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Site Investigation Work Plan

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Town of Greenburgh

April 2015

woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

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1. INTRODUCTION

Woodard & Curran P.A.P.C. (Woodard & Curran), on behalf of the Town of Greenburgh (Greenburgh) has prepared the following Site Investigation Work Plan (SIWP) for the property located at 715 Dobbs Ferry Road (herein referred to as the "Site"), in Greenburgh, Westchester County, New York (Figure 1). Woodard & Curran met with representatives from the New York State Department of Environmental Conservation (NYSDEC) on December 4, 2014 and it was agreed that additional field investigations to better define the nature and extent of buried debris was necessary. This SIWP was prepared based on the December 4, 2014 meeting with the NYSDEC and in general accordance with the NYSDEC Region 3 Outline of Requirements for Investigation & Remediation of Unauthorized C&D Debris Disposal Sites, dated December 2002, Revised October 2010 (Region 3 SOP). This SIWP considers the findings of previous investigations conducted at the Site outlined herein and in consultation with the NYSDEC Region 3.

2. SITE BACKGROUND

2.1 PHYSICAL SETTING

The Site is a 6.89-acre lot located at 715 Dobbs Ferry Road in Greenburgh, Westchester County, New York (Figure 1). The Site was most currently utilized as a plant nursery and retail store and has been vacant for approximately ten years. Impervious surfaces including asphalt and cement/concrete and the existing building footprint cover the majority of the Site, with the exception of a vegetative area in the southern portion of the Site. According to the Town of Greenburgh Assessor's office, the Site is identified as Section 8.50, Block 28, and Lot 9.

2.2 SITE LOCATION AND USE

As shown on Figure 1, the Site is situated on the south side of Dobbs Ferry Road approximately one-third of a mile west of the Sprain Brook Parkway. As shown on Figure 2, the Site is developed with a one-story masonry building that is approximately 50,000 square feet in area. There are two associated asphalt paved parking lots including one to the north of the building and a smaller lot to the south of the building (Figure 2).

According to the Town of Greenburgh Building Department, the Subject Property is zoned "R 30." Uses allowed in the "R-30" zone include single-family dwellings; parks; playgrounds; recreational facilities; municipal or government uses; religious uses; regularly organized elementary or secondary schools.

2.3 SITE OPERATIONAL HISTORY

The Site is currently vacant. Prior to vacancy, the Site was operated by Frank's Nursery and Crafts, Inc. (Frank's), a nursery and retailer of lawn and garden products. Frank's was in operation between 1994 and 1997. Based on a City Directory review, the Site was used as a nursery/garden retailer as early as 1971 and aerial photographs indicate the Site was developed between 1964 and 1974. A copy of the City Directory and aerial photographs are included in Appendix A.

2.4 SURROUNDING LAND USE

The Site is bordered to the north by Dobbs Ferry Road and the Elmwood Country Club; to the west by Westchester Golf Range; to the south by Westchester Greenhouses, and to the east by a public right-of-way containing electrical transmission lines. The area surrounding the Site is zoned "R 30" and "R 7.5" for one-family residence. The nearest residential property is located approximately 260 feet to the east of the Site.

2.5 SITE TOPOGRAPHY AND GEOLOGY

The Site is located approximately 320 feet above mean sea level. The Site is covered with impervious surfaces and is relatively flat. According to Caldwell et. al. (1991), the Site is underlain by glacial till approximately three to nine feet thick. The glacial till is described as a poorly sorted mix of sand, gravel, silt and clay with boulders and cobbles and is generally unstratified. Based on a review of USDA Soil Survey Maps, soils near the Site are classified as urban land in the direct vicinity of the Site. Sutton loam with 3-8% slopes is to the north side of the Site, Udorthents wet substratum soil is to the east side of the Site and Udorthents smoothed soil is to the south and west side of the Site (Figure 3). According to Fisher et. al. (1970), the Site is underlain by the Manhattan formation, which is a pelitic schist.

Subsurface soils observed in soil borings advanced during previous investigations suggest that the Site previously contained a forested wetland area which was cleared and then covered with approximately 5 feet of debris-laden fill. Soil borings contained assorted fill materials including sands, concrete, asphalt, brick, gravels, and other similar

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materials in the top several feet, followed by a layer of woody debris in the 5 feet below ground surface (bgs) to 7 feet bgs range.

2.6 SITE HYDROLOGY AND HYDROGEOLOGY

The Site is located in the Sprain Brook River watershed, which is part of the larger Bronx River watershed that drains to the Long Island sound. A pond is located to the north of the Site at the golf course (Figure 1). The Sprain Brook is located approximately 1/3-mile east –southeast of the Site (Figure 1). The Sprain Brook in that region has been classified by the NYSDEC as a Class C surface water body. The designated uses for Class C surface water are fishing and limited primary and secondary recreational contact. The water is presumed to meet the requirements for these designated uses. The Site is not located in a FEMA Flood Zone nor located in a national wetland (Figure 4).

Ground water during previous investigations was observed at depths ranging from approximately 5.5 feet bgs to 7.8 feet bgs across the Site. Ground water flow direction was observed to be towards the south/southeast during previous investigations.

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3. PREVIOUS INVESTIGATIONS

There have been several investigations conducted at the Site to identify potential areas of concern and/or characterize the nature and extent of contamination identified. Below is a detailed discussion of the previous investigations conducted at the Site by Woodard & Curran between October 2011 and March 2013.

3.1 PHASE I ENVIRONMENTAL SITE ASSESSMENT

Woodard & Curran conducted a Phase I Environmental Site Assessment (ESA) at the Site in 2011. The Phase I ESA identified areas of potential concern based on a review of Site operation history, historical Sanborn Fire Insurance Maps, an environmental database review, and a Site visit. The Phase I ESA identified the following recognized environmental concerns (RECs):

- REC-1: 6,000-gallon Underground Storage Tank (UST)
- REC -2: Open NYSDEC Spill (Spill No. 0100881)
- REC-3: Drum Storage Area
- REC-4: Above Ground Emergency Heating Oil Tank
- REC-5: Electrical Transformer
- REC-6: Historical Fill and Use
- Historical REC 1A/B/C: Closed NYSDEC Spills

Based on the findings of the Phase I ESA, Woodard & Curran recommended an additional investigation of the above referenced RECs, including REC-1 (6,000-gallon UST), REC-2 (NYSDEC Spill No. 0100881), and REC-4 (Above Ground Emergency Heating Oil Tank). A copy of the Phase I ESA is included in Appendix A.

3.2 OCTOBER 2012 SPILL INVESTIGATION

Following the Phase I ESA, Woodard & Curran was retained by the Town of Greenburgh to investigate soil and groundwater at the Site. The focus of the October 2012 Spill Investigation included the investigation of NYSDEC Spill No. 0100881 and the above ground emergency heating oil tank. The spill investigation included the advancement of fifteen soil borings and collection of soil samples, the installation of one permanent ground water monitoring well, and the sampling of six ground water monitoring wells (including wells installed as part of the initial investigation of NYSDEC Spill No. 0100881 and the newly installed well).

Results from the October 2012 Spill Investigation indicated that impacted soil and ground water from NYSDEC Spill Number 0100881 are still present at the Site. The observed subsurface conditions, including petroleum product in ground water monitoring well MW-6 and volatile organic compounds (VOCs) identified in ground water monitoring well MW-2, indicated the impacted soils and ground water are limited to the immediate area of the historic fuel oil spill.

Additional soil and ground water impacts were observed onsite, specifically the concentrations of several semi volatile organic compounds (SVOCs) and metals in soil and SVOCs in ground water exceeding NYSDEC standards outside the MW-6/MW-2 area. These were believed to be likely attributable to the historic fill observed in borings throughout the southern portion of the Site. Woodard & Curran recommended additional delineation of potential impacts to soil and ground water in the vicinity of the spill area. In addition, Woodard & Curran recommended

conducting an investigation to confirm the presence and extent of historic fill material at the Site. A copy of the Spill Investigation Report is included in Appendix A.

3.3 MARCH 2013 SITE INVESTIGATION

To investigate the presence of historic fill material and to further delineate soil and ground water impacts at the Site, Woodard & Curran conducted a Site Investigation in early 2013. Site Investigation activities included the advancement and sampling of twelve soil borings, the installation of two permanent ground water monitoring wells, and the sampling of new and existing ground water monitoring wells.

Results of the March 2013 Site Investigation indicate that concentrations of several SVOCs and metals in soil and SVOCs in ground water exceeding NYSDEC standards are present outside the MW-6/MW-2 area. These impacts are believed to be likely attributable to the historic fill observed in borings throughout the southern portion of the Site. SVOCs exceeding NYSDEC soil standards were distributed sporadically in the horizontal plane and the sample locations exhibiting elevated SVOCs and metals in soil appear to be correlated.

The March 2013 Site Investigation also indicated that SVOCs consistent with fuel oil contamination were detected in several down-gradient and cross-gradient monitoring wells at concentrations exceeding the NYSDEC ambient water quality standards (AWQS). However, due to the presence of historic fill encountered in both the September 2012 Spill Investigation and the March 2013 Site Investigation, SVOCs in ground water may be related to the fill layer underlying the Site. A copy of the Site Investigation Report is included in Appendix A.

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4. SCOPE OF WORK

In consideration of the previously conducted characterization and investigation activities, the proposed Site Investigation includes the following scope of work for the Site:

- Waste/Fill Quantification;
- Utility clearance & mapping and geophysical investigation;
- Test Pit Investigation;
    - Chemical Analysis of Fill;
    - Waste Composition Analysis of Fill;
    - Extract Analysis of Fill
- Landfill Gas Investigation;
- Site Investigation Report.

A detailed discussion of each phase of the Site Investigation is outlined below:

4.1 WASTE/FILL QUANTIFICATION

4.1.1 Horizontal Extent and Estimated Area of C&D Debris

Based on observations made during previous investigations, Woodard & Curran estimates that the horizontal extent of the C&D debris encountered at the Site is approximately 4.9 acres. The approximate area was determined using a Geographic Information System (GIS) to create a polygon with a perimeter derived from points half the distance between observed C&D debris and the property line. Based on the GIS analysis, the approximate area of C&D debris is 216,000 square feet, or 4.9 acres . Woodard & Curran will further investigation the horizontal extent of the C&D debris as part of this SIWP. Figure 5 depicts the estimated horizontal extent of C&D debris at the Site based on the above GIS analysis.

4.1.2 Vertical Extent and Estimated Volume of C&D Debris

Field screening and characterization of subsurface soils during the previous investigations indicate that the C&D debris extends to maximum observed depth of approximately 12 feet below ground surface (bgs), with an approximate thickness of seven feet. The approximate thickness was determined using GIS interpolation analysis, which took the depth of the observed C&D debris along with the distance between data points rather than the average depth of the C&D debris. Woodard & Curran estimates that approximately 1,500,000 cubic feet (approximately 56,00 cubic yards) of C&D debris is present at the Site. Figure 5 depicts the approximate thickness of C&D debris at the Site based on GIS analysis. As part of the SIWP, Woodard & Curran will further investigation the vertical extent and estimated volume of waste/fill at the Site.

4.2 UTILITY CLEARANCE MAPPING AND GEOPHYSICAL INVESTIGATION

As part of the Site Investigation, subsurface features and structures will be located and mapped to ensure no utilities are encountered during intrusive work. Utility clearance will be conducted in two stages. Stage one will be conducted by public utility companies through the Dig Safely New York hotline. Stage two will be conducted by a private utility

locating company to clear potential test pits proposed on private property. In addition, the private utility locating company will locate subsurface anomalies with the use of ground penetrating radar (GPR).

4.3 TEST PIT INVESTIGATION

In accordance with NYSDEC Region 3 SOP's, a test pit investigation will be conducted at the Site to further characterize the nature and extent of waste/fill at the Site. The test pit program will consist of up to 25 test pits as shown on Figure 3. Test pit frequency was determined in accordance with NYSDEC Region 3 SOP's and is based on the estimated volume of fill referenced in Section 4.1 Below is a discussion of the test pit investigation methodology, including proposed excavation, sampling, and analytical protocols.

4.3.1 Test Pit Excavation

Test pits will be excavated using a backhoe, excavator, or other mechanical equipment with dimensions and capabilities necessary to executed the propose test pit investigation. Test pits may be sloped or stepped to allow safe entry to facilitate sample collection. Excavated material will be staged adjacent to the test pit to allow for observation, logging, and sampling of the material. If hazardous conditions are encountered, the material will be stockpiled to one side, preferably downwind, and away from the edge of the test pit to reduce pressure on the pit walls.

For the purposes of this SIWP, it is assumed that test pits will be approximately five feet wide by five feet long, and extend to an approximate depth of 10 feet below ground surface. If additional delineation is required below ten feet, a soil boring may be advanced to determine the vertical extent of the C&D debris. Final test pit dimensions, including depth and sample collection interval will be measured using a weighted tape measure referenced to the ground surface. All pertinent information will be documented in a field notebook.

A test pit log will be prepared for each test pit, indicating the color, texture, type, size and abundance of waste, depth and thickness of each observed layer of waste, depth at which ground water is encountered, and depth at which native or undisturbed soil is encountered. A photographic log included photos of test pits and excavated material will be prepared for each test pit.

Upon completion of the excavation, the test pit will normally be backfilled to the ground surface. During backfilling, materials will be compacted by tamping with the backhoe bucket. The surface will then be graded to the level of the ground surface.

4.3.2 Test Pit Sampling and Analysis

During test pit excavation, samples may be collected from the test pit for geologic characterization, field screening, and laboratory analyses. In accordance with NYSDEC Region 3 SOPs, a minimum of one sample will be collected from each test pit excavated at the Site.

Prior to sampling, soil/fill collected from the test pit will be screened with a photoionization detector (PID) or Flame Ionization Detector (FID) for the presence of organic vapors and readings/observations will be tabulated in a field notebook for inclusion in the test pit logs referenced in Section 4.3.1.

Samples will be collected from the temporarily stockpiled material or the middle of the backhoe bucket, as appropriate. Field personnel may also enter the test pit to collect samples directly from the sidewalls or bottom of the excavation, provided that the depth is less than four feet. Occupational Health and Safety Administration (OSHA) regulations prohibit entry into test pits greater than four feet deep without adequate shoring or benching of sidewalls. Before entry into any test pit, air monitoring will be conducted in accordance to the Site Health and Safety Plan (HASP).

Test pit samples will be a composite of two to four areas within the test pit/excavated material spoils and will be biased towards areas that have the following characteristics:

- Relatively high waste content;
- Dark color;
- Elevated PID or FID readings;
- Other signs of potential contamination.

The composite soil/fill sample from each test pit will be thoroughly mixed in accordance with accepted NYSDEC protocols prior to dividing into subsamples for application of following analytical methods:

- Semi-volatile organic compounds (SVOCs) via EPA method 8270C;
- Pesticides via EPA method 8081A;
- Polychlorinated Biphenyls (PCBs) via EPA method 8082;
- Heavy metals via EPA method 6010B;
- NYSDEC Region 3 Waste Composition Analysis (Appendix B)

In addition to the above reference composite sample analysis, a grab sample will be collected from each test pit for analysis of volatile organic compounds (VOCs) via EPA method 8260B to minimize the potential for VOC loss due mixing during the compositing process. VOC grab sample locations will be biased towards the area with the greatest field indications of contamination, including visual & olfactory observations, and/or elevated PID/FID readings.

All samples will be transferred under chain-of-custody protocols and analyzed by an Environmental Laboratory Accreditation Program (ELAP) New York State certified laboratory.

4.3.3 Extract Analysis

In addition to the soil/fill sampling and analytical program outlined in Section 4.3.2, an extract sample from each test pit may be analyzed to determine if the C&D debris is impacting ground water quality at the Site. Extract analysis will be performed utilizing the EPA'S Synthetic Precipitation Leaching Procedure (SPLP). The SPLP analysis will be performed on samples where contaminant concentrations from the soil/fill analysis exceed the NYSDEC Part 375 Soil Cleanup Objectives (SCOs) for the protection of ground water. SPLP analysis may include the following parameters:

- VOCs via EPA method 8260B;
- SVOCs via EPA method 8270C;
- Pesticides via EPA method 8081A;
- PCBs via EPA method 8082;
- Heavy metals via EPA method 6010B;

All samples will be transferred under chain-of-custody protocols and analyzed by an ELAP New York State certified laboratory.

4.4 LANDFILL GAS INVESTIGATION

Concurrent with the test pit investigation outlined in Section 4.3 and in accordance with NYSDEC Region 3 SOP's, a landfill gas investigation will be conducted at the Site as follows:

4.4.1 Soil Gas Sampling

The proposed soil gas-sampling plan will consist of up to eight potential sampling locations as shown on Figure 3 to screen for the presence of VOC and landfill gases, and to evaluate the potential vapor intrusion into the existing and any future building footprints. Prior to sample collection, bar-hole sampling will be conducted to screen for the presence of VOCs methane and other gases. To conduct bar-hole sampling, a metal bar will be inserted up to five feet below ground surface. The bar will then be removed and the void space will be screened with a PID, a multi-gas meter (Hydrogen Sulfide, Carbon Monoxide, % Oxygen, % Lower Explosive Limit), and a methane meter. If field conditions indicate the presence of methane, VOCs, or any other gases, a soil-gas sample will be collected. The sampling will be completed utilizing temporary soil gas sample points in accordance with the New York State Department of Health, Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006).

Soil gas samples will be collected from a depth of five feet below grade or at least one foot above the water table if the water table is less than six feet below grade. Soil gas samples will be collected by drilling to the prescribed depth with a soil gas sampling probe and installing temporary tubing. Once the temporary tubing is installed, the hole will be sealed at the surface with bentonite or similar sealant. A helium shroud will be utilized to confirm sampling probe seal integrity and ensure no ambient air is drawn into the soil gas sample.

The temporary soil gas sampling points will be sampled utilizing a Summa™ canister. The sampling point will be connected to the canister utilizing polyethylene or Teflon tubing. The Summa™ canisters will be fitted with flow controllers to allow sampling over one-hour, which is the minimum sampling interval in accordance with the NYSDOH soil gas guidance document (October 2006). Soil gas samples will be transferred under chain-of-custody protocols and analyzed by an ELAP New York State certified laboratory VOCs and methane via USEPA Method to-15 and 3C, respectively.

4.4.2 Bar-Hole Sampling

In addition to the above referenced proposed soil gas sampling plan, a perimeter bar-hole survey will be conducted in accordance with Part 360-2.15 to address the potential presence of gases onsite, and the potential for gases to migrate offsite. To conduct bar-hole sampling, a metal bar will be inserted into the ground to an approximate depth of 5 feet below ground surface. The bar will then be removed and the void space will be screened with a PID, a mutli-gas meter and a methane meter. All sample locations and field readings will be recorded and logged to document findings.

4.4.3 Ambient Air Sampling

An ambient air sample will be collected during a 24-hr period or as long as necessary during the soil gas sampling, to document background conditions during sampling. In addition, a site weather station will be setup to record weather conditions during the soil gas sampling event.

4.5 BACKGROUND SOIL SAMPLING

In accordance with NYSDEC Region 3 SOP, it may be necessary to collect samples of undisturbed "natural" soil from areas of the Site or vicinity where fill material has not been placed. Background soil sampling that may be required as part of this SIWP will be collected in consultation with and under the supervision of the NYSDEC, if appropriate. Parameter concentrations obtained from the laboratory analysis of background soil samples may be used as alternatives to the Part 375 SCOs with NYSDEC approval.

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5. REPORTING

Following completion of field activities, all data will be evaluated and interpreted for the purposes of preparing a Site Investigation Report (SIR). The SIR will be prepared in accordance with DER-10 and Region 3 SOPs and will provide the following information:

- Site Background and physical setting;
- Summary of previous investigations;
- Investigation methodology;
- Description of the amount, concentration, and location of contaminant(s) present;
- Analytical data validation results, including a Data Usability Summary Report (DUSR);
- Summary of the overall nature and extent of contamination using the applicable NYSDEC and/ or NYSDOH standards, criteria and guidance;
- Summary of any significant events, observations, or variations which may have influenced sampling procedures or analytical results;
- Stratigraphic logs including soil/fill physical descriptions, if applicable, including the following information:
    - Test Pit Logs;
    - Field instrument readings;
- Photographic logs of test pits and excavated material spoils;
- Site Figures including the following:
    - Site/ area of concern base maps;
    - Stratigraphic cross-sections (if applicable) ;
    - Sample location maps with surveyed or GPS located sample points for any ground water, soil or sample types with sample information including sample depths and contaminant concentrations; and,
    - Contaminant concentration maps, if applicable.

In addition to the above information, the SIR will include conclusions and recommendations, which will summarize the areas of concern, identify any potential exposure pathways, and recommend any future work including supplemental investigation activities, or the development of a Site Remediation Plan, if applicable.

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6. QUALITY ASSURANCE PROJECT PLAN

The purpose of this Quality Assurance Project Plan (QAPP) is to ensure that scientific data are acquired according to established methods and procedures designed to obtain results that are objective, true, repeatable, and of known accuracy. Specifically, this QAPP provides guidance and specifications to ensure that activities associated with remedial investigations at the Site are planned and executed in a manner consistent with the quality assurance objectives stated below:

- Field determinations and analytical results are valid through adherence to NYSDEC field procedures, NYSDEC-approved analytical protocol, and calibration and preventive maintenance of equipment;
- Samples are identified and controlled through chain-of-custody procedures;
- Records are retained as documentary evidence of field activities and observations;
- Generated data are validated in accordance with respective NYSDEC data validation guidelines; and,
- Evaluations of the data are accurate, appropriate, and consistent throughout the project.

The content of this QAPP is based on the NYSDEC requirements for a quality assurance project plan as stated in NYSDEC DER-10. This QAPP includes:

- Data Quality Objectives and Project Scope;
- Project Organization and Responsibility;
- Sample Collection and Field Data Acquisition Procedures;
- Sample Analysis and Laboratory Data Deliverable Format;
- Sample Quality Assurance; and,
- Quality Control Procedures.

6.1 DATA QUALITY OBJECTIVES AND PROJECT SCOPE

The overall objective of the RI is to determine tidal influence on ground water flow direction, refine the delineation of ground water contamination and install new monitoring wells if needed, and conduct a vapor intrusion investigation at the Site. The proposed Data Quality Objectives (DQO) and scope of work for the RI includes the following:

- DQO – Determine vertical and horizontal extent of unauthorized C&D debris:
    - Excavate test pits to determine horizontal and vertical extent of C&D debris at the Site
- DQO – Determine Composition and Nature of C&D Debris:
    - Collect samples from each test pit to determine waste composition of C&D debris.
    - Collect sample from each test pit for laboratory analysis of C&D debris.
- DQO – Vapor Intrusion Investigation:
    - Collect soil vapor samples for laboratory analysis
    - Conduct bar hole survey to investigation potential for landfill gas migration; and,
    - Collect ambient air samples for laboratory analysis.

6.2 PROJECT ORGANIZATION

The principal personnel for the project are identified below. The environmental consultant and New York-certified analytical laboratory are also listed below.

Environmental Consultant – Woodard & Curran P.A.P.C.

Mr. Anthony Catalano, PE, BCEE is Woodard & Curran's Principal in Charge (PIC). As the PIC Mr. Catalano will provide oversight and ensure resources are available to complete work scopes at the Site.

Mr. Michael van der Heijden, LSRP is Woodard & Curran's Technical Director. As the Technical Director Mr. van der Heijden will provide technical oversight as necessary to complete work scopes and review project deliverables. Mr. van der Heijden will also serve and Woodard & Curran's Project Quality Assurance Office and will be responsible for reviewing data and evaluating analytical results.

Mr. Evan Trumpatori is Woodard & Curran's Task Manager. Mr. Trumpatori will be responsible for managing the project, including field sampling activities, and preparing project deliverables.

Woodard & Curran's contact information is provided below:

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Analytical Laboratory –The analytical laboratory will be Alpha Analytical, Inc. (Alpha) of Westborough Massachusetts; a NYSDEC-certified laboratory.

6.3 SAMPLE ACQUISITION AND FIELD DATA COLLECTION PROCEDURES

Test pit excavation and sampling will be conducted in accordance with established NYSDEC and USEPA protocols. Soil vapor sampling will be conducted in accordance with the NYDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH 2006).

6.4 DECONTAMINATION PROCEDURES

6.4.1 Excavation and Drilling Equipment

Drilling and excavation equipment will be decontaminated and at the end of the field activities. Decontamination will consist of a high-pressure water or "steam" wash and brushing to remove encrusted material from the drill rig, backhoe or excavator.

6.4.2 Field Sampling Equipment

Field equipment decontamination procedures will be conducted in accordance with USEPA Standard Operating Procedure (SOP) #2006 for Sampling Equipment Decontamination (Dated 8/11/94).

6.5 INVESTIGATION DERIVED WASTE

Investigation derived wastes (IDW) including residual solids and residual fluids (such as decontamination water will be collected and stored in Department of Transportation (DOT)-approved (or equivalent) 55-gallon drums in a designated storage area at the Site. These residual materials will be characterized for waste classification and disposed off-site in accordance with applicable federal and state regulations, and individual disposal facility requirements.

6.6 FIELD DATA AND NOTES

Field notebooks contain the documentary evidence for procedures as performed by field personnel. Hard cover, bound field notebooks will be used because of their compact size, durability and secure page binding. The pages of the notebook will be numbered consecutively and will not be removed.

Entries will be made in waterproof, indelible ink. No erasures will be allowed. If an incorrect entry is made, the information will be crossed out with a single strike mark and the change initialed and dated by the team member making the change.

Each entry will be dated. Entries will be legible and contain accurate and complete documentation of the individual or sampling team's activities or observations made. The level of detail will be sufficient to explain and reconstruct the activity conducted. Each entry will be signed by the person(s) making the entry.

The following types of information will be provided for each sampling task, as appropriate:

- Project name and number;
- Reasons for being on Site or taking the sample such as re-sampling to confirm previous analysis, initial Site assessment, etc.;
- Date and time of activity;
- Sample identification number;
- Geographical location of the sampling point with reference to Site (or other) facilities or a map coordinate system. Sketches will be made in the field logbook when appropriate;
- Physical location of the sampling point such as depth below ground surface or water surface;
- Description of the method of sampling including procedures followed, equipment used, and any departure from the specified procedures. Volume of water purged and water levels will be included for ground water samples;
- Description of the sample such as physical characteristics, odor, etc.;
- Results of field measurements such as organic vapors, etc.;
- Readings obtained from health and safety equipment;
- Weather conditions at the time of sampling and previous meteorological events that may affect the representative nature of a sample;
- Photographic information including a brief description of what was photographed, the date and time, and the compass direction of the picture. ;
- Reference numbers from all serialized forms on which the sample is listed or labels which are attached to the sample (i.e., chain-of-custody forms, airbill numbers, etc.);

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- Other pertinent observations such as the presence of other persons on the Site (those associated with the job or members of the press, special interest groups, or passers-by), actions by others that may affect performance of Site tasks, etc.; and,
- Names of sampling personnel and signature of persons making entries.

6.7 FIELD INSTRUMENT CALIBRATION AND MAINTENANCE

The following field equipment may be utilized at the Site:

- Photo-Ionization Detector;
- Multi-gas Meter/Landfill Gas Meter (% Methane, %Oxygen, Carbon Monoxide, Hydrogen Sulfide, % Lower Explosive Limit); and,
- Dust Meter.

On-site field calibration activities include the use of calibration standards and field equipment checks, as appropriate, for the equipment being used. Field calibration and/or field checking of each meter will be accomplished by following the procedures outlined in the operating manual for the instrument. At a minimum, field calibration will occur daily, prior to the initiation of sampling activities. Field calibration will be documented in the field notebook.

Equipment that fails calibration or becomes inoperable during use will be removed from service and segregated to prevent inadvertent use. The equipment will be properly tagged to indicate that it is out of calibration. Such equipment will be repaired and recalibrated to approved standards by qualified personnel. Equipment that cannot be repaired will be replaced.

Results of activities performed using field equipment that has failed recalibration will be evaluated by the Project Manager or designee. If the activity results are adversely affected, the results of the evaluation will be documented, appropriate personnel notified, and a decision made of the validity of the results.

Off-site calibration and maintenance of field instruments will be conducted as appropriate throughout the duration of project activities. All field instrumentation, sampling equipment, and accessories will be maintained in accordance with the manufacturer's recommendations and specifications and established field equipment practice. Off-site calibration and maintenance will be performed by qualified personnel.

6.8 SAMPLE ANALYSIS AND LABORATORY DELIVERABLE FORMAT

Samples collected during the Site Investigation will be analyzed by a New York-certified laboratory. The analytical methods and laboratory container are summarized in Tables 1 and Table 2, respectively.

Laboratory analytical data will be reported in Analytical Services Protocol (ASP) Category B reports. Following analysis, the laboratory data will be reviewed by an independent data validation service for the purposes of developing a DUSR. In addition, electronic data deliverables (EDDs) will be submitted in EQuIS™ format utilizing the NYSDEC DER Environmental Information Management System (EIMS).

6.9 SAMPLE QUALITY ASSURANCE

6.9.1 Sampling Program

Analytical methods and quality assurance parameters associated with the sampling program are presented in Tables 1 and Table 2. Table 1 provides a summary of analyses to be conducted as part of the Site Investigation. Table 2 provides details by parameter on the container volume and type, sample preservation, and holding times for the

sampling program. The frequency of associated field blanks, and duplicates will be in accordance with NYSDEC protocols.

6.9.2 Sample Labeling

Each sample collected will be assigned a unique identification number and placed in an appropriate sample container. Each sample container will have a sample label affixed to the outside with the date, time of sample collection and project name. In addition, this label will contain the sample identification number, analysis required, and chemical preservatives added, if any. All documentation will be completed in waterproof ink.

6.9.3 Sample Handling

The analytical laboratory will provide pre-cleaned and prepared sample containers to collect samples for all matrices. The laboratory will also prepare and supply the required field blank sample containers, reagent preservatives, and trip blank sample containers according to the media to be samples. Sample bottle containers, including the field blank and trip blank sample containers will be placed into coolers and the coolers filled with ice in plastic bags and/or ice packs to maintain a temperature of approximately 4 degrees Celsius (ºC). These coolers will be received by the field sampling team within 24 hours of their preparation in the laboratory.

Samples collected in the field for laboratory analysis will be placed directly into the laboratory-supplied sample containers. Individual sample containers will be sealed by hand-tightening container lids.

Possession of samples collected in the field will be traceable from the time of collection until they are analyzed by an analytical laboratory or disposed. To maintain and document sample possession, chain-of-custody procedures as described in Section 6.9.7 will be followed. Samples will be packaged and shipped as described in Section 6.9.8.

Coolers containing field blanks and/or trip blanks received from the laboratory will be held on Site for no longer than two calendar days. Coolers containing the sample containers and associated field and trip blanks will be received at the laboratory within 24 hours of their shipment from the field.

SUMMA™ canisters will be individually certified and a pressure gauge will be utilized to note the initial and final canister pressure to verify sample integrity. The canisters will be shipped in secure packaging to prevent damage to the canisters during transit.

6.9.4 Sample Preservation

Sample preservation measures will be used to attempt to prevent sample decomposition by contamination, degradation, biological transformation, chemical interactions, and other factors during the time between sample collection and analysis. Steps taken to maintain in-situ characteristics may include refrigeration of samples at approximately 4 ºC, freezing, pH adjustment, and/or chemical fixation. Samples are preserved according to the requirements of the specific analytical method selected.

The analytical laboratory will add the required preservatives to the appropriate sample containers during preparation of the containers. SUMMA™ canisters do not require specific preservation. The sample preservation method for each sample media is provided in Table 2.

6.9.5 Sample Blanks and Duplicates

Field blanks will be collected for ground water samples. Field blanks for all matrices will be obtained by pouring laboratory-demonstrated analyte-free water through one of the decontaminated sampling devices to be used for sample collection that day. As the laboratory water passes over the sampling device, it will be collected in the appropriate container for analysis. Field blanks for ground water samples will be collected at a frequency of one per day and analyzed for the same parameters as the samples.

Duplicate samples will also be collected and analyzed for quality assurance purposes..

6.9.6 Chain-of-Custody Procedures

A program has been established for sample chain-of-custody that will be followed during sample handling activities in both field and laboratory operations. The primary purpose of chain-of-custody procedures is to document the possession of the samples from collection through shipping, storage and analysis to data reporting and disposal.

Chain-of-custody refers to the actual possession of the samples. Samples are considered to be in custody if they are within sight of the individual responsible for their security or locked in a secure location. Each person who takes possession of the samples, except the shipping courier, is responsible for sample integrity and safe keeping.

Chain-of-custody procedures are provided below:

- Chain-of-custody will be initiated by the laboratory supplying the pre-cleaned and prepared sample containers. Chain-of-custody forms will accompany the sample containers;
- At the time of sample collection, the chain-of-custody form will be completed for the sample collected. The sample identification number, date and time of sample collection, analysis requested and other pertinent information (e.g., preservatives) will be recorded on the form. All entries will be made in waterproof, indelible blue or black ink;
- Field samplers will be responsible for the care and custody of the samples collected until the samples are transferred to another party, dispatched to the laboratory, or disposed. The sampling team leader will be responsible for enforcing chain-of-custody procedures during field work;
- When the form is full or when all samples have been collected that will fit in a single cooler, the sampling team leader will check the form for possible errors and sign the chain-of-custody form. Any necessary corrections will be made to the record with a single strike mark, dated, and initialed; and,
- A shipping bill will be completed for each cooler and the shipping bill number recorded on the chain-of-custody form.

A copy of the chain-of-custody form will be retained by the sampling team for the project file and the original will be sent with the samples.

When transferring custody of the samples, the individuals relinquishing and receiving custody of the samples will verify sample numbers and condition and will document the sample acquisition and transfer by signing and dating the chain-of-custody form. This process documents sample custody transfer from the sampler, usually through an express courier, to the analyst in the analytical laboratory.

Laboratory chain-of-custody will be maintained throughout the analytical processes as described in the laboratory's Quality Assurance Manual. The analytical laboratory will return the original chain-of-custody in the analytical data deliverable package. The chain-of-custody form becomes the permanent record of sample handling and shipment.

6.9.7 Sample Shipment

Although it is not anticipated, any samples requiring shipment will be packaged and shipped as environmental samples in accordance with applicable federal and state regulations. Declarations of type of samples and media will be made on the shipping label.

6.9.7.1 Packaging

Sample containers will be packed with appropriate packaging material to minimize breakage and placed in coolers. Paperwork will be put in a plastic bag and placed on top of the sample containers/ice or taped to the inside lid of the cooler. The cooler will be taped closed and signed custody seals will be affixed to the cooler. Laboratory address labels will be placed on top of the cooler.

6.9.7.2 Shipping

Standard procedures to be followed for shipping environmental samples to the analytical laboratory are outlined below.

- All environmental samples collected will be transported to the laboratory by field personnel, by laboratory personnel, by courier, or shipped through Federal Express or equivalent overnight service;
- Daily shipments will be sent whenever necessary to meet holding time requirements; and,
- The laboratory will be notified to be prepared to receive a shipment of samples. If the number, type, or date of shipment changes due to Site constraints or program changes, the laboratory will be informed.

6.9.8 Sample Storage

Once samples are transported to the laboratory, custodial responsibility of the samples is transferred to the Laboratory Sample Manager to assure that the appropriate procedures and methods are followed. Sample storage procedures will be in accordance with the laboratory's Quality Assurance Manual.

6.10 QUALITY CONTROL PROCEDURES

Sample quality control consists of those activities specifically conducted to ensure that the quality assurance program described in this QAPP is being implemented according to the specified requirements, to assess the effectiveness of the sample quality assurance program, to identify non-conformances, and to verify that any identified deficiencies are corrected. If any significant deviations from the quality assurance program are documented, corrective action measure(s) will be immediately implemented and documented.

For this investigation, sample quality control will consist of three activities: field quality control audit, data validation, and technical review. Each of these activities is described below.

6.10.1 Data Review

Laboratory analytical data will be subject to data review to ensure laboratory compliance with quality assurance requirements of the selected analytical methods. Data review will be conducted on a minimum of 10 percent of the samples by the environmental consulting firm for the parameters outlined in Tables 2 and 3 using non-Contract Laboratory Program (CLP) data validation criteria.

The required precision and accuracy from the analytical method will be applied. Where no guidelines or criteria exist, analytical documentation, report results versus raw data, and quantitative calculations will be verified and professional judgment will be applied in reviewing the data.

6.10.2 Technical Review

The reduction and analysis of data obtained through the sampling program along with the conclusions/recommendations reached based on these data will be reviewed to ensure the quality of the data and the validity of the conclusions/recommendations.

To ensure accurate transfer of laboratory data, the accuracy of electronic copies of analytical data provided by the laboratory will be verified by manually checking a minimum of ten percent of the sample data to the hard copy laboratory data package(s). Similarly, data that are reduced into tables and/or electronically reformatted to facilitate data evaluation (e.g., data summary tables highlighting exceedences of cleanup standards) will be verified by manually checking a minimum of ten percent of the sample data. If inaccuracies are detected, additional data will be checked and appropriate corrective actions taken.

Conclusions and/or recommendations will be reviewed by one or more peers of the professional who develops the conclusion/recommendation to ensure their accuracy on the basis of the data that have been acquired and the analysis that has been conducted. Technical reviews will be performed by professionals who have the necessary knowledge and skill to perform the review..

6.11 HEALTH AND SAFETY PLAN

A Site-Specific Health and Safety Plan (HASP) will be developed in accordance with the Occupational Safety and Health Administration (OSHA) HAZWOPER regulations (Standard 1910.120 "Hazardous Waste Operations and Emergency Response.") The standard contains the safety requirements that must be met in order to conduct these operations.

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7. REFERENCES

DER-10 — DER-10/Technical Guidance for Site Investigation and Remediation, New York State Department of Environmental Conservation, DEC Program Policy, May 3, 2010

NYSDOH 2006 — Guidance for Evaluating Soil Vapor Intrusion in the State of New York, New York State Department of Health, October 2006.

Region 3 SOP — Outline of Requirements for Investigation & Remediation of Unauthorized C&D Debris Disposal Sites, New York State Department of Environmental Conservation/Region 3, December 2002 (Revised October 210).

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TABLES

Table 1
Summary of Analytical Program
Site Investigation Work Plan
Frank's Nursery - 715 Dobbs Ferry Road, Greenburgh NY

Analyte	Method	Soil	Air	Duplicates[1]	Field Blanks
Volatile Organic Compounds	USEPA method 8260B	25	0	2	2
Semivolatile Organic Compounds	USEPA method 8270C	25	0	2	2
Metals	USEPA method 6010b	25	0	2	2
Pesticides	USEPA 8081A	25	0	2	2
Polychlorinated Biphenyls	USEPA Method 8082A	25	0	2	2
Waste Composition Analysis	Region 3 SOP	25	0	0	0
SPLP Extract Analysis	USEPA Method 1312	5 [2]	0	0	0
Methane (Air)	USEPA 3C	0	8 [3]	0	0
Volatile Organic Compounds (Air)	USEPA Method TO-15	0	8 [3]	0	0

NOTES:

USEPA - United Stated Environmental Protection Agency

MS/MSD - Matrix Spike/Matrix Spike Duplicate

SPLP - Synthetic Precipiate Leaching Procedure

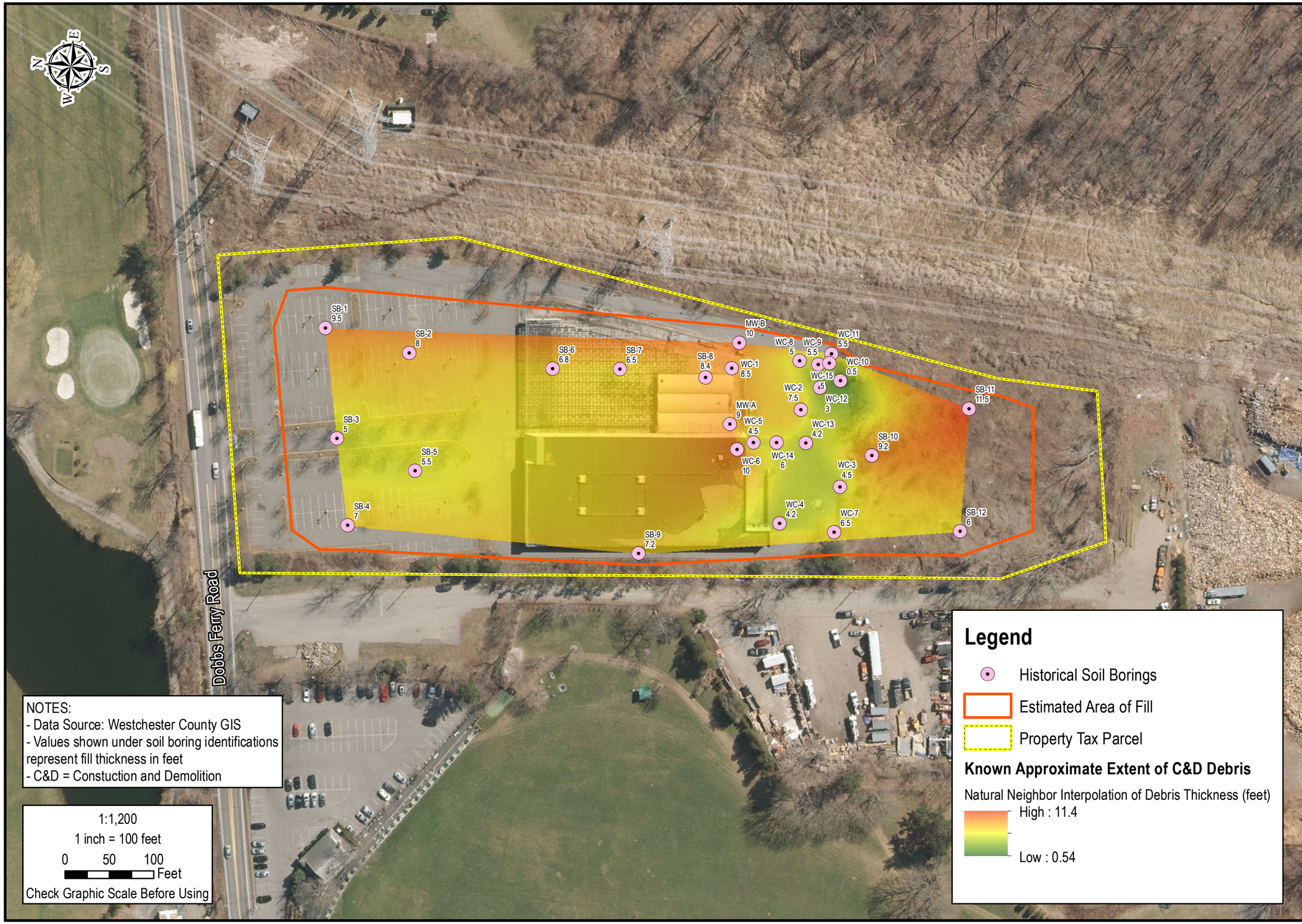
1. Duplicate samples will be collected at a rate of 1 per 20 for each sample matrix
2. Assumess SPLP analysis on 20% of test pits; additional SPLP analysis may be required based on results of soil analysis

Table 2
Sample Containers, Preservation Requirements, and Holding Times
Site Investigation Work Plan
Frank's Nursery - 715 Dobbs Ferry Road, Greenburgh NY

Non-Aqueous Matrix (Air)			
Analysis	**Container Requirements**	**Preservation Requirements**	**Holding Times***
Methane	Stainless Steel SUMMA™ Canister	**NA**	**30 Days**
VOCs	Stainless Steel SUMMA™ Canister	NA	30-days
Non-Aqueous Matrix (Soil)			
Analysis	**Container Requirements**	**Preservation Requirements**	**Holding Times***
VOCs	3 Encore samplers	No preservative/ Cool to 4 degrees C	48 Hours
SVOCs	8 oz container	No preservative/ Cool to 4 degrees C	14-days (extraction)
Metals	4 oz container	No preservative/ Cool to 4 degrees C	180-days
Mercury	4 oz container	No preservative/ Cool to 4 degrees C	28-days
Pesticides	250 ml plastic	No preservative/ Cool to 4 degrees C	28-days
PCBs	4 oz container	No preservative/ Cool to 4 degrees C	14-days (extraction)
Synthetic Precipitate Leaching Procedure (Soil)			
Analysis	**Container Requirements**	**Preservation Requirements**	**Holding Times***
VOCs	3 Encore samplers	No preservative/ Cool to 4 degrees C	48 Hours
SVOCs	8 oz container	No preservative/ Cool to 4 degrees C	14-days (extraction)
Metals	4 oz container	No preservative/ Cool to 4 degrees C	180-days
Mercury	4 oz container	No preservative/ Cool to 4 degrees C	28-days
Pesticides	250 ml plastic	No preservative/ Cool to 4 degrees C	28-days
PCBs	4 oz container	No preservative/ Cool to 4 degrees C	14-days (extraction)

NOTES:
* Holding time begins at time of sample collection
ml - mililiter
NA - Not applicable
HCl = Hydrochloric Acid
HNO3 = Nitric Acid
VOCs = Volatile Organic Compounds

FIGURES



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COMMITMENT & INTEGRITY DRIVE RESULTS

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Approximate Area of Fill

Town of Greenburgh
Site Investigation Workplan

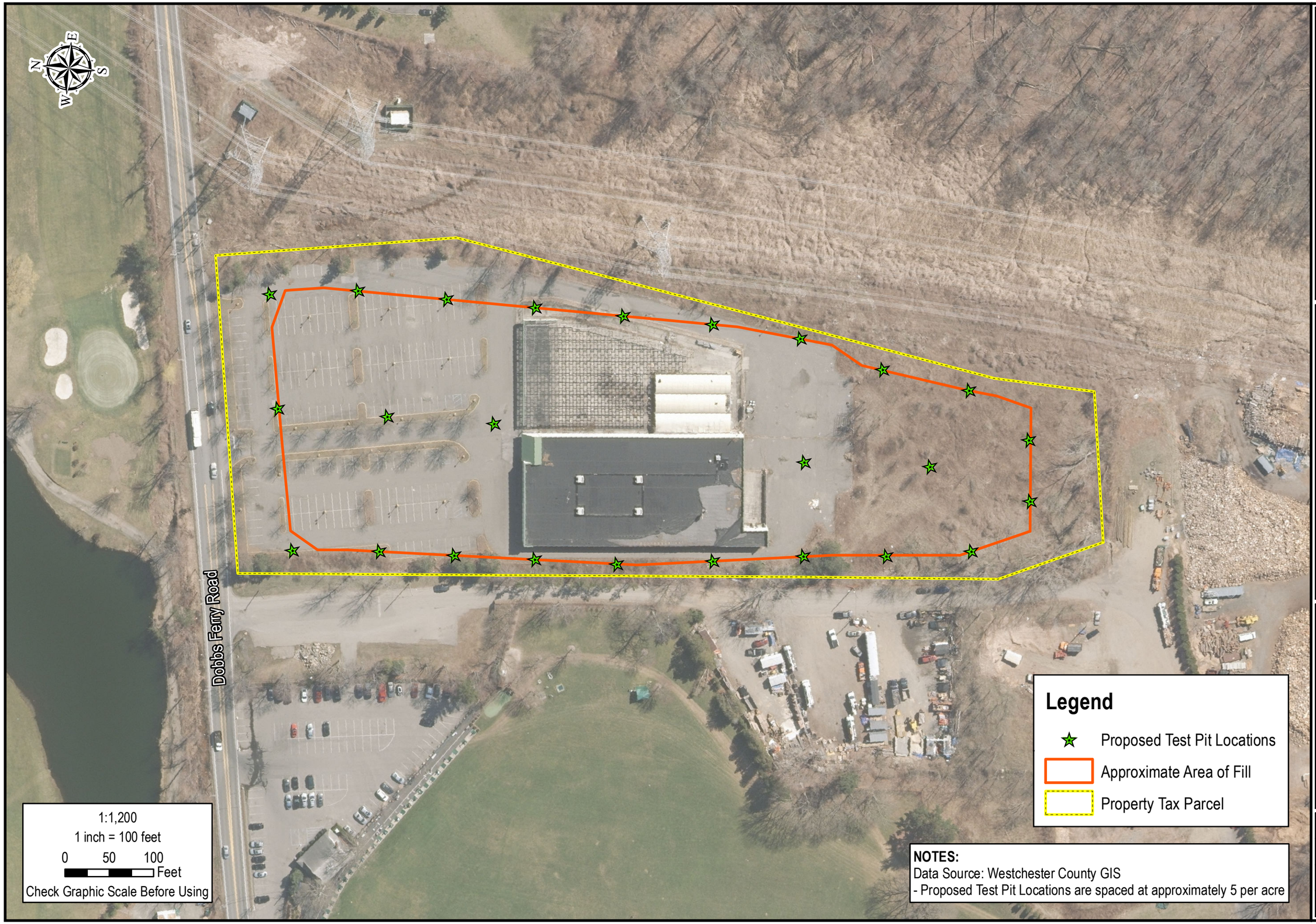
715 Dobbs Ferry Road
Greenburgh, NY 10607

JOB NO.: 213948.03

DRAWN BY: KCS

DATE: March 2015

FIGURE 5



NOTES:
Data Source: Westchester County GIS
- Proposed Test Pit Locations are spaced at approximately 5 per acre

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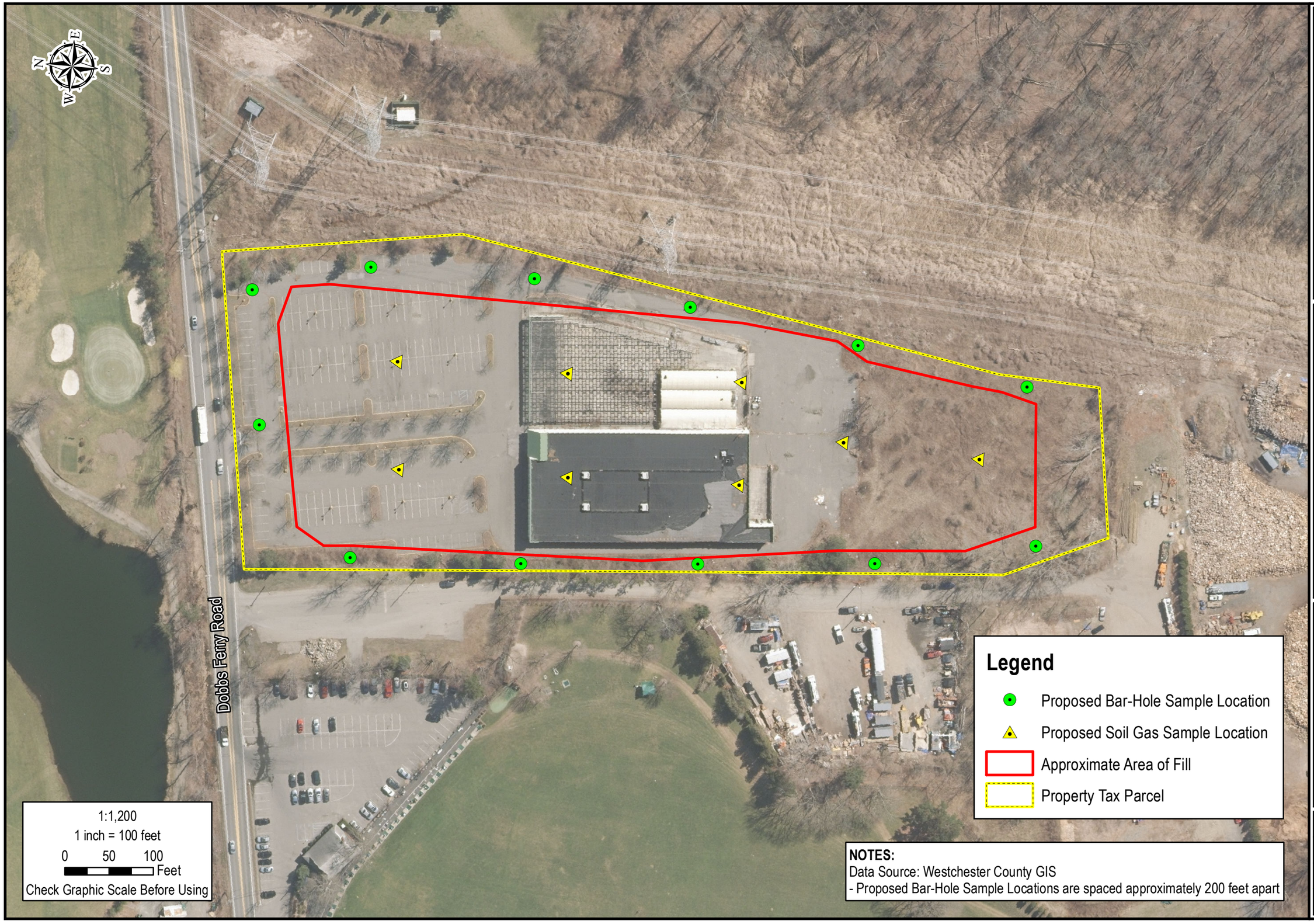
Proposed Test Pit Locations

Town of Greenburgh
Site Investigation Workplan

715 Dobbs Ferry Road
Greenburgh, NY 10607

JOB NO.: 213948.03
DRAWN BY: KCS
DATE: April 2015

FIGURE 6



NOTES:
Data Source: Westchester County GIS
- Proposed Bar-Hole Sample Locations are spaced approximately 200 feet apart

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Proposed Soil Gas and Bar-Hole Sample Locations

Town of Greenburgh
Site Investigation Workplan

715 Dobbs Ferry Road
Greenburgh, NY 10607

JOB NO.: 213948.03

DRAWN BY: KCS

DATE: April 2015

FIGURE 7

APPENDIX A: HISTORICAL DOCUMENTS

APPENDIX B: NYSDEC REGION 3 WASTE COMPOSITION ANALYTICAL PROTOCOLS

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION/REGION 3

OUTLINE OF REQUIREMENTS FOR INVESTIGATION & REMEDIATION OF UNAUTHORIZED C&D DEBRIS DISPOSAL SITES

December 2002 (rev October 2010)

Explanation: The purpose of this outline is to standardize the type of information required in investigations of unauthorized C&D debris disposal sites and to provide consistency in the manner in which that information is used to make decisions regarding requirements for site remediation. Typically these are unpermitted sites which operated under the Part 360 exemption for C&D debris disposal sites but failed to comply with the exemption criteria prescribed at 6 NYCRR Part 360-7.1(b)(1)(i). Fill material typically consists largely of concrete, brick, asphalt pavement, glass, soil and rock but contains minor amounts of other waste types not allowed at exempt disposal sites such as fragments of wood, tile, metal pipes, electrical wiring components, gypsum wallboard, roofing shingles, fiberglass insulation, plastic, fabric, paper, coal and/or coal ash. For cases involving larger quantities of these or other waste types not acceptable at exempt disposal sites, the requirements outlined below may not be adequate to address all regulatory and technical requirements.

This outline is based on experience gained in numerous enforcement cases involving unauthorized disposal of C&D debris and reflects requirements which have typically been included in schedules of compliance and approved work plans. Each consent order is negotiated on a case-by-case basis and this outline should not be construed as an offer of settlement in any particular case. This outline has not been adopted as an official guidance document and is not applicable to any specific case unless it has been incorporated into a fully executed Order on Consent.

This outline specifies requirements for investigation and remediation when non-compliant fill material is left in place. It should not be assumed that all enforcement cases can be settled in this manner. In many cases, based on the nature of the fill material, the results of the investigation, the environmental setting or other factors, the Department may determine that the case can only be settled by removal of the waste/fill material and disposal at an authorized solid waste management facility. In some cases, it may be less expensive to remove and properly dispose of the waste/fill material rather than to comply with the requirements outlined below.

When adopted as part of an Order on Consent, this outline is to be used by the respondent's engineering consultant to prepare a *Site Investigation Work Plan* prior to carrying out the investigation and to prepare a *Site Remediation Plan* after the results of the investigation have been obtained. The site investigation work plan should include a description of the site and its history (section I), and a description of the methods to be used for waste/fill characterization (section II). The respondent should obtain written approval for the work plan from the Department before initiating the work and should contact the Department in advance to schedule a time when Department staff will be available to oversee the work. All work should be carried out with oversight by a project manager who is a NYS licensed professional engineer or other qualified individual acceptable to the Department. It is the responsibility of the project manager to ensure that all work is carried out in a manner which complies with applicable health and safety requirements.

I. Site Background Information - The following information should be included:

a) Figure showing the location of the site on a USGS topographic map;

b) Figure showing the location of the site on a USDA soil survey map sheet;

c) Figure showing the location of the site on a NYSDEC freshwater wetlands map;

d) NYTM coordinates of a point at the center of the filled area determined using a global positioning satellite (GPS) receiver;

e) Site plan showing the limits of the filled area in relation to property boundaries, buildings, roads, water bodies and other site features (minimum scale 1 in. = 100 ft);

f) Narrative describing the type of waste disposed of, the source of the waste and the time period over which the site was operated;

g) Estimate of the horizontal dimensions of the filled area, the average thickness of the fill material and the total volume of fill material (show calculations); and

h) Description of the environmental setting including adjacent land uses, approximate distance to nearest occupied dwelling, approximate distance to nearest drinking water supply well. (If surrounding area is served exclusively by public water, provide documentation).

II. Waste/Fill Characterization

a) Test Pits

1. Where possible, pits should fully penetrate the thickness of the waste mass.

2. Test pits should be uniformly spaced throughout the filled area. The number of test pits required may be determined as follows:

Size of Filled Area	Maximum spacing between pits	Minimum number of pits
Up to 5,000 square feet	50 ft	1
5,000 to 50,000 square feet	100 ft	1 per 10,000 square ft or part thereof
Over 50,000 square feet	200 ft	5 per acre (for fractions of an acre round off to nearest whole number)

3. Show approximate locations of proposed test pits on the site plan. Adjust locations in the field as directed by DEC staff.

4. Pits may be sloped or stepped to provide a shallow area to allow safe entry into the pit for the purpose of sample collection. As an alternative, samples can be collected from the bucket of the backhoe or excavator provided that measures are taken to accurately determine and record the sampling depth. Sampling procedures and criteria for entering test pits should must conform with applicable OSHA requirements.

5. Arrange spoils by depth interval along the side of the test pit to permit close examination, logging and sampling of the material.

6. Prepare logs for each test pit indicating type, size and abundance of waste fragments observed in the fill material, texture and color of fill matrix, depth and thickness of each discrete layer or horizon, depth at which groundwater is encountered and the depth at which undisturbed soil is encountered. Screen material excavated for volatile organic compounds using a photoionization detector (PID), flame ionization detector (FID) or other suitable method.

7. Document fill appearance for each test pit using representative color photos of the test pit side walls and/or material excavated;

b) Soil Borings - May be required where the fill thickness exceeds 20 ft.

c) Waste/Fill Sampling:

1. Collect one or more representative samples from each test pit. Each sample should be a composite taken from areas which show relatively high waste content, dark color, high PID or FID readings, or other signs of potential contamination;

2. Each sample should be a composite of 2 to 4 areas within the test pit or excavated material spoils;

3. The number of samples required is based on the estimated volume of fill material as indicated below but should not be less than 1 per required test pit:

Estimated Volume of Fill	Number of samples required
Up to 1,000 CY	3
1,000 - 10,000 CY	3 for the first 1,000 CY plus 1 for every additional 1,000 CY or part thereof
10,000 - 100,000 CY	12 for the first 10,000 plus 1 per each additional 10,000 CY or part thereof
100,000 CY or greater	21 for first 100,000 plus 1 per additional 100,000 CY or part thereof

4. Composite samples should be thoroughly mixed prior to dividing into split samples for replicate analysis or into subsamples for application of different analytical methods. Divide samples by "cone and quarter" method or another method acceptable to the Department.

d) Chemical Analysis of Samples - All samples should be analyzed for the following parameters:

1. Volatile organic compounds (EPA 8260B);
2. Semi-volatile organic compounds (EPA 8270C);
3. Pesticides (EPA 8081A);
4. PCBs (EPA 8082); and
5. Heavy metals including arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc (EPA 6010B).

e) Waste Composition Analysis - Required in cases where the fill material includes processed or unrecognizable C&D debris . Use DEC/Region 3 SOP or approved alternative method.

f) Extract Analysis - Required for samples with contaminant concentrations exceeding applicable groundwater quality based levels of concern. The extract used must be appropriate for the

parameter(s) of concern. The EPA's Synthetic Precipitation Leaching Procedure (SPLP) extract is normally used. (TCLP is generally not used unless required for the purpose of a hazardous waste determination.)

g) Detection Limits and Applicable Levels of Concern - The plan should specify the levels of concern to which results of analysis will be compared. Detection limits must be low enough to determine whether contaminant concentrations exceed applicable levels of concern or, where that is not possible, the practical quantitation limit (PQL) identified by the lab for undetected values must be no higher than the contract required quantitation limit (CRQL) listed in the Department's Analytical Services Protocol (ASP). Unless otherwise approved by the Department, levels of concern for contaminants measured in the solid matrix will be those listed in Table 375-6.8(a) entitled "Unrestricted Use Soil Cleanup Objectives" which is found in the Department's Part 375 Brownfield Cleanup Program Regulations, and for liquid matrix (SPLP extract) shall be those listed in the Department's Technical and Operational Guidance Series (TOGS) 1.1.1, entitled *Ambient Water Quality Standards and Guidance Values and Ground Water Effluent Limitations*. Both documents are available on the Department's website at http://www.dec.ny.gov.

h) Landfill Gas Investigation - Required where test pits indicate substantial amounts of buried organic wastes or gypsum wastes, where odors characteristic of decomposition of organic wastes or hydrogen sulfide are observed, or where iron sulfide coatings are observed on soil and/or waste particles.

e) Site Background - In some cases, it will be necessary to collect samples of undisturbed "natural" soil from areas of the site or site vicinity where fill material has not been placed and where sources of potential contamination other than atmospheric deposition are not present. Parameter concentrations obtained from analysis of these samples may be used with Department approval as alternatives to the levels of concern provided in Part 375.

Background samples must be collected with Department oversight. The number of background samples required will depend on the observed variability and there must be a statistically valid basis for comparison of contaminant levels in the fill material with site background.

III. Remedial Measures

Based on the results of the site investigation, a Site Remediation Plan should be developed which may include any or all of the following elements, where appropriate:

1. Separation Layer - A layer of uncontaminated soil and/or rock which covers fill/waste material containing contaminants in excess of applicable human health based levels of concern. The required thickness will depend upon the environmental setting and anticipated use of the site. With Department approval, portions of this layer may be replaced by pavement and/or building foundations.

2. Gas Venting/Control Measures - Required where site investigation indicates potential for generation of explosive landfill gases. The adequacy of gas venting/control measures proposed must be certified by a licensed professional engineer.

3. Hydraulic Barrier Layer - Low permeability barrier to prevent infiltration of precipitation or surface water into fill material with contaminant concentrations exceeding groundwater quality based levels of concern. This may be a layer of low permeability soil or it may be asphalt pavement or some other low permeability surface as approved by the Department.

4. Soil Erosion Controls - Erosion of the separation layer or barrier layer must be prevented by establishment and maintenance of an adequate vegetative cover or by other means acceptable to the Department.

5. Groundwater Monitoring Plan - In cases where fill/waste testing indicates a potential for contravention of groundwater quality standards and where potential groundwater quality impacts will not be addressed by the proposed remedial measures, a plan for groundwater quality monitoring will be required.

6. Property Deed Notification - The Remedial plan must include a provision for modification of the property deed to include a notification regarding the presence of fill material consisting of regulated solid waste on the property. Information provided in the deed notification must include the nature of the waste material, the location of the waste material, the nature of remedial measures and the requirements for maintenance of these remedial measures. Reference must be made to the Order on Consent, the approved Site Investigation Plan and the approved Site Remediation Plan. Copies of these documents must be filed with the County clerk along with the property deed and deed notification.

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7. Engineer's Certification - The Site Remediation Plan must include all data collected for the site investigation together with plans and specifications for proposed remedial measures. The plan must also include a professional engineer's certification that based on the data collected the remedial measures proposed will be protective of public health and safety and groundwater quality. The PE must also certify that all investigative and remedial work has been carried out in accordance with the requirements in the Order on Consent (this outline) and the approved site investigation and remedial work plans. Any deviations from the approved plans must be identified as part of the certification.

APPENDIX C - QUALIFICATIONS

The following procedure is used by Department staff in the Region 3 Office for examination of construction and demolition (C&D) debris which is pulverized and/or commingled with soil such that the nature and amount of waste material present cannot be readily determined by direct visual observation of the material. This procedure can be used to evaluate any soil or soil-like material when it is suspected that pulverized C&D debris may be present. The method includes a determination of the overall particle size distribution with respect to three size fractions: > 6 mm, 2-6 mm and < 2 mm. In addition, a quantitative determination is made of the waste types present and their weight percentages within the 2-6 mm fraction.

This method is provided as guidance only. Users must exercise their own professional judgment in determining whether this method will provide the type and quality of information needed for a particular situation. When doing work for review by the Department in connection with a permit application or consent order, written concurrence to use this or any other test method should be obtained in writing from the Department in advance of doing the work.

The procedure described below is based on standard methods traditionally employed in soil testing laboratories with the following exceptions:

1. In soil testing labs, it is customary to break soil aggregates by grinding or crushing the air-dry material prior to sieving. In this case, large recognizable soil aggregates can be crushed manually but samples should not be subjected to extensive grinding because of the desire to preserve relatively soft materials such as gypsum wallboard and to avoid altering the size distribution of waste fragments which is indicative of the degree of C&D debris processing.

2. For this method, samples generally do not need to be treated chemically to destroy cementing agents such as soil organic matter or easily reducible iron compounds as would generally be the case for analysis of natural soils or size fractions smaller than 2 millimeters. In addition, this method avoids the use of chemical dispersants such as sodium hexametaphosphate to break down soil aggregates prior to or during wet sieving.

The following equipment is needed for this procedure: drying oven, nest of standard sieves (6-mm, 2-mm, cover and pan), 5-gallon plastic bucket, analytical balance (minimum 0.1 gram accuracy), 0.1 N hydrochloric acid, magnet, binocular microscope and forceps.

Step One - Sample Collection: A soil or C&D debris sample of approximately one kilogram is collected and placed in a heavy plastic or cloth bag for transport to the laboratory. Samples may be composites or grabs taken from excavation spoils or directly from the sidewall of a test pit. If surface samples are collected, areas subject to erosion by water such as erosional gullies should be avoided since these areas may not be representative of the soil or fill material as a whole. As a practical matter, samples will not include the entire size range of particles when individual particles greater than one or two inches in size are present.

Step Two - Sample Preparation: As soon as samples are brought back from the field they should be spread out on a sheet of plastic or heavy paper and allowed to air dry. If samples must be stored in a sealed container for any period of time prior to air-drying, it is recommended that they be refrigerated to prevent biological activity such as the growth of molds on organic components of the sample. Air dry samples are then partitioned using the "cone and quarter" method described by Jackson (1958) and ASTM (1998) to produce a representative subsample of the desired size for analysis. In general, a sample size of about ½ kilogram should be adequate. The remainder of the sample should be returned to the sample bag for storage and future reference. The sample to be analyzed is oven-dried at 100 degrees centigrade to eliminate free moisture and facilitate dry-sieving.

Step Three - Dry Sieving: The oven-dry sample is placed in a nest of standard soil testing sieves consisting of a pan, a 2-mm sieve, a 6-mm sieve and a cover and is shaken vigorously for one minute. The preliminary weight of material retained in each sieve and the preliminary weight of the material passing through the 2 mm sieve are measured and recorded. The < 2-mm fraction is placed in a suitable container for storage, if desired, or is discarded.

Step Three - Wet Sieving: The material retained in the 6-mm sieve is washed using clean water to break down any aggregates remaining after dry-sieving and to remove coatings of fine particles from the individual grains. Wet sieving is carried out using a stream of moderate force and the 2-mm sieve is left in place below the 6-mm sieve to catch and retain any 2-6 mm particles which are washed through the 6-mm sieve. The 6-mm sieve is then removed and set aside and the material in the 2-mm sieve is washed to remove fine particles and break down any remaining aggregates. Material washed through the 2-mm sieve is collected in a large clean container such as a 5-gallon plastic bucket. After wet sieving, material retained in the 6-mm and 2-mm is oven dried at 105 degrees centigrade and weighed.

Step Four – Correcting Weights for Particle Size Distribution: The final weights of the > 6 mm fraction and the 2-6 mm fractions are the oven dry weights after wet sieving. The preliminary weight of the < 2 mm fraction which is determined in step three must be corrected by adding the weight of fine particle aggregates and coatings which are dispersed and removed from the > 6 mm and 2-6 mm fractions during wet sieving. Two alternatives are available for this correction. The first alternative is to decant the rinse water in the 5 gallon bucket used during wet sieving, transfer the accumulated solids into an evaporating dish, oven dry and weigh. The second alternative is to calculate the weight of this material by subtracting the final weights of the > 6 mm and 2-6 mm fractions determined after wet sieving from the preliminary weights determined after dry sieving in step three. The final weight of the < 2 mm fraction is determined by adding the weight(s) measured or calculated in this step to the preliminary weight measured in step three.

Step Four - Visual Examination of the > 6 mm Fraction: Washed and dried material retained in the 6 mm sieve is large enough to be readily identified by visual examination now that it has been separated from the finer material. The types of waste material can be recorded and rough estimates can be made of the approximate amounts of each type. (A quantitative analysis cannot be made using this fraction because the size fraction does not represent the full range of particle sizes which may be present in the field due to practical limits on the maximum size of particles which can be included in the sample.)

Step Five - Quantitative determination of waste composition of the 2-6 mm fraction: For the quantitative determination of waste composition, the 2-6 mm fraction provides results which are considered to be representative of the material as a whole because, when C&D debris is processed by crushing and screening, an abundance of particles within this size range is normally produced. This fraction provides grains which are large enough to be readily identified without magnification or with low power magnification and the number of individual grains present is generally large enough to yield statistically valid results. Generally, a sample size of 50 to150 grams works well. (A 100 gram sample should contain more than 1000 individual grains assuming an average particle size of 4 mm equivalent spherical diameter and an average particle density of 2.5 g/cc.) If less than 50 grams of material is retained in the 2 mm sieve, it will be necessary to increase the initial sample size prior to sieving. Where more than 150 grams of sample are retained in the 2 mm sieve, the sample can be partitioned by cone and quartering to produce a more manageable sample size for this step of the procedure.

The sample, or a representative subsample, is sorted into waste categories which typically include natural rock, concrete, brick, asphalt, glass, wood fragments, plant debris (e.g., roots, leaf fragments, etc.), coal ash and slag, coal, gypsum, metal and other miscellaneous waste types. The weight of each component is determined using an

analytical balance and is expressed on a weight percentage basis.

Natural rock fragments are readily identified by persons with training in geology and a knowledge of lithology of the source area. A magnet can be used to separate out metals and other magnetic particles. Dilute (0.1 normal) hydrochloric acid can be used to aid in identification of concrete fragments provided that knowledge of source area geology is adequate to avoid misidentification of natural carbonate cemented sedimentary rocks. Application of heat is useful in identification of asphalt particles. Coal ash is identified by its characteristic vesicular structure or trapped gas bubbles and coal boiler slag is identified by its black color, smooth glassy texture and conchoidal fracture (Hatt and Rimmer 1989). A special note regarding identification of gypsum-bearing wastes is provided below.

In general the most efficient way to separate waste types is to look at groups of 25 to 50 grains under the microscope and pick out recognizable grains of each waste type. When recognizable waste materials have been removed, natural rock, which is usually the most abundant particle category, will be left. If there is any doubt regarding the nature of an individual particle, it should be left with the natural rock to ensure a conservative determination is made which does not overestimate the content of waste materials in the sample.

Figures illustrating the appearance of the most common waste types and a sample waste composition analysis worksheet are attached.

NOTE ON DETERMINING THE PRESENCE OF GYPSUM : Due to its potential for biochemical reduction in the soil environment and the associated hydrogen sulfide odor problems which may occur, it is important to determine whether gypsum wallboard or other gypsum-bearing wastes are present in the sample. Gypsum is extremely soft compared to other C&D debris components and may not be apparent in the 2-6 mm fraction even though substantial amounts could be present in the smaller size fractions. For this reason, where the potential presence of gypsum is a concern, it may be advisable to supplement the above procedure by performing a screening test for gypsum as described in Kunze and Dixon (1986). To determine the presence of gypsum, an extract is prepared using 10 grams of the < 2 mm fraction shaken in 200 ml of distilled water at 15 minute intervals for one hour. The extract is filtered and the filtrate is mixed with an equal volume of acetone. Formation of a gel-like precipitate indicates the presence of gypsum in the sample.

References:

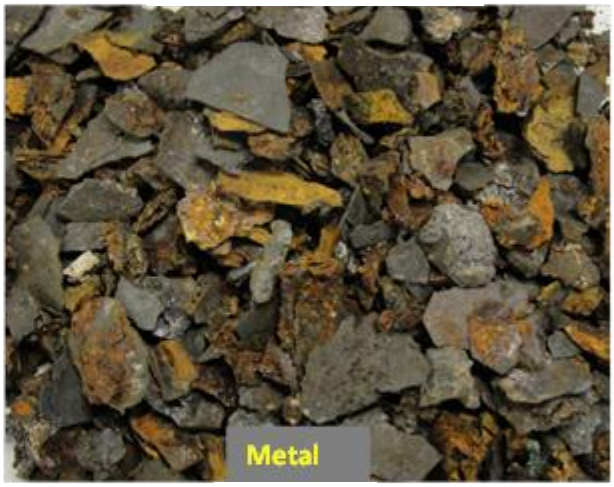
ASTM (1998) ASTM Test Method C 702-98: Standard Practice for Reducing Samples of Aggregate to Testing Size. American Society for Testing and Materials. Philadelphia . PA

Hatt, R.M. and S. M. Rimmer (1989) Classification and sampling of deposits from coal-fired boilers. Journal of Coal Quality. Vol 8. No. 2: 40-44

Jackson, M.L. (1958) Soil Chemical Analysis Prentice Hall, Inc. Englewood Cliffs, NJ 498 pp.

Kunze, G.W. and J.B. Dixon (1986) Pre-treatment for mineralogical analysis; in Methods of Soil Analysis, Part I. Physical and Mineralogical Methods - Agronomy Monograph No. 9 (2nd Edition), American Society of Agronomy - Soil Science Society of America, Madison, WI

C&D Debris Waste Composition Analysis – Particles Separated by Waste Type



NYSDEC/Region 3 Office/Solid Waste Program
C&D DEBRIS SAMPLE EVALUATION WORKSHEET

Site or Facility Name/Sample ID/Depth:

Sample Collected by/Date &Time Collected:

Particle Size Distribution (all weights in grams)

	Size Fraction:	Weight	% Total Weight
a	Total Oven Dry Sample		
b	> 6 mm Fraction (preliminary weight after initial dry		
c	2-6 mm Fraction (preliminary weight after initial dry		
d	< 2 mm Fraction (preliminary weight after initial dry		
e	> 6 mm Fraction (final weight after wet sieving)		
f	2-6 mm Fraction (final weight after wet sieving)		
g	< 2 mm material recovered from wash bucket		
h	< 2 mm Fraction Corrected (d + g) or (d + [b-e] + [c-f])		
i	Total recovered (e + f + h)		
j	Sieve Loss Corrrected (a - i):		

Waste Composition Analysis of 2-6 mm Fraction:

Component:	Weight	% Total Weight
Total		
Natural Rock		
Brick + Concrete + Glass		
Asphalt		
Coal/Slag/Ash		
Other - Specify_____:		
Total Recovered		
Sieve Loss		

Notes:
1
2

Analyzed by: Checked by: Date Completed:

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