Both surface water and groundwater elevation measurements will be obtained concurrently during the site investigation to assess surface water and groundwater interactions.

3.3.1 Sediment Sampling

The technique used to collect the sediment samples will depend upon the specific conditions at each sample location (USEPA, 2001). In dry or shallow water conditions, the samples will be collected using a bucket or dutch auger. Should standing water prevent the collection of the samples without sample washing (loss as the sample is brought up through the water column), PVC pipe will be used. At such locations, a decontaminated, four-inch diameter PVC pipe will be driven into the sediment to a depth of 1.5 feet. This will allow for the collection of multi-level sediment samples to depths of six inches and one foot with minimal collapse of the borehole, as the PVC pipe will impede the influx of water. The sediment sample will then be collected from within the pipe using a decontaminated stainless steel auger.

Under either sampling method, the contents of the auger will be placed carefully (with minimal disturbance) into a dedicated, stainless steel mixing bowl to allow for the collection of an aliquot for the analysis of volatile organic compounds (VOCs). After the aliquot has been collected for VOC analysis, the contents of the bowl will then be homogenized with a decontaminated stainless steel spoon and placed directly into the appropriate sample containers for the remaining analyses. The sediment sample will be geologically logged for grain size, color, texture, consistency, and other physical parameters (e.g., staining, odors, etc.). These

observations will be recorded in a field notebook. (Note that this procedure will also apply to the collection of soil samples, should they be collected at any time during the investigation.)

3.3.2 Surface Water Sampling

All surface water samples will be collected during a single-day sampling event at the site. Surface water sampling will be conducted in a downstream to upstream manor and prior to any sediment sampling at the same location to prevent any disturbance of the surface water sampling conditions (i.e., the potential for introducing sediment into the water column). Surface water samples will be collected either directly into the appropriate sample containers by facing upstream and partially submerging the containers within the stream current or with another appropriate water sampling device (e.g. dipper), depending upon site conditions. All surface water samples will be collected from the surface of the water and care will be taken to minimize turbulence during sampling. Any equipment used for water sampling will be dedicated or decontaminated between each sample location. Any such sampling equipment will also be rinsed with surface water at the particular location just prior to sampling.

At each of the sample locations, the physical characteristics of the stream will be noted (e.g. depth, width, and approximate flow velocity) and recorded in a field notebook. An aliquot of water will also be collected and retained in the sampling cup of a multi-parameter monitoring device for the performance of field chemistry measurements, including pH, temperature, specific conductance, dissolved oxygen, turbidity, and oxidation-reduction potential.

3.3.3 Sediment and Surface Water Sampling Parameters and Frequency

Each sediment and surface water sample will initially be analyzed according to the parameters shown in Table 2. Sediment samples will only be collected once during this investigation at the time of the first surface water sampling. As with the groundwater monitoring wells, the surface water sampling locations will be sampled once per season over the course of one year with subsequent sampling events occurring consecutively with one each in the spring, summer, winter and fall.

3.4 Task 4 - Flow Monitoring

The flow of the unnamed stream and Poorhouse Brook will be measured by establishing cross-sections at appropriate upstream and downstream locations to be determined during the impact evaluation. To estimate the average stream velocity, a portable flow meter will be used. The flow for each segment will be calculated by multiplying the velocity for the segment by the average depth and width. The flow for each interval will be summed to obtain the total flow. The following equation applies to this method:

$$Q = \sum_{i=0}^{n} * V_i * w_i * d_i$$

Where Q = Stream flow in cubic feet per second (cfs),
V_i = Average segment velocity in feet per second (ft/s,)
w_i = the width of the stream segment in feet (ft),
d_i = the average stream segment depth in ft and
n = the number of segments in the stream cross section.

3.5 Task 5 - Hydraulic Conductivity Testing

In order to collect data regarding the horizontal hydraulic conductivity (K) of the overburden, in-situ testing will be conducted. Typically, the most effective means of determining K in a given formation is through a slug test where a solid impermeable material of a known volume is quickly inserted or removed from the saturated portion of a monitoring well while the groundwater level in the well is monitored with a pressure transducer until the water level returns to equilibrium. The data collected from the transducer is then utilized to estimate K. The number of slug tests and the locations of wells used for the tests will need to be determined in the future and will be based on observations made during the installation of the proposed additional monitoring wells.

3.6 Task 6 - Surveying

Although all sampling points will be located by GPS during the fieldwork, following the completion of all field activities, the locations and elevations of soil borings, monitoring wells, surface water and sediment samples, stream gauges, outfalls and leachate seeps will be surveyed by a licensed surveyor and added to the survey currently in production. Monitoring wells will be surveyed for elevation at the top of the protective casing, at the top of the well casing and at the

adjacent land surface. The elevation of a designated point on each stream gauge will also be surveyed. In addition, the ground elevations of all other sample locations will also be surveyed. Elevations will be referenced to a United States Geological Survey benchmark and mean sea level or other appropriate datum to the nearest 0.01 foot.

3.7 Task 7 – Leachate Modeling

Using information obtained from the off-site impact evaluation as well as other information gathered specifically for this task, the Hydrologic Evaluation of Landfill Performance (HELP) model developed by the USEPA will be used to estimate water balances for the site both pre- and post-closure. The HELP model will use weather, soil, groundwater and design data to confirm the behavior of leachate generation in the landfill in its current state and predict leachate generation once the landfill has been capped. Understanding the generation of leachate of the closed landfill will assist in the comparison of potential design alternatives and predict if leachate capture may be needed to reduce or eliminate impact to the surface waters of the unnamed stream or Poorhouse Brook. Ultimately the recommended approach will involve evaluation of the actual groundwater and surface water quality post-closure monitoring results over a three year period before a final decision is made regarding the need for additional measures to capture and manage leachate. The trends developed over a three year monitoring period should be sufficient to predict if the landfill cap alone is sufficient to meet surface water quality standards.

3.8 Task 8 - Report

At the completion of the initial sampling of groundwater, surface water, sediment and leachate, an evaluation of the preliminary data will be performed. The goal of this preliminary assessment will be to determine if immediate corrective action is required to prevent further impact to downgradient receptors. If a condition is found to exist that represents a threat to off-site receptors, the City and the CTDEP will be immediately notified and presented with tabulated data, figures and recommendations for the necessary corrective action plan. If corrective action is necessary, it should not impact the landfill cap design, but may incorporate additional measures needed to mitigate the impact to off-site receptors.

Following completion of the year-long investigations, a draft report will be prepared and submitted to the City for review. The report will summarize all field tasks and sampling observations and results. The conceptual site model and hydrogeological evaluation presented and validated. Conclusions will be presented regarding the nature and extent of off-site impact and will include leachate modeling results. TRC will address any comments received from the City and issue a draft final report for submittal to the CTDEP. After review, comment and approval by the CTDEP, the off-site impact evaluation report will be finalized.

4.0 LEACHATE SEEP INVESTIGATION

As required in the Consent Order, a leachate seep investigation will be conducted in conjunction with the other investigations to be completed at or in the vicinity of the site. The objectives of the seep investigation are to:

- Complete a leachate seep inspection to identify the location, extent and characteristics of seeps observed along landfill slopes and in other on-site or off-site areas; and
- Characterize seeps observed along landfill slopes and in other areas seasonally.

Preliminary evaluation of the boundary areas of the landfill indicates that some seeps are present on the north slope between the landfill materials and the unnamed brook. In addition to the seep areas, it is apparent that landfill leachate is entering the drainage pipe that runs beneath the landfill. This location, prior to the plugging and abandonment of the pipe should be considered a seep location. The location of the pipe outfall and the general areas of other seeps observed during a preliminary site evaluation are shown on Figure D.

4.1 Visual Leachate Seep Inspection

The initial visual leachate seep inspection will serve as a baseline for continuing investigation over the course of the field investigation phase of the landfill closure. The visual inspection will consist of a field scientist walking over the entire perimeter of the landfill area. Based on preliminary inspections already conducted, the visual inspection will focus on the following areas:

- The slope along the northern boundary of the landfill along the unnamed stream;
- Slopes along the eastern boundary of the landfill along Scofieldtown Road;
- The sloping hillside that separates the composting area from the park; and
- Any other areas where seeps may be identified.

The above specific locations will be subjected to inspections as well as any nearby low-lying areas or changes in slope where leachate or groundwater may discharge from the landfill materials. Specific items to be investigated will include identifying erosion rills, areas of surface staining and/or stressed vegetation and wet or saturated areas resulting from seeping liquid. Each location will be marked in the field using a stake driven into the ground and painted or

flagged sufficiently to allow it to be relocated during future inspection events. The seep location will also be located using a hand-held Global Positioning System device (GPS) for coordinates and will be surveyed at a later date with the other sampling locations. A photographic log will also be kept during the inspection. The log will include the date of the photograph, a specific description of what the photograph depicts and the field inspector's name.

At the conclusion of the initial baseline inspection, all staked and flagged locations will be surveyed for horizontal and vertical location and identified on the master base map for the landfill.

4.2 Additional Inspections

After the initial leachate inspection, three additional inspections should take place over a one year period. Depending upon the season in which the first inspection takes place, the other inspections should occur consecutively, occurring one each in the spring, summer, winter and fall. The multiple inspections will provide information on seasonal trends both in leachate seep activity and leachate quality. If during a subsequent inspection, additional leachate seep areas are observed, the same actions will be taken to properly document the seep's location.

Leachate seep inspections will not be performed during precipitation events and no sooner than 24 hours after a precipitation event. Long-term weather forecasts should be consulted prior to the scheduling of each seep inspection event to attempt to have several days of dry conditions prior to the inspection. All weather conditions will be noted in the field logs for the inspection.

4.3 Seep Characterization

Seep characterization will consist of both visual logging and analytical sampling. During the visual inspection, the following will be recorded in the field logs:

- Color of staining and seep flow;
- Area (square feet) of staining;
- Whether the seep is active or inactive;
- Estimate of seep flow;
- Presence of erosion, pooling or odor;
- PID/FID readings; and
- Any other relevant or identifying details.

After completing the field description of the seep, the field inspector will then collect samples of the leachate (as detailed below). The seep will be analyzed for the parameters identified in Table 2. If a seep is active, then liquid sampling will be attempted. Clean sampling jars will be placed in such a way as to allow liquid to flow into the vial or jar. If the seep is discharging directly to the unnamed brook to the north of the landfill, then a sample of the surface water immediately adjacent to the seep will be collected. As the volume of liquid may be limited depending upon seep location and time of year, prioritization of requested analyses for the samples will be completed.

Sampling of leachate will be conducted using the same methods and protocols as those used to sample other media, such as soil and groundwater. Trip blanks, field blanks and duplicate samples (if sufficient sample is available) will be collected in conjunction with the seep collection. The QA/QC sample frequencies are specified in Appendix F.

Seep samples may also be collected using shallow driven screened probes that are inserted to the groundwater surface near the toe of slope. A peristaltic pump will be used to slowly extract the liquid at the groundwater surface.

4.4 Seep Evaluation

The field observations and analytical data generated from each seep sampling event will be reviewed and evaluated. Each quarterly sampling event will be tabulated and results will be compared to the Connecticut Water Quality Standards (CTDEP, 2002) as well as to concentrations of previous or baseline sampling events. If significant changes in seep leachate parameter concentrations, seep leachate volume or field observations, recommendations for additional investigation in that area may be made. The assessment and evaluation of each of the leachate sampling events will be provided to the City during quarterly reports and the CTDEP with other data collected on a periodic basis as well as included in the final impact evaluation report.

5.0 LANDFILL CLOSURE ENGINEERING APPROACH

5.1 Goals

The approach chosen to close the Scofieldtown Landfill is to create a cap that encompasses the entire site, ensuring that all areas of waste disposal are covered. The goals of the engineering design approach for the landfill closure are as follows:

- Eliminate direct human and ecological exposure with landfill materials and polluted soil. Soils used above the cap membrane must be compatible with the future anticipated uses;
- Minimize the generation of leachate caused by infiltration of rain through the landfill using an engineered cap, thereby allowing the landfill to exist without causing unacceptable water quality degradation to the adjacent receiving surface waters;
- Eliminate pathways of landfill leachate generation resulting from existing pond bottom infiltration and leaking drainage pipe system;
- Comply with the requirements of the CTDEP Solid Waste Management Regulations 22a-209-13 – Closing of Solid Waste Facilities;
- Provide a capping system that is structurally stable under the anticipated static, seismic and transient loading conditions. The transient loads include cap construction and long-term future site use including vehicular traffic where needed;
- Recommend a capping system that provides the greatest degree of flexibility with selection of future site uses and surface grade shaping;
- Provide a stable, erosion resistant surface that is capable of managing rainfall runoff during all phases of construction and future site use;
- Provide engineered surface and membrane drainage systems that can safely convey rainfall runoff and infiltration without causing on-site or off-site damage;
- Provide an engineered water quality management system that complies with the Connecticut Water Quality Manual for both construction phase and permanent site use runoff management to ensure surface water quality goals are satisfied;
- Provide engineered drainage systems that safely convey piped runoff entering the site without damaging the landfill cap;
- Provide engineered protection for capped landfill slopes that may be subject to erosion from abutting watercourses;

- Safely capture and vent landfill gas resulting from the decomposition of organic waste, if necessary. Assessment of landfill gas generation will be incorporated into the site evaluation process to determine the need;

- Provide a strategy for evaluation of landfill leachate production following cap installation and during the post-closure care phase. Provide conceptual capture and control strategy for landfill leachate, if required;

- Establish minimum criteria for engineering of the cap system, drainage and construction quality control; and

- Provide criteria for post-closure maintenance and monitoring.

5.2 Environmental Issues Evaluation

The groundwater pathway of contaminants is the most significant aspect of the landfill closure that must be addressed. The former landfill site is located in close proximity to stream systems that have small watershed contribution and thus limited capacity to assimilate pollutants. The distance that leachate must travel from the groundwater beneath the landfill to the adjacent surface waters receiving the groundwater discharge is very short. The main problem therefore that must be corrected by the landfill closure activity is the reduction of leachate generation to levels that will be protective of surface water quality along the perimeter of the landfill. The quantity and quality of the leachate currently being produced by the landfill waste mass will be evaluated as discussed in Section 4.0 of this plan. The data generated from the study will be used to assess the impact that the landfill closure activities will have on leachate generation, groundwater quality and surface water impacts. The main components of the closure activities that will result in significant reduction of leachate generation are as follows:

- Eliminate rainfall infiltration through the landfill waste mass by installing an engineered membrane surface cap that covers all areas containing landfill waste;

- Reduce groundwater mounding beneath the waste mass caused by rainfall infiltration and pond area surcharge by installing the engineered barrier, lining the pond and redirecting the stream entering the pond;

- Eliminate direct pathways for leachate discharge caused by the leaky drainage pipe crossing beneath the waste mass; and

- Redirect surface drainage and a stream that enter the site around the waste mass.

It is anticipated that addressing the above problem areas will adequately manage the leachate generation issues associated with the site and be protective of surface water. It is important to note that groundwater quality beneath the landfill and to the point of surface discharge will not meet the Connecticut GA Groundwater Protection Criteria. It is typical of all landfills permitted in the State of Connecticut that groundwater quality between the landfill and surface water discharge will be degraded. The regulatory approach is that the landfill owner must either own the property between the landfill and receiving surface water or control the use of groundwater. The properties that directly adjoin the surface waters and that are the likely discharge point for the groundwater flowing beneath the landfill are controlled by the City and private property owners. This will need to be confirmed as part of the future groundwater and leachate studies described in this plan. Groundwater reclassification in this zone of influence will be required for the groundwater quality to comply with the Connecticut RSRs. Guidance to apply for groundwater reclassification is available from the CTDEP (CTDEP August 2009).

In the event that the measures described above are not adequate to fully address leachate generation and surface water quality impacts to the receiving waters, then additional future leachate management measures may be necessary. These measures are discussed in greater detail in Section 5.14 of this plan. The approaches would likely consist of up-gradient site control of groundwater or down-gradient control and capture.

The other contaminant exposure pathways involving surface soils and pond sediments will be fully address by installing an engineered cap that completely isolates the contaminants from direct exposure, ingestion and spreading by surface erosion. The only instance that would allow contaminants to come in direct contact would be an activity that disturbs the engineered cap and exposes the underlying waste. The City will be required to have a plan in place that defines health and safety guidelines for disruption activities following notification of the CTDEP. The plan would also address proper cap restoration procedures to ensure that the integrity is not compromised and the waste isolation barrier is restored.

The environmental classification of surface soils that are placed directly beneath the cap membrane and on top of the cap membrane will vary depending upon the future uses contemplated for the site. Section 6.0 of this plan discusses the strategy for future site use. The plan is to have a portion of the top surface of the landfill to be used for a public park and the remaining portion to be used for salt storage, residential recycling drop-off/transfer and other

municipal public works maintenance and operations activities. With proper site access controls, the City will provide soil above the cap membrane within the public park area as meeting the Residential Direct Exposure Criteria (RDEC) under CTDEP Remediation Standards Regulations 22a-133k-1 through 22a-133k-3 (RSRs). All other portions of the site outside the park will have soil above the membrane that meet the Industrial/Commercial Direct Exposure Criteria (I/CDEC) under the RSRs. All soils placed above the cap membrane will meet the GA Pollutant Mobility Criteria (GAPMC) under the RSRs to ensure that surface runoff and cap drainage water meet the requirements of the groundwater aquifer surrounding the landfill. The soil that is used for the subgrade support layer below the cap membrane will comply with the I/CDEC and GBPMC criteria contained in the RSRs. The area of the site used exclusively for the public park will be separated from the other areas of the site using a physical barrier, such as a chain link fence, that restricts access. The entire landfill perimeter (on the toe of the landfill) will also have a fence that restricts public access. The environmental testing and compliance requirements for soil used to close the landfill are covered in the Specifications contained in Appendix G.

Rainfall runoff from the active areas of the site used for salt storage, composting, recycling drop-off/transfer and other public works activities is not collected, managed and treated to meet current State of Connecticut Best Water Quality Management guidelines. The runoff from the active site flows overland to various portions of the site perimeter with a portion along the north and east flowing across the vegetated slopes and in eroded drainage swales. The other active areas of the site runoff to Rock Rimmon Road or the on-site pond. The landfill closure will incorporate engineered systems to collect, filter, treat and attenuate peak flows from the active portions of the site to meet Best Management Practices. This will result in compliance with the Connecticut Stormwater Permitting requirements for Industrial Activities and improve water quality for the receiving surface waters.

Landfill gas generation and management is a common problem with landfill closures involving wastes consisting of municipal solid waste and the biodegradable products contained in construction/demolition debris. Beside the waste composition, the age of the Scofieldtown Landfill is a major factor affecting the quantity and quality of landfill gas generated. It has been more than 40 years since the site was used as an active landfill. Usually when that amount of time has passed decomposition has virtually ceased resulting in low levels of methane and other gas generation. Landfill gas has not been reported as a problem at the site. Installing a

membrane cap over the waste will trap any gas generated. Sufficient passive venting of the gas will need to be considered as part of the engineering design of the cap to relieve excess pressure and prevent cap damage and lateral gas migration. Structures on the landfill that penetrate the cap will need to be protected and monitored for gas intrusion. As part of the subsurface investigations performed at the site, borings and gas monitoring wells will be installed to assess landfill gas generation. The data gathered during this assessment will provide the data needed to design the venting system. It is not anticipated that capture and control of gas will be required based on the age of the waste and the effect that membrane caps have on landfill gas production. The membrane will cause the waste to desiccate over time and significantly reduce decomposition.

5.3 Site Grading and Cap Selection Overview

Closure of the Scofieldtown Landfill is going to require a significant amount of regrading and site work. The landfill was not constructed with a formal operations plan and grade control. As such there are portions of the slopes along the north, east and south that are much too steep to construct a membrane cap system and comply with the stability requirements of the regulations. The toe of the landfill waste in many areas along the slopes is very close to the property boundary and abutting stream/wetlands. The construction of veneer membrane cap systems requires that earth moving equipment have access along the bottom of the slopes in order to push cover soils in an upslope direction. The reasons for this requirement have to do with the interface friction angles of the cap components and the high transient loads that earth moving equipment generate when pushing soil downslope. The only way to control the construction loading without causing failure of the cap components is to push the cover soil from the bottom of the slope in an upslope direction. Membrane and drainage geonet manufactures will not guarantee their products unless installed in the recommended manner. If waste is encountered along the toe of the landfill slopes both to the north and east during regrading and site work, this waste will be pulled into the landfill area for coverage.

The closure grading plan requires that the landfill cover soil and wastes be regraded to allow the construction of a continuous haul road along the proposed toe of the landfill along the north and east facing sides. The east facing slope along Scofieldtown Road will be accessible from the road, so a separate haul road is not required. The haul road will become a permanent

feature of the closure to allow access for slope maintenance, leachate monitoring and groundwater monitoring.

The selection of a suitable slope for the closed landfill is based upon the components selected for the landfill cap, which requires a detailed engineering analysis of slope stability. There are a wide variety of materials available for landfill capping, but the single most difficult problem is the interface friction angle of the cap components. A membrane cap with internal drainage is a thin veneer system of several materials, including the membrane, geotextiles, drainage geonet and several soil layers. The weak link is always the interface friction angle between two of the cap components and the membrane is generally one of the critical components. Membranes accepted by regulatory agencies for landfill capping are generally made of high density polyethylene (HDPE), low density polyethylene (LDPE), very low density polyethylene (VLDPE) or low linear density polyethylene (LLDPE). The keys to the membrane selection are frictional resistance, strength, flexibility and ease of installation. The methods and consistency of texturing on both surfaces of the membrane is the single most difficult problem for membrane manufacturers. There are several different techniques for membrane texturing and selecting the membrane and the other cap components that come in direct contact must be accomplished by rigorous laboratory testing of the actual materials and soil used for the project. Engineering and construction of veneer landfill caps has been around for several decades and the materials have improved over that time. In spite of all of the advances there are physical limitations on the interaction of the manufactured materials and natural soils to produce safe stable slopes. It is generally accepted that slopes having a grade of 3 horizontal to 1 vertical (18.4 degrees) are acceptable for most sites and will allow static stability factors of safety of at least 1.5 to be achieved. Slopes steeper than this will reduce the factor of safety and require other special and expensive methods to improve stability and prevent sliding. The slope selected for the Scofieldtown Landfill will be 3 to 1 and the specification of the cap components will be selected to achieve a static factor of safety of 1.5. Transient construction loads will have a lower factor of safety of around 1.2 and seismic stability will be such that slippage of the cap components will not occur during the design earthquake for the area. Additional detail on the cap design is provided in Section 5.10 of this plan.

The existing landfill slope grades vary widely and there are generally areas where slopes are greater than 3 to 1 alongside flatter slopes. The approach used for this site will be regrading

the slopes to achieve a maximum 3 to 1 slope throughout. The densely vegetated slopes will need to be cleared of the trees, stumps, brush and solid waste debris prior to commencing with the regrading. Since the slope regrading will result in excess cut material being generated, the excess material will be placed and spread upon the top of the landfill to generate surface contours that are acceptable for the top finish grades. It will be important at this site to perform the entire site regrading as a single operation to ensure that the landfill top surface produces continuous uniform grades to allow the drainage geonet on top of the membrane to convey the rainwater that infiltrates the cap soil. The top of the landfill surface and corresponding membrane will be graded to a minimum 4% grade to achieve the desired water conveyance. The landfill surface grades are based upon estimates of volumes calculated from surface topography that has not been verified by detailed ground survey of the site. The goal is to provide landfill re-grading that balances the volume of cut material with the volume of fill to prevent the importation or exportation of material to achieve the cap subgrade. Combining survey inaccuracies with the inherent inaccuracies with estimating material volumes involving excavation, regrading and compaction will require that adjustments to the final top surface grades be made during final placement of material. The City has commissioned a more detailed topographic and property boundary survey that will help reduce some of the possible volumetric inaccuracy when the final engineering design is provided.

The finish surface grades that are provided in Figure E of this plan are intended to represent the grades proposed for the underlying membrane and the minimum surface grades that are achievable with the recommended landfill cap design. Future uses proposed for the site will ultimately alter these grades on the top surface depending upon the activities approved by the City. In particular, the designated future park area of the site will likely result in the most significant regrading adjustments. Any future regrading will be performed in a manner that doesn't disturb the membrane cap grades (4%) and does not result in fill depths over the membrane less than 18 inches. For example, a large ball field that has grading maximums of 2% would have to be adjusted by raising and flattening the surface grade with more fill material. In this manner the membrane cap drainage system will still function as designed and sufficient soil will rest on the membrane to protect it from damage.

Vegetated areas of the site will be stabilized by planting a hearty low maintenance grass cover that can be either maintained in a mowed or un-mowed condition. The type of veneer cap

system proposed for the site will not allow the planting of deep rooted woody vegetation. Large trees are not stable when planted on top of membrane veneer covers and damage to cover soils, cap drainage and membrane can occur when high winds topple trees. Areas of the site that require vegetative screening or other aesthetic plantings will have to be carefully selected to ensure they will not damage the cap system. It will be required to place additional fill material in screening/planting areas to ensure there is sufficient soil for plant survival and cap protection. When properly designed with sufficient soil cover planting generally not exceeding ten feet in height will be acceptable to incorporate into the final reuse plan.

5.4 Membrane Drainage System Overview

Drainage of excess water that infiltrates through the cover soils on top of the membrane is essential to the stability of the cover soils. The maximum potential rate that water can infiltrate the cover soil is a direct function of the permeability of the soil. The goal is to provide cover soil that limits infiltration so that the drainage layer is not overwhelmed by the flow of water that must be transmitted across the membrane surface. Typically soils on top of the membrane are placed and compacted to achieve at least 90% of their optimum density. Soils that have permeability of 0.0001 cm/sec or less are sufficient to limit infiltration sufficiently to design cap drainage without special measures. Soils in the 0.0001 to 0.00001 cm/sec range also are readily available, stable, do not have excessive amounts of clay or silt and are not highly erodible. This closure will specify the use of soils that have a maximum 0.0001 cm/sec permeability and a maximum of 25% passing the #200 sieve (silt/clay sizes).

There are two main ways that the membrane surface is drained to remove the infiltrated rainwater. Composite drainage geonets are placed directly on top of the textured geomembrane and provide a continuous thin open gap for infiltrated water to flow in sheet fashion along the sloped membrane surface. The composite drainage geonets are made of high density polyethylene ribbons that form a criss-cross structure that allows for the free flow of water. The drainage geonet is heat bonded to non-woven geotextile fabric on one side or both sides. The geotextile allows cover soil to be placed directly on top of the drainage geonet to prevent fines in the soil from clogging the geonet structure. These materials, when properly designed and installed, will be able to handle vehicular traffic.

The material is manufactured in rolls that allow the material to be quickly and easily deployed. The geotextile covering the drainage geonet overlaps at the seams and allows the geotextile to be sewn to the adjoining row of material. The composite drainage geonets come in two basic types. Bi-planar geonets are thinner in cross section and transmit less water than the thicker tri-planar geonets. The choice of the type of geonet is an engineering decision based on the cap design and cost. The cover soil permeability, membrane slope and distance between cap drainage interceptors typically control the design selection. Interface friction of the composite drainage geonet and the textured geomembrane is an important design consideration on the steeper 3 to 1 slopes. The designer must also consider the bond strength of the geotextile and drainage geonet to ensure that it does not fail during placement, spreading and compaction of cover soil on the steeper landfill slopes. Manufacturers can increase the heat bond strength between the geotextile and geonet, if necessary, but the effect that this has on the geonet transmissivity must be considered by the designer.

The alternative cap drainage system is to employ a screened washed clean sand layer that is highly transmissive. The permeability of the sand must be at least 0.01 cm/sec to be effective. The sand is usually placed in a layer of at least 9 inches thickness directly on top of the geomembrane. A layer of non-woven geotextile is placed on top of the sand layer to prevent fines in the cover soil migrating down and clogging the sand. Because the sand is much less transmissive than a composite drainage geonet, an extensive network of flat perforated pipe is required to remove the buildup of water within the sand layer. On the steeper slope area the flat pipe spacing is likely needed every 20 feet apart. On the flatter top portion the spacing would have to be about 10 feet apart. The main disadvantages with a sand cap drainage layer are as follows:

- Difficulty finding a local borrow source for uniform clean sand;
- Reduced thickness of cover soil layer affects moisture available for grass cover;
- Extensive network of flat perforated drain pipes required to remove sand pore water;
- Labor intensive installation required; and
- Sand placed on steep slopes is highly susceptible to erosion from intense rainfall events prior to placing cover soil.

For the above reasons a composite drainage geonet has been selected to provide the necessary geomembrane cap drainage. Figure E shows a conceptual layout of perforated relief drain pipes on the flatter top surface of the landfill. The spacing and location of this system will

be determined by the designer when all of the landfill cap materials are selected and specified. The drains are intended to capture the sheet flow within the composite drainage geonet before it reaches a depth that exceeds the geonet capacity. The pipe system will provide relief and conveyance of the intercepted water and send it to the stormwater quality management basin. The length of the steeper 3 to 1 side slopes is such that interceptor drains will likely not be required. The sheet flow water traveling down the slopes within the geonet will be discharged at the toe of slope within a modified riprap layer. Along the north and east slopes the cap drain water will travel across the crushed stone haul road, where it will enter the adjacent wetland/stream system. Along the south slope the water will discharge into the drainage swale that is proposed to run parallel to Scofieldtown Road.

5.5 Stormwater Management Overview

Areas of the site that will be paved and used for driveways, parking and public works operations will generate runoff that will have to be collected with catch basin drainage structures and piped to the stormwater quality management basin shown on Figure E. The location of the catch basins and layout of the conveyance piping is not shown on the figures furnished with this plan. These are features that will need to be designed when all of the final site layout and use is determined by the City. Depending upon the uses proposed by the City within the public works and recycling areas, the stormwater collection system may require grit separation and oil/water separation prior to entering the basin. The need for these systems will be determined by the designer to ensure compliance with the stormwater regulations.

The existing perennial stream that enters the site via pipe into the pond near the intersection of Rock Rimmon Road and Scofieldtown Road will be rerouted within a new pipe system outside the edge of the landfill along Scofieldtown Road. The point of discharge will be just upstream of the twin culverts that carry Poorhouse Brook under Scofieldtown Road. The pipe will also convey the stormwater runoff and cap drainage water that is collected by the proposed stormwater quality management basin that will replace the existing pond. The design of the new pipe discharge will allow conveyance of peak flows from a storm having recurrence of 100 years. Further discussion on the stormwater quality management basin is provided in Section 5.6 of this plan. The existing concrete pipe that runs directly beneath the landfill and conveys water from the pond to the stream along the east side will be plugged at each end. The

method used for plugging the pipe will have to ensure that the pipe no longer can convey landfill leachate to a surface discharge.

The existing stormwater culvert pipe that discharges onto the property in the northwest corner will be extended to the bottom of the existing steep slope. A manhole structure will be installed in the location of the existing stone masonry endwall and the pipe will convey the flow to the bottom of the slope outside the edge of the landfill cap. The pipe slope will be flattened to produce non-erosive discharge velocities and a riprap splash pad will be installed at the flared-end outlet. The existing pipe discharges into a fairly steep poorly defined drainage swale at the very edge of the landfill. The approach proposed will eliminate the possibility that off-site surface drainage will damage the landfill cap.

The grass vegetated 3 to 1 slopes will be designed to be sufficiently stable to handle the rainfall runoff that is generated during storm events that have a recurrence interval of 100 years. All of the top surface drainage will be directed away from the steeper slopes to prevent erosion from concentrated flow. The slopes are designed to produce uniform sheet flow runoff without concentrating flow into channels. The design will assess the peak discharge across the slope for the 100 year storm. The bottom portion of the slope will have a specially designed permanent erosion geonet embedded in the soil that reinforces the soil and grass cover matrix, allowing higher flows to be transmitted across the surface to prevent soil erosion. The toe of the landfill slopes will also have riprap erosion protection along the edge. Refer to the detail on Figure F of this plan.

5.6 Stormwater Water Quality Management Basin

The existing pond area on the site will be converted to a lined stormwater quality management basin that provides primary treatment for the surface runoff generated from the top surface of the closed landfill. Before the pond is converted it will be completely drained and the new discharge pipe along Scofieldtown Road and basin outlet structure will be installed to redirect the influent perennial stream. This will allow the existing pipe that runs beneath the landfill to be properly abandoned. During the construction phase of the project, the pond will serve as a temporary sediment removal/retention basin for the surface runoff generated from the site regrading and cap construction activities. Once the site is stabilized and vegetated then the final stormwater quality management (SQM) basin will be constructed. The existing pond

bottom sediments and the sediment trapped during construction will be capped with a geomembrane and soil. This will completely isolate the sediments and prevent infiltration through the sediments and underlying landfill material.

There are many variations on SQM basin designs that act as primary stormwater treatment. The selection and final design of the basin will depend upon the anticipated chemical nature of the stormwater runoff from the active areas of the site and the type of basin that is compatible with the future park use. As such, no details for the SQM basin design were included on Figure F. The basin will also serve to attenuate the peak flows of runoff from the paved surfaces by acting as a stormwater detention basin. The designer will utilize the Connecticut Stormwater Quality Manual to evaluate the appropriate SQM basin types that can be used and determine in conjunction with the City and CTDEP the recommended design for the site. The following types of SQM basins will be considered and may involve combinations or variations of those listed below:

- Wet Pond;
- Micropool Extended Detention Basin;
- Wet Extended Detention Basin;
- Multiple Pond System;
- Shallow Wetland;
- Extended Detention Shallow Wetland;
- Pond/Wetland System;
- Lined Bioretention Basin; and
- Dry Detention Basin;

The design will consider the limitations on basin slope grading where geomembrane cover soils are submerged by standing water in the basin and erosion by flow through the basin. Side slopes of 4 horizontal to 1 vertical, or flatter will likely be required to remain stable. The influent part of the basin will incorporate a sediment forebay that traps the coarser sediments, slows the velocity of the influent water and creates a stable laminar flow condition. The outlet structure design will depend on the type of basin design. Regardless of the basin type there will be an emergency spillway that can handle the peak flow from a 100 year storm event.

5.7 Construction Stormwater Management

The management of stormwater during the construction phase of the landfill closure is a critical element that will be designed in accordance with Best Management Practices contained

in the Connecticut Sediment and Erosion Control Manual and the CTDEP regulations governing construction activities. The area of disturbance will necessitate that a detailed stormwater pollution prevention plan (SPPP) be developed and reviewed by the CTDEP before a permit is issued for the construction activity. The project will result in the disturbance of approximately 17 acres of land surface. The management of surface runoff on a project involving the regrading of tens of thousands of cubic yards of soil and the placement of over 50,000 cubic yards of subgrade and cover soils will require a management plan that is flexible enough to adapt to the changes that will occur during the various phase of construction. The two main areas of concern with the work that will be performed are the slopes and the much larger top surface area. The slopes will have to be treated differently than the top area. The keys to the slope erosion protection that will be incorporated into the SPPP are as follows:

- Toe of slope silt fence and staked haybale protection;
- Divert top surface runoff so that it doesn't run down the slopes;
- Minimize the amount of unprotected slope surface area with final cover soil and topsoil;
- Install temporary and permanent soil erosion controls on the slopes immediately following topsoil placement in each work area;
- Apply hydroseed and mulch mixture as soon as possible after topsoiling each slope area;
- Repair gully erosion immediately following damage from excessive runoff;
- Maintain silt fence and staked haybales to prevent damage and release of sediment; and
- Work only during times of the year that will allow vegetation to germinate and root before becoming dormant.

The top of the landfill surface will be graded in a manner that funnels all of the surface runoff toward the existing pond, which will be converted to a temporary sediment basin during the construction phase. This will allow the work activities to proceed with the greatest degree of flexibility. The top surface will have stockpiles of landfill material staged for regrading, soil stockpiles for the capping activities, equipment storage, materials storage and other site related

activities. Where individual sediment and erosion controls are appropriate to deal with each activity, these will be incorporated into the SPPP. It is anticipated that the perimeter of the temporary sediment basin will have a silt fence and staked haybale system to limit the volume of sediment laden runoff entering the basin. The basin will serve as the main system of treatment to settle and clarify runoff from the top surface of the site. This will require the design of an outlet system that skims the clarified water from the top several inches of the pool of water. Depending upon the nature of the sediments in the runoff, it may be appropriate to use polymer agents that improve the settling process. The temporary sediment basin will be designed to clarify the runoff volume from a storm that has a 10 year recurrence interval.

5.8 Construction Fugitive Dust Management

The extensive site regrading and cap construction activities will generate fugitive dust emissions that must be properly managed and controlled. The main problem with the site activities is the operation of earth moving equipment across bare soil surfaces that have insufficient moisture to control airborne dust. The primary measure for control of the emissions is the application of water sprayed across the surface area of active construction areas on the site. The project specifications will require that the contractor furnish water tanker sprayer and spray systems to keep the soil surfaces sufficiently moist to control dust generation. The entry/exit points of the site are also problem areas for fugitive dust generation. As trucks leave the site, if the soil in the tires has not been removed then it will be spread onto the paved road and become a generation point for fugitive dust. There are several techniques commonly used to keep this problem under control. The simplest method is stone anti-tracking pads that trucks drive over to knock soil off of the tires. This type of system will require aggressive road sweeping to remove the soil from the paved road surfaces that is not removed by the ant-tracking pad. Another more aggressive management approach is to use manual or automated spraying of trucks leaving the site to remove soil. This type of system requires that the runoff from the spray area be captured and directed to a settling area before discharge. Other activities that involve the processing, screening or mixing of soil materials will require separate measures designed to control and manage dust generation. Individual pieces of soil processing/screening equipment used onsite will be required to have permits for their use and control of emissions. The resident engineer or

other construction oversight staff is usually assigned to ensure that the contractor is complying with the requirements of the fugitive dust management specifications.

5.9 Landfill Gas Management

If landfill gas management is required at the site, it is anticipated that a simple passive gas venting system will be adequate. A network appropriately spaced gas vent wells should be adequate for the site. The nature and extent of this network will be determined during final design. The wells are typically installed with screens that start just beneath the geomembrane and extend to the bottom of waste or top of the groundwater surface, whichever is shallower. Usually wells spaced approximately on a one acre grid are sufficient to relieve gas pressure and protect the cap and prevent lateral migration. Since the site will have several different future uses, it will be necessary to connect the wells with a common header pipe and route the riser for the gas vent discharge to a location that is remote from site activity and high enough to prevent it from being a possible hazard.

In addition to the passive gas venting system, any structures on the site with foundations that penetrate below the geomembrane, will need to be protected to prevent possible landfill gas intrusion. The salt shed should not be an issue since it is an open structure with adequate ventilation. This will be checked during the landfill investigation phase. The only other permanent structure on-site is the small concrete block maintenance structure in the vicinity of the pond. If this structure remains it may be necessary to install a sub-slab venting system. Any new structures proposed for the site will be designed to vent landfill gas and prevent gas intrusion.

5.10 Cap Stability Requirements

There are two main aspects of stability that will be assessed during the engineering design and selection of the landfill cap manmade materials and soil components. Overall landfill slope stability involving a deep failure that penetrates into the waste material and/or underling natural soils will likely not be an issue. The waste material has undergone decades of decomposition, settlement and compaction from the site uses. The existing slopes, which are steeper than the proposed 3 horizontal to 1 vertical, do not show any sign of slippage or failure. Regrading the slopes to the flatter uniform grade will improve overall stability. The only factor that will increase the loading and decrease stability is the raising of the top surface grade

elevation near the slopes in order to achieve the final design grades. The engineering design will involve performing computerized slope stability analysis that simulates failure planes and circles through the landfill waste and the underlying natural soils. Soils information and Standard Penetration Test (SPT) data will be gathered during the drilling of wells in the off-site impact evaluation. This information will be used to simulate both static and dynamic failure analyses of the completed landfill. Seismic parameters for dynamic analysis will incorporate site specific information published by the United States Geological Service (USGS) and the Connecticut Building Codes. A static factor of safety of 1.5 or greater will apply to the site. Dynamic stability is handled differently than static analysis. The analysis first determines if there will be any displacement of the slope that occurs during the design seismic event. Then if there is displacement the analysis determines the projected amount. It is desirable to have no displacement, but displacements of 0.5 feet or less are generally acceptable for a landfill system.

The more difficult engineering problem with veneer landfill caps is the stability of the cap components themselves and the interface between the components. The manmade materials, such as geotextiles, textured geomembranes and composite drainage geonets all behave differently when in contact with one another or when in contact with cap soil materials. The only accepted method to determine the stability of the components is to place them in a testing apparatus that simulate the shear loadings on each interface. The loads placed on the materials in the plane perpendicular to the shear plane need to simulate three loads that span the actual load that will be imposed. The three data points for each test are used to plot a line that determines the actual interface friction angle between the materials and the cohesion, if any. The test must be run to simulate all of the material interfaces. The interface that has the lowest friction angle is the weak plane and must exceed the minimum specified by the design engineer. An engineering analysis will be performed during design to determine the minimum angle of interface friction required to produce a static stability factor of safety of 1.5. The analysis will also include required internal angles of friction for the cap soil components. For a landfill cap having 3 to 1 slopes the minimum required angle of interface friction is usually 29 degrees to achieve a 1.5 factor of safety. It is recommended that a slightly higher value of 30 to 31 degrees be used to account for manufacturing inconsistencies of the textured geomembrane and composite drainage geonet. Soils for the cap should have angles of internal friction of at least 37 degrees with no

cohesion. Dynamic stability will also be performed on the veneer cap system to ensure that the materials don't slide off the cap during the design seismic event.

5.11 Construction Quality Assurance/Quality Control (QA/QC)

The performance of the landfill cap system will require multiple layers of QA/QC to verify that the cap system is installed and will meet the intended long-term performance requirements. The engineer designer will specify all of the requirements of the cap system components and the testing required by the construction contractor to insure the QC requirements are adhered to. The construction contractor will be required to retain the services of independent testing laboratories to perform the required QC testing. The resident engineer, who may also be the design engineer, will be responsible for witnessing tests and reviewing the results for consistency with the project specifications. The resident engineer or other third party QA/QC engineer acts independently of the construction contractor and will be responsible for certifying that all of the required testing was performed and the results passed. The resident engineer or third party QA/QC engineer may also take samples of material from time to time and perform separate analyses to determine conformance with the project specifications. The resident or QA/QC engineer will be on-site at all times during the construction of the landfill cap system.

The normal QA/QC process for landfill closure involves several layers of review and testing during the process. The following are systems for QA/QC that will be used for this project:

- Shop drawing and manufacturer material submittal review;
- Manufacturer material certifications;
- Source testing of manmade and soil cap components;
- Interface friction cap component testing;
- In-place testing of geomembrane and soil materials; and
- Destructive testing of geomembrane seams.

A Draft Quality Assurance Plan (QAP) is contained in Appendix H of this plan. The QAP defines the roles of all of the parties involved in the landfill closure project and the testing and other elements necessary to ensure that the completed landfill cap meets all of the design requirements. The Draft QAP will be finalized after all of the design, plans and specification

preparation are completed. Testing requirements in the final QAP will need to be made consistent with the final specifications.

5.12 Materials Requirements and Testing

The design engineer will make the final determination on the materials specified for the landfill cap. Appendix G of this plan contains sample specifications that will be used as the template for the final project specifications. The sample specifications are being provided with the plan to show the intent of the requirements that will be included in the final design for the main landfill cap components. The specifications provided in Appendix G include the following:

- 02220 - Excavation, Backfill and Landfill Regrading
- 02225 – Subbase Material
- 02227 – Vegetative Cover Soil Material
- 02228 – Topsoil Material
- 02900 – Landscaping
- 06642 – Erosion Control Geosynthetics
- 06643 – Geomembranes
- 06645 – Geosynthetics
- 06647 – Cold Weather Installation - Geomembrane

There will be other specifications that will be required to complete all of the elements of the closure activities that are not included with this plan. A list of additional sections anticipated is as follows:

- 02230 – Crushed Stone and Gravel
- 02271 – Riprap
- 02514 – Bituminous Concrete Pavement
- 02721 – Corrugated HDPE Pipe
- 03300 – Concrete
- 03431 – Pre-Cast Concrete Structures
- 03600 – Grout
- 15050 – Pipe and Pipe Fittings
- 15051 – Buried Pipe Installation

5.13 Engineering Design Plans

The design engineer will prepare a complete set of plans that will be sufficient for filing with the CTDEP for final closure and for a construction contractor to complete the landfill closure project. A draft outline for the engineering design plans are as follows:

1. Title Sheet
   The Title Sheet will include the title of the project, a locus plan and the drawing index.

2. Site Plan
   The Site Plan will be prepared at a scale of 1" = 1 00' and will include the following:

   Site access point(s)
   Limits of work
   Drawing key
   Stockpile and Laydown areas
   Restricted areas
   Survey benchmarks
   Staging area
   Construction trailer location
   Location of temporary sanitary facilities

3. Subgrade Preparation Plans
   Subgrade Preparation Plans shall be prepared at a maximum scale of 1" = 40'. These plans will identify the surface topography and elevations that must be achieved prior to the placement of the first layer (cap subbase) of the landfill cover system. The Subgrade Preparation Plans will show the existing conditions topography and the proposed subgrade topography with cut/fill depths on a 25 foot grid over the entire landfill area. This information will also be used by the engineer to evaluate the earthwork cost for subgrade preparation. The plans will have a construction baseline that is tied to the grid system and site survey.

4. Final Grading Plans
   These plans will be prepared at a maximum scale of 1" = 40' and show contours of the surface of the vegetative support (uppermost) layer of the landfill cap system. The final grading plans will show the location of the surface drainage features and any subsurface cap membrane drainage features.

5. Landscaping Plans
   If required, these plans will be prepared at a minimum scale of 1”= 40’ will show the location and number of any plantings that are proposed to enhance the surface of the final vegetated cap.

6. Facility Entrance and Access Road Plan
   The engineer will prepare a facility entrance and access road plan which will include a plan of the entrance roadway, outlines of buildings, location of fences, local site topography, erosion control, and the proposed access road leading to the work area.

7. Erosion Control Plans
   A separate set of plan view drawings showing all of the temporary erosion control measures that are to be provided by the contractor prior to commencement of the construction activities. The plans will include detailed notes regarding the installation, monitoring, maintenance, repair and removal of the erosion control measures.

8. Cross Sections
   The engineer will prepare cross sections as necessary to identify the relationship between existing conditions, elevations of the various components of the final cover system, drainage components, and limits of work.

9. Final Cover System Details
   Details of the final cover system will include:

   Typical Cover System Details
   Membrane Cap Drainage Details
   Anchor Trench Details
   Geomembrane Tie-in to Structure Foundations
   Geomembrane Boot Seals around Penetrations
   Gas Collection and Venting Details, if necessary

10. Drainage Details
    The engineer will prepare details for the required drainage swales, downchutes, piping, inlet/outlet structures, energy dissipation structures, tie in with existing drainage features, pipe abandonment, drainage re-routing, stormwater quality management basin, etc.

11. Erosion Control and Miscellaneous Details
    The engineer will provide details for the required erosion and sediment control measures shown on the erosion and sediment control plans, as well as other miscellaneous details.

5.14 Landfill Leachate Management

The landfill cap proposed under this plan will act as the primary component of the overall leachate management for the site. The geomembrane and cap drainage system will reduce the total volume of leachate generated from rainwater infiltration to negligible volumes. The artificial groundwater mounding caused by the stream entering the pond on the site will be eliminated, further reducing leachate produced. Finally, the pipe running beneath the landfill from the pond will be plugged and abandoned. The effect that all of these changes will have on leachate production will be modeled as discussed in Section 3.8 of this plan. The results of the modeling study will be used to determine the anticipated leachate production and loading to the groundwater and adjacent streams. The need for additional leachate control measures however will not be known until approximately three years of groundwater and surface water monitoring data is gathered and assessed. There will be a lagging response to the final closure activities and take it will take several years of monitoring to see if the concentrations have stabilized and are reflective of the long-term continuous impact the closed landfill will have. This data will be used to determine if the closed landfill impact requires any further measures to reduce leachate loading.

Several measures that may be employed alone or in combination if additional leachate control is required include the following:

- Up-Gradient Groundwater Control - Reduces groundwater level beneath the landfill to eliminate groundwater contact with waste materials in the bottom of the landfill;
- Down-Gradient Leachate Capture – Intercept leachate along the toe of the landfill slope;
- Groundwater Extraction – Pump groundwater from beneath the landfill to maintain hydraulic control of the leachate generated;
- Vertical Impermeable Barrier – Vertical barrier around perimeter of landfill to improve leachate capture and control;
- Permeable Reactive Treatment Barrier – Filter and treat leachate below ground with an in-situ treatment system as groundwater flows through the reactive agents.

The selection of an appropriate leachate management approach will depend on many factors, but the main factors are: geology, hydrogeology, site constraints, contaminant types, cost and long-term operations/maintenance.

5.15 Post-Closure Care

A detailed post-closure care plan that will address all of the following elements will be prepared following the final design and closure of the landfill. Generally quarterly inspections and reporting is sufficient to ensure the proper maintenance of the cap system and other site features.

- General Maintenance – Including inspection of the surface for cracks, soil failure on slopes, erosion, animal burrows and nuisance woody vegetation. Repairs will be performed as problems are identified. Mowing will be performed as needed for the active site use and control of invasive vegetation;
- Stormwater Systems – Including inspection and cleaning of drainage structures, pipe systems and stormwater water quality management basin;
- Site Access Control and Interior Control Fencing – Inspect for damage and repair;
- Gas Venting and Monitoring Wells – Inspect for damage and repair;
- Landfill Gas Testing – Sample and test perimeter gas monitoring wells and inside structures.
- Groundwater Monitoring Wells – Inspect for damage and repair. Sampling and analysis is covered elsewhere in this plan;
- Leachate Seepage – Check the perimeter of the site for possible evidence of landfill leachate seepage; and
- Landfill Leachate Management – Operation and maintenance of any leachate management system, if necessary.

Landfill settlement is not expected to be an issue at this site due to the age of the landfill waste.

5.16 Post Closure Groundwater and Surface Water Monitoring Plan

5.16.1 Overview

This section describes the actions necessary to comply with Section B, Number 2d of the Consent Order by addressing the monitoring requirements for surface water and groundwater after the capping and closure of the landfill has been completed.

5.17 Groundwater Monitoring Program

The monitoring well network for the Scofieldtown Park landfill will be determined based on the analytical findings of the groundwater sampling described in Section 3.2. In general, wells will be selected for the groundwater monitoring program to achieve the stated objectives of the program as described below.

5.17.1 Background/Upgradient Wells

Several wells located hydraulically upgradient or in an area determined to represent background conditions in the area of the landfill will be utilized to establish background concentrations of all identified constituents of concern. These wells will provide representative points at which groundwater quality will be evaluated prior to being impacted by landfill leachate. These proposed background/upgradient well locations may include some of the well locations identified on Figure D or other locations may be needed once the results of the off-site impact evaluation have been examined.

5.17.2 Plume Characterization Wells

To determine worst case contaminant concentrations within the landfill itself, several wells located immediately downgradient, but within the known impacted area will be selected for monitoring. These wells will be utilized to establish baseline contaminant concentrations within the landfill footprint and to monitor the natural attenuation of these contaminants over the post closure period. Since it is likely that monitoring wells within the landfill itself may be destroyed during the installation of the cap, additional monitoring wells may be needed for the post closure program. Other wells located for the impact evaluation may be suitable for continuing use during the monitoring program.

5.17.3 Fringe/Compliance Wells

To detect whether the leachate plume is migrating beyond the area of known impacts several wells will be selected in areas outside the area of known impacts. Again, to the extent possible, existing wells will be selected for use during the post-closure period.

5.17.4 Analytical Parameters and Sampling Frequency

The list of analytical parameters selected for groundwater samples collected from the background/upgradient, plume characterization, and fringe/compliance wells will initially consist of the groundwater analytical parameters summarized in Table 2. After approximately three years of post-closure monitoring, the analytical findings of the initial sampling events will be evaluated. Depending upon the outcome of the evaluation, the list of analytical parameters of future events may be reduced.

During the first year of the post closure monitoring, it is anticipated that quarterly sampling of the monitoring wells will take place to establish the baseline post-closure conditions. After one year, sampling frequency will be reduced to semi-annually with sampling events occurring in the spring and fall months. After the third year, with the re-evaluation of the sampling parameters, the sampling frequency will be evaluated to determine if yearly sampling is sufficient.

5.17.5 Groundwater Sampling Procedures

Groundwater samples will be collected from each of the selected wells utilizing bladder pump systems. The procedures will likely be similar to those outlined in Section 3 of this document. However, other procedures, such as automated systems will be evaluated before the start of the post closure monitoring to determine which are the most technically and economically sound.

5.18 Surface Water Monitoring Program

Surface waters located downgradient of the Scofieldtown landfill include the unnamed stream flowing west to east directly north of the landfill footprint. This unnamed stream becomes Poorhouse Brook at the point at which it flows under Scofieldtown Road. Poorhouse Brook continues in a southeasterly direction along the topographic low located between

Scofieldtown Road and Hannah Road. The following sections describe the monitoring program to assess the water quality in the surface water adjacent to the landfill.

5.18.1 Monitoring Locations

As indicated on Figure D, four surface water sample locations will be located along the unnamed stream oriented west to east. Location SW-1 will be located near the headwaters of the unnamed stream and based on currently known hydrogeology information of the site, represents a location cross-gradient to the groundwater flow direction. This location will be used to monitor background constituent concentrations of the unnamed stream. Locations SW-2 through SW-4 along the unnamed stream are located directly downgradient from the landfill. Samples collected from these locations will provide data on the overall impact of leachate discharging to the unnamed stream. Location SW-5 will be located directly downstream from the confluence point of the unnamed stream and the stream that emanates from the wetlands to the north. Locations SW-6 and SW-7 along Poorhouse Brook are located just upstream from where Poorhouse Brook crosses Scofieldtown Road and approximately 100 yards downstream from this point, respectively. Samples collected from these points will provide data on the overall impact of the closed landfill on Poorhouse Brook.

All monitoring points will be clearly marked in the field in a manner that will ensure durability to allow for consistent sample collection over the post closure period.

5.18.2 Analytical Parameters

The list of analytical parameters for surface water samples collected from the locations along the unnamed stream and Poorhouse Brook will initially consist of the surface water analytical parameters summarized in Table 2. As with the groundwater monitoring, after approximately three years of post-closure monitoring, the analytical findings of the initial sampling events will be evaluated. Depending upon the outcome of the evaluation, the list of analytical parameters of future events may be reduced.

During the first year of the post closure monitoring, it is anticipated that quarterly sampling of the surface water monitoring points will take place with the sampling of the monitoring wells and will serve to establish the baseline post-closure conditions. After one year, sampling frequency will also be reduced to semi-annually with sampling events occurring in the

spring and fall months. After the third year, with the re-evaluation of the sampling parameters, the sampling frequency will be evaluated to determine if yearly sampling is sufficient.

The surface water monitoring program is designed to provide analytical data that is representative of surface water quality during normal flow conditions. In order to achieve this, surface water samples shall not be collected when greater than 0.1-inches have fallen in the prior 48-hour period. To monitor precipitation levels at the landfill, data from a nearby North American Citizen Weather Observer Program (CWOP) Station located approximately 1.5 miles to the west of the landfill will be obtained in the period leading up to each sampling event.

5.19 Reporting

The field observations and analytical data generated from each post closure monitoring event will be reviewed and evaluated. Each quarterly sampling event will be tabulated and results will be compared to the appropriate groundwater and surface water standards as well as to concentrations of previous or baseline sampling events. If significant changes in groundwater or surface water parameter concentrations are observed, recommendations for additional evaluation may be made. The assessment and evaluation of each of the post-closure monitoring events will be compiled in a report provided to the City and the CTDEP.

6.0 FUTURE USE

The existing uses on the site consist of the following:

- Public Works Salt Storage and Related Operations – Northwest corner of the site;
- Public Works Leaf Shredding and Composting – Northern and northeastern half of the site;
- Public Works Materials, Vehicle and Equipment Storage;
- Resident Recycling Drop-off and Recyclable Storage – Roll-off containers on westerly side of the site; and
- Former Public Park Area – Tennis courts, picnic pavilion and playscape on southerly half of the site.

The future uses proposed for the site will be consistent with the current uses and will involve improvements to the layout and function of the use features. A generalized plan for future use is shown on Figure G.

The existing covered salt storage shed is a well-maintained and constructed facility. The shed roof structure sits on a reinforced concrete foundation system that is in very good condition. The salt shed will remain in its current form and will be incorporated into the landfill cap system. The cap geomembrane will be secured to the foundation walls of the salt shed structure and will be sealed to prevent infiltration. The tie-in to this structure will incorporate sufficient slack in the geomembranes to prevent possible damage from the minor settlement anticipated.

The existing leaf shredding and composting operations will be eliminated from the future site use. The area that will remain once the future park is constructed will be too small to continue this use. It has also been determined that the shredding and composting would not be a compatible use with the public park immediately adjacent.

The City proposes a state-of-the-art recycling center on a portion of the site. Additional future uses of the site included enhanced and improved park amenities including fields, game courts, parking, landscaping, and grading. Landscaping for park and perimeter areas will be considered during final design.

7.0 REFERENCES

ASTM International, 1996. D-1586-84 Methods for the Collection of Subsurface Samples During Environmental Site Assessments, ASTM International, 1996.

CTDEP, 2002. Water Quality Standards, Connecticut Department of Environmental Protection, April 1996 and December 2002.

CTDEP, 2009. Guidance for the Submission of Application to Lower Groundwater Quality Classification to Class GG. Connecticut Department of Environmental Protection. August 2009.

CTDEP, 2010. Natural Drainage Basins Map Connecticut Department of Environmental Protection, January 2010.

Rogers 1985. Bedrock Geology Map of Connecticut, 1985, State of Connecticut State Geological and Natural History Survey.

Stone, J.R., etal, 2005. Quaternary Geologic Map of Connecticut and Long Island Sound Basin, United States Geological Survey Scientific Investigations Map 2784, 2005.

TRC, 2010. Environmental Investigation Report, TRC Environmental Corporation, March 2010.

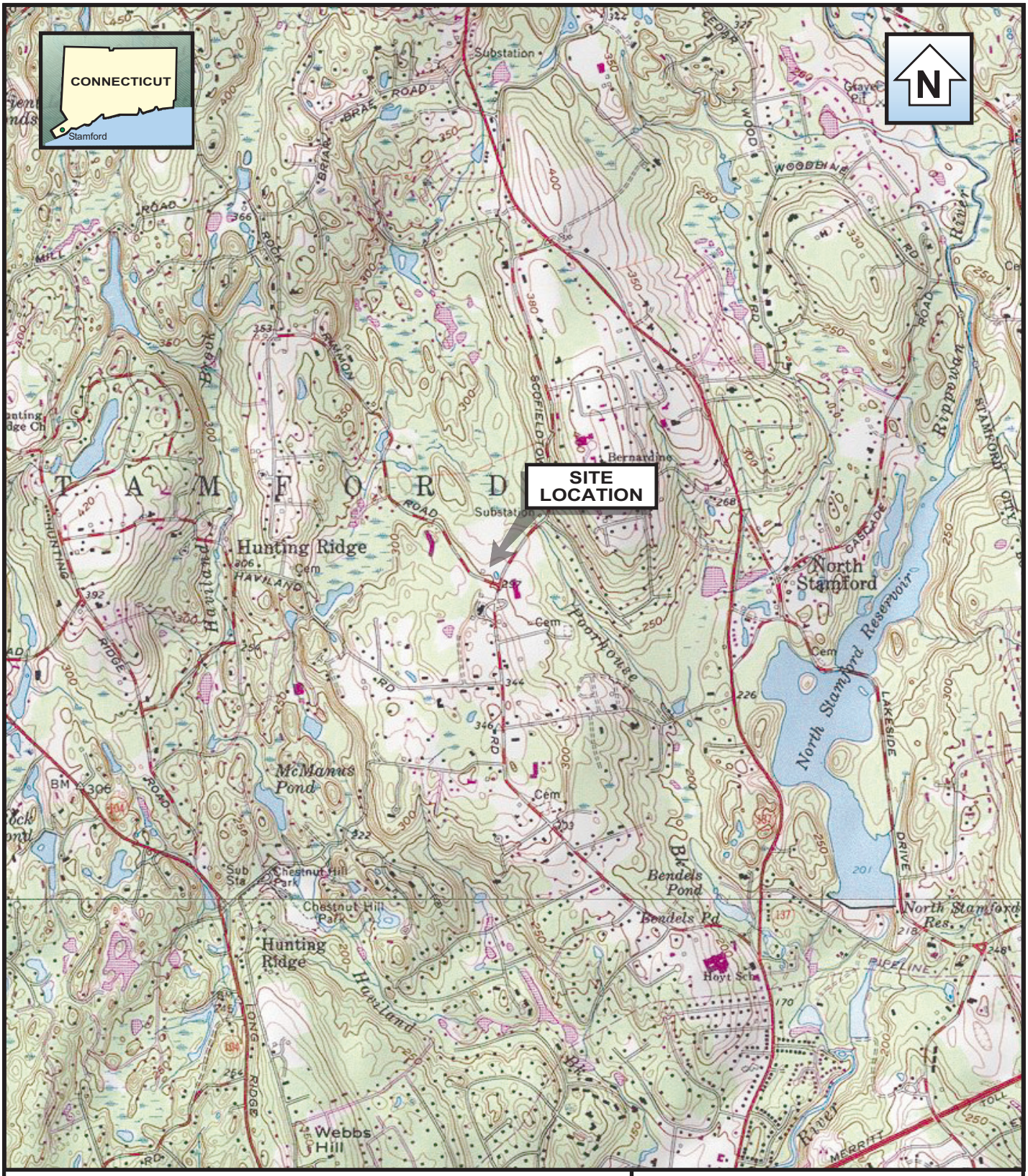
U.S. Environmental Protection Agency (USEPA). 1986. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). Third Edition, including Final Update III, November 2000.

USEPA, 1992. Office of Emergency and Remedial Response Standard Operating and Safety Guides Publication 9285.1-03, June 1992.

USEPA, 2001. Methods for the Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual, Office of Water. EPA-823-B-01-002. October, 2001.

USEPA, 2008. Final Site Reassessment Report for Scofieldtown Road Park, Stamford, Connecticut, Office of Site Remediation and Restoration. EPA-W-05-042. December 2008.

FIGURES



0 2000
SCALE FEET

0 1
SCALE MILE

1:24000

BASE CREATED WITH TOPO™ © 1996 WILDFLOWERS PRODUCTIONS,
www.topo.com 7.5' USGS TOPOGRAPHIC MAP

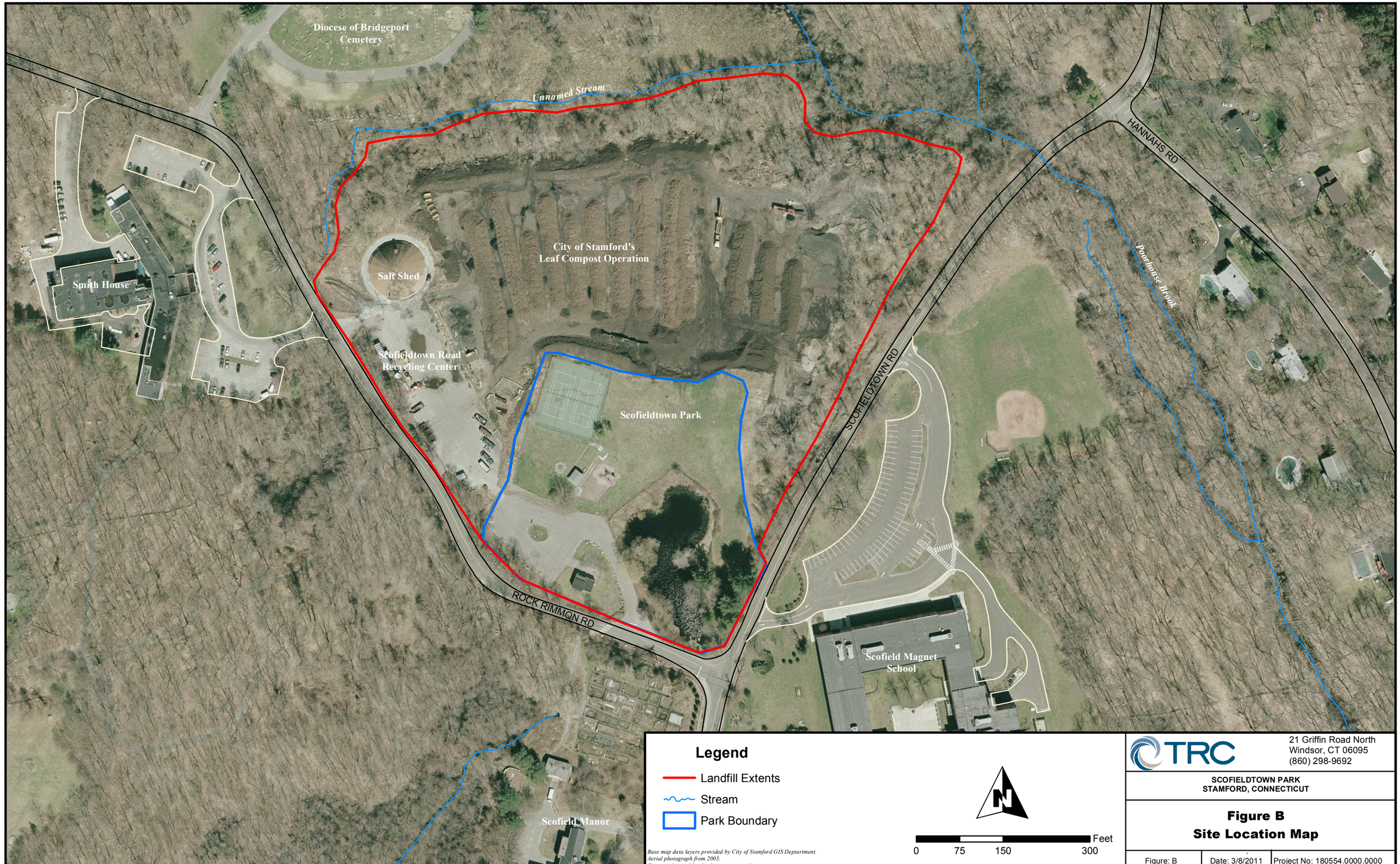
TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

SCOFIELDTOWN LANDFILL
STAMFORD, CONNECTICUT

FIGURE A
AREA LOCATION MAP

Date: 02/11 | **Project No.** 180554.0000.000000

GRAPHIPCS/BROWNFIELDS/STAMFORD.180554 STAMFORD TOPO.FH10


Diocese of Bridgeport Cemetery
Unnamed Stream
HANNAHS RD
Poorhouse Brook
City of Stamford's Leaf Compost Operation
Salt Shed
Smith House
Scofieldtown Road Recycling Center
Scofieldtown Park
SCOFIELDTOWN RD
ROCK RIMMON RD
Scofield Magnet School
Scofield Manor
Legend
Landfill Extents
Stream
Park Boundary
N
0
75
150
300
Feet
Base map data layers provided by City of Stamford GIS Deptartment.
Aerial photograph from 2005.
Figure to be used for display purposes only.
TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692
SCOFIELDTOWN PARK
STAMFORD, CONNECTICUT
Figure B
Site Location Map
Figure: B
Date: 3/8/2011
Project No: 180554.0000.0000

ARCHDIOCESE OF BRIDGEPORT CEMETERY PROPERTY

CL&P PROPERTY

POORHOUSE BROOK

DENSE WOODED & BRUSH VEGETATION ON SLOPE

LEAF SHREDDING AND COMPOSTING AREA

36" RCP

MW-6(R)

MW-2(R)

MW-2(OB)

MW-1(R)

MW-1(OB)

COVERD SALT SHED STRUCTURE

PAVED AREA

CITY OF STAMFORD SMITH HOUSE

ROCK RIMMON RD.

STAMFORD PUBLIC WORKS AREA

TRAILER

POLY TANK (BRINE SOLUTION)

PAVED AREA

RECYCLING DROP-OFF & MATERIAL STORAGE CONTAINERS (TYP.)

GUARD SHACK

TENNIS COURTS

LIMITS OF EXISTING PARK

GRASS AREA

COVERED PICNIC AREA

GRASS AREA

MW-9(R)

DENSE WOODED & BRUSH VEGETATION ON SLOPE

LANDFILL SITE PROPERTY BOUNDARY

ROAD

SCOFIELDTOWN

MW-4(R)

MW-4(OB)

MW-5(R)

MW-3(R)

MW-3(OB)

PAVED AREA

12" RCP

POND OVERFLOW STRUCTURE

LOCATION OF OVERFLOW STRUCTURE

POND

MAINT. BLDG.

CITY OF STAMFORD SCOFIELDTOWN MANOR

GRASS AREA

STAMFORD SCOFIELDTOWN MAGNET SCHOOL

COMMUNITY GARDENS

30" RCP

30" RCP CARRIES EXIST. STREAM TO POND

LEGEND

1 PHOTOGRAPH LOCATION WITH IDENTIFICATION AND DIRECTION

0 40' 80'
GRAPHIC SCALE

27.904 SFMS

NO.	REVISIONS	DATE	APPROVAL

CITY OF STAMFORD
SCOFIELDTOWN PARK LANDFILL
STAMFORD, CONNECTICUT

TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

LANDFILL CAP
EXISTING CONDITIONS PLAN

DESIGN:	CNS	12/21/10
DRAWN:	KDH	12/21/10
CHECKED:	CNS	12/21/10
SCALE: 1"=40'		
PROJECT: 180554-000002-00000		

FIGURE No.
C

J:\CAD\180554\Cap Design\
Figure C-D-E & D.dwg Layout:Figure C March 08, 2011-1:32PM Kholenbeck

ARCHDIOCESE OF BRIDGEPORT CEMETERY PROPERTY

CL&P PROPERTY

POORHOUSE BROOK

DENSE WOODED & BRUSH VEGETATION ON SLOPE

LEAF SHREDDING AND COMPOSTING AREA

36" RCP

MW-1(R)
MW-1(OB)
MW-2(R)
MW-2(OB)
MW-3(R)
MW-3(OB)
MW-4(R)
MW-4(OB)
MW-5(R)
MW-6(R)
(OB)
MW-9(R)
(OB)

COVERD SALT SHED STRUCTURE

PAVED AREA

STAMFORD PUBLIC WORKS AREA

TRAILER

POLY TANK (BRINE SOLUTION)

PAVED AREA

RECYCLING DROP-OFF & MATERIAL STORAGE CONTAINERS (TYP.)

GUARD SHACK

CITY OF STAMFORD SMITH HOUSE

ROCK RIMMON RD.

TENNIS COURTS

LIMITS OF EXISTING PARK

GRASS AREA

COVERED PICNIC AREA

GRASS AREA

PAVED AREA

MAINT. BLDG.

POND OVERFLOW STRUCTURE

POND

12" RCP

30" RCP

30" RCP CARRIES EXIST. STREAM TO POND

DENSE WOODED & BRUSH VEGETATION ON SLOPE

LANDFILL SITE PROPERTY BOUNDARY

SCOFIELDTOWN ROAD

GRASS AREA

CITY OF STAMFORD SCOFIELDTOWN MANOR

COMMUNITY GARDENS

STAMFORD SCOFIELDTOWN MAGNET SCHOOL

LEGEND

MW-1	EXISTING MONITORING WELLS INSTALLED IN 2009
	PRELIMINARY LEACHATE ANALYSIS (FINAL NUMBER AND LOCATION TO BE DETERMINED AFTER LEACHATE SEEP ANALYSIS)
A	PROPOSED OVERBURDEN (OB) AND BEDROCK (R) MONITORING WELL PAIRS
1	PROPOSED SURFACE WATER/SEDIMENT SAMPLE LOCATION

0 40' 80'
GRAPHIC SCALE

CT-SPC 1983

NO.	REVISIONS	DATE	APPROVAL

CITY OF STAMFORD
SCOFIELDTOWN PARK LANDFILL
STAMFORD, CONNECTICUT

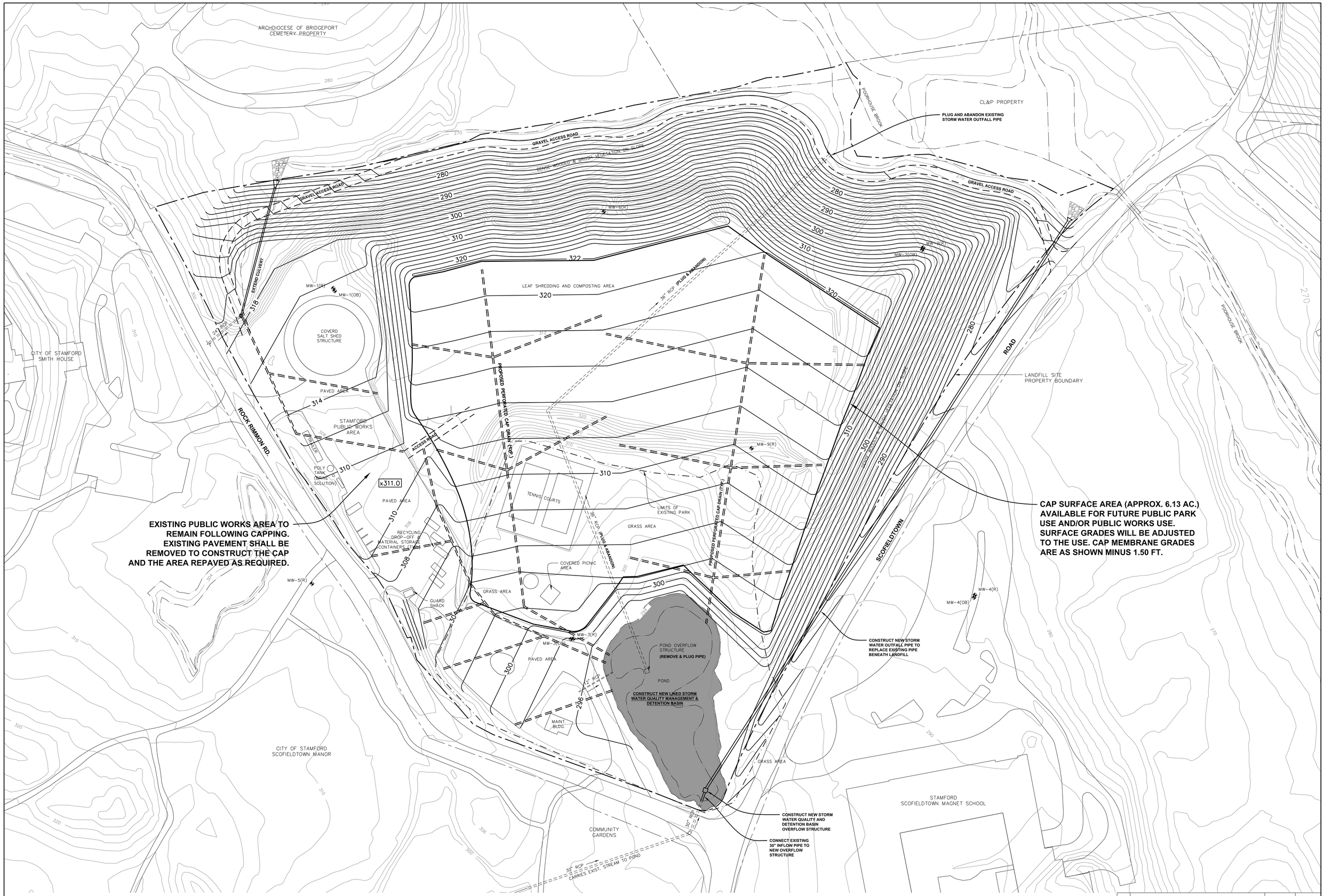
TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

DESIGN:	CNS	02/16/11
DRAWN:	KDH	02/16/11
CHECKED:	CNS	02/16/11
SCALE: 1"=40'		
PROJECT: 180554-000002-00000		

PROPOSED MONITORING WELL AND SAMPLE LOCATIONS

FIGURE No.
D

I:\CAD\180554\Cap Design\
Figure D-D-E & D(Reg Layout)Figure D March 08, 2011-1:31PM Khistenbeck



NOTES:

1) CAPPING WILL REQUIRE THE IMPORTATION OF SOIL MATERIAL. THE SOIL MATERIALS AND RE-GRADED LANDFILL MATERIALS WILL BE MANAGED IN TEMPORARY STOCKPILES FOR STAGING AND USE DURING CONSTRUCTION.
2) ALL AREAS OF THE SITE BEING RE-GRADED TO CONSTRUCT THE LANDFILL CAP SHALL BE CLEARED AND GRUBBED.

NO.	REVISIONS	DATE	APPROVAL

CITY OF STAMFORD
SCOFIELDTOWN PARK LANDFILL
STAMFORD, CONNECTICUT

TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

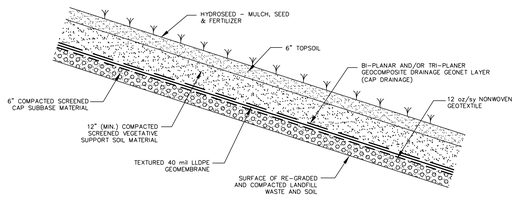
LANDFILL CAP
SURFACE GRADING PLAN
PRELIMINARY

DESIGN:	CNS	12/21/10
DRAWN:	KDH	12/21/10
CHECKED:	CNS	12/21/10
SCALE: 1"=40'		
PROJECT: 180554-000002-00000		

FIGURE No.
E

J:\CAD\180554\Cap Design\
Figure E-D+E & Grdwg Layout:Figure E March 08, 2011-1:30PM Khotenbeck

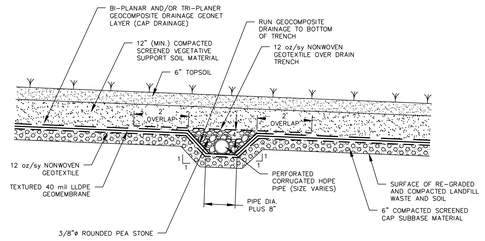
NOTE:
FUTURE USE IN PROPOSED PUBLIC PARK WILL REQUIRE THAT THE VEGETATIVE SUPPORT SOIL LAYER VARY IN THICKNESS FROM THE TYPICAL SECTION. A MINIMUM OF 18" OF SOIL SHALL BE MAINTAINED IN ALL AREAS REGRADED FOR PARK USE.



NOTE:
MAXIMUM MEMBRANE SLOPE: 3 HORIZONTAL TO 1 VERTICAL (STABILITY)
MINIMUM MEMBRANE SLOPE: 4% (CAP DRAINAGE)

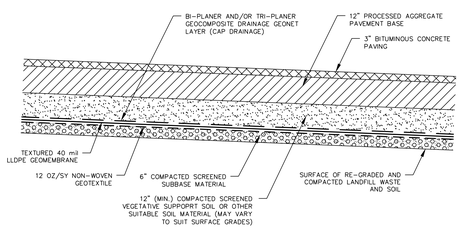
RECOMMENDED TYPICAL LANDFILL CAP SECTION (VEGETATED AREAS)

NOT TO SCALE



TYPICAL LANDFILL CAP DRAINAGE - PERFORATED PIPE INTERCEPTOR

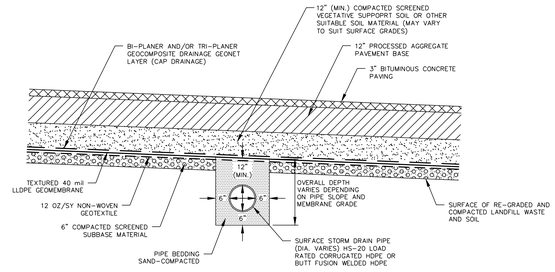
NOT TO SCALE



NOTE:
MINIMUM MEMBRANE SLOPE: 4% (CAP DRAINAGE)

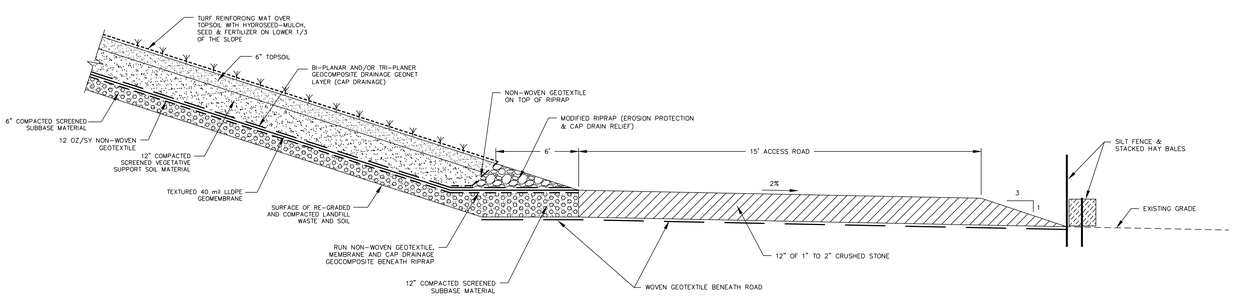
RECOMMENDED TYPICAL LANDFILL CAP SECTION (PAVED AREAS)

NOT TO SCALE



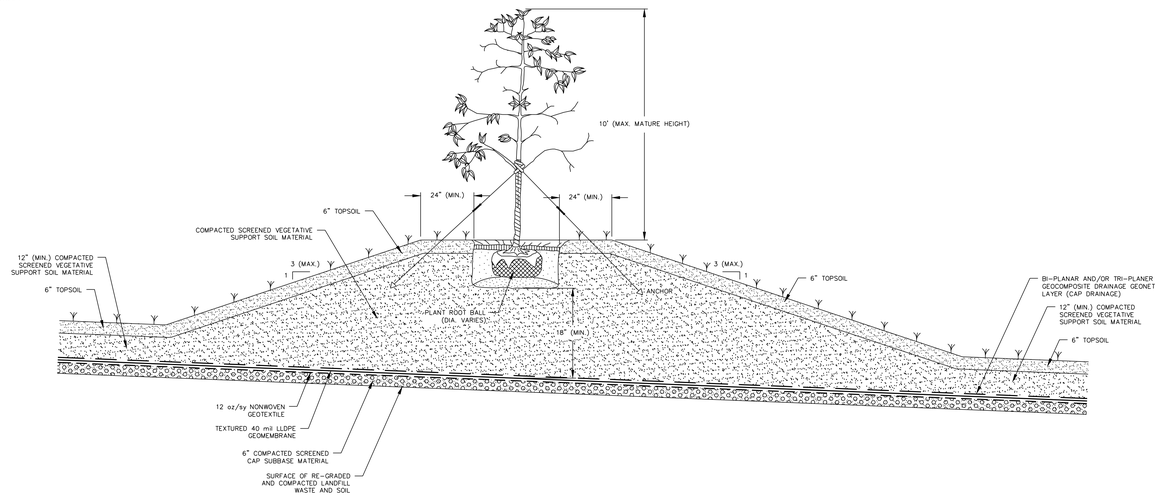
TYPICAL SECTION - SURFACE STORM DRAIN PIPE INSTALLATION

NOT TO SCALE



TYPICAL LANDFILL CAP TOE AND ACCESS ROAD SECTION - NORTH AND EAST SLOPES

NOT TO SCALE



TYPICAL SECTION - LANDSCAPE PLANTING MOUND

NOT TO SCALE

NOTE:
THE SECTIONS SHOWN ON THIS FIGURE ARE TYPICAL SECTIONS FOR THE PROJECT AND THE LOCATIONS WHERE THEY APPLY VARY ACROSS THE SITE.

NO.	REVISIONS	DATE	APPROVAL

CITY OF STAMFORD
SCOFIELDTOWN PARK LANDFILL
STAMFORD, CONNECTICUT

TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

LANDFILL CAP DETAILS

DESIGN:	CNS	2/16/11
DRAWN:	KDH	2/16/11
CHECKED:	CNS	2/16/11
SCALE: NONE		
PROJECT: 180554-000002-00000		

FIGURE No.
F

ARCHDIOCESE OF BRIDGEPORT CEMETERY PROPERTY

CL&P PROPERTY

POORHOUSE BROOK

DENSE WOODED & BRUSH VEGETATION ON SLOPE

MW-6(R)

MW-2(R)

MW-2(OB)

LEAF SHREDDING AND COMPOSTING AREA

36" RCP

MW-1(R)

MW-1(OB)

COVERD SALT SHED STRUCTURE

PUBLIC WORKS MAINTENANCE YARD

FUTURE PUBLIC PARK

CITY OF STAMFORD SMITH HOUSE

PAVED AREA

STAMFORD PUBLIC WORKS AREA

TRAILER

POLY TANK (BRINE SOLUTION)

ROCK RIMMON RD.

PAVED AREA

RESIDENT RECYCLING DROP-OFF & TRANSFER AREA

TENNIS COURTS

LIMITS OF EXISTING PARK

GRASS AREA

MW-9(R)

DENSE WOODED & BRUSH VEGETATION ON SLOPE

LANDFILL SITE PROPERTY BOUNDARY

ROAD

SCOFIELDTOWN

LIMITS OF FUTURE PUBLIC PARK AND ACCESS CONTROL FENCE

COVERED PICNIC AREA

GRASS AREA

MW-5(R)

GUARD SHACK

MW-3(R)

MW-3(OB)

PAVED AREA

POND OVERFLOW STRUCTURE

STORM WATER MANAGEMENT WATER QUALITY BASIN

12" RCP

MAINT. BLDG.

MW-4(R)

MW-4(OB)

CITY OF STAMFORD SCOFIELDTOWN MANOR

GRASS AREA

STAMFORD SCOFIELDTOWN MAGNET SCHOOL

COMMUNITY GARDENS

30" RCP

30" RCP CARRIES EXIST. STREAM TO POND

NOTES:

1) COMPOSITION AND ENVIRONMENTAL QUALITY OF SOIL PLACED ABOVE THE GEOMEMBRANE WILL BE DIFFERENT BETWEEN THE PARK AREA AND THE PUBLIC WORKS AREA.

0 40' 80'
GRAPHIC SCALE

CT GRID 1983

NO.	REVISIONS	DATE	APPROVAL

CITY OF STAMFORD
SCOFIELDTOWN PARK LANDFILL
STAMFORD, CONNECTICUT

FUTURE USE PLAN

TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

DESIGN:	CNS	2/16/11
DRAWN:	KDH	2/16/11
CHECKED:	CNS	2/16/11
SCALE: 1"=40'		
PROJECT: 180554-000002-00000		

FIGURE No.
G

J:\CAD\180554\Cap Design\
Figure G-D-E & D(leg layout)Figure G March 08, 2011-1:30PM Kholenbeck

PHOTOGRAPHS

PHOTO 1
View of Former Scofieldtown Park.

PHOTO 2
View of Recycling Center and Leaf Composting Operation.

PHOTO 3
View of Salt Shed.

PHOTO 4
Drainage Pipe That Crosses Rock Rimmon Road.

PHOTO 5
Weir Structure at Man-made Berm on Unnamed Stream.

PHOTO 6
Double Culvert at Scofieldtown Road.

PHOTO 7
View of Former Scofieldtown Park.

PHOTO 8
Man-Made Pond in Former Scofieldtown Park.

PHOTO 9
Overflow Weir Structure in Man-Made Pond.

PHOTO 10
Outfall of Pipe that Extends Beneath the Landfill.

PHOTO 11
Leaf Composting Area.

APPENDIX A

CONSENT ORDER SRD-205, SEPTEMBER 10, 2010

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

First original of two

STATE OF CONNECTICUT

V.

CITY OF STAMFORD

CONSENT ORDER NUMBER SRD-205

DATE ISSUED: September 10, 2010

A. With the agreement of the City of Stamford ("Respondent"), the Commissioner of the Department of Environmental Protection ("the Commissioner") finds:

1. Respondent is the owner of record of real property located at 612 Scofieldtown Road, in the City of Stamford, Connecticut, ("the Site"), identified as Lot 15 of Block 390 on Map 35 in the Stamford Tax Assessor's office.

2. The Site was operated as a municipal solid waste landfill from the mid 1930's until 1968 at which time the landfill was graded with soil cover and subsequently redeveloped. The former landfill was not constructed with a liner to collect landfill leachate or a low permeability cover to reduce infiltration.

3. Respondent has been the property owner of record of the Site since at least 1938, according to the 1938 Atlas available in the City of Stamford Assessor's Office, and currently operates a leaf composting and recycling center and maintains a public works facility at the property.

4. Scofieldtown Park, located on the southern portion of the Site, contains a basketball court, tennis courts, a playscape and a small man-made pond. The Respondent closed the park to the public on May 14, 2009.

5. The Site was formerly known as the Scofieldtown Landfill and encompasses approximately 18.1 acres with a waste depth of up to thirty feet below grade.

6. The US EPA conducted pre-remedial site assessments of the landfill between 1986 and 2008 under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The assessments stated in part that a time-critical removal response action by the EPA under CERCLA authority was not appropriate due to the lack of elevated levels of hazardous substances detected during the Removal Program Preliminary Assessment/Site Investigation of the Site in 1996.

7. Respondent, through its technical consultant, TRC Environmental Corporation (TRC), conducted a limited groundwater investigation of the landfill in 2009. Findings of TRC's study included, in part:

    a. No anomalies characteristic of storage tanks or drum clusters were detected during the ground penetrating radar survey of the landfill;

    b. Soil sample results, from the landfill, reported elevated concentrations of eleven SVOCs, extractable total petroleum hydrocarbons (ETPH), one PCB, and two metals;

    c. Surface water results from, on, and directly adjacent to the landfill reported a slightly elevated level of one VOC; and

    d. On-site monitoring wells contained elevated levels of one VOC and two metals, as well as elevated levels of sodium in the vicinity of the salt shed.

8. By virtue of the above, Respondent maintains a solid waste disposal area.

9. By agreeing to the issuance of this consent order, Respondent makes no admission of fact or law with respect to the matters addressed herein, other than those in paragraphs A.1-7 and does not waive any rights or defenses it may have relating to any actions which may be taken by the Commissioner except as expressly provided in this consent order.

B. With the agreement of the Respondent, the Commissioner, acting under Connecticut General Statutes (CGS), §22a-6, 22a-208, 22a-208a(c), 22a-225 and 22a-432 as well as the Regulations of Connecticut State Agencies (RCSA), §22a-209-7, orders Respondent as follows:

1. Within **ninety (90) days** from the date of issuance of this consent order, Respondent shall:

    a. Retain a Professional Engineer (PE), licensed to practice in the state of Connecticut, to oversee the development and submittal of all required documents pursuant to this order; and

    b. Retain an environmental professional (LEP) licensed pursuant to CGS §22a-133v to perform required actions in section B.3. of this consent order and to assess existing leachate quality and propose a long-term water quality monitoring program.

    Both such professionals shall have a minimum of five (5) years experience preparing and implementing closure plans.

2. Within **ninety (90) days** from the date of retention of the PE and LEP as required in section B.1. of this consent order, Respondent shall submit for the review and written approval of the Commissioner, a closure plan, as defined in CGS §22a-207(26), for the Site, in accordance with RCSA §22a-209-13, that at a minimum addresses the following:

   a. A detailed plan for the immediate evaluation and investigation of the potential impact of the landfill off site including but not limited to any existing and potential extent and degree of groundwater and surface water impacts and any leachate outbreaks and seeps. This interim off site impact plan shall include a proposed schedule for all required elements, and detailed provisions for reporting and monitoring. If off site impacts are detected that require corrective action, then within 30 days of Respondent obtaining knowledge of any such off site impacts, but in no case later than 30 days from the date of any Commissioner written notification to the Respondent of any such off site impacts, or such other time frame if approved by the Commissioner, Respondent shall submit a plan, for corrective action including a schedule for initiating such corrective action. Upon receipt of written approval of the Commissioner, Respondent shall implement said plan;

   b. The installation of a landfill cap;

   c. A plan for post-closure monitoring and maintenance of the cap including water monitoring;

   d. A plan for post-closure surface and ground water monitoring;

   e. A plan for evaluating leachate quality as well as initiating and continuing leachate monitoring on a quarterly basis, including criteria for initiating corrective action as needed; and

   f. A plan for post-closure use of the Site.

3. Within **sixty (60) days** from the date of approval of the closure plan required by paragraph B.2. of this consent order, Respondent shall implement the plan as approved by the Commissioner, provided that Respondent implements any interim corrective action identified in paragraph B.2.a. on a schedule as approved by the Commissioner.

4. On or before the last day of March, June, September, and December of each year after issuance of this consent order and continuing until all actions required by this consent order have been completed as approved and to the Commissioner's satisfaction, Respondent shall submit a progress report to the Commissioner describing the actions which Respondent has taken to date to comply with this consent order. The Commissioner may approve in writing an alternative schedule for submitting progress reports.

5. Respondent shall not be considered in full compliance with this consent order until all actions required by this consent order have been completed as approved and to the Commissioner's satisfaction.

6. All sample analyses, which are required by this consent order, and all reporting of such sample analyses shall be done by a laboratory certified by the Connecticut Department of Public Health for such analyses. All sampling and sample analyses performed under this consent order shall be performed in accordance with procedures specified or approved in writing by the Commissioner, or, if no such procedures have been specified or approved, in accordance with 40 CFR Part 136. Unless otherwise specified by the Commissioner in writing, the value of each parameter shall be reported to the maximum level of precision and accuracy specified in the applicable protocol, and if no such level is specified, to the Analytical Detection Limit as defined in RCSA §22a-133k.

7. Respondent shall use best efforts to submit to the Commissioner all documents required by this consent order in a complete and approvable form. If the Commissioner notifies Respondent that any document or other action is deficient, and does not approve it with conditions or modifications, it is deemed disapproved, and Respondent shall correct the deficiencies and resubmit it within the time specified by the Commissioner or, if no time is specified by the Commissioner, within **thirty (30) days** of the Commissioner's notice of deficiencies. In approving any document or other action under this consent order, the Commissioner may approve the document or other action as submitted or performed or with such conditions or modifications as the Commissioner deems necessary to carry out the purposes of this consent order. Nothing in this paragraph shall excuse noncompliance or delay.

8. As used in this consent order, "Commissioner" means the Commissioner or a duly authorized representative of the Commissioner. The date of "issuance" of this consent order is the date the consent order is deposited in the U.S. mail or personally delivered, whichever is earlier.

9. The date of submission to the Commissioner of any document required by this consent order shall be the date such document is received by the Commissioner. The date of any notice by the Commissioner under this consent order, including but not limited to notice of approval or disapproval of any document or other action, shall be the date such notice is deposited in the U.S. mail or is personally delivered, whichever is earlier. Except as otherwise specified in this consent order, the word "day" as used in this consent order means calendar day. Any document or action which is required by this consent order to be submitted or performed by a date which falls on a Saturday, Sunday or a Connecticut or federal holiday shall be submitted or performed by the next day which is not a Saturday, Sunday or Connecticut or federal holiday.

10. Any document, including but not limited to any notice, which is required to be submitted to the Commissioner under this consent order shall be signed by Respondent or, if Respondent is not an individual, by Respondent's chief executive officers or a duly authorized representatives of such officers, as those terms are defined in §22a-430-3(b)(2) of the Regulations of Connecticut State Agencies, and by the individual(s) responsible for actually preparing such document, and Respondent or Respondent's chief executive officers and each such individuals shall certify in writing as follows:

> "I have personally examined and am familiar with the information submitted in this document and all attachments hereto, and I certify, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement made in the submitted information may be punishable as a criminal offense under §53a-157b of the Connecticut General Statutes and any other applicable law."

16. This consent order is a final order of the Commissioner with respect to the matters addressed herein, and is nonappealable and immediately enforceable. Failure to comply with this consent order may subject Respondents to an injunction and penalties.

17. Any false statement in any information submitted pursuant to this consent order may be punishable as a criminal offense under §53a-157b of the CGS and any other applicable law.

18. Until Respondents have fully complied with this consent order, Respondents shall notify the Commissioner in writing no later than **fifteen (15) days** after transferring all or any portion of the facility, the operations, the Site or the business which is the subject of this consent order or after obtaining a new mailing or location address. Respondent's obligations under this consent order shall not be affected by the passage of title to any property to any other person or municipality.

19. Nothing in this consent order shall affect the Commissioner's authority to institute any proceeding or take any other action to prevent or abate violations of law, prevent or abate pollution, recover costs and natural resource damages, and to impose penalties for past, present, or future violations of law. If at any time the Commissioner determines that the actions taken by Respondents pursuant to this consent order have not successfully corrected all violations, fully characterized the extent or degree of any pollution, or successfully abated or prevented pollution, the Commissioner may institute any proceeding to require Respondents to undertake further investigation or further action to prevent or abate violations or pollution.

20. Nothing in this consent order shall relieve Respondents of other obligations under applicable federal, state and local law.

21. No provision of this consent order and no action or inaction by the Commissioner shall be construed to constitute an assurance by the Commissioner that the actions taken by Respondents pursuant to this consent order will result in compliance or prevent or abate pollution.

22. Any representative of the Department of Environmental Protection may enter the Site without prior notice for the purposes of monitoring and enforcing the actions required or allowed by this consent order.

23. This consent order neither creates nor affects any rights of persons or municipalities that are not parties to this consent order.

24. Within **fifteen (15) days** of the date Respondents become aware of a change in any information submitted to the Commissioner under this consent order, or that any such information was inaccurate or misleading or that any relevant information was omitted, Respondent shall submit the correct or omitted information to the Commissioner.

25. In the event that Respondents become aware that it did not or may not comply, or did not or may not comply on time, with any requirement of this consent order or of any document required hereunder, Respondents shall immediately notify by telephone the individual identified in the next paragraph and shall take all reasonable steps to ensure that any noncompliance or delay is avoided or, if unavoidable, is minimized to the greatest extent possible. Within **five (5) days** of the initial notice, Respondents shall submit in writing the date, time, and duration of the noncompliance and the reasons for the noncompliance or delay and propose, for the review and written approval of the Commissioner, dates by which compliance will be achieved, and Respondents shall comply with any dates which may be approved in writing by the Commissioner. Notification by Respondents shall not excuse noncompliance or delay, and the Commissioner's approval of any compliance dates proposed shall not excuse noncompliance or delay unless specifically so stated by the Commissioner in writing.

26. Any document required to be submitted to the Commissioner under this consent order shall, unless otherwise specified in this consent order or in writing by the Commissioner, be directed to:

Scofieldtown Landfill (Stamford) Closure Project
Attn: Ms. Amanda Flad
Remediation Division
Bureau of Water Protection and Land Reuse
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

The undersigned certifies that he is fully authorized to enter into this Consent Order and to legally bind the Respondent to the terms and conditions of this Consent Order.

RESPONDENT – City of Stamford

9/9/2010
Date

Michael A. Pavia
Mayor, City of Stamford

9/9/10
Date

Michael D. Larobina
Director of Legal Affairs and Corporation Counsel, City of Stamford

Issued as a final Order of the Commissioner of the Department of Environmental Protection.

September 10, 2010
Date

Amey Marrella
Commissioner

ORDER NO. SRD-205

APPENDIX B

AERIAL PHOTOGRAPHS

Scofieldtown Park
Rock Rimmon Rd/ Scofieldtown Rd
Stamford, CT 06903

Inquiry Number: 2650665.2
December 03, 2009

The EDR Aerial Photo Decade Package

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDRs professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Disclaimer - Copyright and Trademark Notice

This Report contains certain information obtained from a variety of public and other sources reasonably available to Environmental Data Resources, Inc. It cannot be concluded from this Report that coverage information for the target and surrounding properties does not exist from other sources. **NO WARRANTY EXPRESSED OR IMPLIED, IS MADE WHATSOEVER IN CONNECTION WITH THIS REPORT. ENVIRONMENTAL DATA RESOURCES, INC. SPECIFICALLY DISCLAIMS THE MAKING OF ANY SUCH WARRANTIES, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE. ALL RISK IS ASSUMED BY THE USER. IN NO EVENT SHALL ENVIRONMENTAL DATA RESOURCES, INC. BE LIABLE TO ANYONE, WHETHER ARISING OUT OF ERRORS OR OMISSIONS, NEGLIGENCE, ACCIDENT OR ANY OTHER CAUSE, FOR ANY LOSS OF DAMAGE, INCLUDING, WITHOUT LIMITATION, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES. ANY LIABILITY ON THE PART OF ENVIRONMENTAL DATA RESOURCES, INC. IS STRICTLY LIMITED TO A REFUND OF THE AMOUNT PAID FOR THIS REPORT.** Purchaser accepts this Report AS IS. Any analyses, estimates, ratings, environmental risk levels or risk codes provided in this Report are provided for illustrative purposes only, and are not intended to provide, nor should they be interpreted as providing any facts regarding, or prediction or forecast of, any environmental risk for any property. Only a Phase I Environmental Site Assessment performed by an environmental professional can provide information regarding the environmental risk for any property. Additionally, the information provided in this Report is not to be construed as legal advice.

Copyright 2009 by Environmental Data Resources, Inc. All rights reserved. Reproduction in any media or format, in whole or in part, of any report or map of Environmental Data Resources, Inc., or its affiliates, is prohibited without prior written permission.

EDR and its logos (including Sanborn and Sanborn Map) are trademarks of Environmental Data Resources, Inc. or its affiliates. All other trademarks used herein are the property of their respective owners.

Date EDR Searched Historical Sources:

Aerial Photography December 03, 2009

Target Property:

Rock Rimmon Rd/ Scofieldtown Rd
Stamford, CT 06903

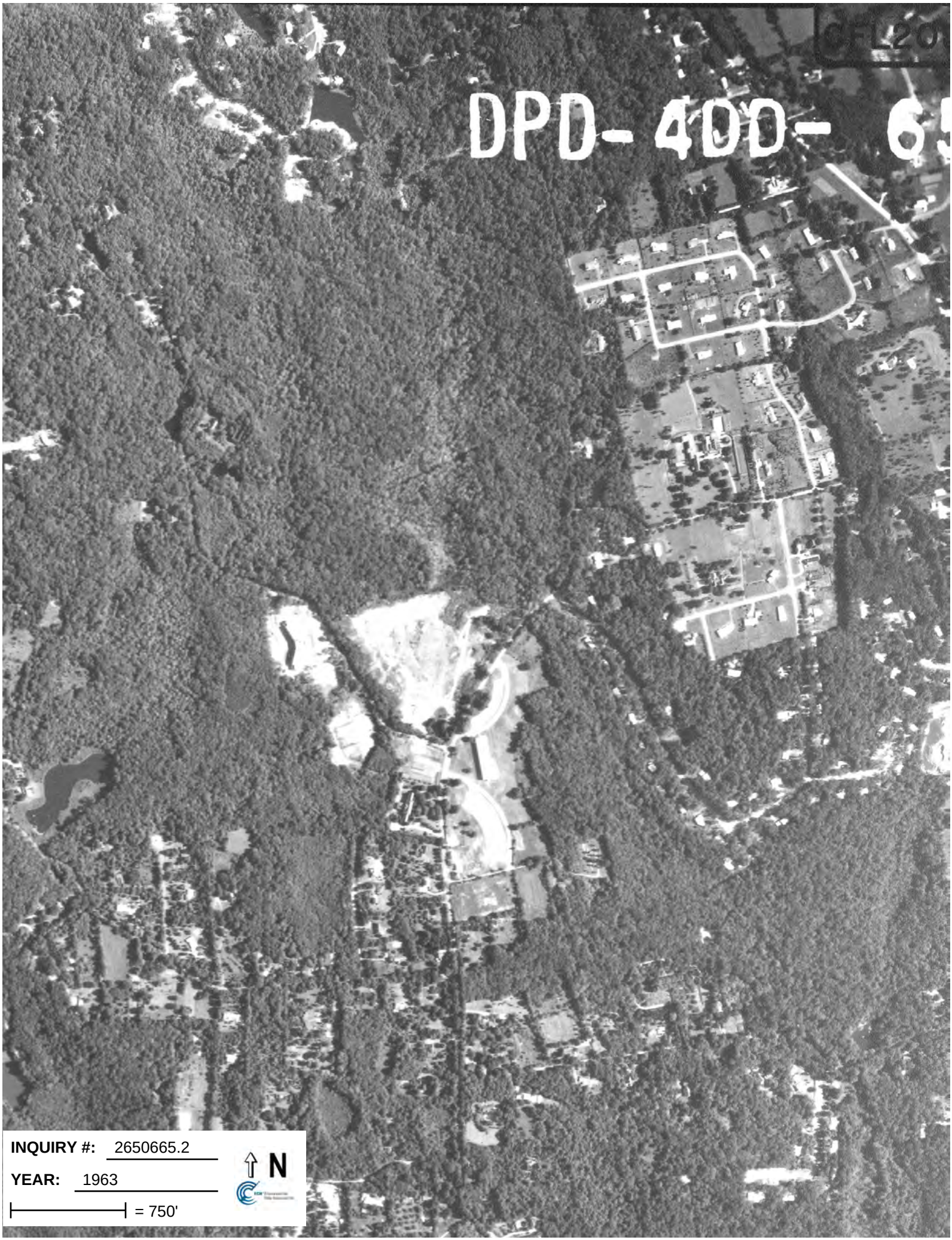
Note: 1934 Aerial Photograph added by TRC as obtained from the Connecticut State Library 1934 Aerial Survey of Connecticut photograph number:04112.

Year	***Scale***	***Details***	***Source***
1951	Aerial Photograph. Scale: 1"=500'	Panel #: 2441073-B5/Flight Date: September 24, 1951	EDR
1960	Aerial Photograph. Scale: 1"=750'	Panel #: 2441073-B5/Flight Date: April 01, 1960	EDR
1963	Aerial Photograph. Scale: 1"=750'	Panel #: 2441073-B5/Flight Date: July 05, 1963	EDR
1979	Aerial Photograph. Scale: 1"=750'	Panel #: 2441073-B5/Flight Date: June 14, 1979	EDR
1985	Aerial Photograph. Scale: 1"=750'	Panel #: 2441073-B5/Flight Date: March 16, 1985	EDR
1989	Aerial Photograph. Scale: 1"=750'	Panel #: 2441073-B5/Flight Date: April 20, 1989	EDR
1991	Aerial Photograph. Scale: 1"=750'	Panel #: 2441073-B5/Flight Date: March 31, 1991	EDR
1994	Aerial Photograph. Scale: 1"=750'	Panel #: 2441073-B5/Flight Date: April 04, 1994	EDR
2006	Aerial Photograph. 1" = 604'	Flight Year: 2006	EDR

Reference:
Connecticut State Library, Aerial survey of Connecticut 1934 photograph 04112

INQUIRY #: 2650665.2
YEAR: 1951
= 500'
N

INQUIRY #: 2650665.2
YEAR: 1960
= 750'
N



INQUIRY #: 2650665.2

YEAR: 1963

= 750'

N

INQUIRY #: 2650665.2
YEAR: 1979
= 750'
N

152 02 CT DEP 02-08
INQUIRY #: 2650665.2
YEAR: 1985
= 750'
N

INQUIRY #: 2650665.2
YEAR: 1989
= 750'
N

INQUIRY #: 2650665.2
YEAR: 1991
= 750'
N

INQUIRY #: 2650665.2
YEAR: 1994
= 750'
N

INQUIRY #: 2650665.2
YEAR: 2006
= 604'
N

APPENDIX C

CHRONOLOGY OF EVENTS

Appendix C
Chronology of Events at Scofieldtown Landfill

Agency	Description	Date	Comments
City of Stamford	Tasks TRC with development of a Closure Plan for the former landfill.	Sept-10	
City of Stamford & CTDEP	City and State entered into Consent Order (SRD-205) stipulating the immediate actions to be taken by the city with respect to the former landfill.	10-Sept-10	
TRC	TRC submits report entitled; "*Environmental Investigation Report Scofieldtown Park Area*" dated April 2010 to the City of Stamford	April-10	Based on findings of report, TRC concludes that landfill is not source of pesticide contamination in residential wells
TRC	TRC performs field activities for below scope of work.	26-Oct-09 to 30-Dec-09	
TRC	Submits Scope of Work to augment environmental data regarding soil and ground water quality of site and immediate area.	16-Oct-09	Scope consisted of: geophysical survey, installation of monitoring wells and the collection of surface and ground water samples.
City of Stamford	Extends public water supply through neighborhoods where contamination has been detected in residential drinking water samples.	July-09 to Feb-10	
USEPA	Site Investigation closure memo issued	11-Aug-09	
Law Dept.	Final site re-assessment report	3-Feb-09	DEP troubled by SS-03 and SS-18. DEP asked us to perform soil testing
USEPA	Final Site Reassessment Report	23-Dec-08	
USEPA	Draft site re-assessment report	6-Oct-08	
USEPA	Letter indicating fulfillment of all cleanup and reporting outlined in order	26-Sep-08	
USEPA	Unilateral Admin. Order for Removal Action	30-Jun-08	Relates to samples taken from 2 drums on Nov 20, 2007
USEPA	Collected 20 surface soil samples	24-26 Mar 08 & 2-3 Apr 08	
USEPA	Performed a removal PA/SI site evaluation	13-Jun-07 & 20-Nov-07	Refer to Figure 3 for 20 SS locations

Appendix C
Chronology of Events at Scofieldtown Landfill

Agency	Description	Date	Comments
USEPA's START team	As part of SR START conducted on-site recon.	16-Jan-07	
USEPA	Initiated the Site reassessment	2004	
CTDEP	Collected soil samples	16-Oct-97	
CTDEP	Resident complaint	Aug.-97	
CTDEP	Collected drinking water samples	5-Feb-97	
USEPA	Completed SIP	1-Mar-96	
USEPA	Completed Prelim Site Assessment	2-Feb-96	2 drums
USEPA	Performed removal site evaluation	28-Nov-95	
USEPA	Completed Site Inspection Prioritization (SIP)	20-Jul-94	
CTDEP	Collected 3 drinking water samples on Hannah's Road	18-Sep-92	Concluded none of samples contained water that was unsafe for consumption
Stamford DOH	Expressed concern to DEP about erosion of land fill cap	13-Jan-90	
CTDEP	Collected 12 drinking water samples	July-Aug. 89	
City	Collected soil samples	1-Jun-89	
CTDEP	Expressed concern over drainage from tennis courts directed to landfill	22-Feb-89	
CTDHS	Collected 2 surface water samples	7-Nov-88	
CTDEP	Sends letter to Mayor requesting removal of more rusted drums	2-Aug-88	
CTDEP	Responded to complaint about chemical dumping	14-Jul-88	In 8/88 CTDEP asked Mayor to remove drums
USEPA	Prepared final SI, recommended surface water and groundwater sampling	11-Mar-88	
City	17 drums were removed and disposed of site	22-Dec-87	
City	City collected drum samples	Nov.-87	
CTDHS	Collected sediment sample from stream and soil sample in area of drums	27-Mar-87	
Stamford DPW	moved 17 visible drums observed by DEP in May	Jul.-86 - Mar.-87	

Appendix C
Chronology of Events at Scofieldtown Landfill

Agency	Description	Date	Comments
	1986		
USEPA	Completed prelim. assessment	1-Aug-86	
CTDEP	Sent letter to City to secure drums	28-Jul-86	
CT DEP	Site listed on CERCLIS database	1-May-86	
	Complaint filed by resident to DEP	1-May-86	Stating drums were discovered
CTDEP	Approved City's regarding plan related to NOV	Aug.-85	
CTDEP	Issued Notice of Violation	12-Apr-85	Failure to provide drainage and failure to obtain DEP approval to alter landfill
Stamford DOH	Observed erosion	Dec-84 - Feb-85	
	Complaint filed by resident to DEP	Feb.-80	Unsubstantiated claim

APPENDIX D

FIGURES AND TABLES FROM EPA 2008 REPORT

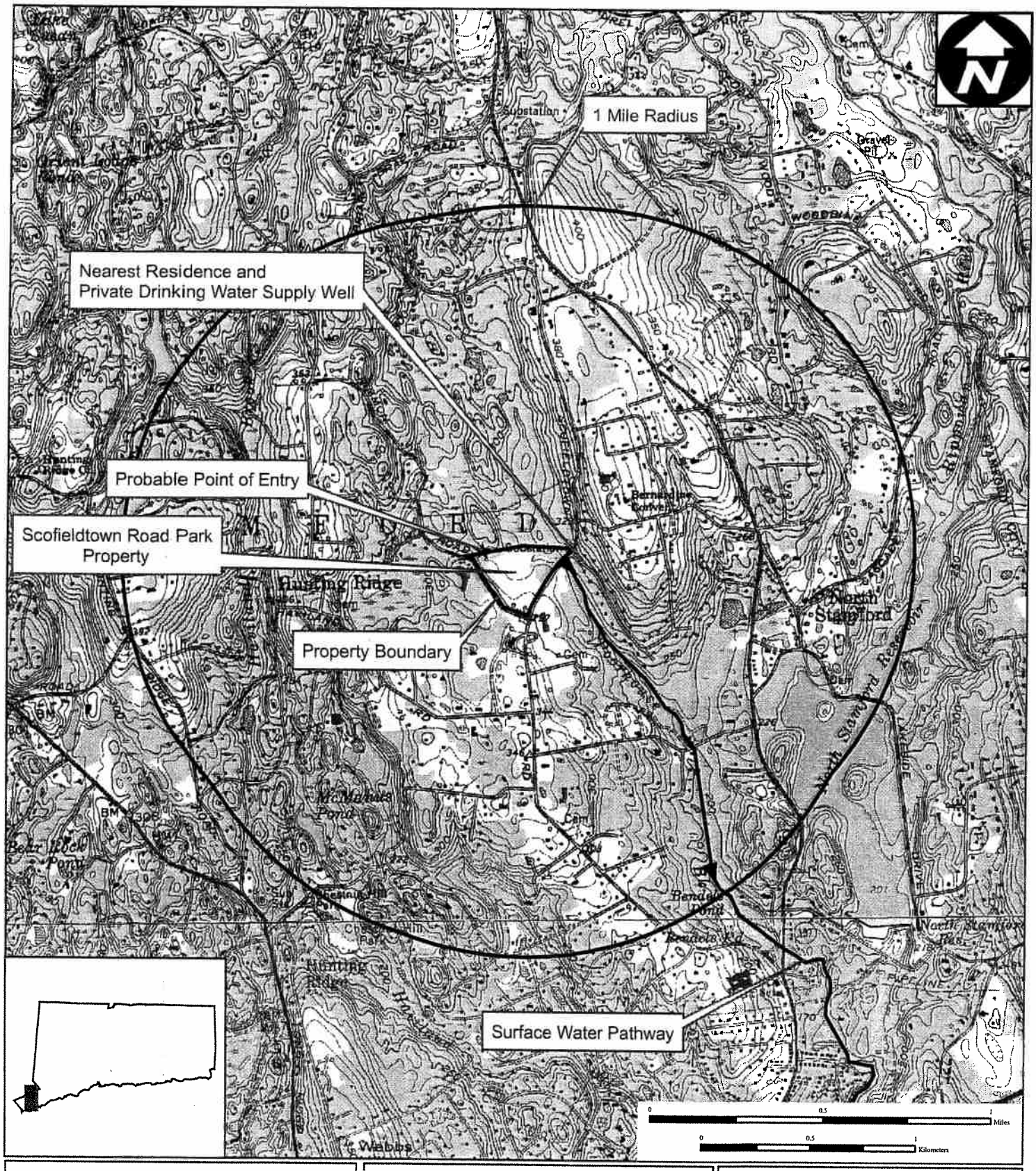


FIGURE 1

SITE LOCATION MAP

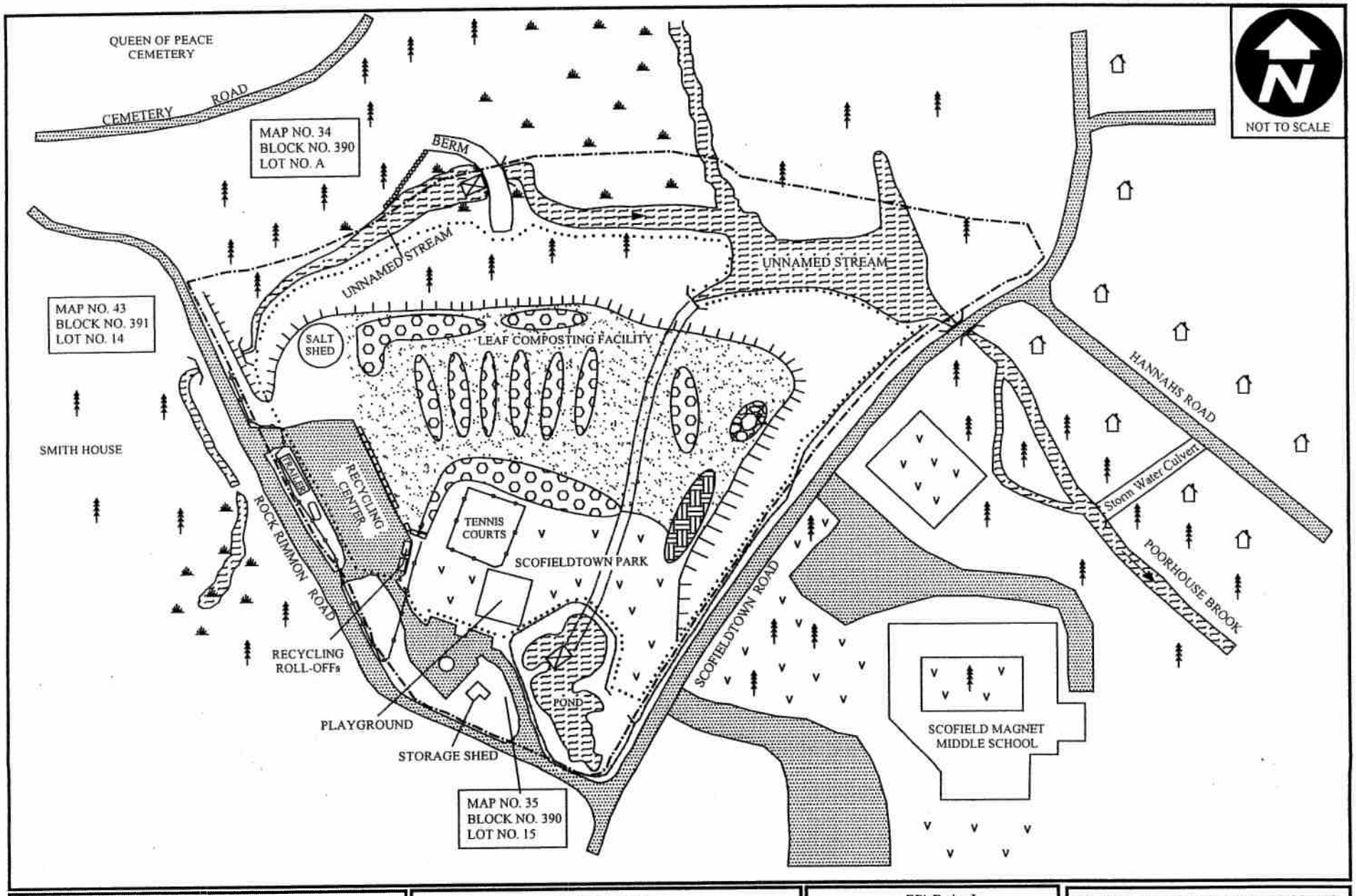
SCOFIELDTOWN ROAD PARK
612 SCOFIELDTOWN ROAD
STAMFORD, CONNECTICUT

EPA Region I
Superfund Technical Assessment and Response Team (START) III
Contract No. EP-W-05-042

TDD Number:	06-07-0007
Created by:	G. Hornok
Created on:	10 April 2007
Modified by:	G. Hornok
Modified on:	23 December 2008

Data Sources:
Topos: MicroPath/USGS
Quad Name(s): Stamford, CT; Pound Ridge, NY/CT
All other data: START

WESTON SOLUTIONS
Restoring Resource Efficiency



LEGEND

- PAVED AREA
- SURFACE WATER
- PROPERTY BOUNDARY
- STEEP SLOPE
- TREE
- ABOVEGROUND STORAGE TANK (AST)
- ROCK WALL
- COMPOST PIT
- FILL PIT
- FENCE
- CULVERT
- WETLANDS
- OVERFLOW DRAIN
- ASSUMED EXTENT OF LANDFILL
- ASPHALT MILLINGS PIT
- ASPHALT MILLINGS COVER
- GRASS
- RESIDENCE
- STREAM FLOW DIRECTION
- ASSUMED UNDERGROUND PIPE

FIGURE 2

SITE SKETCH

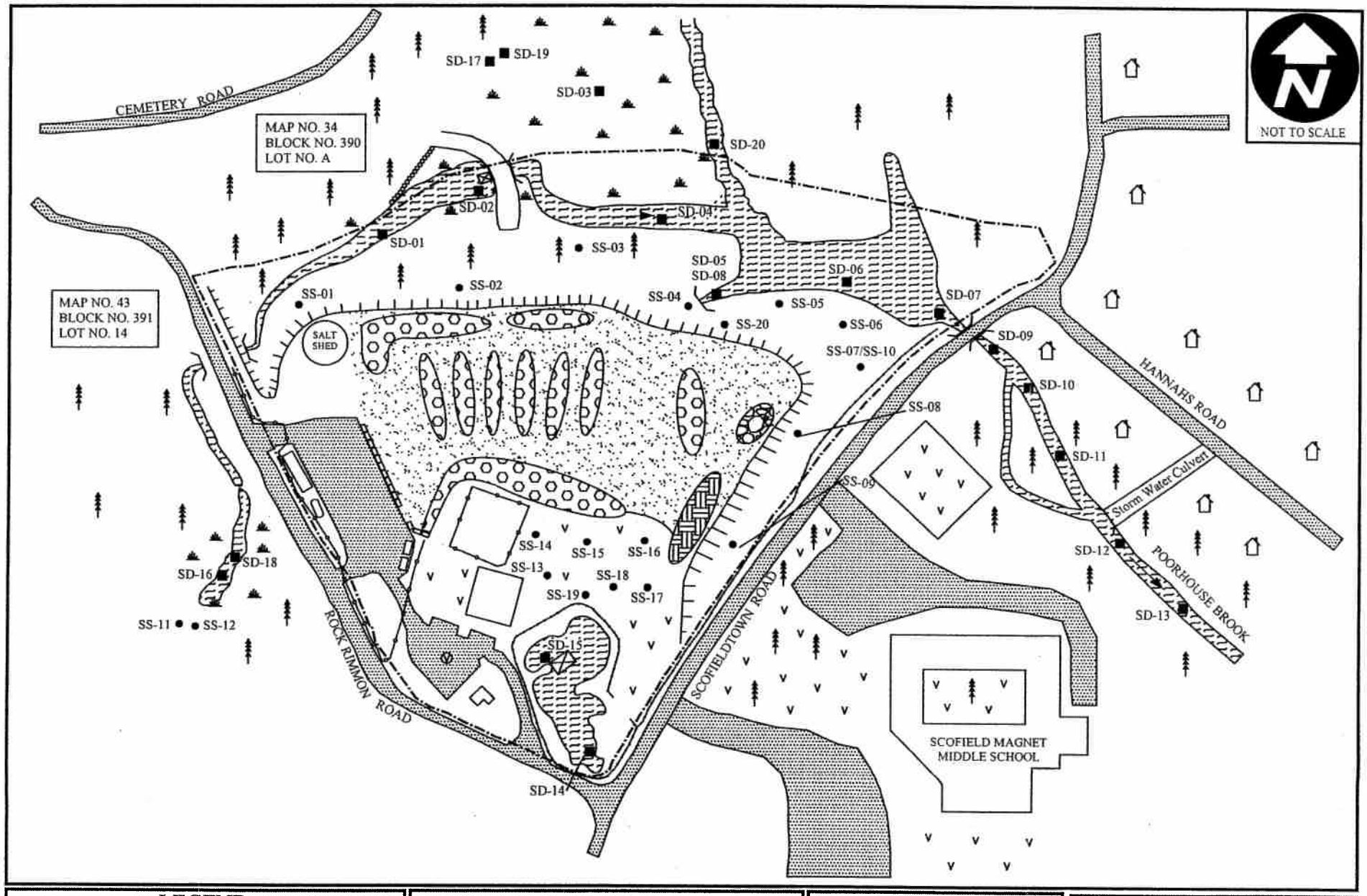
SCOFIELDTOWN ROAD PARK
612 SCOFIELDTOWN ROAD
STAMFORD, CONNECTICUT

EPA Region 1
Superfund Technical Assessment and Response Team (START) III
Contract No. EP-W-05-042

TDD Number:	06-07-0007
Created by:	G. Hornok
Created on:	6 August 2007
Modified by:	G. Hornok
Modified on:	23 December 2008

SOURCES: WESTON/START FIELDBOOK NO. 01405-S FOR SCOFIELDTOWN ROAD - 2007
CITY OF STAMFORD TAX ASSESSORS MAPS

WESTON SOLUTIONS
Restoring Resource Efficiency



LEGEND

- PAVED AREA
- SURFACE WATER
- PROPERTY BOUNDARY
- STEEP SLOPE
- TREE
- ABOVEGROUND STORAGE TANK (AST)
- SEDIMENT SAMPLE LOCATION
- COMPOST
- FILL
- FENCE
- CULVERT
- WETLANDS
- SOIL SAMPLE LOCATION
- LANDFILL BOUNDARY
- OVERFLOW
- ASPHALT MILLINGS
- ASPHALT MILLINGS COVER
- GRASS
- RESIDENCE
- FLOW DIRECTION
- ROCK WALL

FIGURE 3
START SURFACE SOIL/SOURCE AND SEDIMENT SAMPLE LOCATION SKETCH

SCOFIELDTOWN ROAD PARK
612 SCOFIELDTOWN ROAD
STAMFORD, CONNECTICUT

EPA Region I
Superfund Technical Assessment and Response Team (START) III
Contract No. EP-W-05-042

TDD Number:	06-07-0007
Created by:	G. Hornok
Created on:	6 August 2007
Modified by:	G. Hornok
Modified on:	23 December 2008

SOURCES: WESTON/START FIELDBOOK NO. 01405-S FOR SCOFIELDTOWN ROAD - 2007
CITY OF STAMFORD TAX ASSESSORS MAPS

WESTON SOLUTIONS
Restoring Resource Efficiency

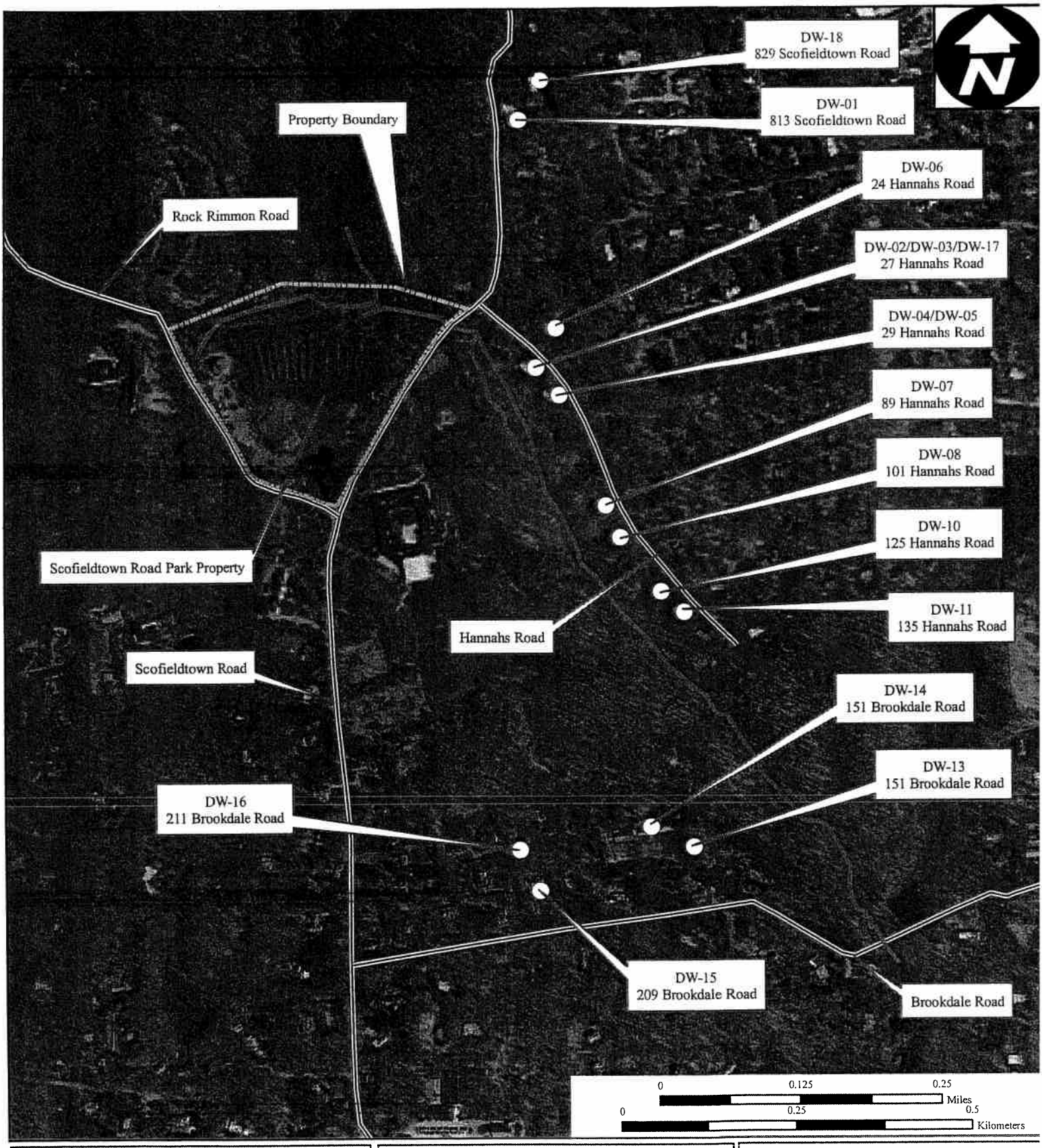


Figure 4

START Drinking Water Sample Locations

Scofieldtown Road Park
612 Scofieldtown Road
Stamford, Connecticut

EPA Region 1
Superfund Technical Assessment and Response Team (START) III
Contract No. EP-W-05-042

TDD Number:	06-07-0007
Created by:	G. Hornok
Created on:	18 April 2008
Modified by:	G. Hornok
Modified on:	23 December 2008

Data Sources:
Aerial Photograph: CT MAGIC
All other data: START

WESTON SOLUTIONS
Restoring Resource Efficiency

Table 1 presents identified structures or areas on the Scofieldtown Road Park property that are documented or potential sources of contamination, the containment factors associated with each source, and the relative location of each source.

Table 1

Source Evaluation for Scofieldtown Road Park

Source Area	Containment Factors	Spatial Location
Drums Containing Waste Material	None	Along northern and eastern boundaries of former landfill
Former Landfill	Asphalt millings cap on top surface	Entire approximately 18-acre property

[100; 140]

Table 2 summarizes the types of potentially hazardous substances which have been disposed, used, or stored on the Scofieldtown Road Park property.

Table 2

Hazardous Waste Quantity for Scofieldtown Road Park

Substance	Quantity or Volume/Area	Years of Use/Storage	Years of Disposal	Source Area
Drums containing VOCs, SVOCs, Pesticides, PCBs, and metals.	Unknown	NA	mid-1930s to early-1970s	Drums Containing Waste Material
Miscellaneous solid waste and soil contaminated with VOCs, SVOCs, Pesticides, PCBs, metals, and cyanide.	Estimated 784,806 ft^2 (18 acres)	NA	mid-1930s to early-1970s	Former Landfill

VOCs = Volatile Organic Compounds
SVOCs =Semivolatile Organic Compounds
PCBs = Polychlorinated Biphenyls
ft^2 = Square feet
NA = Not Applicable

[100-114; 140]

Including the Scofieldtown Road Park property, there are four sites in Stamford, CT listed in the CERCLIS database. In addition, there are 228 Resource Conservation and Recovery Information System (RCRIS) sites, and 155 CT DEP Site Remediation sites located in Stamford, CT [142-144].

on the Scofieldtown Road Park property and the adjacent property (to the west across Rock Rimmon Road), to determine the presence of hazardous substances in on-site surface soils. Surface soil/source samples SS-01 through SS-06 and SS-20 were collected along the northern slope of the former landfill. Surface soil/source samples SS-07 through SS-10 were collected along the eastern slope of the former landfill. Surface soil/source samples SS-11 and SS-12 were collected from the Smith House Property, located to the west of the Scofieldtown Road Park property (across Rock Rimmon Road), to document reference soil conditions. Surface soil/source samples SS-13 through SS-19 were collected from the park area, located on the southern portion of the Scofieldtown Road Park property [100, pp. 15-31]. Surface soil/source samples SS-01 through SS-11 and SS-13 through SS-20 were submitted to the EPA OEME Laboratory for VOC, SVOC, pesticide, PCB, metal, and cyanide analyses. Surface soil/source sample SS-12 was submitted to the EPA OEME Laboratory for metal analysis only [101-114].

Table 3 summarizes the surface soil/source samples collected by START on 25 and 26 March 2008.

Table 3

Surface Soil/Source Sample Summary: Scofieldtown Road Park
Samples Collected by START on 25 and 26 March 2008

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Surface Soil/Source					
SS-01	D21810	3/26/08 1046	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger in the northwestern portion of the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was dark brown, SILT, some fine sand, little medium-to-coarse sand, trace plastic, fine-to-medium gravel, and organics. PID = 0.0 units above background. 41° 08′ 23.89″ North Latitude 73° 33′ 39.41″ West Longitude
SS-02	D21811	3/26/08 1049	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger along the northern slope of the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was dark brown, SILT, some fine sand, little organics. PID = 0.0 units above background. 41° 08′ 25.23″ North Latitude 73° 33′ 34.54″ West Longitude

Table 3

Surface Soil/Source Sample Summary: Scofieldtown Road Park
Samples Collected by START on 25 and 26 March 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Surface Soil/Source (Continued)					
SS-03 (MS/MSD)	D21812	3/26/08 1123	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger along the northern slope of the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was dark brown, SILT, some fine sand, little medium-to-coarse sand, trace organics, gravel, and debris (plastic). PID = 0.0 units above background. 41° 08′ 26.28″ North Latitude 73° 33′ 32.19″ West Longitude
SS-04	D21813	3/26/08 1205	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger along the northeastern slope of the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was dark brown, fine SAND, some silt and fine-to-medium gravel, little medium-to-coarse sand, trace organics and debris. PID = 0.0 units above background. 41° 08′ 25.60″ North Latitude 73° 33′ 29.57″ West Longitude
SS-05	D21814	3/26/08 1144	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger along the northeastern slope of the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was brown, fine-to-medium SAND, some coarse sand, little silt, trace fine-to-medium gravel and organics. PID = 0.0 units above background. 41° 08′ 24.81″ North Latitude 73° 33′ 28.38″ West Longitude

Table 3

Surface Soil/Source Sample Summary: Scofieldtown Road Park
Samples Collected by START on 25 and 26 March 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Surface Soil/Source (Continued)					
SS-06	D21815	3/26/08 1153	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger along the northeastern slope of the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was light brown, SILT, some fine sand, little medium-to-coarse sand, trace fine-to-medium gravel and organics. PID = 0.0 units above background. 41° 08′ 24.81″ North Latitude 73° 33′ 26.97″ West Longitude
SS-07	D21816	3/26/08 1450	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger along the northeastern slope of the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was dark brown, SILT, some fine sand, trace fine-to-medium gravel, debris, and organics. PID = 0.0 units above background. 41° 08′ 24.32″ North Latitude 73° 33′ 26.77″ West Longitude
SS-08	D21817	3/26/08 1532	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand along the eastern slope of the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was light brown, fine SAND, some silt, trace organics and debris (plastic and black solid). PID = 0.0 units above background. 41° 08′ 21.55″ North Latitude 73° 33′ 28.59″ West Longitude

Table 3

Surface Soil/Source Sample Summary: Scofieldtown Road Park
Samples Collected by START on 25 and 26 March 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Surface Soil/Source (Continued)					
SS-09	D21818	3/26/08 1531	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger along the eastern slope of the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was brown, fine SAND, some fine-to-medium gravel, and coarse gravel, little medium-to-coarse sand, trace organics. PID = 0.0 units above background. 41° 08′ 19.20″ North Latitude 73° 33′ 29.64″ West Longitude
SS-10	D21819	3/26/08 1450	Grab	0 to 2	Field duplicate of surface soil/source sample SS-07, collected for quality control.
SS-11	D21820	3/26/08 1355	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger on the property located southwest of the Scofieldtown Road Park property (88 Rock Rimmon Road), to establish reference concentrations for surface soil/source sample comparisons. Material was dark brown, SILT, trace medium-to-coarse sand, fine gravel, and organics. PID = 0.0 units above background. 41° 08′ 19.27″ North Latitude 73° 33′ 39.92″ West Longitude
SS-12	D21821	3/26/08 1359	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger on the property located southwest of the Scofieldtown Road Park property (88 Rock Rimmon Road), to establish reference concentrations for surface soil/source sample comparisons (metals analysis only). Material was dark brown, SILT, some fine sand and medium-to-coarse sand, and trace fine-to-medium gravel, clay, and organics. PID = 0.0 units above background. 41° 08′ 19.45″ North Latitude 73° 33′ 40.07″ West Longitude

Table 3

Surface Soil/Source Sample Summary: Scofieldtown Road Park
Samples Collected by START on 25 and 26 March 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Surface Soil/Source (Continued)					
SS-13	D21822	3/25/08 0845	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger in the central portion of the park located on the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was dark brown, fine-to-medium SAND, little fine gravel. PID = 0.0 units above background. 41° 08′ 20.58″ North Latitude 73° 33′ 32.42″ West Longitude
SS-14	D21823	3/25/08 0955	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger in the northern portion of the park located on the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was dark brown, medium SAND, some debris (glass, wire, fabric, wood and paper), and little fine gravel. PID = 0.0 units above background. 41° 08′ 21.13″ North Latitude 73° 33′ 32.89″ West Longitude
SS-15	D21824	3/25/08 0825	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger in the northern portion of the park located on the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was dark brown, fine SAND, some silt and organics, trace fine gravel. PID = 0.0 units above background. 41° 08′ 21.01″ North Latitude 73° 33′ 31.75″ West Longitude
SS-16	D21825	3/25/08 1100	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger in the northeastern portion of the park located on the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was light-to-dark brown, medium SAND, some fine-to-medium gravel, trace debris (glass and plastic). PID = 0.0 units above background. 41° 08′ 21.03″ North Latitude 73° 33′ 30.80″ West Longitude

Table 3

Surface Soil/Source Sample Summary: Scofieldtown Road Park
Samples Collected by START on 25 and 26 March 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Surface Soil/Source (Continued)					
SS-17	D21826	3/25/08 0907	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger in the eastern portion of the park located on the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was dark brown, fine SAND, some silt, little fine-to-medium gravel, trace organics. PID = 0.0 units above background. 41° 08′ 20.34″ North Latitude 73° 33′ 30.83″ West Longitude
SS-18	D21827	3/25/08 1059	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger in the eastern portion of the park located on the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was light-to-dark brown, fine SAND, some silt, little fine-to-medium gravel and debris (glass and plastic), trace organics. PID = 0.0 units above background. 41° 08′ 19.96″ North Latitude 73° 33′ 31.34″ West Longitude
SS-19	D21828	3/25/08 1011	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger in the central portion of the park located on the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was dark brown, SILT and fine SAND, some clay, little organics and debris (glass, plastic, and Styrofoam), trace fine-to-medium gravel. PID = 0.0 units above background. 41° 08′ 20.01″ North Latitude 73° 33′ 31.93″ West Longitude

Table 3

Surface Soil/Source Sample Summary: Scofieldtown Road Park Samples Collected by START on 25 and 26 March 2008 (Concluded)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Surface Soil/Source (Concluded)					
SS-20	D21829	3/26/08 1451	Grab	0 to 2	Surface soil/source sample collected from a soil boring advanced using a hand auger along the northeastern slope of the former landfill, to determine the presence of any hazardous substances that may have been disposed of in this area. Material was black-to-dark brown, SILT, some fine sand, trace medium-to-coarse sand, clay, fine gravel, organics, and debris (glass, plastic, wire coating). PID = 0.0 units above background. 41° 08′ 24.95″ North Latitude 73° 33′ 29.47″ West Longitude

MS/MSD = Matrix Spike/Matrix Spike Duplicate.
No. = Number.
″ = Seconds.
bgs = Below Ground Surface.
START = Superfund Technical Assessment and Response Team.
PID = Photoionization Detector.
° = Degrees.
′ = Minutes.

[100, pp. 15-31]

Complete analytical results of START surface soil/source samples, including quantitation and reporting limits, are presented in *Attachment A* of this report. START has reported the data as it was received from the EPA OEME Laboratory. START has not performed data validation of the EPA OEME Laboratory data. An internal data review was performed by EPA OEME Laboratory personnel prior to submittal to the EPA Contracting Officer's Representative (COR). EPA OEME Laboratory Data Qualifiers, defined by the EPA OEME Laboratory in the Project's Laboratory Reports, are listed in *Attachment A* of this report. Sample results qualified with a "E" on analytical tables are considered estimated values as the value given exceeds the calibration range of the instrument. Sample results qualified with a "J" on analytical tables are considered estimated values. Sample results qualified with a "J1" on analytical tables are estimated due to the matrix spike recovery which is outside the acceptance criteria. Sample results qualified with a "J3" on analytical tables are estimated due to relative percent difference which is outside the acceptance criteria. Sample results qualified with a "P" on analytical tables are compounds in which the confirmation value exceeded 35 percent (%) difference and is less than 100%. In this case, the lower value is reported [101-114].

Complete analytical results, as reported by the EPA OEME Laboratory, for START equipment rinsate, trip, and preservative blank samples collected in accordance with the Quality Assurance

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park

Sample Location	Compound/ Element	Sample Concentration		Reference Concentration			Comments	CT DEP RSR Residential DEC for Soil		CT DEP RSR Industrial/ Commercial DEC for Soil	
SS-01	**SVOCs**										
	Butylbenzylphthalate	640	µg/Kg	440	ND	µg/Kg	1.5 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	PESTICIDES/PCBs										
	4,4'-DDD	18	µg/Kg	5.0	ND	µg/Kg	3.6 × RL	2,600	µg/Kg	24,000	µg/Kg
	4,4'-DDE	55	µg/Kg	5.0	ND	µg/Kg	11 × RL	1,800	µg/Kg	17,000	µg/Kg
	4,4'-DDT	50	µg/Kg	5.0	ND	µg/Kg	10 × RL	1,800	µg/Kg	17,000	µg/Kg
	Alpha Chlordane [1]	92	µg/Kg	5.0	ND	µg/Kg	18.4 × RL	490	µg/Kg	2,200	µg/Kg
	Gamma Chlordane [1]	46	µg/Kg	5.0	ND	µg/Kg	9.2 × RL	490	µg/Kg	2,200	µg/Kg
	Aroclor-1254 [2]	990	µg/Kg	100	ND	µg/Kg	9.9 × RL	1,000	µg/Kg	10,000	µg/Kg
	INORGANICS										
	Calcium	4,300	mg/Kg	510		mg/Kg	8.4 × Ref	NE		NE	
	Copper	470	mg/Kg	27		mg/Kg	17.4 × Ref	2,500	mg/Kg	76,000	mg/Kg
	Lead	120	mg/Kg	22		mg/Kg	5.5 × Ref	500	mg/Kg	1,000	mg/Kg
	Mercury	0.17	mg/Kg	0.049		mg/Kg	3.5 × Ref	20	mg/Kg	610	mg/Kg
	Zinc	230	mg/Kg	55		mg/Kg	4.2 × Ref	20,000	mg/Kg	610,000	mg/Kg
	Cyanide	0.83	mg/Kg	0.31	ND	mg/Kg	2.7 × RL	1,400	mg/Kg	41,000	mg/Kg
SS-02	**PESTICIDES/PCBs**										
	4,4'-DDE	31	µg/Kg	5.0	ND	µg/Kg	6.2 × RL	1,800	µg/Kg	17,000	µg/Kg
	Alpha Chlordane [1]	55	µg/Kg	5.0	ND	µg/Kg	11 × RL	490	µg/Kg	2,200	µg/Kg
	Gamma Chlordane [1]	37	µg/Kg	5.0	ND	µg/Kg	7.4 × RL	490	µg/Kg	2,200	µg/Kg
	INORGANICS										
	Antimony	2.8	mg/Kg	2.3	ND	mg/Kg	1.2 × RL	27	mg/Kg	8,200	mg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	CT DEP RSR Residential DEC for Soil	CT DEP RSR Industrial/ Commercial DEC for Soil
SS-02 (Concluded)	**INORGANICS (Concluded)**					
	Calcium	27,000 mg/Kg	510 mg/Kg	52.9 × Ref	NE	NE
	Lead	88 mg/Kg	22 mg/Kg	4 × Ref	500 mg/Kg	1,000 mg/Kg
	Mercury	0.21 mg/Kg	0.049 mg/Kg	4.3 × Ref	20 mg/Kg	610 mg/Kg
	Zinc	180 mg/Kg	55 mg/Kg	3.3 × Ref	20,000 mg/Kg	610,000 mg/Kg
	Cyanide	0.71 mg/Kg	0.31 ND mg/Kg	2.3 × RL	1,400 mg/Kg	41,000 mg/Kg
SS-03	**VOCs**					
	1,1,1-Trichloroethane	16 µg/Kg	1.1 ND µg/Kg	14.5 × RL	500,000 µg/Kg	1E+06 µg/Kg
	1,1-Dichloroethane	2.1 µg/Kg	1.1 ND µg/Kg	1.9 × RL	500,000 µg/Kg	1E+06 µg/Kg
	Benzene	5.3 µg/Kg	1.1 ND µg/Kg	4.8 × RL	21,000 µg/Kg	200,000 µg/Kg
	Toluene	2.3 µg/Kg	1.1 ND µg/Kg	2.1 × RL	500,000 µg/Kg	1E+06 µg/Kg
	Trichloroethylene	150 E µg/Kg	1.1 ND µg/Kg	136.4 × RL	56,000 µg/Kg	520,000 µg/Kg
	cis-1,2-Dichloroethylene	1.3 µg/Kg	1.1 ND µg/Kg	1.2 × RL	500,000 µg/Kg	1E+06 µg/Kg
	SVOCs					
	1-Methylnapthalene	450 µg/Kg	440 ND µg/Kg	1.0 × RL	NL	NL
	2-Methylnapthalene	820 µg/Kg	440 ND µg/Kg	1.9 × RL	474,000 µg/Kg	2.5E+06 µg/Kg
	Acenaphthene	2,300 µg/Kg	440 ND µg/Kg	5.2 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Anthracene	6,500 µg/Kg	440 ND µg/Kg	14.8 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Benzo(a) anthracene	**12,000 µg/Kg**	440 ND µg/Kg	27.3 × RL	1,000 µg/Kg	**7,800 µg/Kg**
	Benzo(a)pyrene	**12,000 µg/Kg**	440 ND µg/Kg	27.3 × RL	1,000 µg/Kg	**1,000 µg/Kg**
	Benzo(b) fluoranthene	**11,000 µg/Kg**	440 ND µg/Kg	25 × RL	1,000 µg/Kg	**7,800 µg/Kg**

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration			Reference Concentration			Comments	CT DEP RSR Residential DEC for Soil		CT DEP RSR Industrial/ Commercial DEC for Soil	
SS-03 (Continued)	**SVOCs (Concluded)**											
	Benzo(g,h,i) perylene	8,500		µg/Kg	440	ND	µg/Kg	19.3 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Benzo(k) fluoranthene	8,900		µg/Kg	440	ND	µg/Kg	20.2 × RL	8,400	µg/Kg	78,000	µg/Kg
	Carbazole	3,100		µg/Kg	440	ND	µg/Kg	7.0 × RL	31,000	µg/Kg	290,000	µg/Kg
	Chrysene	12,000		µg/Kg	440	ND	µg/Kg	27.3 × RL	84,000	µg/Kg	780,000	µg/Kg
	Di-n-butylphthalate	1,700		µg/Kg	440	ND	µg/Kg	3.9 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Dibenz(a,h) anthracene [4]	**2,400**		**µg/Kg**	440	ND	µg/Kg	5.5 × RL	1,000	µg/Kg	**1,000**	**µg/Kg**
	Dibenzofuran	1,400		µg/Kg	440	ND	µg/Kg	3.2 × RL	270,000	µg/Kg	2.5E+06	µg/Kg
	Fluoranthene	35,000		µg/Kg	440	ND	µg/Kg	79.5 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Fluorene	2,500		µg/Kg	440	ND	µg/Kg	5.7 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Indeno(1,2,3-cd) pyrene	7,500		µg/Kg	440	ND	µg/Kg	17 × RL	1,000	µg/Kg	7,800	µg/Kg
	Napthalene	1,000		µg/Kg	440	ND	µg/Kg	2.3 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Phenanthrene	26,000		µg/Kg	440	ND	µg/Kg	59.1 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Phenol	440		µg/Kg	440	ND	µg/Kg	1 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Pyrene	28,000		µg/Kg	440	ND	µg/Kg	63.6 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	PESTICIDES/PCBs											
	Aroclor-1254 [2]	**29,000**		**µg/Kg**	100	ND	µg/Kg	290 × RL	1,000	µg/Kg	**10,000**	**µg/Kg**
	INORGANICS											
	Calcium	13,000	J3	mg/Kg	510		mg/Kg	18.6 × Ref	NE		NE	
	Chromium [3]	610		mg/Kg	39		mg/Kg	15.6 × Ref	3,900	mg/Kg	51,000	mg/Kg
	Copper	660	J3	mg/Kg	27		mg/Kg	12.6 × Ref	2,500	mg/Kg	76,000	mg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	CT DEP RSR Residential DEC for Soil	CT DEP RSR Industrial/ Commercial DEC for Soil
SS-03 (Concluded)	**INORGANICS (Concluded)**					
	Iron	84,000 mg/Kg	24,000 mg/Kg	3.5 × Ref	NL	NL
	Lead	**30,000 J3 mg/Kg**	22 mg/Kg	322.7 × Ref	500 mg/Kg	**1,000 mg/Kg**
	Mercury	2.9 mg/Kg	0.049 mg/Kg	59.2 × Ref	20 mg/Kg	610 mg/Kg
	Vanadium	130 mg/Kg	42 mg/Kg	3.1 × Ref	470 mg/Kg	14,000 mg/Kg
	Zinc	720 mg/Kg	55 mg/Kg	13.1 × Ref	20,000 mg/Kg	610,000 mg/Kg
	Cyanide	0.46 mg/Kg	0.31 ND mg/Kg	1.5 × RL	1,400 mg/Kg	41,000 mg/Kg
SS-04	**PESTICIDES/PCBs**					
	4,4-DDT	12 µg/Kg	5.0 ND µg/Kg	2.4 × RL	1,800 µg/Kg	17,000 µg/Kg
	INORGANICS					
	Calcium	1,600 mg/Kg	510 mg/Kg	3.1 × Ref	NE	NE
SS-05	**SVOCs**					
	Benzoic Acid	790 µg/Kg	440 ND µg/Kg	1.8 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Fluoranthene	680 µg/Kg	440 ND µg/Kg	1.5 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Pyrene	540 µg/Kg	440 ND µg/Kg	1.2 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	PESTICIDES/PCBs					
	4,4-DDE	11 µg/Kg	5.0 ND µg/Kg	2.2 × RL	1,800 µg/Kg	17,000 µg/Kg
	4'4-DDT	12 µg/Kg	5.0 ND µg/Kg	2.4 × RL	1,800 µg/Kg	17,000 µg/Kg
	Alpha Chlordane [1]	31 µg/Kg	5.0 ND µg/Kg	6.2 × RL	490 µg/Kg	2,200 µg/Kg
	Gamma Chlordane [1]	21 µg/Kg	5.0 ND µg/Kg	4.2 × RL	490 µg/Kg	2,200 µg/Kg
	INORGANICS					
	Calcium	30,000 mg/Kg	510 mg/Kg	58.8 × Ref	NE	NE

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration			Reference Concentration			Comments	CT DEP RSR Residential DEC for Soil		CT DEP RSR Industrial/ Commercial DEC for Soil	
SS-06	**INORGANICS**											
	Calcium	2,900		mg/Kg	510		mg/Kg	5.7 × Ref	NE		NE	
SS-07	**PESTICIDES/PCBs**											
	4,4'-DDD	130	J	µg/Kg	5.0	ND	µg/Kg	26 × RL	2,600	µg/Kg	24,000	µg/Kg
	4,4'-DDE	440	J	µg/Kg	5.0	ND	µg/Kg	88 × RL	1,800	µg/Kg	17,000	µg/Kg
	4,4'-DDT	620	J	µg/Kg	5.0	ND	µg/Kg	124 × RL	1,800	µg/Kg	17,000	µg/Kg
	INORGANICS											
	Calcium	2,800		mg/Kg	510		mg/Kg	5.5 × Ref	NE		NE	
SS-08	**SVOCs**											
	1-Methylnapthalene	4,500		µg/Kg	440	ND	µg/Kg	10.2 × RL	NL		NL	
	2-Methylnapthalene	7,600		µg/Kg	440	ND	µg/Kg	17.3 × RL	474,000	µg/Kg	2.5E+06	µg/Kg
	Acenaphthene	27,000		µg/Kg	440	ND	µg/Kg	61.4 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Acenaphthylene	870		µg/Kg	440	ND	µg/Kg	2.0 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Anthracene	65,000		µg/Kg	440	ND	µg/Kg	147.7 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Benzo(a) anthracene	**79,000**		**µg/Kg**	440	ND	µg/Kg	179.5 × RL	1,000	µg/Kg	**7,800**	**µg/Kg**
	Benzo(a)pyrene	**58,000**		**µg/Kg**	440	ND	µg/Kg	131.8 × RL	1,000	µg/Kg	**1,000**	**µg/Kg**
	Benzo(b) fluoranthene	**59,000**		**µg/Kg**	440	ND	µg/Kg	134.1 × RL	1,000	µg/Kg	**7,800**	**µg/Kg**
	Benzo(g,h,i) perylene	43,000		µg/Kg	440	ND	µg/Kg	97.7 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Benzo(k) fluoranthene	58,000		µg/Kg	440	ND	µg/Kg	131.8 × RL	8,400	µg/Kg	78,000	µg/Kg
	bis(2-Ethylhexyl) phthalate	2,000		µg/Kg	440	ND	µg/Kg	4.5 × RL	44,000	µg/Kg	410,000	µg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	CT DEP RSR Residential DEC for Soil	CT DEP RSR Industrial/ Commercial DEC for Soil
SS-08 (Concluded)	**SVOCs (Concluded)**					
	Carbazole	30,000 µg/Kg	440 ND µg/Kg	68.2 × RL	31,000 µg/Kg	290,000 µg/Kg
	Chrysene	73,000 µg/Kg	440 ND µg/Kg	165.9 × RL	84,000 µg/Kg	780,000 µg/Kg
	Dibenz(a,h) anthracene [4]	**13,000 µg/Kg**	440 ND µg/Kg	29.5 × RL	1,000 µg/Kg	**1,000 µg/Kg**
	Dibenzofuran	21,000 µg/Kg	440 ND µg/Kg	47.7 × RL	270,000 µg/Kg	2.5E+06 µg/Kg
	Fluoranthene	210,000 µg/Kg	440 ND µg/Kg	477.3 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Fluorene	31,000 µg/Kg	440 ND µg/Kg	70.5 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Indeno(1,2,3-cd) pyrene	**41,000 µg/Kg**	440 ND µg/Kg	93.2 × RL	1,000 µg/Kg	**7,800 µg/Kg**
	Naphthalene	28,000 µg/Kg	440 ND µg/Kg	63.6 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Phenanthrene	200,000 µg/Kg	440 ND µg/Kg	454.5 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Pyrene	170,000 µg/Kg	440 ND µg/Kg	386.4 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	INORGANICS					
	Arsenic	5.9 mg/Kg	4.6 ND mg/Kg	1.3 × RL	10 mg/Kg	10 mg/Kg
	Cadmium	2.5 mg/Kg	2.3 ND mg/Kg	1.1 × RL	34 mg/Kg	1,000 mg/Kg
	Calcium	7,800 mg/Kg	510 mg/Kg	15.3 × Ref	NE	NE
	Copper	100 mg/Kg	27 mg/Kg	3.7 × Ref	2,500 mg/Kg	76,000 mg/Kg
	Lead	110 mg/Kg	22 mg/Kg	5 × Ref	500 mg/Kg	1,000 mg/Kg
	Zinc	400 mg/Kg	55 mg/Kg	7.3 × Ref	20,000 mg/Kg	610,000 mg/Kg
SS-09	**PESTICIDES/PCBs**					
	4,4'-DDD	28 J µg/Kg	5.0 ND µg/Kg	5.6 × RL	2,600 µg/Kg	24,000 µg/Kg
	4,4'-DDE	180 J µg/Kg	5.0 ND µg/Kg	36 × RL	1,800 µg/Kg	17,000 µg/Kg
	4,4'-DDT	100 J µg/Kg	5.0 ND µg/Kg	20 × RL	1,800 µg/Kg	17,000 µg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration			Reference Concentration			Comments	CT DEP RSR Residential DEC for Soil		CT DEP RSR Industrial/ Commercial DEC for Soil	
SS-09 (Concluded)	**INORGANICS**											
	Arsenic	4.8		mg/Kg	4.6	ND	mg/Kg	1.04 × RL	10	mg/Kg	10	mg/Kg
	Lead	71		mg/Kg	22		mg/Kg	3.2 × Ref	500	mg/Kg	1,000	mg/Kg
SS-10	**VOCs**											
	Benzene	1.1		µg/Kg	1.1	ND	µg/Kg	1.0 × RL	21,000	µg/Kg	200,000	µg/Kg
	PESTICIDES/PCBs											
	4,4'-DDD	97	J	µg/Kg	5.0	ND	µg/Kg	19.4 × RL	2,600	µg/Kg	24,000	µg/Kg
	4,4'-DDE	160	J	µg/Kg	5.0	ND	µg/Kg	32 × RL	1,800	µg/Kg	17,000	µg/Kg
	4,4'-DDT	340	J	µg/Kg	5.0	ND	µg/Kg	68 × RL	1,800	µg/Kg	17,000	µg/Kg
	INORGANICS											
	Calcium	2,600		mg/Kg	510		mg/Kg	5.1 × Ref	NE		NE	
SS-13	**SVOCs**											
	Benzoic Acid	720		µg/Kg	440	ND	µg/Kg	1.6 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Fluoranthene	540		µg/Kg	440	ND	µg/Kg	1.2 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Pyrene	500		µg/Kg	440	ND	µg/Kg	1.1 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	PESTICIDES/PCBs											
	4,4'-DDD	8.4	J	µg/Kg	5.0	ND	µg/Kg	1.7 × RL	2,600	µg/Kg	24,000	µg/Kg
	4,4'-DDE	15	J	µg/Kg	5.0	ND	µg/Kg	3.0 × RL	1,800	µg/Kg	17,000	µg/Kg
	4,4'-DDT	26	J	µg/Kg	5.0	ND	µg/Kg	5.2 × RL	1,800	µg/Kg	17,000	µg/Kg
	Alpha Chlordane [1]	7.4		µg/Kg	5.0	ND	µg/Kg	1.5 × RL	490	µg/Kg	2,200	µg/Kg
	Aroclor-1254 [2]	120		µg/Kg	100	ND	µg/Kg	1.2 × RL	1,000	µg/Kg	10,000	µg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	CT DEP RSR Residential DEC for Soil	CT DEP RSR Industrial/ Commercial DEC for Soil
SS-13 (Concluded)	**INORGANICS**					
	Calcium	6,900 mg/Kg	510 mg/Kg	13.5 × Ref	NE	NE
	Lead	100 mg/Kg	22 mg/Kg	4.5 × Ref	500 mg/Kg	1,000 mg/Kg
	Cyanide	0.33 mg/Kg	0.31 ND mg/Kg	1.1 × RL	1,400 mg/Kg	41,000 mg/Kg
SS-14	**VOCs**					
	1,4-Dichlorobenzene	9.6 µg/Kg	1.1 ND µg/Kg	8.7 × RL	26,000 µg/Kg	240,000 µg/Kg
	Tetrahydrofuran [5]	3.0 µg/Kg	1.1 ND µg/Kg	2.7 × RL	81,000 µg/Kg	NE
	Toluene	2.2 µg/Kg	1.1 ND µg/Kg	2.0 × RL	500,000 µg/Kg	1E+06 µg/Kg
	SVOCs					
	Benzoic Acid	1,200 µg/Kg	440 ND µg/Kg	2.7 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	PESTICIDES/PCBs					
	4,4'-DDD	37 J,P µg/Kg	5.0 ND µg/Kg	7.4 × RL	2,600 µg/Kg	24,000 µg/Kg
	4,4'-DDE	30 J µg/Kg	5.0 ND µg/Kg	6.0 × RL	1,800 µg/Kg	17,000 µg/Kg
	4,4'-DDT	17 J µg/Kg	5.0 ND µg/Kg	3.4 × RL	1,800 µg/Kg	17,000 µg/Kg
	Alpha Chlordane [1]	45 µg/Kg	5.0 ND µg/Kg	9.0 × RL	490 µg/Kg	2,200 µg/Kg
	Gamma Chlordane [1]	16 P µg/Kg	5.0 ND µg/Kg	3.2 × RL	490 µg/Kg	2,200 µg/Kg
	Aroclor-1248 [2]	**1,700 µg/Kg**	100 ND µg/Kg	17.0 × RL	**1,000 µg/Kg**	10,000 µg/Kg
	INORGANICS					
	Arsenic	7.7 mg/Kg	4.6 ND mg/Kg	1.7 × RL	10 mg/Kg	10 mg/Kg
	Calcium	31,000 mg/Kg	510 mg/Kg	60.8 × Ref	NE	NE
	Copper	130 mg/Kg	27 mg/Kg	4.8 × Ref	2,500 mg/Kg	76,000 mg/Kg
	Lead	130 mg/Kg	22 mg/Kg	5.9 × Ref	500 mg/Kg	1,000 mg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration			Reference Concentration			Comments	CT DEP RSR Residential DEC for Soil		CT DEP RSR Industrial/ Commercial DEC for Soil	
SS-14 (Concluded)	**INORGANICS (Concluded)**											
	Mercury	0.42		mg/Kg	0.049		mg/Kg	8.6 × Ref	20	mg/Kg	610	mg/Kg
	Zinc	410		mg/Kg	55		mg/Kg	7.5 × Ref	20,000	mg/Kg	610,000	mg/Kg
	Cyanide	1.2		mg/Kg	0.31	ND	mg/Kg	3.9 × RL	1,400	mg/Kg	41,000	mg/Kg
SS-15	**SVOCs**											
	Benzoic Acid	980		µg/Kg	440	ND	µg/Kg	2.2 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	PESTICIDES/PCBs											
	4,4'-DDE	13	J	µg/Kg	5.0	ND	µg/Kg	2.6 × RL	1,800	µg/Kg	17,000	µg/Kg
	4,4'-DDT	11	J	µg/Kg	5.0	ND	µg/Kg	2.2 × RL	1,800	µg/Kg	17,000	µg/Kg
	Alpha Chlordane [1]	13		µg/Kg	5.0	ND	µg/Kg	2.6 × RL	490	µg/Kg	2,200	µg/Kg
	Gamma Chlordane [1]	6		µg/Kg	5.0	ND	µg/Kg	1.2 × RL	490	µg/Kg	2,200	µg/Kg
	Aroclor-1254 [2]	280		µg/Kg	100	ND	µg/Kg	2.8 × RL	1,000	µg/Kg	10,000	µg/Kg
	INORGANICS											
	Calcium	2,100		mg/Kg	510		mg/Kg	4.1 × Ref	NE		NE	
	Cyanide	0.41		mg/Kg	0.31	ND	mg/Kg	1.3 × RL	1,400	mg/Kg	41,000	mg/Kg
SS-16	**VOCs**											
	1,4-Dichlorobenzene	2.0		µg/Kg	1.1	ND	µg/Kg	1.8 × RL	26,000	µg/Kg	240,000	µg/Kg
	Benzene	1.9		µg/Kg	1.1	ND	µg/Kg	1.7 × RL	21,000	µg/Kg	200,000	µg/Kg
	Tetrachloroethylene	1.8		µg/Kg	1.1	ND	µg/Kg	1.6 × RL	12,000	µg/Kg	110,000	µg/Kg
	Tetrahydrofuran [5]	1.1		µg/Kg	1.1	ND	µg/Kg	1.0 × RL	81,000	µg/Kg	NE	
	Toluene	8.0		µg/Kg	1.1	ND	µg/Kg	7.3 × RL	500,000	µg/Kg	1E+06	µg/Kg
	Trichloroethylene	1.3		µg/Kg	1.1	ND	µg/Kg	1.2 × RL	56,000	µg/Kg	520,000	µg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	CT DEP RSR Residential DEC for Soil	CT DEP RSR Industrial/ Commercial DEC for Soil
SS-16 (Continued)	**SVOCs**					
	Benzo(a) anthracene	650 µg/Kg	440 ND µg/Kg	1.5 × RL	1,000 µg/Kg	7,800 µg/Kg
	Benzo(a)pyrene	730 µg/Kg	440 ND µg/Kg	1.7 × RL	1,000 µg/Kg	1,000 µg/Kg
	Benzo(b) fluoranthene	650 µg/Kg	440 ND µg/Kg	1.5 × RL	1,000 µg/Kg	7,800 µg/Kg
	Benzo(g,h,i) perylene	590 µg/Kg	440 ND µg/Kg	1.3 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Benzo(k) fluoranthene	620 µg/Kg	440 ND µg/Kg	1.4 × RL	8,400 µg/Kg	78,000 µg/Kg
	Benzoic Acid	940 µg/Kg	440 ND µg/Kg	2.1 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	bis(2-Ethylhexyl) phthalate	6,700 µg/Kg	440 ND µg/Kg	15.2 × RL	44,000 µg/Kg	410,000 µg/Kg
	Chrysene	600 µg/Kg	440 ND µg/Kg	1.4 × RL	84,000 µg/Kg	780,000 µg/Kg
	Fluoranthene	1,300 µg/Kg	440 ND µg/Kg	3.0 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Indeno(1,2,3-cd) pyrene	490 µg/Kg	440 ND µg/Kg	1.1 × RL	1,000 µg/Kg	7,800 µg/Kg
	Phenanthrene	600 µg/Kg	440 ND µg/Kg	1.4 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Pyrene	1,100 µg/Kg	440 ND µg/Kg	2.5 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	PESTICIDES/PCBs					
	4,4'-DDE	47 J µg/Kg	5.0 ND µg/Kg	9.4 × RL	1,800 µg/Kg	17,000 µg/Kg
	4,4'-DDT	19 J µg/Kg	5.0 ND µg/Kg	3.8 × RL	1,800 µg/Kg	17,000 µg/Kg
	Alpha Chlordane [1]	81 µg/Kg	5.0 ND µg/Kg	16.2 × RL	490 µg/Kg	2,200 µg/Kg
	Gamma Chlordane [1]	43 µg/Kg	5.0 ND µg/Kg	8.6× RL	490 µg/Kg	2,200 µg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration			Reference Concentration			Comments	CT DEP RSR Residential DEC for Soil		CT DEP RSR Industrial/ Commercial DEC for Soil	
SS-16 (Concluded)	**PESTICIDES/PCBs (Concluded)**											
	Aroclor-1254 [2]	**1,700**		**µg/Kg**	100	ND	µg/Kg	17.0 × RL	**1,000**	**µg/Kg**	10,000	µg/Kg
	Aroclor-1260 [2]	710		µg/Kg	100	ND	µg/Kg	7.1 × RL	1,000	µg/Kg	10,000	µg/Kg
	INORGANICS											
	Arsenic	6.1		mg/Kg	4.6	ND	mg/Kg	1.3 × RL	10	mg/Kg	10	mg/Kg
	Cadmium	2.6		mg/Kg	2.3	ND	mg/Kg	1.1 × RL	34	mg/Kg	1,000	mg/Kg
	Calcium	5,700		mg/Kg	510		mg/Kg	11.2 × Ref	NE		NE	
	Copper	180		mg/Kg	27		mg/Kg	6.7 × Ref	2,500	mg/Kg	76,000	mg/Kg
	Lead	270	J1	mg/Kg	22		mg/Kg	12.3 × Ref	500	mg/Kg	1,000	mg/Kg
	Mercury	0.46		mg/Kg	0.049		mg/Kg	9.4 × Ref	20	mg/Kg	610	mg/Kg
	Zinc	570		mg/Kg	55		mg/Kg	10.4 × Ref	20,000	mg/Kg	610,000	mg/Kg
	Cyanide	0.32		mg/Kg	0.31	ND	mg/Kg	1.0 × RL	1,400	mg/Kg	41,000	mg/Kg
SS-17	**VOCs**											
	Toluene	1.5		µg/Kg	1.1	ND	µg/Kg	1.4 × RL	500,000	µg/Kg	1E+06	µg/Kg
	SVOCs											
	Benzoic Acid	1,000		µg/Kg	440	ND	µg/Kg	2.3 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Fluoranthene	560		µg/Kg	440	ND	µg/Kg	1.3 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Pyrene	520		µg/Kg	440	ND	µg/Kg	1.2 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	PESTICIDES/PCBs											
	4,4'-DDE	27	J	µg/Kg	5.0	ND	µg/Kg	5.4 × RL	1,800	µg/Kg	17,000	µg/Kg
	4,4'-DDT	37	J	µg/Kg	5.0	ND	µg/Kg	7.4 × RL	1,800	µg/Kg	17,000	µg/Kg
	Alpha Chlordane [1]	19		µg/Kg	5.0	ND	µg/Kg	3.8 × RL	490	µg/Kg	2,200	µg/Kg
	Gamma Chlordane [1]	11		µg/Kg	5.0	ND	µg/Kg	2.2× RL	490	µg/Kg	2,200	µg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	CT DEP RSR Residential DEC for Soil	CT DEP RSR Industrial/ Commercial DEC for Soil
SS-17 (Concluded)	**PESTICIDES/PCBs (Concluded)**					
	Aroclor-1254 [2]	450 µg/Kg	100 ND µg/Kg	4.5 × RL	1,000 µg/Kg	10,000 µg/Kg
	Aroclor-1260 [2]	420 µg/Kg	100 ND µg/Kg	4.2 × RL	1,000 µg/Kg	10,000 µg/Kg
	INORGANICS					
	Calcium	3,400 mg/Kg	510 mg/Kg	6.7 × Ref	NE	NE
	Copper	140 mg/Kg	27 mg/Kg	5.2 × Ref	2,500 mg/Kg	76,000 mg/Kg
	Lead	150 mg/Kg	22 mg/Kg	6.8 × Ref	500 mg/Kg	1,000 mg/Kg
	Mercury	0.45 mg/Kg	0.049 mg/Kg	9.2 × Ref	20 mg/Kg	610 mg/Kg
	Zinc	300 mg/Kg	55 mg/Kg	5.5 × Ref	20,000 mg/Kg	610,000 mg/Kg
	Cyanide	0.70 mg/Kg	0.31 ND mg/Kg	2.3 × RL	1,400 mg/Kg	41,000 mg/Kg
SS-18	**VOCs**					
	Toluene	2.2 µg/Kg	1.1 ND µg/Kg	2.0 × RL	500,000 µg/Kg	1E+06 µg/Kg
	SVOCs					
	Acenaphthylene	1,100 µg/Kg	440 ND µg/Kg	2.5 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Anthracene	1,200 µg/Kg	440 ND µg/Kg	2.7 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Benzo(a) anthracene	**4,300 µg/Kg**	440 ND µg/Kg	9.8 × RL	**1,000 µg/Kg**	7,800 µg/Kg
	Benzo(a)pyrene	**3,300 µg/Kg**	440 ND µg/Kg	7.5 × RL	**1,000 µg/Kg**	1,000 µg/Kg
	Benzo(b) fluoranthene	**3,900 µg/Kg**	440 ND µg/Kg	8.9 × RL	**1,000 µg/Kg**	7,800 µg/Kg
	Benzo(g,h,i) perylene	3,700 µg/Kg	440 ND µg/Kg	8.4 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Benzo(k) fluoranthene	3,600 µg/Kg	440 ND µg/Kg	8.2 × RL	8,400 µg/Kg	78,000 µg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration		Reference Concentration			Comments	CT DEP RSR Residential DEC for Soil [a]		CT DEP RSR Industrial/ Commercial DEC for Soil	
SS-18 (Concluded)	**SVOCs (Concluded)**										
	Benzoic Acid	750	µg/Kg	440	ND	µg/Kg	1.7 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Chrysene	4,400	µg/Kg	440	ND	µg/Kg	10.0 × RL	84,000	µg/Kg	780,000	µg/Kg
	Dibenz(a,h) anthracene [4]	**1,100**	**µg/Kg**	440	ND	µg/Kg	2.5 × RL	**1,000**	**µg/Kg**	1,000	µg/Kg
	Diethylphthalate	840	µg/Kg	440	ND	µg/Kg	1.9 × RL	1E+06	µg/Kg	1E+06	µg/Kg
	Fluoranthene	6,500	µg/Kg	440	ND	µg/Kg	14.8 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Indeno(1,2,3-cd) pyrene	**3,100**	**µg/Kg**	440	ND	µg/Kg	7.0 × RL	**1,000**	**µg/Kg**	7,800	µg/Kg
	Phenanthrene	3,100	µg/Kg	440	ND	µg/Kg	7.0 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Pyrene	6,300	µg/Kg	440	ND	µg/Kg	14.3 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	PESTICIDES/PCBs										
	Technical Chlordane [1]	**15,000**	**µg/Kg**	100	ND	µg/Kg	150 × RL	**490**	**µg/Kg**	2,200	µg/Kg
	INORGANICS										
	Calcium	2,700	mg/Kg	510		mg/Kg	5.3 × Ref	NE		NE	
	Copper	92	mg/Kg	27		mg/Kg	3.4 × Ref	2,500	mg/Kg	76,000	mg/Kg
	Lead	180	mg/Kg	22		mg/Kg	8.2 × Ref	500	mg/Kg	1,000	mg/Kg
	Zinc	620	mg/Kg	55		mg/Kg	11.3 × Ref	20,000	mg/Kg	610,000	mg/Kg
SS-19	**VOCs**										
	4-Methyl-2-Pentanone (MIBK)	1.2	µg/Kg	1.1	ND	µg/Kg	1.1 × RL	500,000	µg/Kg	1E+06	µg/Kg
	Carbon Disulfide	2.3	µg/Kg	1.1	ND	µg/Kg	2.1 × RL	500,000	µg/Kg	1E+06	µg/Kg
	Trichloroethylene	2.4	µg/Kg	1.1	ND	µg/Kg	2.2 × RL	56,000	µg/Kg	520,000	µg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	CT DEP RSR Residential DEC for Soil [a]	CT DEP RSR Industrial/ Commercial DEC for Soil
SS-19 (Continued)	**SVOCs**					
	Anthracene	570 µg/Kg	440 ND µg/Kg	1.3 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Benzo(a) anthracene	**1,500 µg/Kg**	440 ND µg/Kg	3.4 × RL	**1,000 µg/Kg**	7,800 µg/Kg
	Benzo(a)pyrene	**1,200 µg/Kg**	440 ND µg/Kg	2.7 × RL	**1,000 µg/Kg**	1,000 µg/Kg
	Benzo(b) fluoranthene	**1,100 µg/Kg**	440 ND µg/Kg	2.5 × RL	**1,000 µg/Kg**	7,800 µg/Kg
	Benzo(g,h,i) perylene	600 µg/Kg	440 ND µg/Kg	1.4 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Benzo(k) fluoranthene	1,100 µg/Kg	440 ND µg/Kg	2.5 × RL	8,400 µg/Kg	78,000 µg/Kg
	Benzoic Acid	850 µg/Kg	440 ND µg/Kg	1.9 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Chrysene	1,400 µg/Kg	440 ND µg/Kg	3.2 × RL	84,000 µg/Kg	780,000 µg/Kg
	Diethylphthalate	930 µg/Kg	440 ND µg/Kg	2.1 × RL	1E+06 µg/Kg	1E+06 µg/Kg
	Fluoranthene	3,100 µg/Kg	440 ND µg/Kg	7.0 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Indeno(1,2,3-cd) pyrene	620 µg/Kg	440 ND µg/Kg	1.4 × RL	1,000 µg/Kg	7,800 µg/Kg
	Phenanthrene	1,800 µg/Kg	440 ND µg/Kg	4.1 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Pyrene	2,300 µg/Kg	440 ND µg/Kg	5.2 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	PESTICIDES/PCBs					
	4,4'-DDD	61 J,P µg/Kg	5.0 ND µg/Kg	12.2 × RL	2,600 µg/Kg	24,000 µg/Kg
	4,4'-DDE	57 J µg/Kg	5.0 ND µg/Kg	11.4 × RL	1,800 µg/Kg	17,000 µg/Kg
	4,4'-DDT	35 J µg/Kg	5.0 ND µg/Kg	7.0 × RL	1,800 µg/Kg	17,000 µg/Kg
	Alpha Chlordane [1]	110 µg/Kg	5.0 ND µg/Kg	22.0 × RL	490 µg/Kg	2,200 µg/Kg
	Gamma Chlordane [1]	68 µg/Kg	5.0 ND µg/Kg	13.6× RL	490 µg/Kg	2,200 µg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration		Reference Concentration			Comments	CT DEP RSR Residential DEC for Soil [a]		CT DEP RSR Industrial/ Commercial DEC for Soil	
SS-19 (Concluded)	**PESTICIDES/PCBs (Concluded)**										
	Aroclor-1254 [2]	**1,600**	**µg/Kg**	100	ND	µg/Kg	16.0 × RL	**1,000**	**µg/Kg**	10,000	µg/Kg
	Aroclor-1260 [2]	780	µg/Kg	100	ND	µg/Kg	7.8 × RL	1,000	µg/Kg	10,000	µg/Kg
	INORGANICS										
	Arsenic	7.9	mg/Kg	4.6	ND	mg/Kg	1.7 × RL	10	mg/Kg	10	mg/Kg
	Cadmium	4.8	mg/Kg	2.3	ND	mg/Kg	2.1 × RL	34	mg/Kg	1,000	mg/Kg
	Calcium	3,500	mg/Kg	510		mg/Kg	6.9 × Ref	NE		NE	
	Copper	150	mg/Kg	27		mg/Kg	5.6 × Ref	2,500	mg/Kg	76,000	mg/Kg
	Lead	210	mg/Kg	22		mg/Kg	9.5 × Ref	500	mg/Kg	1,000	mg/Kg
	Mercury	0.70	mg/Kg	0.049		mg/Kg	14.3 × Ref	20	mg/Kg	610	mg/Kg
	Zinc	2,400	mg/Kg	55		mg/Kg	43.6 × Ref	20,000	mg/Kg	610,000	mg/Kg
SS-20	**VOCs**										
	Benzene	9.3	µg/Kg	1.1	ND	µg/Kg	8.5 × RL	21,000	µg/Kg	200,000	µg/Kg
	Carbon Disulfide	3.2	µg/Kg	1.1	ND	µg/Kg	2.9 × RL	500,000	µg/Kg	1E+06	µg/Kg
	Toluene	3.7	µg/Kg	1.1	ND	µg/Kg	3.4 × RL	500,000	µg/Kg	1E+06	µg/Kg
	Trichloroethylene	1.1	µg/Kg	1.1	ND	µg/Kg	1.0 × RL	56,000	µg/Kg	520,000	µg/Kg
	SVOCs										
	Anthracene	1,700	µg/Kg	440	ND	µg/Kg	3.9 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg
	Benzo(a) anthracene	4,700	µg/Kg	440	ND	µg/Kg	10.7 × RL	1,000	µg/Kg	7,800	µg/Kg
	Benzo(a) pyrene	**5,000**	**µg/Kg**	440	ND	µg/Kg	11.4 × RL	1,000	µg/Kg	**1,000**	**µg/Kg**
	Benzo(b)fluoranthene	3,800	µg/Kg	440	ND	µg/Kg	8.6 × RL	1,000	µg/Kg	7,800	µg/Kg
	Benzo(g,h,i)perylene	3,300	µg/Kg	440	ND	µg/Kg	7.5 × RL	1E+06	µg/Kg	2.5E+06	µg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	CT DEP RSR Residential DEC for Soil [a]	CT DEP RSR Industrial/ Commercial DEC for Soil
SS-20 (Continued)	**SVOCs (Concluded)**					
	Benzo(k)fluoranthene	3,500 µg/Kg	440 ND µg/Kg	8.0 × RL	8,400 µg/Kg	78,000 µg/Kg
	Benzoic Acid	1,300 J µg/Kg	440 ND µg/Kg	3.0 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Carbazole	560 µg/Kg	440 ND µg/Kg	1.3 × RL	31,000 µg/Kg	290,000 µg/Kg
	Chrysene	4,700 µg/Kg	440 ND µg/Kg	10.7 × RL	84,000 µg/Kg	780,000 µg/Kg
	Dibenz(a,h) anthracene [4]	**1,100 µg/Kg**	440 ND µg/Kg	2.5 × RL	1,000 µg/Kg	**1,000 µg/Kg**
	Fluoranthene	10,000 µg/Kg	440 ND µg/Kg	22.7 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Fluorene	490 µg/Kg	440 ND µg/Kg	1.1 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Phenanthrene	5,900 µg/Kg	440 ND µg/Kg	13.4 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	Pyrene	8,900 µg/Kg	440 ND µg/Kg	20.2 × RL	1E+06 µg/Kg	2.5E+06 µg/Kg
	PESTICIDES/PCBs					
	4,4'-DDD	22 J µg/Kg	5.0 ND µg/Kg	4.4 × RL	2,600 µg/Kg	24,000 µg/Kg
	4,4'-DDE	29 J µg/Kg	5.0 ND µg/Kg	5.8 × RL	1,800 µg/Kg	17,000 µg/Kg
	4,4'-DDT	63 J µg/Kg	5.0 ND µg/Kg	12.6 × RL	1,800 µg/Kg	17,000 µg/Kg
	Alpha Chlordane [1]	49 µg/Kg	5.0 ND µg/Kg	9.8 × RL	490 µg/Kg	2,200 µg/Kg
	Gamma Chlordane [1]	21 P µg/Kg	5.0 ND µg/Kg	4.2× RL	490 µg/Kg	2,200 µg/Kg
	Aroclor-1254 [2]	770 µg/Kg	100 ND µg/Kg	7.7 × RL	1,000 µg/Kg	10,000 µg/Kg
	INORGANICS					
	Cadmium	2.4 mg/Kg	2.3 ND mg/Kg	1.0 × RL	34 mg/Kg	1,000 mg/Kg
	Calcium	14,000 mg/Kg	510 mg/Kg	27.5 × Ref	NE	NE
	Copper	170 mg/Kg	27 mg/Kg	6.3 × Ref	2,500 mg/Kg	76,000 mg/Kg
	Lead	320 mg/Kg	22 mg/Kg	14.5 × Ref	500 mg/Kg	1,000 mg/Kg
	Mercury	0.42 mg/Kg	0.049 mg/Kg	8.6 × Ref	20 mg/Kg	610 mg/Kg

Table 4

Summary of Analytical Results
Surface Soil/Source Sample Analysis for Scofieldtown Road Park (Concluded)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	CT DEP RSR Residential DEC for Soil	CT DEP RSR Industrial/ Commercial DEC for Soil
SS-20 (Concluded)	**INORGANICS (Concluded)**					
	Zinc	350 mg/Kg	55 mg/Kg	6.4 × Ref	20,000 mg/Kg	610,000 mg/Kg

Notes: START has reported the data as it was received from the EPA OEME Laboratory. START has not performed data validation of the EPA OEME Laboratory data. An internal data review was performed by EPA OEME Laboratory personnel prior to submittal to the EPA COR. EPA OEME Laboratory Data Qualifiers, defined by the EPA OEME Laboratory in the Project's Laboratory Reports, are listed below.

Bolded values indicate the organic compound or inorganic element was detected at a concentration equal to or greater than the sample's respective CT DEP RSR Residential or Industrial/Commercial DEC for soil. Based on sample location characteristics, each sample was compared to the respective Residential or Industrial/Commercial DEC.

[1] Indicates the CT DEP RSR for Residential and Industrial/Commercial DEC for soils for chlordane is listed, as a standard for alpha chlordane, gamma chlordane, and technical chlordane do not exist.

[2] Indicates the CT DEP RSR for Residential and Industrial/Commercial DEC for soils for polychlorinated biphenyls is listed, as standards for specific aroclors do not exist.

[3] Indicates the CT DEP RSR for Residential and Industrial/Commercial DEC for soils for trivalent chromium is listed, as a standard for total chromium does not exist.

[4] Indicates the CT DEP RSR for Residential and Industrial/Commercial DEC for soils for dibenz(a,h)anthracene is based on detection limits.

[5] Indicates that a statewide criteria for tetrahydrofuran has not been established, but site specific criteria are available. The most conservative site specific value is listed.

NA	=	Not Applicable.	RL	=	Reporting Limit.
Ref	=	Reference value.	PCBs	=	Polychlorinated Biphenyls.
VOCs	=	Volatile Organic Compounds.	SVOCs	=	Semivolatile Organic Compounds.
mg/Kg	=	Milligrams per kilogram. [equivalent to parts per million (ppm)].	NL	=	Not Listed.
µg/Kg	=	Micrograms per kilogram. [equivalent to parts per billion (ppb)].	RSR	=	Remediation Standard Regulation.
CT DEP	=	Connecticut Department of Environmental Protection.	DEC	=	Direct Exposure Criteria.
J	=	Estimated value.	NE	=	Criteria has not been established by CT DEP.
ND	=	Indicates the sample was analyzed but not detected and reports the detection value. The associated value is the RL.			
J1	=	Estimated value due to matrix spike recovery outside acceptance criteria.			
J3	=	Estimated value due to relative percent difference result outside acceptance criteria.			
P	=	The confirmation value exceeded 35 percent (%) difference and is less than 100%. The lower value is reported.			
E	=	Estimated value exceeds the calibration range of the instrument.			

[100-114; 145; 156]

New Canaan System (PWS ID No. CT0900014), located approximately 3.71 miles northeast of the Scofieldtown Road Park property, is comprised of one well serving approximately 190 people [95; 149]. In addition, there are three community wells managed by Aquarion which are located within 4 radial miles of the Scofieldtown Road Park property. Occasionally, during heightened demand, water is drawn from the Mayo, Lloyd, and Country Day Wells, which are located 2.8 miles northeast, 2.9 miles east-southeast, and 2.0 miles east-southeast, respectively [76]. Since the Mayo, Lloyd, and Country Day Wells are not typically used to supply drinking water, START will not use these wells to estimate the population served by groundwater sources within 4 radial miles of the Scofieldtown Road Park property.

Residents of the Town of Darien are supplied drinking water through private wells and public supply sources managed by Aquarion. However, there are no public drinking water supply wells located in the Town of Darien that are within 4 radial miles of the Scofieldtown Road Park property [76; 95].

Residents of the Town of Greenwich are supplied drinking water through private wells and public supply sources managed by Aquarion. There is one non-transient, non-community well field located in Greenwich within 4 radial miles of the Scofieldtown Road Park property. The North Street Shopping Center System (PWS ID No. CT0570262), located approximately 3.90 miles west-southwest of the Scofieldtown Road Park property, is comprised of six wells serving approximately 150 people [95; 149].

The entire town of Pound Ridge, NY is supplied drinking water from private wells. There are no community or non-community wells located in Pound Ridge that are located within 4 radial miles of the Scofieldtown Road Park property [91]. Table 5 summarizes the populations which rely on public groundwater supply sources within 4 radial miles of the Scofieldtown Road Park property.

Table 5

Public Groundwater Supply Sources
Within 4 Radial Miles of Scofieldtown Road Park

Distance/ Direction from Site	Source Name	PWS ID No./Type	Location of Source[a]	Estimated Population Served	Well Type Bedrock/ Overburden
0.71 miles south	Church of the Holy Spirit System (1 well)	CT1355043/NTNC	Stamford	350	Unknown
0.80 miles southeast	Trinity Emmanuel Episcopal Church System (1 well)	CT1355013/NTNC	Stamford	55	Unknown
1.18 miles south-southeast	The Children's School System (1 well)	CT1355033/NTNC	Stamford	80	Unknown
2.20 miles southeast	Wire Mill Well (Part of Aquarion System)	NA	Stamford	1,030	Overburden
2.22 miles east	Long Ridge School System (1 well)	CT1350212/NTNC	Stamford	140	Unknown
2.25 miles northwest	Caanan Ridge School System (1 well)	CT1350182/NTNC	Stamford	70	Unknown
2.42 miles northwest	Rock Rimmon Country Club System (1 well)	CT1350042/NTNC	Stamford	60	Unknown

Table 5

Public Groundwater Supply Sources Within 4 Radial Miles of Scofieldtown Road Park (Concluded)

Distance/ Direction from Site	Source Name	PWS ID No./Type	Location of Source[a]	Estimated Population Served	Well Type Bedrock/ Overburden
3.71 miles northeast	Country Club of New Caanan System (1 well)	CT0900014/NTNC	New Canaan	190	Unknown
3.90 miles west-southwest	North Street Shopping Center System (6 wells)	CT0570262/NTNC	Greenwich	150	Unknown

[a] Indicates Town in which well is located.
[b] Overburden, Bedrock, or Unknown.
NA = Not Available.
NTNC = Non-transient, non-community water system.
No. = Number.
PWS ID No. = Public Water System Identification Number.

[76; 84; 95]

Private groundwater supplies located within 4 radial miles of the Scofieldtown Road Park property were estimated using equal distribution calculations of U.S. Census CENTRACTS data identifying population, households, and private water wells for "Block Groups" which lie within or partially within individual radial distance rings measured from the property. An estimated 19,739 people are served by private groundwater drinking water supply wells within 4 radial miles of the Scofieldtown Road Park property. The location of the nearest private drinking water supply well is estimated to be within 500 feet of the Scofieldtown Road Park property, located at 27 Hannahs Road [77; 100, pp. 15-31; 154]. The estimated population which relies on groundwater drinking water sources within 4 radial miles of the property is 21,864 people. Table 6 summarizes the populations which rely on groundwater supply sources within 4 radial miles of the Scofieldtown Road Park property.

Table 6

Estimated Drinking Water Populations Served by Groundwater Sources Within 4 Radial Miles of Scofieldtown Road Park

Radial Distance from Scofieldtown Road Park (miles)	Estimated Population Served by Private Wells	Estimated Population Served by Public Wells	Total Estimated Population Served by Groundwater Sources Within the Ring
≥ 0.00 to 0.25	168	0	168
≥ 0.25 to 0.50	525	0	525
≥ 0.50 to 1.00	1,821	405	2,226
≥ 1.00 to 2.00	6,353	80	6,433
≥ 2.00 to 3.00	6,279	1,300	7,579
≥ 3.00 to 4.00	4,593	340	4,933
TOTAL	19,739	2,125	21,864

[76; 77; 84; 95]

presence of two pesticides at concentrations exceeding state drinking water action levels (concentrations in parentheses): dieldrin (0.247 µg/L) and chlordane (0.322 µg/L) [56]. Dieldrin and chlordane have been detected in soil/source samples collected as part of the CDM Federal SIP and START SR [54; 100; 107-108]. Therefore, START considers the presence of dieldrin and chlordane in drinking water samples collected by CT DEP to be at least partially attributable to source areas located on the Scofieldtown Road Park property.

On 24 through 26 March 2008, as part of the SR, START personnel collected 16 residential drinking water samples (DW-01 through DW-08, DW-10 through DW-11, and DW-13 through DW-18), including one duplicate, from 13 private drinking water supply wells in the vicinity of the Scofieldtown Road Park property. The drinking water samples were collected to determine if the private drinking water supply wells had been impacted by contaminants associated with the Scofieldtown Road Park property. Drinking water samples DW-01 and DW-18 were collected from 813 and 829 Scofieldtown Road, respectively, to document background private drinking water supply well conditions. Drinking water samples DW-02 through DW-08, DW-10, DW-11, and DW-17 were collected from residential bedrock supply wells located along Hannahs Road, east of the Scofieldtown Road Park property. Drinking water samples DW-03 and DW-05 were collected after water filtration treatment devices at 27 and 29 Hannahs Road, respectively. The remaining samples along Hannahs Road were collected prior to treatment. Drinking water samples DW-13 and DW-14 were collected from the two bedrock drinking water supply wells located at the Bartlett Arboretum (151 Brookdale Road) southeast of the Scofieldtown Road Park property. Drinking water samples DW-15 and DW-16 were collected from residential bedrock supply wells located along Brookdale Road, southeast of the Scofieldtown Road Park property [100, pp. 15-31].

Drinking water samples DW-01 through DW-08, DW-10 through DW-11, and DW-13 through DW-18 were submitted to EPA OEME Laboratory for VOC, SVOC, pesticide, PCB, Target Analyte List (TAL) metals, and cyanide analyses [100, pp. 15-31; 154]. Samples DW-09 and DW-12 were not collected due to access issues/resident availability. Table 7 summarizes the drinking water samples collected by START on 24 through 26 March 2008.

Table 7

Drinking Water Sample Summary: Scofieldtown Road Park
Samples Collected by START on 24 through 26 March 2008

Sample Location No.	Traffic Report No.	Date/ Time (hrs)	Remarks	Sample Source
MATRIX: Drinking Water				
DW-01	D21830	3/24/08 1445	Grab	Drinking water sample collected from a spigot on the holding tank (pre-filtration) located at 813 Scofieldtown Road, depicted on City of Stamford Tax Assessor's Map No. 35, as Block No. 389, Lot B, to establish reference drinking water conditions. The water quality readings at the time of sampling were as follows: Conductivity = 151.4 µS/cm; Temperature = 11.8°C; Turbidity = 10.5 NTU; pH (meter) = 6.30; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 34.77″ North Latitude 73° 33′ 20.13″ West Longitude

Table 7

Drinking Water Sample Summary: Scofieldtown Road Park
Samples Collected by START on 24 through 26 March 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hrs)	Remarks	Sample Source
MATRIX: Drinking Water (Continued)				
DW-02	D21831	3/25/08 0850	Grab	Drinking water sample collected from the basement spigot (pre-filtration) located 27 Hannahs Road, depicted City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 56, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 405.1 µS/cm; Temperature = 11.9°C; Turbidity = 0.09 NTU; pH (meter) = 6.44; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 24.23″ North Latitude 73° 33′ 20.79″ West Longitude
DW-03	D21832	3/25/08 0927	Grab	Drinking water sample collected from the basement sink spigot (post-filtration) located at 27 Hannahs Road, depicted City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 56, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 404.2 µS/cm; Temperature = 12.1°C; Turbidity = NR; pH (meter) = 6.63; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 24.23″ North Latitude 73° 33′ 20.79″ West Longitude
DW-04 (MS/MSD)	D21833	3/24/08 1615	Grab	Drinking water sample collected from the basement spigot (pre-filtration but after the water softener and neutralizer) located at 29 Hannahs Road, depicted on City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 55, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 410.8 µS/cm; Temperature = 11.4°C; Turbidity = NR; pH (meter) = 5.91; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 21.86″ North Latitude 73° 33′ 17.48″ West Longitude

Table 7

Drinking Water Sample Summary: Scofieldtown Road Park
Samples Collected by START on 24 through 26 March 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hrs)	Remarks	Sample Source
MATRIX: Drinking Water (Continued)				
DW-05	D21834	3/24/08 1544	Grab	Drinking water sample collected from the basement spigot (post-filtration) located at 29 Hannahs Road, depicted on City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 55, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 440.5 µS/cm; Temperature = 12.3°C; Turbidity = NR; pH (meter) = 6.23; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 21.86″ North Latitude 73° 33′ 17.48″ West Longitude
DW-06	D21835	3/25/08 1047	Grab	Drinking water sample collected from the outside spigot (pre-filtration) located at 24 Hannahs Road, depicted on City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 10B, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 344.5 µS/cm; Temperature = 11.5°C; Turbidity = 0.06 NTU; pH (meter) = 6.79; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 25.01″ North Latitude 73° 33′ 17.68″ West Longitude
DW-07	D21836	3/25/08 1411	Grab	Drinking water sample collected from the outside spigot (pre-filtration) located at 89 Hannahs Road, depicted on City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 52, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 312.9 µS/cm; Temperature = 11.8°C; Turbidity = 0.72 NTU; pH (meter) = 6.37; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 17.15″ North Latitude 73° 33′ 14.88″ West Longitude

Table 7

Drinking Water Sample Summary: Scofieldtown Road Park
Samples Collected by START on 24 through 26 March 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hrs)	Remarks	Sample Source
MATRIX: Drinking Water (Continued)				
DW-08	D21837	3/26/08 1659	Grab	Drinking water sample collected from the outside spigot (pre-filtration) located at 101 Hannahs Road, depicted on City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 51, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 144.7 µS/cm; Temperature = 10.6°C; Turbidity = 0.54 NTU; pH (meter) = 6.05; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 15.81″ North Latitude 73° 33′ 13.88″ West Longitude
DW-10	D21839	3/25/08 1139	Grab	Drinking water sample collected from the outside spigot (pre-filtration) located at 125 Hannahs Road, depicted on City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 49, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 226.0 µS/cm; Temperature = 11.2°C; Turbidity = NR; pH (meter) = 6.17; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 13.12″ North Latitude 73° 33′ 11.10″ West Longitude
DW-11	D21840	3/25/08 1501	Grab	Drinking water sample collected from the outside spigot (pre-filtration) located at 135 Hannahs Road, depicted on City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 48, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 318.3 µS/cm; Temperature = 12.0°C; Turbidity = 1.01; pH (meter) = 5.95; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 11.98″ North Latitude 73° 33′ 09.63″ West Longitude

Table 7

Drinking Water Sample Summary: Scofieldtown Road Park
Samples Collected by START on 24 through 26 March 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hrs)	Remarks	Sample Source
MATRIX: Drinking Water (Continued)				
DW-13	D21841	3/25/08 1750	Grab	Drinking water sample collected from the outside spigot of the pump-house (pre-filtration) located at 151 Brookdale Road, depicted on City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 24, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 207.1 µS/cm; Temperature = 9.8°C; Turbidity = 1.85; pH (meter) = 6.04; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 00.93″ North Latitude 73° 33′ 09.04″ West Longitude
DW-14	D21842	3/25/08 1644	Grab	Drinking water sample collected from the outside spigot of the greenhouse (pre-filtration) located at 151 Brookdale Road (second well), depicted on City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 24, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 166.8 µS/cm; Temperature = 11.8°C; Turbidity = 0.71; pH (meter) = 5.99; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 01.83″ North Latitude 73° 33′ 11.64″ West Longitude
DW-15	D21844	3/25/08 1401	Grab	Drinking water sample collected from the kitchen sink spigot (pre-filtration) locate at 209 Brookdale Road, depicted on City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 1, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 102.8 µS/cm; Temperature = 12.6°C; Turbidity = NR; pH (meter) = 6.39; pH (paper) = NA. PID = 0.0 units above background. 41° 07′ 58.86″ North Latitude 73° 33′ 18.47″ West Longitude

Table 7

Drinking Water Sample Summary: Scofieldtown Road Park
Samples Collected by START on 24 through 26 March 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hrs)	Remarks	Sample Source
MATRIX: Drinking Water (Continued)				
DW-16	D21845	3/25/08 1452	Grab	Drinking water sample collected from the kitchen sink spigot (pre-filtration) located at 211 Brookdale Road, depicted on City of Stamford Tax Assessor's Map No. 35, as Block No. 387, Lot No. 3, to determine whether local private drinking water supply wells have been impacted by on-site sources. The water quality readings at the time of sampling were as follows: Conductivity = 264.0 µS/cm; Temperature = 10.3°C; Turbidity = 9.58; pH (meter) = 6.63; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 00.79″ North Latitude 73° 33′ 19.66″ West Longitude
DW-17	D21846	3/25/08 0850	Grab	Field duplicate of drinking water sample DW-02 (pre-filtration), collected for quality control.
DW-18	D21847	3/24/08 1443	Grab	Drinking water sample collected from a spigot after the holding tank (pre-filtration) located at 829 Scofieldtown Road on City of Stamford Tax Assessor's Map No. 35 as Block No. 389 Lot A, to establish reference drinking water conditions. The water quality readings at the time of sampling were as follows: Conductivity = 220.3 µS/cm; Temperature = 13.1°C; Turbidity = 3.84; pH (meter) = 7.58; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 36.67″ North Latitude 73° 33′ 18.83″ West Longitude

MS/MSD	=	Matrix Spike/Matrix Spike Duplicate.	NA	=	Not applicable.
PID	=	Photoionization Detector.	°C	=	Degrees Celsius.
µS/cm	=	Micro Siemens per centimeter.	NTU	=	Nephelometric Turbidity Units.
DO	=	Dissolved Oxygen.	No.	=	Number.
°	=	Degrees.	″	=	Seconds.
′	=	Minutes.	NR	=	Not Recorded (Negative Number).
hrs	=	Hours.			
START	=	Superfund Technical Assessment and Response Team.			

[100, pp. 15-31]

Complete analytical results of START drinking water samples, including quantitation and reporting limits, are presented in *Attachment C* of this report. START has reported the data as it was received from the EPA OEME Laboratory. START has not performed data validation of the EPA OEME Laboratory data. An internal data review was performed by EPA OEME Laboratory personnel prior to submittal to the EPA COR. EPA OEME Laboratory Data Qualifiers, defined by the EPA OEME Laboratory in the Project's Laboratory Reports, are listed in *Attachment C* of this report. Sample results qualified with a "J" on analytical tables are considered estimated values [100, pp. 15-31; 115-126].

Complete analytical results, as reported by the EPA OEME Laboratory, for START equipment rinsate, trip, and preservative blank samples collected in accordance with the QAPP for the Region I START Contract, are presented in *Attachment B* of this report [101; 103; 111; 115-127; 134-139].

Table 8 is a summary of organic compounds and inorganic elements detected through laboratory analyses of START drinking water samples. For each sample location, a compound or element is listed if it is detected at three times or greater than the highest reference samples' concentration (DW-01 and DW-18). However, if the compound or element is not detected in the reference sample or is detected in the reference sample at a concentration below the reporting limit, the reference samples' reporting limit is used as the reference value. Compounds and elements are considered exceeding reference criteria if they occurred at a value equal to or greater than the reference samples' reporting limit, and are designated by their approximate relative concentration above these values. In addition, Table 8 also contains any organic compounds and inorganic elements that were detected in START drinking water samples at concentrations exceeding their respective Connecticut Department of Health (CT DPH) Drinking Water Action Levels (DWAL) and EPA MCLs, but not exceeding reference criteria [100, pp. 15-31; 115-126; 146; 150].

Analytical results of START drinking water samples collected as part of the Scofieldtown Road Park SR are compared against current CT DPH DWAL and EPA MCLs [146; 150]. Bolded values indicate the compound or element was detected at a concentration equal to or greater than its respective CT DPH DWAL or EPA MCL values.

Table 8

Summary of Analytical Results
Drinking Water Sample Analysis for Scofieldtown Road Park

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	EPA MCLs	CT DPH DWAL
DW-01	**INORGANICS**					
	Lead †	24 µg/L	NA	NA	15 µg/L	15 µg/L
DW-02	**PESTICIDES/PCBs**					
	Dieldrin	**0.036 µg/L**	0.025 ND µg/L	1.4 × RL	NL	0.03 µg/L
DW-04	**PESTICIDES/PCBs**					
	Alpha Chlordane [1]	0.036 µg/L	0.025 ND µg/L	1.4 × RL	2.0 µg/L	0.3 µg/L
	Dieldrin	**0.33 µg/L**	0.025 ND µg/L	13.2 × RL	NL	0.03 µg/L
	Endrin Ketone	0.025 J µg/L	0.025 ND µg/L	1.4 × RL	NL	NL
	Gamma Chlordane [1]	0.031 µg/L	0.025 ND µg/L	1.4 × RL	2.0 µg/L	0.3 µg/L
DW-05	**VOCs**					
	Chloroform	1.5 µg/L	0.50 ND µg/L	3.0 × RL	NL	NL
DW-06	**PESTICIDES/PCBs**					
	Dieldrin	**0.070 µg/L**	0.025 ND µg/L	2.8 × RL	NL	0.03 µg/L

Table 8

Summary of Analytical Results
Drinking Water Sample Analysis for Scofieldtown Road Park (Concluded)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	EPA MCLs	CT DPH DWAL
DW-07	**INORGANICS**					
	Silver	0.27 µg/L	0.20 ND µg/L	1.4 × RL	NL	NL
DW-08	**INORGANICS**					
	Copper	330 µg/L	64 µg/L	5.2 × Ref	1,300 µg/L	NL
DW-10	**INORGANICS**					
	Aluminum	87 µg/L	20 µg/L	4.4 × Ref	NL	NL
DW-15	**INORGANICS**					
	Copper	230 µg/L	64 µg/L	3.6 × Ref	1,300 µg/L	NL
DW-16	**INORGANICS**					
	Zinc	1,600 µg/L	270 µg/L	5.9 × Ref	NL	NL
DW-17	**PESTICIDES/PCBs**					
	Dieldrin	**0.042 µg/L**	0.025 ND µg/L	1.7 × RL	NL	0.03 µg/L

Notes: START has reported the data as it was received from the EPA OEME Laboratory. START has not performed data validation of the EPA OEME Laboratory data. An internal data review was performed by EPA OEME Laboratory personnel prior to submittal to the EPA COR. EPA OEME Laboratory Data Qualifiers, defined by the EPA OEME Laboratory in the Project's Laboratory Reports, are listed below.

† Indicates an inorganic element that was detected at concentrations exceeding its respective EPA MCL or CT DPH DWAL, but not at concentrations exceeding reference criteria.

Bolded values indicate the organic compound or inorganic element was detected at a concentration equal to or greater than its respective EPA MCL and/or CT DPH DWAL.

[1] Indicates standard for Chlordane listed, as specific standards for Alpha and Gamma Chlordane do not exist.

Ref = Reference concentration.
RL = Reporting Limit.
VOCs = Volatile Organic Compounds.
PCBs = Polychlorinated Biphenyls.
MCL = Maximum Contaminant Level.
µg/L = Micrograms per liter [equivalent to parts per billion (ppb)].
J = Quantitation is approximate due to limitations identified during the quality control review.
ND = The compound/substance was analyzed for, but not detected. The associated numerical value is the RL.
NL = Not Listed. No EPA MCL or CT DPH DWAL exists for this Substance.
NA = Not Applicable.
CT DPH= Connecticut Department of Health.
SVOCs = Semivolatile Organic Compounds.
DWAL = Drinking Water Action Level.

[100, pp. 15-31; 115-126; 146; 150]

Two VOCs were detected at concentrations above laboratory reporting limits in START drinking water samples collected as part of the Scofieldtown Road Park SR. However, only one VOC (chloroform) was detected at a concentration exceeding reference criteria. Chloroform was detected in drinking water sample DW-05 (1.5 µg/L), collected from 29 Hannahs Road. No VOCs were detected in START drinking water samples at concentrations exceeding their respective CT DPH DWAL or EPA MCL values [100, pp. 15-31; 115-116; 146]. Chloroform

Long Island Sound. The terminus of the 15-mile downstream surface water pathway extends radially, 5.5 miles into Long Island Sound, extending from Greenwich, CT to Darien, CT (Figure 5) [65-70; 86-88; 93; 94].

There are no United States Geological Survey (USGS) gauging stations located along the unnamed stream or Poorhouse Brook. START observed and assumes that the flow rate along the unnamed stream does not exceed 2.3 cubic feet per second (cfs). Using the USGS StreamStats program, the drainage basin area for location where the unnamed stream crosses under Scofieldtown Road and enters into Poorhouse Brook was calculated. The drainage basin area was calculated to be 1.25 square miles (mi^2). Using the USGS conversion factor of 1.8 cfs/mi^2, an estimation of the average intensity, rate, and frequency of overland flow in New England, the estimated flow rate of Poorhouse Brook, at Scofieldtown Road was calculated to be 2.3 cfs [90]. The drainage basin area was also calculated for the point where Poorhouse Brook enters into the Rippowam River. The drainage basin area was calculated to be 2.82 mi^2. Using the USGS conversion factor of 1.8 cfs/mi^2, the flow rate was calculated to be 5.1 cfs. Therefore, the flow rate of Poorhouse Brook ranges from 2.3 cfs to 5.1 cfs [85; 86; 90].

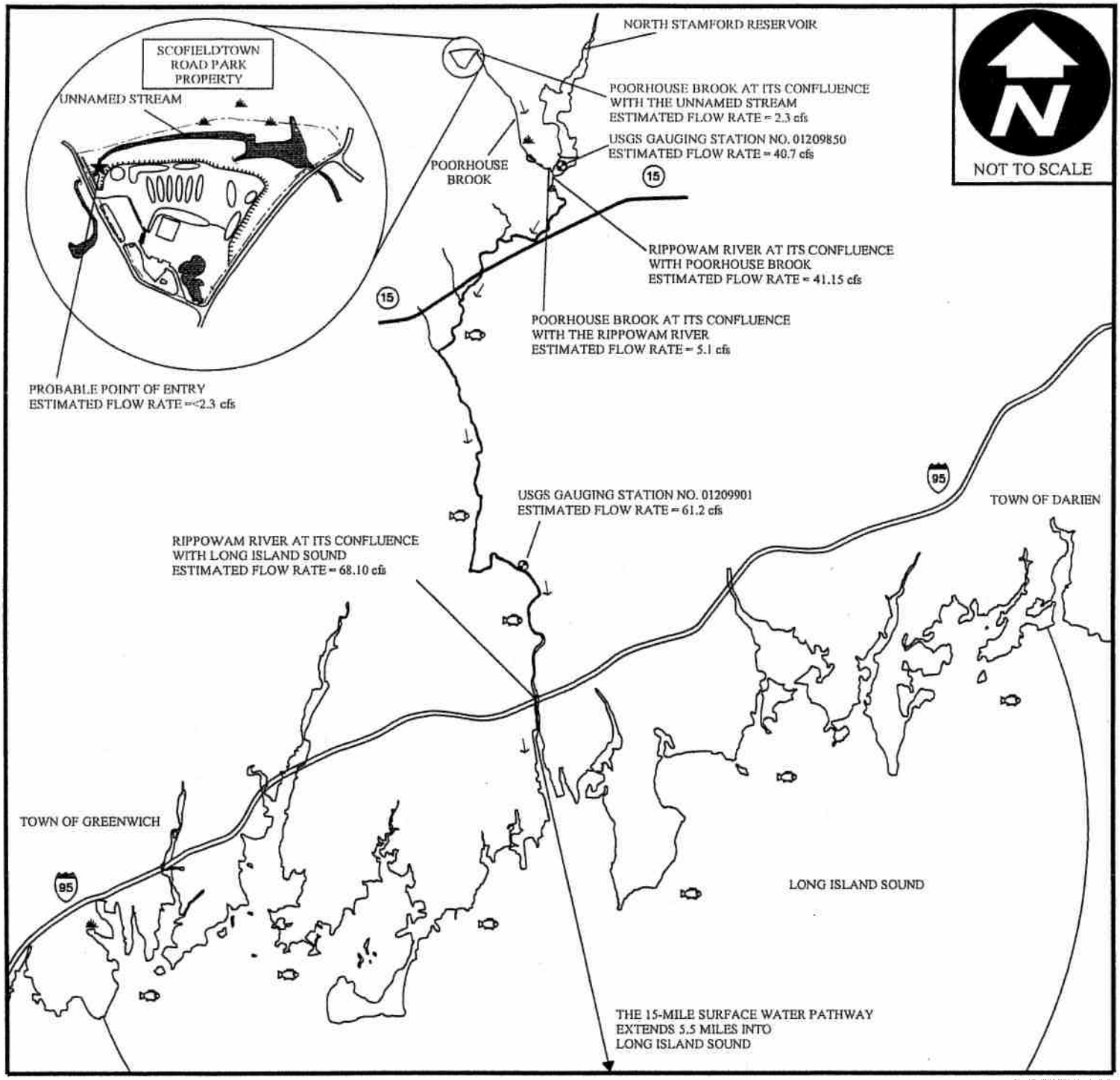
USGS Gauging Station No. 01209850 is located 0.13 miles upstream of the confluence of Poorhouse Brook and the Rippowam River. At this gauging station, the Rippowam River has a drainage area of 22.6 mi^2. Using the USGS conversion factor of 1.8 cfs/mi^2, the Rippowam River has an estimated flow rate of 40.7 cfs at the gauging station. A second gauging station, USGS Gauging Station No. 01209901, is located on the Rippowam River, approximately 5.8 miles downstream from the confluence of Poorhouse Brook and the Rippowam River. At this gauging station, the Rippowam River has a drainage area of 34.0 mi^2. Using the USGS conversion factor of 1.8 cfs/mi^2, the Rippowam River has an estimated flow rate of 61.2 cfs at the gauging station. Using interpolation and extrapolation, the estimated flow rate of the Rippowam River, where it meets Poorhouse Brook and where it discharges to the Long Island Sound (2.0 miles from USGS Gauging Station No. 01209901), is 41.15 cfs to 68.10 cfs, respectively [85; 86; 90].

The terminus of the 15-mile downstream surface water pathway extends into Long Island Sound, extending from Greenwich, CT to Darien, CT. The Long Island Sound is classified as costal tidal waters and therefore a flow rate is not applicable [86]. Table 9 summarizes surface water bodies along the 15-mile downstream surface water pathway.

Table 9

Surface Water Bodies Along the 15-Mile Downstream Pathway from Scofieldtown Road Park

Surface Water Body	Descriptor[a]	Length of Reach (miles)	Flow Characteristics (cfs)[b]	Length of Wetland Frontage (miles)
Unnamed Stream	Minimal Stream	0.2	< 2.3	0.40
Poorhouse Brook	Minimal stream	1.5	2.3 to 5.1	0.68



LEGEND

- ★ PROBABLE POINT OF ENTRY TO THE SURFACE WATER PATHWAY
- FISHERY
- WETLANDS
- STATE ROUTE
- ↘ FLOW DIRECTION
- cfs = CUBIC FEET PER SECOND
- GAUGING STATION
- INTERSTATE ROUTE

SOURCE: USGS 7.5 MINUTE SERIES QUADRANGLE(S):-
STAMFORD, CT 1985
POUND RIDGE, NY 1973, PHOTOREVISED 1975
JONES INLET, NY 1969, PHOTOREVISED 1975

INSET OF SURFACE WATER PATHWAY AREA

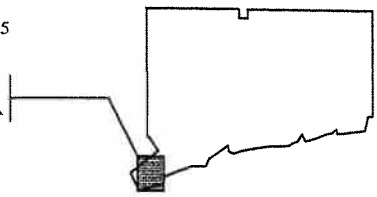


FIGURE 5
SURFACE WATER PATHWAY SKETCH

SCOFIELDTOWN ROAD PARK
612 SCOFIELDTOWN ROAD
STAMFORD, CONNECTICUT

EPA Region I
Superfund Technical Assessment and Response Team (START) III
Contract No. EP-W-05-042

TDD Number:	06-07-0007
Created by:	G. Hornok
Created on:	12 August 2008
Modified by:	G. Hornok
Modified on:	23 December 2008

WESTON SOLUTIONS
Restoring Resource Efficiency

Table 9

Surface Water Bodies Along the 15-Mile Downstream Pathway from Scofieldtown Road Park(Concluded)

Surface Water Body	Descriptor[a]	Length of Reach (miles)	Flow Characteristics (cfs)[b]	Length of Wetland Frontage (miles)
Rippowam River	Small to moderate stream	7.8	41.15 to 68.10	0
Long Island Sound	Coastal tidal waters (flow not applicable)	5.5	NA	0.02

[a] Minimal stream <10 cfs. Small to moderate stream 10-100 cfs. Coastal tidal waters (flow not applicable).
[b] Cubic feet per second.

NA = Not Applicable.

[82; 86; 90]

There are no known surface water drinking water intakes located along the 15-mile surface water pathway from the Scofieldtown Road Park property [76; 95]. According to the Connecticut Anglers Guide, the Rippowam River and Long Island Sound are classified as recreational fisheries [83]. There are two locations along the Rippowam River which are habitats for one state-listed endangered/federally-listed threatened species and one state-listed endangered/federally-listed endangered species. In addition, there are one state-listed threatened/federally-listed endangered species and one state-listed threatened species habitats located within the Long Island Sound, along the 15-mile Surface Water Pathway [84; 89]. The unnamed stream is a Clean Water Act (CWA)-protected water body. Approximately 1.1 miles of wetland frontage are located along the Scofieldtown Road 15-mile downstream surface water pathway [82]. Table 10 summarizes known sensitive environments located along the 15-mile downstream pathway from the Scofieldtown Road Park property.

Table 10

Sensitive Environments Along the 15-Mile Downstream Pathway from Scofieldtown Road Park

Sensitive Environment Name	Sensitive Environment Type	Surface Water Body	Downstream Distance from PPE (miles)	Flow Rate at Environment (cfs)
Unnamed Stream Wetlands	Wetland (0.40 miles)	Unnamed Stream	0 to 0.2	< 2.3
Unnamed Stream	CWA-protected water body	Unnamed Stream	0 to 0.2	< 2.3
Poorhouse Brook Wetlands	Wetlands (0.68 miles)	Poorhouse Brook	0.2 to 1.7	2.3 to 5.1
One State-listed Endangered/Federal-listed Threatened Species Habitat	State-listed Endangered/Federal-listed Threatened Species Habitat	Rippowam River	2.6	41.15 to 68.10
One State-listed Endangered/Federal-listed Endangered Species Habitat	State-listed Endangered/Federal-listed Endangered Species Habitat	Rippowam River	8.8	41.15 to 68.10

Table 10

Sensitive Environments Along the 15-Mile Downstream Pathway from Scofieldtown Road Park (Concluded)

Sensitive Environment Name	Sensitive Environment Type	Surface Water Body	Downstream Distance from PPE (miles)	Flow Rate at Environment (cfs)
Long Island Sound Wetlands	Wetlands (0.02 miles)	Long Island Sound	> 9.5 to 15	NA
One State-listed Threatened /Federal-listed Endangered Species Habitat	State-listed Threatened /Federal-listed Endangered Species Habitat	Long Island Sound	13.0	NA
One State-listed Threatened Species Habitat	State Threatened Species Habitat	Long Island Sound	13.2	NA

cfs = Cubic feet per second. CWA = Clean Water Act.
PPE = Probable Point of Entry. NA = Not Applicable.

[82; 84; 86; 89]

On 29 May 1986, as part of an on-site investigation of a complaint, CT DEP personnel collected two surface water samples from the unnamed stream located adjacent to the drainage pipe/culvert along the northern slope of the former landfill. The samples were analyzed for hydrocarbons and metals. Analytical results indicated the presence of the following substances at concentrations above laboratory detection limits (maximum concentrations in parentheses): lead (0.02 mg/L), barium (0.4 mg/L), chlorobenzene (trace), and benzene (trace) [24; 25; 54, pp. 5]. Lead, barium, chlorobenzene, and benzene were detected in historical drum and soil/source samples collected from the Scofieldtown Road Park property [54, pp. 8-13; 55; 100, pp. 15-31; 101-104; 111-112]. Therefore, these substances are considered at least partially attributable to source areas located on the Scofieldtown Road Park property.

On 27 March 1987, as part of an investigation of drums found on the Scofieldtown Road Park property, CT DHS personnel collected one sediment sample from the unnamed stream, in the vicinity of the area of drum removal located adjacent to the drainage pipe/culvert along the northern slope of the former landfill. The sediment sample was analyzed for hydrocarbons (benzene, ethyl benzene, toluene, and mixed xylenes). Analytical results indicated the presence of the following substances at concentrations above laboratory detection limits (concentrations in parentheses): benzene (530 μg/Kg), ethyl benzene (9,100 μg/Kg), toluene (35,000 μg/Kg), and mixed xylenes (40,000 μg/Kg) [27; 30]. Benzene, ethylbenzene, toluene, and mixed xylenes were detected in historical drum and soil/source samples collected from the Scofieldtown Road Park property [54, pp. 8-13; 55; 100, pp. 15-31; 101-104; 111-112]. Therefore, these substances are considered at least partially attributable to source areas located on the Scofieldtown Road Park property.

On 7 November 1988, as part of an inspection, CT DHS personnel collected two surface water samples from the unnamed stream, located adjacent to the drainage pipe/culvert along the northern slope of the former landfill and from the unnamed stream prior to exiting the property. The samples were analyzed for total metals, hydrocarbons, and organic halides. Analytical results

park area. Sediment samples SD-01 through SD-15 were collected to determine if a release of hazardous substances to sediment has occurred in association with the former landfill.

All sediment samples were submitted to the EPA OEME Laboratory for VOC, SVOC, pesticide, PCB, metal, and cyanide analyses, with the exception of sediment samples SD-18 and SD-19, which were analyzed for metals only [100, pp. 15-31; 127-133]. Table 11 summarizes the sediment samples collected by START on 2 through 3 April 2008.

Table 11

Sediment Sample Summary: Scofieldtown Road Park
Samples Collected by START on 2 through 3 April 2008

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Sediment					
SD-01	D21848	4/3/08 1203	Grab	0 to 2	Sediment sample collected, using a hand auger, from the unnamed stream, located west of the berm along the northern property boundary, to determine if a release of hazardous materials to the surface water pathway has occurred. Material was black, SILT, some organics, little fine sand, trace medium sand and clay. Water quality parameters at that time of sampling were as follows: Conductivity = 1322 µS/cm; Temperature = 3.4°C (ice cover); Turbidity = NA; pH (meter) = 6.83; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 25.91″ North Latitude 73° 33′ 36.49″ West Longitude
SD-02	D21849	4/3/08 1139	Grab	0 to 2	Sediment sample collected, using a hand auger, from the wetland area along the unnamed stream, adjacent to the culvert located along the berm, on the northern property boundary, to determine if a release of hazardous materials to the surface water pathway has occurred. Material was black, SILT, some clay, little organics, trace fine-to-coarse sand. Water quality parameters at that time of sampling were as follows: Conductivity = 1238 µS/cm; Temperature = 4.6°C; Turbidity = 0.12; pH (meter) = 6.93; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 26.74″ North Latitude 73° 33′ 34.68″ West Longitude

Table 11

Sediment Sample Summary: Scofieldtown Road Park
Samples Collected by START on 2 through 3 April 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Sediment (Continued)					
SD-03	D21850	4/3/08 1026	Grab	0 to 2	Sediment sample collected, using a hand auger, from the wetland area located north of the property, to determine if a release of hazardous materials to the wetland has occurred. Material was black, SILT, major organics, trace fine sand. Water quality parameters at that time of sampling were as follows: Conductivity = 398.3 µS/cm; Temperature = 4.7°C; Turbidity = NA; pH (meter) = 6.47; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 28.04″ North Latitude 73° 33′ 31.47″ West Longitude
SD-04 (MS/MSD)	D21851	4/3/08 0855	Grab	0 to 2	Sediment sample collected, using a hand auger, from the wetland area located along the unnamed stream located on the northern portion of the property, to determine if a release of hazardous materials to the wetland has occurred. Material was black, SILT, some organics. Water quality parameters at that time of sampling were as follows: Conductivity = 770 µS/cm; Temperature = 0.7°C (ice cover); Turbidity = 366; pH (meter) = 7.17; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 26.81″ North Latitude 73° 33′ 30.04″ West Longitude
SD-05	D21852	4/2/08 1755	Grab	0 to 2	Sediment sample collected, using a hand auger, from the unnamed stream adjacent to the drainage culvert protruding from the northern slope of the former landfill, to determine if a release of hazardous materials to the surface water pathway has occurred. Material was black, SILT, some fine sand, little clay, trace medium-to-coarse sand and organics. An oil-like sheen was released from the sediments during augering to collect the sample. Water quality parameters at that time of sampling were as follows: Conductivity = 448.8 µS/cm; Temperature = 9.7°C; Turbidity = 7.43; pH (meter) = 6.68; pH (paper) = NA. PID = 0.5 units above background. 41° 08′ 25.57″ North Latitude 73° 33′ 29.41″ West Longitude

Table 11

Sediment Sample Summary: Scofieldtown Road Park
Samples Collected by START on 2 through 3 April 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Sediment (Continued)					
SD-06	D21853	4/2/08 1735	Grab	0 to 2	Sediment sample collected, using a hand auger, from the unnamed stream, downstream (east) of the drainage culvert protruding from the northern slope of the former landfill, to determine if a release of hazardous materials to the surface water pathway has occurred. Material was black-to-dark gray, fine SAND, some silt, trace medium-to-coarse sand and organics. Water quality parameters at that time of sampling were as follows: Conductivity = 321.3 µS/cm; Temperature = 11.0°C; Turbidity = 5.44; pH (meter) = 7.3; pH (paper) = NA. PID = 0.2 units above background. 41° 08′ 25.78″ North Latitude 73° 33′ 28.08″ West Longitude
SD-07	D21854	4/2/08 1715	Grab	0 to 2	Sediment sample collected, using a hand auger, from the unnamed stream, prior to the surface water flowing off the property, to determine if a release of hazardous materials to the surface water pathway has occurred. Material was black, SILT, some fine sand and organics, little clay, trace medium-to-coarse sand. Water quality parameters at that time of sampling were as follows: Conductivity = 309.4 µS/cm; Temperature = 11.4°C; Turbidity = 1.55; pH (meter) = 7.01; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 25.33″ North Latitude 73° 33′ 25.57″ West Longitude
SD-08	D21855	4/2/08 1755	Grab	0 to 2	Field duplicate of sediment sample SD-05, collected for quality control.

Table 11

Sediment Sample Summary: Scofieldtown Road Park
Samples Collected by START on 2 through 3 April 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Sediment (Continued)					
SD-09	D21856	4/2/08 1640	Grab	0 to 2	Sediment sample collected, using a hand auger, from a downstream location along Poorhouse Brook and adjacent to the culvert leading from the Scofieldtown Road Park property, to determine if a release of hazardous materials to the surface water pathway has occurred. Material was dark gray, SILT, some fine sand, little clay, trace fine gravel, medium-to-coarse sand, and organics. Water quality parameters at that time of sampling were as follows: Conductivity = 318.1 µS/cm; Temperature = 12.2°C; Turbidity = 2.98; pH (meter) = 7.04; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 24.66″ North Latitude 73° 33′ 23.03″ West Longitude
SD-10	D21857	4/2/08 1536	Grab	0 to 2	Sediment sample collected, using a hand auger, from a downstream location along Poorhouse Brook, to determine if a release of hazardous materials to the surface water pathway has occurred. Material was black-to-dark gray, fine-to-coarse SAND, some fine gravel, little medium gravel, trace silt and debris. Water quality parameters at that time of sampling were as follows: Conductivity = 314.1 µS/cm; Temperature = 12.5°C; Turbidity = 3.27; pH (meter) = 7.19; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 22.45″ North Latitude 73° 33′ 21.06″ West Longitude
SD-11	D21858	4/2/08 1525	Grab	0 to 2	Sediment sample collected, using a hand auger, from a downstream location along Poorhouse Brook, to determine if a release of hazardous materials to the surface water pathway has occurred. Material was light brown, medium SAND, some fine-to-coarse sand, little silt, trace fine gravel. Water quality parameters at that time of sampling were as follows: Conductivity = 320.4 µS/cm; Temperature = 12.3°C; Turbidity = 3.10; pH (meter) = 6.75; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 20.64″ North Latitude 73° 33′ 20.73″ West Longitude

Table 11

Sediment Sample Summary: Scofieldtown Road Park
Samples Collected by START on 2 through 3 April 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Sediment (Continued)					
SD-12	D21859	4/2/08 1454	Grab	0 to 2	Sediment sample collected, using a hand auger, from a downstream location along Poorhouse Brook, to determine if a release of hazardous materials to the surface water pathway has occurred. Material was light-to-dark gray, fine SAND, some silt and medium-to-coarse sand, trace clay, fine-to-medium gravel, and organics. Water quality parameters at that time of sampling were as follows: Conductivity = 307.6 µS/cm; Temperature = 11.4°C; Turbidity = 4.61; pH (meter) = 6.52; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 15.82″ North Latitude 73° 33′ 17.28″ West Longitude
SD-13	D21860	4/2/08 1420	Grab	0 to 2	Sediment sample collected, using a hand auger, from a downstream location along Poorhouse Brook, to determine if a release of hazardous materials to the surface water pathway has occurred. Material was light-to-dark gray, fine SAND, some medium sand and silt, little organics, trace coarse sand, clay, and fine-to-medium gravel. Water quality parameters at that time of sampling were as follows: Conductivity = 300.6 µS/cm; Temperature = 10.07°C; Turbidity = 5.07; pH (meter) = 6.53; pH (paper) = NA. PID = 0.04 units above background. 41° 08′ 10.68″ North Latitude 73° 33′ 12.16″ West Longitude
SD-14	D21861	4/2/08 1850	Grab	0 to 2	Sediment sample collected, using a hand auger, from the southern portion of the pond located in the park area of the Scofieldtown Road Park property, to determine if a release of hazardous materials to the surface water pathway has occurred. Material was black, SILT, some organics, trace fine sand. Water quality parameters at that time of sampling were as follows: Conductivity = 300.6 µS/cm; Temperature = 10.07°C; Turbidity = 5.07; pH (meter) = 6.53; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 17.64″ North Latitude 73° 33′ 32.01″ West Longitude

Table 11

Sediment Sample Summary: Scofieldtown Road Park
Samples Collected by START on 2 through 3 April 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Sediment (Continued)					
SD-15	D21862	4/2/08 1910	Grab	0 to 2	Sediment sample collected, using a hand auger, from the northern portion of the pond located in the park area of the Scofieldtown Road Park property, to determine if a release of hazardous materials to the surface water pathway has occurred. Material was black, SILT, some fine sand and organics, little fine-to-medium gravel, trace fine-to-medium sand and clay. Water quality parameters at that time of sampling were as follows: Conductivity = 242.6 µS/cm; Temperature = 9.3°C; Turbidity = 8.14; pH (meter) = 7.54; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 18.61″ North Latitude 73° 33′ 32.94″ West Longitude
SD-16	D21863	4/3/08 1403	Grab	0 to 2	Sediment sample collected, using a hand auger, from the Smith House property (88 Rock Rimmon Road) located southwest of the Scofieldtown Road Park property, to document reference concentrations for sediment sample comparison. Material was black, SILT, some clay, little organics, trace fine-to-coarse sand. Water quality parameters at that time of sampling were as follows: Conductivity = 51.1 µS/cm; Temperature = 9.6°C; Turbidity = 8.94; pH (meter) = 8.98; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 19.28″ North Latitude 73° 33′ 40.52″ West Longitude
SD-17	D21864	4/3/08 1217	Grab	0 to 2	Sediment sample collected, using a hand auger, from the wetland area located north of the Scofieldtown Road Park property, to document reference concentrations for sediment sample comparison. Material was black, SILT, some organics, trace fine-to-coarse sand. Water quality parameters at that time of sampling were as follows: Conductivity = 330.0 µS/cm; Temperature = 9.2°C; Turbidity = 0.36; pH (meter) = 6.60; pH (paper) = NA. PID = 0.05 units above background. 41° 08′ 19.53″ North Latitude 73° 33′ 40.32″ West Longitude

Table 11

Sediment Sample Summary: Scofieldtown Road Park
Samples Collected by START on 2 through 3 April 2008 (Continued)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Sediment (Continued)					
SD-18	D21865	4/3/08 1350	Grab	0 to 2	Sediment sample collected, using a hand auger, from the Smith House property (88 Rock Rimmon Road) located southwest of the Scofieldtown Road Park property, to document reference concentrations for sediment sample comparison (metals analyses only). Material was black, SILT, little fine sand, trace medium-to-coarse sand, trace clay, some organics. Water quality parameters at that time of sampling were as follows: Conductivity = 330.0 µS/cm; Temperature = 9.2°C; Turbidity = 0.36; pH (meter) = 6.60; pH (paper) = NA. PID = 0.0 units above background. FID = 0.0 units above background. 41° 08′ 30.20″ North Latitude 73° 33′ 34.61″ West Longitude
SD-19	D21866	4/3/08 1245	Grab	0 to 2	Sediment sample collected, using a hand auger, from the wetland area located to the north of the Scofieldtown Road Park property, to document reference concentrations for sediment sample comparison (metals analyses only). Material was black, SILT, some clay, little organics, trace fine sand. Water quality parameters at that time of sampling were as follows: Conductivity = 349.8 µS/cm; Temperature = 9.5°C; Turbidity = 1.68; pH (meter) = 6.33; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 30.03″ North Latitude 73° 33′ 34.85″ West Longitude

Table 11

Sediment Sample Summary: Scofieldtown Road Park
Samples Collected by START on 2 through 3 April 2008 (Concluded)

Sample Location No.	Traffic Report No.	Date/ Time (hours)	Remarks	Sample Depth (feet bgs)	Sample Description/Rationale
MATRIX: Sediment (Concluded)					
SD-20	D21904	4/3/08 1043	Grab	0 to 2	Sediment sample collected, using a hand auger, from the tributary to the unnamed stream, located east of the wetland area, north of the Scofieldtown Road Park property, to document reference concentrations for sediment sample comparison. Material was light gray, fine-to-coarse SAND, some fine gravel, little organics, trace medium gravel and silt. Water quality parameters at that time of sampling were as follows: Conductivity = 268.1 µS/cm; Temperature = 5.4°C; Turbidity = 1.29; pH (meter) = 7.30; pH (paper) = NA. PID = 0.0 units above background. 41° 08′ 27.71″ North Latitude 73° 33′ 29.72″ West Longitude

MS/MSD = Matrix Spike/Matrix Spike Duplicate.
" = Seconds.
µS/cm = microSiemens per centimeter.
° = Degrees.
PID = Photoionization detector.
bgs = Below ground surface.
START = Superfund Technical Assessment and Response Team
' = Minutes.
No. = Number.
Temp. = Temperature.
C = Celsius.
FID = Flame ionization detector.

[100, pp. 15-31]

Complete analytical results of START sediment samples, including quantitation and reporting limits, are presented in *Attachment D* of this report. START has reported the data as it was received from the EPA OEME Laboratory. START has not performed data validation of the EPA OEME Laboratory data. An internal data review was performed by EPA OEME Laboratory personnel prior to submittal to the EPA COR. EPA OEME Laboratory Data Qualifiers, defined by the EPA OEME Laboratory in the Project's Laboratory Reports, are listed in *Attachment D* of this report. Sample results qualified with a "B" on analytical tables are considered estimated values because the analyte is associated with contamination detected in the laboratory blank or the trip blank. Sample results qualified with a "L" on analytical tables are considered estimated values because the analyte is below the calibration range. Sample results qualified with a "P" are analytes in which the confirmation value exceeded 35% difference and is less than 100%, therefore the lower value is reported [127-133].

Complete analytical results, as reported by the EPA OEME Laboratory, for START equipment rinsate, trip, and preservative blank samples collected in accordance with the QAPP for the Region I START Contract, are presented in *Attachment B* of this report [134-139].

Table 12

Summary of Analytical Results
Sediment Sample Analysis for Scofieldtown Road Park

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	NOAA SQuiRT TEL Value	NOAA SQuiRT PEL Value
SD-01	**SVOC**					
	Anthracene	290 µg/Kg	260 ND µg/Kg	1.1 × RL	NL	NL
	Benzo(a)anthracene	**1,200 µg/Kg**	260 ND µg/Kg	4.6 × RL	31.7 µg/Kg	385 µg/Kg
	Benzo(a)pyrene	**1,100 µg/Kg**	260 ND µg/Kg	4.2 × RL	31.9 µg/Kg	782 µg/Kg
	Benzo(b)fluoranthene	1,100 µg/Kg	260 ND µg/Kg	4.2 × RL	NL	NL
	Benzo(g,h,i)perylene	920 µg/Kg	260 ND µg/Kg	3.5 × RL	NL	NL
	Benzo(k)fluoranthene	980 µg/Kg	260 ND µg/Kg	3.8 × RL	NL	NL
	bis(2-Ethylhexyl)phthalate	530 µg/Kg	260 ND µg/Kg	2.0 × RL	NL	NL
	Chrysene	**1,400 µg/Kg**	260 ND µg/Kg	5.4 × RL	57.1 µg/Kg	862 µg/Kg
	Dibenz(a,h)anthracene	**310 µg/Kg**	260 ND µg/Kg	1.2 × RL	6.22 µg/Kg	135 µg/Kg
	Diethylphthalate	560 B µg/Kg	260 ND µg/Kg	2.2 × RL	NL	NL
	Fluoranthene	**2,400 µg/Kg**	260 ND µg/Kg	9.2 × RL	111 µg/Kg	2,355 µg/Kg
	Indeno(1,2,3-cd)pyrene	870 µg/Kg	260 ND µg/Kg	3.3 × RL	NL	NL
	Phenanthrene	**1,200 µg/Kg**	260 ND µg/Kg	4.6 × RL	41.9 µg/Kg	515 µg/Kg
	Pyrene	**2,200 µg/Kg**	260 ND µg/Kg	8.5 × RL	53 µg/Kg	825 µg/Kg
	PESTICIDES/PCBs					
	4,4'-DDE	**87 µg/Kg**	3.0 ND µg/Kg	29.0 × RL	1.42 µg/Kg	6.75 µg/Kg
	4,4'-DDT	**57 µg/Kg**	3.0 ND µg/Kg	19.0 × RL	1.19 µg/Kg	4.77 µg/Kg
	Alpha Chlordane [1]	**57 µg/Kg**	3.0 ND µg/Kg	19.0 × RL	4.5 µg/Kg	8.9 µg/Kg
	Aroclor-1254	**180 µg/Kg**	61 ND µg/Kg	3.0 × RL	60 µg/Kg	340 µg/Kg
	Aroclor-1260 [2]	**66 µg/Kg**	61 ND µg/Kg	1.1 × RL	34.1 µg/Kg	277 µg/Kg

Table 12

Summary of Analytical Results
Sediment Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	NOAA SQuiRT TEL Value	NOAA SQuiRT PEL Value
SD-01 (Concluded)	**INORGANICS**					
	Calcium	13,000 mg/Kg	2,000 mg/Kg	6.5 × Ref	NL	NL
	Cobalt	8.2 mg/Kg	3.0 ND mg/Kg	2.7 × RL	NL	NL
	Copper	**150 mg/Kg**	27 mg/Kg	5.6 × Ref	35.7 mg/Kg	197 mg/Kg
	Iron	32,000 mg/Kg	7,000 mg/Kg	4.6 × Ref	NL	NL
	Lead	**230 mg/Kg**	34 mg/Kg	6.8 × Ref	35.0 mg/Kg	91.3 mg/Kg
	Magnesium	6,900 mg/Kg	1,000 mg/Kg	6.9 × Ref	NL	NL
	Manganese	390 mg/Kg	110 mg/Kg	3.5 × Ref	NL	NL
	Mercury †	**0.2 mg/Kg**	NA	NA	0.174 mg/Kg	0.486 mg/Kg
	Nickel †	**31 mg/Kg**	NA	NA	18.0 mg/Kg	36 mg/Kg
	Vanadium	63 mg/Kg	18 mg/Kg	3.5 × Ref	NL	NL
	Zinc	**470 mg/Kg**	38 mg/Kg	12.4 × Ref	123 mg/Kg	315 mg/Kg
SD-02	**VOCs**					
	Carbon Disulfide	4.5 µg/Kg	2.3 ND µg/Kg	2.0 × RL	NL	NL
	Chloroethane	5.3 µg/Kg	2.3 ND µg/Kg	2.3 × RL	NL	NL
	SVOCs					
	Diethylphthalate	580 B µg/Kg	260 ND µg/Kg	2.2 × RL	NL	NL
	PESTICIDE/PCBs					
	4,4'-DDD	3.3 L µg/Kg	3.0 ND µg/Kg	1.1 × RL	3.54 µg/Kg	8.51 µg/Kg
	4,4'-DDE †	**2.5 µg/Kg**	NA	NA	1.42 µg/Kg	6.75 µg/Kg
	INORGANICS					
	Cobalt	3.5 mg/Kg	3.0 ND mg/Kg	1.2 × RL	NL	NL
	Zinc	**220 mg/Kg**	38 mg/Kg	5.8 × Ref	123 mg/Kg	315 mg/Kg

Table 12

Summary of Analytical Results
Sediment Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	NOAA SQuiRT TEL Value	NOAA SQuiRT PEL Value
SD-03	**SVOCs**					
	Benzoic Acid	1,600 µg/Kg	580 ND µg/Kg	2.8 × RL	NL	NL
	PESTICIDE/PCBs					
	4,4'-DDD †	**30 µg/Kg**	NA	NA	3.54 µg/Kg	8.51 µg/Kg
	4,4'-DDE †	**17 µg/Kg**	NA	NA	1.42 µg/Kg	6.75 µg/Kg
	INORGANICS					
	Copper †	**38 mg/kg**	NA	NA	35.7 mg/Kg	197 mg/Kg
	Lead †	**63 mg/kg**	NA	NA	35.0 mg/Kg	91.3 mg/Kg
	Mercury †	**0.27 mg/kg**	NA	NA	0.174 mg/Kg	0.486 mg/Kg
SD-04	**SVOCs**					
	Diethylphthalate	1,400 µg/Kg	260 ND µg/Kg	5.4 × RL	NL	NL
	PESTICIDE/PCBs					
	4,4'-DDD	**340 µg/Kg**	3.0 ND µg/Kg	113.3 × RL	3.54 µg/Kg	8.51 µg/Kg
	4,4'-DDE	**190 µg/Kg**	3.0 ND µg/Kg	63.3 × RL	1.42 µg/Kg	6.75 µg/Kg
	INORGANICS					
	Arsenic	**13 mg/Kg**	3.0 ND mg/Kg	4.3 × RL	5.9 mg/Kg	17 mg/Kg
	Barium	830 mg/Kg	110 mg/Kg	7.5 × Ref	NL	NL
	Calcium	21,000 mg/Kg	2,000 mg/Kg	10.5 × Ref	NL	NL
	Copper	**120 mg/Kg**	27 mg/Kg	4.4 × Ref	35.7 mg/Kg	197 mg/Kg
	Iron	80,000 mg/Kg	7,000 mg/Kg	11.4 × Ref	NL	NL
	Lead	**220 mg/Kg**	34 mg/Kg	6.5 × Ref	35.0 mg/Kg	91.3 mg/Kg
	Mercury	**0.72 mg/Kg**	0.21 mg/Kg	3.4 × Ref	0.174 mg/Kg	0.486 mg/Kg
	Nickel	**34 mg/Kg**	11 mg/Kg	3.1 × Ref	18.0 mg/Kg	36 mg/Kg
	Zinc	**740 mg/Kg**	38 mg/Kg	19.5 × Ref	123 mg/Kg	315 mg/Kg

Table 12

Summary of Analytical Results
Sediment Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	NOAA SQuiRT TEL Value	NOAA SQuiRT PEL Value
SD-05	**VOCs**					
	1,2,4-Trimethylbenzene	4,000 µg/Kg	2.3 ND µg/Kg	1,739.1 × RL	NL	NL
	1,3,5-Trimethylbenzene	1,600 µg/Kg	2.3 ND µg/Kg	695.7 × RL	NL	NL
	SVOCs					
	Fluoranthene †	**170 µg/Kg**	NA	NA	111.0 µg/Kg	2,355 µg/Kg
	Pyrene †	**160 µg/Kg**	NA	NA	53.0 µg/Kg	825 µg/Kg
	PESTICIDE/PCBs					
	4,4'-DDD	**61 µg/Kg**	4.1 ND µg/Kg	14.9 × RL	3.54 µg/Kg	8.51 µg/Kg
	4,4'-DDE	**33 µg/Kg**	4.1 ND µg/Kg	8.0 × RL	1.42 µg/Kg	6.75 µg/Kg
	4,4'-DDT	**48 µg/Kg**	4.1 ND µg/Kg	11.7 × RL	1.19 µg/Kg	4.47 µg/Kg
	Alpha Chlordane [1]	**26 µg/Kg**	4.1 ND µg/Kg	6.3 × RL	4.5 µg/Kg	8.9 µg/Kg
	Gamma Chlordane [1]	**8.8 µg/Kg**	4.1 ND µg/Kg	2.1 × RL	4.5 µg/Kg	8.9 µg/Kg
	Aroclor-1254	**350 µg/Kg**	83 ND µg/Kg	4.2 × RL	60 µg/Kg	340 µg/Kg
	Aroclor-1260 † [2]	**51 µg/Kg**	NA	NA	34.1 µg/Kg	277 µg/Kg
	INORGANICS					
	Arsenic	**29 mg/Kg**	3.0 ND mg/Kg	9.7 × RL	5.9 mg/Kg	17 mg/Kg
	Calcium	7,700 mg/Kg	2,000 mg/Kg	3.9 × Ref	NL	NL
	Copper	**150 mg/Kg**	27 mg/Kg	5.6 × Ref	35.7 mg/Kg	197 mg/Kg
	Iron	39,000 mg/Kg	7,000 mg/Kg	5.6 × Ref	NL	NL
	Lead †	**82 mg/Kg**	NA	NA	35 mg/Kg	91.3 mg/Kg
	Manganese	1,000 mg/Kg	110 mg/Kg	9.1 × Ref	NL	NL
	Nickel †	**21 mg/Kg**	NA	NA	18 mg/Kg	36 mg/Kg
	Vanadium	61 mg/Kg	18 mg/Kg	3.4 × Ref	NL	NL
	Zinc	**230 mg/Kg**	38 mg/Kg	6.1 × Ref	123 mg/Kg	315 mg/Kg

Table 12

Summary of Analytical Results
Sediment Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	NOAA SQuiRT TEL Value	NOAA SQuiRT PEL Value
SD-06	**SVOCs**					
	Anthracene	450 µg/Kg	260 ND µg/Kg	1.7 × RL	NL	NL
	Benzo(a)antrhacene	**1,200 µg/Kg**	260 ND µg/Kg	4.6 × RL	31.7 µg/Kg	385 µg/Kg
	Benzo(a)pyrene	**900 µg/Kg**	260 ND µg/Kg	3.5 × RL	31.9 µg/Kg	782 µg/Kg
	Benzo(b)fluoranthene	970 µg/Kg	260 ND µg/Kg	3.7 × RL	NL	NL
	Benzo(g,h,i)perylene	780 µg/Kg	260 ND µg/Kg	3.0 × RL	NL	NL
	Benzo(k)fluoranthene	830 µg/Kg	260 ND µg/Kg	3.2 × RL	NL	NL
	Chrysene	**1,300 µg/Kg**	260 ND µg/Kg	5.0 × RL	57.1 µg/Kg	862 µg/Kg
	Fluoranthene	**2,500 µg/Kg**	260 ND µg/Kg	9.6 × RL	111 µg/Kg	2,355 µg/Kg
	Indeno(1,2,3-cd)pyrene	700 µg/Kg	260 ND µg/Kg	2.7 × RL	NL	NL
	Phenanthrene	**1,800 µg/Kg**	260 ND µg/Kg	6.9 × RL	41.9 µg/Kg	515 µg/Kg
	Pyrene	**2,500 µg/Kg**	260 ND µg/Kg	9.6 × RL	53 µg/Kg	825 µg/Kg
	PESTICIDE/PCBs					
	4,4'-DDD	**160 µg/Kg**	4.1 ND µg/Kg	39.0 × RL	3.54 µg/Kg	8.51 µg/Kg
	4,4'-DDE	**69 µg/Kg**	4.1 ND µg/Kg	16.8 × RL	1.42 µg/Kg	6.75 µg/Kg
	4,4'-DDT	**300 µg/Kg**	4.1 ND µg/Kg	73.1 × RL	1.19 µg/Kg	4.77 µg/Kg
	Alpha Chlordane [1]	**49 µg/Kg**	4.1 ND µg/Kg	12.0 × RL	4.5 µg/Kg	8.9 µg/Kg
	Gamma Chlordane [1]	**47 µg/Kg**	4.1 ND µg/Kg	11.5 × RL	4.5 µg/Kg	8.9 µg/Kg
	INORGANICS					
	Calcium	12,000 mg/Kg	2,000 mg/Kg	6.0 × Ref	NL	NL
	Lead [†]	**65 mg/Kg**	NA	NA	35 mg/Kg	91.3 mg/Kg
	Magnesium	3,800 mg/Kg	1,000 mg/Kg	3.8 × Ref	NL	NL

Table 12

Summary of Analytical Results
Sediment Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration		Reference Concentration			Comments	NOAA SQuiRT TEL Value		NOAA SQuiRT PEL Value	
SD-07	**PESTICIDE/PCBs**										
	4,4'-DDD	**14**	**µg/Kg**	4.1	ND	µg/Kg	3.4 × RL	3.54	µg/Kg	8.51	µg/Kg
	4,4'-DDE	**5.1**	**µg/Kg**	4.1	ND	µg/Kg	1.2 × RL	1.42	µg/Kg	6.75	µg/Kg
	4,4'-DDT	**5.8**	**µg/Kg**	4.1	ND	µg/Kg	1.4 × RL	1.19	µg/Kg	4.77	µg/Kg
SD-08	**VOCs**										
	1,2,4-Trimethylbenzene	990	µg/Kg	2.3	ND	µg/Kg	430.4 × RL	NL		NL	
	1,3,5-Trimethylbenzene	400	µg/Kg	2.3	ND	µg/Kg	173.9 × RL	NL		NL	
	M/P Xylene	750	µg/Kg	4.5	ND	µg/Kg	166.7 × RL	NL		NL	
	SVOCs										
	Fluoranthene	**320**	**µg/Kg**	260	ND	µg/Kg	1.2 × RL	111.0	µg/Kg	2,355	µg/Kg
	Pyrene	**280**	**µg/Kg**	260	ND	µg/Kg	1.1 × RL	53.0	µg/Kg	825	µg/Kg
	PESTICIDE/PCBs										µg/Kg
	4,4'-DDD	**160**	**µg/Kg**	4.1	ND	µg/Kg	39.0 × RL	3.54	µg/Kg	8.51	µg/Kg
	4,4'-DDE	**36**	**µg/Kg**	4.1	ND	µg/Kg	8.8 × RL	1.42	µg/Kg	6.75	µg/Kg
	4,4'-DDT	**36**	**µg/Kg**	4.1	ND	µg/Kg	8.8 × RL	1.19	µg/Kg	4.77	µg/Kg
	Alpha Chlordane [1]	**31**	**µg/Kg**	4.1	ND	µg/Kg	7.6 × RL	4.5	µg/Kg	8.9	µg/Kg
	Gamma Chlordane [1]	**24**	**µg/Kg**	4.1	ND	µg/Kg	5.9 × RL	4.5	µg/Kg	8.9	µg/Kg
	Aroclor-1254	**430**	**µg/Kg**	83	ND	µg/Kg	5.2 × RL	60	µg/Kg	340	µg/Kg
	Aroclor-1260 [2]	**89**	**µg/Kg**	83	ND	µg/Kg	1.1 × RL	34.1	µg/Kg	277	µg/Kg
	INORGANICS										
	Arsenic	**27**	**mg/Kg**	3.0	ND	mg/Kg	9.0 × RL	5.9	mg/Kg	17	mg/Kg
	Calcium	6,500	mg/Kg	2,000		mg/Kg	3.3 × Ref	NL		NL	

Table 12

Summary of Analytical Results
Sediment Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	NOAA SQuiRT TEL Value	NOAA SQuiRT PEL Value
SD-08 (Concluded)	**INORGANICS (Concluded)**					
	Copper	**580 mg/Kg**	27 mg/Kg	21.5 × Ref	35.7 mg/Kg	197 mg/Kg
	Iron	42,000 mg/Kg	7,000 mg/Kg	6.0 × Ref	NL	NL
	Lead †	**72 mg/Kg**	NA	NA	35 mg/Kg	91.3 mg/Kg
	Magnesium	3,500 mg/Kg	1,000 mg/Kg	3.5 × Ref	NL	NL
	Manganese	880 mg/Kg	110 mg/Kg	8.0 × Ref	NL	NL
	Mercury †	**0.23 mg/Kg**	NA	NA	0.174 mg/Kg	0.486 mg/Kg
	Nickel †	**27 mg/Kg**	NA	NA	18 mg/Kg	36 mg/Kg
	Vanadium	63 mg/Kg	18 mg/Kg	3.5 × Ref	NL	NL
	Zinc	**360 mg/Kg**	38 mg/Kg	9.5 × Ref	123 mg/Kg	315 mg/Kg
SD-09	**PESTICIDE/PCBs**					
	4,4'-DDD	**5.6 µg/Kg**	4.1 ND µg/Kg	1.4 × RL	3.54 µg/Kg	8.51 µg/Kg
	4,4'-DDE †	**2.4 µg/Kg**	NA	NA	1.42 µg/Kg	6.75 µg/Kg
	4,4'-DDT	**8.6 µg/Kg**	4.1 ND µg/Kg	2.1 × RL	1.19 µg/Kg	4.47 µg/Kg
SD-10	**VOCs**					
	Carbon Disulfide	26 µg/Kg	1.9 µg/Kg	13.7 × Ref	NL	NL
	PESTICIDE/PCBs					
	4,4'-DDD	**9 µg/Kg**	4.1 ND µg/Kg	2.2 × RL	3.54 µg/Kg	8.51 µg/Kg
	4,4'-DDE	**4.4 µg/Kg**	4.1 ND µg/Kg	1.1 × RL	1.42 µg/Kg	6.75 µg/Kg
	4,4'-DDT	**17 µg/Kg**	4.1 ND µg/Kg	4.1 × RL	1.19 µg/Kg	4.47 µg/Kg

Table 12

Summary of Analytical Results
Sediment Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration		Reference Concentration			Comments	NOAA SQuiRT TEL Value		NOAA SQuiRT PEL Value	
SD-11	**SVOCs**										
	Fluoranthene	**310**	**µg/Kg**	260	ND	µg/Kg	1.2 × RL	111.0	µg/Kg	2,355	µg/Kg
	Phenanthrene †	**150**	**µg/Kg**		NA		NA	41.9	µg/Kg	515	µg/Kg
	Pyrene †	**210**	**µg/Kg**		NA		NA	53	µg/Kg	825	µg/Kg
	PESTICIDE/PCBs										
	4,4'-DDT	**4.9**	**µg/Kg**	4.1	ND	µg/Kg	1.2 × RL	1.19	µg/Kg	4.47	µg/Kg
SD-12	**SVOCs**										
	Benzo(a)antrhacene †	**150**	**µg/Kg**		NA		NA	31.7	µg/Kg	385	µg/Kg
	Benzo(a)pyrene †	**150**	**µg/Kg**		NA		NA	31.9	µg/Kg	782	µg/Kg
	Chrysene †	**160**	**µg/Kg**		NA		NA	57.1	µg/Kg	862	µg/Kg
	Fluoranthene	**370**	**µg/Kg**	260	ND	µg/Kg	1.4 × RL	111.0	µg/Kg	2,355	µg/Kg
	Phenanthrene †	**140**	**µg/Kg**		NA		NA	41.9	µg/Kg	515	µg/Kg
	Pyrene	**270**	**µg/Kg**	260	ND	µg/Kg	1.0 × RL	53	µg/Kg	825	µg/Kg
	PESTICIDE/PCBs										
	4,4'-DDD	**9.8**	**µg/Kg**	4.1	ND	µg/Kg	2.4 × RL	3.54	µg/Kg	8.51	µg/Kg
	4,4'-DDE †	**3.5**	**µg/Kg**		NA		NA	1.42	µg/Kg	6.75	µg/Kg
	4,4'-DDT	**4.3**	**µg/Kg**	4.1	ND	µg/Kg	1.0 × RL	1.19	µg/Kg	4.47	µg/Kg
	INORGANICS										
	Manganese	380	mg/Kg	110		mg/Kg	3.5 × Ref	NL		NL	

Table 12

Summary of Analytical Results
Sediment Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	NOAA SQuiRT TEL Value	NOAA SQuiRT PEL Value
SD-13	**SVOCs**					
	Fluoranthene †	**220 µg/Kg**	NA	NA	111.0 µg/Kg	2,355 µg/Kg
	Pyrene †	**150 µg/Kg**	NA	NA	53 µg/Kg	825 µg/Kg
	PESTICIDE/PCBs					
	4,4'-DDD	**5.4 µg/Kg**	4.1 ND µg/Kg	1.3 × RL	3.54 µg/Kg	8.51 µg/Kg
	4,4'-DDE	**6.5 µg/Kg**	4.1 ND µg/Kg	1.6 × RL	1.42 µg/Kg	6.75 µg/Kg
	4,4'-DDT	**21 µg/Kg**	4.1 ND µg/Kg	5.1 × RL	1.19 µg/Kg	4.47 µg/Kg
SD-14	**SVOCs**					
	Benzo(a)anthracene	**690 µg/Kg**	260 ND µg/Kg	2.7 × RL	31.7 µg/Kg	385 µg/Kg
	Benzo(a)pyrene	**750 µg/Kg**	260 ND µg/Kg	2.9 × RL	31.9 µg/Kg	782 µg/Kg
	Benzo(b)fluoranthene	680 µg/Kg	260 ND µg/Kg	2.6 × RL	NL	NL
	Benzo(g,h,i)perylene	510 µg/Kg	260 ND µg/Kg	2.0 × RL	NL	NL
	Benzo(k)fluoranthene	690 µg/Kg	260 ND µg/Kg	2.7 × RL	NL	NL
	Chrysene	**820 µg/Kg**	260 ND µg/Kg	3.2 × RL	57.1 µg/Kg	862 µg/Kg
	Fluoranthene	**1,800 µg/Kg**	260 ND µg/Kg	6.9 × RL	111 µg/Kg	2,355 µg/Kg
	Indeno(1,2,3-cd)pyrene	470 µg/Kg	260 ND µg/Kg	1.8 × RL	NL	NL
	Phenanthrene	**850 µg/Kg**	260 ND µg/Kg	3.3 × RL	41.9 µg/Kg	515 µg/Kg
	Pyrene	**1,500 µg/Kg**	260 ND µg/Kg	5.8 × RL	53 µg/Kg	825 µg/Kg
	PESTICIDE/PCBs					µg/Kg
	4,4'-DDD	**660 µg/Kg**	4.1 ND µg/Kg	161.0 × RL	3.54 µg/Kg	8.51 µg/Kg
	4,4'-DDE	**110 µg/Kg**	4.1 ND µg/Kg	26.8 × RL	1.42 µg/Kg	6.75 µg/Kg
	4,4'-DDT	**140 µg/Kg**	4.1 ND µg/Kg	34.1 × RL	1.19 µg/Kg	4.47 µg/Kg
	Alpha Chlordane [1]	**54 µg/Kg**	4.1 ND µg/Kg	13.2 × RL	4.5 µg/Kg	8.9 µg/Kg
	Gamma Chlordane [1]	**42 P µg/Kg**	4.1 ND µg/Kg	10.2 × RL	4.5 µg/Kg	8.9 µg/Kg

Table 12

Summary of Analytical Results
Sediment Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	NOAA SQuiRT TEL Value	NOAA SQuiRT PEL Value
SD-14 (Concluded)	**PESTICIDE/PCBs (Concluded)**					
	Aroclor-1254	**290 µg/Kg**	83 ND µg/Kg	3.5 × RL	60 µg/Kg	340 µg/Kg
	Aroclor-1260 [2]	**180 µg/Kg**	83 ND µg/Kg	2.2 × RL	34.1 µg/Kg	277 µg/Kg
	INORGANICS					
	Copper	**83 mg/Kg**	27 mg/Kg	3.1 × Ref	35.7 mg/Kg	197 mg/Kg
	Lead	**260 mg/Kg**	34 mg/Kg	7.6 × RL	35 mg/Kg	91.3 mg/Kg
	Magnesium	5,200 mg/Kg	1,000 mg/Kg	5.2 × Ref	NL	NL
	Mercury [†]	**0.34 mg/Kg**	NA	NA	0.174 mg/Kg	0.486 mg/Kg
	Nickel [†]	**27 mg/Kg**	NA	NA	18 mg/Kg	36 mg/Kg
	Zinc	**210 mg/Kg**	38 mg/Kg	5.5 × Ref	123 mg/Kg	315 mg/Kg
SD-15	**SVOCs**					
	Benzo(a)anthracene	**420 µg/Kg**	260 ND µg/Kg	1.6 × RL	31.7 µg/Kg	385 µg/Kg
	Benzo(a)pyrene	**490 µg/Kg**	260 ND µg/Kg	1.9 × RL	31.9 µg/Kg	782 µg/Kg
	Benzo(b)fluoranthene	390 µg/Kg	260 ND µg/Kg	1.5 × RL	NL	NL
	Benzo(g,h,i)perylene	350 µg/Kg	260 ND µg/Kg	1.3 × RL	NL	NL
	Benzo(k)fluoranthene	350 µg/Kg	260 ND µg/Kg	1.3 × RL	NL	NL
	Chrysene	**470 µg/Kg**	260 ND µg/Kg	1.8 × RL	57.1 µg/Kg	862 µg/Kg
	Fluoranthene	**1,100 µg/Kg**	260 ND µg/Kg	4.2 × RL	111 µg/Kg	2,355 µg/Kg
	Indeno(1,2,3-cd)pyrene	310 µg/Kg	260 ND µg/Kg	1.2 × RL	NL	NL
	Phenanthrene	**510 µg/Kg**	260 ND µg/Kg	2.0 × RL	41.9 µg/Kg	515 µg/Kg
	Pyrene	**850 µg/Kg**	260 ND µg/Kg	3.3 × RL	53 µg/Kg	825 µg/Kg

Table 12

Summary of Analytical Results
Sediment Sample Analysis for Scofieldtown Road Park (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	NOAA SQuiRT TEL Value	NOAA SQuiRT PEL Value
SD-15 (Concluded)	**PESTICIDE/PCBs**					
	4,4'-DDD	**29 µg/Kg**	4.1 ND µg/Kg	7.1 × RL	3.54 µg/Kg	8.51 µg/Kg
	4,4'-DDE	**16 µg/Kg**	4.1 ND µg/Kg	3.9 × RL	1.42 µg/Kg	6.75 µg/Kg
	4,4'-DDT	**11 µg/Kg**	4.1 ND µg/Kg	2.7 × RL	1.19 µg/Kg	4.47 µg/Kg
	Alpha Chlordane [1]	**4.9 µg/Kg**	4.1 ND µg/Kg	1.2 × RL	4.5 µg/Kg	8.9 µg/Kg
	Dieldrin	**4.4 µg/Kg**	4.1 ND µg/Kg	1.1 × RL	2.85 µg/Kg	6.67 µg/Kg
	Gamma Chlordane [1]	**4.5 P µg/Kg**	4.1 ND µg/Kg	1.1 × RL	4.5 µg/Kg	8.9 µg/Kg
	INORGANICS					
	Copper [†]	**76 mg/Kg**	NA	NA	35.7 mg/Kg	197 mg/Kg
	Lead [†]	**53 mg/Kg**	NA	NA	35 mg/Kg	91.3 mg/Kg
SD-16	**INORGANICS**					
	Mercury [†]	**0.20 mg/kg**	NA	NA	0.174 mg/Kg	0.486 mg/Kg
SD-17	**PESTICIDE/PCBs**					
	4,4'-DDD [†]	**31 µg/Kg**	NA	NA	3.54 µg/Kg	8.51 µg/Kg
	4,4'-DDE [†]	**21 µg/Kg**	NA	NA	1.42 µg/Kg	6.75 µg/Kg
	INORGANICS					
	Cadmium [†]	**1.1 mg/Kg**	NA	NA	0.596 mg/Kg	3.53 mg/Kg
	Copper [†]	**36 mg/Kg**	NA	NA	35.7 mg/Kg	197 mg/Kg
	Lead [†]	**71 mg/Kg**	NA	NA	35 mg/Kg	91.3 mg/Kg
	Mercury [†]	**0.31 mg/Kg**	NA	NA	0.174 mg/Kg	0.486 mg/Kg

Table 12

Summary of Analytical Results
Sediment Sample Analysis for Scofieldtown Road Park (Concluded)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments	NOAA SQuiRT TEL Value	NOAA SQuiRT PEL Value
SD-18	**INORGANICS**					
	Mercury †	**0.21 mg/Kg**	NA	NA	0.174 mg/Kg	0.486 mg/Kg

Notes: START has reported the data as it was received from the EPA OEME Laboratory. START has not performed data validation of the EPA OEME Laboratory data. An internal data review was performed by EPA OEME Laboratory personnel prior to submittal to the EPA COR. EPA OEME Laboratory Data Qualifiers, defined by the EPA OEME Laboratory in the Project's Laboratory Reports, are listed below.

Bolded values indicate the organic compound or inorganic element was detected at a concentration equal to or greater than its respective NOAA SQuiRTs TEL and/or PEL values for freshwater sediment.

† Indicates an organic compound or inorganic element that was detected at concentrations exceeding NOAA SQuiRTs TEL and/or PEL values for freshwater sediment, but not at concentrations exceeding reference criteria.

[1] Indicates the NOAA SQuiRTs TEL and PEL for total chlordane is listed, as a standard for individual alpha and gamma chlordane does not exist.

[2] Indicates the NOAA SQuiRTs TEL and PEL for polychlorinated biphenyls (sum) is listed, as a standard for individual aroclors does not exist.

Ref	=	Reference value.	VOCs	=	Volatile Organic Compounds.
NA	=	Not Applicable.	RL	=	Reporting Limit.
TEL	=	Threshold Effects Level.	PEL	=	Probable Effects Level.
NOAA	=	National Oceanic and Administration.	µg/Kg	=	Micrograms per kilogram [equivalent to parts per billion (ppb)].
SQuiRTs	=	Screening Quick Reference Tables.	mg/Kg	=	Milligrams per kilogram [equivalent to parts per million (ppm)].
SVOCs	=	Semivolatile Organic Compounds.	PCBs	=	Polychlorinated Biphenyls.

ND = Indicates the organic compound or inorganic element was analyzed for, but was not detected above the reporting limit. The associated value is the reporting limit.

B = Indicates the organic compound or inorganic element is an estimated value because the analyte is associated with contamination detected in the laboratory or trip blank.

L = Indicates the organic compound is an estimated value because the analyte is below the calibration range.

P = Indicates the organic compound in which the confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.

NL = Not Listed. No NOAA SQuiRTs TEL or PEL values for freshwater sediment exist for this organic compound or inorganic element.

[90; 100, pp. 15-31; 127-133]

Table 13 summarizes the population within 4 radial miles of the Scofieldtown Road Park property.

Table 13

Estimated Population Within 4 Radial Miles of Scofieldtown Road Park

Radial Distance from the Scofieldtown Road Park (miles)	Estimated Population
On a Source	2 *
> 0.00 to 0.25	208
> 0.25 to 0.50	639
> 0.50 to 1.00	2,205
> 1.00 to 2.00	7,700
> 2.00 to 3.00	10,922
> 3.00 to 4.00	22,064
TOTAL	43,740

* Includes two on-site workers.

[77]

Approximately 985.5 acres of wetlands, a CWA-protected water body, one Federal-listed threatened species habitat, and one State-listed endangered species habitat are located within 4 radial miles of the Scofieldtown Road Park property [82; 98]. Table 14 summarizes sensitive environments located within 4 radial miles of the property.

Table 14

Sensitive Environments Located Within 4 Radial Miles of Scofieldtown Road Park

Radial Distance from Scofieldtown Road Park (miles)	Sensitive Environment/Species (status)
On a Source	1.97 acres of wetlands
	Clean Water Act-protected water body
> 0.00 to < 0.25	35.22 acres of wetlands
≥ 0.25 to < 0.50	21.26 acres of wetlands
≥ 0.50 to < 1.00	51.87 acres of wetlands
≥ 1.00 to < 2.00	142.31 acres of wetlands

Table 14

Sensitive Environments Located Within 4 Radial Miles of Scofieldtown Road Park (Concluded)

Radial Distance from Scofieldtown Road (miles)	Sensitive Environment/Species (status)
≥ 2.00 to < 3.00	257.63 acres of wetlands
	One Federal-listed threatened species habitat
	One State-listed endangered species habitat
≥ 3.00 to < 4.00	475.24 acres of wetlands

[82; 98]

Ambient air monitoring for personnel health and safety purposes was conducted by START during the on-site activities at the Scofieldtown Road Park property using a photoionization detector (PID), flame ionization detector (FID), radiation meter, and a combustible gas indicator/oxygen meter (CGI/O_2). No readings above background levels were detected [100, pp. 3-10].

START did not conduct Air Pathway sampling as part of this SR. No quantitative or qualitative laboratory air samples are known to have been collected in association with the Scofieldtown Road Park property to date. As a result, a release of hazardous substances to the ambient air from on-site sources has not been documented. No impacts to nearby residential populations, on-site workers, or sensitive environments are known or suspected.

SUMMARY

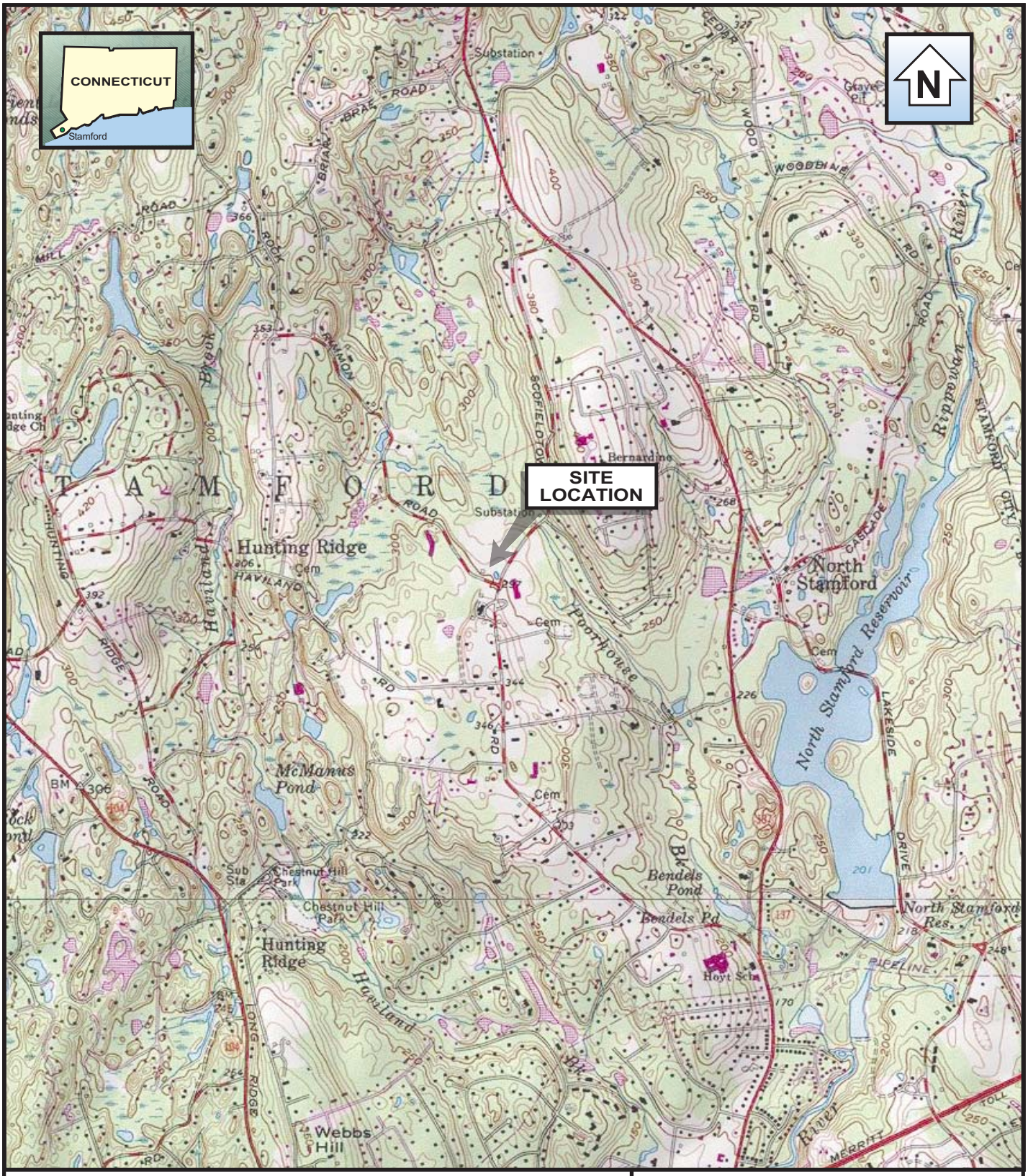
The Scofieldtown Road Park property is located at 612 Scofieldtown Road, in Stamford, Fairfield County, Connecticut (CT). The geographical coordinates of the property, as measured from its approximate center, are 41° 08′ 22.6″ north latitude and 73° 33′ 34.2″ west longitude. The Scofieldtown Road Park property consists of approximately 18.1 acres of land, and is identified by the City of Stamford, CT Tax Assessor's Parcel Identification Number (No.) 002-5936, as Block No. 0390, and Lot No. 15. The property is currently owned by the City of Stamford, CT. The Scofieldtown Road Park property is currently operated by the City of Stamford, CT and consists of a recycling and leaf composting facility as well as a public recreation park. Both operations lie atop a former landfill that operated on the property. The landfill is estimated to have encompassed 10 to 18 acres with a maximum waste depth ranging from 10 to 30 feet.

As of January 2007, the Scofieldtown Road Park property consisted of a former landfill area (currently the recycling and composting area and park area), which is covered with pavement millings to form a flat surface. Piles of composting leaves, asphalt millings, and fill material lie atop the former landfill. In addition, a salt hut and office trailer are present on the northern portion of the property. A steep slope exists along the northern border of the former landfill. An unnamed stream flows west to east along the northern border of the former landfill and property.

APPENDIX E

FIGURES AND TABLES FROM TRC 2010 REPORT

FIGURES



0 2000
SCALE FEET

0 1
SCALE MILE

1:24000

BASE CREATED WITH TOPO™ © 1996 WILDFLOWERS PRODUCTIONS,
www.topo.com 7.5' USGS TOPOGRAPHIC MAP

TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

SCOFIELD PARK
STAMFORD, CONNECTICUT

FIGURE 1
AREA LOCATION MAP

Date: 01/10 | **Project No.** 168936.0000.000000

PERS/JWALESZCZYK/HAZ 168936 STAMFORD TOPO.FH10

Legend

- Landfill Extents
- Stream/River
- Park Boundary

N

0 150 300 600 Feet

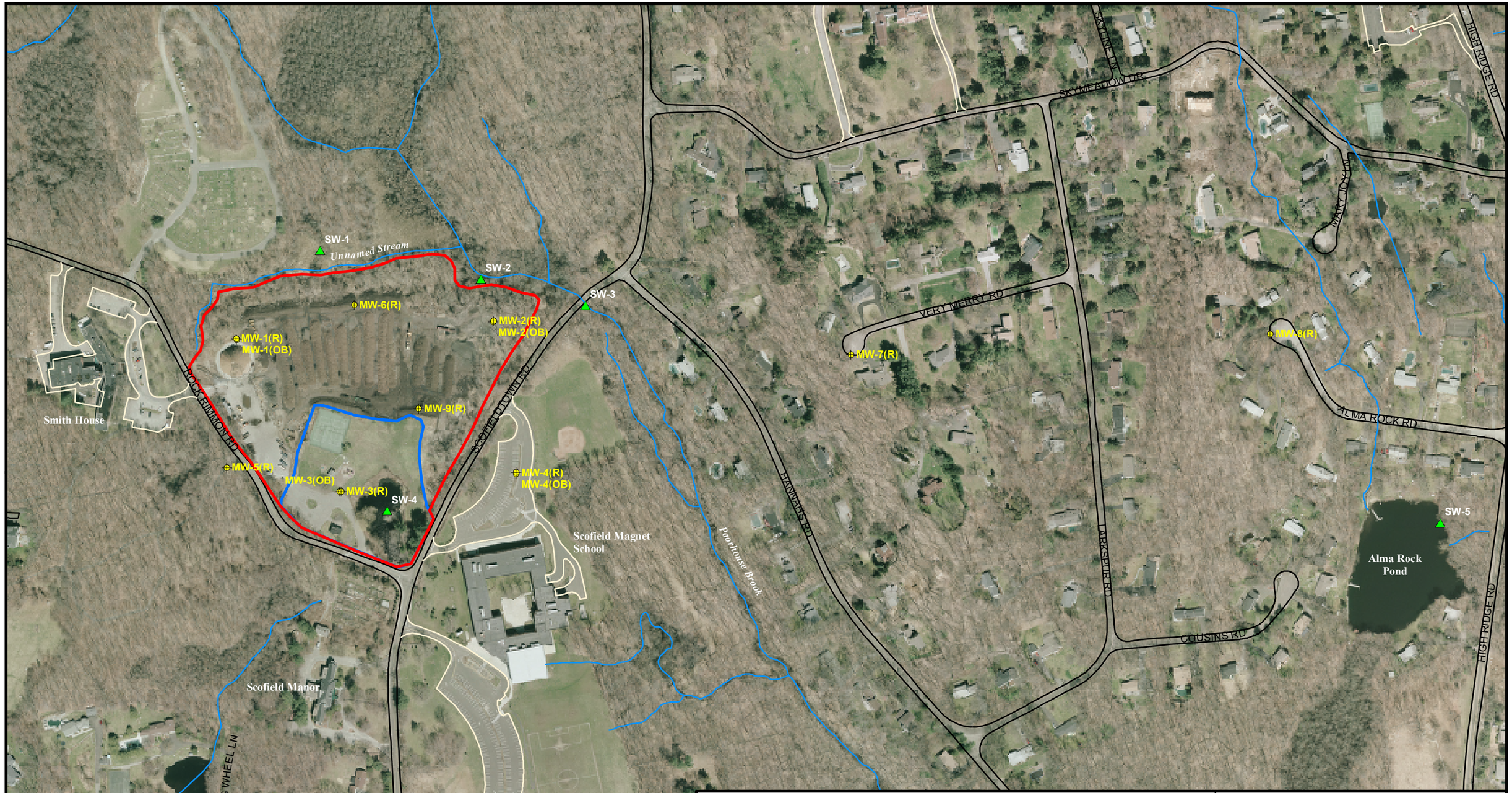
Base map data layers provided by City of Stamford GIS Deptartment.
Aerial photograph from 2005.
Figure to be used for display purposes only.

21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

SCOFIELDTOWN PARK
STAMFORD, CONNECTICUT

Figure 2
Site Location Map

Figure: 2	Date: 1/28/2010	Project No: 168936.0000.0000



Legend

- Surface Water Sample Location
- Monitoring Well Location
- Landfill Extents
- Stream/River
- Park Boundary

N

0 150 300 600 Feet

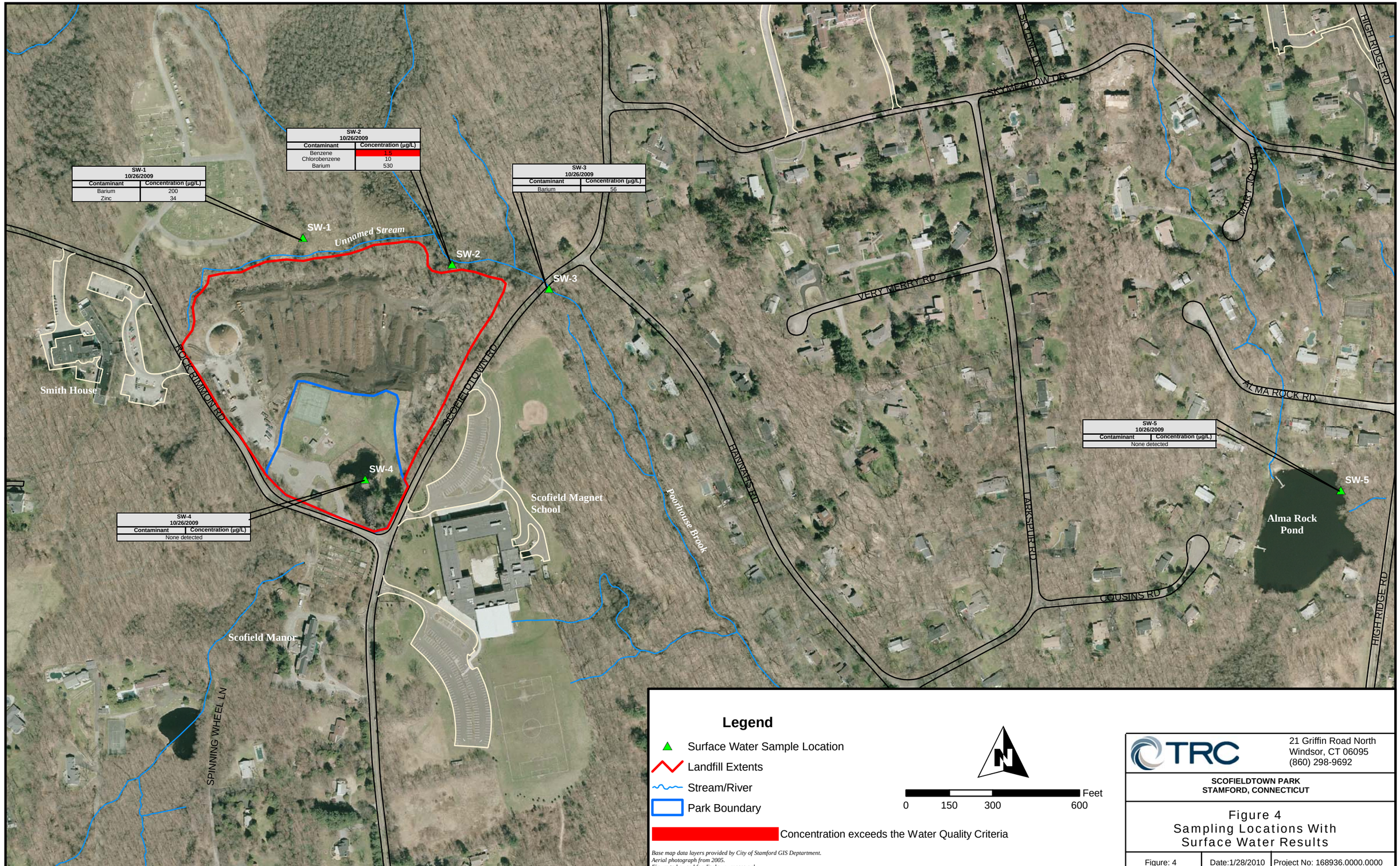
Base map data layers provided by City of Stamford GIS Deptartment.
Aerial photograph from 2005.
Figure to be used for display purposes only.

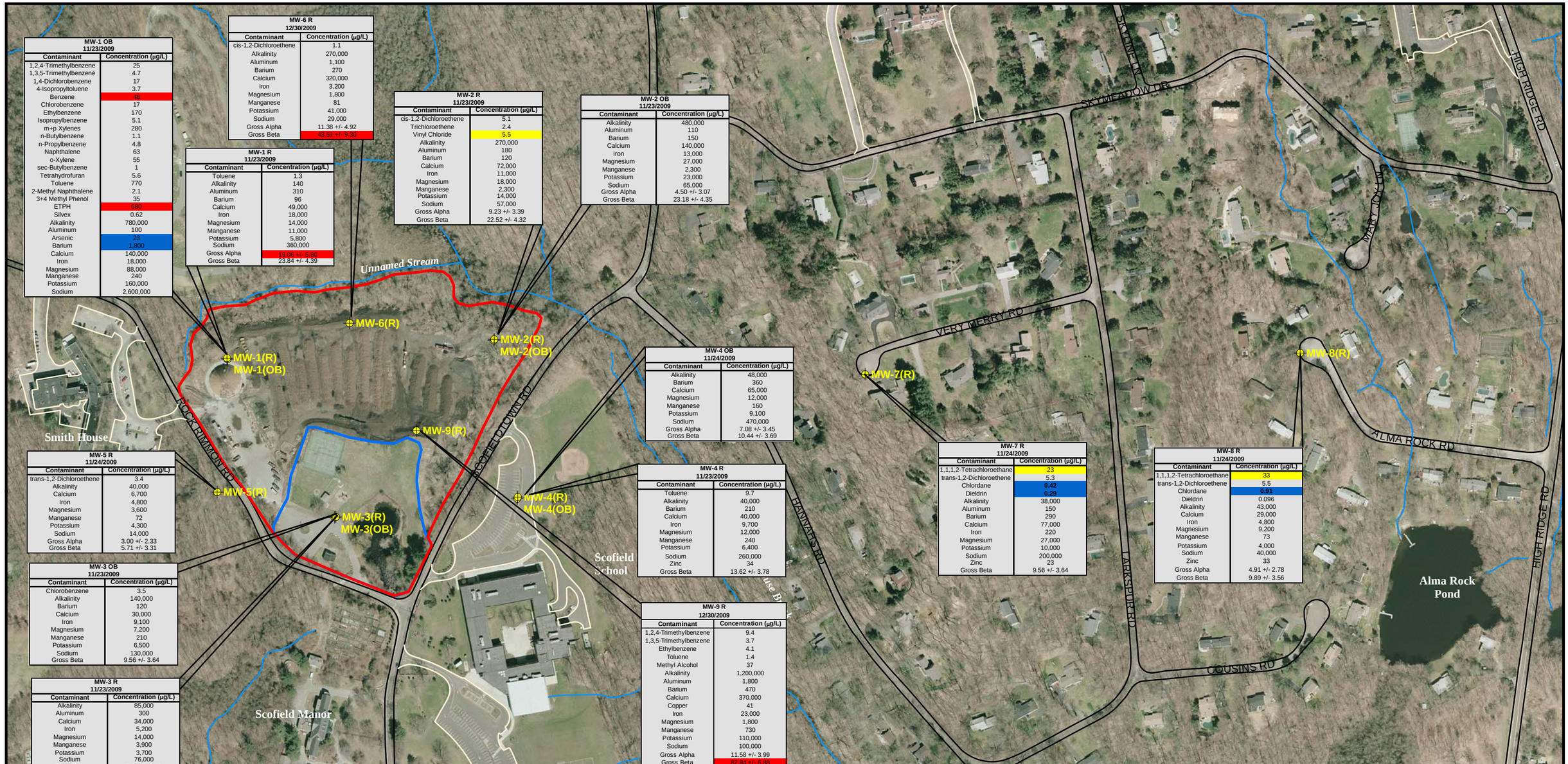
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

SCOFIELDTOWN PARK
STAMFORD, CONNECTICUT

Figure 3
Sampling Location Map

Figure: 3	Date: 1/28/2010	Project No: 168936.0000.0000


SW-1
10/26/2009
Contaminant | Concentration (µg/L)
Barium | 200
Zinc | 34
SW-2
10/26/2009
Contaminant | Concentration (µg/L)
Benzene | 15
Chlorobenzene | 10
Barium | 530
SW-3
10/26/2009
Contaminant | Concentration (µg/L)
Barium | 56
SW-4
10/26/2009
Contaminant | Concentration (µg/L)
None detected
SW-5
10/26/2009
Contaminant | Concentration (µg/L)
None detected
SW-1
SW-2
SW-3
SW-4
SW-5
Unnamed Stream
Smith House
Scofield Magnet School
Scofield Manor
Alma Rock Pond
Poorhouse Brook
ROCKRIMMON RD
SCOFIELDTOWN RD
SKYLINE TR
SKYMEADOW DR
HIGH RIDGE RD
MARY JO LN
VERY MERRY RD
ALMA ROCK RD
HANNAFIN'S RD
LARKSPUR RD
COUSINS RD
SPINNING WHEEL LN
Legend
Surface Water Sample Location
Landfill Extents
Stream/River
Park Boundary
Concentration exceeds the Water Quality Criteria
N
0
150
300
600
Feet
Base map data layers provided by City of Stamford GIS Deptartment.
Aerial photograph from 2005.
Figure to be used for display purposes only.
TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692
SCOFIELDTOWN PARK
STAMFORD, CONNECTICUT
Figure 4
Sampling Locations With
Surface Water Results
Figure: 4
Date:1/28/2010
Project No: 168936.0000.0000



MW-1 OB 11/23/2009

Contaminant	Concentration (µg/L)
1,2,4-Trimethylbenzene	25
1,3,5-Trimethylbenzene	4.7
1,4-Dichlorobenzene	17
4-Isopropyltoluene	3.7
Benzene	49
Chlorobenzene	17
Ethylbenzene	170
Isopropylbenzene	5.1
m+p Xylenes	280
n-Butylbenzene	1.1
n-Propylbenzene	4.8
Naphthalene	63
o-Xylene	55
sec-Butylbenzene	1
Tetrahydrofuran	5.6
Toluene	770
2-Methyl Naphthalene	2.1
3+4 Methyl Phenol	35
ETPH	684
Silvex	0.62
Alkalinity	780,000
Aluminum	100
Arsenic	23
Barium	1,800
Calcium	140,000
Iron	18,000
Magnesium	88,000
Manganese	240
Potassium	160,000
Sodium	2,600,000

MW-6 R 12/30/2009

Contaminant	Concentration (µg/L)
cis-1,2-Dichloroethene	1.1
Alkalinity	270,000
Aluminum	1,100
Barium	270
Calcium	320,000
Iron	3,200
Magnesium	1,800
Manganese	81
Potassium	41,000
Sodium	29,000
Gross Alpha	11.38 +/- 4.92
Gross Beta	48.51 +/- 9.30

MW-1 R 11/23/2009

Contaminant	Concentration (µg/L)
Toluene	1.3
Alkalinity	140
Aluminum	310
Barium	96
Calcium	49,000
Iron	18,000
Magnesium	14,000
Manganese	11,000
Potassium	5,800
Sodium	360,000
Gross Alpha	19.06 +/- 5.80
Gross Beta	23.84 +/- 4.39

MW-2 R 11/23/2009

Contaminant	Concentration (µg/L)
cis-1,2-Dichloroethene	5.1
Trichloroethene	2.4
Vinyl Chloride	5.5
Alkalinity	270,000
Aluminum	180
Barium	120
Calcium	72,000
Iron	11,000
Magnesium	18,000
Manganese	2,300
Potassium	14,000
Sodium	57,000
Gross Alpha	9.23 +/- 3.39
Gross Beta	22.52 +/- 4.32

MW-2 OB 11/23/2009

Contaminant	Concentration (µg/L)
Alkalinity	480,000
Aluminum	110
Barium	150
Calcium	140,000
Iron	13,000
Magnesium	27,000
Manganese	2,300
Potassium	23,000
Sodium	65,000
Gross Alpha	4.50 +/- 3.07
Gross Beta	23.18 +/- 4.35

MW-4 OB 11/24/2009

Contaminant	Concentration (µg/L)
Alkalinity	48,000
Barium	360
Calcium	65,000
Magnesium	12,000
Manganese	160
Potassium	9,100
Sodium	470,000
Gross Alpha	7.08 +/- 3.45
Gross Beta	10.44 +/- 3.69

MW-4 R 11/23/2009

Contaminant	Concentration (µg/L)
Toluene	9.7
Alkalinity	40,000
Barium	210
Calcium	40,000
Iron	9,700
Magnesium	12,000
Manganese	240
Potassium	6,400
Sodium	260,000
Zinc	34
Gross Beta	13.62 +/- 3.78

MW-9 R 12/30/2009

Contaminant	Concentration (µg/L)
1,2,4-Trimethylbenzene	9.4
1,3,5-Trimethylbenzene	3.7
Ethylbenzene	4.1
Toluene	1.4
Methyl Alcohol	37
Alkalinity	1,200,000
Aluminum	1,800
Barium	470
Calcium	370,000
Copper	41
Iron	23,000
Magnesium	1,800
Manganese	730
Potassium	110,000
Sodium	100,000
Gross Alpha	11.58 +/- 3.99
Gross Beta	82.84 +/- 6.88

MW-7 R 11/24/2009

Contaminant	Concentration (µg/L)
1,1,1,2-Tetrachloroethane	23
trans-1,2-Dichloroethene	5.3
Chlordane	0.42
Dieldrin	0.29
Alkalinity	38,000
Aluminum	150
Barium	290
Calcium	77,000
Iron	220
Magnesium	27,000
Potassium	10,000
Sodium	200,000
Zinc	23
Gross Beta	9.56 +/- 3.64

MW-8 R 11/24/2009

Contaminant	Concentration (µg/L)
1,1,1,2-Tetrachloroethane	33
trans-1,2-Dichloroethene	5.5
Chlordane	0.91
Dieldrin	0.096
Alkalinity	43,000
Calcium	29,000
Iron	4,800
Magnesium	9,200
Manganese	73
Potassium	4,000
Sodium	40,000
Zinc	33
Gross Alpha	4.91 +/- 2.78
Gross Beta	9.89 +/- 3.56

MW-5 R 11/24/2009

Contaminant	Concentration (µg/L)
trans-1,2-Dichloroethene	3.4
Alkalinity	40,000
Calcium	6,700
Iron	4,800
Magnesium	3,600
Manganese	72
Potassium	4,300
Sodium	14,000
Gross Alpha	3.00 +/- 2.33
Gross Beta	5.71 +/- 3.31

MW-3 OB 11/23/2009

Contaminant	Concentration (µg/L)
Chlorobenzene	3.5
Alkalinity	140,000
Barium	120
Calcium	30,000
Iron	9,100
Magnesium	7,200
Manganese	210
Potassium	6,500
Sodium	130,000
Gross Beta	9.56 +/- 3.64

MW-3 R 11/23/2009

Contaminant	Concentration (µg/L)
Alkalinity	85,000
Aluminum	300
Calcium	34,000
Iron	5,200
Magnesium	14,000
Manganese	3,900
Potassium	3,700
Sodium	76,000
Gross Beta	6.81 +/- 3.38

Legend

- Monitoring Well Location
- Landfill Extents
- Stream/River
- Park Boundary

N

0 150 300 600 Feet

- Concentration exceeds the GWPC or USEPA Drinking Water MCL*
- Concentration exceeds the GWPC and GWVC
- Concentration exceeds both the GWPC and the SWPC
- 500 Concentration exceeds the GWVC

Base map data layers provided by City of Stamford GIS Deptartment.
Aerial photograph from 2005.
Figure to be used for display purposes only.

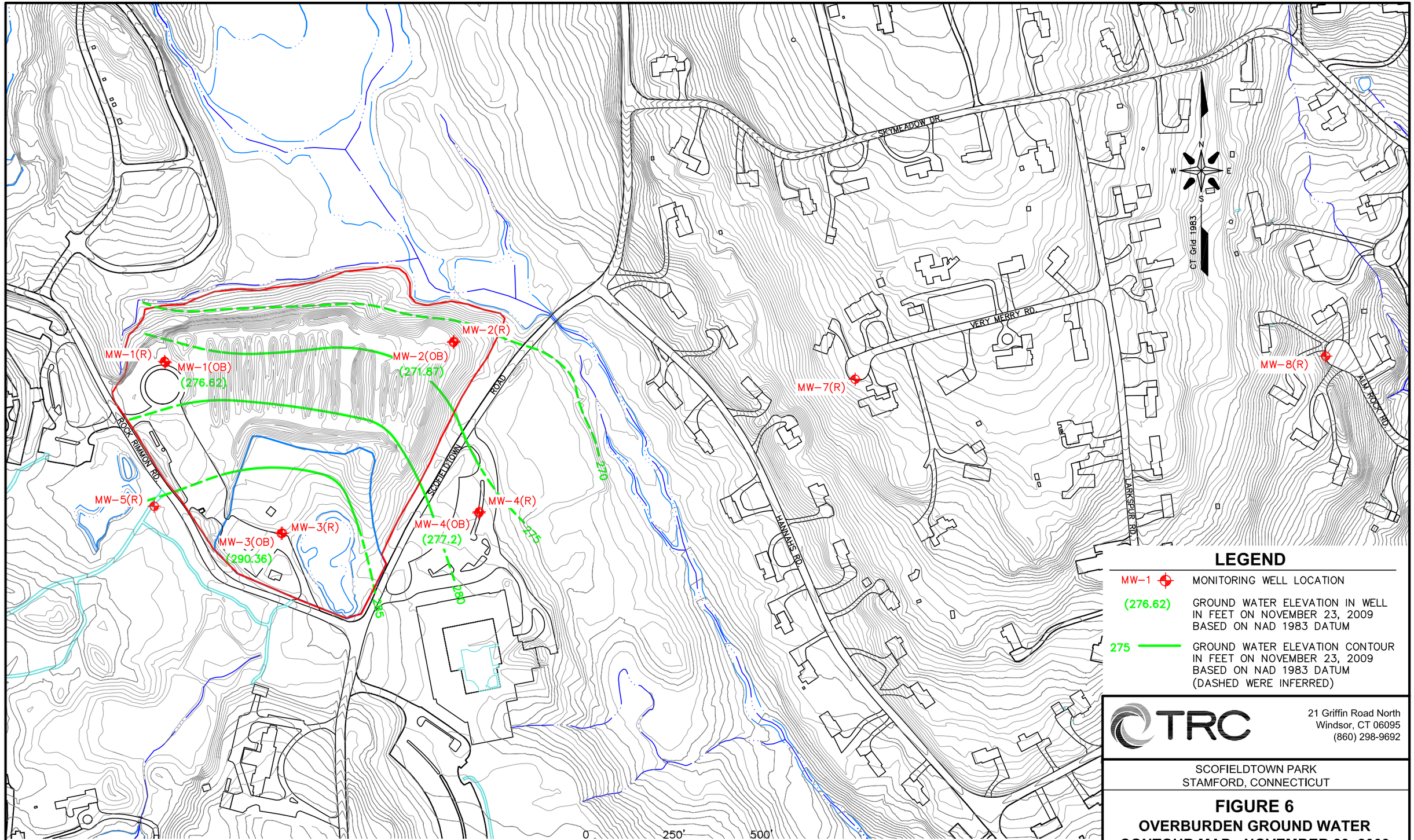
* - MCL for Gross Alpha & Beta Only

TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

SCOFIELDTOWN PARK
STAMFORD, CONNECTICUT

Figure 5
Sampling Locations With Ground Water Results

Figure: 5	Date:1/28/2010	Project No: 168936.0000.0000



LEGEND

MW-1	MONITORING WELL LOCATION
(276.62)	GROUND WATER ELEVATION IN WELL IN FEET ON NOVEMBER 23, 2009 BASED ON NAD 1983 DATUM
275	GROUND WATER ELEVATION CONTOUR IN FEET ON NOVEMBER 23, 2009 BASED ON NAD 1983 DATUM (DASHED WERE INFERRED)

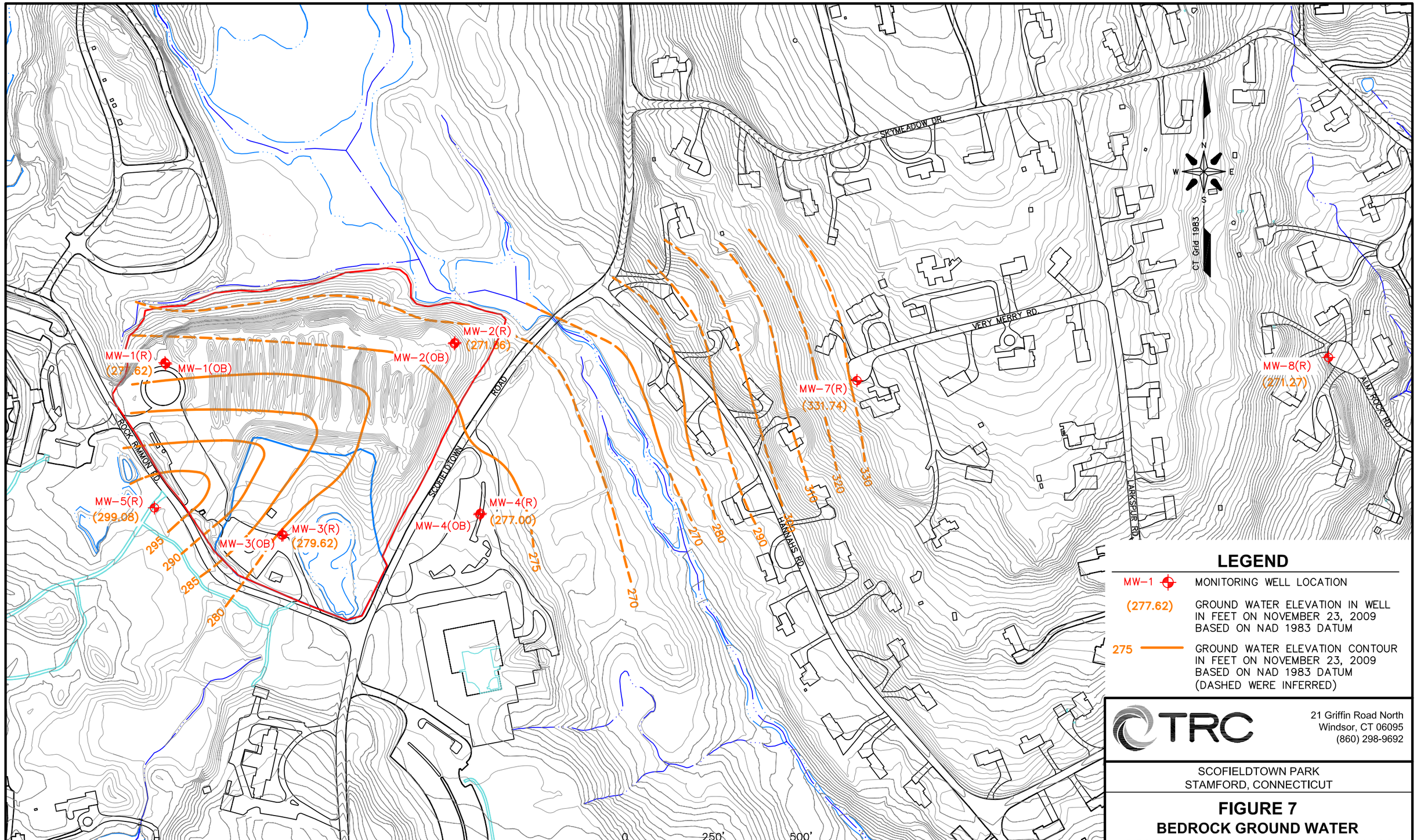
TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

SCOFIELDTOWN PARK
STAMFORD, CONNECTICUT

FIGURE 6
OVERBURDEN GROUND WATER CONTOUR MAP - NOVEMBER 23, 2009

Date: 01/28/10 | Project No. 168936-000000-000000

J:\CAD\168936\
Plate-1.dwg Layout:Figure 6 January 28, 2010-1:50PM Khollenbeck



LEGEND

MW-1	MONITORING WELL LOCATION
(277.62)	GROUND WATER ELEVATION IN WELL IN FEET ON NOVEMBER 23, 2009 BASED ON NAD 1983 DATUM
275	GROUND WATER ELEVATION CONTOUR IN FEET ON NOVEMBER 23, 2009 BASED ON NAD 1983 DATUM (DASHED WERE INFERRED)

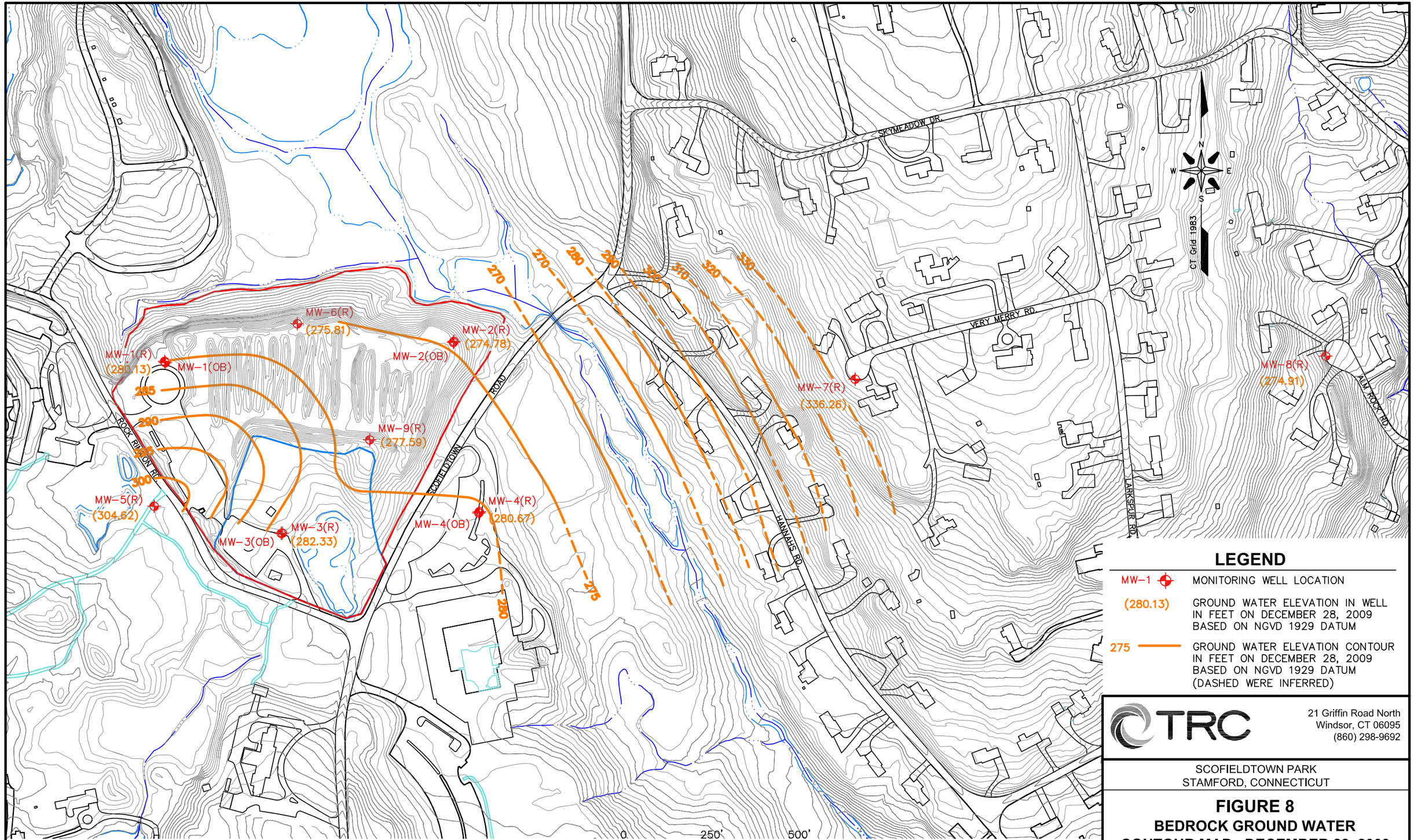
TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

SCOFIELDTOWN PARK
STAMFORD, CONNECTICUT

FIGURE 7
BEDROCK GROUND WATER CONTOUR MAP - NOVEMBER 23, 2009

Date: 01/28/10 | Project No. 168936-000000-000000

J:\CAD\168936\
Plate-1.dwg Layout:Figure 7 January 28, 2010-1:52PM Khollenbeck


SKYMEADOW DR.
VERY MERRY RD.
ROCK RIMON RD.
SCOFIELDTOWN ROAD
HANNAHS RD.
LARKSPUR RD.
ALM ROCK RD.
CT Grid 1983
N
S
E
W
MW-1(R)
(280.13)
MW-1(OB)
MW-2(R)
(274.78)
MW-2(OB)
MW-3(R)
(282.33)
MW-3(OB)
MW-4(R)
(280.67)
MW-4(OB)
MW-5(R)
(304.62)
MW-6(R)
(275.81)
MW-7(R)
(336.26)
MW-8(R)
(274.91)
MW-9(R)
(277.59)
270
280
290
300
310
320
330
275
0
250'
500'
GRAPHIC SCALE
LEGEND
MW-1 MONITORING WELL LOCATION
(280.13) GROUND WATER ELEVATION IN WELL IN FEET ON DECEMBER 28, 2009 BASED ON NGVD 1929 DATUM
275 GROUND WATER ELEVATION CONTOUR IN FEET ON DECEMBER 28, 2009 BASED ON NGVD 1929 DATUM (DASHED WERE INFERRED)
TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692
SCOFIELDTOWN PARK
STAMFORD, CONNECTICUT
FIGURE 8
BEDROCK GROUND WATER
CONTOUR MAP - DECEMBER 28, 2009
Date: 01/28/10
Project No. 168936-000000-000000
J:\CAD\168936\
Plate-1.dwg Layout:Figure 8 January 28, 2010-1:15PM Khollenbeck

TABLES

TABLE 1
SUMMARY OF SOIL SAMPLE ANALYTICAL RESULTS
Scofieldtown Park
Stamford, Connecticut

Sample Designation: Associated Well Designation: Sample Interval (ft bgs):		SB-1 MW-1 OB 25-27	SB-2 MW-2 OB 30-32	SB-3 MW-3 OB 2-4	CT RSR Criteria	
Analytes	**Units**				**RES DEC**	**GA PMC**
VOCs by EPA Method 8260			ND			
1,2,4-Trimethylbenzene	mg/kg	0.095		0.059	500	7
1,3,5-Trimethylbenzene	mg/kg	0.097		0.049	500	7
4-Isopropyltoluene	mg/kg	0.0075		0.032	500	0.6
Ethylbenzene	mg/kg	0.15			500	10.1
Isopropylbenzene	mg/kg	0.01			500	0.6
m+p Xylenes	mg/kg	0.41		0.015	500	19.5
n-Butylbenzene	mg/kg	0.013			500	1.4
n-Propylbenzene	mg/kg	0.021			500	1.4
Naphthalene	mg/kg	0.046		0.079	1000	5.6
o-Xylene	mg/kg	0.034		0.017	500	19.5
sec-Butylbenzene	mg/kg			0.007	500	1.4
Toluene	mg/kg	0.0092		0.0062	500	20
SVOCs by EPA Method 8270C			ND			
2-Methyl Naphthalene	mg/kg	1.6		0.63	474	0.98
Acenaphthene	mg/kg	0.45		1.3	1,000	8.4
Anthracene	mg/kg	0.47		1.9	1,000	40
Benzo[a]anthracene	mg/kg	0.9		**4.2**	1	1
Benzo[a]pyrene	mg/kg	0.81		**4**	1	1
Benzo[b]fluoranthene	mg/kg	**1.4**		**5.8**	1	1
Benzo[g,h,i]perylene	mg/kg			1.3	1,000	4.2
Benzo[k]fluoranthene	mg/kg			2.4	8.4	1
bis(2-Ethylhexyl)phthalate	mg/kg			0.95	44	1
Carbazole	mg/kg	0.93		1.8	NE	NE
Chrysene	mg/kg	1.2		4.1	84	1
Dibenz[a,h]anthracene	mg/kg			0.36	1	1
Dibenzofuran	mg/kg	0.46		0.8	270	1
Fluoranthene	mg/kg	2.3		8.1	1,000	5.6
Fluorene	mg/kg	0.69		1.5	1,000	5.6
Indeno[1,2,3-cd]pyrene	mg/kg			**1.1**	1	1
Naphthalene	mg/kg	6.1		0.76	1,000	5.6
Phenanthrene	mg/kg	3.4		6.6	1,000	4
Pyrene	mg/kg	2.8		7.2	1,000	4
CT Extractable Total Petroleum Hydrocarbons		2500				
ETPH	mg/kg	**2,800**	ND	**960**	500	500
Chlorinated Pesticides by EPA Method 8081B		ND	ND			
4,4-DDD	mg/kg			0.069	2.6	NE
Chlorinated Herbicides by EPA Method 8151A		ND	ND	ND		
PCBs by EPA Method 8082			ND	ND		
PCB-1254	mg/kg	**1.5**			1	0.005

TABLE 1 (cont)
SUMMARY OF SOIL SAMPLE ANALYTICAL RESULTS
Scofieldtown Park
Stamford, Connecticut

Sample Designation: Associated Well Designation: Sample Interval (ft bgs):		SB-1 MW-1 OB 25-27	SB-2 MW-2 OB 30-32	SB-3 MW-3 OB 2-4	CT RSR Criteria	
Analytes	**Units**				**RES DEC**	**GA PMC**
Total CT RSR-15 Metals by EPA Method 200.8						
Total Mercury	mg/kg	8.8			20	
Antimony	mg/kg	13			27	
Arsenic	mg/kg	7.5		3.1	10	
Barium	mg/kg	200	53	86	4,700	
Cadmium	mg/kg	13			34	
Chromium	mg/kg	130	15	17	NE	
Copper	mg/kg	210	18	27	2,500	
Lead	mg/kg	300	9.5	63	400	
Nickel	mg/kg	63	12	9.3	1,400	
Silver	mg/kg	35			340	
Vanadium	mg/kg	36	19	20	470	
Zinc	mg/kg	470	57	100	20,000	
SPLP CT RSR-15 Metals by EPA Method 6020A			ND			
Mercury	mg/L					0.02
Antimony	mg/L	**0.019**				0.006
Arsenic	mg/L					0.01
Barium	mg/L	0.19		0.085		1
Beryllium	mg/L					0.004
Cadmium	mg/L					0.005
Chromium	mg/L					0.05
Copper	mg/L					1.3
Lead	mg/L	**0.037**				0.015
Nickel	mg/L					0.1
Selenium	mg/L					0.05
Silver	mg/L					0.036
Thallium	mg/L					0.005
Vanadium	mg/L			0.088		0.05
Zinc	mg/L	0.037				5

Notes:

1) Only constituents which were detected are included in this table.
2) mg/kg = miligrams per kilogram; mg/L = miligrams per liter
3) RES DEC = Residential Direct Exposure Criteria; GA PMC = GA Pollutant Mobility Criteria
4) Total metals concentrations are comparable to the RES DEC only; SPLP concentrations are comparable to the GA PMC.
5) NE = Not established; ND = the analyte was not detected above the method detection limit (MDL).
6) Numbers in **BOLD** indicate the detected concentration exceeds the RES DEC. Numbers that are shaded indicate the detected concentration exceeds the GA PMC. Numbers which are bold and shaded indicate the detected concentration exceeds both the RES DEC and the GA PMC.

TABLE 2
SUMMARY OF SURFACE WATER SAMPLE ANALYTICAL RESULTS
Scofieldtown Park
Stamford, Connecticut

Sample Designation: / Sample Location: / Analytes	Units	SW-1 Unnamed Stream 10/26/2009	SW-2 Unnamed Stream 10/26/2009	SW-3 Poorhouse Brook 10/26/2009	SW-4 Scofieldtown Park Pond 10/26/2009	SW-5 Alma Rock Pond 10/26/2009	CTDEP Water Quality Standards
VOCs by EPA Method 8260							
Benzene	ug/l		**1.5**				1.2
Chlorobenzene	ug/l		10				100
SVOCs by EPA Method 8270C							
SVOCs	ug/l	ND	ND	ND	ND	ND	varies by analyte
CT Extractable Total Petroleum Hydrocarbons							
CT ETPH	ug/l	ND	ND	ND	ND	ND	varies by analyte
Chlorinated Pesticides by EPA Method 8081B							
Pesticides	ug/l	ND	ND	ND	ND	ND	varies by analyte
PCBs by EPA Method 8082							
PCBs	ug/l	ND	ND	ND	ND	ND	varies by analyte
Chlorinated Herbicides by EPA Method 8151A							
Herbicides	ug/l	ND	ND	ND	ND	ND	varies by analyte
Total Metals by EPA Method 200.8							
Barium	ug/l	200	530	56			NE
Zinc	ug/l	34					9,100

Notes:
1) Only detections are shown in this table.
2) Surface water sample analytical results are compared to the Connecticut Department of Environmental Conservation (CTDEP) Water Quality Standards published on December 17, 2002. The numbers presented for comparison are the Numerical Water Quality Criteria for Chemical Constituents for the Consumption of Water and Organisms.
3) Numbers in bold are above the CTDEP Water Quality Standards.

TABLE 3
SUMMARY OF GROUND WATER SAMPLE ANALYTICAL RESULTS
Scofieldtown Park Area
Stamford, CT

Sample Designation:		TB112309	FB112309	MW-1 OB	Duplicate of MW-1 OB	MW-1 R	MW-2 OB	MW-2 R	MW-3 OB	MW-3 R	MW-4 R	MW-4 OB	MW-5 R	MW-6R	MW-7 R	MW-8 R	MW-9R			
Sample Location:				Compost Facility		Compost Facility	Compost Facility	Compost Facility	Park	Park	Middle School	Middle School	West of Rock Rimmon Road	Compost Facility	Very Merry Road	Alma Rock Road	Compost Facility			
Notes:		Trip Blank	Field Blank															CT RSR Criteria		
Analytes	Units	11/23/2009	11/23/2009	11/23/2009	11/23/2009	11/23/2009	11/23/2009	11/23/2009	11/23/2009	11/23/2009	11/23/2009	11/24/2009	11/24/2009	12/30/2009	11/24/2009	11/24/2009	12/30/2009	GWPC	SWPC	Proposed RES GWVC
VOCs by EPA Method 8260		ND	ND				ND			ND		ND								
1,1,1,2-Tetrachloroethane	ug/l														**23**	**33**		1	NE	2
1,2,4-Trimethylbenzene	ug/l			25	25												9.4	350	NE	360
1,3,5-Trimethylbenzene	ug/l			4.7	4.8												3.7	350	NE	280
1,4-Dichlorobenzene	ug/l			17	17													75	26,000	1,400
4-Isopropyltoluene	ug/l			3.7	3.5													30	NE	1,600
Benzene	ug/l			**48**	**48**													1	710	130
Chlorobenzene	ug/l			17	17				3.5									100	420,000	1,800
cis-1,2-Dichloroethene	ug/l							5.1						1.1				70	860	830
Ethylbenzene	ug/l			170	180												4.1	700	580,000	2,700
Isopropylbenzene	ug/l			5.1	5.1													30	NE	2,800
m+p Xylenes	ug/l			280	280													530	NE	8,700
n-Butylbenzene	ug/l			1.1														61	NE	1,500
n-Propylbenzene	ug/l			4.8	4.9													61	NE	NE
Naphthalene	ug/l			63	62													280	NE	NE
o-Xylene	ug/l			55	55													530	NE	8,700
sec-Butylbenzene	ug/l			1.0														61	NE	1,500
Tetrahydrofuran	ug/l			5.6	5.4													NE	NE	NE
Toluene	ug/l			770	820	1.3					9.7						1.4	1,000	4,000,000	7,100
trans-1,2-Dichloroethene	ug/l												3.4		5.3	5.5		100	NE	1,000
Trichloroethene	ug/l							2.4										5	2,340	27
Vinyl Chloride	ug/l							**5.5**										2	15,750	1.6
SVOCs by EPA Method 8270C		NA	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
2-Methyl Naphthalene	ug/l			2.1	2.0													49	NE	NE
3+4 Methyl Phenol	ug/l			35	33													NE	NE	NE
Benzyl Alcohol	ug/l				ND<20												37	NE	NE	NE
Naphthalene	ug/l			22	21													280	NE	NE
CT Extractable Total Petroleum Hydrocarbons		NA	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
ETPH	ug/l			**680**	**2,400**													100	NE	NE
Chlorinated Pesticides by EPA Method 8081B		NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND			
Chlordane	ug/l														**0.42**	**0.91**		0.3	0.3	NE
Dieldrin	ug/l														**0.29**	**0.096**		0.002	0.1	NE
Chlorinated Herbicides by EPA Method 8151A		NA	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
Silvex	ug/l			0.62	0.59													NE	NE	NE
PCBs by EPA Method 8082	ug/l		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5	0.5	NE

TABLE 3 (cont)
SUMMARY OFGROUND WATER SAMPLE ANALYTICAL RESULTS
Scofieldtown Park Area
Stamford, CT

Sample Designation: / Sample Location: / Notes: / Analytes	Units	TB112309 Trip Blank 11/23/2009	FB112309 Field Blank 11/23/2009	MW-1 OB Compost Facility 11/23/2009	Duplicate of MW-1 OB 11/23/2009	MW-1 R Compost Facility 11/23/2009	MW-2 OB Compost Facility 11/23/2009	MW-2 R Compost Facility 11/23/2009	MW-3 OB Park 11/23/2009	MW-3 R Park 11/23/2009	MW-4 R Middle School 11/23/2009	MW-4 OB Middle School 11/24/2009	MW-5 R West of Rock Rimmon Road 11/24/2009	MW-6R Compost Facility 12/30/2009	MW-7 R Very Merry Road 11/24/2009	MW-8 R Alma Rock Road 11/24/2009	MW-9R Compost Facility 12/30/2009	CT RSR Criteria GWPC	CT RSR Criteria SWPC	CT RSR Criteria Proposed RES GWVC
Alkalinity, (as $CaCO_3$)		NA	ND																	
Alkalinity	ug/l			780,000	770,000	140,000	480,000	270,000	140,000	85,000	40,000	48,000	40,000	630,000	38,000	43,000	1,200,000	NE	NE	NE
Total Cyanide																				
Cyanide	ug/l	NA	ND	ND	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200	52	NE
Total Metals by EPA Method 200.8			ND																	
Aluminum	ug/l			100	110	310	110	180		300				1,100	150		1,800	NE	NE	NE
Arsenic	ug/l			**23**	23													10	4	NE
Barium	ug/l			**1,800**	1,800	96	150	120	120		210	360		270	290		470	1,000	NE	NE
Calcium	ug/l			140,000	140,000	49,000	140,000	72,000	30,000	34,000	40,000	65,000	6,700	320,000	77,000	29,000	370,000	NE	NE	NE
Copper	ug/l				ND<40												41	1,300	48	NE
Iron	ug/l			18,000	18,000	18,000	13,000	11,000	9,100	5,200	9,700		4,800	3,200	220	4,800	23,000	NE	NE	NE
Magnesium	ug/l			88,000	88,000	14,000	27,000	18,000	7,200	14,000	12,000	12,000	3,600	1,800	27,000	9,200	1,800	NE	NE	NE
Manganese	ug/l			240	250	11,000	2,300	2,300	210	3,900	240	160	72	81		73	730	NE	NE	NE
Potassium	ug/l			160,000	160,000	5,800	23,000	14,000	6,500	3,700	6,400	9,100	4,300	41,000	10,000	4,000	110,000	NE	NE	NE
Sodium	ug/l			2,600,000	2,600,000	360,000	65,000	57,000	130,000	76,000	260,000	470,000	14,000	290,000	200,000	40,000	100,000	NE	NE	NE
Zinc	ug/l										34				23	33		5,000	123	NE
Gross Radionuclides by EPA Method 900.0		NA	ND															**USEPA Drinking Water Standards Maximum Contaminant Level (MCL)**		
Gross Alpha	pci/l			*	*	**19.06 +/- 5.80**	4.50 +/- 3.07	9.23 +/- 3.39	ND	ND	ND	7.08 +/- 3.45	3.00 +/- 2.33	11.38 +/- 4.92	ND	4.91 +/- 2.78	11.58 +/- 3.99	15		
Gross Beta	pci/l			*	*	23.84 +/- 4.39	23.18 +/- 4.35	22.52 +/- 4.32	9.56 +/- 3.64	6.81 +/- 3.38	13.62 +/- 3.78	10.44 +/- 3.69	5.71 +/- 3.31	**43.51 +/- 9.30**	9.56 +/- 3.64	9.89 +/- 3.56	**82.84 +/- 6.88**	30		

Notes:
1) Only those analytes which were detected above the Laboratory's Method Detection Limits (MDL) are presented in this table.
2) ug/L = micrograms per liter.
3) ND indicates the analyte was not detected above the MDL.
4) NA indicates the sample was not analyzed.
5) CT RSR = Connecticut Remediation Standards Regulations.
6) GWPC = Ground Water Protection Criteria.
7) SWPC = Surface Water Protection Criteria.
8) GWVC = Ground Water Volatilization Criteria.
9) NE = Criteria not Established for Analyte.
10) RES = Residential.
11) Numbers in BOLD indicate the detected concentration is above the GWPC. Shaded numbers indicate the detected concentration is above the SWPC. Underlined numbers indicate that the detected concentration is above the RES GWVC.
12) * Sample unsuitable for analysis due to high solids.

TABLE 4
WELL AND GROUND WATER TABLE ELEVATIONS
Scofieldtown Park Area
Stamford, CT

Well ID	Well Location			Well Elevations		Ground Water Measurements			
						11/23/2009		12/28/2009	
	Description	Northing	Easting	Ground	Top of Casing	DTW	GW Elevation	DTW	GW Elevation
MW-1 (OB)	Northwest Corner of Compost facility	612,769.81	776,716.48	307.6	309.55	31.99	277.56	28.58	280.97
MW-1 (R)	Northwest Corner of Compost facility	612,773.45	776,714.40	307.4	308.84	32.22	276.62	28.71	280.13
MW-2 (OB)	Northeast Corner of Compost Facility	612,827.21	777,537.38	302.6	304.76	32.89	271.87	30.02	274.74
MW-2 (R)	Northeast Corner of Compost Facility	612,830.40	777,538.74	302.7	304.6	32.74	271.86	29.82	274.78
MW-3 (OB)	Center of Scofieldtown Park	612,283.18	777,046.64	297.7	299.74	9.38	290.36	4.6	295.14
MW-3 (R)	Center of Scofieldtown Park	612.283.83	777,050.16	297.6	299.74	20.12	279.62	17.41	282.33
MW-4 (OB)	Scofield Magnet School	612,341.24	777,609.72	286.5	286.23	9.03	277.2	5.26	280.97
MW-4 (R)	Scofield Magnet School	612,344.85	777,610.98	286.4	285.78	8.78	277	5.11	280.67
MW-5 (R)	West of Rock Rimmon Road	612,360.61	776,684.71	309	309.94	10.86	299.08	5.32	304.62
MW-6 (R)	Central North Boundary of Compost Facility	612,880.50	777,092.46	308.8	311.33	NM	NM	35.52	275.81
MW-7 (R)	Cul-de-Sac Very Merry Road	612,722.54	778,681.82	358.7	357.91	26.17	331.74	21.65	336.26
MW-8 (R)	Cul-de-Sac Alma Rock Road	612,788.35	780,022.75	276.1	275.64	4.37	271.27	0.73	274.91
MW-9 (R)	Central South Boundary of Compost Facility	612,549.81	777,298.89	311.4	313.31	NM	NM	35.72	277.59

Notes:
1) DTW = Depth to Ground Water as measured from top of well casing
2) GW Elevation = Ground Water elevation
3) Northing and easting coordinates based on NAD83 US feet
4) Elevations based on NGVD29 US feet

APPENDIX F

QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

APPENDIX F

QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

1.0 Analytical Parameters

Table 2 in Section 3.0 summarizes the analyses that may be completed for samples as part of this investigation. The analyses to be conducted for this investigation will be completed using EPA (USEPA, 1986), Connecticut State–approved methods, or others, as noted below. The laboratory that will perform the analyses will be selected prior to the start of the investigatory program.

A copy of the laboratory's QA manual, certifications, performance evaluations and standard operating procedures will be provided upon request prior to the investigation.

Field measurements of pH, temperature, conductivity, dissolved oxygen, turbidity and oxidation-reduction potential will be performed for surface water and ground water during the investigation.

1.1 Field Analytical Procedures

As indicated above, surface water and ground water samples will be field analyzed for pH, temperature, conductivity, dissolved oxygen, turbidity and oxidation-reduction potential. The field measurements for these parameters will be conducted using a multi-parameter meter (YSI 6920, or equivalent) calibrated in accordance with the manufacturer's instructions. Samples will also be screened for VOCs in the field using a PID and/or a FID.

1.2 Field Quality Control Samples

Field quality control (QC) samples will be collected as part of this investigation and will include equipment blanks, solvent blanks, field duplicates, matrix spike/matrix spike duplicates (MS/MSDs), cooler temperature blanks and trip blanks.

1.3 Equipment Blanks

Equipment blanks will be used to check for procedural contamination that could cause sample contamination and to ensure that decontamination procedures have been adequately carried out. The equipment blank will be collected by pouring laboratory-supplied, HPLC-grade,

ASTM Type II water over the decontaminated sample collection equipment and into the appropriate sample containers. The water shall be demonstrated as analyte-free. Equipment blanks will be collected for equipment associated with sediment and ground water sample collection (and surface water collection, should it be conducted using sampling equipment rather than direct-filling of the sample containers). One equipment blank will be collected for each type of equipment used, each day a field decontamination event is conducted. Equipment blanks will be collected at the beginning of the day's sampling event and will accompany the samples collected that day. Equipment blanks will be submitted for analysis of the same parameters as the associated sample matrix.

1.4 Solvent Blanks

Solvent blanks are used to assess whether the extraction solvents provided by the laboratory for the field preservation of sediment/soil samples to be analyzed for VOCs have been tainted. The solvent blanks also serve to assess the possible effects of ambient field conditions on the samples. Solvent blanks will be submitted along with sediment/soil samples slated for VOC analysis at a frequency of 5 percent (i.e., one per 20 samples) or whenever a new batch of solvent is sent to the Site for use in the field preservation of samples (whichever is greater).

1.5 Field Duplicates

Field duplicates are additional aliquots of the same sample submitted for analysis of the same parameters as the original sample. Field duplicates will be used to assess the sampling and analytical reproducibility. The procedure for collecting field duplicate samples consists of alternating the collection of the sample between the sample collection bottle and the duplicate bottle. Field duplicates will be submitted at a frequency of one per twenty investigative samples for each environmental medium sampled for all parameters. Field duplicates will be submitted to the laboratory as "blind duplicates", using the sample identification procedures described in Section 1.10.3.

1.6 MS/MSDs

MSs and/or MSDs are an additional aliquot of the same sample submitted for analysis of the same parameters as the original sample. However, the additional aliquot is spiked with the compounds of concern at the laboratory. Matrix spikes provide information about the effect of the sample matrix on digestion and/or measurement methodology. MSs will be submitted at a frequency of one per every twenty investigative samples per matrix for each parameter. MSDs will be submitted at a frequency of one per every twenty investigative samples per matrix for each organic parameter.

1.7 Temperature Blanks

Cooler temperature blanks consist of a laboratory-supplied sample container filled with non-preserved water (potable or distilled) and are included in all coolers. The laboratory uses these temperature blanks to ensure that proper preservation of the samples has been maintained during sample shipment. The temperature of these blanks must be 4 ºC ±2º to demonstrate that proper preservation has been maintained. The laboratory records the results of the temperature blanks on the chain-of-custody immediately upon receipt of the samples at the laboratory, prior to inventory and refrigeration.

1.8 Trip Blanks

Trip blank samples will be supplied by the laboratory and will consist of pre-preserved vials containing laboratory-supplied water. Trip blanks samples will be submitted to the laboratory with every cooler containing aqueous VOC samples and will only be analyzed for VOCs. Trip blanks will be used to evaluate if contamination is introduced during shipment.

1.9 Sample Documentation Requirements

1.9.1 Field Notes

Field team members will keep a field logbook to document all field activities. Field logbooks will provide the means of recording field observations as well as the chronology of data collection activities performed during the investigation. As such, entries will be described

in as much detail as possible so that a particular situation could be reconstructed without reliance on memory.

The logbook will be a bound notebook with water-resistant pages. Logbook entries will be dated, legible, and contain accurate and inclusive documentation of the activity. The title page of each logbook will contain the following:

- Person to whom the logbook is assigned,
- The logbook number,
- Project name and number,
- Site name and location,
- Project start date, and
- End date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather and names of all sampling team members present will be entered. Each page of the logbook will be signed and dated by the person making the entry. All notebooks will have consecutively numbered pages. All entries will be made in permanent ink, signed, and dated and no erasures or obliterations will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark which is initialed and dated by the sampler. The correction shall be written adjacent to the error.

Field activities will be fully documented. Information included in the logbook will include, but may not be limited to the following:

- Chronology of activities, including entry and exit times,
- Names of all people involved in sampling activities,
- Level of personal protection used,
- Any changes made to planned protocol,
- Names of visitors to the Site during sampling and reason for their visit,
- Sample location and identification,
- Changes in weather conditions,
- Dates (month/day/year) and times (military) of sample collection,
- Measurement equipment identification (model/manufacturer) and calibration information,
- Sample matrix (e.g., soil, sediment, surface water, etc.),
- Sample collection methods and equipment,
- Sample depths,
- Whether grab or composite sample collected,

- How sample composited, if applicable,
- Sample description (color, odor, texture, etc.),
- Sample identification code,
- Tests or analyses to be performed,
- Sample preservation and storage conditions,
- Any field measurements made such as pH, temperature, conductivity, etc.,
- Equipment decontamination procedures,
- QC sample collection including the sample labels assigned to blind duplicate samples,
- Unusual observations,
- Record of photographs,
- Sketches or diagrams, and
- Signature of person recording the information.

Field logbooks will be reviewed on a daily basis by the field team leader. Logbooks will be supported by standardized forms.

A project file will be maintained for the investigations. Documents that may be included in the project file include: field documents, correspondence, photographs, laboratory data, reports, subcontract agreements, authorizations, logs, and sketches.

1.9.2 Chain-of-Custody Records

Sample custody is discussed in detail in Section 1.14.1 of this document. Chain-of-custody records are initiated by the samplers in the field. A chain-of-custody record will accompany the sample from initial sample container selection and preparation at the laboratory to the field for sample containment and preservation and through its return to the laboratory. If samples are split and sent to different laboratories, a copy of the chain-of-custody record will be sent with each sample. TRC will retain one copy of the chain-of-custody upon relinquishing the sample. The field portion of the custody documentation will include: the project name; the sample number, date and time of collection, and whether the sample is grab or composite; signatures of individuals involved in sampling; and if applicable, air bill or other shipping number. Sample receipt and log-in procedures at the laboratory are described in Section 1.14 of this document.

On a daily basis, samples will be transferred to the custody of the respective laboratory(ies) via third-party commercial carriers or via laboratory courier service. Sample packaging and shipping procedures and field chain-of-custody procedures are described in Section 1.14 of this document.

1.9.3 Sample Labeling

Each sample collected during the investigation field activities will be assigned a unique identifier. The sample identification will include information that reflects the sample was collected as part of the investigation, a sample number, the sample matrix, and reference to the depth interval from which the sample was collected. For example, a ground water sample collected from a monitoring well identified as number 3 would be designated as T1- MW3 where the terminology indicates:

T1: indicates a sample collected as part of the Tier 1 Investigation
MW: indicates a ground water sample collected from a monitoring well
3: indicates the monitoring well designation

Elements of the nomenclature to be utilized for samples collected as part of the investigation are included as follows:

Sample Media:

SO: Soil (if it is determined during the course of the field work that the collection of soil samples is warranted)
RK: Rock core
SED: Sediment
SW: Surface water
MW: Ground water collected from a monitoring well
LS: Leachate Seep

Field duplicate samples will be labeled as blind duplicates by giving them sample numbers indistinguishable from a normal sample.

Equipment/field blanks will be designated as “FB” and the associated matrix will be identified (e.g. FB - SED). Solvent blanks will be designated as “SB” and will include the date submitted (e.g., SB031508). Trip blanks will be designated as “TB” and will include the date shipped (e.g., TB031508).

MS/MSDs will be noted in the “Remarks” column of the chain-of-custody.

Sample labels will be filled out at the time of sampling and will be affixed to each container to identify the project name and/or sample location, sample number, sampler’s initials,

date and time of collection, number of containers per parameter (e.g., 1 of 2, etc.), preservatives added, and analyses requested for the sample. Sample labels will be completed for each sample using waterproof ink, unless prohibited by weather conditions. In such a situation, a logbook notation will explain that a pencil was used to fill out the sample label because the pen would not function in wet weather.

1.9.4 Sample Sequence

Surface water and sediment samples will be collected in a downstream to upstream fashion to minimize impacts of water/sediment disturbances on subsequent sampling locations. Should field observations made at the time of the soil boring/well installation portion of the field program suggest that there may be impacts to the soils or ground water at any given location(s), an attempt will be made to coordinate a sampling sequence hierarchy from less likely to more likely contaminated locations to reduce the potential for cross-contamination between locations.

1.10 Field Equipment Decontamination Procedures

Prior to borehole drilling, well installation and well development at successive locations, all non-dedicated equipment will be properly cleaned. This includes scrubbing steel casing, split spoons, drill rods, core barrel and drill tools with a laboratory grade glassware detergent and rinsing by steam cleaning. Should a submersible pump be required for well development, the pump will also be rinsed with a proper detergent and clean water by circulating the water through the pump prior to developing subsequent wells. All wash water will be managed separately from the clean water used during drilling activities (e.g., well installation or coring).

Sampling equipment used during the field activities, such as stainless steel spoons or spatulas, stainless steel mixing bowls, and stainless steel bucket augers, will be decontaminated using the following procedure:

1. Wash and scrub with low phosphate detergent in tap water;
2. Rinse with tap water;
3. Rinse with distilled and deionized (ASTM Type II) water;[1]
4. Rinse with 10% ultra pure nitric acid;[2]
5. Rinse with distilled and deionized (ASTM Type II) water rinse;[1,2]
6. Rinse with acetone – pesticide grade solvents or better;[3]
7. Air dry – on clean polyethylene sheeting;[4]

8. Rinse with distilled and deionized (HPLC-grade, ASTM Type II) water rinse;[3]
9. Wrap in aluminum foil, shiny side out, for transport (if not being used immediately).

NOTES:

[1] Intermediate sample rinses may be performed with tap rather than ASTM Type II water.

[2] Only if sample is to be analyzed for metals.

[3] Only if the sample is to be analyzed for organics. The final rinse must be performed with analyte free HPLC-grade ASTM Type II water. Rinsate volume must be at least five times the volume of the solvent rinse in step 6.

[4] Clean equipment may rest on, but never be wrapped in, clean polyethylene sheeting.

Sampling equipment will be decontaminated prior to use at each sampling location. Phthalate-free gloves must be worn during the decontamination procedure. Field decontamination will not be performed within 100 feet of any stream, river or pond. Decontamination rinsates will be collected and containerized for subsequent determination of proper handling and/or disposal (see Section 1.12).

1.11 Investigation-Derived Waste Plan

Investigation-derived waste (IDW) materials produced during the execution of the investigations may include solid or liquid residue generated as a result of media sampling events, decontamination solutions, and expendable equipment. Care will be taken to minimize the amount of IDW material that is generated and handled during the field activities.

1.12 Sampling Residue

1.12.1 Solid Material

Excess solid material (e.g., drilling spoils, hand auger spoils, excess river sediment, etc.) will be generated during the investigatory program. Although it is not suspected that the soils or sediments at the Site are significantly impacted, field observations (e.g., staining, odors) and the results of field monitoring (using a PID and/or FID) will be utilized to help to manage the sampling residue. Only solid material from the Site that is observed to be grossly contaminated will be segregated onto plastic sheeting or containerized in 55-gallon drums and properly managed. If possible, all other spoils will be returned to their respective boreholes. If it is

impossible to return the spoils to the sample locations without disturbing the water column (e.g., in the river), the sediment spoils will be deposited on the nearest bank of the river with care taken to place the materials above an elevation where erosion will be a concern.

1.12.2 Liquid Material

Liquids generated as a result of field sampling activities (e.g., ground water sampling) will be allowed to infiltrate to the ground surface in the immediate vicinity of the monitoring well. Should field observations/measurements indicate that the ground water at any given location is grossly contaminated, the liquid will be drummed for proper handling and subsequent disposal.

1.12.3 Decontamination Solutions

Waste decontamination materials, such as spent acetone and nitric acid used for decontamination of sampling equipment, will be segregated according to compatibility class, containerized, labeled, and managed for proper treatment or disposal. Since acetone is classified as a flammable liquid and nitric acid is a corrosive liquid, these solutions will be managed separately during decontamination. Recovered spent acetone solutions will be handled and labeled as flammable waste liquid and recovered, and spent nitric solutions will be handled and labeled as a corrosive liquid.

The pH of dilute solutions of containerized spent acid and water (tap and/or deionized water) will be field checked for pH prior to disposal. If the spent solution registers a pH less than 2.0 units or greater than 12.5 units, the solution will be managed as a corrosive waste.

In order to minimize waste generated during this field program, the majority of sampling equipment (e.g., stainless steel spoons, bowls, etc.) will be laboratory decontaminated, thus reducing the generation of chemical decontamination solutions during the field investigation.

1.12.4 Expendable Supplies and Equipment

In general, expendable supplies and equipment will be placed into trash bags and disposed of in refuse containers located at the office. If gross contamination is encountered, expendable supplies and equipment (e.g., tyvek coveralls, gloves, boot covers, tubing, etc.) which exhibit visual evidence of gross contamination (e.g., heavily soiled tyvek, boot covers,

gloves, etc.) will be segregated from the rest of the solid waste stream and will be handled/disposed of properly.

1.13 Sample Handling and Shipping

Appropriate sample containers will be used so no chemical alteration occurs between the collection of samples in the field and the receipt of samples at the laboratory and so that breakage during transport is minimized. The sample bottles will be prepared and shipped to the field by the analytical laboratory under the direction of the Laboratory QC Coordinator. The sample bottles will be transported to the Site within shipping coolers. These bottles will be cleaned by the manufacturer to meet or exceed all analyte specifications established in the latest U.S. EPA's Specifications and Guidance for Contaminant-Free Sample Containers. Certificates of analysis are provided with each bottle lot and maintained on file in the laboratory to document conformance to EPA specifications.

After the bottles for a given sample location have been filled and labeled, they will be immediately preserved and placed in a shipping cooler. Samples will be stored in such a way as to protect them from temperature extremes, light, breakage and water damage. Each glass sample container will be placed in an individual bubble wrap bag before being placed in the cooler. Field personnel will add bags of crushed ice or ice packs to the shipping coolers as the samples are collected. When the cooler is filled, additional absorbent, non-combustible packing material (e.g., vermiculite) will be placed in the cooler so that the contents are secure.

Samples will be delivered to the laboratory for analysis as soon as practical after the number of samples and sample containers are sufficient to comprise a shipment, preferably the same day the samples are collected. Samples will be stored in coolers at a temperature of 4ºC. During sampling and sample shipment activities, the Project Manager (or his/her designee) will contact the laboratory daily to provide information about impending shipments.

1.13.1 Sample Custody

Custody is one of several factors that are necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files.

A sample or evidence file is considered to be under a person's custody if:

- the item is in the actual possession of a person;
- the item is in the view of the person after being in actual possession of the person;
- the item was in the actual physical possession of the person but is locked up to prevent tampering; or
- the item is in a designated and identified secure area.

1.13.2 Field Custody Procedures

Samples will be collected following the sampling procedures documented in Section 3.0 of this document. Sample chain-of-custody and packaging procedures are summarized below. These procedures will ensure that the samples will arrive at the laboratory with the chain-of-custody intact.

- The field sampler is personally responsible for the care and custody of the samples until they are transferred or dispatched properly. Field procedures have been designed such that as few people as possible will handle the samples.

- All bottles will be identified by the use of sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis. The sample numbering system and labeling process are presented earlier in this document.

- Samples will be accompanied by a properly completed chain-of-custody record. The sample numbers and locations will be listed on the chain-of-custody record. When transferring the possession of samples, the individuals relinquishing and receiving the samples will sign, date, and note the time on the record. This documents the transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage location.

- All shipments will be accompanied by the chain-of-custody record identifying the contents. A minimum of two copies of the chain-of-custody record will accompany the shipment to the laboratory, and copies of the record will be retained by the sampler and placed in the project files. The laboratory will maintain one file copy, and the completed original will be returned to the Project Manager. A copy of the completed original will be included as part of the final analytical report.

- Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. The custody seals will be attached to the front right and back left of the cooler and covered with

clear plastic tape after being signed by field personnel. The cooler will be strapped shut with strapping tape in at least two locations.

- If the samples are sent by common carrier, an air bill will be used. Air bills will be retained as part of the permanent documentation. Commercial carriers are not required to sign off on the custody records since the custody records will be sealed inside the sample cooler and the custody seals will remain intact.

- Samples remain in the custody of the sampler until transfer of custody is completed. This consists of delivery of samples to the laboratory sample custodian, the signature of the laboratory sample custodian on the chain-of-custody record as receiving the samples, and the signature of the sampler as relinquishing samples.

1.13.3 Laboratory Custody Procedures

The Project Manager or his/her designee will notify the laboratory of upcoming field sampling activities and subsequent sample transfer to the laboratory. This notification will include information concerning the number and type of samples to be shipped, as well as the anticipated sample arrival date. Samples will be received and logged in by a designated sample custodian or his/her designee. The sample custodian is responsible for maintaining sample custody and for maintaining all associated custodial documentation records. Upon sample receipt, the sample custodian will:

- Examine the shipping containers to verify that the custody tape is intact,
- Examine all sample containers for damage (i.e., breakage or leaks),
- Determine if the temperature required for the requested testing program has been maintained during shipment using the cooler temperature blanks and document the temperature on the chain-of-custody records,
- Compare samples received against those listed on the chain-of-custody,
- Verify that sample holding times have not been exceeded,
- Examine all shipping records for accuracy and completeness,
- Determine sample pH (if applicable) of aqueous samples and record on chain-of-custody record,
- Sign and date the chain-of-custody record immediately (if shipment is accepted), note the time that the samples were received and attach the air bill (if applicable),
- Note any problems associated with the coolers and/or samples on the laboratory's cooler receipt form and notify the Laboratory Project Manager, who will be responsible for contacting the Project Manager,
- Attach laboratory sample container labels with unique laboratory identification and required tests, and
- Place the samples in the proper laboratory storage.

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the laboratory tracking system. At a minimum, the following information will be entered: project name or identification, unique sample numbers (both client and internal laboratory), type of sample, required tests, date and time of laboratory receipt of samples, and field ID provided by field personnel.
- The Laboratory Project Manager will be notified of sample arrival.

The completed chain-of-custody, air bills, and any additional documentation associated with the custody process will be placed in the final evidence file by the Project Manager or his/her designee.

1.14 Data Validation and Reporting

Appropriate QC measures will be used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal in this project.

1.14.1 Data Reporting

The laboratory data packages will include deliverables that conform with Connecticut's Reasonable Confidence Protocols (RCPs). At a minimum, the data packages from the analytical laboratory will include the following:

- An Index of Samples (a presentation of the field identification numbers and associated laboratory identification numbers, sample matrix and dates of sample collection and receipt by the laboratory);
- Methodologies;
- Subcontracting information (as necessary – if the prime laboratory subcontracted analyses to another laboratory);
- A laboratory narrative (used to describe non-conformances);
- Results (including sample identification numbers, preparation and analysis dates, analytical results and reporting limits); and
- QC results.

1.15 Field Data Evaluation

Measurements and sample collection information will be transcribed directly into the field logbook or onto standardized forms. If errors are made, results will be legibly crossed out,

initialed and dated by the person recording the data, and corrected in a space adjacent to the original (erroneous) entry. Daily reviews of the field records by the Field Team Leader will ensure that:

- Logbooks and standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed.

- Records are legible and in accordance with good record keeping procedures, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained.

- Sample collection, handling, preservation, and storage procedures were conducted in accordance with the protocols described in this document, and that any deviations were documented and approved by the appropriate personnel.

1.15.1 Analytical Data Validation

Analytical data validation will consist of procedures conducted within the laboratory. Prior to being released as final, laboratory data will proceed through a tiered internal review process. Data verification starts with the analyst or technician, who reviews all of the data he/she generates to ensure the work was done correctly the first time. It is the responsibility of the analyst or technician to ensure that the verification of data generated in his or her area is complete. The data reduction and initial verification process must ensure that:

- Sample preparation and analysis information is correct and complete;
- Results are correct and complete;
- The appropriate SOPs have been followed and are identified in the project records;
- Proper documentation procedures have been followed;
- All nonconformances have been documented; and
- Project-specific requirements have been met.

Following the completion of the initial verification by the analyst or technician, a systematic check of the data will be performed by an experienced peer, Laboratory Section Leader, or designee. This check will be performed to ensure that initial review has been completed correctly and thoroughly. Included in this review will be an assessment of the acceptability of the data with respect to:

- Adherence of the procedure used to laboratory standard operating procedures (SOPs) and any project-specific methods and specific instructions;
- Correct interpretation of data (e.g., mass spectra, chromatographic interferences, etc.);
- Correctness of numerical input when computer programs are used (checked randomly) and numerical correctness of calculations and formulas (checked randomly);
- Acceptability of QC data;
- Documentation that instruments were operating according to method specifications (calibrations, performance checks, etc.);
- Documentation of dilution factors, standard concentrations, etc.;
- Sample holding time assessment; and
- Nonconforming events have been addressed by corrective action as defined on a nonconformance memo.

A third-level review will be performed by the Laboratory Project Manager before results are submitted. This review serves to verify the completeness of the data report and to ensure that project requirements are met for the analyses performed. The items to be reviewed will include:

- Results are present for every sample in the analytical batch or reporting group;
- Every parameter or target compound requested is reported;
- The correct units and correct number of significant figures are utilized;
- All nonconformances, including holding time violations, and data evaluation statements that impact the data quality are accompanied by clearly expressed comments from the laboratory; and
- The final report is legible, contains all the supporting documentation required by the project, and is in either the standard format or in the client-required format.

A narrative to accompany the final report will be finalized by the Laboratory Project Manager. This narrative will include relevant comments, including data anomalies and non-conformances.

Once the data have been received, a review of the narrative will be conducted to identify what, if any, factors may affect the data usability. If any such factors are identified, the Project Manager will discuss corrective actions with the laboratory personnel. In addition, the Project Manager or his/her designee will conduct a review of all data received by the laboratory in electronic deliverable formats to provide additional QA/QC measures.

APPENDIX G

SAMPLE TECHNICAL SPECIFICATIONS

SECTION 02225

SUBBASE MATERIAL

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. The work to be performed under this Section shall include materials, all labor, tools, equipment, and testing for furnishing, placing, grading, and compacting subbase material over the prepared and accepted ash subgrade as shown on the Contract Drawings or as otherwise directed by the ENGINEER.
2. The CONTRACTOR is solely responsible for the management of surface water runoff. The ENGINEER shall verify that all required sediment and erosion controls have been installed to specifications prior to the CONTRACTOR starting any construction activities at the site. The ENGINEER shall also periodically inspect sediment and erosion controls, including after rainfall events, and inform the CONTRACTOR of repairs or removal of accumulated sediments that are required to maintain the effectiveness of the sediment and erosion controls. The CONTRACTOR shall promptly perform these repairs and removal actions as directed by the ENGINEER. The CONTRACTOR is responsible for the costs associated with these repairs and removal actions.
3. All necessary testing of materials as required in the Contract Documents.
4. CONTRACTOR field test data shall indicate compliance with the Contract Documents in order to be accepted. The field data shall be certified by the ENGINEER.
5. CONTRACTOR shall provide the ENGINEER with access to the borrow pits or material sources upon request for the purposes of observing material source operations and obtaining samples. The CONTRACTOR shall be responsible for supplying all required samples for testing.
6. All soil layer thicknesses referenced in this Section represent the installed compacted thickness.
7. Items listed in Section 02220, Part 1 - General, 1.1 Description also apply.

B. Related Sections:

Section 02220, Excavation, Backfill and Regrading
Section 02227, Vegetative Cover Soil Material
Section 02228, Topsoil
Section 06643, Geomembranes.
Section 06645, Geosynthetics.

1.2 QUALITY ASSURANCE

A. Tests:

1. The services of a qualified testing laboratory shall be engaged by the CONTRACTOR to make tests and determine acceptability of the fill or material as listed below. The laboratory shall be acceptable to the ENGINEER.
2. Required Tests:
   a. Gradation, ASTM D 422, Plasticity Index, ASTM D 4318, Soil Classification, ASTM D 2487, Priority Pollutant Semivolatile Compounds, EPA Method 8270, Priority Pollutant Volatile Organic Compounds, EPA Method 8260, Extractable Total Petroleum Hydrocarbons, Connecticut Method, Priority Pollutant Metals, EPA Method 6010 (HG Method), Pesticides, EPA Method 8081, PCBs, EPA Method 8082, Herbicides, EPA Method 8151. All test results shall be in conformance with the criteria for Industrial Direct Exposure Criteria (IDEC) and Class GB Groundwater Pollutant Mobility Criteria (GBPMC) of the CTDEP's Remediation Standard Regulations (RSRs), 22a-133k-l to k-3 of the Regulations of Connecticut State Agencies.

   b. Compacted Subbase material: Compaction, ASTM D 1557, ASTM D 1556, ASTM D 2922 and ASTM D3017.

B. Permits and Regulations:
   1. Material transfer and storage shall comply with all local and state permits required for management and storage of soil having restricted re-use in the State of Connecticut. In particular compliance with the State of Connecticut General Permit for Contaminated Soil and/or Sediment Management (Staging & Transfer) requirements under sections 22a-133z and 22a-208a of the Regulations of Connecticut State Agencies is required.

C. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified.
   1. ASTM D 422, Particle-Size Analysis of Soils.
   2. ASTM D 4318, Liquid Limit, Plastic Limit and Plasticity Index of Soils.
   3. ASTM D 1557, Moisture-Density Relations of Soils, using 10.0 lb (4.5 kg) Rammer and 18-in. (457 mm) Drop.
   4. ASTM D 2922, Density of Soil in Place by Nuclear Methods.
   5. ASTM D 3017, Water Content of Soil and Rock in Place by Nuclear Methods.
   6. ASTM D 2487, Classification of Soils for Engineering.
   7. Priority Pollutant Semivolatile Compounds by EPA Method 8270.
   8. Priority Pollutant Volatile Organic Compounds by EPA Method 8260.
   9. Extractable Total Petroleum Hydrocarbons by the Connecticut Method.
   10. Priority Pollutant Metals by EPA Method 6010 (HG Method).
   11. Pesticides, EPA Method 8081.
   12. Herbicides, EPA Method 8151.
   13. PCBs/EPA Method 8082.

   Note: Items 7 through 13 as noted above will be referred to as "environmental testing" throughout these Specifications.

1.3 SUBMITTALS

A. Test Reports:

1. Submit six (6) copies of the following reports directly to ENGINEER from the testing service, with copy to the CONTRACTOR:
   a. All tests for subbase material.
   b. Compliance testing during construction.
   c. Field density tests.
   d. Optimum moisture - maximum density curve for each soil.
2. Testing shall conform to the following as a minimum.
   a. Tests on material
      1) Subbase material: Environmental, particle size, modified proctor, and interface and internal friction angle tests for Subbase material from off-site shall be performed at a frequency of 1 per 3,000 cubic yards if from a natural borrow source or 1 per source, whichever is more stringent. Material that is not from a natural borrow source shall be tested at a frequency of 1 per 1,000 cubic yards.
   b. Field density tests:
      1) Subbase material: CONTRACTOR shall conduct one (1) test every 10,000 square feet per 6 inch lift. A Troxler Nuclear Moisture-Density gauge shall be used for all field density tests. Test locations shall be tied into a site grid system 50 foot square. Test reports shall note the grid location point and lift for each test. CONTRACTOR shall establish and maintain grid points for each lift of material placed.
   c. Moisture-density curve for each Subbase material used in construction.

B. Submit six (6) samples of all Subbase materials required.

C. ENGINEER shall prepare prior to mobilization, a Stormwater Pollution Control Plan prepared in accordance with the CTDEP's General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities. This plan shall address temporary means needed to prevent discharge of sediment to water courses because of dewatering systems or erosion and off-site removal and disposal of all water that has contacted exposed solid waste material as a result of construction activities.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Not Applicable.

2.2 SUBBASE

A. SUBBASE

1. Subbase shall be provided to cover the waste areas and for supporting the overlying geomembrane. Subbase shall be placed where shown or specified on the Drawings, or as otherwise directed by ENGINEER.
2. Subbase shall be low plasticity inorganic soil borrow with adequate shear strength

properties. The material shall be an earthen soil which is free of vegetation, ice or frozen material, wood, glass, metal, or other deleterious material. The maximum particle size shall be 1/2-inch and free of sharp edges.

3. The Subbase shall meet or exceed the following requirements:
   a. Internal Shear Strength:
      All Subbase material must adhere to the range of cohesion/internal friction angle properties (i.e. 0 psf, 37°) specified below:

Cohesion, psf	Peak Internal Friction Angle Φ
0	37
10	36
20	34
35	32
45	30

      The tests shall be performed for a minimum of three normal tresses that simulate field loading conditions. The following normal loads shall be used:
      i. Condition No. 1 - 100psf, 300psf, 500psf.
   b. U.S. Standard Sieve analysis parameters:
      i. 100% passing 1/4-inch square sieve.
      ii. Less than or equal to 30% passing #200 sieve.
   c. Plasticity index (PI) < 5.
   d. The CONTRACTOR shall submit to the ENGINEER engineering calculations prepared by a licensed Connecticut Professional Engineer, shop drawings, proposed quality assurance and quality control measures, product information, laboratory test results and all other necessary and applicable data to the ENGINEER.
   e. The Subbase shall be tested in accordance with ASTM D5321, based on soil type and geosynthetics used and shall exhibit an interface friction angle >30°. Refer to Section 06643 and 06645 for testing requirements.
4. Provide approved soil materials for Subbase, free of contaminated soil, clay, rock or gravel larger than 0.5 inches in any dimension, debris, waste, frozen materials, vegetable and other deleterious matter. Soil material acceptable for use as Subbase shall be classified as SW, SP or SM according to the Unified Soil Classification System.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The ENGINEER or his representative will examine the areas and conditions under which excavating, filling, and grading are to be performed and notify the CONTRACTOR of conditions CONTRACTOR may encounter that are detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions

have been corrected in an acceptable manner.

B. CONTRACTOR shall provide the ENGINEER or his representative with clean, unused, scalable 5-gallon pails with handles and lids to obtain samples. CONTRACTOR shall provide personnel to the ENGINEER or his representative to collect samples.

C. Prior to procurement of material and starting construction, the ENGINEER shall have submitted and received approvals for the materials based on the testing required in this Section.

D. Subbase material shall be pushed up side slopes, never down slope or sideways. It is imperative that the CONTRACTOR makes every reasonable effort to minimize the potential for Subbase to adversely affect the overlying proposed geomembrane via penetration. Therefore, a crew of 3 workers shall work near the earthmoving equipment and remove all rocks, stones, roots or other debris in excess of 1/2-inch in any dimension that could cause damage to the proposed overlying geomembrane. Equipment operators shall not be permitted to make sharp turns or quick stops.

E. Subbase shall be placed on all areas as shown on the Drawings or as directed by the ENGINEER and as described in these Specifications. The thickness of each lift prior to compaction of the Subbase shall be no greater than eight (8) inches. Total compacted thickness of the Subbase shall be as shown on the Drawings. Compaction of the Subbase shall be accomplished by suitable compaction equipment, subject to approval by the ENGINEER.

F. The Subbase shall be placed and compacted as necessary to achieve the required shear strength (internal friction angle). The Subbase shall be compacted to 95 percent of Modified Proctor. The moisture content of the material shall be maintained within 3 percent of optimum moisture. Contractor shall not work wet cover material that cannot support equipment. Subbase material that becomes wet and soft from rainfall shall be allowed to dry and firm before placing geomembrane.

G. The existing on-site material or material delivered to the site shall be visually inspected by the ENGINEER during construction to check that it is consistently the same as the materials previously existent or delivered to the site. If changes in the material occur, the ENGINEER shall verify the material is from an approved source and the ENGINEER may require additional testing in accordance with Paragraph 1.3, Part A (2) of this Section. If the material is not from an approved source or if the material is determined to not be acceptable by the ENGINEER, the CONTRACTOR shall be notified that the material is not approved. The ENGINEER shall reject any work performed by the CONTRACTOR using the new material until the appropriate testing is conducted and the material is approved by the ENGINEER.

H. The thickness of the in-place Subbase will be checked after the completion of the work on a grid pattern not to exceed 50-foot by 50-foot by digging, by hand, in the presence of and as directed by the ENGINEER. The size of the test hole shall not be less than one-foot in diameter. Measurements shall be made perpendicular to the slope. The CONTRACTOR

shall be responsible for digging holes in the Subbase to allow for the measurements to be taken by the ENGINEER. After measurements have been made, the CONTRACTOR shall backfill the holes with Subbase, and hand tamp.

I. The CONTRACTOR shall be responsible to repair damage to the Subbase between testing and acceptance. Rills and gullies shall be repaired before placing the geomembrane.

J. All soil samples are to be obtained under the direction of the ENGINEER.

K. Final acceptance of Subbase is dependent upon:
   a. Satisfying the minimum requirement of compacted thickness (6 inches) of the Subbase layer measured perpendicular to the slope.
   b. Subbase meeting all the physical/analytical properties listed in Section 02225.
   c. Final inspection conducted by the ENGINEER ensuring that the final state of the Subbase and Subbase surface will not puncture, wrinkle, or damage the proposed overlying geomembrane in any manner. If the compacted Subbase does not meet the ENGINEER'S requirements to ensure the integrity of the proposed overlying geomembrane, then the CONTRACTOR will perform all work necessary to mitigate to acceptable Subbase conditions, at no additional cost to the OWNER.

L. Any damage, disturbance, or settlement that occurs as a result of the CONTRACTOR's stockpiling of material or equipment on site shall be the responsibility of the CONTRACTOR to repair and/or supply additional materials to compensate for settlement caused by the CONTRACTOR'S actions.

3.2 SOURCE QUALIFICATION TESTING

A. Prior to acceptance of the borrow or stockpile site, the CONTRACTOR shall provide the following soil analyses to the ENGINEER:
   1. Results of interface friction test performed for the interface between the proposed Subbase and proposed geotextile material in accordance with ASTM Standard Test Method D 5321 (latest revision) performed under saturated conditions, with a 24-hour saturation period prior to the test, Determining the Coefficient of Soil/Geosynthetic Friction by the Direct Shear Method. The test shall be performed for a minimum of three normal stresses applied to bracket the normal stress of 300 psf at the interface being tested. The CONTRACTOR shall take particular note that this test shall be repeated for every proposed geotextile and Subbase combination used in the construction.
   2. Results of compaction tests conducted in accordance with ASTM D 1557 (latest revision), Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
   3. Results of Atterberg limits, plastic and liquid limit, and plasticity index conducted in accordance with ASTM D 4318 (latest revision), Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
   4. Results of the particle-size analysis conducted in accordance with ASTM D 421/422 (latest revision). Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants/Test Method for Particle Size Analysis of Soils.

5. Results of chemical analyses conducted in accordance with the requirements of Section 02225.

3.3 SUBBASE

A. Subbase Material:

1. Quality Control Testing:
   a. The ENGINEER shall perform quality control testing during construction. This testing is in addition to all other tests required to be conducted by the CONTRACTOR.
   b. The ENGINEER shall collect representative samples from each material source of Subbase for testing at a frequency determined by the ENGINEER.
   c. The Subbase shall exhibit an interface friction angle in accordance with the values as specified in paragraph 2.2 A.3.e of this specification. Materials tested by the ENGINEER exhibiting results not meeting the interface friction angle requirements will be rejected, or the CONTRACTOR may be required to furnish additional test data, at his expense, to demonstrate acceptability of the material.

3.4 MEASUREMENT AND PAYMENT

A. Payment will be made on a unit price basis for furnishing, transporting, and stockpiling materials onsite and for placing, compacting, and for performing and passing the required testing. No payment will be made for placing and compacting soil that does not meet the specified requirements and the CONTRACTOR shall be required to repair, replace, and re-compact soil until all specifications are met at their own cost.

B. Measurement for payment for furnishing, transporting and stockpiling materials onsite and for placing, compacting and performing and passing the required testing will be made based upon the final, in-place volumes for work that is accepted by the ENGINEER.

C. The OWNER reserves the right to furnish, transport, and stockpile materials onsite for use by the CONTRACTOR. The CONTRACTOR shall use the materials provided by the OWNER as instructed by the ENGINEER and shall assume that the materials are suitable for the directed use. The OWNER shall provide the CONTRACTOR with the testing data for all materials provided by the OWNER.

END OF SECTION 02225

SECTION 02227

VEGETATIVE COVER SOIL MATERIAL

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. The work to be performed under this Section shall include all materials, labor, tools, equipment, and testing for furnishing, placing, grading, and compacting Vegetative Cover Soil Material as shown on the Drawings or as otherwise directed by the ENGINEER.
2. The CONTRACTOR is solely responsible for the management of surface water runoff. The ENGINEER shall verify that all required sediment and erosion controls have been installed to specifications prior to the CONTRACTOR starting any construction activities at the site. The ENGINEER shall also periodically inspect sediment and erosion controls, including after rainfall events, and inform the CONTRACTOR of repairs or removal of accumulated sediments that are required to maintain the effectiveness of the sediment and erosion controls. The CONTRACTOR shall promptly perform these repairs and removal actions as directed by the ENGINEER. The CONTRACTOR is responsible for the costs associated with these repairs and removal actions.
3. All necessary testing of materials as required in the Contract Documents.
4. CONTRACTOR field test data shall indicate compliance with the Contract Documents in order to be accepted. The field data shall be certified by the ENGINEER.
5. CONTRACTOR shall provide the ENGINEER with access to the borrow pits or material sources upon request for the purposes of observing material source operations and obtaining samples. The CONTRACTOR shall be responsible for supplying all required samples for testing.
6. All soil layer thicknesses referenced in this Section represent the installed compacted thickness.

B. Related Sections:

Section 02220, Excavation and Backfill and Regrading
Section 02225, Subbase
Section 02228, Topsoil
Section 06643, Geomembranes
Section 06645, Geosynthetics

1.2 QUALITY ASSURANCE

A. Tests:

1. The services of a qualified testing laboratory shall be engaged by the CONTRACTOR to make tests and determine acceptability of all fill or material as listed below. The laboratory shall be acceptable to the ENGINEER.

2. Required Tests:
   a. Gradation, ASTM D 422, Plasticity Index, ASTM D 4318, Soil Classification, ASTM D 2487, Priority Pollutant Semivolatile Compounds, EPA Method 8270, Priority Pollutant Volatile Organic Compounds, EPA Method 8260, Extractable Total Petroleum Hydrocarbons, Connecticut Method, Priority Pollutant Metals, EPA Method 6010 (HG Method), Pesticides, EPA Method 8081, PCBs, EPA Method 8082, Herbicides, EPA Method 8151. All test results shall be in conformance with the criteria for either Residential Direct Exposure Criteria (RDEC) or the Industrial Direct Exposure Criteria (IDEC) and Class GA Groundwater Pollutant Mobility Criteria (GAPMC) of the CTDEP's Remediation Standard Regulations (RSRs), 22a-133k-l to k-3 of the Regulations of Connecticut State Agencies. Soil designated as Vegetative Support Soil within the proposed park area on the site shall comply with the RDEC and all other material shall comply with the IDEC
   b. Compacted Cover Soil and Drainage Sand material: Compaction, ASTM D 1557, ASTM D 1556, ASTM D 2922 and ASTM D3017.

B. Permits and Regulations:

1. CONTRACTOR shall obtain all necessary permits for work.
2. CONTRACTOR shall perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

3 Material transfer and storage shall comply with all local and state permits required for management and storage of soil having restricted re-use in the State of Connecticut, except as noted below. In particular compliance with the State of Connecticut General Permit for Contaminated Soil and/or Sediment Management (Staging & Transfer) requirements under sections 22a-133z and 22a-208a of the Regulations of Connecticut State Agencies is required. Soils meeting the RDEC and GAPMC are not considered Contaminated Soil and as such will not be covered by the above General Permit.

C. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified.

1. ASTM D 422, Particle-Size Analysis of Soils.
2. ASTM D4318, Liquid Limit, Plastic Limit and Plasticity Index for Soils.
3. ASTM D 1556, Density of Soil in Place by the Sand-Cone Method.
4. ASTM D 1557, Moisture-Density Relations of Soils, using 10.0 lb (4.5 kg) Rammer and 18-in. (457 mm) Drop.
5. ASTM D 2922, Density of Soil in Place by Nuclear Methods.
6. ASTM D 3017, Water Content of Soil and Rock in Place by Nuclear Methods.
7. Priority Pollutant Semivolatile Compounds by EPA Method 8270.
8. Priority Pollutant Volatile Organic Compounds by EPA Method 8260.

9. Extractable Total Petroleum Hydrocarbons by the Connecticut Method.
10. Priority Pollutant Metals by EPA Method 6010 (HG Method).
11. Pesticides, EPA Method 8081.
12. Herbicides, EPA Method 8151.
13. PCBs/EPA Method 8082.

Note: Items 7 through 13 as noted above will be referred to as "environmental testing" throughout this Specifications.

1.3 SUBMITTALS

A. Test Reports:
   1. Submit six (6) copies of the following reports directly to ENGINEER from the testing service, with copy to the CONTRACTOR:
      a. All tests for cover soil and drainage sand material.
      b. Compliance testing during construction.
      c. Field density tests.
      d. Optimum moisture - maximum density curve for each soil.
   2. Testing shall conform to the following as a minimum.
      a. Tests on material
         1) Vegetative Cover Soil material: Environmental, hydraulic conductivity, particle size, modified proctor, and interface and internal friction angle tests for Cover Soil material from off-site shall be performed at a frequency of 1 per 3,000 cubic yards if from a natural borrow source or 1 per source, whichever is more stringent. Material that is not from a natural borrow source shall be tested at a frequency of 1 per 1,000 cubic yards.
      b. Field density tests:
         1) Vegetative Cover Soil material: CONTRACTOR shall conduct one (1) test every 10,000 square feet per 6 inch lift. A Troxler Nuclear Moisture-Density gauge shall be used for all field density tests. Test locations shall be tied into a site grid system 50 foot square. Test reports shall note the grid location point and lift for each test. CONTRACTOR shall establish and maintain grid points for each lift of material placed.
      c. Moisture-density curve for each cover soil and drainage sand material used in construction.

B. Submit six (6) samples of all Vegetative Cover Soil materials required.

C. ENGINEER shall prepare prior to mobilization, a Stormwater Pollution Control Plan prepared in accordance with the CTDEP's General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities. This plan shall address temporary means needed to prevent discharge of sediment to water courses because of dewatering systems or erosion and off-site removal and disposal of all water that has contacted exposed solid waste material as a result of construction activities.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Not Applicable.

2.2 VEGETATIVE COVER SOIL

A. Vegetative Cover Soil

1. Vegetative Cover Soil shall be placed where shown or specified on the Drawings, or as otherwise directed by ENGINEER.
2. Vegetative Cover Soil shall be low plasticity inorganic soil borrow with adequate shear strength properties. The material shall be an earthen soil which is free of vegetation, ice or frozen material, wood, glass, metal, or other deleterious material. The maximum particle size shall be 1/2 inch for all soil placed within 6 inches of the geomembrane and shall be free of sharp edges. The maximum particle size shall be 3 inches and free of sharp edges for all other cover soil.
3. The Vegetative Support Soil Material shall meet the following requirements:

   a. Permeability: The coefficient of hydraulic conductivity, k, of suitable material shall be less permeable than 1.0×10^{-4} cm/s at 90% of optimum Proctor Density in accordance with ASTM D1557.
   b. Internal Shear Strength: All Vegetative Support Material must adhere to the range of cohesion/internal friction angle properties specified below:

Cohesion (psf)	Internal Friction Angle (Φ)
0	37
10	36
20	34
35	32
45	30

   The tests shall be performed for a minimum of three normal stresses that simulate field loading conditions. The following normal loads shall be used, 100 psf, 300 psf, 500 psf.
   c. U.S Standard Sieve analysis parameters:
   i. 100% passing ½ inch or 3-inch square sieve (see A2 above)
   ii. Less than or equal to 25% passing No. 200 sieve for suitable overlying material
   d. Plasticity index (PI) <10
4. Provide approved soil materials for Vegetative Support Soil, free of contaminated soil, debris, waste, frozen materials, vegetable and other deleterious matter. Soil material acceptable for use shall be classified as GM, GC, SM or SC according to the Unified Soil Classification System.
5. The Contractor shall submit to the Engineer engineering calculations prepared by a licensed Connecticut Professional Engineer, shop drawings, proposed quality

assurance and quality control measures, product information, laboratory test results and all other necessary and applicable data to the Engineer.

6. The Cover Soil material shall be tested in accordance with ASTM D 5321, based on soil type and geosynthetics used and shall exhibit an interface friction angle of >30º.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The ENGINEER or his representative will examine the areas and conditions under which excavating, filling, and grading are to be performed and notify the CONTRACTOR of conditions CONTRACTOR may encounter that are detrimental to the proper and timely completion of the Work. The CONTRACTOR shall not proceed with the Work until unsatisfactory conditions have been corrected in an acceptable manner.

B. CONTRACTOR shall provide the ENGINEER or his representative with clean, unused, scalable 5-gallon pails with handles and lids to obtain samples. CONTRACTOR shall provide personnel to the ENGINEER or his representative to collect samples.

C. Prior to procurement of material and starting construction, the CONTRACTOR shall have submitted and received approvals for the materials based on the testing required in this Section.

D. Vegetative Cover Soil material shall be pushed only upslope using low pressure equipment and a minimum of 12 inches of material shall be kept beneath the tracks at all times. It is imperative that the CONTRACTOR makes every reasonable effort to minimize the potential for Cover Soil to adversely affect the underlying geomembrane and composite drainage geonet via penetration or slippage. Therefore, low pressure equipment shall be used to place cover materials. Equipment operators shall not be permitted to make sharp turns or quick stops.

E. Vegetative Cover Soil material shall be placed on all areas as shown on the Drawings or as directed by the ENGINEER and as described in these Specifications. The thickness of each lift prior to compaction of the cover material shall be no greater than twelve (12) inches. Total compacted thickness of the cover material shall be as shown on the Drawings. Compaction of the Vegetative Cover Soil material shall be accomplished by suitable compaction equipment, subject to approval by the ENGINEER.

F. The Vegetative Cover Soil material shall be placed and compacted as necessary to achieve the required permeabilities and shear strength. The Vegetative Cover Soil material shall be compacted to 90 percent of Modified Proctor. The moisture content of the material shall be maintained within 3 percent of optimum moisture. Contractor shall not work wet cover material that cannot support equipment.

G. If changes in the material occur, the ENGINEER shall verify the material is from an

approved source and the ENGINEER may require additional testing in accordance with Paragraph 1.3, Part A (2) of this Section. If the material is not from an approved source or if the material is determined to not be acceptable by the ENGINEER, the CONTRACTOR shall be notified that the material is not approved. The ENGINEER shall reject any work performed by the CONTRACTOR using the new material until the appropriate testing is conducted and the material is approved by the ENGINEER.

H. The thickness of the in-place materials will be checked after the completion of the work on a grid pattern not to exceed 50-foot by 50-foot by digging, by hand, with a plastic shovel in the presence of and as directed by the ENGINEER. The size of the test hole shall not be less than one-foot in diameter. Measurements shall be made perpendicular to the slope. The CONTRACTOR shall be responsible for digging holes in the cover material to allow for the measurements to be taken by the ENGINEER. After measurements have been made, the CONTRACTOR shall backfill the holes with cover material, and hand tamp. During digging and backfill of test holes, the CONTRACTOR shall use plastic shovels and exercise care not to damage any materials. Any such damage shall be repaired at the expense of the CONTRACTOR.

I. The CONTRACTOR shall be responsible to repair damage to the cover material between testing and acceptance.

J. All soil samples are to be obtained under the direction of the ENGINEER.

K. Final acceptance of cover material is dependent on:
   a. Satisfying the minimum requirement of thickness from the selected alternative as shown on the Contract Drawings measured perpendicular to the slope.
   b. Vegetative Cover Soil material meeting all the physical/analytical properties listed in Section 02227.

L. Any damage, disturbance, or settlement that occurs as a result of the CONTRACTOR'S stockpiling of material or equipment on site shall be the responsibility of the CONTRACTOR to repair and/or supply additional materials to compensate for settlement caused by the CONTRACTOR'S actions.

3.2 <u>SOURCE QUALIFICATION TESTING</u>

A. Prior to acceptance of the borrow or stockpile site, the CONTRACTOR shall provide the following soil analyses to the ENGINEER:
   1. Results of interface friction test performed for the interface between the proposed Vegetative Cover Soil with proposed geosynthetics in accordance with ASTM Standard Test Method D 5321 (latest revision) performed under saturated conditions, with a 24-hour saturation period prior to the test, Determining the Coefficient of Soil/Geosynthetic Friction by the Direct Shear Method. The test shall be performed for a minimum of three normal stresses applied to bracket the normal stress of 300 psf at the interface being tested. The CONTRACTOR shall take particular note that this test shall be repeated for every proposed geosynthetic and Vegetative Cover Soil combination used in the construction.

2. Results of compaction tests conducted in accordance with ASTM D 1557 (latest revision), Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
3. Results of Atterberg limits, plastic and liquid limit, and plasticity index conducted in accordance with ASTM D 4318 (latest revision), Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
4. Results of the particle-size analysis conducted in accordance with ASTM D 421/422 (latest revision). Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants/Test Method for Particle Size Analysis of Soils.
5. Results of hydraulic conductivity testing conducted in accordance with ASTM D 5084 (latest revision), Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
6. Results of chemical analyses conducted in accordance with the requirements of Section 02227.

3.3 VEGETATIVE COVER SOIL

A. Vegetative Cover Soil

1. Quality Control Testing:
   a. The ENGINEER shall perform quality control testing during construction. This testing is in addition to all other tests required to be conducted by the CONTRACTOR.
   b. The ENGINEER shall collect representative samples from each material source of Vegetative Cover Soil for testing at a frequency determined by the ENGINEER.
   c. The Vegetative Cover Soil shall exhibit an interface friction angle in accordance with the values as specified in Section 2.2(A) of this specification. Materials tested by the ENGINEER exhibiting results not meeting the interface friction angle requirements will be rejected, or the CONTRACTOR may be required to furnish additional test data, at his expense, to demonstrate acceptability of the material.

3.4 MEASUREMENT AND PAYMENT

A. Payment will be made on a unit price basis for furnishing, transporting, and stockpiling materials onsite and for placing, compacting, and for performing and passing the required testing. No payment will be made for placing and compacting soil that does not meet the specified requirements and the CONTRACTOR shall be required to repair, replace, and re-compact soil until all specifications are met at their own cost.

B. Measurement for payment for furnishing, transporting and stockpiling materials onsite and for placing, compacting and performing and passing the required testing will be made based upon the final, in-place volumes for work that is accepted by the ENGINEER.

C. The OWNER reserves the right to furnish, transport, and stockpile materials onsite for use by the CONTRACTOR. The CONTRACTOR shall use the materials provided by the OWNER as instructed by the ENGINEER and shall assume that the materials are suitable for the directed

use. The OWNER shall provide the CONTRACTOR with the testing data for all materials provided by the OWNER.

END OF SECTION 02227

SECTION 02228

TOPSOIL MATERIAL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
1. CONTRACTOR shall furnish and place topsoil as shown on the Contract Drawings.
2. The CONTRACTOR is solely responsible for the management of surface water runoff. The ENGINEER shall verify that all required sediment and erosion controls have been installed to specifications prior to the CONTRACTOR starting any construction activities at the site. The ENGINEER shall also periodically inspect sediment and erosion controls, including after rainfall events, and inform the CONTRACTOR of repairs or removal of accumulated sediments that are required to maintain the effectiveness of the sediment and erosion controls. The CONTRACTOR shall promptly perform these repairs and removal actions as directed by the ENGINEER. The CONTRACTOR is responsible for the costs associated with these repairs and removal actions.

B. Related Sections:
1. Section 02220, Excavation and Backfill and Regrading.
2. Section 02227, Vegetative Cover soil Material.
3. Section 02900, Landscaping.

C. General:
1. CONTRACTOR is required to use approved material from off-site sources.

D. CONTRACTOR shall provide ENGINEER with access to the material source upon request for the purposes of observing material source operations and obtaining samples.

1.2 QUALITY ASSURANCE

A. Tests:
1. The services of a qualified testing laboratory shall be engaged by the CONTRACTOR to make tests and determine acceptability of the material as listed below. The laboratory shall be acceptable to the ENGINEER.
2. Required Tests:
   a. Gradation, ASTM D 422, Plasticity Index, ASTM D 4318, Soil Classification, ASTM D 2487, pH, Organic Content, ASTM D2974, Priority Pollutant Semi-volatile Compounds, EPA Method 8270, Priority Pollutant Volatile Organic Compounds, EPA Method 8260, Extractable Total Petroleum Hydrocarbons, Connecticut Method, Priority Pollutant Metals, EPA Method 6010 (HG Method), Pesticides, EPA Method 8081, PCBs, EPA Method 8082, Herbicides, EPA Method 8151. All test results shall be in conformance with the criteria for either Residential Direct Exposure Criteria (RDEC) or the Industrial Direct Exposure

Criteria (IDEC) and Class GA Groundwater Pollutant Mobility Criteria (GAPMC) of the CTDEP's Remediation Standard Regulations (RSRs), 22a-133k-l to k-3 of the Regulations of Connecticut State Agencies. Soil designated as Topsoil within the proposed park area on the site shall comply with the RDEC and all other material shall comply with the IDEC.

B. Permits and Regulations:

1. Material transfer and storage shall comply with all local and state permits required for management and storage of soil having restricted re-use in the State of Connecticut, except as noted below. In particular compliance with the State of Connecticut General Permit for Contaminated Soil and/or Sediment Management (Staging & Transfer) requirements under sections 22a-133z and 22a-208a of the Regulations of Connecticut State Agencies is required. Soils meeting the RDEC and GAPMC are not considered Contaminated Soil and as such will not be covered by the above General Permit.

C. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified.

1. ASTM D 422, Particle-Size Analysis of Soils.
2. ASTM D 4318, Liquid Limit, Plastic Limit and Plasticity Index of Soils.
3. ASTM D 2487, Classification of Soils for Engineering.
4. Association of Official Analytical Chemists, Official Methods of Analysis.
5. Priority Pollutant Semivolatile Compounds by EPA Method 8270.
6. Priority Pollutant Volatile Organic Compounds by EPA Method 8260.
7. Extractable Total Petroleum Hydrocarbons by the Connecticut Method.
8. Priority Pollutant Metals by EPA Method 6010 (HG Method).
9. Pesticides, EPA Method 8081.
10. Herbicides, EPA Method 8151.
11. PCBs/EPA Method 8082.

Note: Items 5 through 11 as noted above will be referred to as "environmental testing" throughout this Specification.

1.3 SUBMITTALS

A. Test Reports:

1. Submit six (6) copies of the following reports directly to ENGINEER from the testing service, with copy to the CONTRACTOR:
   a. Environmental, particle size, pH, and internal friction angle tests for Topsoil material from off-site shall be performed at a frequency of 1 per 3,000 cubic yards if from a natural borrow source or 1 per source, whichever is more stringent. Material that is not from a natural borrow source shall be tested at a frequency of 1 per 1,000 cubic yards.
   b. Written statement giving the location of the properties from which the Topsoil is to be obtained, the names and addresses of the suppliers, and, if applicable, crops grown on the properties during the past 2 years.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Topsoil:
   1. Topsoil shall be placed where shown or specified or directed by ENGINEER.
   2. Provide approved soil materials for Topsoil, free of contaminated soil, clay, rock or gravel larger than 1 inch in any dimension, debris, waste, frozen materials, vegetable and other deleterious matter.
   3. All Topsoil materials must adhere to the range of cohesion/internal friction angle properties (i.e. 0 psf, 37°) specified below:

Cohesion, psf	Peak Internal Friction Angle (Φ)
0	37
10	36
20	34
35	32
45	30

Provide, which is fertile, friable, natural loam, surface soil, capable of sustaining vigorous plant growth, free of any admixture of subsoil, clods of hard earth, plants or roots, sticks or other extraneous material harmful to plant growth. Supply topsoil with the following analysis:

a. 1 -inch Mesh: 100 percent passing.
   #4 Sieve: 90 to 100 percent passing.
   #200 Sieve: 0-10 percent passing.
b. Clay content of material passing #200 sieve not greater than 60 percent, as determined by hydrometer tests.
c. pH 5.0 to pH 6.5.
d. Organic content not less than 5 percent and not greater than 20 percent, as determined by ignition loss.
e. Free of pests and pest larvae.
f. Plasticity index (PI) <5

PART 3 - EXECUTION

3.1 PLACING

A. ENGINEER will examine the areas and conditions under which Topsoil placing is to be performed and notify the CONTRACTOR of conditions he may find that are detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in an acceptable manner. Placing of Topsoil shall conform to the requirements of Section 02900. The CONTRACTOR shall not be permitted to have more than 2 acres of Topsoil without the final landscaping materials

suitably installed in accordance with Section 02900

B. The thickness of the in-place Topsoil material will be checked after the completion of the work on a grid pattern not to exceed 50-foot by 50-foot by digging, by hand, with a plastic shovel in the presence of and as directed by the ENGINEER. The size of the test hole shall not be less than one-foot in diameter. Measurements shall be made perpendicular to the slope. The CONTRACTOR shall be responsible for digging holes in the Topsoil to allow for measurements to be taken by the ENGINEER. After measurements have been made, the CONTRACTOR shall backfill the holes with cover material, and hand tamp. During digging and backfill of test holes, the CONTRACTOR shall use plastic shovels and exercise care not to damage any materials. Any such damage shall be repaired at the expense of the CONTRACTOR.

3.2 INSPECTION AND EROSION REPAIR

A. ENGINEER will examine the areas and conditions of the Topsoil after it is placed on a periodic basis including after all rain events. The ENGINEER will instruct the CONTRACTOR to repair rills in the Topsoil that are greater than ½-inch deep and 1-wide. The CONTRACTOR shall be responsible for promptly performing the repairs and will be responsible for all costs associated with performing the Work.

3.4 MEASUREMENT AND PAYMENT

A. Payment will be made on a unit price basis for furnishing, transporting, and stockpiling materials onsite and for placing, compacting, and for performing and passing the required testing. No payment will be made for placing and compacting soil that does not meet the specified requirements and the CONTRACTOR shall be required to repair, replace, and re-compact soil until all specifications are met at their own cost.

B. Measurement for payment for furnishing, transporting and stockpiling materials onsite and for placing, compacting and performing and passing the required testing will be made based upon the final, in-place volumes for work that is accepted by the ENGINEER.

C. The OWNER reserves the right to furnish, transport, and stockpile materials onsite for use by the CONTRACTOR. The CONTRACTOR shall use the materials provided by the OWNER as instructed by the ENGINEER and shall assume that the materials are suitable for the directed use. The OWNER shall provide the CONTRACTOR with the testing data for all materials provided by the OWNER.

END OF SECTION 02228

SECTION 02900

LANDSCAPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
1. CONTRACTOR shall provide all labor, tools, materials, testing, equipment and incidentals as shown, specified and required to furnish and perform landscaping work.
2. The extent of the landscaping Work shall be performed as shown and as specified in schedules.
3. The landscaping Work required includes the following:
   a. Importing topsoil from off-site sources if existing cover soils are unacceptable.
   b. Maintenance Work as specified until completion of the Contract.
   c. Soil amendments.
   d. Fertilizers.
   e. Grass materials.
   f. Miscellaneous landscape materials,
   g. Guarantees.

B. Coordination:
1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with the landscaping.
2. Notify other contractors in advance of the installation of the landscaping to provide the other contractors with sufficient time for the installation of items included in their contracts that must be installed before landscaping.

C. Related Sections:
1. Section 02220, Excavation and Backfill and Regrading
2. Section 02228, Topsoil Material.
3. Section 06642, Erosion Control Geosynthetics.

1.2 QUALITY ASSURANCE

A. Landscape Subcontractor Qualifications:
1. Subcontract the landscape Work to a single firm specializing in landscape Work.
2. The landscape subcontractor shall have a minimum of five years of experience of performing substantially similar work.

B. Source Quality Control:
1. General:
   a. Ship landscape materials with certificates of inspection as required by governmental authorities.
   b. Comply with governing regulations applicable to landscape materials.

c. ENGINEER will request inspection of delivery slips for materials to verify specified quantities of bulk deliveries of soil amendments and fertilizers.

2. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Analytical Chemists, wherever applicable or as further specified.
3. Off-Site Topsoil: Obtain topsoil from local sources or from areas having similar soil characteristics to that found at the site of the Work. Obtain topsoil only from naturally well-drained sites where topsoil occurs in depth of not less than 4- inches; do not obtain from bogs or marshes.
4. Topsoil stockpiled for reuse: Existing cover soils will be inspected by ENGINEER prior to particle size testing to determine suitability for reuse. At the time of inspection ENGINEER will require representative soil samples to be tested for physical properties, pH value, organic matter, and available phosphoric acid and potassium if proposed for use as topsoil. Contractor shall supply twenty pound samples and perform tests at no additional expense to OWNER.
5. All Topsoil shall meet the testing requirements of Section 02228.

C. Reference Standards: Comply with the applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. ASTM C 602, Agricultural Liming Materials.
2. American Joint Committee on Horticultural Nomenclature, Standardized Plant Names.
3. Official Seed Analysts of North America, Standards of Quality.
4. FSO-F-241D, Fertilizer, Mixed, Commercial.
5. FSO-F-166E, Peat Moss; Peat, Humus; and Peat, Reed-sedge.

1.3 SUBMITTALS

A. Shop Drawings: The CONTRACTOR shall submit six (6) copies of the following for approval:
1. Planting schedule showing scheduled dates for Turf Work in each area of site.
2. Before delivery of off-site topsoil, written statement giving the location of the properties from which the topsoil is to be obtained, the names and addresses of the suppliers, the depth to be stripped and the crops grown during the past 2 years.
3. Manufacturer's specifications and installation instructions for all materials required.
4. Leachate/Stormwater Management Plan in accordance with Section 02220, Part 1.3 Paragraph C.

B. Test Reports: Submit for approval the following:
1. Before delivery of peat humus an analysis made by an approved laboratory stating the mechanical and chemical analysis of the peat humus proposed for use.

C. Certificates: Submit for approval the following:
1. Certificates of inspection as may be required by governmental authorities to accompany shipments, and manufacturer's or vendors certified analysis for soil amendments and fertilizer materials. For standard products submit other data substantiating that materials comply with specified requirements.

2. Certificates from seed vendors certified statement for each seed mixture required, stating botanical and common name, percentage by weight and percentages of purity, germination, and weed seed for each species.

D. Operation and Maintenance Data: Submit for approval the following:
1. Typewritten instructions recommending procedures to be established by OWNER for the maintenance of landscape Work for one full year. Submit prior to expiration of required maintenance period(s). Include moisture requirements of each type of planting and insect prevention measures including types of spray and application instructions, and special winter protection measures required for each planting.

E. Guarantee: Submit for approval a written guarantee, in the terms specified under "Guarantee" provision of these Specifications, signed by CONTRACTOR.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:
1. Deliver packaged materials in original, unopened containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery.
2. Furnish seed in sealed, standard containers.
3. Notify ENGINEER of delivery schedule in advance so materials may be inspected upon arrival at job site.
4. Remove unacceptable material immediately from project site.

B. Storage of Materials:
1. Store and cover materials to prevent deterioration. Remove packaged materials which have become wet or show deterioration or water marks from the site. Replace at no further cost to OWNER.
2. Seed that is wet or moldy or that has been otherwise damaged in transit or storage is not acceptable. Replace at no further cost to OWNER.

1.5 JOB CONDITIONS

A. Environmental Requirements:
1. Proceed with and complete the Work as rapidly as portions of the Site become available, working within the seasonal limitations for each kind of landscape Work required.
2. Do not spread seed when wind velocity exceeds 5 miles per hour.
3. Do not plant when drought, or excessive moisture, or other unsatisfactory conditions prevail.

B. Scheduling:
1. Plant or install materials only during normal planting seasons for each type of landscape Work required. Correlate planting with specified maintenance periods to provide maintenance until occupancy by OWNER.

C. Wetlands

1. Heavy equipment working in wetlands shall be avoided and if required shall be placed on mats to minimize soil/vegetation disturbance. Disturbed areas in wetlands shall be restored to preconstruction contours upon completion of the work.
2. Temporary fills shall be disposed of at an upland site and suitably contained to prevent erosion and/or transport to a waterway or wetland. Temporary fill areas shall be restored to their original elevations. No temporary fill shall be placed in waters and/or wetlands.
3. The CONTRACTOR shall make every reasonable effort to carry out the construction or operation of the Work in a manner so as to maintain as much as is practicable, and to minimize any adverse impacts on, existing fish, and wildlife, and natural environmental values and to discourage the establishment or spread of plant species identified as non-native invasive species by any federal or state agency.

1.6 ALTERNATIVES

A. Substitutions are not allowed.

1.7 GUARANTEE

A. Guarantee turf through the specified maintenance period, until Final Acceptance of the Work.

B. Immediately remove and replace turf found to be dead or in unhealthy condition during guarantee period and through the specified maintenance period. Make replacements during growth season following end of guarantee period. Furnish and plant replacements which comply with requirements shown and specified. ENGINEER will make another inspection at end of extended guarantee period, if any, to determine acceptance or rejection. Only one replacement will be required at end of guarantee period, except for losses or replacements due to failure to comply with specified requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil:
1. Existing cover soils shall be analyzed in accordance with Section 02228 to determine the suitability for reuse as topsoil. Soils approved by the ENGINEER for use as topsoil shall be stockpiled by the CONTRACTOR for reuse in landscape Work. If quantity of stockpiled topsoil is insufficient, the CONTRACTOR shall provide additional topsoil as required to complete landscape Work in accordance with Section 02228.

B. Soil Amendments:
1. Lime: Natural limestone containing not less than 85 percent of total carbonates, ground so that not less than 90 percent passes a 10-mesh sieve and not less than 50 percent passes a 100-mesh sieve.
2. Peat Humus: Provide peat humus which is a natural product of with sphagnum moss, reed, or sedge peat, taken from a fresh water site. Supply shredded material, fee from lumps, roots, stones and other extraneous foreign matter, capable of passing through a 1/2-inch screen, which can easily be incorporated with the topsoil. Supply material which has been conditioned in storage piles after excavation for at least 6 months, including one

freezing and thawing period. Supply peat humus with the following analysis:

a. Not less than 90 percent organic matter by weight on an oven dry basis.
b. pH range 5 to 7.5.
c. Moisture content 35 percent at time of incorporation into soil.
d. Water absorbing ability 150 percent to 350 percent by weight.

3. Sand: Washed of fine to medium texture.
4. Ferrous Sulfate: Commercial grade and unadulterated.

C. Commercial Fertilizers:

1. Complete fertilizer of neutral character, with a minimum of 75 percent nitrogen derived from natural organic sources or ureaform; 40-50 percent of the nitrogen shall be water soluble. Available phosphoric acid derived form superphosphate, bone, or tankage. Potash derived from muriate of potash, containing 60 percent potash. Uniform in composition, freeflowing and suitable for application with approved equipment. Provide fertilizer with the following percentages of available plant nutrients.
   a. For lawns, provide fertilizer with not less than 4 percent phosphoric acid and not less than 2 percent potassium, and the percentage of nitrogen required to provide not less than 1.5 pounds of actual nitrogen per 1000 square feet of lawn area. Provide nitrogen in a form that will be available to the lawn during the initial period of growth.
2. Bonemeal: Commercial, raw, finely ground; 4 percent nitrogen and 20 percent phosphoric acid.
3. Superphosphate: Soluble mixture of treated minerals; 20 percent available phosphoric acid.
4. Hydroseeding Fertilizer:
   a. Commercial designation of 18-24-6. Provide a complete fertilizer of neutral character with a minimum of 75 percent nitrogen derived from natural organic sources.
   b. Minimum 40-50 percent of nitrogen shall be water soluble.
   c. Uniform in composition, free-flowing and suitable for application with approved equipment.
   d. Product and Manufacturer: Provide one of the following:
      1) Scotts Starter Fertilizer by the Scotts Company.
      2) Or equal.

D. Grass Materials:

1. Grass Seed Mixture: Provide fresh, clean, new-crop seed complying with the, tolerance for purity and germination established by the Official Seed Analysts of North America. Provide seed of the grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified. Birdsfoot trefoil shall be inoculated before planting.
2. The "Schedule of Grass Seed Requirements" is as follows:

GRASS SEED MIX SEEDING SCHEDULE			
BOTANICAL NAME	COMMON NAME	MIXTURE PERCENT BY WEIGHT	MINIMUM PERCENT PURITY/ GERMINATION
Agrastis tenuis	Colonial Bentgrass	5%	95/90%
Festuca rubra	Chewings Fescue	35%	97/80%
Festuca longifolia	Hard Fescue	30%	96/85%

Lotus corniculatus	Birdsfoot Trefoil	10%	96/90%
Lolium perenne	Perennial Ryegrass	20%	98/90%

The seeding rate for the mixture shall be 175 pounds per acre. The acceptable planting periods are from April 1 through June 15 and September 1 through October 15.

E. Miscellaneous Landscape Materials:
1. Hydromulch:
   a. On areas and slopes within the Limit of Cap as shown on Contract Drawings, provide a hydraulically applied flexible growth medium (FGM) at the rate of 3,500 pounds per acre.
   b. Provide the following:
      1) Product and manufacturer:
         a) Flexterra FGM by Profile Products, LLC
         b) or equal.
2. Water: Potable.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR and his installer shall examine the subgrade, verify the elevations, observe the conditions under which Work is to be performed, and notify ENGINEER of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the ENGINEER.

3.2 PREPARATION

A. Soil Preparation:
1. Loosen subgrade of turfbed areas as required to prepare seedbed. Remove debris over 1-1/2 inches in any dimension and sticks, roots, rubbish and other extraneous matter. Limit preparation to areas which will be planted promptly after preparation.
2. Spread topsoil to minimum depth of 6-inches after natural settlement and light rolling to 85 percent Modified Proctor density.
   a. Do not spread topsoil while in frozen condition or when moisture content is so great that excessive compaction will occur nor when so dry that dust will form in the air or that clods will not break readily.
3. Apply ground limestone, by machine, over all areas to receive turf, as required, to bring the soil to a neutral pH. Work lightly into the top 3 inches of topsoil at least five days before applying the commercial fertilizers.
4. Apply commercial fertilizers in the following quantities:
   a. For grass apply only at a rate sufficient to supply 1.5 pounds of nitrogen per 1000 square feet. For 5-10-5 use 30 pounds per 1000 square feet.
5. Apply commercial fertilizers within 10 days of seeding.
6. Apply commercial fertilizers in 2 operations. First application shall be 3/4 of total amount.

7. Thoroughly and evenly incorporate commercial fertilizers with the soil to depth of 3 inches by discing, or other approved method.
   a. In areas inaccessible to power equipment, use hand tools.
8. Apply superphosphate for grass areas at the rate of 20 pounds per 1000 square feet and incorporate into the top 3 inches of topsoil.
9. Grade turfbed areas to smooth, even surface with loose, uniformly fine texture-Remove all stones and extraneous foreign material in excess of 3/4 inch in diameter. Roll and rake and remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.
10. Apply a second dressing of fertilizer. Use 1/4 of the total amount.
11. Moisten prepared turfbed areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting. Do not create a muddy soil condition.
12. Restore turfbed areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

B. Adequate sedimentation and erosion control management measures, practices and devices, such as phased construction, vegetated filter strips, geotextile silt fences, or other devices shall be installed and properly maintained to reduce erosion and retain sediment on-site during and after construction in accordance with the CONTRACTOR'S Leachate Control Plan and Stormwater Pollution Control Plan. These devices shall be capable of preventing erosion, of collecting sediment, suspended and floating materials, and of filtering fine sediment. These devices shall be removed upon completion of work and the disturbed areas shall be stabilized. The sediment collected by these devices shall be removed and placed at an upland location, in a manner that will prevent its later erosion into a waterway or wetland. If the ENGINEER determines that the on-site placement of the collected sediment may adversely affect the integrity of the site, the collected sediment will be removed and disposed of at no additional cost to the OWNER. All exposed soil and other fills shall be permanently stabilized at the earliest practicable date. See Section 02112 “Sedimentation and Erosion Controls”.

3.3 INSTALLATION

A. Hydroseeding

1. Strictly comply with manufacturer's installation instructions and recommendations. For optimum pumping and application performance use approved mechanically agitated, hydraulic seeding/mulching machines with a fan-type nozzle (50-degree tip). Apply FGM from opposing directions and to achieve best soil coverage.
2 Erosion Control and Revegetation:
   a. For maximum performance, apply FGM in a two-step process:
   b. Step One: Mix and apply seed and soil amendments with small amount of FGM for visual metering.
   c. Step Two: Mix and apply FGM at a rate of 50 lb per 125 gallons (23 kg/475 liters) of water over freshly seeded surfaces. Confirm loading rates with equipment manufacturer. Do not leave seeded surfaces unprotected, especially if precipitation is imminent.
   d. Depending upon site conditions FGM may be applied in a one-step process where all components may be mixed together in single tank loads. Consult with manufacturer for further details.

3 Mixing:
A mechanically agitated hydraulic-application machine is recommended:
   a. Fill tank to middle of agitator shaft or tank about 1/3 full of water. Turn on pump to wet or purge lines. Begin agitating. Keep adding water slowly while adding the FGM at a steady rate.
   b. Consult application and loading charts to determine number of bags to be added. Mix at a rate of 50 lbs. of FGM per 125 gallons (23kg/475 liters). Contact equipment manufacturer to confirm optimum FGM mixing rates.
   c. All FGM should be loaded when the tank is approximately 3/4 full.
   d. Fertilizer should be added once the tank is nearly full.
   e. Before applying, mix the slurry for at least 10 minutes after adding the last amount of FGM. This is very important to fully activate the bonding additives and to attain proper viscosity.
   f. Turn off recirculation valve to minimize potential for air entrainment within the slurry.
4. Application:
   a. Use a fan-type nozzle (50-degree tip) whenever possible for best soil surface coverage. Apply FGM from opposing directions to soil surface, reducing the "shadow effect" and assuring a minimum of 95% of soil surface coverage. Slope interruption devices or water diversion techniques are recommended when slope lengths exceed 100 ft (30m).
   b. Install materials at an application rate of 3500 pounds per acre.
   c. Increase application rates on highly erosive soils or chiseled, disked, furrowed or tracked slopes. Contact Manufacturer for additional details.
   d. Material should not be applied in channels, swales or other areas where concentrated flows are anticipated, unless installed in conjunction with a temporary erosion control blanket or non-degradable turf reinforcement mat.
   e. After application, thoroughly flush the tank, pumps and hoses to remove all FGM material. Wash all material from the exterior of the machine and remove any slurry spills. FGM will be more difficult to remove once it dries.
5. Prevent foot or vehicular traffic, or the movement of equipment over the seeded areas. Reseed areas damaged as a result of such activity.
6. Prevent the seeded areas from drying out. After seedlings appear in about 2-3 weeks reseed all bare spots larger than 18-inches in diameter. Areas to be reseeded shall be hand raked to scarify the surface and seed shall be applied by cyclone spreader. Lightly rake the seed into the soil.

B. Reconditioning Existing Turf:
1. Recondition existing turf areas damaged by CONTRACTOR'S operations including storage of materials and equipment and movement of vehicles. Also recondition existing turf areas where minor regrading is required.
2. Provide fertilizer, seed or sod, soil amendments, and erosion control matting as specified for new turf and as required to provide a satisfactorily reconditioned turf. Provide new topsoil as required to fill low spots and meet new finish grades.
3. Cultivate bare and compacted areas thoroughly to provide a satisfactory planting bed.
4. Remove diseased and unsatisfactory turf areas; do not bury into soil. Remove topsoil containing foreign materials resulting from CONTRACTOR'S operations including, but not

limited to oil drippings, stone, gravel and other loose building materials.

5. In areas approved by ENGINEER, where substantial turf remains (but is thin), mow, rake, aerate if compacted, fill low spots, remove humps and cultivate soil, fertilize, and seed. Remove weeds before seeding or if extensive, apply selective chemical weed killers as required. Apply a seedbed mulch, if required, to maintain moist conditions.
6. Water newly planted areas and keep moist until new turf is established.

3.4 MAINTENANCE

A. Begin maintenance immediately after planting.

B. Maintain turf for not less than the period stated below, and longer as required to establish an acceptable stand, as determined by ENGINEER.
   1. Grass seed lawns, not less than 60 days.
   2. If seeded in fall and not given a full 60 days maintenance, or if not considered acceptable at that time, continue maintenance the following spring until acceptable lawn is established.

3.5 CLEANUP AND PROTECTION

A. During landscape Work, store materials and equipment where directed. Keep pavements clean and work area in an orderly condition.

B. Protect landscape Work and materials form damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain production during installation and maintenance periods. Treat, repair or replace damaged landscape Work as directed.

C. Take all precautions to insure that hydroseed slurry, is only placed on the areas designated. Completely clean any overspray, on areas not designated to receive slurry, to the satisfaction of ENGINEER.

D. Remove all rubbish, equipment and rejected materials from the site.

E. Protection includes all temporary fences, barriers and signs and other Work incidental to proper maintenance.

3.6 INSPECTION AND ACCEPTANCE

A. When the landscape Work is completed, including maintenance, the ENGINEER will make an inspection to determine acceptability.

B. Where inspected landscape Work does not comply with the requirements, replace rejected Work and continue specified maintenance until reinspected by ENGINEER and found to be acceptable. Remove rejected plants and materials promptly from the project site.

C. Any damage, disturbance, or settlement that occurs as a result of the CONTRACTOR'S stockpiling of material or equipment on site shall be the responsibility of the

CONTRACTOR to repair and/or supply additional materials to compensate for settlement caused by the CONTRACTOR'S actions.

D. The thickness of the in-place Topsoil will be checked by the CONTRACTOR after the completion of the work on a grid pattern not to exceed 50-foot by 50-foot by digging, by hand, with a plastic shovel in the presence of and as directed by the ENGINEER. The size of the test hole shall not be less than one-foot in diameter. Measurements shall be made perpendicular to the slope. The CONTRACTOR shall be responsible for digging holes in the Topsoil to allow for the measurements to be taken by the ENGINEER. After measurements have been made, the CONTRACTOR shall backfill the holes with Topsoil, and hand tamp. During digging and backfill of test holes, the CONTRACTOR shall use plastic shovels and exercise care not to damage any materials. Any such damage shall be repaired at the expense of the CONTRACTOR.

END OF SECTION 02900

SECTION 06642

EROSION CONTROL GEOSYNTHETICS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope: CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals necessary for the placement of erosion control geosynthetics and Turf Reinforcement Mats (TRM) on slopes and drainage swales as shown and specified on the Drawings, or as otherwise directed by the ENGINEER. TRM shall be installed wherever the Green Armor System is shown on the Contract Drawings.

B. Related Sections:
   1. Section 02900, Landscaping.

1.2 QUALITY CONTROL

A. Manufacturer Qualifications: Erosion control geosynthetic manufacturer shall be a specialist in the manufacture of the particular geosynthetic.

1.3 SUBMITTALS

A. Shop Drawings:
   1. Submit six (6) copies of manufacturer data, specifications, dimensions and installation instructions for erosive soils and high runoff velocities.
   2. Submit six (6) copies of an affidavit certifying that each geosynthetic furnished complies with all requirements specified herein.
   3. No geosynthetic shall be shipped until the affidavit is submitted to ENGINEER.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

A. Turf Reinforcement Mat (TRM)
   1. TRM shall be non-biodegradable turf reinforcing erosion control material mesh matrix with stabilizer (as necessary to protect from ultraviolet radiation), supplied in rolls. Permanent Erosion control geosynthetic shall be:
      a. Enkamat 7010 produced by Colband Geosynthetics, Inc..
      b. Or equal.

B. The TRM shall be made from 100% synthetic material and contain no biodegradable or photodegradable components or materials.

C. The TRM shall be a three-dimensional matrix and maintain the three dimensional stability without laminated or stitched layers. The TRM shall have a sufficient Area Holding

Capacity and a minimum 90% open space available for soil and root interaction. The TRM shall not loose its structural integrity and shall not unravel or separate when TRM is cut in the field.

D. The TRM shall exhibit no buoyancy factor (i.e., the specific gravity of the fibers used should be greater than 1.0) so as to allow the TRM to maintain intimate contact with the soil (particularly between fasteners) under low flow conditions.

E. The TRM shall meet the requirements of Table 1.

TABLE 1 – PERMANENT TURF REINFORCEMENT MAT

Property	Test Method	Units	Value
Mass/Unit Area	ASTM D 5261	oz/yd^2	8.0
Thickness	ASTM D 5199	inches	0.4
Tensile Strength (MD)	ASTM D 5035 mod	lb/ft	160.0
Area Holding Capacity	Calculated	in^3/yd^2	450
Porosity	Calculated	%	>95
UV Stability	ASTM D 1682 mod	%	80
Velocity 30 min. Vegetated 50 hr. Vegetated	Flume Testing[1]	ft/sec	 19.0 14.0
Shear 30 min. Vegetated 50 hr. Vegetated	Flume Testing[1]	lb/ft^2	 8.0 6.0

1 – Acceptable facilities include Utah State University, Colorado State University

F. Anchoring Devices

1. The TRM shall be secured in place using heavy-duty metal staples. The metal staples shall be U-shaped, a minimum of 6 inch long (each leg), one and one half (1-1/2) inches wide, and shall be fabricated from 9 gauge diameter metal wire. If difficulties arise installing the staples, then 10 inch pins fabricated from 9 gauge with one and one half (1-1/2) inch diameter washer or 7 inch gutter spike with one and one half (1-1/2) inch diameter washer shall be used. In some cases where loose soil conditions exists and anchors of stated length do not properly secure the TRM to the ground, then longer staple should be used such as a 8-12 inch long staples or pins.

PART 3 - EXECUTION

3.1 PREPARATION

A. The TRM product will be installed explicitly according to the manufacturer recommendations. The installation site shall be prepared by filling the area to the design grade.

B. The surface to receive the TRM shall be prepared to relatively smooth conditions free of obstructions, depressions, debris and soft or low density pockets of material. The material

shall be capable of supporting a vegetative cover.

C. Erosion features such as rills, gullies, etc. must be graded out of the surface before TRM deployment. Smooth roll drum compaction may be required before deploying TRM to make sure the TRM makes immediate contact with the soil.

D. Cut trenches for initial anchor trenches, termination trench and longitudinal anchor trenches (6 inches wide and 9 inches in depth).

E. CONTRACTOR shall place all cover materials in such a manner to ensure: the erosion control geosynthetics are not damaged; minimal slippage of the erosion control geosynthetics or underlying layers; and no excess tensile stresses are introduced into the erosion control geosynthetic.

F. CONTRACTOR shall consult with manufacturer regarding recommendation as to the sequence for seeding and placement of the erosion control geosynthetic. Following seeding and placement of the erosion control geosynthetic, CONTRACTOR may be directed by the ENGINEER to mulch the surface in accordance with directions for mulching in Section 02900 Landscaping.

3.2 INSTALLATION - SLOPES

A. Install Erosion control geosynthetics as per Manufacturer's installation procedure, or as described below.

B. Grade subgrade to be stable and firm, but not crusted.

C. Apply erosion control geosynthetic with the length of roll laid perpendicular to the slope.

D. Install an anchor slot at the up slope and down slope ends of the geosynthetic placement. Bury at least 12 inches of the end of the geosynthetic horizontally in the anchor slots. Secure the geosynthetic in the anchor slot by stakes at intervals of 3 feet or less prior to burying. Tamp the soil against the geosynthetic in the slot.

E. Overlap successive lengths of the erosion control geosynthetic at least 3 feet, with the up slope length on top. Stake the overlap by placing 3 staples spaced across the end of each of the overlapping lengths and by placing 3 staples across the width of the center of overlap area.

F. Construct check slots by placing a fold at least 6 inches vertically into the soil. Staple the geosynthetic at each check slot edge, overlap and in the center of the geosynthetic. Coordinate check slots with adjacent rolls such that check slots are not staggered. Check slots shall be placed at a frequency of every 25 feet.

G. Place 1 row of staples, spaced 10 inches on center on each side of check slot and place staples on all longitudinal overlaps at a maximum spacing of 3 feet.

H. Maintain the geosynthetic until all Work has been completed and accepted. CONTRACTOR shall repair areas where damaged by any cause until vegetation final acceptance.

I. Place additional staples to maintain contact of geosynthetic with ground surface as required by manufacturer.

END OF SECTION 06642

SECTION 06643

GEOMEMBRANES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
1. CONTRACTOR shall furnish all labor, materials, tools, testing, equipment and incidentals required to supply, install and test textured linear low density (LLDPE) polyethylene flexible geomembrane as shown on the Drawings and specified herein. Only one type of LLDPE geomembrane shall be used for the entire project, and will at a minimum be utilized within the entire limit of waste
2. The textured LLDPE geomembrane shall be textured on both sides.
3. Subgrade preparation is included under Section 02220 and Section 02225.
4. Refer to Section 06647 for additional requirements relating to cold weather construction and installation.

B. Related Sections:
1. Section 06645, Geosynthetics.
2. Section 06646, Geocomposite Drainage Layer
3. Section 06647, Cold Weather Installation - Geomembrane.
4. Section 02225, Subbase
5. Section 02227, Vegetative Cover Soil Material

C. CONTRACTOR shall supply field enclosures, field tensiometers, arbor presses and all other equipment and appurtenances for completing and testing the work.

1.2 DEFINITIONS

A. Roll: One roll shall be a length of liner material delivered to the site, packaged or rolled in some manner as to prevent kinks, creases, pinholes or cold bends in the material.

1.3 QUALITY ASSURANCE

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
1. Standards of American Society for Testing and Materials (ASTM).

B. Single Source:
1. All liner material shall be obtained from a single material supplier and all liner sheets shall be manufactured by a single liner manufacturer.

C. Liner Manufacturer's Qualifications and Experience:
1. Liner manufacturer shall be a specialist in the manufacture of textured PE liners and

shall demonstrate:

a. At least five years experience in the manufacture of textured PE liners.
b. At least 10 million square feet of textured PE liner.
c. At least 10 completed projects.

2. Liner Manufacturers:
   a. GSE, Inc.
   b. Or equal.

D. Liner Installer's Qualifications and Experience:

1. Liner installer shall be a specialist in the installation of textured PE liners and shall have installed at least 10 million square feet of PE liner during the last five years. The installer is responsible for field handling, placing, seaming, loading (against wind) and other aspects of geomembranes and geosynthetics.
   a. Installer's field crew shall include at least one "master seamer", whose experience conforms to Article 3.4 of this Section.
   b. Submit resume of master seamers.
   c. Submit resume of field superintendent.

E. Liner Installer's Field Services and Reports:

1. Retain services of liner installer's factory trained representatives with demonstrated ability and experience in the field seaming, field testing and all other pertinent aspects of PE liner installation to perform the services listed below:
   a. Inspect the drainage layer material and supervise any corrective work required. Prepare an inspection report.
      1) Identify ASTM methods and values that result from repairs.
      2) Describe corrective work.
   b. Supervise the unloading handling, and storage of all liner sheets.
   c. Supervise the handling, unrolling and placement of all liner sheets.
   d. Perform all field seaming and testing of liner.
   e. Perform all repairs to damaged liner sections.
   f. Supervise the placement of top drainage layer/liner cover material.
   g. Conduct startup seam testing.
   h. Conduct field destructive and non-destructive seam tests.
   i. Prepare detailed test reports and submit copies of these reports to ENGINEER daily.
   j. Prepare a written report at the completion of the work which includes the following:
      1) Complete identification of flexible membrane liner, including but not limited to, resin type, physical properties and other pertinent data.
         a. Identify ASTM methods and values.
      2) Complete description of field seaming system used including material, method, temperatures, seam overlap width and cure or aging time.
      3) Complete description of field sampling and testing including test equipment used, location of field tests, copy of test results, conditioning procedure prior to destructive seam testing, method of recording loading and determining average load for destructive test methods and type of failure in tests (i.e. within the seam, within the sheet material, clamp edge, seam edge). Copies

of all non-destructive test results for seam and repair areas and discussions on repair methods used for failed seams.

4) "As-built" drawings showing actual layout of liner sheets, destructive sample locations, patch/repair locations, pipe penetration details and anchor trench details.

5) An affidavit of compliance from the liner manufacturer, per Article 3.11.A.5.

F. Quality Control During Manufacturing:

1. Prior to the installation of any geomembrane material, the CONTRACTOR shall submit for approval to the ENGINEER information obtained from the manufacturer.
   a. origin (Resin Supplier's name, resin production plant), identification (brand name, number) and production date of the PE resin;
   b. copy of quality control certificates issued by the PE Resin Supplier; and
   c. reports on the test conducted by the PE Resin Supplier and/or liner Manufacturer to verify the quality of the PE resin used to manufacture the geomembrane rolls tests shall include, specific gravity (ASTM D792 Method A or ASTM D1505), melt index (ASTM D1238 Condition E) density (ASTM D1505) and percent carbon.
2. Random sampling shall be performed by the Liner Manufacturer, at no additional cost to the OWNER, throughout the liner production run to assure proper quality control. The minimum frequency of such sampling shall be as follows:
   a. Two (2) samples taken from each day's production, and
   b. One (1) sample per two (2) rolls, and
   c. All non-consecutive rolls delivered to the project.
   d. Other sampling as proposed by the CONTRACTOR and approved by the ENGINEER.
3. The samples shall be tested for the following properties:
   a. Uniformity: Visual inspection to assure the material is free of holes, blisters, undispersed raw material, or foreign matter.
   b. Thickness: Measurement along the sample to assure that the sheet is within the specified tolerances of thickness (ASTM D 1593).
   c. Carbon Black: The proper amount, grade and degree of dispersion are imperative to assure proper U.V. radiation protection (ASTM D 1248).
   d. Tensile Properties: One (1) dimensional tensile testing which measures tensile strength at yield and at break and elongation at yield and at break shall be made (ASTM D 638).
4. All pre-assembled panel seems shall be tested at the factory in accordance with the destructive and nondestructive testing specified in Paragraph 3.8 and 3.9 of this Section.
5. The CONTRACTOR shall provide the OWNER and ENGINEER with certified copies of the manufacturer's test results.
6. The OWNER and ENGINEER, at their discretion, may employ and pay for an independent testing laboratory to perform additional testing of the liner materials. This testing may also include all properties specified in Paragraph 2.2E and need not be limited to the testing performed by the Manufacturer. The CONTRACTOR shall, at no additional cost, provide field destructive samples to the OWNER or ENGINEER as required.

7. The CONTRACTOR shall be solely responsible to the OWNER for the quality of the material provided. Should any of the tests performed on the material yield unsatisfactory results, the CONTRACTOR will be responsible for replacing the material with satisfactory material without delaying the total project time and without any cost to the OWNER.

G. Testing Laboratory:

1. The services of a qualified testing laboratory shall be engaged by the CONTRACTOR to make tests and determine the acceptability of the liner materials. CONTRACTOR shall be responsible for coordinating and scheduling all testing with the laboratory so as not to delay completion of the Work.

H. Friction Angle Tests:

Prior to placement of the textured PE geomembranes, CONTRACTOR shall provide ENGINEER with laboratory test results as described below. These tests are intended to verify the side slope stability of the landfill.

1. Textured PE liner, geosynthetics and cover soils; PE liners, geosynthetics and cover soils shall be fabricated, and soils shall be chosen, to achieve a minimum peak friction angle of:
   a. Textured PE and either Drainage Sand and Drainage Geocomposite; 30 degrees with a normal stress of 150 psf between the textured PE liner and the drainage sand and the proposed drainage geocomposite,
   b. Textured PE and Geotextile Fabric: 30 degrees with a normal stress of 150 psf between the textured PE liner and the proposed geotextile fabric.
   c. Drainage net composite and Drainage Sand; 30 degrees with a normal stress of 150 psf between the drainage net composite and Drainage Sand.
   d. 30 degrees with a normal stress of 150 psf between the all other interfaces including, but not limited to Subbase material and Ash Fill, Subbase Material and Geotextile, Drainage Sand and Geotextile, Cover Soil and Geotextile, and between Cover Soil Material and Topsoil.
2. During construction and before completion, CONTRACTOR shall repeat the above tests with the materials used on-site, if the ENGINEER determines that the materials have changed, or if the test materials used in the preparation of the Shop Drawings are not identical to those used in construction.
3. The friction angle testing outlined above shall be conducted using ASTM D5321 and ASTM 3080 modified to be in general accordance with the following requirements is intended to indicate the performance of the various components by attempting to model the field conditions:
   a. The shear box shall be a minimum of 12 inches square in plan dimensions.
   b. Each half of the shear box shall be a minimum of three inches in depth.
   c. Proposed soils shall be compacted to approximately 90 percent Modified Proctor Density, with a moisture content, determined through the laboratory testing and topsoil shall be compacted to approximate 80 percent Modified Proctor density.
   d. The geosynthetics shall be placed in the same sequence as shown on the Drawings. The interface geosynthetics in questions shall be connected to the respective upper or lower shear box frame.
   e. The test shall be performed for a minimum of three normal stresses applied to the

geosynthetic to bracket the normal stresses defined above, as required to define the failure plane friction angle. The peak and residual shear stresses shall be recorded and plotted against the normal compressive stresses used. A best fit straight line shall be constructed for each test series.

f. All samples shall be normally consolidated under the applied load.
g. The direction of shear for each interface tested shall be in the direction of manufacture (machine direction) for each geosynthetic sample.
h. Apply the shear force using a constant rate of displacement not to exceed .01 in./min.
i. All tests shall be continued until a constant shearing force is recorded,
j. All tests shall be conducted with the soil and geosynthetics in a wet condition, by saturating and maintaining the specimen in water for 24 hours prior to and during testing.

The actual test methods and equipment shall be proposed by the CONTRACTOR and approved by the ENGINEER.

In addition to the prequalification testing, a minimum of three tests shall be performed by the CONTRACTOR during the course of the work to confirm that the frictional characteristics of the products continues to meet the requirements of this specification. Testing shall be performed in accordance with paragraph 1.3.H of this section.

1.4 SUBMITTALS

A. Shop Drawings:

1. Submit shop drawings for approval as soon as possible after award of Contract.
2. Shop drawings shall include:
   a. Drawings showing layout of liner sheets, anchor trench details and pipe penetration details. Layout diagram indicating the location of pre-assembled panels. Shop drawings need not identify each sheet and panel by number, per Article 3.2 of this Section; however, quality assurance record shall do so.
   b. Complete description of field seaming procedures.
   c. Work plan for liner installation including manpower and equipment requirements.
   d. Detailed description of field testing methods to be performed.
   e. Name of liner installer and written description of at least three (3) recent liner installation projects completed by liner installer
   g. Provide a list of at least three (3) references for liner installer
   h. Resume(s) of master seamers for liner installer
   i. Resume(s) of field superintendent for liner installer
   j. Liner installers QA/QC plan and cold weather installation procedures.
   k. Provide friction angle test results.

B. Affidavit of Compliance:

1. Provide 6 copies of an affidavit, certifying that all liner materials furnished for this project (reference project title and number) comply with all requirements specified in the Contract Documents.
2. No liner material shall be shipped until the affidavits are submitted to the ENGINEER.

C. Test Reports: Provide 6 copies of all factory and field quality control test reports.

D. Pre-weld seaming records, vacuum and pressure test records, and daily as-built information and sketches shall be submitted to the ENGINEER daily for review. Destructive seam testing, results shall be submitted to the ENGINEER as soon as available.

1.5 WARRANTY

A. The Bidder shall submit 3 copies of the liner manufacturer's offer of warranty with his bid. Pipe penetration seals and field seams, shall be included in the warranty. The warranty shall guarantee materials for a minimum period of 20 years and labor for a minimum period of 5 years.

B. CONTRACTOR shall provide the OWNER with a sample warranty in accordance with offer of warranty submitted with his bid.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery including unloading, storage and handling shall be performed in accordance with the liner manufacturer's recommendations and shall be done in such a manner as to prevent damage to the liner.

B. CONTRACTOR shall provide all labor and equipment required to assist ENGINEER in inspection and sampling of liner materials upon delivery to the site, or as requested by the ENGINEER.

PART 2 - PRODUCTS

2.1 PE RESIN

A. 1. The PE geomembrane shall be manufactured of virgin, first-quality resin and shall be compounded and manufactured specifically for the intended purpose. No regrinded or reprocessed materials shall be used in the manufacturing of the geomembrane. The resin manufacturer shall certify each batch for the specified properties.

2. The Polyethylene (Compounded) resin shall conform to the following properties:

Property	Test Method	Requirements
Specific Gravity	(ASTM* D 792 or ASTM D 1505)	>.915
Melt Index	(ASTM D 1238 Condition E)	<1.0/10min
Carbon Black Content	(ASTM D 1503)	2-3%

B. The resin used for extrusion bonded seams shall be identical in all respects to the PE resin used to manufacture the liner sheets. The installer shall provide certifications for welding rod and/or resin used to manufacture the rod prior to installation.

2.2 PE SHEET MANUFACTURING

A. The PE liner materials shall be formulated from the appropriate polymers and compounding ingredients to form an PE sheet material that meets all requirements for use as a liner for a municipal waste landfill. The sheet material shall be capable of being bonded to itself by thermal bonding in accordance with the sheet manufacturer's recommendations and instructions.

B. Liner sheets which have repair patches upon delivery to the site shall not be accepted.

C. Sheets shall be at least ten feet (10') in width. Individual liner sheets may be pre-assembled at the factory into larger panels to minimize field seams. Liner sheet and pre-assembled panel sizes shall consider access to site and materials handling constraints.

D. Each roll shall be identified by a number and date of manufacture. The number shall identify roll number and batch or lot number as a minimum.

E. The completed sheet, upon thorough quality control testing specified herein, must demonstrate the following properties:

1. General Sheet Properties:

Property	Test Method	Minimum Value	Units
1. Specific Gravity	ASTM D 1505 Method A	0.92	g/cm^3
2. Melt Flow Rate	ASTM D1238	<1.0	g/l0 Min
3. Coefficient of Linear Thermal Expansion, nominal	ASTM D 696	$1.2x10^{-4}$	C^{-1}
4. Water Absorption	ASTM D 570	.10 max.	%wt. change
5. Modulus of Elasticity, Min.	ASTM D 638	80,000	psi
6. Carbon Black Content	ASTM D 1603	2 Min. 3 Max.	% %
7. Dimensional Stability maximum change percent)	ASTM D 1204 212°F 1 hr.	$\pm$2	each dir. %change max.
8. Resistance to Soil Burial	ASTM D 3083		% change max. in original value

a. Tensile Strength Yield and Break		±10	
b. Elongation at Yield and Break		±10	
9. Environmental Stress	ASTM D 1693	1,500	Min. hours

2. Sheet Properties for Specific Sheet Applications:

Property	Test Method	Units	Minimum Values[2]
1. Textured			Yes
a. One side			No
b. Two sides			Yes
2. Thickness, (min. average)	ASTMD1593	mils	38
3. Tear Resistance, min. (MD & CMD)[1]	ASTMD1004 DieC	lbs	22
4. Tensile Strength, min. a. Break (MD & CMD)[1]	ASTM D 638*	lbs/inch width	60
5. Elongation, min. a. Break (MD&CMD)[1]	ASTM D 638*	%	250

Notes:

A. Primary Liner

(1) MD = Machine Direction
CMD = Cross Machine Direction

(2) The minimum values presented are for use as a guide only and represent the absolute minimum properties for the sheet. The critical property will be the minimum friction angle specified and may result is a thicker geomembrane necessary to comply with these specifications.

*Speed 2 ipm, Test Specimen

Property	Test Method	Value	Units
Field Seam Requirements			
1. Bonded Seam Strength	ASTM D 4437	FTB[1] and 76[2] minimum	Breaking factor Ibs/inch mm.
2. Peel Adhesion lb/inch min.	ASTM D 4437	FTB[1] and 60[2]	

(1) FTB - Film Tear Bond, and shall have a maximum of 10% peel in seam or portion of seam tested.

(2) Required minimum failure value for seam.
(3) Both halves of split wedge seams will be tested.

2.3 PIPE PENETRATION MATERIALS

A. Extrusion Joining Resin: Resin used for extrusion joining sheets and sheet to pipe shall be PE produced from the same as the sheet resin. Physical properties shall be the same as those of the resin used in the manufacture of the PE liner. The resin shall be supplied in black.

B. Extrusion weld on pipe shall be non-destructively tested and repaired in accordance with the procedures outlined in paragraph 3.8 of this section or as approved by ENGINEER.

C. Factory fabricated boots will be considered as an alternative by ENGINEER providing:
1. The boot assembly has sufficient length of pipe and PE sheeting to facilitate field installation
2. The manufacturer certifies the materials used conform to the applicable portions of these specifications.
3. The manufacturer provides non-destructive test results on the prepared boot assembly.
4. Any boots that appear to be damaged shall be replaced or repaired as required by the ENGINEER.

PART 3 - EXECUTION

3.1 PREPARATION FOR GEOMEMBRANE INSTALLATION

A. Prepare base material to receive the geomembrane in accordance with geomembrane manufacturer's recommendations. Refer to Section 02220 “Excavation, Backfill, and Ash Regrading,” Section 02227 “Cover Soil and Drainage Sand,” Section 02225 “Subbase” for additional requirements relating to preparation of subbase material and overlying Cover Soil material layer. As a minimum, this certification shall include date, job name, material used, base composition, roll or panel number, and signature of manufacturer's representative.

B. The geomembrane Manufacturer shall certify in writing that the surface on which the geomembrane will be installed is acceptable. This certificate of acceptance shall be given to the ENGINEER prior to commencement of geomembrane installation.

3.2 GEOMEMBRANE PLACEMENT

A. Panel Identification: A panel is the unit area of geomembrane which is to be seamed in the field. A panel is a roll or a portion of roll cut in the field. Each panel shall be given an "identification code" (number or letter-number) consistent with the layout plan. This identification code shall be agreed upon by the ENGINEER and CONTRACTOR. This identification code shall be as simple and logical as possible. The CONTRACTOR shall

establish a table or chart showing correspondence between roll numbers and identification codes. The identification code shall be used for all quality assurance records.

B. Panel Placement:
1. The CONTRACTOR shall verify that panels are installed at the location indicated on the Drawings.
2. Panels placed prior to field seaming shall begin at the low point and proceed upward and outward with "shingle" overlaps to facilitate drainage in the event of precipitation.
3. CONTRACTOR shall record on a drawing the identification code, roll number, location, and date of installation of each panel.

C. Weather Conditions:
1. Geomembrane placement shall not proceed at an ambient temperature above 40°C (104°F) unless otherwise specified or approved by the ENGINEER. For temperatures below 5°C (41°F) refer to Section 06647 Cold Weather Installation - Flexible Membrane Liner. Geomembrane placement shall not be conducted during any precipitation, in the presence of excessive moisture (e.g., fog, dew, or frost), in an area of ponded water, or in the presence of excessive winds, as determined by the ENGINEER.
2. CONTRACTOR shall verify that the above conditions are fulfilled. Additionally, the CONTRACTOR shall verify that the supporting soil has not been damaged by weather conditions.

D. Method of Placement:
1. Use no equipment that could damage the geomembrane by handling, trafficking, leakage of hydrocarbons, or other means;
2. Prohibit all personnel on the geomembrane from smoking, wearing damaging shoes, or engaging in other activities which could damage the geomembrane;
3. Use methods to unroll the panels that do not cause scratches, folds or crimps in the geomembrane and do not damage the subgrade;
4. Use methods to place the panels that minimize wrinkles (especially differential wrinkles between adjacent panels);
5. Place adequate loading (e.g., sand bags), not likely to damage the geomembrane, to prevent uplift by wind; and
6. Minimize direct contact with the geomembrane (i.e., the geomembrane in traffic areas is protected by geotextiles, extra geomembrane, or other suitable materials).

E. Damage: The ENGINEER shall inspect each panel, after placement and prior to seaming, for damage. The ENGINEER shall advise the CONTRACTOR which panels, or portions of panels, shall be rejected, repaired, or accepted. Damaged panels of portions or damaged panels which have been rejected shall be marked and removed from the work area. The damaged materials shall become the property of the CONTRACTOR.
1. Alternatives for disposition of damaged liner with approval of ENGINEER:
   a. Remove from site at expense of CONTRACTOR.
   b. Use as slip sheets.
   c. Use as protective pads beneath vehicles.

d. Use as spill protection.
e. Use as chafe strips along berms.

3.3 ANCHOR TRENCH

A. Excavate anchor trenches to the lines and width shown on the Drawings, prior to geomembrane placement, and as follows:
1. Top of each slope.
2. At end of rolls on slopes.
3. At other points as recommended by manufacturer.

B. Round trench edge to avoid sharp bends in the geomembrane. No loose soil shall be allowed to underlie the geomembrane in the anchor trench.

C. Backfill the anchor trench in accordance with Section 02220, Excavation and Backfill.

3.4 FIELD AND SHOP FABRICATED SEAMING

A. Seam Layout: CONTRACTOR shall provide the ENGINEER with a drawing of the facility to be lined showing shop fabricated seams and field seams in a manner which differentiates the seam types. Field seams should be oriented parallel to the line of maximum slope (e.g., oriented along, not across, the slope). In corners and odd-shaped geometric locations, the number of field seams should be minimized. No horizontal seam shall be constructed on the slope. The seam at the toe of the slope shall be no less than five (5) feet from the toe of the slope.

B. Requirements of Personnel: All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests. At least two seamers shall have experience seaming a minimum of 2,000,000 square feet of PE geomembrane using the same type of seaming apparatus in use at the site. The most experienced seamer, the "master seamer", shall provide direct supervision, as required, over less experienced seamers. No field seaming shall take place without the master seamer being present.

3.5 OVERLAPPING AND TEMPORARY BONDING

A. Overlap panels by a minimum of three (3) inches for extrusion welding and 125 mm (5 inches) for fusion welding, or as approved by ENGINEER.

B. Assure that the procedure used to temporarily bond adjacent panels together does not damage the geomembrane; in particular, the temperature of hot air at the nozzle of any spot welding apparatus is controlled such that the geomembrane is not damaged.

C. No solvent or adhesive shall be used unless the product is approved in writing by the ENGINEER.

3.6 SEAM PREPARATION

A. Prior to seaming, confirm that the seam area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material; and clean seam area as necessary to permit seaming.

B. Where seam overlap bonding is required, the process shall be according to the Manufacturer's instructions and in a way that does not damage the geomembrane.

C. Seams shall be aligned with the fewest possible number of wrinkles and "fishmouths".
   1. Where more than five "fishmouth" per 500 linear feet of seam occur, replace the seam and:
      a. retrain the operator, or
      b. repair seaming equipment.

3.7 SEAMING EQUIPMENT AND PRODUCTS

A. General:
   1. Approved processes for field seaming are extrusion welding and fusion welding.
   2. Use only apparatus which have been specifically approved by make and model.

B. Extrusion Process:
   1. Welding apparatus shall be equipped with gauges giving the temperature in the apparatus and at the nozzle. CONTRACTOR shall provide documentation regarding the PE extrudate to the ENGINEER and shall record and certify that the extrudate temperatures, ambient temperatures, and geomembrane surface temperatures as specified at appropriate intervals.
   2. CONTRACTOR shall comply with the following:
      a. spare operable seaming apparatus is available on-site;
      b. equipment used for seaming is not likely to damage the geomembrane;
      c. the extruder is purged prior to beginning a seam until all heat degraded extrudate has been removed from the barrel;
      d. the electric generator is placed on a smooth base such that no damage occurs to the geomembrane;
      e. splash protection is provided beneath equipment;
      f. fuel cans are stored off the geomembrane;
      g. a smooth insulating plate or fabric is placed beneath the welding apparatus after usage;
      h. the geomembrane is protected from damage in heavily trafficked areas; and
      i. Any comers of panels or areas where two or more seams meet shall be capped with a minimum 1 foot diameter patch.

C. Fusion Process:
   1. Fusion-welding apparatus must be automated vehicular-mounted devices which produce a double seam with an enclosed space. The seaming apparatus shall be equipped with gauges giving the applicable temperatures and pressures. The

CONTRACTOR shall log ambient, seaming apparatus, and geomembrane surface temperatures as well as seaming apparatus pressures.

2. CONTRACTOR shall comply with the following:
   a. spare operable seaming apparatus is available on-site;
   b. equipment used for seaming is not likely to damage the geomembrane;
   c. for cross seams, the edge of the cross seams is ground to a smooth incline (top and bottom) prior to welding;
   d. the electric generator is placed on a smooth base such that no damage occurs to the geomembrane;
   e. a smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage; and
   f. the geomembrane is protected from damage in heavily trafficked areas.

D. Weather Conditions for Seaming:
   1. Field seaming is prohibited during precipitation, in presence of moisture, or when winds are in excess of 20 miles per hour.
   2. Unless authorized in writing by the ENGINEER, no seaming shall be attempted below 5°C (41 °F) nor above 40°C (104°F).
      a. Refer to Section 06647.
   3. Between 5°C (41°F) and 10°C (50°F), seaming is possible if the geomembrane is preheated by either sun or hot air device, and if there is not excessive cooling resulting from wind (as determined by the ENGINEER).
   4. Above 10°C (50°F), no preheating is required.
   5. In all cases, the geomembrane shall be dry and protected from wind damage.

E. Test Seams:
   1. Test seams shall be made on fragment pieces of geomembrane liner to verify that seaming conditions are adequate. Make test seams:
      a. Each day prior to commencing field seaming, a test weld 3 feet long shall be run from each welding machine under the same conditions as exist for the liner welding.
      b. During field seaming, one 1-inch seam test sample shall be prepared and field peeled for every 500 feet of field seam.
      c. Each seamer shall make at least one (1) test seam each day and one test seam at least once every four hours, or at any time equipment is shut down and cooled.
   2. Test seam sample shall be at least three (3) feet long by one (1) foot wide with the seam centered lengthwise. Cut five (5) adjoining specimens one (1) inch wide each from each end of the test seam sample. Test specimens in peel and shear by tensiometer, and the specimens shall not fail in the seam. If test seam fails, repeat the entire seam test operation. If the additional test seam fails, the seaming apparatus or seamer shall not be accepted and shall not be used for seaming until the deficiencies are corrected and two (2) consecutive, successful, full test seams are achieved.
   3. ENGINEER shall observe all test seam procedures. The remainder of the successful test seam sample shall be assigned a number and marked accordingly by the CONTRACTOR, who shall also log the date, hour, ambient temperature, number of seaming unit, welding temperatures, equipment speed, name of seamer, and pass or fail description. The sample itself shall be labeled and submitted to the ENGINEER.

4. All test seam apparatuses shall be as close to the operations as possible to permit continuous observation of construction activities by the ENGINEER.

F. General Seaming Procedure:

1. Extend seaming to the outside edge of panels to be placed in the anchor trench.
2. As required, a firm substrate shall be provided by using a flat board, a conveyor belt, or similar hard surface directly under the seam overlap to achieve proper support.
3. Fishmouths or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles shall be seamed and patched with an oval or round patch of the same geomembrane extending a minimum of six (6) inches beyond the fishmouth or wrinkle in all directions.
4. All seams shall be marked by the seamer with the seamer name, date, equipment number, and starting time. The liner installer shall mark each seam with a number to identity the seam. This number will be used by the installer to record all QA/QC data associated with the seam.
5. All tee seams or intersections where 3 or more panels are joined shall be capped with a patch 6 inches beyond the intersection in all directions.
6. CONTRACTOR shall take samples from the start and stop of each seam welded. Samples shall be one inch wide and shall be tested in peel and shear. Any seam failed shall be reconstructed.
7. Areas of seams which show evidence of overheating or degradation of liner properties due to seaming shall be patched or replaced by the CONTRACTOR at no expense to the OWNER.

3.8 NON-DESTRUCTIVE SEAM TESTING

A. General:

1. CONTRACTOR shall test all field seams non-destructively using a vacuum test unit or air pressure to verify seam continuity.
2. CONTRACTOR shall cap-strip with same geomembrane all locations where seams cannot be non-destructivity tested.
3. CONTRACTOR shall correct all inadequate seams or portions thereof in accordance with approved method.
4. CONTRACTOR shall provide copies of the non-destructive test results to the ENGINEER.

B. Vacuum Box Testing:

1. Inspect all field seams for unbonded areas by applying a vacuum to a soaped section of seam.
2. Apply the vacuum by a vacuum box equipped with a vacuum gage, a clear glass view panel in the top, and a soft rubber gasket on the periphery of the open bottom. The vacuum box shall be similar to the Series A 100 Straight Seam Tester as supplied by the American Parts and Service Company, 2201 West Commonwealth Avenue, P.O. Box 702, Alhambra, California 91802.
3. Thoroughly soap a section of the seam, place the inspection box over the soaped seam section and seal the gasket sealed to the liner.
4. Apply a vacuum of between eight (8) and ten (10) inches of mercury (Hg) to the box for not less than thirty (30) seconds by use of a gasoline or electric driven power-

vacuum pump apparatus. Mark areas that bubble (unbonded areas) for repair by the CONTRACTOR.

5. Box shall have a minimum overlap of three (3) inches when advancing to the next test.

C. Air Pressure Testing: Test all double fusion seams with an air pressure test by sealing both ends and applying air to a pressure between twenty-five (25) and thirty (30) psi. Seam failure will be determined if loss of pressure exceed two (2) psi or does not stabilize. Two gauges shall be used to measure continuity of the air channel, one at each end of the seam. Both gauges shall be observed and recorded. Pressure differential between the two gauges shall be no more than 1 psi. The seam tester shall record on the report forms and on the liner the tester name, the start and end times, start and end pressures at each gauge, and the result of the test.

3.9 DESTRUCTIVE SEAM TESTING

A. Location and Frequency of Samples:

1. ENGINEER shall determine locations where seam samples shall be cut out for laboratory testing. Samples shall be taken at a minimum frequency of one test location per 500 feet of seam length and a maximum frequency shall be agreed upon by the ENGINEER and CONTRACTOR.
2. Additional test locations shall be determined during seaming at the ENGINEER'S discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, offset welds, or any other potential cause of imperfect welding. The CONTRACTOR shall not be informed in advance of the additional locations where the seam samples will be taken.
3. Cut samples as the seaming progresses in order to have laboratory test results before completion of geomembrane installation. Assign a number to each sample, mark it accordingly, record sample location on layout drawing, and record reason for taking the sample at this location.
4. ENGINEER shall witness all field tests and mark all samples and portions with their number. CONTRACTOR shall log the date and time, ambient temperature, number of seaming unit, name of seamer, welding apparatus temperatures and pressures, and pass or fail description, and attach a copy to each sample portion.
5. Samples shall be eighteen (18) inches wide by forty-seven (47) inches long with the seam centered lengthwise. Cut one 1-inch wide strip from each end of the sample and test in the field, by tensiometer, at a separation rate of 2 inches per minute for peel and shear. The remaining sample shall be cut into three (3) parts and distributed as follows:
   a. One portion to the testing laboratory, 18 inches x 15 inches;
   b. One portion to the ENGINEER for archive storage, 18 inches x 15 inches; and
   c. One portion to the installer, 18 inches x 15 inches.

B. Laboratory Testing:

1. CONTRACTOR will forward test samples to an independent laboratory selected by the ENGINEER. Testing shall include "Seam Strength" (ASTM D4437) and "Peel Adhesion" (ASTM D4437). The minimum acceptable values shall be as specified in Section 2.2. Copies of all laboratory test results shall be submitted by the laboratory

to the ENGINEER as soon as they become available. CONTRACTOR shall account for a minimum turnaround time for tests to be 3 business days.

C. Procedures for Destructive Test Failure:

1. The following procedures shall apply whenever a sample fails the field destructive test:
   a. Reconstruct the seam between the failed location and any passed test location, at ten (10) feet, minimum, from the location of the failed test.
   b. Take a sample for an additional field test:
      1) If this additional sample passes the test, reconstruct seam between that location and the original failed location.
      2) If this sample fails, then the process is repeated.
   c. In any case, all acceptable seams must be bounded by two passed test locations (e.g., the above procedure shall be followed in both directions from the original failed location), and
   d. One (1) test must be taken within the reconstructed area.
2. With samples that fail a laboratory destructive test, follow the above procedures, considering laboratory tests exclusively. Since the final seam must be bounded by two (2) passed test locations, it may then be necessary to take one or more new samples for laboratory testing in addition to the one required in the reconstructed seam area.
3. CONTRACTOR may perform additional testing for his purposes, subject to the following restrictions at a minimum:
   a. OWNER will not pay for tests.
   b. Test results will be nonbinding for all purposes upon the OWNER, ENGINEER and laboratory.
   c. PE installation shall proceed in the absence of results of CONTRACTOR'S additional testing; untimely results from CONTRACTOR'S additional testing shall not be cause for delay claim.
   d. CONTRACTOR may only test the installer's sample, obtained and distributed per Article 3.9.A.4.C.

3.10 DEFECTS AND REPAIRS

A. Sweep and wash the geomembrane surface prior to inspection. Inspect all seams and non-seam areas of the geomembrane for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. Non-destructively test each suspect location, both in seam and non-seam areas, using the methods specified herein. Mark and repair each location which fails the non-destructive testing.

B. Repair procedures should be agreed upon between ENGINEER and CONTRACTOR. Unless otherwise agreed, the procedures shall be as follows:

1. Defective seams shall be repaired by reconstruction as described below.
2. Tears or pinholes shall be repaired by seaming or patching.
3. Blisters, larger holes, undispersed raw materials, and contamination by foreign matter shall be repaired by patches.

4. Surfaces of PE geomembrane which are to be patched shall be abraded no more than one (1) hour prior to the repair.
5. All seams used in repairing procedures must be approved extrusion welded seams and shall be subjected to the same non-destructive test procedures as outlined for all other seams.
6. Each patch shall be numbered and logged. Patches shall be round or oval in shape, and made of the same geomembrane, and extend a minimum of six (6) inches beyond the edge of defects in each direction.
7. Patches shall be applied using approved methods only.
8. Where excessive extrudate surface occurs, the affected seam length shall be cap-stripped.
9. Any cold rudded areas shall be patched.

C. Seam reconstruction for the extrusion welding process shall be achieved by grinding the existing seam and rewelding a new seam or patching as determined by ENGINEER. Seam reconstruction for the fusion process shall be achieved by cutting out the existing seam and welding in a replacement strip.

D. Each repair shall be non-destructively tested using the methods specified herein, as appropriate. Repairs which pass the non-destructive test shall be taken as an indication of an adequate repair. Failed tests indicate that the repair shall be redone and retested until a passing test results. The ENGINEER shall observe all non-destructive testing of repairs and the CONTRACTOR shall record the number of each patch, date, name of patcher, and test outcome. The CONTRACTOR will identify each patch and repair on the as-built drawing.

3.11 GEOMEMBRANE ACCEPTANCE

A. At the conclusion of placement of the PE geomembrane, prepare and submit six (6) copies of a written report of the work which includes the following:
1. Complete identification of PE geomembrane liner, including, but not limited to, resin type, physical properties and other pertinent data.
2. Complete description of failed seaming system used including material, method, temperatures, seam overlap width and cure or aging time.
3. Complete description of field sampling and testing including test equipment used, location of field tests, copy of all field laboratory test results, conditioning procedure prior to destructive seam testing, method of recording loading and determining average load for destructive test methods, and type of failure in tests (i.e., within the seam, within the sheet material, clamp edge, seam edge).
4. "As-built" drawings showing actual layout of liner sheets, pipe penetration details, patches, repairs, destructive samples and anchor trench details. "As-built" drawings shall also provide invert and spot elevations for each sump, pipe penetration and at 100-foot intervals along each anchor trench.
5. An affidavit of compliance from the liner manufacturer, containing the following wording:

"I (name and title), as the duly authorized representative of (Company name), hereby certify that the installation of the textured LLDPE geomembrane has been completed in accordance with the terms and conditions of the Contract Documents.

6. Completed warranty for the installed items in accordance with paragraph 1.4 of this section.

By: _____
(signature)

(Corporate Seal) Witness: _____
(signature)

Date: _____

END OF SECTION 06643

SECTION 06645

GEOSYNTHETICS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope: CONTRACTOR shall provide all labor, materials, tools, equipment, testing, and services necessary for the placement of geotextile as liner protection cushion, and a geocomposite drainage layer within the cap system, and weed control fabric in the enclosed flare area as shown on the Drawings and specified, or as otherwise directed by the ENGINEER.

B. Related Sections:
1. Section 06643, Geomembranes.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
1. Geosynthetic manufacturer shall be a specialist in the manufacture of the particular geosynthetic.

B. Submittals:
1. Shop Drawings:
   a. CONTRACTOR shall submit six (6) copies of manufacturer's data, specifications, installation instructions and dimensions.
   b. CONTRACTOR shall submit six (6) copies of an affidavit certifying that each geosynthetic furnished complies with all requirements specified herein.
   c. No geosynthetic shall be shipped until the affidavit is submitted to ENGINEER.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Each roll of geosynthetic delivered to the site shall be labeled by the manufacturer identifying the manufacturer's name, product identification, lot number, roll number and roll dimensions.

B. All geosynthetics shall be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions. Geosynthetic rolls shall be shipped and stored in relatively opaque and watertight wrappings.

C. CONTRACTOR shall provide all labor and equipment required to assist ENGINEER in inspection of materials upon delivery to the site.

PART 2 - PRODUCTS

2.1 GEOTEXTILE

A. Geotextile shall be a needle punched, nonwoven fabric composed of filaments which are formed into a stable network such that the filaments retain their relative position. Filter fabric shall be inert to biological degradation and naturally encountered chemicals, alkalis, and acids. The geotextile shall conform, as a minimum, to the following:

Fabric Property	Unit	Typical Test Method	Value(1)
Unit Weight (mass per unit area)	oz/yd^2	ASTM D 5261	12
Thickness	mils	ASTM D 5199	110
Grab Tensile Strength	lb	ASTM D 4632	320
Grab Tensile/Elongation	%	ASTM D 4632	50
Puncture Strength	lb	ASTM D 4833	190
Trapezoid Tear Strength (MD)	lb	ASTM D 4533	125
Apparent Opening Size	mm	ASTM D 4751	0.150
Falling Head Permeability, “k”	cm/sec	ASTM D 4491	0.29
UV Resistance (500 hrs)	%	ASTM D 4355	70

NOTES:

1. Values listed represent minimum values each roll delivered to the site shall meet when tested in accordance with the specified ASTM test method.

B. Geotextile filter fabric shall be:

1. NW12 produced by GSE Lining Technology, Inc.
2. Or equal.

2.2 COMPOSITE DRAINAGE GEONET

A. The Geonet Drainage Layer (GDL) shall be:

1. Tenflow 770-2 manufactured by Tenax Corporation
2. Or equal.
   a. For any natural drainage material alternative, design and performance demonstration must be submitted for ENGINEER’s approval. Any alternative GDL material for ENGINEER approval must be submitted together with transmissivity testing with1,000 hours at the specified boundary conditions, and demonstrate performance equivalency to all the property requirements and testing methods as indicated in Tables 1& 2, as well as Part B below.

B. The manufacturer of the GDL shall submit documents for the ENGINEER’s review that the GDL to be supplied to the project site has proven installation. As a minimum, the manufacturer shall certify that:

1. The proposed GDL has been installed at least 10 million square feet. The proposed GDL has been installed at least 10 projects that are in operations for a minimum two years.

C. The polymer used to manufacture the Geonet core of the GDL shall be polyethylene. Manufacturer shall certify that no regrind material is used in the geonet manufacturing process.

D. The drainage core of the GDL shall be manufactured by extruding polyethylene to form a triaxial void maintaining structure. The geonet shall meet the property requirements listed in Table 1.

E. The geotextile of the GDL shall be UV resistant, continuous filament, needle punched, nonwoven polypropylene geotextile. The geotextile shall meet the property requirements listed in Table 2.

TABLE 1: REQUIRED GEOCOMPOSITE DRAINAGE LAYER PROPERTIES

PROPERTY	TEST METHOD	UNITS	VALUE
Geonet Structure	Triaxial		
Thickness (min.)	ASTM D 5199	mil	340 ± 10%
Tensile Strength (min.)	ASTM D 4595	lb/ ft	425 ± 10%
Density (min.)	ASTM D 1505	g/cm^3	0.94
Melt Flow Index (max.)	ASTM D 1238	g/10 min	1.0
Carbon Black Content (min.)	ASTM D 4218	%	2
Creep Reduction Factor[1]	GRI- GC8	-	1.1
Geocomposite Ply Adhesion (min.)	ASTM D7005	lb/inch	0.5
Transmissivity[2] –Machine Direction (min.) @1000psf load	ASTM D 4716 GRI –GC8	(m^2/sec)	7.0E-03 @ gradient 0.1 4.0E-03 @ gradient 0.33

Notes:

1. The creep reduction factor is determined from 10,000 hour test duration, extrapolated to 30 years and using a compressive load of 1,000 psf.

2. For both MQC and CQA, transmissivity tests shall be conducted at the frequency of 200,000 square feet per test. The normal compressive load shall be 1,000 psf at hydraulic gradients of 0.1 and 0.33. Testing boundary conditions from the top to bottom are: upper steel load plate/Ottawa sand/Geocomposite/Geomembrane/ lower load plate (the flat side of the geocomposite facing the soil boundary), with a minimum seating period of 100 hours.

TABLE 2: REQUIRED GEOTEXTILE PROPERTIES

PROPERTY	TEST METHOD	UNITS	VALUE
Serviceability Class	Class 2		
UV Resistance @500 Hours (MIN)	ASTM G 154 or D 4355	%	70
Grab Tensile Strength (MARV)	ASTM D4632	lbs	160
Grab Elongation (MARV)	ASTM D4632	%	50
Trapezoid Tear (MARV)	ASTM D4533	lbs	60
Puncture Strength (MARV)	ASTM D4833	lbs	90
AOS (MaxARV)	ASTM D4751	US Sieve (mm)	70 (0.21)
Permittivity (MARV)	ASTM D4491 Falling head	sec^{-1}	1.1

TABLE 3: REQUIRED MANUFACTURER'S QUALITY CONTROL TEST DATA

PROPERTY	TEST METHOD	UNITS	FREQUENCY
Resin Tests			
DENSITY	ASTM D1505	g/cm^3	Per Lot
MELT FLOW INDEX	ASTM D1238	g/10 min	Per Lot
Geonet Tests			
THICKNESS	ASTM D5199	mm	50,000 ft^2
CARBON BLACK CONTENT	ASTM D4218	%	50,000 ft^2
TENSILE STRENGTH-MD	ASTM D4595	lbs/ft	50,000 ft^2
Geotextile Tests			
WEIGHT	ASTM D3776	Oz/sy	100,000 ft^2
AOS	ASTM D4751	US Sieve (mm)	500,000 ft^2
PERMITTVITY	ASTM D4491 Falling head	sec^{-1}	500,000 ft^2
GRAB TENSILE STRENGTH	ASTM D4632	lbs	100,000 ft^2
TRAPEZOID TEAR	ASTM D4533	lbs	100,000 ft^2
PUNCTURE STRENGTH	ASTM D4833	lbs	100,000 ft^2
Geocomposite Tests			
PLY ADHESION	ASTM D7005	lbs/in	100,000 ft^2
TRANSMISSIVITY-MD	ASTM D4716	m^2/sec	200,000 ft^2

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. All geosynthetics shall be weighted with sandbags or the equivalent when required. Such sandbags shall be installed during placement and shall remain until replaced with cover material or geomembrane.

B. If white or light colored geotextile is used, precautions shall be taken against "snowblindness" of personnel.

C. CONTRACTOR shall take any necessary precautions to prevent damage to underlying layers during placement of each geosynthetic.

D. During placement of geosynthetics, care shall be taken not to entrap in the geosynthetics stone, excessive dust, or moisture that could damage the geomembrane, generate clogging, or hamper subsequent seaming.

E. Geosynthetics shall not be exposed to precipitation prior to being installed, and shall not be exposed to direct sunlight for more than 15 days. Any materials not complying with this requirement shall be removed and replaced at no cost to the OWNER.

F. CONTRACTOR shall not operate equipment on geosynthetics without the specified depth of cover.

G. Excavation of fill material over geosynthetics shall be completed by hand with plastic shovels.

3.2 GEOTEXTILE

A. Geotextile fabrics shall be deployed in the direction of the slope unless otherwise directed by ENGINEER.

B. Geotextile fabrics shall be overlapped 3 inches and sewn as detailed on Contract Drawings unless otherwise approved by ENGINEER. Overlaps shall be oriented in the direction of filling.

C. Any bum mark, material defect or tear in the fabric shall be repaired as follows:
   1. A fabric patch shall be sewn into place using a double sewn lock stitch (1/4 inch to 3/4 inch apart and no closer than 1 inch from any edge).
   2. On slopes with a grade less than 8%, the CONTRACTOR may use a fabric patch heat welded in place with a minimum of 24 inches overlap in all directions.
   3. Should any damaged area exceed 10 percent of the width of the roll, the roll shall be cut, overlapped and sewn to form a new seam.

3.3 GEOCOMPOSITE

A. Handling and Placement of GDL

1. After the substratum/geomembrane has been installed/ constructed, tested and approved by the ENGINEER, the surface shall be cleaned and free of excess dirt and debris.
2. The CONTRACTOR and the Installer shall handle all geocomposite in such a manner as to ensure it is not damaged in any way. Precautions shall also been taken to prevent damage to underlying layers during placement of the geocomposite.
3. The geocomposite roll should be installed in the direction of the slope, following the labeled instructions as provided by the manufacturer with respect to the top/bottom sides.
4. If the project contains long, steep slopes, special care shall be taken so that only full-length rolls are used at the top of the slope.
5. In the presence of wind, all geocomposite shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until replaced with cover material.
6. If necessary, the geocomposite shall be positioned by hand after being unrolled to minimize wrinkles.
7. The geocomposite shall be properly anchored to resist sliding. Anchor trench compacting equipment shall not come into direct contact with the geocomposite.
8. If there are any obstructions (such as outlet pipes or monitoring wells) while deploying the geocomposite, the geocomposite shall be cut to fit around the obstruction. Care shall be taken as to make sure there is no gap between the obstruction and the geocomposite. The geocomposite shall be cut in a way that the lower geotextile and geonet core is in contact with the obstruction and the upper geotextile has an excess overhang. There must be enough of the upper geotextile to be able to tuck the upper geotextile back under the geocomposite to protect the exposed geonet core, and prevent soil particles from migrating into the geonet core flow channels.

B. Seams and Overlaps

1. Each component of the geocomposite (geotextile(s) and geonet) shall be secured or seamed to the like component at overlaps.
2. Adjacent edges of geonet along the length of the geocomposite, shall be overlapped 2-3 inches, as shown on the Contract Drawings. These overlaps shall be joined by tying the geonet cores together with white or yellow cable ties or plastic fasteners. These ties shall be spaced at a maximum of every 5 feet along the roll length, or a maximum of 2 feet if the geocomposite is installed vertically.
3. Adjoining geocomposite rolls (end to end) along the roll width shall be shingled down in the direction of the slope, with the geonet portion of the top geocomposite overlapping the geonet portion of the bottom geocomposite a minimum of 12 inches across the roll width as shown on the Contract Drawings. Geonet shall be tied every 12 inches across the roll width and every 6 inches in the anchor trench or as specified by the ENGINEER.
4. The bottom layer of geotextile (if any) shall be overlapped.
5. The top layers of geotextile shall be sewn together, or at the discretion of the ENGINEER may be heat bonded or wedge welded. Geotextiles shall be overlapped

a minimum of 4 inches prior to seaming or heat bonding, geotextile sewing seams to be used are Prayer, "J", or Butterfly, as shown on the Contract Drawings. The seam shall be a two-thread, double-lock stitch, or a double row of single-thread, chain stitch. If heat bonding is to be used, care must be taken to avoid burn through of the geotextile. It is important that the geotextiles be joined continuously along to the roll as to prevent any fugitive particle migration into the geonet core flow channels.

C. Repair

1. Any small holes or tears in the top geotextile shall be patched with an 8" x 8" geotextile piece. The patching geotextile shall be the same as the original one. Apply the spray adhesive (*3M Super 77 adhesive is the recommended)* to one side of the 8" x 8"textile patch. Center and apply the 8" x 8" textile patch over the blemish, hole, tear or thin spot in the geotextile. Firmly press 8" x 8" textile patch over the repair area. If the damaged area of the geotextile is greater than this standard patch size, a bigger size patch is recommended using a multitude of 8" x 8" patches. If the geotextile is damaged beyond 50 percent of the width of the roll, a continuous piece of fabric the same width as the geocomposite may be cap-stripped directly to the adjacent seams by sewing a portion of the new geotextile in place.
2. Any large rips, tears or damage areas on the deployed geocomposite core shall be removed and patched by placing a patch extending 12" beyond the edges of the damaged areas. The patch shall be secured to the original geonet tying every 6 inches with approved tying devices. If the hole or tear width across the roll is more than 50% percent the width of the roll, the damaged area shall be cut out.

3.4 PLACEMENT OF COVER SOIL MATERIALS

A. Placement of the cover soil is recommended to proceed immediately following placement and inspection of the geocomposite.

B. When applying Cover Soil Material, no equipment generally speaking shall drive directly across geocomposite. If a vehicle has to be driven on top of the geocomposite, the vehicle shall be driven in a fashion not to damage the geotextile, geonet or geocomposite. Acceleration or deceleration shall be in a smooth and gentle manner. Operator shall not make any sudden turns or stops when driving on the geonet or geocomposite. If any tear or local damage occurs to the geotextile, geonet or geocomposite, patching technique as described in the above section shall be used.

C. The specified fill material shall be placed and spread utilizing vehicles with a low ground pressure (LGP). The cover soil shall be placed on the geocomposite from the bottom of the slope proceeding upwards and in a manner, which prevents instability of the cover soil or damage to the geocomposite. Unless otherwise specified by the ENGINEER, all equipment for spreading fill material overlying the geocomposite shall comply with the following:

Maximum Equipment Ground Pressure (psi)	Minimum Separation Thickness (inches)
< 5	12
5 - 10	18
>10	24

D. Compaction of the initial lift placed over the geocomposite must be performed in a manner that does not damage the geocomposite.

END OF SECTION 06645

SECTION 06647

COLD WEATHER INSTALLATION - GEOMEMBRANE

PART I - GENERAL

1.1 DESCRIPTION

A. Scope:

1. The Work covered by this section consists of cold weather installation requirements and supplements Section 06643. The CONTRACTOR may be required to work through cold weather months. If cold weather conditions prevail, the CONTRACTOR shall adjust the storage, handling, and installation procedures and conduct all necessary Work to ensure the integrity of the installed bottom and top liners. All of the provisions of Section 06643 will be strictly adhered to, except as modified herein.
2. All necessary Work required for snow and ice removal is included herein.
3. No direct or separate payment will be made for cold weather storage and installation of liners, snow or ice removal and for providing all other labor, materials, tools, equipment and services necessary to meet the requirements specified in this Section.
4. CONTRACTOR shall supply an outdoor thermometer for each welding enclosure.

B. Related Sections:

1. Section 02220, Excavation and Backfill and Regrading.
2. Section 06643, Geomembrane.

1.2 SUBMITTALS

A. The CONTRACTOR may be required to work through cold weather months. Therefore, six (6) copies of the proposed methods of cold weather installation construction shall be submitted in sufficient detail for the OWNER and ENGINEER to evaluate the proposed cold weather methods and techniques, such as preheating materials, the use of portable, heated enclosure shacks for field seaming, and other special equipment.

B. The CONTRACTOR shall pre-submit acceptable evidence (to be approved by the OWNER and ENGINEER) that his performance standards will be maintained at lower temperatures.

C. Submittals for Cold Weather Installation:

1. Seaming shall be suspended when temperatures are below 41°F or above 104°F. At his option, the CONTRACTOR shall submit a cold weather installation plan for the review and approval of the ENGINEER.
2. The CONTRACTOR shall submit to the ENGINEER the following additional cold weather construction items and information for approval, not later than 5 days after the notice to proceed from the OWNER:
   a. Field seaming and fabrication details during cold weather when temperatures are below 41°F.

b. Work plan for liner installation during cold weather including manpower and equipment requirements.
c. Shop Drawings and installation diagrams for liner panel sections layout and penetration details.

3. The ENGINEER will return all submittals to the CONTRACTOR within 10 working days of receipt.
4. The CONTRACTOR shall also specify any additional proposed method of testing the field seams. This testing is to be performed by the Liner Installer who will be required to provide a written report in accordance with Section 06643.
5. The CONTRACTOR shall present a schedule of cold weather operations to the ENGINEER and obtain the ENGINEER'S approval in writing of the same. This schedule shall be submitted sufficiently in advance of the proposed work as to afford a reasonable amount of time for the ENGINEER to review and approve the schedule.
6. The CONTRACTOR shall submit shop drawings for the welding enclosures.
7. The CONTRACTOR shall not install liner at ambient temperatures less than 41°F without an approved cold weather installation plan.

PART 2 - PRODUCTS

(Refer to Section 06643)

PART 3 - EXECUTION

3.1 COLD WEATHER STORAGE OF LLDPE GEOMEMBRANE MATERIALS

A. CONTRACTOR shall store and protect materials in accordance with manufacturer's recommendations and requirements of the Specifications. Additionally, all liner materials shall be stored inside heated areas, if the site temperature is, or is expected to drop, below 41 °F at any time during the storage period. The CONTRACTOR shall make his own provisions for heated storage.

3.2 LINER SUBBASE

A. Liner shall not be placed over water, ice, snow or frozen precipitation of any kind. Liner shall not be placed over frozen subbase which in the opinion of the ENGINEER may be detrimental to the integrity of the liner installation. Unacceptable subbase shall be reworked and replaced as necessary by the CONTRACTOR to provide adequate liner support.

3.3 COLD WEATHER INSTALLATION REQUIREMENTS FOR LLDPE FLEXIBLE MEMBRANE LINER

A. The CONTRACTOR shall be required to implement the previously approved cold weather installation methods when the air temperature reaches 41°F or below. As a minimum the cold weather construction methods to be implemented shall include:

1. Providing additional labor, seaming crews, materials and equipment as required to pursue the work.

2. Adjustment of field seaming pre-heat to control heat loss prior to field welding to accommodate temperature, wind and humidity conditions.
3. Adjustment of the rate of field welding to accommodate temperature, wind and humidity conditions.
4. Exercising extra care in preparing panel edges prior to seaming to insure that edges to be seamed are dry, clean and free of all dirt, snow, ice, slush or water.

B. When the outside ambient temperature drops below 41°F, the CONTRACTOR shall conduct field seaming in heated, portable shelters to minimize liner heat loss and to maintain dry, clean panel edges during seaming.

C. In addition to the quality assurance sampling and testing specified in Section 06643, the CONTRACTOR shall provide and operate a portable pull test machine at the site during field seaming operations. The CONTRACTOR shall sample the liner seam and conduct pull tests during the seaming to insure that acceptable weld seams are being fabricated and to gauge the effectiveness of the cold weather construction methods. Field tested seams must achieve 100 percent of the strength of the base liner material. CONTRACTOR shall sample and perform pull tests a minimum of 4 times per shift and as ordered by the ENGINEER. CONTRACTOR shall adjust the seaming and construction methods to achieve acceptable field seams.

D. CONTRACTOR shall place Geosynthetics and Cover Soil Materials over liner as soon as field seams have cured, been tested and accepted.

E. No Geosynthetics and Cover Soil Materials shall be placed over ice, snow or frozen precipitation. CONTRACTOR will be responsible for ensuring that surfaces are clean and dry prior to placement.

END OF SECTION 06647

APPENDIX H

DRAFT CONSTRUCTION QUALITY ASSURANCE PLAN (QAP)

DRAFT CONSTRUCTION QUALITY ASSURANCE PLAN

Closure

Scofieldtown Landfill

Prepared for

City of Stamford

Stamford, Connecticut

Prepared by

TRC

Windsor, Connecticut

TRC Project No. 180554

March 2011

TRC Environmental Corporation

21 Griffin Road North

Windsor, Connecticut 06095

Telephone 860-298-9692

Facsimile 860-298-6399

TABLE OF CONTENTS

SECTION PAGE

1.0 INTRODUCTION 1

2.0 RESPOSIBILITY AND AUTHORITY 2
- 2.1 General 2
- 2.2 Project Organization and Responsibilities 2
  - 2.2.1 Connecticut Department of Environmental Protection 2
  - 2.2.2 CITY 3
  - 2.2.3 Engineer 3
  - 2.2.4 Quality Assurance Consultant 3
  - 2.2.5 Construction Contractor 4
  - 2.2.6 Land Surveyor 4
- 2.3 Project Meetings 5
  - 2.3.1 Pre-Construction Meeting 5
  - 2.3.2 Project Progress Meetings 5
  - 2.3.3 Daily Meetings 5
  - 2.3.4 Corrective Action Meetings 5

3.0 OBSERVATION AND TESTING 6
- 3.1 General 6
  - 3.1.1 Project Submittals 6
  - 3.1.2 Testing and Reporting Requirements 6
- 3.2 Disruption and Grading of Landfill Materials 7
- 3.3 Subbase Material 7
- 3.4 Vegetative Support Soil Material and Pavement Base Material (Cover Soil). 7
- 3.5 Geomembrane 8
- 3.6 Composite Drainage Geonet 9
- 3.7 Geotextiles 9
- 3.8 Topsoil Material 9
- 3.9 Turf Establishment 9
- 3.10 Riprap 10

4.0 REPORTING AND DOCUMENTATION 11
- 4.1 General 11
- 4.2 Project Record Documents 11
- 4.3 Final Certification Report 11
- 4.4 As-Built Drawings 11

TABLE OF CONTENTS
(Continued)

TABLES

1 Testing/Reporting Summary

1.0 INTRODUCTION

The City of Stamford (CITY) is performing landfill closure activities for the Scofieldtown Landfill (SITE). This document serves as a Quality Assurance Plan (QAP) specifically developed for the proposed closure construction activities at the SITE. In general, closure construction activities will consist of constructing an impermeable barrier and soil cover over approximately 16 acres of the SITE with associated storm water control features. The closure will be performed in two phases. The east side of the landfill will continue to receive waste to reach final elevations, while the west side, which is currently at final elevations, will be closed.

This QAP is intended to provide guidance for control of construction quality aspects of the proposed SITE closure activities. This document outlines specific duties of the Quality Assurance Consultant (QAC) and Construction Contractor, and procedures for documenting and reporting that the closure activities have been conducted in general conformance with the CTDEP-approved plans, specifications, and applicable regulations. Specific details of proposed construction quality assurance/quality control activities will be presented in the Standard General Conditions of the Construction Contract, supplementary conditions, technical specifications and final design drawings that will be made part of the project's contract documents. These documents should be consulted should questions arise or omissions be discovered in this QAP. Table H-1 summarizes the reporting and testing requirements for the major tasks and materials for this project.

2.0 RESPOSIBILITY AND AUTHORITY

2.1 General

Quality assurance consists of implementing a planned system of activities to assure closure construction occurs as specified in the contract documents. The implementation of quality assurance activities for this project involves applying standards and procedures outlined in the contract documents to ensure the closure construction meets or exceeds the performance criteria. The following paragraphs outline the organization of the project participants and their responsibilities, meetings, and testing/submittal requirements.

2.2 Project Organization and Responsibilities

The construction phase of the project involves coordination between six participants:

- Connecticut Department of Environmental Protection (CTDEP)
- CITY
- Engineer
- Quality Assurance Consultant
- Construction Contractor
- Land Surveyor

Each participant has a responsible role in implementing the proposed closure activities. The general lines of communication between the parties as described below:

2.2.1 Connecticut Department of Environmental Protection

The role of the CTDEP in this project is to review and approve, as appropriate, documents submitted in connection with the closure contract, and assess whether or not the closure is being constructed in conformance with the Connecticut General Statutes (CGS) Section 22a-208 and the Regulations of Connecticut State Agencies (RCSA) Section 22a-209.

The closure of the landfill is to be completed in accordance with the terms and conditions of the Consent Order SRD-205, dated September 10, 2010. Closure activities are required to be in conformance with RSCA sections 22a-209-1 through 22a-209-14 and the provisions of the Consent Order.

2.2.2 CITY

CITY is the permit holder. Therefore, CITY is responsible for completing closure activities in accordance with the terms and conditions of the permit. CITY will solicit bids and ultimately hire a qualified Construction Contractor who will complete the construction work. Alternatively, CITY may act as the Construction Contractor for all or part of the closure activities. CITY will also retain the services of a Quality Assurance Consultant who will oversee the implementation of the Quality Assurance Plan.

2.2.3 Engineer

The Engineer for the project will be an experienced civil engineer, licensed by the State of Connecticut. The responsibilities of the Engineer during construction will be detailed in the contract documents. Generally, the Engineer will make visits to the site at intervals appropriate to the various stages of construction in order to observe the progress and quality of the work completed by the Contractor. The Engineer will provide clarifications and interpretations of the contract documents, have the responsibility to authorize minor variations in the work that are compatible with the CTDEP-approved closure plans, and have the authority to reject defective work. The Engineer may, at his discretion, test materials at random or observe quality control testing as it is being performed.

CITY will retain an Engineer to prepare the technical specifications, engineering drawings, and the QAP. The Engineer will report to CITY during the bidding and construction phase of the closure.

2.2.4 Quality Assurance Consultant

The Quality Assurance Consultant (QAC) for the project will be an experienced civil engineer, licensed by the State of Connecticut. The individual or firm serving as the QAC will have a track record of successful landfill closures within the state. The QAC is responsible for coordinating the activities as presented in this QAP and will report to CITY. The responsibilities of the QAC include:

- Providing written certification to the CTDEP that sedimentation and erosion controls have been installed (provided prior to initiating construction);
- Reviewing and approving submittals made by the construction contractor;

- Documenting construction and QAC activities;
- Coordinating independent testing services where applicable; and
- Preparing a final closure certification report upon completion of the landfill closure activities.

The roles of QAC and Engineer may be filled by the same entity.

2.2.5 Construction Contractor

The Construction Contractor is the individual or entity who will complete the proposed closure construction work. Pursuant to the contract documents, the Construction Contractor is also referred to as the "Contractor" who will enter into an agreement with CITY to successfully complete the work.

The Contractor is responsible for supervising and directing the work and solely responsible for the means, methods, techniques, sequences and procedures of construction in accordance with the contract documents. The Contractor is responsible for maintaining and supervising all safety precautions and programs and compliance with all applicable laws. The Contractor also maintains the record documentation, including those annotations made to the construction documents that reflect minor changes to the proposed work.

The Contractor is responsible for providing material submittals to the QAC in a timely manner for review prior to installation. The Contractors is also responsible for performing soil and geomembrane testing on capping materials as required to determine compliance with the project specifications. A soil testing laboratory and a geomembrane testing laboratory approved by the QAC will be retained by the Contractor to provide the Contractor testing and reporting services. These documents will be submitted to the QAC to review for conformance with the requirements of the Contract Documents.

2.2.6 Land Surveyor

The Land Surveyor retained by the Contractor will be a professional land surveyor who is legally qualified to practice in the State of Connecticut and who is experienced in providing land-surveying services of the kind required. The selected Land Surveyor will have a minimum of two years of experience in construction surveying layout and preparation of as-built surveys in accordance with the specified horizontal and vertical control requirements.

2.3 Project Meetings

Project meetings are proposed throughout the course of the project. Meetings may or may not involve all the parties listed in the QAP. The intent of the meetings will be to establish lines of communication to report, control, and resolve problems that could affect the quality of the work. The following meetings are proposed as part of this project.

2.3.1 Pre-Construction Meeting

Prior to any work being undertaken at the site, a meeting with CITY, Contractor, Engineer, QAC, and CTDEP will be held to establish a working understanding among the parties and to discuss the schedules listed in the contract documents (e.g., progress schedule and schedule of shop drawings). Other topics that will be discussed include the procedures for handling shop drawings, processing of applications for payment, and maintaining project record documents.

2.3.2 Project Progress Meetings

Progress meetings will be held bi-weekly (or more frequently as needed) at the site with CITY, Contractor, Engineer, QAC and CTDEP, as necessary, for the purposes of understanding the project's construction and administration progress. The Land Surveyor may also participate, as necessary. Meeting notes will be prepared and distributed to the attendees within five days.

2.3.3 Daily Meetings

The Contractor will conduct daily "tailgate meetings" with the crew leaders, subcontractors, QAC, and CITY, as required, for the purpose of reviewing daily construction schedule and resolving outstanding construction issues.

2.3.4 Corrective Action Meetings

Significant conditions adverse to quality may be identified during the course of the construction work by one or more of the parties involved with the project. The condition reported to be adverse will be analyzed by the reporting party to determine if it represents a significant condition adverse to quality. If determined to be significant, CITY or, at CITY's direction, the Engineer will then perform an analysis to determine if corrective action is required, and if necessary, hold a meeting with the QAC, Contractor and others, as appropriate, to discuss the proper course of action.

3.0 OBSERVATION AND TESTING

3.1 General

Quality control includes testing and final observation of materials and workmanship before and during construction to assess compliance of the materials and workmanship with the final engineering design plans and specifications.

Detailed descriptions of the character and quality of material submittals, workmanship, and observation of the work will be presented in the contract documents. Technical specifications presented in the contract documents detail submittals, specific testing requirements and laboratory testing protocols in accordance with the American Society of Testing Materials (ASTM), the Connecticut Department of Transportation (ConnDOT) Standard Specifications for Roads, Bridges and Incidental Construction (Form 816), and other recognized standards. The Contractor's, QAC's, Engineer's and CITY's responsibilities concerning tests and observations, as well as correction, removal or acceptance of defective work will be presented in the Standard General Conditions of the Construction Contract presented in the contract documents.

3.1.1 Project Submittals

The Contractor will provide the QAC with project submittals for review and approval in accordance with the contract documents. Before providing the project submittals, the Contractor will have determined and verified that the items contained in the submittal are acceptable for their intended use. The QAC will perform a timely review of the material submittal. Submittals determined to be deficient will be returned to the Contractor for corrections. Approved submittals will be returned to the Contractor for his use in maintaining the project record documents. Project record documents, which include a compilation of approved submittals and marked-up (i.e. red-lined) copies of the construction drawings and specifications, will be furnished to the QAC and CITY in connection with final payment at the time of contract closeout.

3.1.2 Testing and Reporting Requirements

Testing and reporting requirements have been established to verify the chemical and physical characteristics of materials and statements supporting the quality control of workmanship. Refer to the technical specifications for more detailed descriptions of the work to be performed and the testing/submittals required.

3.2 Disruption and Grading of Landfill Materials

This work will consist of the excavation, deposition, and regrading, as per the specifications and drawings, of existing on-site materials within the limits of the SITE as necessary to prepare a suitable subgrade for constructing the cap. There are no specific quality assurance submittals/testing associated with this task.

3.3 Subbase Material

The following submittals, required for subbase material imported by the Contractor, will be made as part of the quality control program prior to placing the subbase material layer:

- A materials certificate stating that the subbase material meets the technical specification prior to delivery of soil to the site. If the material is obtained from more than one source, then a materials certificate will be submitted from each source.
- A grain size analysis, permeability test report, interface friction angle test report (for subbase/liner interface), internal friction angle, and any other soil qualification testing listed in the technical specifications.

The following testing, required of the Contractor, will be made part of the quality control program during placement of the subbase material layer:

- Compaction test reports immediately following field testing of material. Field testing will be measured with a Nuclear Density Gauge at a frequency of one per 10,000 square feet.
- Measurements of the subbase material thickness taken following compaction at a frequency of every 50 feet on center.
- Environmental tests, grain size analysis, modified proctor, interface and internal friction angle testing at least once per 3,000 cubic yards of material delivered.

3.4 Vegetative Support Soil Material and Pavement Base Material (Cover Soil)

The following submittals, required for cover soil material imported by the Contractor, will be made part of the quality control program prior to placing the cover material layers (the uppermost topsoil layer is addressed separately in Section 3.8). In the instances where the soil cover material is comprised of more than one soil type, the following submittals are required for each soil material:

- A materials certificate stating that the soil cover material meets the technical specification prior to delivery of soil to the site. If the material is obtained from more than one source, then a materials certificate will be submitted for each source.
- A grain size analysis, permeability test report, interface friction angle test report (for soil cover/liner interface), internal friction angle, and any other soil qualification testing listed in the technical specifications.

The following testing, required of the Contractor, will be made part of the quality control program during placement of the soil cover material layer:

- Compaction test reports immediately following field testing of material. Field testing will be measured with a Nuclear Density Gauge at a frequency of one per 10,000 square feet.
- Measurements of the soil cover material thickness taken following compaction at a frequency of every 50 feet on center.
- Environmental tests, hydraulic conductivity, grain size analysis, modified proctor, interface and internal friction angle testing at least once per 5,000 cubic yards of material delivered.

3.5 Geomembrane

The following submittals, required for geomembrane supplied by the Contractor, will be made as part of the quality control program prior to delivery of the geomembrane:

- Brand information and manufacturer literature, including manufacturer's quality control test results for the batch and lot numbers of material supplied to the project.
- Interface friction angle test results.
- Warranties for geomembrane material and installation workmanship.
- Installation contractor's name, qualifications, references, and project descriptions.
- Installation contractor master seamers' and superintendent's names and qualifications.
- Proposed panel layout drawing.
- QA/QC Plan.

The following submittals shall be provided on a daily basis during the course of geomembrane installation:

- Manufacturer's QA/QC results
- Trial seam testing results
- Non-destructive seam testing results.
- Destructive seam testing results.

The following submittal shall be provided at the completion of the project:

- As-built panel layout drawing indicating panel locations, numbers and repair locations.

3.6 Composite Drainage Geonet

The following submittals, required for the composite drainage geonet supplied by the Contractor, will be made as part of the quality control program at least 10 days prior to delivery of materials to the site:

- A sample of the proposed composite drainage geonet.
- Installer's certifications per technical specifications.
- Certification that the material meets the required specifications.
- Interface friction angle test reports (for geonet/liner and geonet/soil interfaces).

3.7 Geotextiles

The Contractor shall submit to the Engineer samples of the proposed geotextiles, and certification that each material to be used meets the required specifications, at least 10 days prior to delivery of the material to the site.

3.8 Topsoil Material

The following submittals, required of the Contractor, will be made as part of the quality control program prior to and during placement of the topsoil:

- For each source, prior to delivery of the material to the site, certified test reports for environmental sampling in compliance with the technical specifications for topsoil material.
- Written statement indicating borrow source.
- Environmental tests, grain size, pH, and internal friction angle testing per technical specifications once per 3,000 CY
- Measurements of the vegetative support material thickness taken following final grading at a frequency of every 50 feet on center.

3.9 Turf Establishment

The following submittals, required of the Contractor, will be made as part of the quality control program prior to commencement of turf establishment activities:

- A materials certification and copies of catalog cut sheets for review and acceptance for fertilizer, lime, seed, erosion control blanket and matting products documenting that they comply with the specifications.
- A hydroseed procedure and application rates for approval that includes the number of pounds of mulch product to be used per acre.
- Full and complete written maintenance instructions for proper care and development of seeded areas.
- Planting schedule for each area of the site

3.10 Riprap

Prior to delivery of the riprap to the site, material certification of conformance with the specifications and one riprap sample per source meeting the requirements in the specification will be submitted.

4.0 REPORTING AND DOCUMENTATION

4.1 General

Quality assurance documentation consists of the design drawings, approved submittals, addenda, change orders, written clarifications, and all other data required by the contract documents. In addition, documentation prepared by the QAC will include daily field reports, independent laboratory test results (where applicable), and photographs of pertinent phases of the construction.

4.2 Project Record Documents

As specified in the contract documents, record documents will be maintained by the Contractor in a safe place at the site and will be annotated to show changes made during construction. The documents will be made available to CITY and the QAC for reference during construction. Upon final completion of the work, the project record documents will be delivered to the QAC for CITY in connection with final payment.

4.3 Final Certification Report

The QAC will prepare a report that documents the closure was conducted in general conformance with the approved plans and specifications. The report will include copies of daily field reports, testing results and as-built plans. The report will be submitted to the CTDEP upon completion of the landfill closure activities.

4.4 As-Built Drawings

In accordance with RCSA 22a-209-13(f), the CITY will submit to the CTDEP as-built site drawings certified by a Professional Engineer licensed in the State of Connecticut that grading and closure have been completed as specified in the approved closure plan. The as-built drawings will be submitted to the CTDEP within ninety (90) days of completing the landfill closure. The drawings and a detailed description of the landfill will be recorded in the land records of the City of Stamford and a certified copy of the recording will be forwarded to the CTDEP.

TABLES

TABLE H-1
TESTING/REPORTING SUMMARY

Construction Task/Product	Test/Submittal	Frequency
Landfill Regrading	N/A	N/A
Subbase Material	Materials certification w/qualification testing	One per source: prior to delivery
	Environmental testing, grain size analysis, modified proctor, interface and internal friction angle	One per 3,000 CY delivered
	Field density tests	One per 10,000 sq. ft.
	Subbase material thickness	50 ft. on center
Soil Cover Material	Materials certification w/qualification testing	One per source: prior to delivery
	Environmental testing, hydraulic conductivity, grain size analysis, modified proctor, interface and internal friction angle	One per 5,000 CY delivered
	Field density tests	One per 10,000 sq. ft.
	Cover soil material thickness	50 ft. on center
Geomembrane	Materials certification with all shop drawing requirements, including interface friction angle tests	Prior to delivery
	Manufacturer's factory QA/QC results	Per delivery, prior to installation
	Trial seam test results	Daily before commencing field seaming (3 foot test weld)
	Trial seam test results	Every 500 feet of field seam (1 inch test weld)
	Vacuum box testing	Each field seam
	Air pressure testing	Each double fusion seam
	Destructive seam testing	One per 500 feet of seam
	As-built panel layout drawing indicating panel locations, numbers and repair locations.	Upon completion
Composite Drainage Geonet	Material certification and sample with friction angle test results	Prior to delivery
	Installer's certifications	Prior to delivery
Geotextiles	Material certification and sample	One per geotextile specified; Prior to installation
Vegetative Support Material (Topsoil)	Material certification	One per source: prior to delivery
	Environmental testing, grain size (gradation), pH, and internal friction angle	One per 3,000 CY
	Topsoil material thickness	50 ft. on center
Turf Establishment and Erosion Control Products	Material certification and catalog cuts for fertilizer, lime, seed, erosion control products	Prior to delivery
	Hydroseed procedure, application rates	Prior to application
	Planting schedule	Prior to application
	Maintenance instructions	Prior to application
Riprap	Material certification and sample	Prior to installation