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DATE: July 19, 2013

TO: Jeff Catanzarita, EPA/ERT Work Assignment Manager

THROUGH: Rick Leuser, SERAS Deputy Program Manager

FROM: Jean Bolduc, SERAS Task Leader

SUBJECT: SUPPLEMENTAL REMEDIAL INVESTIGATION TECHNICAL MEMORANDUM
NEW CASSEL/HICKSVILLE GROUND WATER CONTAMINATION SITE
NASSAU COUNTY, NEW YORK
TECHNICAL MEMORANDUM SERAS 0-144

INTRODUCTION

In December 2010, the New York State Department of Environmental Conservation (NYSDEC) requested that the U.S. Environmental Protection Agency (EPA) nominate areas of groundwater contamination in North Hempstead, Hempstead and Oyster Bay to the National Priorities List (NPL). EPA's Hazard Ranking System (HRS) sampling results confirmed the presence of volatile organic compounds (VOCs) in raw (pre-treated) water above the Maximum Contaminant Level (MCL) in four Town of Hempstead wells (Bowling Green 1 and 2, Roosevelt Field 10, and Levittown 2A), six Hicksville wells (4-2, 5-2, 5-3, 8-1, 8-3, and 9-3) and Westbury Water District Well 11. The New Cassel/Hicksville Ground Water Contamination (NCHGW) Superfund Site as outlined in Figure 1, from the March 2011HRS package, is an area of widespread groundwater contamination located within the Towns of North Hempstead, Hempstead and Oyster Bay, Nassau County, New York (NY). The NCHGW Site was proposed to the NPL in March 2011 and finalized onto the NPL in September 2011.

Previous NYSDEC investigations have identified groundwater contamination associated with the New Cassel Industrial Area (NCIA), former Sylvania, General Instruments and 123 Post Avenue sites in central Nassau County, New York (Figure 1). These sites have been overseen by the NYSDEC, have documented use and release of VOCs, and are located upgradient of a number of public supply wells (PSWs) found to have VOCs above MCLs during EPA's HRS sampling.

Within the Hamlet of New Cassel, in the Town of North Hempstead, three plumes containing primarily dissolved tetrachloroethylene (PCE) and/or trichloroethylene (TCE) exit the NCIA. Two PSWs, Bowling Green Wells 1 and 2, are located approximately 1,000 feet downgradient of the NCIA in the Hamlet of Salisbury, Town of Hempstead. EPA's HRS sampling found the raw water from these PSWs to be contaminated with PCE (up to 69 micrograms per liter [µg/L]) and TCE (up to 110 µg/L). Water from the Bowling Green Wells 1 and 2 is treated for VOCs to achieve drinking water standards prior to distribution to the public. The Bowling Green Water District routinely conducts monitoring for VOC contamination.

In the Hamlet of Hicksville, within the town of Oyster Bay, raw water from PSWs 5-2 and 5-3, located approximately one mile downgradient of General Instruments and the former Sylvania sites was found to be contaminated with PCE (up to 41 µg/L) and TCE (up to 59 µg/L) during EPA HRS sampling. Water from these PSWs is treated for VOCs to achieve drinking water standards prior to distribution to the public.

During EPA's HRS sampling, Westbury Well 11, in the Village of Westbury, located in town of North Hempstead, was found to contain 0.59 ug/L of cis-1,2 dichloroethylene (cis 1,2-DCE), a common breakdown product of PCE and TCE, in the raw water. 123 Post Avenue is a site located upgradient of Westbury Well 11.

While this memorandum focuses on the aforementioned sites, there may be other potential sources within the vicinity of the NCHGW Site, which may have suspected or documented VOC releases and/or use (Figure 1). At the request of EPA's New York Remediation Branch, the Emergency Response Team (ERT) compiled the information within this memorandum to document past site remedial activities, current site conditions, and to provide recommendations for future work associated with the aforementioned sites and any potential releases associated with the NCHGW Site.

OBJECTIVE

Personnel from the Scientific, Engineering, Response, and Analytical Services (SERAS) contract were tasked by the United States EPA Environmental Response Team (ERT) Work Assignment Manager (WAM) to review and summarize historical data and generate a Scope of Work (SOW) that comprehensively outlines past and recommended future activities to facilitate remediation of contaminated groundwater from groundwater downgradient of the NCIA Off-property, General Instrument, former Sylvania, and 123 Post Avenue sites in association with the NCHGW Site.

ASSUMPTIONS

As NYSDEC has overseen a considerable amount of work at the NCIA Off-Property Groundwater Area, former Sylvania, General Instruments and 123 Post Avenue sites, the EPA has chosen to conduct this review on their background for a more complete understanding of the NCHGW Site. The sites discussed within this memorandum may have or are known to have contributed to the groundwater contamination at the NCHGW Site. For the NCIA Off-Property Groundwater Area, all known source areas within the NCIA are currently managed under NYSDEC orders and were therefore not considered within the scope of work for this technical memorandum.

SITE GEOLOGY

Geology and Hydrogeology

Four regional geologic units of the Atlantic Coastal Plain physiographic province underlie the NCHGW site. These units from youngest to oldest are (USGS, 1972a):

- Glacial deposits comprised of the Ronkonoma and/or Harbor Hill outwash (Upper Glacial);
- Magothy Formation and Matawan Group (Magothy);
- Clay member of the Raritan Formation; and
- Lloyd Sand member of the Raritan Formation (Lloyd).

Site investigations have encountered only two of these units: Upper Glacial and Magothy. Upper Glacial deposits (estimated to be 40- to 80-feet thick) consist of coarse-grained sands and gravels at the site. A distinct contact between the Upper Glacial and Magothy units has not been observed in the area. The underlying Magothy sediments (estimated to be approximately 600-feet thick) are characterized by sand and silty sand with discontinuous clay and silt layers. Sediments tend to fine downward in the Magothy Formation, except within the basal portion where coarse-grained sands and gravels are prevalent (USGS, 1972b).

Unconfined groundwater is generally found at the NCHGW site between 40 and 65 feet below ground surface (bgs) near the estimated boundary between the Upper Glacial and Magothy aquifers (LMS, 2000; EEI, 2010; and EPA, 2011). Horizontal hydraulic conductivities reported for the NCIA Off-property Groundwater Area ranged from 42 feet/day to 291 feet/day based on slug testing results (LMS, 2000). The lower hydraulic conductivities are consistent with the average value published for the upper Magothy Aquifer and the higher hydraulic conductivities are consistent with the average value published for the Upper Glacial Aquifer (USGS, 1972a). Vertical hydraulic conductivities of 1.3 and 3.1 feet/day, consistent with average published values (USGS, 1972a), were obtained for the Magothy aquifer during aquifer testing in the NCIA Off-property Groundwater Area (HDR, 2010). Storage values (0.003 and 0.006), also derived for the Magothy Aquifer during the aquifer testing in the NCIA Off-property Groundwater Area, were at the low end of the published range (0.0006 to 0.10) (USGS, 1983).

A generally east-west trending regional groundwater divide is located near the center of Long Island (USGS, 1972a). Groundwater flows northward or southward on either side of the divide. Local groundwater flow in the Upper Glacial and upper Magothy aquifers is to the south-southwest at the site, within depths (Table 2) above the production interval (463 to 674 feet bgs) of the PSWs in the vicinity (Figure 5). Local groundwater flow in the lower Magothy aquifer within the production interval is likely toward the PSWs when they are actively pumping. The Upper Glacial and Magothy aquifers are hydraulically connected beneath the site (HDR, 2010), consistent with regional characteristics (USGS, 1983). The vertical hydraulic gradient reported between shallow and deep wells at the site averages 0.003 feet/foot (HDR, 2010 and EEI, 2010).

SITE BACKGROUND

NCIA Off-Property Ground Water Area

The NCIA covers approximately 170 acres and is bounded by the Long Island Railroad to the north, Frost Street to the east, Old Country Road to the south, and Grand Boulevard to the southwest. The NCIA was developed for industrial use beginning in the 1950s through the 1970s. It has been reported that on-property leach pools or dry wells in the NCIA were generally used for disposal of wastewater until sewers were installed in the mid-1980s. There are currently an estimated 200 industrial and commercial businesses currently with the NCIA.

To date, the NYSDEC has investigated and listed 17 individual facilities within the NCIA as Class 2 (i.e., NYSDEC Superfund sites where action is required). Five of the facilities within the NCIA have been removed from the NYSDEC Registry and one has been reclassified to a Class 4 Site. Records of Decision (ROD) have been issued for the remaining Class 2 sites within the NCIA and have had varying degrees of remedial activities conducted. The individual sites within the NCIA are under NYSDEC oversight and as discussed earlier, these sites are considered outside the scope of the technical memorandum.

Releases to the groundwater from facilities within the NCIA have been found to contribute to groundwater contamination south of Old Country Road and Grand Boulevard. NYSDEC's NCIA third operable unit (OU3), the geographical designation assigned by NYSDEC as the NCIA Off-property

Groundwater Area, will be discussed herein. This area contains mostly residential properties, some commercial properties, two schools, the Bowling Green well field, and Nassau County properties. Figure 1 depicts the boundaries of the NYSDEC OU3 NCIA Off-property.

NCIA Off-Property Groundwater Area RI/FS

A remedial investigation (RI) involving additional groundwater sampling was conducted in the NCIA Off-property Groundwater Area from 1999 to 2000. Four new monitoring wells (NRMW-1 through NRMW-4) and four Hydropunch® borings (GWHP-01 through GWHP-04) were installed. Three rounds of groundwater monitoring (which included upgradient wells N-10462 and N-10459 in two of the rounds) and one round of Hydropunch® sampling were performed during the RI. Analytical results were compared with historical data to identify the nature and extent of the contamination in the vicinity of the NCIA. The RI data was then used to develop a feasibility study (FS) that evaluated potential remedial alternatives for groundwater contamination in the NCIA Off-property Groundwater Area. Findings of the RI/FS are as follows:

- PCE, TCE, trichloroethane (TCA) and their breakdown products were identified as the primary contaminants of concern. Three NCIA Off-property plumes were identified (eastern, central, and western); however, only two of the plumes (eastern and central) were found in the deepest depth interval (125 to 200 feet) that was examined during the RI (LMS, 2000).

- The area of impacted groundwater in the NCIA Off-property Groundwater Area is similar when comparing historic data to the RI data. The contaminant levels in the RI and historic data set are similar in the four depth ranges (0 to 64 feet, 65 to 99 feet, 100 to 124 feet and 125 to 200 ft bgs) that were comparatively analyzed to evaluate the vertical component. Comparison was noted to be difficult in the NCIA Off-property western plume area as little data had historically been collected in this area.

- Pumping at the Bowling Green Wells produces a significant downward vertical gradient across silts and clays in the deeper portion of the aquifer that tends to draw contaminants downward (LMS, 2000).

- A human health exposure pathway analysis was conducted for the off-property groundwater contamination in the NCIA Off-property Groundwater Area (LMS, 2000).

- Source areas for the NCIA Off-property plumes were attributed to the Class 2 sites in the NCIA. No off-property upgradient sources for the groundwater contamination were identified based on the RI data (LMS, 2000). Groundwater samples collected from upgradient well N-10459 did not contain any PCE or TCE and groundwater samples collected from upgradient well N-10462 contained low concentrations of PCE (8J and 14 µg/L). The locations of N-10459 and N-10462, plus other nearby upgradient wells are shown on Figure 7. Construction details for the upgradient wells are summarized in Table 3.

  The FS identified and screened several remedial alternatives for the Upper Magothy aquifer between depths of 125 and 200 feet, including no further action; in-well vapor stripping; monitored natural attenuation; ex-situ extraction and treatment; and monitoring, assessment.

NCIA Off-property Groundwater Area ROD

NYSDEC's 2003 ROD for the NCIA Off-property Groundwater Area selected full plume remediation of upper and deep portion of the aquifer (to 225 ft bgs) with in-well vapor stripping/localized vapor treatment. Eleven remedial wells were proposed in the ROD as follows: 3 wells to 140 feet, 4 wells to 200 feet, and 4 wells to 225 feet (Figure 6). An element of the selected remedy was a contingency, where after pilot test data had been collected, the effectiveness of the in-well vapor stripping system would be evaluated and if for engineering or economic reasons, in-situ treatment should prove to be less practical, ex-situ extraction and treatment will be substituted without impairing the overall effectiveness of the treatment system. The contingency remedy was not included in the NYSDEC's alternative analysis in their 2000 FS.

Subsequently after the 2003 ROD, it was concluded based on the results of the pre-design investigation conducted in 2008 that heterogeneity (clay layers 5-feet thick or more as shown on Figure 6) and anisotropy (horizontal to vertical conductivity ratios exceeding 34,000) existed in the Upper Magothy aquifer within the proposed remedial area which would likely limit the effectiveness of groundwater circulation wells (D&B, 2009a). Therefore, NYSDEC utilized the contingency remedy and proceeded with the remedial technology of ex-situ extraction (commonly known as groundwater pump and treat [P&T]). NYSDEC has subsequently approved the final pre-design evaluation for P&T at the NCIA Off-property Groundwater Area. The Remedial Action Objectives (RAOs) of NYSDEC's selected remedy for the NCIA Off-property Groundwater Area are to contain and remediate the groundwater contamination such that groundwater exiting the NCIA Off-property Groundwater Area meets the NYSDEC Class GA Groundwater Quality and New York State drinking water standards.

NCIA Off-property Groundwater Area Pre-Remedial Design

NYSDEC conducted pre-remedial design activities from 2008 until 2011. During the completion of the 2011 pre-design investigation for the NCIA Off-property Groundwater Area, the NYSDEC requested that the EPA propose the NCHGW Site to the NPL. No further actions were taken by NYSDEC in the NCIA Off-property Groundwater Area after the pre-design investigation had been finalized and the NCHGW Site was finalized onto NPL in 2011

Three phases of pre-design were conducted to collect information to complete the remedial design for the NCIA Off-property Groundwater Area:

- 2008: Existing monitoring wells (MW-1 through MW-9), early warning wells (EW-1B, EW-1C, EW-2B, and EW-2C), and PSWs (Bowling Green Wells 1 and 2) were sampled. Seven temporary wells (TMW-1, TMW-2, TMW-4 through TMW-7, and TMW-9) and two Hydropunch® borings (TMW-3D and TMW-8D) were installed and sampled to depths of 285 and 500 feet, respectively (Figure 2). Six soil samples collected from boring TMW-3D (77-79 feet, 117-119 feet, 157-159 feet, 217-219 feet, 257-259 feet, and 282-284 feet) and five soil samples collected from boring TMW-8D (57-59 feet, 82-84 feet, 182-184 feet, 222-224 feet and 262-264 feet) were analyzed for particle size using American Society for Testing and Materials (ASTM) D422. Groundwater samples were analyzed for VOCs, ferrous iron, manganese, magnesium, calcium, total organic carbon, alkalinity, chlorides, nitrates, sulfates, carbon dioxide, and methane. Temporary wells and Hydropunch® borings were gamma logged to identify fine-grained (clay or silt) deposits. Soil samples collected from the Hydropunch® borings were analyzed for particle size distribution and vertical hydraulic conductivity. VOCs detected in groundwater samples included PCE, TCE, 1,1,1-TCA and their breakdown products. Total VOCs ranged up to 11,734 µg/L (185-foot sample from TMW-7). Depths to which elevated concentrations of VOCs were detected ranged up to 412 feet and exceeded the maximum depths

(140, 200, and 225 feet) of the treatment wells proposed in the ROD. It was concluded from the gamma logging results that one or more low permeability layers five-feet thick or more occur shallower than 285 feet beneath NCIA Off-property Groundwater Area (Figure 6). Vertical hydraulic conductivity tests (173 feet/day for the Upper Glacial aquifer and 0.1 foot/day for the Magothy aquifer) indicated the Magothy aquifer is highly anisotropic and that groundwater circulation wells with localized vapor treatment would likely not be an effective remedial technology for remaining VOCs from the Upper Magothy aquifer.

- 2009 to 2010: Analytical results for groundwater obtained since the initial RI in 2000 were evaluated for NCIA Off-property Groundwater Area. Based on review of the analytical results, three plumes (western, central, and eastern) were identified in NCIA Off-property Groundwater Area. The NCIA Off-property plumes are characterized by PCE and TCE and appear to be orientated in a south-southwesterly direction.

  Water levels in five monitoring wells (MW-1, MW-4, MW-9, FSMW-14B, and FSMW-14C) were recorded at 15-minute intervals between December 3, 2009 and January 5, 2010. Water level fluctuations observed in the monitoring wells were influenced by pumping of the Bowling Green wells. Drawdown induced by the pumping ranged from 0.1 foot at well MW-4 (depth of 200 feet and distance of 1,175 feet) to 0.5 foot at well MW-9 (depth of 315 feet and distance of 1,075 feet).

- 2010 to 2011: A 72-hour pumping test was performed at a constant rate of 100 gallons per minute (gpm) on well EX-1 (screened from 185 to 205 feet bgs). The pumping test data interpretation was compromised by interference from the Bowling Green wells and fluctuations in the discharge rate at the test well. Water level data indicated that shallow (130 to 140 feet bgs), intermediate (187 to 225 feet bgs) and deep (231 to 255 feet bgs) groundwater flow in the Upper Magothy aquifer was to the south or south-southwest. Significant changes were not observed in the shallow and deep groundwater flow during the pumping test; however, a cone of depression was apparent in the intermediate interval from which groundwater was being extracted during the pumping test. A pilot test was conducted, in conjunction with the pumping test, to evaluate three groundwater treatment scenarios: air stripping, granular activated carbon (GAC), and air stripping combined with GAC. Pilot test results indicate that aboveground use of air stripping, GAC, and air stripping with GAC are effective treatment technologies for the extracted groundwater.

  Eleven monitoring wells (MW-10, MW-11S, MW-11D, MW-12 through MW-15, MW-16S, MW-16D, MW-17S, and MW-17D) and two extraction wells (EX-1 and EX-2) were installed. Fourteen existing monitoring wells, newly installed monitoring wells, and two extraction wells were sampled. The NCIA Off-property western, central, and eastern plumes were further delineated (Figures 8 and 9). The NCIA Off-property eastern plume is characterized by relatively higher concentrations of PCE relative to TCE while the NCIA Off-property western plume is comprised of greater concentrations of TCE compared to PCE. The NCIA Off-property central plume contains relatively little PCE and is characterized by relatively greater concentrations of TCA and 1,1-DCA compared to the NCIA Off-property eastern and western plumes. Data from the 72-hour aquifer pump test was also used to calculate aquifer characteristics, including anisotropic ratios, which were determined to be significantly lower (27 to 100) than the original estimate from the 2009 pre-design investigation. Calculated results for anisotropy were within the published ranges from several United States Geologic Survey (USGS) studies on Long Island.

Former Sylvania

The former Sylvania site was in operation from 1952 to 1967 for the research, development, and fabrication of nuclear elements under contracts with the Atomic Energy Commission. During the time of operations, former Sylvania utilized natural, enriched and depleted uranium (U) and also to a lesser extent utilized thorium (Th). In 1957, nuclear contract work for commercial and other government entities began primarily on the 70 Cantiague Rock Road property. VOCs consisting of primarily PCE and also nickel waste were generated by the manufacturing processes.

The site currently consists of properties 70, 100, and 140 Cantiague Rock Road, Hicksville, NY (Figure A-1, Appendix A). These parcels were occupied by Air Techniques, Inc., Magazine Distributors, Inc., and Gilbert Displays, respectively.

In April 1999, GTE Operations Support Incorporated (GTEOSI), which had acquired Sylvania Electric Products, entered into a Voluntary Agreement (VA) with the NYSDEC for investigation and remediation of soil and groundwater for unrestricted future use of the former Sylvania site. In January 2003, GTEOSI entered into a more inclusive Voluntary Cleanup Agreement (VCA) with the NYSDEC for the site. By 2007, under the Formerly Utilized Site Remedial Action Program (FUSRAP), a phased RI was initiated that is managed under the U.S. Army Corps of Engineers (USACE).

Former Sylvania RI Activities

Site investigations performed from 1987 to the present are summarized as follows:

- 1987: Thirty buried drums and contaminated soil were found on the 70 Property during construction of an addition to Building 4. Soil and drum samples collected by the Nassau County Department of Health (NCDOH) and NYSDEC indicated the presence of VOCs (primarily PCE and TCE), polychlorinated biphenyls (PCBs), and arsenic.

- 1991: An environmental assessment of the 140 Property was performed to identify problems that would restrict property use or financial liability for the current and future owners.

- 1992: A soil vapor survey (near boring B-1 where VOCs were detected after the drum removal), installation of four monitoring wells (MW-1 through MW-4), and groundwater sampling (four on-property wells and one off-property well on the General Instrument property) were included in an investigation to classify the site for no further action (Figure A-2, Appendix A). The highest VOC concentration (31.2 parts per million) was detected north of the former drum area suggesting an upgradient source (ERM, 1993). A supplemental investigation was also performed in 1992 involving the drilling of three soil borings and one monitoring well (MW-5) (Figure A-2, Appendix A).

- 1997: Ground penetrating radar (GPR) survey and an exterior radiation survey were conducted to identify potential sampling locations and to map radiation levels that may indicate the presence of radioactive residuals.

- 1999: An investigation was conducted to evaluate the nature and extent of residual radionuclides (uranium and thorium), metals (nickel), and VOCs (PCE and TCE) in the soil and groundwater. The investigation included a soil gas survey to 4 feet in general areas, 8 feet in suspected radioactive contaminant areas, and 16 feet in leach pool areas. Groundwater sampling involved five on-property monitoring wells, three off-property monitoring wells (W-24, W-24D, and W-25 at the Nassau County Department of Public Works [NCDPW] to the north on Figure 4), and five temporary well points (TW-01 through TW-05). Samples were analyzed for VOCs, SVOCs, metals and

radionuclides. Analytical results identified: isolated areas of above background radiation at each of the properties; isolated areas of above background metals on portions of the 100 and 140 Properties; and PCE and TCE in soil and groundwater at several locations on the 100 and 140 Properties.

- 2000: Analytical results of a supplemental investigation confirmed earlier findings from the 1999 investigation. This investigation included soil vapor surveys in the 70 and 100 Buildings (Figure A-1, Appendix A). The highest PCE and TCE concentrations in the exterior samples were detected at SB-170 (69.8 parts per million by volume [ppmv]) near the southeast corner of the 140 Building and SB-166 (14.1 ppmv) south of the 100 Building, respectively. The highest PCE and TCE concentrations in interior samples from the 140 Building were found in the southeast corner at SB-119 (272 ppmv) and SB-124 (9.7 ppmv), respectively. The highest PCE and TCE concentrations in interior samples from the 100 Building were detected in the northeast and central portions of the building at SB-142 (0.2 ppmv) and SB-124 (0.07 ppmv), respectively.

  - 2001 to 2003: A soil and groundwater investigation was performed to identify the vertical and horizontal extents of select contaminants and to delineate non-impacted areas for potential sheet pile placement. Seven monitoring wells were installed (MW-6 through MW-12) near the boundary of the site supplemented by 170 soil borings. PCE and lesser concentrations of TCE were detected in groundwater samples. The highest concentrations of PCE (up to 2,700 µg/L) were detected in wells MW-7 along the eastern boundary of the 100 Property and MW-10 along the southern boundary of the 70 Property. Radionuclides were not detected above background levels in groundwater samples.

    - Analytical results from monitoring conducted in August 2001 indicated PCE and to a lesser extent TCE were present in samples with the highest concentrations of PCE found in wells MW-5 (2,300 µg/L) and MW-7 (2,600 µg/L) located on the 100 and 70 Properties, respectively (Figure A-1, Appendix A). Nickel was detected in well MW-1 (0.2 milligrams per liter [mg/L]). Technetium-99 (Tc-99) was detected in wells MW-5 (52.1±10 picoCuries per liter [pCi/L]) and MW-7 (28.9 pCi/L). These detections were below the average Tc-99 value (900 pCi/L) which is assumed will yield the MCL of 4 millirem per year established by the EPA for beta emitters such as Tc-99.
    - In 2002, soil borings U-1 through U-147 were drilled and sampled in perimeter areas of potential excavations, potential sheet pile areas, and areas where vertical delineation was needed.
    - Based on the investigation results, the horizontal and vertical extents of nickel, radionuclides, and VOCs in the soil had been defined; however, in 2003, borings U-148 through U-174 were completed to further define the distribution of radionuclides and VOCs in potential mixed-waste areas. Wells MW-1, MW-2, MW-5, MW-6, and MW-7 were decommissioned in April 2003.

  - 2002 to 2004: A multi-phase RI was initiated to characterize the nature and extent of radionuclides, PCE, TCE, and nickel on the 70, 100, and 140 Properties as well as surrounding properties (NCDPW, General Instrument, Golf Course Driving Range [GCDR], Crown Lift, King Kullen, New York Blood Bank, and Waste Management). This investigation included two groundwater sampling events (October 2002 and March 2003) at the 12 on-property wells (MW-1 through MW-12) and groundwater sampling at 55 Waterloo Profiler® drive points (P-01 to P-18, P-20, P-23 to P-38, P-42 to P-47, P-49 to P-56, P-58, P-C to P-F, and P-H) between October 2002 and February 2004 (Figure A-3, Appendix A).

  - 2005: The groundwater investigation was continued with the on-property installation of additional profiling points (P-103, P-107, and P-108) (Figure A-3, Appendix A). Groundwater

samples were analyzed for radionuclides, VOCs, nickel, ferrous iron, total iron, ammonia, chloride, and total chlorine.

- 2005: A soil investigation was conducted at Survey Units (SU) SU-03, SU-04, and SU-05 in the eastern, western, and central portions, respectively, of the 100 Building. Sixty-four borings were advanced to 30 feet bgs (Figure A-4, Appendix A). Samples collected from the borings were analyzed for radionuclides, PCE, TCE, nickel (Ni), and beryllium (Be).
    - At SU-03: Thorium-232 (Th-232) and uranium-238 (U-238) concentrations exceeded site cleanup levels in the four-foot fill sample from boring 010. U-238 exceeded the site cleanup level in the 2-foot fill sample from boring 019. PCE (5.1J milligrams per kilogram [mg/kg]) exceeded the site cleanup level in the 4-foot sample from boring 013. Ni concentrations were below the site cleanup level. The concentrations of Be exceeded the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) #4046 value in several soil samples but were within the reported range for soils in New York State.
    - At SU-04: U-238 exceeded the site cleanup level in the 6-foot fill sample from boring 020. VOCs and Ni were below the site cleanup levels in all soil samples. The concentrations of Be exceeded the TAGM value in several soil samples but were within the reported range for soils in New York State.
    - At SU-05: Radionuclides, VOCs, and Ni were below the site cleanup levels in all soil samples. The concentrations of Be exceeded the TAGM value in several soil samples but were within the reported range for soils in New York State.

Other investigations performed prior to, concurrent with, and subsequent to the systematic investigation included:

- A focused assessment at the 100 Building prior to the systematic investigation with a total of 19 soil borings at suspected floor drains, catch basins, and Historic Leach Pools (LPHs) LPH-01, LPH-03 through LPH-06 located either partially or entirely beneath the building, and outside the historic footprint of the building (Figures A-5 and A-6, Appendix A). Eleven borings had Th-232 and U-238 concentrations exceeding cleanup levels, three borings had PCE or TCE concentrations exceeding cleanup levels, and two borings had Ni concentrations exceeding cleanup levels. LPH-03 and LPH-04 had U-238 and/or PCE concentrations exceeding the site cleanup levels between depths of 6 and 22 feet.
- An investigation of contaminants remaining in soil following remediation of Cell 9 located south of Building 100. Fifteen soil borings (located in subcells D16, C17 to E17, and C18 to H18) were advanced inside the 100 Building during the investigation (Figure A-7, Appendix A). Five of the soil borings had contaminants (primarily U-238) above site cleanup levels between depths of 7 and 47 feet.
- Six borings (located in subcells F13, G13, F14, and G14) were advanced near soil boring 009 to further delineate PCE and TCE concentrations at SU-04 in the 100 Building (Figure A-4, Appendix A). TCE (1.202 mg/kg) exceeded the site cleanup level in the near-surface fill from boring DL01 in subcell G13.
- Eight additional borings (located in subcells I-19, J19, K17, L16, two in L17, M19, and N12) were advanced at the request of NYSDEC to supplement the systematic investigation of the 100 Building (Figure A-4, Appendix A). Seven of the borings had PCE concentrations above the site cleanup level.
- A 2,500 gallon underground storage tank (UST) (labeled as UST-H) was discovered approximately 5.5 feet beneath the concrete slab of the 100 Building. The UST contained approximately 150 gallons of liquid and 250 gallons of sludge with elevated concentrations of

PCE, TCE, cis-1,2-DCE, uranium, various metals, and a PCB (Arochlor 1260). An emulsifier was added to the UST to solidify its contents, abandon the UST in place, and protect the integrity of the building.

- 2005: A soil investigation was completed west of the 100 and 140 Buildings (SU-01) and south of the 100 Building (SU-02). Forty-nine soil borings were advanced to 30 feet bgs (Figure A-8, Appendix A). Samples collected from the soil borings were analyzed for radionuclides, PCE, TCE, Ni, and Be. Radionuclides, PCE, TCE, and Ni concentrations were below site cleanup levels in all soil samples. Be concentrations exceeded the TAGM value in several soil samples but were within the reported range for soils in New York State.

  An assessment of LPHs was conducted in conjunction with the systematic investigation of SU-01 and SU-02. LPH-16 and LPH-17 fell within the boundaries of SU-01. LPH-12 through LPH-15 fell within the boundaries of SU-02. The results of this assessment did not indicate any contaminants above site cleanup levels in samples collected from these LPHs.

- 2005: Another soil investigation was performed at SU-06 and SU-07 beneath the eastern and western portions of the 140 Building. Thirty-seven soil borings were advanced to 30 feet bgs (Figure A-9, Appendix A). Samples collected from the soil borings were analyzed for radionuclides, PCE, TCE, Ni, and Be. Radionuclides, PCE, TCE, and Ni concentrations were below site cleanup levels in all samples. Be concentrations exceeded the TAGM value in several soil samples but were within the reported range for soils in New York State.

  An assessment of LPHs was conducted in conjunction with the systematic investigation of Building 140 (Figure A-10, Appendix A). LPH-20 and LPH-21 fell within the boundaries of SU-06. LPH-34 fell within the boundaries of SU-07. The near-surface soil sample from boring 04 in LPH-20 contained a Ni concentration exceeding the site cleanup level. Soil boring 01 in LPH-21 had concentrations of Th-232, U-234, U-238, TCE, and PCE exceeding site cleanup levels from 16 to 19 feet bgs. The 10-foot soil sample from boring 05 in LPH-21 had a U-238 concentration exceeding the site cleanup level. Soil samples from LPH-34 did not have any contaminant concentrations exceeding site cleanup levels.

- 2005: A systematic soil investigation and limited excavation were performed along a 5 by 500 foot strip north of the 140 Building. Twenty-four soil borings were advanced to a depth of 8 feet. Soil samples were analyzed for radionuclides, PCE, TCE, Ni, and Be. Analytical results from the systematic investigation indicated Ni and U-238 concentrations in the range of or slightly greater than the site cleanup levels in shallow soils at subcells M03, N03, and O03. A limited excavation of soil to a depth of five feet at these subcells was extended east into subcell P03. Approximately 207,900 pounds of soil and debris were excavated and properly disposed off site (URS and Envirocon, Inc., 2005d). Additional excavation was performed at subcell N03 based on verification sampling results for Ni. Supplemental verification samples from the final excavation met site cleanup goals (Figures A-11 and A-12, Appendix A).

- 2005: PCE contamination remaining below remedial excavation depths was investigated at Cells 3, 4, 12, 14 and the GCDR. Thirty-five borings were advanced to 64 feet bgs (Figure A-13, Appendix A). The samples were analyzed for radionuclides, PCE, TCE, Ni, and Be. Radionuclides and Ni concentrations were below the site cleanup levels in all the samples. PCE and TCE concentrations exceeding site cleanup levels were detected in samples from the northern half of Cell 4, central portion of Cell 14, and along the western boundary of the GCDR. Be concentrations exceeded the TAGM value in several soil samples but were within the reported range for soils in New York State. An additional 14 borings were advanced on the GCDR (Figure A-14, Appendix A). Radionuclides,

PCE, TCE, and Ni concentrations were below site cleanup levels in samples from those borings. Be concentrations were detected exceeding the TAGM value in several soil samples but were within the reported range for soils in New York State.

- 2005: A soil investigation was conducted to delineate remaining soil contamination following remediation at Cell 9. Soil samples collected from the excavation surfaces contained U-234 and U-238 in subcell E20 and Ni in subcell G20 exceeding site cleanup levels. Post backfill soil sample results indicated Ni concentrations exceeded site cleanup levels in subcell E20. Therefore, 64 soil borings were advanced to a depth of 64 feet for additional delineation in Cells 8 and 9 (Figure A-15, Appendix A). Samples collected from the soil borings were analyzed for radionuclides, PCE, TCE, Ni, and Be. Radionuclides, PCE, and TCE concentrations did not exceed site cleanup levels in the soil samples. Ni exceeded the site cleanup level in soil samples from several borings to a depth of 64 feet. Be was detected at a concentration exceeding the TAGM value in several soil samples but was within the reported range for soils in New York State.

- 2005: NYSDEC oversaw soil vapor surveys at SU-03, SU-04, SU-05, and SU-07. Elevated soil vapor readings were detected in the southern portion of SU-04 (central Building 100) but not detected in SU-05 (western half of Building 100) or SU-07 (western portion of Building 140).

  A 2,500-gallon UST was discovered during installation of soil gas sampling points at SU-03 and SU-04 resulting in the installation of additional soil vapor points to the north and south of the UST. The UST was abandoned in place using an emulsifier to stabilize the contents.

- 2006 to 2010: Additional investigation of the former Sylvania site was managed by the USACE under the FUSRAP. Three phases of remedial investigation were performed to fill data gaps.

  - Phase I involved soil vapor (passive exterior and subslab at the 70, 100 and 140 Buildings), geophysical, walkover gamma radiation surveys; ambient indoor air (70, 100, and 140 Buildings), and transformer pad (south of the 70 Building) sampling; and a limited radiation survey in the 70 Building (Figures A-16 through A-19, Appendix A).

  - Phase II was conducted in Phases IIa and IIb. The work included: 22 soil borings at drains, leach pools, and dry wells not previously evaluated; 32 confirmatory soil borings at previously excavated remediation cells on the 70, 100, and 140 Properties; 149 soil borings at leach pools, drains, and dry wells not previously investigated on the 70, 100 and 140 Properties; 21 test trenches at geophysical anomalies identified during Phase I; and 7 concrete cores at radiological anomalies identified in Building 70 during Phase I (Figures A-20 and A-21, Appendix A).

  - Phase II was conducted in Phases IIa and IIb. The work included: 22 soil borings at drains, leach pools, and dry wells not previously evaluated; 32 confirmatory soil borings at previously excavated remediation cells on the 70, 100, and 140 Properties; 149 soil borings at leach pools, drains, and dry wells not previously investigated on the 70, 100 and 140 Properties; 21 test trenches at geophysical anomalies identified during Phase I; and 7 concrete cores at radiological anomalies identified in Building 70 during Phase I (Figures A-20 and A-21, Appendix A).

  - Phase III was designed to fill data gaps for the soil investigation (total metals in soil and identifying some floor drain locations) and to characterize groundwater contamination on site and off site at the GCDR. Thirty soil samples were collected from the 0 to 2-foot depth to support a risk assessment during Phase IIIa. Another 30 soil samples were also collected from the 2- to 8-foot depth at the same locations. Sample locations were equally spaced along a grid established across the site (Figure A-22, Appendix A). Smoke tests were performed to identify floor drain

discharge locations in Building 70. Phase IIIa included groundwater profiling of four borings where no wells were installed and the groundwater profiling of 23 borings where 19 deep wells and 4 shallow wells were installed, developed, and sampled. Phase IIIb involved additional groundwater profiling at 5 borings and the installation, development, and sampling of 24 shallow, 13 intermediate and 4 deep wells. Figure A-23 (Appendix A) shows the locations of the Phase III borings and wells.

- 2007: VCP multi-phase RI continued with the off-property installation of additional profiling points (P-102, P-104, P-110, P-112 to P-114, and P-118) (Figure A-3, Appendix A). Four sentinel monitoring wells (MWP-110-335, MWP-110-440, MWP-114-170, and MWP-114-290) were installed in the area of existing sentinel wells S-1-325 and S-1-450 (Figure A-24, Appendix A). Groundwater samples were analyzed for radionuclides, VOCs, nickel, ferrous iron, total iron, ammonia, chloride, and total chlorine.

- 2009: The VCP multi-phase RI concluded with the off-property installation of additional profiling points (P-119 and P-120) (Figure A-3, Appendix A). Groundwater samples were analyzed for radionuclides, VOCs, nickel, ferrous iron, total iron, ammonia, chloride, and total chlorine.

- 2010: A report on the VCP multi-phase RI was issued for the former Sylvania site. This report contained on- and off-property groundwater data collected on behalf of GTEOSI and contained data generated by General Instrument, NYSDEC, and USACE. These data were obtained during sampling of profile boreholes, monitoring wells, and Continuous Multi-Chamber Tubing (CMT) ports (Figures A-24 and A-25, Appendix A). Included in the report was a qualitative exposure assessment of fish and wildlife resources as well as human health.

Former Sylvania Remedial Activities

In 2003, a soil remedial excavation work plan designed to provide for unrestricted future use of the site was submitted to NYSDEC. Approved cleanup levels listed in the work plan are as follows:

- Total Uranium – 100 picoCuries per gram (piC/g),
- U-238 and U-234 – 50 piC/g,
- Th-232 – 2.8 piC/g above the background concentration,
- PCE – 1.82 mg/kg,
- TCE – 0.70 mg/kg,
- Ni – 560 mg/kg.

Characterization and confirmation samples collected during the remediation were to be analyzed for radionuclides, PCE, TCE, and Ni. Proposed excavation areas were west of Buildings 100 and 140, south of Building 100, and along the western boundary of the GCDR. The eastern portion of Building 140 would be demolished to accommodate the excavation activities.

Remedial activities conducted at the former Sylvania property are summarized below:

- Drum and UST Removal: In 1987, a total of 57 drums (including the initial 30 drums) and 90 cubic yards of soil were removed from the 70 Property. The approximate location of the drum burial area is shown on Figure A-16, Appendix A. A geophysical survey, additional excavation, and post excavation soil sampling were also conducted at the 70 Property. In 2004, a letter report was issued documenting that a 6,000-gallon UST was encountered and removed during excavation of soil from Cell 2 (140 Property). In 2005, 2,500-gallon UST was discovered during installation of soil gas sampling points at SU-03 and SU-04 in the 100 Building. The UST was abandoned in place using an

emulsifier to stabilize the contents. Additional USTs were found and removed including one fuel oil UST in SU-01 (west of the 100 and 140 Buildings); three USTS (10,000-gallon diesel and two 2,000-gallon gasoline) at Cell 11 (southeast corner of Building 100), and diesel USTs along the south side of the 100 Building (EEI, 2007).

Soil Excavation and Disposal: During 2003 to 2004, Phase I remedial excavation was conducted at Cells 1 through 14. The cells were excavated to depths ranging up to 54 feet. Verification soil sampling was conducted at each cell along the final excavation surfaces. Focused sampling following backfilling, beginning at the final excavation depth and continuing to a depth of 64 feet, was also performed at some cells. Soil samples were analyzed for radionuclides, PCE, TCE, and Ni. Following the remedial excavation there was contamination remaining beneath Cells 3 and 4 (PCE and TCE at depths between 24 and 62 feet), Cell 6 (uranium at depths between 43 and 57 feet), and Cell 9 (uranium, nickel, and thorium to a lesser extent at depths between 24 and 64 feet).

General Instrument

The General Instrument facility is on an approximately 11.5 acre property in the Hamlet of Hicksville within the Town of Oyster Bay, Nassau County, NY. The facility has consisted of a research and design laboratory and a small manufacturing operation that produces semiconductors. The facility has also been used to produce radar systems and electronic equipment.

In December 1986, General Instrument entered into a Consent Order (CO) with the NYSDEC to conduct on- and off-property assessment work. In January 1989, General Instrument entered into another CO with the NYSDEC to conduct a RI/FS at the site. Two OUs were identified in the CO: OU-1 for on-property contaminated soil and OU-2 for contaminated groundwater. In March 1997, NYSDEC issued a ROD for OU-1 requiring soil vapor extraction for on-property soil. In June 2004, NYSDEC approved a groundwater circulation well technology as an interim remedial measure (IRM) for OU-2. An IRM system comprised of Unterdruck-Verdampfer-Brunnen (UVB) technology wells (UVB-1 to UBV-3) operated from 2004 to 2009. The UVB wells are currently inactive.

General Instrument RI Activities

RI work was conducted at the General Instrument site between 1981 and 2008 in accordance with the NYSDEC COs as follows:

- 1981: Two groundwater monitoring wells (W-1-75 and W-2D-120) were installed hydraulically downgradient from a 2,000-gallon waste solvent UST (Figure B-1, Appendix B). Analysis of groundwater samples collected from these monitoring wells in December 1981 and May 1982 identified high concentrations of TCE (up to 4,300 µg/L at W-1-75) and PCE (up to 2,700 µg/L at W-1-75) in the Upper Glacial aquifer.

- 1986 to 1987: Four additional monitoring wells (W-3-72, W-3-112, W-5-78, and W-6-79) were installed at the site to define the lateral extent of PCE and TCE in the groundwater (Figure B-1, Appendix B). Groundwater samples were collected from six on-property monitoring wells in June 1986 and July 1987. Samples from upgradient wells (W-3-72 and W-3-112) contained PCE (up to 491 µg/L) with lesser concentrations of TCE (up to 47.6 µg/L) suggesting an upgradient off-property source. The June 1986 groundwater samples from downgradient well W-6-79 contained a TCE concentration of 263 µg/L, suggesting the VOC plume had migrated from the former 2,000-gallon UST area to the southern boundary of the site or there was another source of TCE near well W-6-79.

- 1992: Ten monitoring wells (W-1D-120, W-2-71, W-7-71, W-8-71, W-10-71/120, W-11-70, W-12-70/120, and W-13-63) and six soil borings (TB-1 and TB-3 through TB-8) were installed during the Phase I RI (Figure B-1, Appendix B). The investigation identified three potential on-property sources of VOCs (Figure B-2, Appendix B):

    - Area A: 2,000-gallon waste solvent UST located north of the building,
    - Area B: 1,000-gallon waste solvent UST located west of the building, and
    - Area C: tunnel sump located in the building.

  The highest concentrations of TCE and PCE were detected in soil samples from borings TB-1, TB-4, and TB-6 drilled in Area A and TB-8 drilled in Area B. Relatively high concentrations of 1,2-dichlorobenzene (1,2-DCB) (between 830 and 4,200 mg/kg) were also detected in soil samples from borings located in Area A (TB-1 between 8 and 32 feet) and Area B (TB-8 between 60 and 62 feet). Low concentrations of 1,2-DCB (0.8 and 1.1 mg/kg) were detected in soil samples from boring TB-7 drilled at the former wastewater lagoon.

- 1994: During the Phase II RI: one monitoring well (W-14-150) was installed in Area A, five soil samples (SS-1 through SS-5) were collected from the hazardous waste storage area, two samples (Sump-S and Sump-D) were collected at the tunnel sump (Area C), 17 monitoring wells were sampled, and a soil vapor survey was conducted along the western and southern property lines (Figure B-3, Appendix B). VOC impacts to groundwater in Area A appeared to extend to a depth between 130 and 150 feet based on Hydropunch® and well W-14-150 sampling data. Analytical results for soil indicated that the tunnel sump (up to 16,000 mg/kg TCE and up to 2,900J mg/kg PCE) was a potential source for groundwater impacts and the hazardous waste storage area (up to 2J mg/kg TCE and PCE not detected) was not a potential source. TCE and PCE concentrations were not quantified in the soil vapor samples; however, chlorinated VOCs included in the analyses were not detected in the samples. Analytical results indicated the highest concentrations of TCE were detected in the Upper Glacial Aquifer at wells downgradient of the former 2,000-gallon UST (14,000J µg/L in W-1-75 and 2,700 µg/L in W-2-71) and former 1,000-gallon UST (1,700J µg/L in W-10-71).

- 1997: During the Phase III RI, four monitoring wells (W-15-168, W-16-148, and W-17-130) and three soil borings (SB-1-97 through SB-3-97) were installed and sampled along the northern boundary of the King Kullen property (Figure B-4, Appendix B). Eleven on-property monitoring wells were sampled. The highest concentrations of TCE continued to be detected in the Upper Glacial aquifer beneath the former 2,000-gallon UST area (1,900 µg/L in W-1-75). The highest concentration of TCE detected in off-property groundwater from the Upper Magothy Aquifer beneath the King Kullen property was found in well W-16-148 (430 µg/L) located downgradient of Area A. A high concentration of PCE (230 µg/L) relative to TCE (36 µg/L) was detected in westernmost well W-15-168, suggesting the General Instrument plume merged with another plume from a separate VOC source.

- 2001: During the Phase IV RI, six soil borings (SB-4 through SB-9) and three nested monitoring wells (W-19-110/150, W-20-120/160, and W-21-150/180) were installed and sampled along the southern boundary of the King Kullen property (Figure B-4, Appendix B). The objective of this investigation was to evaluate the nature and extent of a VOC plume in the area of the proposed ozone-sparge system. Groundwater plumes from separate PCE and TCE sources, suspected to have migrated off the former Sylvania and General Instrument sites and merged hydraulically downgradient, were detected in wells installed during the Phase IV RI. Groundwater containing predominantly PCE, suspected of being from the former Sylvania site, was detected in wells W-19-110/150 and W-20-160. Groundwater containing a greater proportion of TCE, suspected of being from the General Instrument site, was detected in well W-20-120.

- 2002: Ten off-property monitoring wells (W-23-110, W-24-260, W-25-150/188, W-26-270, W-27-240/285, W-28-262, W-30-285, and W-31-95) and two on-property monitoring wells (W-22-95 and W-32-110) were installed during the Phase V RI (Figure B-4, Appendix B). Analytical results from the on-property wells suggested an off-property source of PCE located to the north of the General Instrument property and data from the off-property wells indicated commingling of the PCE and TCE plumes located hydraulically downgradient of the General Instrument site.

- 2003: Two off-property sentinel wells (S-1-325 and S-1-450) were installed and sampled as requested by NYSDEC (Figure B-4, Appendix B). The sentinel wells are located approximately 1,400 feet north of Hicksville Wells 5-2 and 5-3. Groundwater in well S-1-325 contained predominantly TCE (38 µg/L) while well S-1-450 contained similar concentrations of TCE (13 µg/L) and PCE (14 µg/L).

- 2007 to 2008: Seven Waterloo Profiler® points (WP-01 through WP-07) were installed during the Phase VI RI to determine the vertical extent of 1,2-DCB (a chemical marker distinguishing the General Instrument plume from the other plumes) (Figure A-3, Appendix A). Two monitoring well pairs (W-36-390/448 and W-37-325/385) were installed to confirm the profiling results (Figure B-4, Appendix B). The wells were first sampled in March 2009 and 1,2-DCB was not detected in any of the groundwater samples. Groundwater samples collected from three of the seven profiling points (WP-01 through WP-03) contained detectable concentrations of 1,2-DCB (up to 450 µg/L at WP-01). Elevated concentrations of PCE and TCE were detected in the profiling points to depths up to 493 feet. Predominant compounds detected in groundwater samples from well couplets W-36 and W-37 were TCE and PCE.

General Instruments Remedial Activities

In 2003, a pilot test of the UVB groundwater circulation well technology was completed at the NYS Park Service/Ackerman properties located south of the General Instrument site. The test involved one UVB well (UVB-1) and four observation wells screened within the middle and lower portions of the Upper Magothy Aquifer (Figure B-4, Appendix B). The pilot test ran for one month and was considered to be successful at intercepting and removing VOCs from the aquifer (ESC, 2004). The UVB well continued to operate while the full-scale system was being designed. An IRM system comprised of wells UVB-1 to UBV-3 operated from 2004 to 2009. The UVB wells are currently inactive.

Remedial activities conducted at the former General Instrument property are summarized below:

- Soil Excavation and Removal: In 1985, approximately 230 cubic yards of contaminated sludge and soil were removed during closure of a wastewater discharge lagoon. The lagoon (approximately 20-feet deep) was located along the northern property line of the site (Figure B-2, Appendix B). A composite sample of the sludge contained VOCs including TCE (660 parts per billion [ppb]) and 1,2-DCB (300 ppb) plus semivolatile organic compounds (SVOCs) including bis (2 ethyl hexyl) phthalate (52,000 ppb), and butyl phthalate (102 ppb) (FCHA, 1985). VOCs including TCE (622 ppb) were also detected in a composite sample from a 60-foot soil boring drilled in the northeast corner of the site (FCHA, 1985). Discrete samples from a second test boring drilled at the same location contained detectable concentrations of benzene and toluene (5 to 20 ppb) at depths between 14 and 61 feet. Bis (2 ethyl hexyl phthalate) (55 to 16,000 ppb), butyl phthalate (20 to 100 ppb), xylenes (46 to 77 ppb), and 1,2-DCB (11 to 45 ppb) were detected in composite samples collected from the floor and sidewalls of the finished excavation (FCHA, 1985).

- Groundwater Pump and Treat: A groundwater P&T system operated in Area A between 1982 and 1985. Groundwater was extracted at 20 gpm from well W-2-120. The recovered groundwater was

treated using an experimental carbonaceous absorbent material. Treated groundwater was recharged at 5 gpm along a gravel bed installed over the former UST pit and discharged at 15 gpm into the former wastewater storage lagoon. The system was shutdown because it could not handle the high levels of VOCs and suspended inorganic solids in the groundwater.

- Soil Vapor Extraction: During 1992 to 1993, soil vapor extraction (SVE) was proposed as an IRM for the VOC contaminated soil at the site. In March 1994, the SVE system began extracting from two intervals (an upper 30-foot zone and a lower 20-foot zone) between depths of 8 and 60 feet. In March 1995, the GAC canisters were replaced with a PADRE® system for improved treatment of the extracted VOC vapors. The system was subsequently upgraded as a result of the NYSDEC's ROD issued in March 1997 requiring SVE for remediation of OU-1. Confirmation testing performed in 2001 indicated Areas B and C were sufficiently remediated to discontinue SVE at those locations; however, additional SVE was needed to further remediate Area A. In 2002, subsequent testing in Areas B and C showed soil reached remedial goals (Stearns and Wheler, LLC, 2002) and SVE operations ceased in those areas with consent from the NYSDEC. In November 2009, the SVE system was shutdown pending results of closure testing in Area A. Review of the closure report issued in August 2010 identified 1,2-DCB, 1,4-DCB, ethylbenzene, and total xylenes exceeding TAGM values in soil samples collected between 14 and 38 feet from the southernmost boring B-5. Consequently, additional SVE wells were proposed for the vicinity of boring B-5 and the SVE system was scheduled to be restarted in fall of 2010 (WSP, 2010).

- Ozone Sparging: An IRM consisting of a KVA C-Sparger® system was proposed for the King Kullen property to treat the off-property groundwater plume using pulsed ozone injection. Three wells with 5-foot sparge points set at depths of 125, 150, and 180 feet bgs were proposed between wells W-18-150 and W-20-120/160, but the ozone sparging system was never installed because results of the Phase V RI indicated the IRM needed to be re-evaluated.

- UVB Groundwater Circulation: In 2004, a UVB groundwater circulation system began operation as IRM-2 to treat the off-property groundwater VOC plume. The system consisted of three UVB wells (UVB-1 through UVB-3) with two of the wells (UVB-1 and UVB-2) located on the NYS Park Service property and one of the wells (UVB-3) located on the King Kullen property (Figure B-4, Appendix B). The wells were a stacked-cell design with screened depths from 210 to 240 feet, 285 to 315 feet, and 360 to 380 feet. Each well was equipped with a below grade air stripper. The wells were initially pumped so that 30 to 35 gpm circulation rates were maintained at the upper and lower screened intervals. Operation of UVB-1 was stopped in June 2008 due to the uncontrollable flow of very fine-grained sand into the well. Wells UVB-2 and UVB-3 were manually turned off in May 2009.

123 Post Avenue

The 123 Post Avenue site property consists of a building that is currently used for a dry cleaning business and a parking area which surrounds the building. Since the 1950s, the property has been used for dry cleaning operations. 123 Post Avenue was placed on the NYS Registry of Inactive Hazardous Waste Disposal Sites in December 1998.

NYSDEC has divided the site into two operable units: OU-1 is the 0.2-acre dry cleaner property and OU-2 is the off-property contaminated groundwater. NYSDEC signed RODs for OU-1 and OU-2 in March 2003 and 2004, respectively. OU-1 was addressed by the NCDOH and the potential responsible party (PRP) with NYSDEC oversight. OU-2 is being addressed under the New York State Superfund Program.

123 Post Avenue RI Activities

Remedial investigation work showed site-related PCE contamination in soils and groundwater. On-property soils were found to be contaminated with PCE and groundwater was found to be contaminated with PCE and its breakdown products TCE and DCE. Indoor air was found to contain elevated concentrations of PCE at buildings north and northwest of the site. The source for the contamination was identified to be on-property drywells that had been improperly used to dispose waste PCE. In 2001, five monitor wells (OU2-1 through OU2-5) and 20 profile boreholes (P-1 through P-20) were sampled to define the off-property extent of the VOC groundwater contamination between the site and Westbury-Well 11 (Figure 14). Construction details for the wells are summarized in Table 2.

Remedial investigation work for OU-1 began in October 2000. In 2001, the PRP agreed to implement a full remedial program for OU-1. While the RI was in progress for OU-1, the owner installed an interim remedial measure (soil vapor extraction) to address the elevated levels of PCE in the on-property soil and indoor air at buildings to the north and northwest of the site.

Following the remedial investigation work conducted in 2001, additional remedial investigation at OU-2 was performed between 2006 and 2012. During that period: 29 profile boreholes (P-1 through P-29), 7 temporary wells (TP-1 through TP-6 and TP-9), 13 monitor wells (OU2-6, OU2-7A, OU2-7B, OU2-8A, OU2-8B, OU2-8C, OU2-9A, OU2-9B, OU2-9C, OU2-10A, OU2-10B, OU2-10C, OU2-11), two soil borings (SB-1 and SB-2), and three injection wells (IW-1, IW-3, and IW-4) were installed and sampled (Figures 15 through 17). The work plan for an 18-week pilot test program for OU-2 was submitted to NYSDEC. The selected remedy for OU-2 presented in the work plan is in-situ chemical oxidation. Permanganate will be injected (at pilot test wells IW-1, IW-3 and IW-4) into the impacted aquifer to the south of the site near the intersection of Lennox Avenue and South Grand Street in Westbury, NY.

123 Post Avenue Remedial Activities

Interim remedial measures conducted for OU-1 consisted of soil excavation and SVE to address the subsurface contamination and portable air purifiers to address the indoor air contamination. Indoor levels of PCE dropped below New York State Department of Health (NYSDOH) guidelines following operation of the SVE system. No further action was approved by NYSDEC for OU-1 groundwater. However, NYSDEC required continued operation of the SVE system to eliminate or mitigate the threat of any future air or groundwater impacts. An air sparging contingency plan was developed for OU-1 in case groundwater concentrations rebounded. Implementation of in-situ chemical oxidation for OU-2 is ongoing.

CURRENT NATURE AND EXTENT OF CONTAMINATION

The evaluation of historical analytical results focused herein on PCE and TCE that are present at the relative greatest concentrations in groundwater samples collected from PSWs during the HRS event in August 2010. Groundwater plumes for PCE and TCE were mapped using concentrations exceeding 100 µg/L that were detected during sampling in the area between 2007 and 2012. Historically, a 100 µg/L isoconcentration contour was used to define the extents of the groundwater plumes in the NCIA (LMS, 2000; NYSDEC, 2003; HDR, 2010 and 2011). On Figures 8 through 13, the maps and cross sections show the inferred lateral and vertical extents of the PCE and TCE groundwater plumes migrating from the 123 Post Avenue, NCIA Off-property Groundwater Area, former Sylvania, and General Instrument sites. VOC data plotted on the maps and cross sections are tabulated in Appendix C.

NCIA Off-property Ground Water Area

Groundwater

Three groundwater plumes (NCIA Off-property eastern, central, and western plumes) characterized by PCE and TCE are present in NCIA Off-property Groundwater area. The NCIA Off-property eastern and western plumes are more extensive laterally than the NCIA Off-property central plume (Figure 18). These three plumes are generally oriented in a south-southwest direction consistent with regional groundwater flow. A downward hydraulic gradient appears to drive the three plumes to greater depths as they migrate through the NCIA Off-property Groundwater Area.

- NCIA Off-property Eastern Plume: Wells EW-1A/B, EX-1, FWMW-13A to 13C, FWMW-14A to 14C, GWHP-2, MW-14, MW-16D, MW-17D, TMW-7, and TMW-8D are located in the NCIA Off-property eastern plume (Figure 18). The NCIA Off-property eastern plume is characterized by a generally higher molar fraction of PCE relative to TCE at depths less than approximately 205 feet and a generally higher molar fraction of TCE compared to PCE at depths greater than approximately 205 feet (Figure 18). Molar fractions of TCE and PCE detected in the NCIA Off-property eastern plume groundwater below 205 feet are similar to those found in wells to the east. During the most recent sampling of the NCIA Off-property eastern plume in April 2011, the highest concentrations of PCE (16,000 µg/L) and TCE (1,800 µg/L) were detected in well FSMW-14A screened in the Upper Magothy Aquifer from 119 to 129 feet bgs. Bowling Green Wells 1 and 2 contain PCE and TCE (Figure 18) that may be from one or more of the NCIA Off-property plumes (Figures 8 through 11).

- NCIA Off-property Central Plume: The wells located in the NCIA Off-property central plume include MW-1 through MW-4, MW-6, MW-9, MW-10, and TMW-5 (Figure 18). The NCIA Off-property central plume contains a generally higher molar fraction of TCE and DCE compared to PCE (Figure 18). PCE and TCE concentrations detected in the NCIA Off-property central plume appear to be commingled with those of the NCIA Off-property western plume below a depth of approximately 150 feet bgs at the NCIA Off-property Groundwater Area. The highest concentration of PCE (330 µg/L) was detected in the Upper Magothy Aquifer at 165 feet bgs in TMW-5 (August 2008) and the highest concentration of TCE (1,800 µg/L) was detected in the Upper Magothy Aquifer at 128 to 130 feet bgs and 138 to 140 feet bgs in GWHP-01 (January 2000). Relatively high concentrations of 1,1,1-TCA (up to 1,400 µg/L at TMW-5) are also detected in the NCIA Off-property central plume based on August 2008 data.

- NCIA Off-property Western Plume: This plume may extend to the north-northeast beneath the residential area bounded by NCIA on the north, Arlington Street on the west, Old Country Road on the south, and Belmont Place on the east. Wells EX-2, MW-7, MW-11-S/D, MW-12, MW-13, TMW-1, TMW-2, TMW-3D, and TMW-9D are located in the NCIA Off-property western plume (Figure 18). The NCIA Off-property western plume has a generally higher molar fraction of TCE compared to PCE with occasional higher molar fractions of PCE compared to TCE (Figure 18). The highest concentration of TCE (5,100 µg/L) was detected in the Upper Magothy Aquifer at 225 feet bgs in TMW-2 (August 2008) located along the western side of the plume. The highest concentration of PCE (3,700 µg/L) was detected in the Upper Magothy Aquifer at 225 feet bgs in TMW-1 (August 2008) located in the southern portion of the plume. PCE and TCE appear to extend no deeper than 450 feet in the NCIA Off-property western plume beneath the NCIA Off-property Groundwater Area (Figures 10 and 11).

Former Sylvania

Soil

PCE, TCE, nickel, uranium, and thorium were identified as FUSRAP wastes in soil during the RI (EEI, 2010). Based on analytical results from the RI performed by USACE and remedial excavation sampling conducted by GTEOSI:

- PCE and TCE concentrations exceeding 1,000 µg/kg were detected in soil beneath and east of the 100 and 140 Buildings; between the 70 and 140 Buildings; beneath the 70 Building, beneath Cell 14 in the GCDR (Figures A-26 and A-27, Appendix A).

- Nickel concentrations exceeding the background threshold value (BTV) of 16.1 mg/kg were detected in soil samples from beneath and south of the 100 Building, on the 70 Building property near the source area found south of the 100 Building, and in isolated locations beneath the 140 Building (Figures A-28 and A-29, Appendix A).

- Uranium concentrations exceeding BTV values (U-234 of 0.81 pCi/g, U-235 of 0.091 pCi/g, and U-238 of 0.901 pCi/g) were detected in soil at one or more isolated locations beneath and east of the 70 and 100 Buildings extending beneath the GCDR; between the 70 and 100 Buildings; and beneath, south and east of the 140 Building (Figures A-30 and A-31, Appendix A).

- Thorium concentrations exceeding three times the BTV values (Th-228 of 1.2 pCi/g, Th-230 of 1.02 pCi/g, and Th-232 of 1.18pCi/g) were detected in soil samples from isolated locations beneath and south of the 100 Building and beneath the 140 Building at boring LPH-21 (Figure A-32, Appendix A).

Groundwater

PCE, TCE, nickel, and uranium were identified as FUSRAP wastes in groundwater during the RI (EEI, 2010). Based on analytical results from RIs conducted by the USACE and GTEOSI:

- Upgradient groundwater contained low concentrations of VOCs which are thought to have originated on the NCDPW and GCDR properties or other sources further upgradient. Former Sylvania on-property groundwater data collected in April 2010 indicated the area east of Building 100 is a source of VOCs contamination with the highest concentrations of PCE (1,800 µg/L) and TCE (91 µg/L) detected in shallow groundwater collected from well MW-22S. Lesser source areas for VOCs are located under and adjacent to the 70, 100, and 140 Buildings (Figures A-26 and A-27, Appendix A). Some of the PCE and TCE released in the source area east of the 100 Building was detected under the VOCs that have migrated off the General Instrument site (MPI, 2011). The former Sylvania off-property groundwater containing TCE and PCE from the former Sylvania site has merged with separate VOCs plumes from the General Instrument site and other unknown sources (Figure A-33, Appendix A). The areal extent of TCE and PCE from the former Sylvania site in groundwater can be inferred from higher molar fractions of PCE found in off-property wells. Wells located in the off-property TCE/PCE plume include: MWP-110-440, W-16-148, W-19-110/150, W-26-270, W-30-285, W-31-95, PW-02-07, PW-05-07, and PW-06-07. Other VOCs detected in off-property wells that do not appear to have originated from the former Sylvania site include 1,1,1-TCA, 1,1-DCA, 1,1-DCE, chloroform, carbon tetrachloride and ethylbenzene. VOCs detected in predominantly intermediate-depth groundwater samples from on-property wells that are thought to have originated from upgradient sources are 1,1,1-TCE, 1,1-DCE, and chloroform.

- Nickel impacts to groundwater are mainly limited to the southern portion of the Sylvania site. Nickel concentrations (102 to 1,550 µg/L) that exceed the NYSDEC GA Groundwater Standard (100 µg/L)

were found in shallow- to intermediate-depth groundwater extending from the source area south of the 100 Building to an area slightly past the southern boundary of the 70 Property (Figures A-28 and A-29, Appendix A). Dissolved nickel concentrations exceeding the NYSDEC GA Groundwater Standard were detected in April 2010 samples from wells MW-08, MW-23S, MW-26I, MW-27S, MW-31D, MW-44S, and MW-50I. The maximum detected concentration of nickel was 2,240 mg/L in MW-23S.

- A chromium concentration (60.4 µg/L) exceeding the NYSDEC GA Groundwater Standard (50 µg/L) was detected in the April 2010 shallow sample from well W-31-95. In addition, chromium concentrations (91.5 to 180 µg/L) exceeding the NYSDEC GA Groundwater Standard were detected in shallow upgradient wells (W-2-70, W-10-120, and W-12-70) suggesting the General Instrument site is a source for the chromium. The deep groundwater sample from downgradient well MW-36-448 also contained a chromium concentration (62 µg/L) that exceeded the NYSDEC GA Groundwater Standard.

- Dissolved and total sodium concentrations (20,100 to 491,000 µg/L) exceeding the NYSDEC GW GA Standard (20,000 µg/L) were detected in April 2010 samples from several on-property and off-property wells. The source for the sodium is considered to be a salt pile on the NCDPW site to the north.

- On-property uranium concentrations exceeding the MCL (27 piC/L) are limited to the northeast corner of the 70 Building Property (wells MW-18S/I, MW20S, and MW-41S) where a recharge basin was formerly located. No off-property uranium impacts, other than an isolated area (well MW-33S) on the GCDR, were identified based on the April 2010 data. Thorium was not detected at concentrations exceeding the MCL in any April 2010 groundwater samples.

General Instrument

Soil

- Two waste solvent USTs (Areas A and B) and a tunnel sump (Area C) have been identified at the General Instrument site as potential sources for TCE, PCE, 1,2-DCB, and 1,1-DCE (Figure B-3, Appendix B). VOC contaminated soil in Areas A and B was remediated by SVE; whereas, VOC contaminated soil in Area C was excavated. Based on historical data, it does not appear these USTs areas are contributing significant VOC mass to the on-property groundwater.

- There may be an unknown source for chromium in soil at the General Instrument site. Chromium concentrations exceeding the NYSDEC GA Groundwater Standard were detected in on- and off-property wells.

Groundwater

- Releases to groundwater from the three source areas on the General Instrument site appear to be characterized by a generally higher ratio of TCE to PCE (Stearns & Wheler, LLC, 1992 and 1997).
    - Semi-annual groundwater monitoring data indicate that TCE and PCE concentrations exceeding 100 µg/L have not been detected in on-property monitor wells since 2005 (WSP Engineering, 2010).
    - Off-property groundwater containing TCE and PCE from the General Instrument site is commingled with the VOCs plumes from the former Sylvania site and other unknown sources (Figure A-33, Appendix A).

- Releases from Areas A and B also contain significant concentrations of 1,2-DCB. Plan and cross-section views of the 1,2-DCB distribution in groundwater are shown on Figures B-5 and B-6 (Appendix B). The areal extent of TCE and PCE in groundwater from the General Instrument site can be inferred using the 1,2-DCB occurrence and higher molar fraction of TCE found in off-property wells. Monitoring wells and profiling borings located in the General Instrument TCE/PCE plume include: WP-01 through WP-03, W-1-75/120, W-10-71/120, W-20-120/160, W-22-95, W-23-110, W-25-150/188, W-26-270, W-27-240/285, and W-30-285.

- Chromium concentrations (91.5 to 180 µg/L) exceeding the NYSDEC GA Groundwater Standard were detected in on-property shallow wells (W-2-70, W-10-120, and W-12-70) and off-property wells W-31-95 and MW-36-448 during sampling conducted in 2010 for the former Sylvania site. A source for the chromium is currently unknown.

123 Post Avenue

Groundwater analytical results from March 2010 for wells OU2-1 and OU2-2 (USGS database for Nassau County) and from January 2012 (Dvirka and Bartilucci, 2012), indicated off-property wells OU2-1 through OU2-11 contained concentrations of PCE up to 3,900 µg/L, TCE up to 44 µg/L, and DCE up to 130 µg/L. A groundwater sample collected for the HRS evaluation in August 2010 from nearby Westbury-Well 11 contained TCE (1.7 µg/L) and DCE (0.59 µg/L). Molar fractions for total ethenes calculated using the analytical data are plotted on Figure 19. Based on review of Figure 19, it appears unlikely the PCE and DCE concentrations found in Westbury-Well 11 are related to the 123 Post Avenue site.

EXISTING DATA GAPS

An evaluation of the information presented herein indicates the following data gaps should be considered when evaluating the future approach for the NCIA Off-property Groundwater Area, former Sylvania, General Instrument, and 123 Post Avenue sites:

NCIA Off-property Ground Water Area

Groundwater
Data gaps for NCIA Off-property Groundwater Area are:

- A more expansive monitoring well network should be installed in the NCIA Off-property Groundwater Area to monitor any future remedial activities. The network of wells will aid in monitoring the vertical and horizontal extents of the NCIA Off-property western, central and eastern plumes. Additionally, a network of monitoring wells should be installed further north and south of the NCIA Off-property Groundwater Area.

- Further evaluation needs to be conducted of the high molar fraction of TCE in the lower portion of the NCIA Off-property eastern plume.

- During the remedial design phase, ground water should be analyzed for the Target Analyte List (TAL) metals and hexavalent chromium (CrVI) in groundwater beneath the NCIA Off-property Groundwater Area.

- Concentrations of electron acceptors and metabolic byproducts in background and contaminated groundwater that can be used to evaluate the natural attenuation of dissolved VOCs in groundwater beneath NCIA Off-property Groundwater Area have not been evaluated.

- Prior aquifer pumping tests should be reviewed during design investigations to evaluate interference from the Bowling Green wells and fluctuations in discharge rate that may have influenced the results during the 72-hour pump test such that specific response (i.e., unconfined or leaky) of the Magothy aquifer to pumping is unknown.

- The P&T system flow rate should be estimated for containment and remediation of the three finger plumes beneath NCIA Off-property Groundwater Area during design investigations. The anticipated effect of the Bowling Green wells on the P&T system should be evaluated. Maximum sustained flow rates for existing extraction wells (EX-1 and EX-2) in NCIA Off-property Groundwater Area have not been determined.

- As part of a design investigation, ground water deeper than 225 feet in the NCIA Off-property Groundwater Area should be analyzed.

- Human health assessment has not been prepared for the NCIA Off-property Groundwater Area.

Former Sylvania

Soil
Remedial alternatives for on-property soil have not been evaluated through a feasibility study that meets technical requirements under the Comprehensive Environmental Response, Compensation, Liability Act (CERCLA).

Groundwater
The data gaps for groundwater are:

- A groundwater RI/FS should be completed.

- The source of the elevated concentrations of TCE detected in intermediate to deep groundwater beneath the western portion of the 70 Building Property (in samples from profile borings for MW-25D and MW-30D and monitor well MW-30I) should be further evaluated.

- The source of the elevated concentration of TCE detected in deep groundwater beneath the central portion of the 100 Building Property (in samples from profile borings for MW-24DD and MW-27DD) should be further evaluated.

- The source of the elevated concentration of nickel detected in intermediate groundwater beneath the western portion of the 70 Building Property (in samples from the profile boring for MW-25D and monitor well MW-25S) should be further evaluated.

- The source of the elevated concentrations of PCE, nickel, and uranium detected beneath remedial cell 9 (in samples from both profile boring MW-24S and well MW-24S) should be further evaluated.

- Concentrations of alternate electron acceptors and metabolic byproducts in background and contaminated groundwater that can be used to evaluate the natural attenuation of dissolved VOCs migrating from the former Sylvania site should be further evaluated.

- Existing groundwater conditions and monitor well locations should be determined at the properties with chlorinated solvent usage (as noted in Figure 1) located downgradient and along the path of the Sylvania VOC plume.

- The southern and western extents of the off-property groundwater contamination should be further delineated.

General Instrument

Soil
Data gaps for soil include:

- Remedial confirmation of soil sampling results and the outcome of the pending closure request for Area A should be reviewed when available.

- It is unknown if additional USTs are buried at the site. In addition to the USTs removed from Areas A and B, a 10,000-gallon storage tank was located to the east of the former wastewater pond on the General Instrument site (Figure B-1, Appendix B). NYSDEC does not have a closure report for this UST, but believes the UST to be a fuel oil tank.

- A potential chromium source may exist in soil beneath the site. Chromium concentrations exceeding the NYSDEC GA Groundwater Standard were detected in groundwater samples collected from on-property and off-property wells during sampling conducted in 2010 by a consultant for the former Sylvania site.

Groundwater
The data gaps for groundwater are:

- A groundwater RI/FS should be completed.

  The RI/FS should include an investigation into the presence of the dissolved chromium detected in groundwater samples collected in 2010 from on-property and off-property wells.

- A human health risk assessment for on-property groundwater contamination should be conducted. An ecological risk assessment should also be conducted, if determined necessary by EPA.

- The RI sampling should include analysis for concentrations of alternate electron acceptors and metabolic byproducts in background and contaminated groundwater that can be used to evaluate the natural attenuation of dissolved VOCs migrating from the General Instrument site.

- A final remedial strategy for off-property groundwater should be selected after completion of an RI/FS.

123 Post Avenue

Soil
There were no data gaps identified for soil at OU-1 and OU-2.

Groundwater
The data gaps for groundwater are:

- The vertical and lateral extent of the OU-2 plume should be further delineated.

- A human health risk exposure assessments has not been conducted for the off-property groundwater contamination.

SCOPE OF WORK

This SOW has been prepared to fill data gaps that were identified by evaluating site background, current nature and extent of contamination, and data gaps at the NCIA Off-property Groundwater Area, former Sylvania, General Instrument, and 123 Post Avenue sites.

NCIA Off-property Groundwater Area

Groundwater

- Vertical profiling should be conducted at/near the Bowling Green wellfield and in the area up gradient of the well field.

- A network of groundwater monitoring wells should be installed at multiple locations to monitor progress of future remedial efforts in the NCIA Off-property Groundwater Area as part of the remedial design phase. These locations will be incorporated into a long term monitoring program. The monitoring well network should include well locations that are west of the NCIA Off-property western plume, east of the NCIA Off-property eastern plume, and upgradient of the NCIA. For assessment of the vertical extent, this monitoring well network and also additional locations in the NCIA Off-property central plume should also be extended to depths past the screened interval at Bowling Green Well 1 and 2.

  A Uniform Federal Policy (UFP) Quality Assurance Project Plan (QAPP) will need to be prepared for this work.

- Groundwater samples should also be collected from the newly installed and existing monitor wells at the NCIA Off-property Groundwater Area in accordance with the EPA Region 2 document entitled *Groundwater Sampling Procedure, Low Stress (Low-Flow) Purging and Sampling* during pre-design investigations. The investigation should include at least two rounds of sampling, spaced three months apart. The first round samples should be analyzed for TCL VOCs using EPA Method 8260B and total/dissolved TAL metals including CrVI using EPA Methods 6010B/7470 and 7199, respectively. Second round samples should be analyzed for TCL VOCs and selected samples should also be analyzed for natural attenuation indicator parameters: pH, dissolved oxygen (DO), electrical conductivity (EC), temperature, turbidity, oxidation-reduction potential (ORP), total organic carbon by SW 9060, nitrate and nitrite by SW 353.2, sulfate by SW 375.4, sulfide by SW 376.2, chloride by SW 352.2, ferrous iron by SM 3500Fe-D, manganese by EPA Method 6010B, alkalinity by SW 310.1, volatile fatty acids by SW 5560C, hydrogen by RSK-194, and carbon dioxide, methane, and ethane/ethene by SW 3810. The frequency and chemical analyses should be reviewed and adjusted, if necessary, after a work plan has been developed.

- Step-drawdown tests should be conducted using wells EX-1 and EX-2, designed to remove interference from the nearby PSWs.

- Groundwater flow and contaminant transport modeling should be conducted in a pre-design investigation to:

  - Assist in the P&T system design for hydraulic containment of the VOC plumes; and

- Evaluate the effects of the nearby PSWs on that system.

- The existing P&T strategy should be expanded to address the VOC contaminated groundwater below a depth of 225 feet at NCIA Off-property Groundwater Area.

- Update the human health risk assessment using data that has been collected post NYSDEC's 2003 ROD for the groundwater contamination in the NCIA Off-property Groundwater Area. An ecological risk assessment should also be conducted, if determined necessary by EPA.

Former Sylvania

Soil

- USACE FUSRAP program plans to model site groundwater in preparation for scoping the off-property groundwater assessment. The existing data gaps for soil should be re-evaluated to determine whether additional on-property assessment is necessary, based on the modeling results (EEI, 2010).

Groundwater

- USACE plans should continue for off-property groundwater characterization which includes the drilling and sampling of 14 groundwater profile boreholes ranging in depth from 200 to 600 feet, installation of 29 monitor wells field screening of the profile boreholes for VOCs using an AQR Color-Tec® kit, sampling of the profile boreholes and monitor wells for VOCs and Ni, and selected groundwater samples will also be analyzed for total uranium (LBGI and EEI, 2011).

- USACE plans should continue for sampling of selected wells (during a second round of monitoring) for natural attenuation indicator parameters: pH, DO, EC, temperature, ORP, nitrate, nitrite, sulfate, chloride, sulfide, major cations, ferrous iron and manganese, alkalinity, volatile fatty acids, carbon dioxide, methane, hydrogen, ethane/ethene, total organic carbon, and *Dehalococcoides spp.* (LBGI and EEI, 2011).

- USACE plans should continue for preparation of a Feasibility Study Report to address the on-property soil and groundwater contamination and off-property groundwater contamination (LBGI and EEI, 2011).

General Instrument

Soil and Groundwater

- All on-property wells and selected off-property wells (W-31-95 and MW-36-448) should be resampled to confirm total chromium concentrations from the 2010 sampling event conducted by the consultant for the former Sylvania site. Groundwater samples should be analyzed for total and dissolved chromium and CrVI using EPA Methods 6010C and 7199, respectively. If total chromium and CrVI concentrations exceeding the NYSDEC GA Groundwater Standard (50 µg/L) are detected in the on-property groundwater samples, then soil borings should be drilled and sampled at five-foot intervals to groundwater (approximately 60 feet bgs) in the vicinity of the well containing the highest concentrations of chromium and CrVI to identify a source. The soil samples should be analyzed for total chromium and CrVI using EPA Methods 6010C and 7196/7199, respectively.

- Low-flow groundwater samples should be collected from site-related wells and analyzed for TCL VOCs and natural attenuation indicator parameters: pH, DO, EC, temperature, ORP, nitrate, nitrite, sulfate, chloride, sulfide, major cations, ferrous iron and manganese, alkalinity, volatile fatty acids, carbon dioxide, methane, hydrogen, ethane/ethene, and total organic carbon.

- A human health assessment should be conducted for the on-property groundwater contamination. An ecological risk assessment should also be conducted, if determined necessary by EPA.

123 Post Avenue

Soil

No additional investigation or remediation is recommended for soil in OU-1 and OU-2.

Groundwater

- Installation of a groundwater monitoring well near the intersection of Lafayette Avenue and South Grand Street to evaluate groundwater quality impacting the public supply well. Use of either a multi-port system or cluster of wells to gather data at multiple depth intervals. The well should be drilled, field screened, constructed, and developed in the same manner as those proposed for the NCIA Off-property Groundwater Area. Following installation, the well should be included in the monitoring program that has been implemented for the other wells in OU-2 for 123 Post Avenue.

- The results for the in-situ oxidation pilot test being conducted in OU-2 should be evaluated.

REFERENCES

Dvirka and Bartilucci (D&B), 2009a, Pre-Design Investigation Report, New Cassel Industrial Area Site, Operable Unit No. 3, Town of North Hempstead, Nassau County, New York, Site No. 1-30-043, Dated June 2009.

_____, 2009b, Vertical Profile Sample Locations and VOC Results – 2001, Figure 1-A, 123 Post Avenue – Operable Unit 2 Remedial Design, Westbury, New York, dated May 1, 2009.

_____, 2009c, Vertical Profile Sample Locations and VOC Results – 2006, Figure 1-B, 123 Post Avenue – Operable Unit 2 Remedial Design, Westbury, New York, dated May 1, 2009.

_____, 2010, Estimated Areal Extent of VOC Plume Based on Existing Data, Figure 1, 123 Post Avenue – Operable Unit 2 Remedial Design, Westbury, New York, dated June 10, 2010.

_____, 2012, Monitoring Well Location Map, Figure 1, 123 Post Avenue – Operable Unit 2 Remedial Design, Westbury, New York, included with January 2012 data table.

Ecology and Environment, Inc. (EEI), 2007, Final Remedial Investigation Work Plan (Phases I and II) for the Sylvania Corning FUSRAP Site, Hicksville, County of Nassau, New York, Dated March 2007.

_____, 2008, Final Remedial Investigation Work Plan (Phase III Groundwater) for the Sylvania Corning FUSRAP Site, Hicksville, County of Nassau, New York, Dated October 2008.

_____, 2010, Final Remedial Investigation for the Sylvania Corning FUSRAP Site, Hicksville, County of Nassau, New York, Dated September 2010.

ERM-Northeast (ERM), 1993, Phase II Investigation Report, Air Techniques Site, Hicksville, Nassau County, New York, Site No. 1-30-040, GTE Operations Support Incorporated.

ESC Engineering of New York, P.C., 2004, Groundwater Interim Remedial Measure, Operable Unit No. 2, Full-Scale System Completion Report, Groundwater Circulation Well System, Former General Instrument Corporation Site, Hicksville, New York, Dated October 2004.

Fred C. Hart Associates, Inc. (FCHA), 1985, Letter Report on the Cleanup of the Wastewater Lagoon, General Instrument Corporation Site, Hicksville, New York, Dated July 1985.

Henningson, Durham, and Richardson Architecture and Engineering P.C. (HDR), 2010, Pre-Design Investigation Evaluation Report, New Cassel Industrial Area, Offsite Groundwater OU#3, Dated March 2010.

_____, 2011, Draft Pre-Design Investigation Report, New Cassel Industrial Area, Offsite Groundwater OU#3, Dated August 2011.

Lawler, Matusky and Skelly Engineers LLP (LMS), 2000, Remedial Investigation Report, New Cassel Industrial Area, Off-Site Groundwater, Town of North Hempstead, Nassau County, Dated September 2000.

The Louis Berger Group, Inc. (LBGI) and Ecology and Environment, Inc. (EEI), 2011, Final Work Plan Off-Site Groundwater Characterization and Feasibility Study for the Sylvania Corning FUSRAP Site, Hicksville, New York, Dated May 2011.

Malcolm Pirnie, Inc. (MPI), 2007, Groundwater Investigation Report, Former Sylvania Electric Products Incorporated Facility, Hicksville, New York, Voluntary Cleanup Program Site No. V00089-1, Dated January 2007.

_____, 2011, Groundwater Remedial Investigation Report, Former Sylvania Electric Products Incorporated Facility, Hicksville, New York, Voluntary Cleanup Program Site No. V00089-1, Dated January 2011.

New York State Department of Environmental Conservation (NYSDEC), 2003, Record of Decision, New Cassel Industrial Area Sites, Town of North Hempstead, Nassau County, New York, Off-Site Groundwater South of the New Cassel Industrial Area, Operable Unit No. 3, Dated October 2003.

Stearns and Wheler, LLC., 1992, Draft Remedial Investigation, General Instrument Corporation, Hicksville, New York, Dated January 1992.

_____, 1995. Supplemental Field Work, General Instrument Site, Hicksville, NY, Dated April 1995.

_____, 1997. Phase III Remedial Investigation, General Instrument Site, Hicksville, NY, Dated September 1997.

_____, 2002. Soil Boring Results, General Semiconductor Site, Hicksville, NY, Site Code 1-30-020, S&W No. 80147.5, Dated April 2002.

WSP Engineering of New York, P.C. (WSP), 2008, November 2007 Semiannual Groundwater Monitoring Report, Former General Instrument Corporation Site, Hicksville, New York, Dated March 2008.

_____, 2010, Operable Unit 1, Summary of SVE System Closure Sampling in Area A, Former General Instrument Corporation Site, Hicksville, New York, Dated August 2010.

United States Environmental Protection Agency (EPA), 2011, HRS Documentation Record, New Cassel/ Hicksville Ground Water Contamination, Dated March 2011.

United States Geological Survey (USGS), 1972a, Regional Rates of Ground-Water Movement on Long Island, New York, Professional Paper 800-C, pages C271-C277.

_____, 1972b, Water Transmitting Properties of Aquifers on Long Island, New York, Professional Paper 800-C, pages E1 to E24.

_____, 1983, Effects of Sanitary Sewers on Ground-Water Levels and Streams in Nassau and Suffolk Counties, New York, Part 1: Geohydrology, Modeling Strategy, and Regional Evaluation, Water Resources Investigations 82-4045.

URS Corporation (URS) and Envirocon, Inc., 2005a, Systematic Subsurface Soil Sampling and Analysis Report, Investigation Beneath the 100 Building, Former Sylvania Electric Products Incorporated Facility, Hicksville, New York, Dated November 2005.

_____, 2005b, West of the 140 and 100 Buildings and Southwest of the 100 Building (Survey Unit 01 and Survey Unit 02) Report, Former Sylvania Electric Products Incorporated Facility, Hicksville, New York, Dated November 2005.

_____, 2005c, Investigation Beneath the 140 Building (Survey Unit 06 and Survey Unit 07), Former Sylvania Electric Products Incorporated Facility, Hicksville, New York, Dated November 2005.

_____, 2005d, Investigation and Remediation of Soils North of the 140, Former Sylvania Electric Products Incorporated Facility, Hicksville, New York, Dated August 2005.

_____, 2005e, Cells 3, 4, 12, 14 and Golf Course Driving Range Subsurface Soil Delineation, Former Sylvania Electric Products Incorporated Facility, Hicksville, New York, Dated August 2005.

_____, 2005f, Cell 9 Subsurface Soil Delineation, Former Sylvania Electric Products Incorporated Facility, Hicksville, New York, Dated August 2005.

TABLES
New Cassel/Hicksville Ground Water Contamination Site
Nassau County, New York
July 2013

TABLE 1

Well Construction Details

New Cassel/Hicksville Ground Water Contamination Site

Nassau County, NY

October 2012

Well No.	Northing (feet)	Easting (feet)	TOC or GS Elev. (ft-amsl)	Screen/Sample Interval		Status	Comments
				Top (ft-bgs)	Bottom (ft-bgs)		
New Cassel Industrial Area OU-3							
EW-1B	214139.02	1106606.83	113.84	154	164	Active	
EW-1C	214133.38	1106591.29	113.99	506	516	Active	
EW-2B	214176.02	1105922.15	114.88	132	142	Active	
EW-2C	214169.96	1105910.27	114.80	504	514	Active	
EX-1	213894.38	1107322.85	107.71	185	205	Active	Groundwater extraction well.
EX-2	212587.22	1103835.27	105.47	265	285	Active	Groundwater extraction well.
FSMW-6A	214930.39	1107494.93	NA	70	80	Active	
FSMW-6B	214928.38	1107488.06	NA	149	159	Active	
FSMW-7A	214823.99	1107063.34	122.70	69	79	Active	
FSMW-7B	214816.77	1107063.15	121.27	148	158	Active	
FSMW-13A	214665.46	1107432.23	117.74	69	79	Active	
FSMW-13B	214659.28	1107433.80	117.77	119	129	Active	
FSMW-13C	214651.61	1107436.15	117.66	239	249	Active	
FSMW-14A	214580.13	1107262.83	116.99	119	129	Active	
FSMW-14B	214582.56	1107256.69	117.18	159	169	Active	
FSMW-14C	214584.35	1107249.01	116.97	239	249	Active	
GWHP-1	214657.78	1107129.44	NA	60	150	Inactive	Sampled at generally 10-foot intervals from HydroPunch boring.
GWHP-2	211592.49	1106085.25	NA	58	150	Inactive	Sampled at generally 10-foot intervals from HydroPunch boring.
GWHP-3	214136.05	1104185.50	NA	58	150	Inactive	Sampled at generally 10-foot intervals from HydroPunch boring.
GWHP-4	216555.29	1106236.13	NA	58	150	Inactive	Sampled at generally 10-foot intervals from HydroPunch boring.
MW-1	213450.19	1105300.86	113.67	90	110	Active	
MW-2	213453.60	1105304.62	113.69	110	130	Active	
MW-3	213456.32	1105307.42	113.67	130	150	Active	
MW-4	213460.96	1105312.86	113.76	180	200	Active	
MW-5	213806.40	1105650.97	115.64	90	110	Active	
MW-6	213802.99	1105653.58	115.70	110	130	Active	
MW-7	211946.79	1104331.50	105.92	90	110	Active	
MW-8	211947.25	1104337.36	105.85	120	140	Active	
MW-9	212954.47	1105703.40	109.94	310	315	Active	

TABLE 1
Well Construction Details
New Cassel/Hicksville Ground Water Contamination Site
Nassau County, NY
October 2012

Well No.	Northing (feet)	Easting (feet)	TOC or GS Elev. (ft-amsl)	Screen/Sample Interval		Status	Comments
				Top (ft-bgs)	Bottom (ft-bgs)		
MW-10	213449.23	1105233.35	113.05	275	285	Active	
MW-11S	212056.64	1104018.49	106.96	215	225	Active	
MW-11D	212056.64	1104018.49	106.96	275	285	Active	
MW-12	212461.12	1103100.39	104.70	215	225	Active	
MW-13	211667.02	1103498.73	105.26	200	210	Active	
MW-14	214120.66	1107347.51	111.85	185	205	Active	
MW-15	213749.98	1106780.90	111.03	185	205	Active	
MW-16S	213313.45	1106226.97	109.04	215	225	Active	
MW-16D	213313.45	1106226.97	109.07	275	285	Active	
MW-17S	213282.84	1107304.77	113.90	215	225	Active	
MW-17D	213282.84	1107304.77	113.87	275	285	Active	
NRMW-1	211513.00	1106072.00	107.01	60	70	Active	
NRMW-2	213343.00	1105420.00	112.70	60	70	Active	
NRMW-3	213033.00	1105923.00	108.24	60	70	Active	
NRMW-4	213356.00	1104001.00	110.03	60	70	Active	
TMW-1	212023.94	1103888.96	NA	72	285	Inactive	Sampled at generally 10- to 20-foot intervals from temporary monitor wells.
TMW-2	212826.11	1103638.25	NA	65	285	Inactive	Sampled at generally 20-foot intervals from temporary monitor wells.
TMW-3D	212720.39	1104659.48	NA	52	502	Inactive	Sampled at generally 20-foot intervals from temporary monitor wells.
TMW-4	212458.05	1105294.74	NA	65	285	Inactive	Sampled at 20-foot intervals from temporary monitor wells.
TMW-5	213463.41	1105545.03	NA	65	285	Inactive	Sampled at 20-foot intervals from temporary monitor wells.
TMW-6	214301.81	1106269.29	NA	63	283	Inactive	Sampled at 20-foot intervals from temporary monitor wells.
TMW-7	214207.61	1107381.31	NA	65	285	Inactive	Sampled at 20-foot intervals from temporary monitor wells.
TMW-8D	213297.60	1106240.24	NA	52	502	Inactive	Sampled at generally 20-foot intervals from temporary monitor wells.
TMW-9	213417.25	1104512.43	NA	60	280	Inactive	Sampled at 20-foot intervals from temporary monitor wells.
GTEOSI							
MW-1	219282.26	1109064.47	142.68	58	78	Inactive	Decommissioned in 2003.
MW-2	219286.98	1109131.42	142.36	58	78	Inactive	Decommissioned in 2003.
MW-3	219002.76	1108996.06	141.12	58	78	Active	
MW-4	219031.11	1109103.06	140.73	58	78	Active	
MW-5	219246.85	1109234.58	142.29	58	78	Inactive	Decommissioned in 2003.

TABLE 1
Well Construction Details
New Cassel/Hicksville Ground Water Contamination Site
Nassau County, NY
October 2012

Well No.	Northing (feet)	Easting (feet)	TOC or GS Elev. (ft-amsl)	Screen/Sample Interval		Status	Comments
				Top (ft-bgs)	Bottom (ft-bgs)		
MW-6	219238.97	1109255.77	142.45	58	78	Inactive	Decommissioned in 2003.
MW-7	219468.63	1109357.78	143.09	58	78	Inactive	Decommissioned in 2003.
MW-8	219009.41	1109060.39	140.91	120	130	Active	
MW-9	219036.42	1109195.54	141.58	72	82	Active	
MW-10	219039.36	1109218.76	141.47	120	130	Active	
MW-11	219079.07	1109296.90	141.77	71	81	Active	
MW-12	219057.73	1109301.31	142.28	120	130	Active	
MW-55I	219559.76	1109452.50	136.65	85	95	Active	
MW-P110-355	213717.02	1109434.84	118.71	345	355	Active	
MW-P110-440	213702.57	1109439.01	118.91	430	440	Active	
MW-P114-170	213920.33	1110463.49	120.02	160	170	Active	
MW-P114-290	213904.34	1110454.96	119.90	280	290	Active	
W-24	NA	NA	146.60	67	87	Inactive	Located to north in Nassau County Department of Public Works yard.
W-24D	NA	NA	145.45	109	129	Inactive	Located to north in Nassau County Department of Public Works yard.
W-25	NA	NA	145.97	64	84	Inactive	Located to north in Nassau County Department of Public Works yard.
Former Sylvania							
MW-13S	219755.81	1108764.46	145.3	70	80	Active	On NCDPW site to north
MW-13D	219754.58	1108775.11	145.42	290	300	Active	On NCDPW site to north
MW-14S	219812.98	1109078.70	144.39	70	80	Active	On NCDPW site to north
MW-14D	219828.19	1109083.22	144.29	294	304	Active	On NCDPW site to north
MW-14DD	219846.10	1109088.99	144.04	365	375	Active	On NCDPW site to north
MW-15S	219751.76	1109340.84	144.18	70	80	Active	On NCDPW site to north
MW-15D	219760.98	1109357.20	144.14	300	310	Active	On NCDPW site to north
MW-15DD	219742.81	1109354.66	144.24	360	370	Active	On NCDPW site to north
MW-16S	220169.77	1109630.96	145.52	70	80	Active	
MW-16D	220170.22	1109648.11	144.72	280	290	Active	
MW-17S	219668.79	1108969.28	144.48	65	75	Active	
MW-18S	219623.98	1109344.50	144.01	62	72	Active	
MW-18I	219610.04	1109338.61	144.16	118	128	Active	
MW-19S	219606.67	1108964.58	143.27	70	80	Active	

TABLE 1
Well Construction Details
New Cassel/Hicksville Ground Water Contamination Site
Nassau County, NY
October 2012

Well No.	Northing (feet)	Easting (feet)	TOC or GS Elev. (ft-amsl)	Screen/Sample Interval		Status	Comments
				Top (ft-bgs)	Bottom (ft-bgs)		
MW-19D	219606.48	1108952.25	143.18	296	306	Active	
MW-20S	219567.86	1109323.36	143.89	70	80	Active	
MW-20I	219552.35	1109310.52	144.13	140	150	Active	
MW-20D	219561.48	1109312.83	144.01	300	310	Active	
MW-21D	219484.07	1108737.14	143.16	300	310	Active	
MW-21I	219472.33	1108737.14	143.16	170	180	Active	
MW-22S	219412.43	1109340.10	144.21	70	80	Active	
MW-22I	219399.95	1109338.68	144.29	140	150	Active	
MW-22D	219392.39	1109334.39	144.17	305	315	Active	
MW-23S	219265.09	1108968.58	141.94	90	100	Active	
MW-23I	219256.48	1108976.54	141.75	170	180	Active	
MW-23D	219265.64	1108976.29	141.66	330	340	Active	
MW-24S	219336.90	1109094.78	142.43	70	80	Active	
MW-24DD	219337.08	1109085.13	145.66	360	370	Active	
MW-25S	219236.75	1108768.63	142.15	105	115	Active	
MW-25I	219219.53	1108770.39	142.00	230	240	Active	
MW-25D	219227.63	1108769.75	142.16	340	350	Active	
MW-26I	219265.30	1108864.44	142.40	110	120	Active	
MW-26D	219260.25	1108868.37	142.10	266	276	Active	
MW-27S	219236.67	1109092.07	141.66	80	90	Active	
MW-27I	219240.51	1109097.44	141.53	280	290	Active	
MW-27D	219240.51	1109097.44	141.64	365	375	Active	
MW-28S	219267.08	1109279.72	144.59	90	100	Active	On GCDR to east
MW-28I	219263.60	1109270.16	147.25	149	159	Active	On GCDR to east
MW-28D	219275.31	1109273.99	147.30	277	287	Active	On GCDR to east
MW-30S	218953.99	1108771.74	140.91	90	100	Active	
MW-30I	218958.16	1108787.67	140.92	230	240	Active	
MW-30D	218955.84	1108779.60	140.96	330	340	Active	
MW-31I	218998.56	1109004.30	140.99	180	190	Active	
MW-31D	218996.58	1108997.26	140.91	320	330	Active	

TABLE 1
Well Construction Details
New Cassel/Hicksville Ground Water Contamination Site
Nassau County, NY
October 2012

Well No.	Northing (feet)	Easting (feet)	TOC or GS Elev. (ft-amsl)	Screen/Sample Interval		Status	Comments
				Top (ft-bgs)	Bottom (ft-bgs)		
MW-32D	219079.80	1109291.05	141.24	295	305	Active	
MW-33S	219259.46	1109471.56	135.84	65	75	Active	On GCDR to east
MW-33D	219265.89	1109481.07	135.56	290	300	Active	On GCDR to east
MW-34S	219165.60	1109692.72	136.76	65	75	Active	On GCDR to east
MW-34D	219167.75	1109702.65	136.59	270	280	Active	On GCDR to east
MW-39S	218962.25	1108815.90	141.05	76	86	Active	
MW-41S	219576.13	1109279.36	143.62	66	76	Active	
MW-42I	219570.81	1109383.96	143.80	140	150	Active	
MW-43S	219515.52	1109327.65	144.03	65	75	Active	
MW-44S	219302.78	1108970.41	142.85	65	75	Active	
MW-49S	219338.60	1108812.55	143.98	100	110	Active	
MW-50I	219197.64	1108903.78	141.71	120	130	Active	
MW-51I	219015.32	1109094.89	140.52	130	140	Active	
MW-52D	219148.36	1109567.12	137.07	275	285	Active	On GCDR to east
MW-53S	219129.66	1109462.22	137.21	70	80	Active	On GCDR to east
MW-55S	219559.76	1109452.50	136.50	85.5	95.5	Active	On GCDR to east
General Instrument							
S-1-325	213800.45	1109869.93	119.98	285	325	Active	
S-1-450	213800.77	1109870.04	119.93	410	450	Active	
UVB-1	216450.07	1108886.67	NA	210	240	Inactive	Groundwater recirculation well.
				285	315		
				360	380		
UVB-2	2160005.73	1108640.70	NA	210	240	Inactive	Groundwater recirculation well.
				285	315		
				360	380		
UVB-3	216555.76	1109202.26	NA	210	240	Inactive	Groundwater recirculation well.
				285	315		
				360	380		
W-1-75	218830.11	1109106.86	139.80	65	75	Active	
W-1-120	218839.34	1109099.30	139.33	110	120	Active	
W-2-70	218772.64	1109070.18	139.25	60	70	Active	

TABLE 1
Well Construction Details
New Cassel/Hicksville Ground Water Contamination Site
Nassau County, NY
October 2012

Well No.	Northing (feet)	Easting (feet)	TOC or GS Elev. (ft-amsl)	Screen/Sample Interval		Status	Comments
				Top (ft-bgs)	Bottom (ft-bgs)		
W-2-120	218758.00	1109089.00	NA	110	120	Inactive	Abandoned
W-3-72	218985.21	1109072.29	140.88	62	72	Active	
W-3-112	218992.41	1109071.12	140.71	102	112	Active	
W-5-78	218404.23	1108995.96	141.01	68	78	Active	
W-6-79	218428.26	1109179.60	140.39	69	79	Active	
W-8-71	219039.93	1109322.09	141.25	61	71	Active	
W-9-71	218805.00	1109033.00	139.32	61	71	Inactive	Damaged or destroyed.
W-10-70	218492.38	1109241.73	139.13	60	70	Inactive	Damaged or destroyed.
W-10-71	218388.54	1108813.29	139.27	61	71	Active	
W-10-120	218376.12	1108814.76	138.52	110	120	Active	
W-11-70	218490.00	1109245.00	139.10	60	70	Active	
W-12-70	218463.84	1109389.05	138.56	60	70	Active	
W-12-120	218463.12	1109381.53	138.28	110	120	Active	
W-13-63			NA	53	63	Inactive	Damaged or destroyed.
W-14-150	218837.64	1109108.59	139.65	140	150	Active	
W-15-168	218200.94	1108867.25	134.37	158	168	Active	
W-16-148	218248.07	1109205.06	139.55	138	148	Active	
W-17-130	218257.00	1109313.00	NA	120	130	Inactive	
W-18-150	217372.48	1109179.95	135.87	140	150	Active	
W-19-110	217398.97	1109278.95	133.98	100	110	Active	
W-19-150	217398.93	1109278.77	134.09	140	150	Active	
W-20-120	217306.05	1109013.64	134.27	100	110	Active	
W-20-160	217306.17	1109014.01	134.42	150	160	Active	
W-21-150	217193.59	1108680.33	NA	140	150	Inactive	Damaged or destroyed.
W-21-180	217193.59	1108680.33	NA	170	180	Inactive	Damaged or destroyed.
W-22-95	218441.85	1109091.54	139.46	85	95	Active	
W-23-110	217819.01	1108789.41	134.21	100	110	Active	
W-24-260	217532.01	1108435.95	133.11	250	260	Active	
W-25-150	217162.46	1108555.28	131.15	140	150	Active	
W-25-188	217162.72	1108554.98	131.34	178	188	Active	

TABLE 1
Well Construction Details
New Cassel/Hicksville Ground Water Contamination Site
Nassau County, NY
October 2012

Well No.	Northing (feet)	Easting (feet)	TOC or GS Elev. (ft-amsl)	Screen/Sample Interval		Status	Comments
				Top (ft-bgs)	Bottom (ft-bgs)		
W-26-270	216618.46	1109374.25	119.91	260	270	Active	
W-27-240	216474.81	1108928.53	124.46	210	240	Active	
W-27-285	216475.64	1108932.98	123.64	275	285	Active	
W-28-262	216375.00	1108687.00	NA	252	262	Inactive	Abandoned.
W-30-285	216536.61	1109150.83	122.99	275	285	Active	
W-31-95	218256.87	1109258.27	138.94	85	95	Active	
W-32-110	218699.33	1108849.47	139.37	100	110	Active	
W-34-285	217344.71	1109122.27	134.56	275	285	Active	
W-35-240	216329.00	1108921.00	123.30	230	240	Inactive	Abandoned
W-35-315	216329.00	1108921.00	123.52	305	315	Inactive	Abandoned
W-35-380	216329.00	1108921.00	123.68	370	380	Inactive	Abandoned
W-36-390	213889.49	1108271.23	117.65	350	390	Active	
W-36-448	213889.45	1108271.54	117.65	418	448	Active	
W-37-325	215594.50	1107539.94	124.00	285	325	Active	
W-37-385	215594.31	1107539.90	124.01	355	385	Active	
Anchor Chemical							
PW-02	218052.98	1109640.14	134.45	71	162	Active	CMT multilevel well with seven 2-foot sampling ports.
PW-03	218036.53	1109746.24	134.18	70	163	Active	CMT multilevel well with seven 2-foot sampling ports.
PW-04	218107.17	1109958.49	130.72	71	163	Active	CMT multilevel well with seven 2-foot sampling ports.
PW-05	217670.32	1109481.43	132.43	68.5	221	Active	CMT multilevel well with seven 2-foot sampling ports.
PW-06	217610.45	1109694.83	132.10	70	222	Active	CMT multilevel well with seven 2-foot sampling ports.
PW-07	217856.59	1109922.09	129.11	70	221	Active	CMT multilevel well with seven 2-foot sampling ports.
123 Post Avenue							
OU2-1	213738.02	1098158.37	NA	35	50	Active	
OU2-2	213545.44	1098122.97	NA	56	66	Active	
OU2-3	212716.62	1097779.57	NA	90	100	Active	
OU2-4	212208.83	1097657.79	NA	104	114	Active	
OU2-5	212037.49	1097837.63	NA	111	121	Active	
OU2-6	212753.53	1097853.65	NA	105	115	Active	
OU2-7A	212675.49	1097750.64	NA	90	100	Active	
OU2-7B	212675.49	1097750.64	NA	110	120	Active	

TABLE 1
Well Construction Details
New Cassel/Hicksville Ground Water Contamination Site
Nassau County, NY
October 2012

Well No.	Northing (feet)	Easting (feet)	TOC or GS Elev. (ft-amsl)	Screen/Sample Interval		Status	Comments
				Top (ft-bgs)	Bottom (ft-bgs)		
OU2-7C	212675.49	1097750.64	NA	140	150	Active	
OU2-8A	212538.15	1097747.52	NA	90	100	Active	
OU2-8B	212538.15	1097747.52	NA	115	125	Active	
OU2-8C	212538.15	1097747.52	NA	140	150	Active	
OU2-9A	212541.27	1097816.19	NA	90	100	Active	
OU2-9B	212541.27	1097816.19	NA	115	125	Active	
OU2-9C	212541.27	1097816.19	NA	140	150	Active	
OU2-10A	212550.63	1097881.74	NA	90	100	Active	
OU2-10B	212550.63	1097881.74	NA	115	125	Active	
OU2-10C	212550.63	1097881.74	NA	140	150	Active	
OU2-11	212257.22	1097753.76	NA	190	200	Active	
IW-1	212733.53	1097719.57	NA	90	95	Active	Oxidation injection well.
IW-3	212753.53	1097809.57	NA	90	95	Active	Oxidation injection well.
IW-4	212753.53	1097913.65	NA	90	95	Active	Oxidation injection well.

TOC = top of casing
GS = ground surface
ft-amsl = feet above mean sea level
ft-bgs = feet below ground surface
Vertical datum = NAVD 88
Coordinate system = NAD83 New York State Plane, Long Island Zone
NA - not available
Coordinates for the 123 Post Avenue site wells were estimated using Geographic Information System software.

TABLE 2

Groundwater Elevation Data

New Cassel/Hicksville Ground Water Contamination Site

Nassau County, NY

October 2012

Well No.	Date	Top of Casing Elev. (ft-amsl)	Screen Interval (ft-bgs)		Depth to Groundwater (ft-btoc)	Groundwater Elevation (ft-amsl)
New Cassel Industrial Area Site						
MW-9	12/3/2009	109.94	310	315	41.55	68.39
FSMW-14C	12/3/2009	116.97	239	249	45.76	71.21
General Instrument Site						
S-1-325	11/30/2009	119.90	285	325	49.65	70.25
W-24-260	11/30/2009	133.04	250	260	57.24	75.80
W-26-270	11/30/2009	119.84	260	270	44.96	74.88
W-27-285	11/30/2009	123.58	275	285	49.11	74.47
W-30-285	11/30/2009	122.93	275	285	48.03	74.90
W-34-285	11/30/2009	134.54	275	285	59.01	75.53
W-36-390	11/30/2009	117.59	350	390	47.63	69.96
W-37-325	11/30/2009	123.94	285	325	50.96	72.98

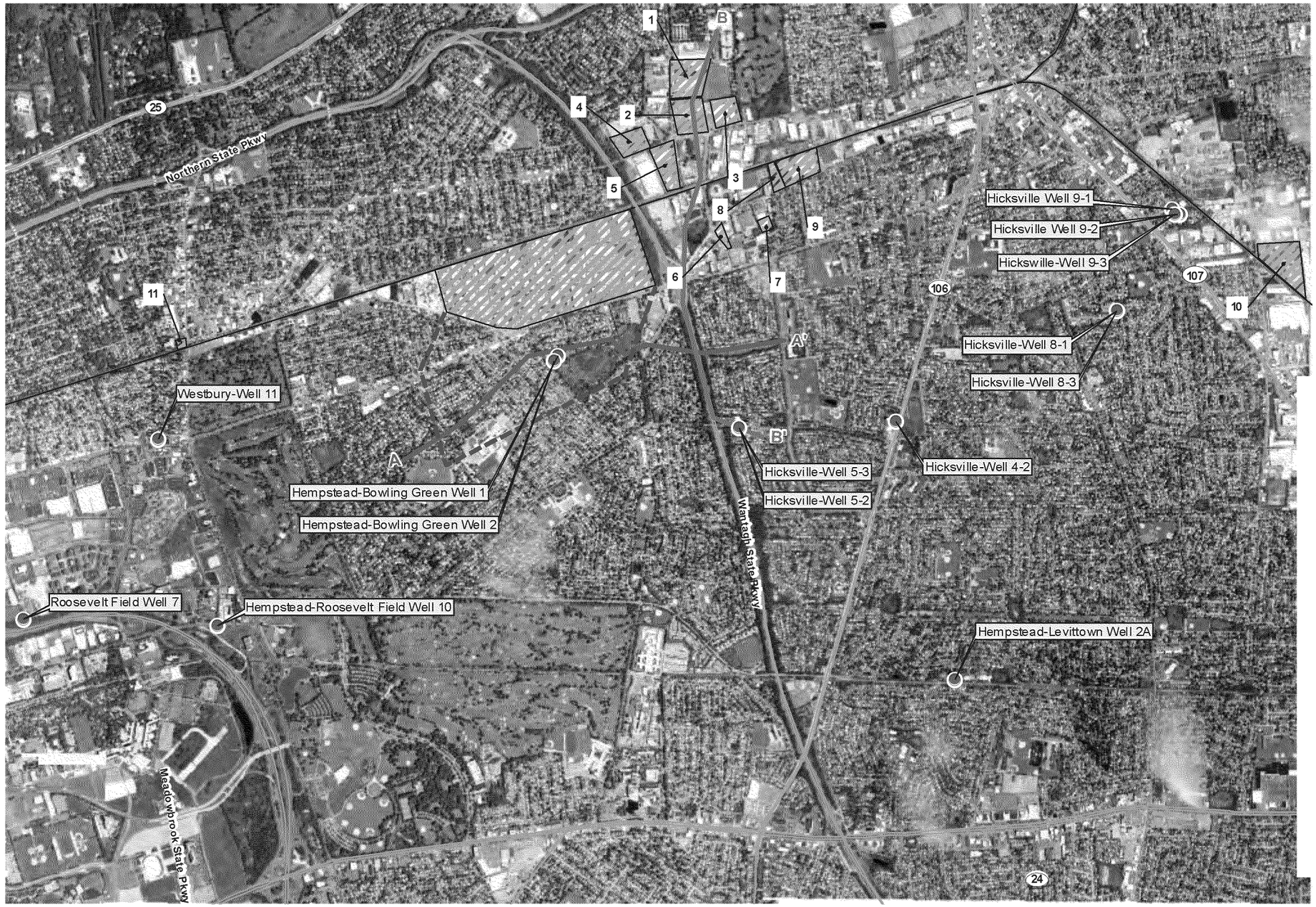
ft-amsl = feet above mean sea level
ft-bgs = feet below ground surface
ft-btoc = feet below top of casing

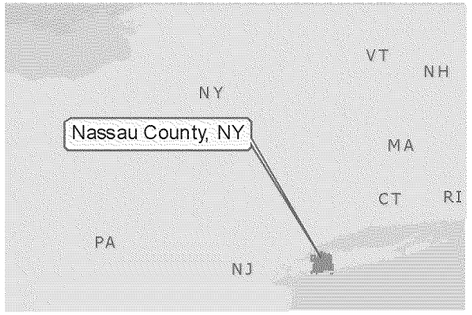
TABLE 3
Upgradient Well Construction Details
New Cassel Industrial Area OU-3
Nassau County, NY
October 2012

Well No.	Northing (feet)	Easting (feet)	TOC or GS Elev. (ft-amsl)	Screen/Sample Interval		Status
				Top (ft-bgs)	Bottom (ft-bgs)	
N-5007	218110.92	1102868.06	NA	209	259	Unknown
N-5655	217014.85	1106336.38	NA	205	255	Unknown
N-6819	216609.87	1106338.47	NA	215	265	Unknown
N-7353	218105.87	1103151.45	NA	300	390	Unknown
N-9354	216780.13	1099719.38	NA	89	94	Unknown
N-10459	217192.00	1106450.00	NA	68	78	Unknown
N-10460	217395.00	1107526.00	NA	68	78	Unknown
N-10461	216303.74	1105801.23	NA	66	76	Unknown
N-10462	216381.00	1104914.00	NA	64	74	Unknown

TOC = top of casing
GS = ground surface
ft-amsl = feet above mean sea level
ft-bgs = feet below ground surface
Vertical datum = NAVD 88
Coordinate system = NAD83 New York State Plane, Long Island Zone
NA - not available
Well information from USGS Nassau County Database

FIGURES
New Cassel/Hicksville Ground Water Contamination Site
Nassau County, New York
July 2013





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Legend

- Public Supply Well with Observed Release Concentration
- Public Supply Well with Background Concentration
- Geologic Cross Section A-A'
- Geologic Cross Section B-B'
- New Cassel Industrial Area
- New Cassel Industrial Area Off-Property Groundwater OU3
- Other Sites Where Chlorinated Solvents Were Used

1 - Former Sylvania
2 - General Instrument
3 - Former Anchor Chemical
4 - Metco
5 - Former Harris PRD
6 - Former Depew Manufacturing
7 - Former Bowe Systems
8 - Former Magnusonic
9 - Former Alsy Manufacturing
10 - Hooker Chemical/Ruco Polymer
11 - 123 Post Avenue

NOTE: Sites 2 through 9 are downgradient or along plume path of former Sylvania.

2,000 0 2,000
Feet

Map created using NAIP imagery data from USGS, Sample Location supplied by EPA.

Map Creation Date: 03 October 2011

Coordinate system: New York State Plane Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

Data: g:\arcviewprojects\SERAS01\00-144
MXD file: g:\ArcInfoProjects\SERAS01\SER00144_NewCassel_IndustrialArea\144_Site_Location_F1

U.S EPA Environmental Response Team Scientific Engineering Response and Analytical Services EP-W-09-031 W.A.# 0-144	Figure 1 Site Location NCHGW Superfund Site Nassau County, New York

R2-0003435

Map created using NAIP imagery data from USGS, Sample Location supplied by USGS.

Map Creation Date: 08 December 2011

Coordinate system: New York State Plane Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

Data: g:\arcviewprojects\SERAS01\00-144
MXD file: g:\ArcInfoProjects\SERAS01\SER00144_NewCassel_IndustrialArea\144_Well_Boring_Locations(New)_F2

N
W E
S

680 0 680
Feet

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EP-W-09-031
W.A.# 0-144

Figure 2
Well and Boring Locations
New Cassel Industrial Area OU-3
and 123 Post Avenue
Nassau County, New York

R2-0003436

Map created using NAIP imagery data from USGS, Sample Location supplied by EPA.

Map Creation Date: 29 August, 2012

Coordinate system: New York State Plane Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

Data: g:\arcviewprojects\SERAS01\00-144
MXD file: g:\ArcInfoProjects\SERAS01\SER00144_NewCassel_IndustrialArea\144_Former_Sylvania_Well_Loc_F3

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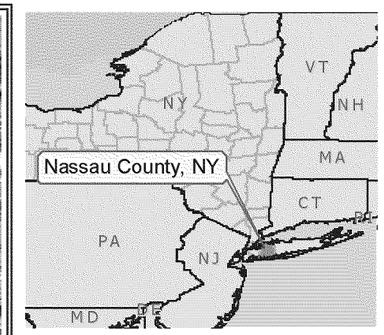
W.A.# 0-144

Figure 3
Well Locations
Former Sylvania
NCHGW Superfund Site
Nassau County, New York

R2-0003437

ED_001164_00018869-00044



Legend

- Active Monitor Well, GTEOSI
- Inactive Monitor Well, GTEOSI
- Active Monitor Well, Anchor Chemical
- Active Monitor Well, General Instrument
- Inactive Monitor Well, General Instrument
- Public Supply Wells

Map created using NAIP imagery data from USGS, Sample Location supplied by USGS.

Map Creation Date: August 2012

Coordinate system: New York State Plane Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

Data: g:\arcviewprojects\SERAS01\00-144
MXD file: g:\ArcInfoProjects\SERAS01\SER00144_NewCassel_IndustrialArea\144_AnchChem_GEIndust_Well_Loc_F4

0 850 1,700 Feet

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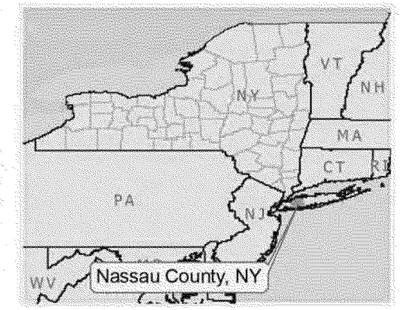
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-144

Figure 4
Well Locations
GTEOSI, Anchor Chemical and General Instrument
NCHGW Superfund Site
Nassau County, New York

R2-0003438



Legend

- Monitor Well Location
- Groundwater Elevation Contour (C.I.= 1 ft)
- Groundwater Flow Direction

Note:
Groundwater elevation measured in MW-9 and FSMW-14C on 12/3/2009 and in all other wells on 11/30/2009.

Map created using NAIP imagery data from USGS, Sample Location supplied by EPA.

Map Creation Date: 11 November 2011

Coordinate system: New York State Plane Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

600 0 600
Feet

Data: g:\arcviewprojects\SERAS01\00-144
MXD file: g:\ArcInfoProjects\SERAS01\SER00144_NewCassel_IndustrialArea\144_Groundwater_Elevation_Contour_Map_F5

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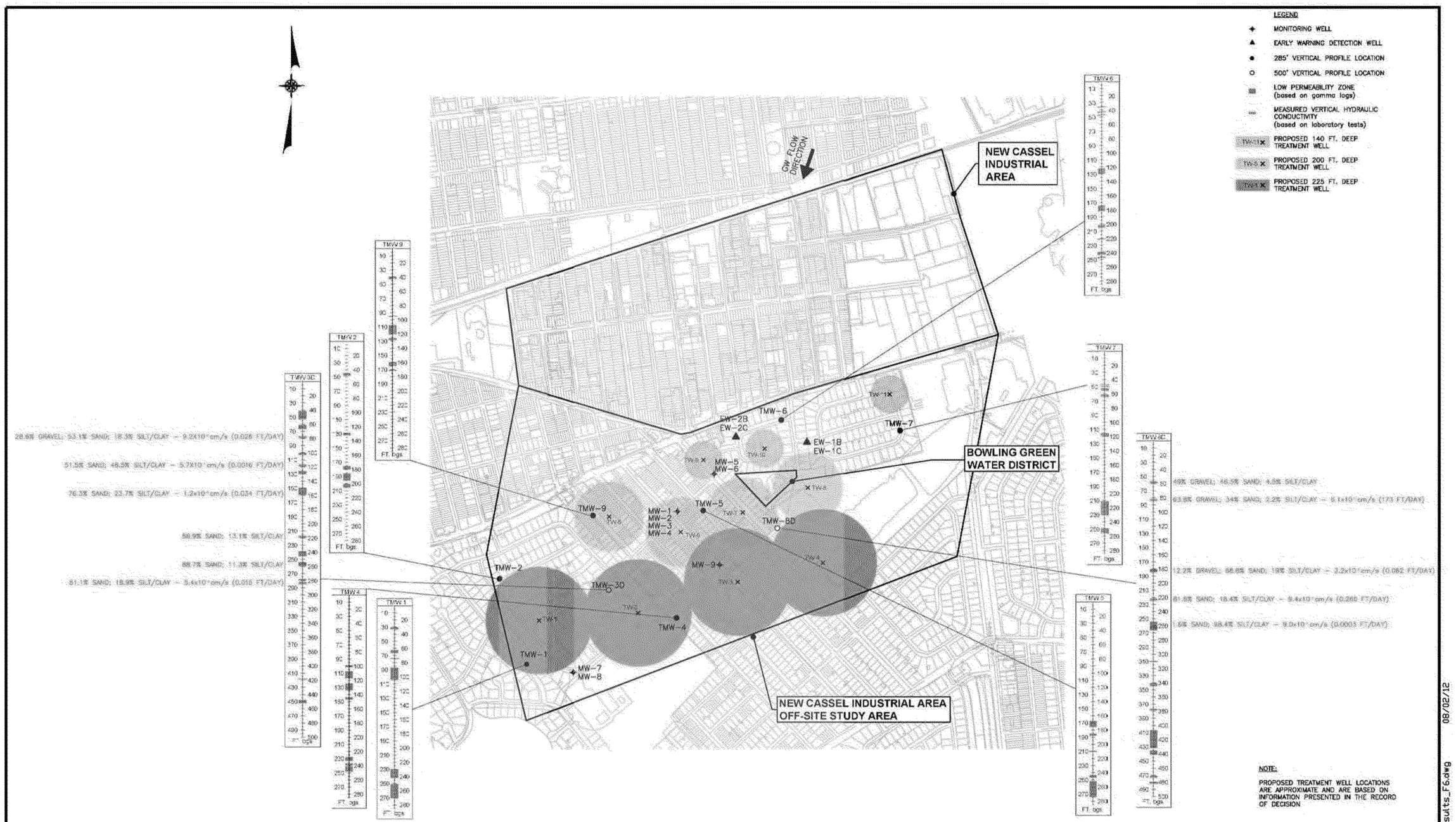
W.A.# 0-144

Figure 5
Groundwater Elevation Contour Map
(239 to 325 Feet BGS)
NCHGW Superfund Site
Nassau County, New York



REFERENCE: Predesign Investigation Report, 2009, Dvirka and Bartilucci.

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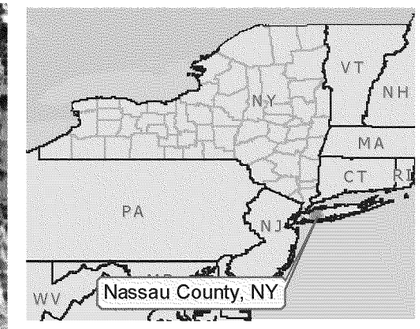
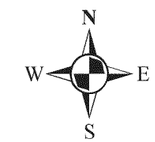
W.A.# 0-144

Figure 6
Low Permeability Layers Based on Geophysical Logging Results
NCHGW Superfund Site
Nassau County, NY

R2-0003440

ED_001164_00018869-00047





Magnetic North

Legend

Upgradient Well

Outline of NCIA

Map created using NAIP imagery data from USGS, Sample Location supplied by EPA.

Map Creation Date: 29 August 2012

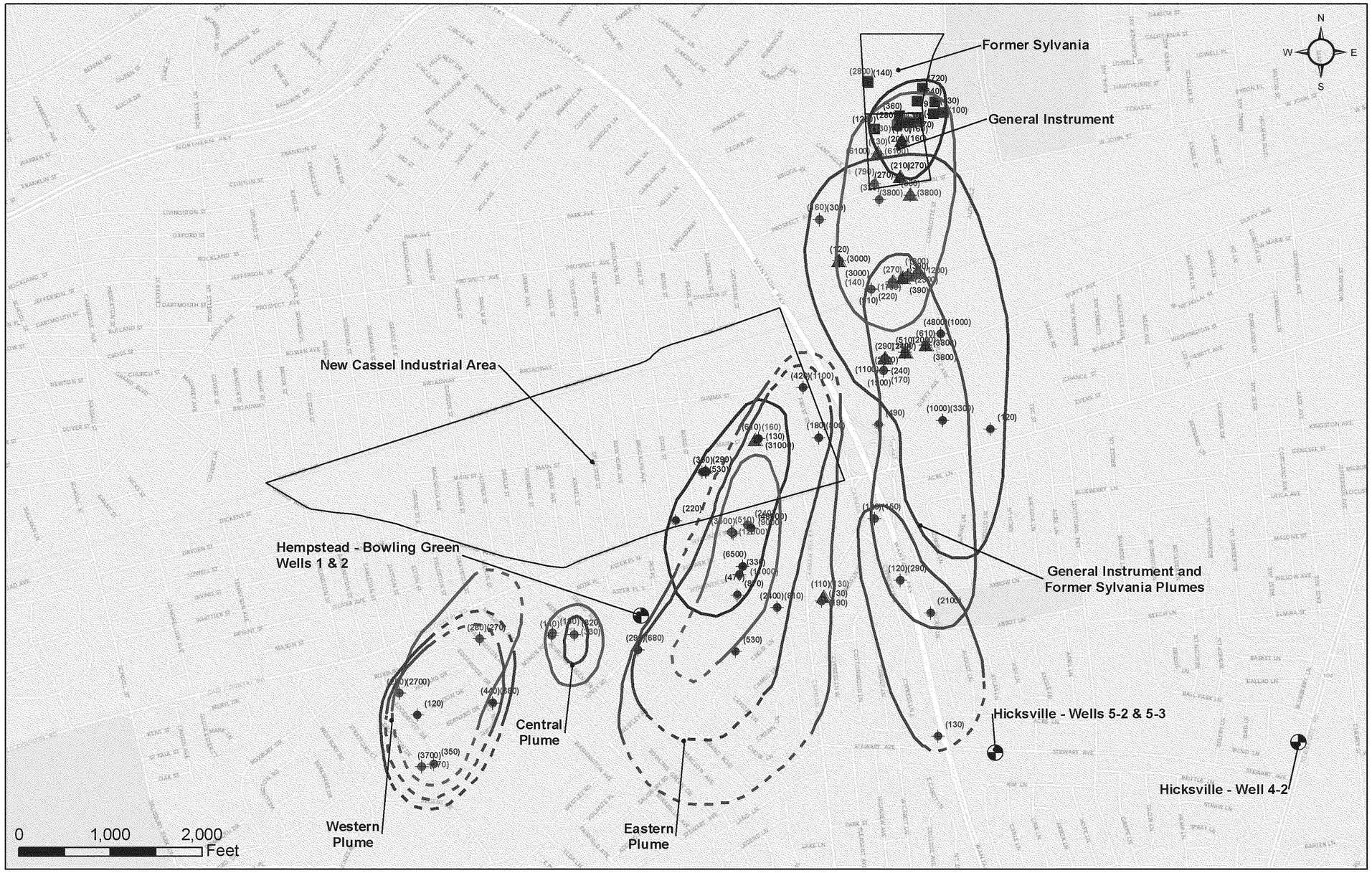
Coordinate system: New York State Plane Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

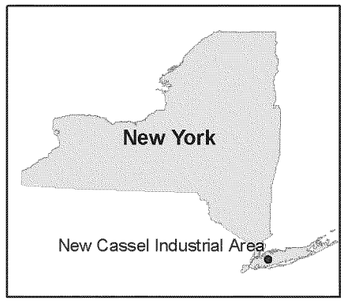
Data: g:\arcviewprojects\SERAS01\00-144
MXD file: g:\ArcInfoProjects\SERAS01\SER00144_NewCassel_IndustrialArea\144_Upgradient Well Loc_F7

900 0 900
Feet

U.S EPA Environmental Response Team Scientific Engineering Response and Analytical Services EP-W-09-031 W.A.# 0-144	Figure 7 Upgradient Well Locations NCHGW Superfund Site Nassau County, New York

R2-0003441





Legend

Public Supply Wells

100 ug/L Tetrachloroethylene isoconcentration Contours
(DASHED WHERE INFERRED)

- 50 - 100 FEET BGS
- 101 - 200 FEET BGS
- 201 - 300 FEET BGS
- 301 - 400 FEET BGS
- 401 - 500 FEET BGS

New Cassel Off-property Tetrachloroethylene > 99 ug/L

- 50 - 100 FEET BGS
- 101 - 200 FEET BGS
- 201 - 300 FEET BGS
- 301 - 400 FEET BGS
- 401 - 500 FEET BGS

General Instrument Tetrachloroethylene > 99 ug/L

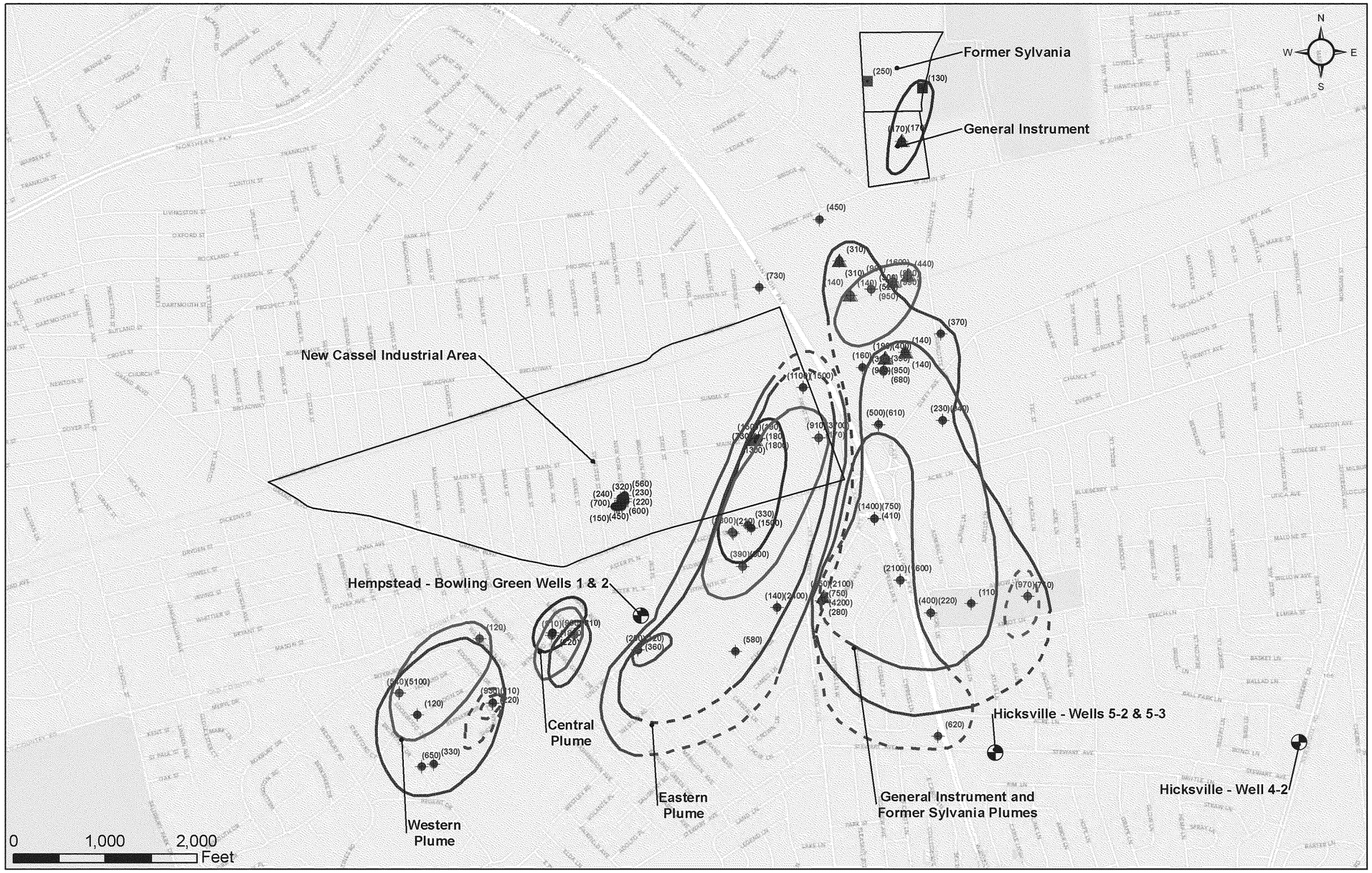
- 50 - 100 FEET BGS
- 101 - 200 FEET BGS
- 201 - 300 FEET BGS
- 301 - 400 FEET BGS
- 401 - 500 FEET BGS

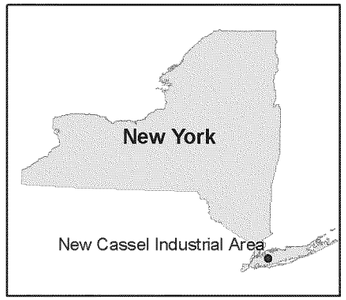
Former Sylvania Tetrachloroethylene > 99 ug/L

- 50 - 100 FEET BGS
- 101 - 200 FEET BGS
- 201 - 300 FEET BGS
- 301 - 400 FEET BGS

Map Content: Base Map supplied by ESRI, Sample Locations supplied by EPA Map Creation Date: 29 December 2011 Coordinate System: New York State Plane Long Island FIPS: 3104 Datum: NAD83 Units: Feet	**NCHGW Superfund Site** **100 ug/L isoconcentration Contours** **for Tetrachloroethylene (PCE)**	U.S EPA Environmental Response Team Scientific Engineering Response and Analytical Services EP-W-09-031 W.A.# 0-144	Figure 8 NCHGW Superfund Site 100 ug/L isoconcentration Contours for Tetrachloroethylene (PCE) Nassau County, New York

R2-0003442





Legend

Public Supply Wells

100 ug/L Trichloroethylene isoconcentration Contours (DASHED WHERE INFERRED)

- 50-100 FEET BGS
- 101-200 FEET BGS
- 201-300 FEET BGS
- 301-400 FEET BGS
- 401-500 FEET BGS

New Cassel Off-property Trichloroethylene > 99 ug/L

- 50 - 100 FEET BGS
- 101 - 200 FEET BGS
- 201 - 300 FEET BGS
- 301 - 400 FEET BGS
- 401 - 500 FEET BGS

General Instrument Trichloroethylene > 99 ug/L

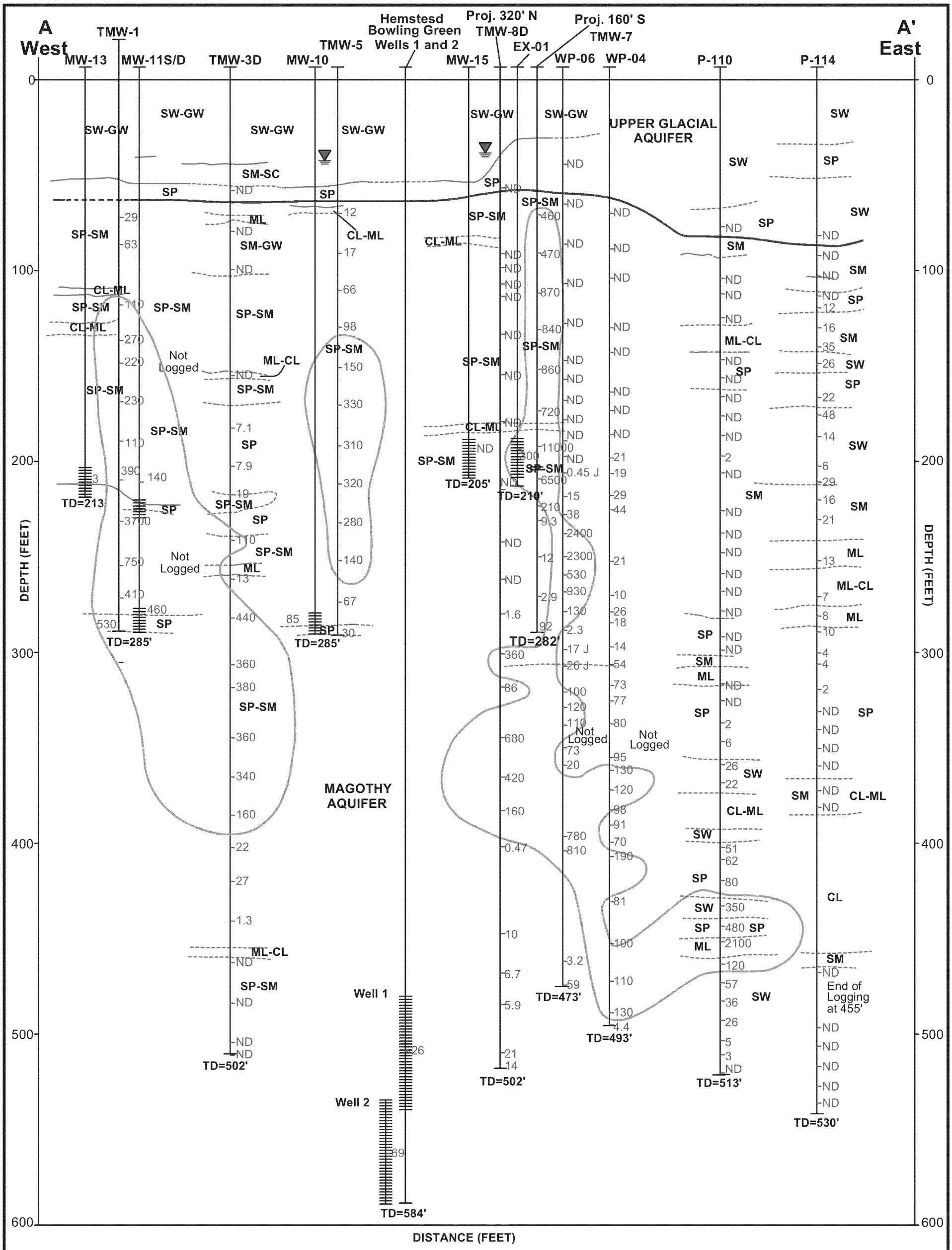
- 50 - 100 FEET BGS
- 101 - 200 FEET BGS
- 201 - 300 FEET BGS
- 301 - 400 FEET BGS
- 401 - 500 FEET BGS

Former Sylvania Trichloroethylene > 99 ug/L

- 50 - 100 FEET BGS
- 301 - 400 FEET BGS

Map Content: Base Map supplied by ESRI, Sample Locations supplied by EPA Map Creation Date: 29 December 2011 Coordinate System: New York State Plane Long Island FIPS: 3104 Datum: NAD83 Units: Feet	**NCHGW Superfund Site** **100 ug/L isoconcentration Contours** **for Trichloroethylene (TCE)**	U.S EPA Environmental Response Team Scientific Engineering Response and Analytical Services EP-W-09-031 W.A.# 0-144	Figure 9 NCHGW Superfund Site 100 ug/L isoconcentration Contours for Trichloroethylene (TCE) Nassau County, New York

R2-0003443



LEGEND

Tetrachloroethylene Isoconcentration Contour of 100 µg/L

110 = Trichloroethylene Isoconcentration in µg/L.

ND = Not Detected

SP-SM, SM-SC, SP, SM, SW = Sand

SW-GW = Sand and Gravel

CL-ML = Clay and Silt

CL = Clay

= Screen Interval

= Groundwater Level measured on 4/13/11

SCALE:

50'

1000'

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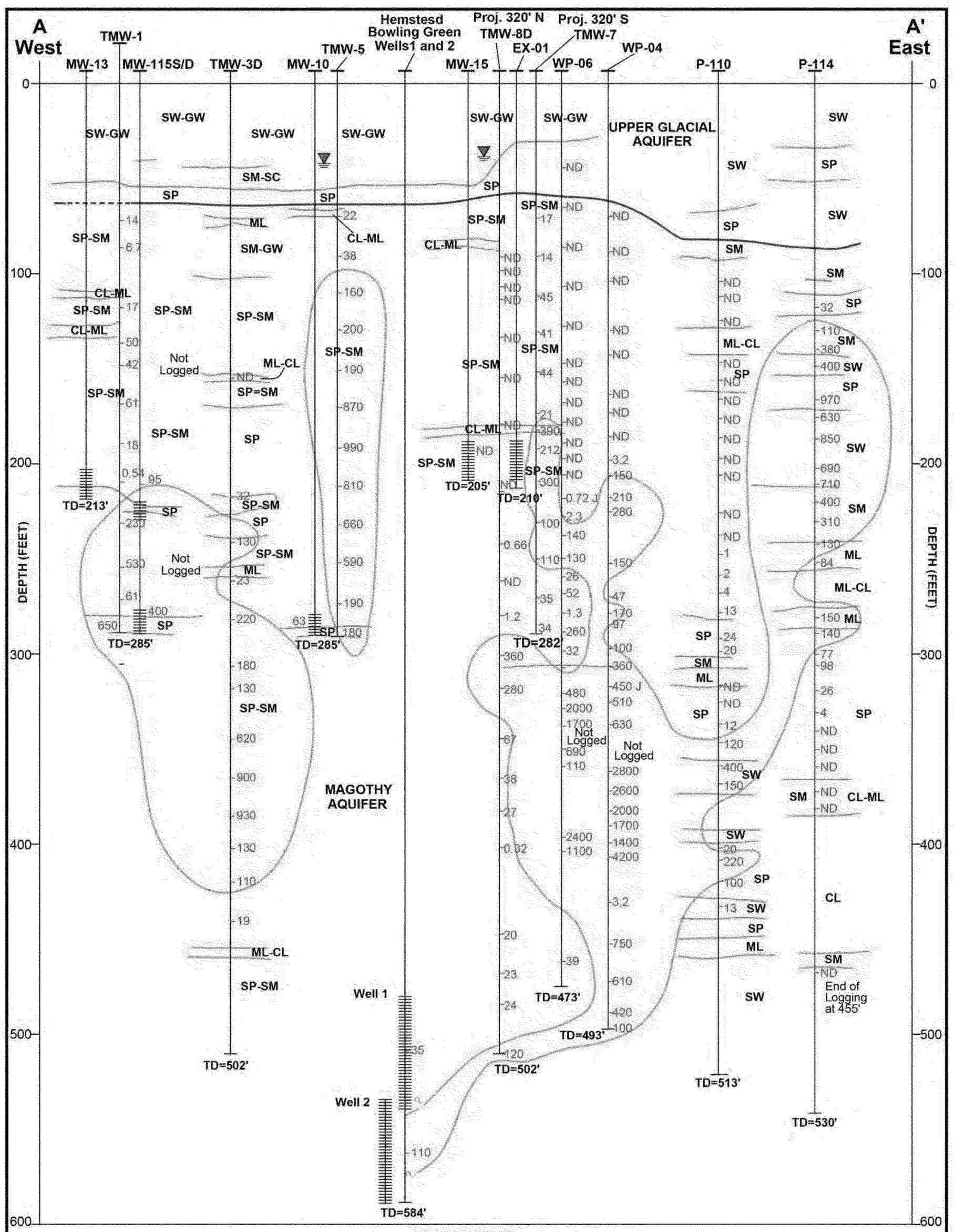
EP-W-09-031
W.A.# 0 -144

Figure 10
Cross Section A-A'
Showing Tetrachloroethylene (PCE)
Concentrations in Groundwater
NCHGW Superfund Site
Nassau County, NY

00-144/144_Cr_Sect_AA'_PCE.dwg

R2-0003444



LEGEND

Trichloroethylene Isoconcentration Contour of 100 µg/L

110 = Trichloroethylene Isoconcentration in µg/L.

ND = Not Detected

SP-SM, SM-SC, SP, SM, SW = Sand

SW-GW = Sand and Gravel

CL-ML = Clay and Silt

CL = Clay

= Screen Interval

= Groundwater Level measured on 4/13/11

SCALE:

50'

1000'

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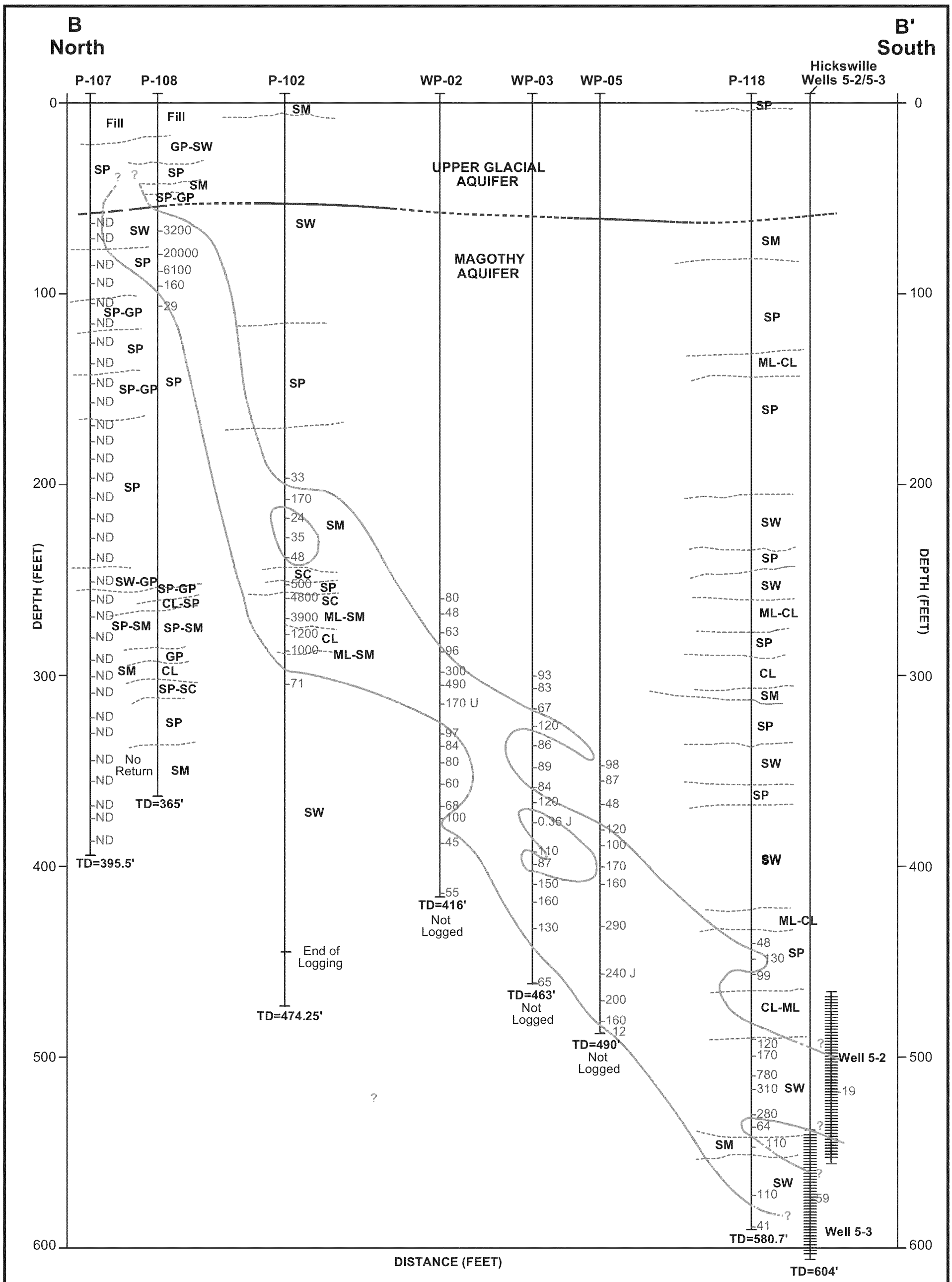
EP-W-09-031
W.A.# 0-144

Figure 11
Cross Section A-A'
Showing Trichloroethylene (TCE)
Concentrations in Groundwater
NCHGW Superfund Site
Nassau County, NY

00-144/144_Cr_Sect_AA'_TCE.dwg



LEGEND

Tetrachloroethylene Isoconcentration Contour of 100 µg/L

4800 = Tetrachloroethylene Isoconcentration in µg/L.

ND = Not Detected

GP = Gravel

SP-SC, SP, SM, SW = Sand

SW-GP, SP-GP = Sand and Gravel

CL-ML = Clay and Silt

CL = Clay

= Screen Interval

SCALE:

50'

1000'

U.S. EPA Environmental Response Team
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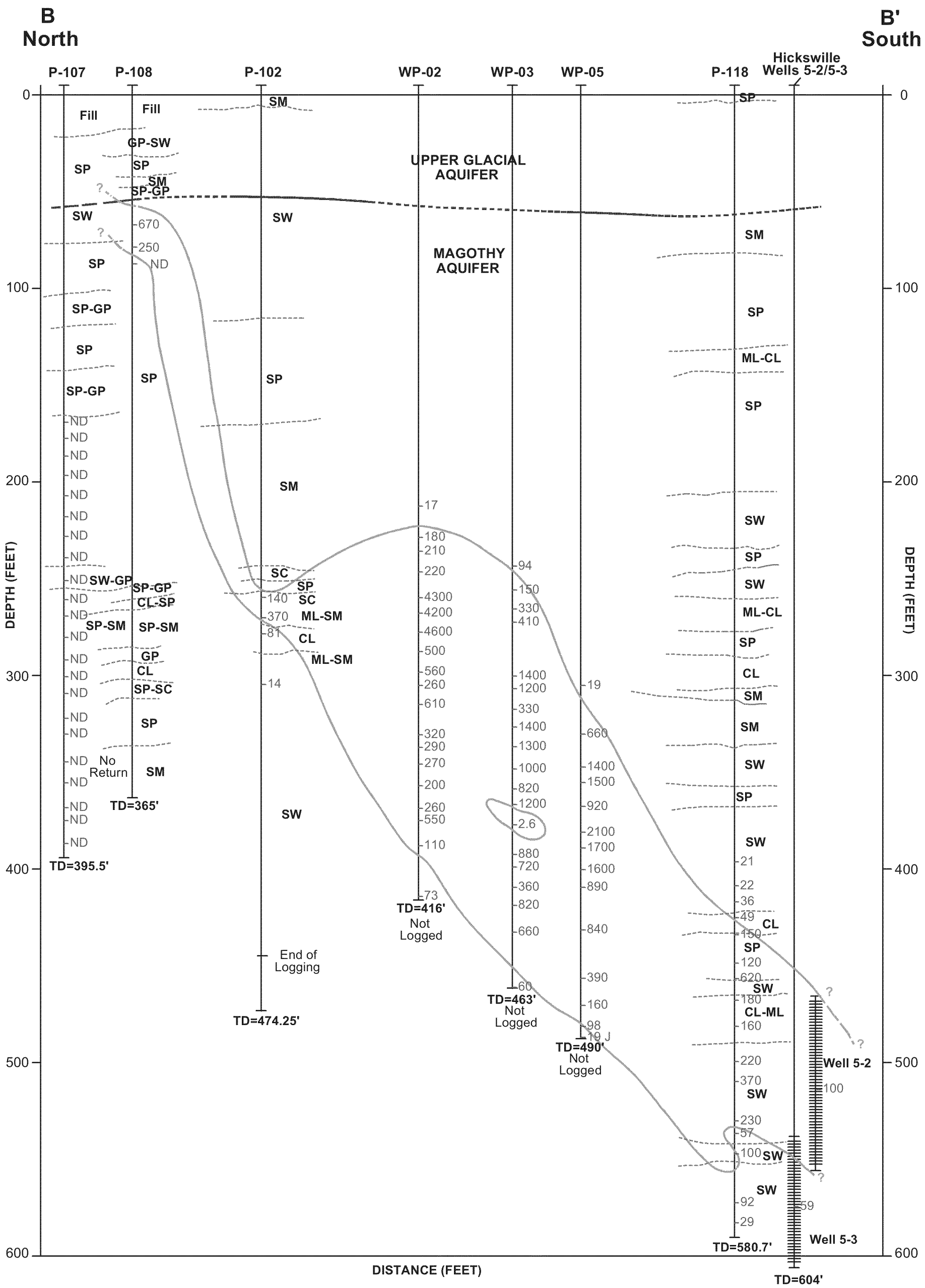
EP-W-09-031
W.A.# 0 -144

Figure 12
Cross Section B-B'
Showing Tetrachloroethylene (PCE)
Concentrations in Groundwater
NCHGW Superfund Site
Nassau County, NY

00-144/144_Cr_Sect_BB'_PCE.dwg

R2-0003446



LEGEND

Trichloroethylene Isoconcentration Contour of 100 µg/L

320 = Trichloroethylene Isoconcentration in µg/L.

ND = Not Detected

GP = Gravel

SP-SC, SP, SM, SW = Sand

SW-GP, SP-GP = Sand and Gravel

CL-ML = Clay and Silt

CL = Clay

= Screen Interval

SCALE:

50'

1000'

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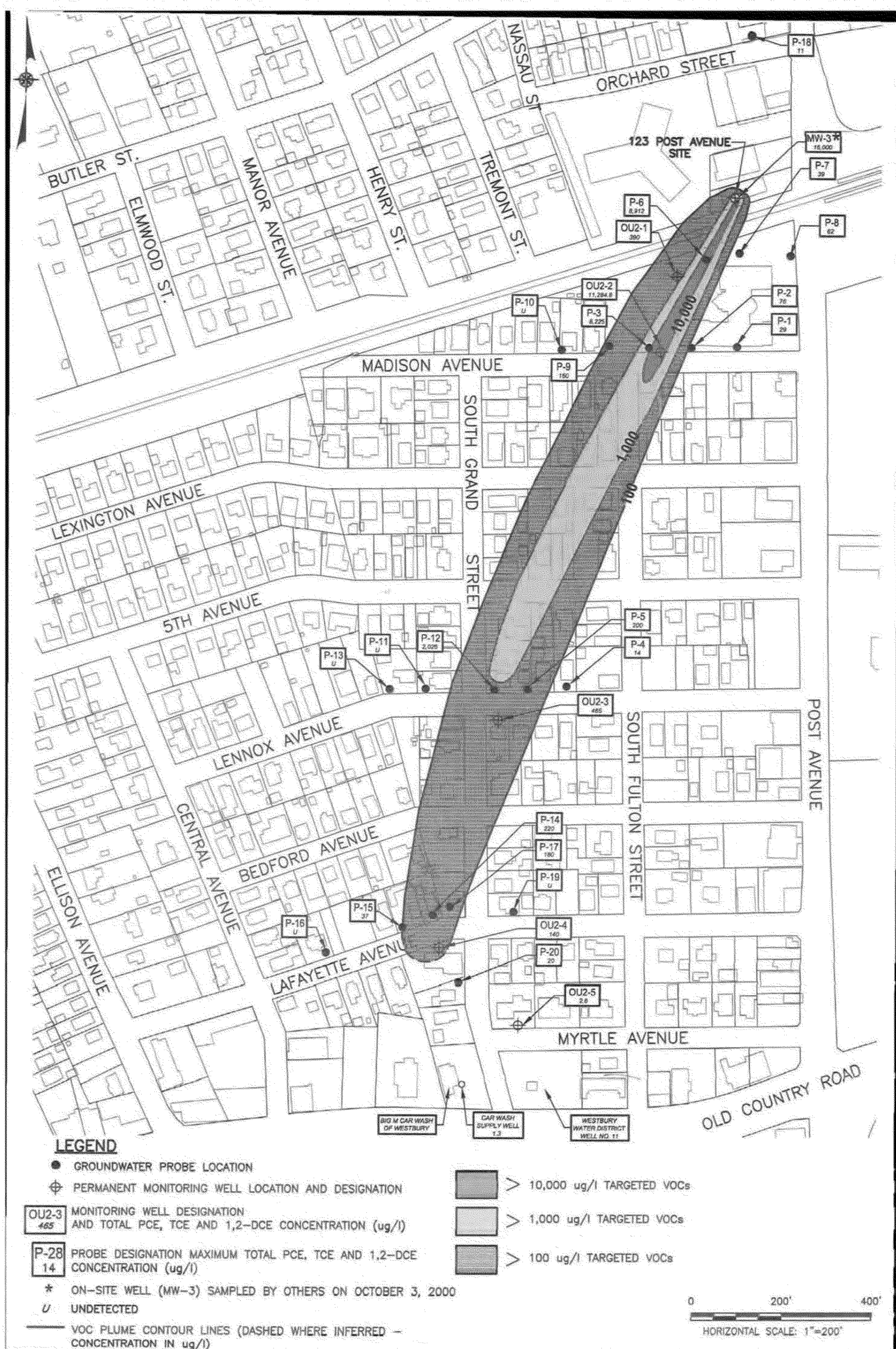
EP-W-09-031
W.A.# 0 -144

Figure 13
Cross Section B-B'
Showing Trichloroethylene (TCE)
Concentrations in Groundwater
NCHGW Superfund Site
Nassau County, NY

00-144/144_Cr_Sect_BB'_TCE.dwg

R2-0003447



SOURCE: Dvirka and Bartilucci, 2009a

U.S. EPA Environmental Response Team
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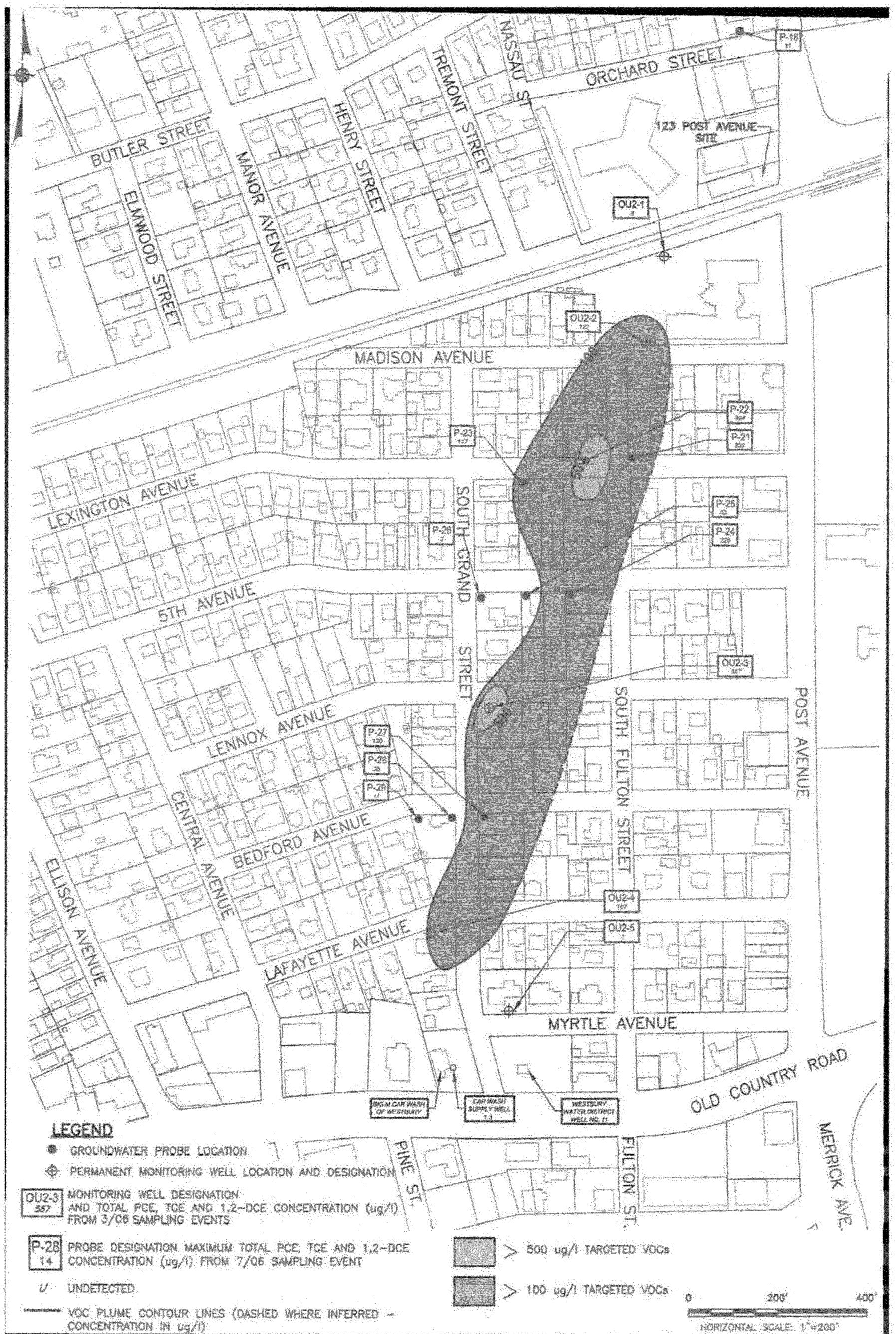
EP-W-09-031
W.A.# 0 -144

Figure 14
Vertical Profile Sample Locations and VOC Results-2001
123 Post Avenue-
Operable Unit 2 Remedial Design
NCHGW Superfund Site
Nassau County, New York

144/144_New Cassel_Fig20 10/05/12

R2-0003448



SOURCE: Dvirka and Bartilucci, 2009b

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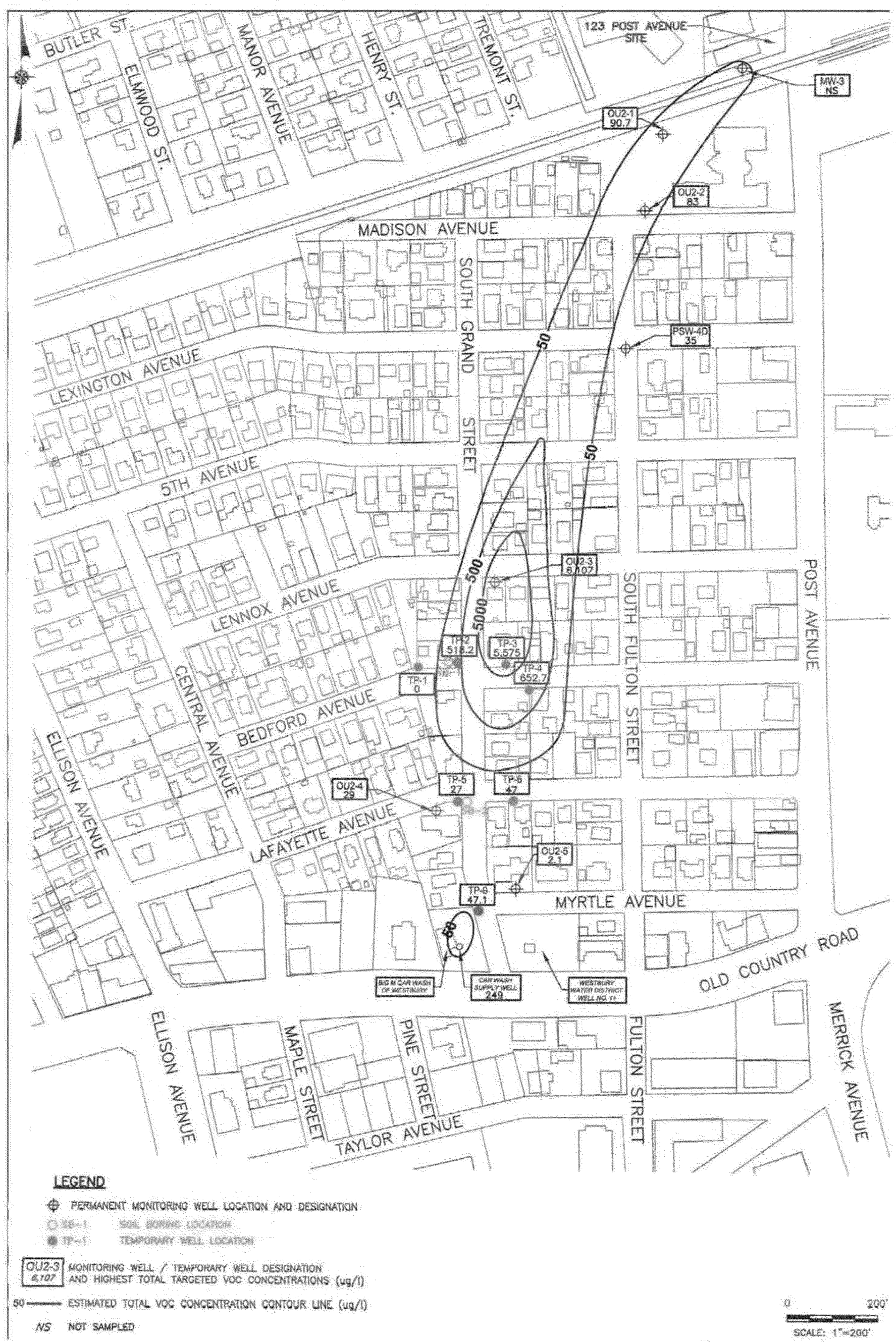
EP-W-09-031
W.A.# 0 -144

Figure 15
Vertical Profile Sample Locations and VOC Results-2006
123 Post Avenue-
Operable Unit 2 Remedial Design
NCHGW Superfund Site
Nassau County, New York



SOURCE: Dvirka and Bartilucci, 2010

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EP-W-09-031
W.A.# 0-144

Figure 16
Estimate Areal Extent of VOC Plume
Based on Existing Data
123 Post Avenue-
Operable Unit 2 Remedial Design
NCHGW Superfund Site
Nassau County, New York

144/144_New Cassel_Fig22 10/05/12

R2-0003450

ED_001164_00018869-00057

SOURCE: Dvirka and Bartilucci, 2012

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W.A.# 0-144

Figure 17
Monitoring Well Location Map
123 Post Avenue-Operable Unit 2
Remedial Design
NCHGW Superfund Site
Nassau County, New York

144/144_New Cassel_Fig23 10/05/12

R2-0003451

ED_001164_00018869-00058

Map created using NAIP imagery data from USGS, Sample Location supplied by USGS.

Map Creation Date: 08 December 2011

Coordinate system: New York State Plane Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

Data: g:\arcviewprojects\SERAS01\00-144
MXD file: g:\ArcInfoProjects\SERAS01\SER00144_NewCassel_IndustrialArea\144_MonitorWell_MolarFractions_F24

U.S EPA Environmental Response Team
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EP-W-09-031
W.A.# 0-144

Figure 18
Molar Fractions of Total Ethenes
NCHGW Superfund Site
Nassau County, New York

R2-0003452

Map created using NAIP imagery data from USGS, Sample Location supplied by USGS.

Map Creation Date: October 2012

Coordinate system: New York State Plane Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

200 0 200
Feet

Legend

Molar Fraction of Total Ethenes

PCE
TCE
DCE
VC

U.S EPA Environmental Response Team Scientific Engineering Response and Analytical Services EP-W-09-031 W.A.# 0-144	Figure 19 Molar Fractions of Total Ethenes 123 Post Avenue Nassau County, New York

Data: g:\arcviewprojects\SERAS01\00-144
MXD file: g:\ArcInfoProjects\SERAS01\SER00144_NewCassel_IndustrialArea\144_Molar_Fractions_ofTotal_Ethenes_F25

R2-0003453