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March 29, 2012

Ms. Gloria Sosa
Western New York Remediation Section
New York Remediation Branch
Emergency and Remediation Response Division
U.S. EPA – Region II
290 Broadway, 20th Floor
New York, NY 10007-1866

Dear Ms. Sosa:

NECCO PARK 2011 ANNUAL REPORT

Enclosed are two copies of the *Remedial Action Post-Construction Monitoring 2011 Annual Report* for the DuPont Necco Park Hydraulic Controls System (HCS), Groundwater Treatment Facility (GWTF), and landfill cap.

This seventh annual report for the Necco Park Remedy has been prepared pursuant to Administrative Order (AO) Index No. II CERCLA-98-0215 dated September 28, 1998, issued by United States Environmental Protection Agency (USEPA). This report describes hydraulic and chemistry monitoring conducted in 2011 as required by the *Long-Term Groundwater Monitoring Plan,* dated April 2005 for the DuPont Necco Park Site located in Niagara Falls, New York.

Construction and start-up of the HCS and GWTF was substantially complete on April 5, 2005. Thereafter, the systems have been operated in accordance with the Operations and Maintenance Plan (O&M Plan). System operation uptime for 2011 was 90.5 %. Discounting scheduled maintenance shutdowns, system uptime for 2011 was 93.7 %.

In 2010, DuPont submitted a request to the USEPA for modifications to the LTGMP. DuPont requested that the frequency of MNA sampling be reduced to every five years and several wells be removed from the list of wells to be sampled annually. The USEPA agreed to the reduction in the number of wells sampled annually, but required MNA monitoring to be completed in 2013. Results from the 2013 MNA evaluation will then be used to determine if expanding to a five year time frame is justified. Additionally, USEPA is requiring that all wells included in Table 3-12 of the 2009 Annual Report be sampled on a three or five year schedule to monitor source area groundwater chemistry trends. These changes were instituted in the 2010 annual report and continued here. Additionally, interpretive recommendations from the November 17th meeting between DuPont and the USEPA were instituted here in. Specifically, drawdown analysis (tables and plots) were substituted with long-term hydrographs.

Please call me at (716) 278-5496 if you have any questions or comments regarding this submittal.

Sincerely,

CORPORATE REMEDIATION GROUP

Paul F. Mazierski
Project Director

Enc. 2011 Annual Report

cc: M. Hinton/NYSDEC
E. Felter/Parsons
C. Luttrell/ DuPont

PARSONS

REMEDIAL ACTION POST-CONSTRUCTION MONITORING 2011 ANNUAL REPORT

DUPONT NECCO PARK
NIAGARA FALLS, NEW YORK

Prepared for:

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March 2012

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ACRONYMS

Acronym	**Definition / Description**
ACO	Administrative Consent Order
AO	Administrative Order
AOA	Analysis of Alternatives
BFBT	Blast-Fractured Bedrock Trench
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cis-DCE	cis-1,2-dichloroethene
CMMP	Cap Maintenance and Monitoring Plan
CRG	DuPont Corporate Remediation Group
DCE	Dichloroethene
DDR	Data Deliverable Review
DNAPL	Dense Non-Aqueous Phase Liquid
DuPont	E. I. du Pont de Nemours and Company
GWTF	Groundwater Treatment Facility
HCBD	Hexachlorobutadiene
HCS	Hydraulic Controls System
HDPE	High-Density Polyethylene
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LTGMP	Long-Term Groundwater Monitoring Plan
MDL	Method Detection Limit
MNA	Monitored Natural Attenuation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
Necco Park	DuPont Necco Park Site
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and Maintenance
PDI	Pre-Design Investigation
POTW	Publicly-Owned Treatment Works
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance and Project Plan
RPD	Relative Percent Difference
SAMP	Sampling, Analysis, and Monitoring Plan
SAR	Source Area Report
SFR	Subsurface Formation Repair
SIU	Significant Industrial User
SOW	Statement of Work

Acronym	Definition / Description
SVOC	Semi-Volatile Organic Compound
TCE	Trichloroethene
TIC	Tentatively Identified Compound
trans-DCE	trans-1,2-dichloroethene
TVOC	Total Volatile Organic Compound
USEPA	United States Environmental Protection Agency
VC	Vinyl Chloride
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

This Remedial Action Post-Construction Monitoring 2011 Annual Report has been prepared pursuant to Administrative Order (AO) Index No. II Comprehensive Environmental Response, Compensation and Liability Act (Superfund) (CERCLA)-98-0215 issued by United States Environmental Protection Agency (USEPA) on September 28, 1998. This is the seventh such report and describes hydraulic and chemistry monitoring conducted in 2011 at the E. I. du Pont de Nemours and Company (DuPont) Necco Park Site in Niagara Falls, New York. Monitoring activities were conducted in accordance with the Long-Term Groundwater Monitoring Plan (LTGMP) dated April 2005 (DuPont Corporate Remediation Group 2005a).

The Necco Park Remedial Action consists of an upgraded cap over the landfill and a groundwater hydraulic control system (HCS). The HCS includes a network of five groundwater recovery wells and a groundwater treatment facility (GWTF). Construction and startup of the HCS and GWTF was substantially complete on April 5, 2005. Thereafter, the systems have been operated in accordance with the Operations and Maintenance Plan (O&M Plan) (DuPont CRG 2005b). System operation uptime for 2011 was 90.5%. Discounting scheduled maintenance shutdowns, system uptime for 2011 was 93.7%. Summaries of system operations and hydraulic head data were previously provided to the USEPA and the New York State Department of Environmental Conservation (NYSDEC) in the 2011 Quarterly Data Packages (Parsons 2011a, 2011b, 2011c, and 2012). This Annual Report provides a detailed evaluation of system effectiveness with respect to the performance standards presented in the Necco Park Statement of Work (SOW).

Hydraulic monitoring data from 2011 show that, overall, the HCS has maintained hydraulic control of the source area. Improved hydraulic control in the upper bedrock in the western portion of the site began in 4Q08 when a blast-fractured bedrock trench (BFBT) and a new B/C-Zone recovery well (RW-11) were put into operation. Well RW-11 was installed to replace recovery well RW-10, which exhibited diminished hydraulic efficiency after startup in 2005. Well rehabilitation was conducted at RW-11 for the first time since installation. Well yield significantly increased likely due to a combination of site-standard mechanical rehabilitation (air lift and scrubbing) and flow rate fluctuations (surging/over-pumping).

In accordance with the LTGMP (DuPont CRG 2005a), annual groundwater sampling began in 2008 after three years of biannual sampling. Groundwater sampling results from 2011 continue to show an overall decrease in concentrations of total volatile organic compounds (TVOCs) for all flow zones compared to historical results. The 2011 results indicate:

- With the exception of one near source area well, TVOC concentrations for the A-Zone were below 2 μg/l.
- TVOC concentrations at key source area limit wells, such as 150B and 172B, continue to have declining trends.
- Similar decreasing or stable TVOC concentrations are apparent in the deeper bedrock zones and at key source area limit wells such as 146E.

In 2010, DuPont submitted a request to the USEPA for modifications to the LTGMP. DuPont requested that the frequency of MNA sampling be reduced to every five years and several wells be removed from the list of wells to be sampled annually. The USEPA agreed to the reduction in the number of wells sampled annually, but required MNA monitoring to be completed in 2013. Results from the next MNA evaluation (2013) will then be used to determine if expanding to a five-year time frame is justified. Additionally, USEPA is requiring that all wells included in Table

3-12 of the 2009 Annual Report be sampled on a three- or five-year schedule to monitor source area groundwater chemistry trends.

On November 17th, DuPont met with the USEPA to discuss long-term monitoring for the site and made recommendation regarding the most appropriate tools for evaluating the remedy as the data set increases in volume and long-term trends are established. DuPont submitted a follow-up letter to the USEPA for additional modifications to the LTGMP on December 8, 2011. USEPA concurred with the following modification in a letter dated January 27, 2012:

- The list of water level monitoring locations used for demonstrating hydraulic control was formally changed to include wells installed at the site since 2005 (these locations had been monitored/reported yet were not on the LTGMP list) and to eliminate water level measurements from abandoned wells and AT-zone wells. Several other wells that were not adding value to the interpretation of hydraulic capture were also requested to be removed.
- Monitoring and evaluating the discontinuous/perched AT-zone was eliminated.
- GWTF process monitoring was reduced to volatile organic compound (VOC) analysis only.
- The text of the LTGMP downtime reporting was modified to report when any well in the recovery system is not operating (is “down”) for a period of more than 48 hours consecutively. Documentation of all system downtime for a given quarter (scheduled or unscheduled) is to be provided in the Necco Park Quarterly Data Packages and summarized in the Annual Report.
- Quarterly drawdown plots will be replaced with hydrographs in the quarterly reports.
- In determination of source area, the two criteria of historic presence of dense non-aqueous phase liquid (DNAPL) and meeting effective solubility for a given compound should be weighted heavier than the 1% pure phase solubility criteria in assessing source area extent.

The changes listed above are now considered part of the current reporting requirements. This Annual Report includes data collected in 2011 from the above programs; however, interpretive tools such as drawdown plots and data are not included (in concurrence with DuPont and USEPA’s verbal communication).

DNAPL monitoring was completed monthly throughout 2011, and DNAPL was identified in March, April, May, June, and November in RW-5. DNAPL was removed from RW-5 on each occasion, at volumes of 70, 12, 20, 16, and 12 gallons, respectively. A total of 8,555 gallons of DNAPL has been removed since initiation of the recovery program in 1989.

1.0 INTRODUCTION

1.1 Site Location

The E. I. du Pont de Nemours and Company (DuPont) Necco Park site (Necco Park) is located approximately 1.5 miles north of the Niagara River in a predominantly industrial area of Niagara Falls, New York (Figure 1-1). Necco Park is a 24-acre inactive industrial waste disposal site.

1.2 Source Area Remedial Action Documentation and Reporting

The approved remedy for the Necco Park Site included construction of the Bedrock and Overburden Source Area Hydraulic Controls System (HCS) and the Landfill Cap Upgrade. Completion of the remedy and compliance with the performance standards described in the Statement of Work (SOW) are documented in the Remedial Action Report (DuPont Corporate Remediation Group [CRG] 2007). This 2011 Annual Report presents hydraulic and chemical monitoring results from the seventh year of operation of the hydraulic controls. In addition, this 2011 Annual Report includes historical groundwater chemistry results for assessment of trends in groundwater quality.

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2.0 HCS OPERATIONS SUMMARY

The groundwater Operations and Maintenance (O&M) Plan (DuPont CRG 2005b), in conjunction with vendor O&M Manuals, describes normal operation and shutdown procedures, emergency shutdown procedures, alarm conditions, trouble-shooting, and preventative maintenance procedures for the HCS and the GWTF. This section of the report summarizes HCS operations in 2011.

2.1 Operational Summary

Operational information for the HCS is provided in the 2011 Quarterly Data Packages (Parsons 2011a, 2011b, 2011c, and 2012). The table below summarizes system operations for 2011.

	HCS Uptime (%)	HCS Uptime [excluding scheduled maintenance downtime] (%)	Groundwater Treated (Gallons)	DNAPL Removed (Gallons)
1Q11	94.6	97.6	3,679,957	70
2Q11	89.3	89.6	3,370,066	48
3Q11	91.7	96.2	2,947,721	0
4Q11	86.5	91.4	3,167,844	12
2011 Total	**90.5**	**93.7**	**13,165,588**	**130**

DNAPL – dense non-aqueous phase liquid

A summary of monthly groundwater quantities and uptime for each recovery well is provided in Table 2-1.

The HCS remained fully operational throughout 2011, averaging 90.5% total system uptime through December 31, 2011. Groundwater treatment facility (GWTF) downtime has been minimized by continuously monitoring operating conditions and implementing mechanical and procedural changes to the process equipment and the Honeywell Experion® PKS (Process Knowledge System) operating system.

HCS downtime in 2011 was a result of scheduled maintenance, unscheduled maintenance, and upgrades. The recovery wells were off for two days in January because of ice accumulation in the emissions stack. In February, RW-5 was off for two days for an unscheduled pump repair. In March, RW-5 was off for three days for another unscheduled pump repair. RW-11 was off for two days in April due to a pump motor failure. In May, RW-11 was off for two days due to a control system limit condition for the acid addition valve that caused the pump to shut down. A power failure in May resulted in 36 hours of HCS downtime. In June, RW-4, RW-5, and RW-11 were down for seven days due to a failed piping elbow in the containment vault. In August, the HCS was down for 28.5 hours for scheduled air emission stack inspection, and RW-5 was off for 76.3 hours due to a flow meter malfunction. In September, RW-5 and RW-11 were off for scheduled rehabilitation; the systems were off for 55.8 hours and 100.5 hours, respectively. In October, RW-5 was off for 52 hours (unscheduled) as the result of process control adjustments to the pH interlock response time, and for 148.6 hours (scheduled) due to a mandatory five-year internal acid tank inspection. RW-11 was also down for 180.2 hours during the acid tank inspection. In November, RW-4, RW-5, and RW-11 were off for 49.9 hours due to a process control logic modification of pH interlock response time. In December, RW-4, RW-5, and RW-11 were off for 60.1 hours, and RW-11 was off again later in the month for 51.8 hours due to a process control logic modification of pH interlock response time. Process logic settings were adjusted to prevent further occurrence of unscheduled down time due to pH interlock.

The following table summarizes HCS downtime in 2011:

Reason	Contributing Downtime %	Comments
Process Component Malfunction	0.6%	Unexpected process-related downtime as a result of the emission stack freezing.
Scheduled Maintenance shutdowns and system upgrades/inspections	0.3%	Routine inspections, interlock verification, preventative maintenance, equipment inspection and mechanical upgrades to process-related infrastructure.

Scheduled maintenance shutdowns are based on operating conditions and the necessity to take corrective or preventative action to mitigate the need for future, larger scale maintenance. These shutdowns occur routinely to inspect, repair, and/or upgrade process-related components to ensure long-term operational success. Efforts to minimize downtime during planned maintenance shutdowns are employed. Influent tank capacity is used while maintenance occurs to minimize recovery well downtime. Additional scheduled maintenance activities associated with GWTF maintenance included a shutdown of the HCS (completed from August 22 to 23) that allowed for inspection of the air emissions stack.

DuPont submitted a request to the USEPA in December 2011 to change the language in Section 9 of the O&M Plan referring to how downtime is reported. As agreed to by the USEPA in a letter dated January 27, 2012, the language in the O&M Plan will be revised to indicate that notification will be given to USEPA and NYSDEC when any recovery well is not operating for a period of more than 48 consecutive hours.

2.2 GWTF Process Sampling

In accordance with the Sampling, Analysis and Monitoring Plan (SAMP), quarterly process sampling is conducted to assess the effectiveness of the treatment system in removing VOCs from groundwater. Two influent samples (one from the B/C-Zone influent tank and one from the D/E/F-Zone influent tank) are collected. One effluent sample is collected from the combined effluent tank. The samples are analyzed for VOCs, semi-volatile organic compounds (SVOCs), total barium, dissolved barium, total cyanide, and sulfate. A summary of results for the process sampling conducted in 2011 is provided in Table 2-2.

DuPont submitted a request to the USEPA in December 2011 to reduce the quarterly process sampling analytical parameters to VOCs only, as discussed in the November 17, 2011 meeting. This request was based on the system process monitoring that has been completed through 2011 showing that the SVOC component is significantly smaller than the VOC portion and the SVOC component has remained stable. The USEPA agreed to this change with the caveat that SVOC monitoring should resume if significant changes occur to the remedial system. The revised sampling will be instituted in 2012.

2.3 Sewer Sampling Summary

A Significant Industrial User (SIU) permit with the City of Niagara Falls publicly-owned treatment works (POTW) regulates the treated groundwater effluent discharged from Necco Park. Quarterly sampling conducted at the permitted discharge point (MS#1) demonstrates that the GWTF is operating as designed. The permit (SIU Permit No. 64) was renewed in May 2009, and is valid from May 1, 2009, to May 1, 2014.

2.4 Recovery Well Rehabilitations and Maintenance

Two recovery wells (RW-5 and RW-11) were rehabilitated during 2011. RW-5 was rehabilitated twice (06-09-11 to 06-10-11 and 09-15-11 to 09-16-11), while RW-11 was rehabilitated once (09-19-11 to 09-20-11). Typically RW-5 is rehabilitated once a year, although it was decided that twice a year may provide improved results. RW-11 was rehabilitated for the first time since installation. Well rehabilitations were completed by Nothnagle Drilling, Inc., of Scottsville, New York, with oversight by Parsons.

The rehabilitation procedures for both wells were similar, although special precautions were taken when working on RW-11 due to the steel well screen, as opposed to RW-5 which has no screen. The bottom of the well was cleaned of sediment via air lifting methods. Using a drill rig and length of drill rod fitted with ½-inch-diameter steel cable secured perpendicular to the drill rod, the open rock-hole portion of the well was scoured by rotating the drill string. Scrubbing of the rock hole was concentrated on the depth of the water-bearing fractures. In RW-11, the well screen was scrubbed using similar technique but with a softer polyethylene brush. After the well scrubbing, solids were removed from the well using air lift methods. At well RW-5, the treatment had a similar effect as in previous years, with marginal increase in flow rates. At RW-11, the flow rate initially changed less than expected. However, subsequent to the mechanical rehabilitation, the plant technician began oscillating the set point as part of a systems test. These changes in set point caused interim increases and decreases in flow rate which appeared to further re-development the well. While oscillating the set point (and flow) the well yield significantly increased to near original levels.

Well painting, labeling and protective casing repairs were performed in 2011 as part of continual site maintenance. Approximately 48 well casings were painted/relabeled, and two casings were repaired for corrosion damage.

2.5 Air Emissions Stack Inspection and Repair

Between August 22 and 24, 2011, the GWTF was shut down to complete an inspection of the air emissions stack. Information regarding this shutdown was communicated to the USEPA in an email from DuPont dated August 2, 2011. The air emissions stack was pressure cleaned, and a camera inspection was conducted to assess the current condition of the stack. The external inspection and thickness measurement were recorded to create a baseline for future inspections. During the temporary shutdown, all recovery wells were offline.

As a result of the air emissions stack inspection, the 45-degree process tie-in point on the stack was determined to be approaching retirement thickness. The bottom deflector plate located below the process stream tie point was also observed to be corroded and identified for replacement. The affected area was removed, and a stainless steel plate was welded on to provide structural integrity. The repairs on the stack were performed in December 2011 and resulted in approximately 57 hours of downtime.

2.6 Acid Tank Inspection

Between October 16 and October 25, 2011, a five-year internal inspection was performed on the 2000-gallon (Fiber Reinforced Plastic) hydrochloric (HCl) acid storage tank. An assessment and evaluation of the system tightness, structural soundness, wear, and operability was carried out through visual inspection and hardness tests. During the inspection, exposed piping, joints, welds, ancillary equipment, and connections were examined. The tank and all ancillary equipment were found to be in good condition.

2.7 Acid Tank Conservation Vent

During the acid tank inspection, the conservation vent was tested for opening and reseating pressure and inspected for corrosion, fouling or scaling. Although operable, the conservation vent had been in service for an extended period of time and deterioration was noted. Therefore, DuPont made the decision to replace the vent in 2012.

3.0 HCS PERFORMANCE

3.1 Hydraulic Head Monitoring

Potentiometric surface maps based on water level elevations are the primary evidence of groundwater control. Supporting lines of evidence are well hydrographs and groundwater chemistry changes. Sections 3.1 and 3.2 discuss the results of hydraulic head monitoring and the associated potentiometric maps and hydrographs. Section 3.3 discuses the groundwater chemistry. As described above and in correspondence between DuPont and the USEPA (January 27, 2012), a revised list of water level measurements will be instituted in 2012. Additionally, drawdown analysis plots completed quarterly are being replaced by hydrographs. All water level measurements taken in 2011 are presented in this report; however, previously utilized interpretive tools such as drawdown plots and tables are not provided.

Groundwater hydraulic head measurements are used to evaluate control of groundwater in the overburden and bedrock groundwater flow zones by the HCS at Necco Park. Depth-to-water measurements and measuring point elevation data are used to calculate the elevation of groundwater and to generate hydrographs that show groundwater elevation trends in individual monitoring wells. These measurements are also used to generate potentiometric surface-contour maps, which depict groundwater elevation distribution for assessing flow directions and hydraulic gradients. These presentations are used to determine the extent and effectiveness of hydraulic control effect by the HCS at Necco Park. Potentiometric surface contour maps for the A-Zone through F-Zone include the zone-specific source area limits.

Quarterly groundwater level measurements collected during 2011 were provided in the Quarterly Data Packages (Parsons 2011a, 2011b, 2011c, and 2012). Potentiometric surface-contour maps for the AT-Zone (top-of-clay), A-Zone (overburden), and bedrock zones B, C, D, E, and F were also included in the 2011 Quarterly Data Packages. These maps were used to assess effectiveness of hydraulic control of the HCS. Monitoring and recovery well locations are shown in Figure 3-1. A list of groundwater level monitoring locations is provided in Table 3-1.

Long-term hydrographs for select wells and piezometers within each water-bearing zone are included as Figures 3-2 through Figure 3-8. As discussed above and the conveyed in correspondence between the USEPA and DuPont, the hydrographs are secondary evidence of groundwater control established by the recovery wells. The hydrographs show long-term groundwater hydraulic responses to startup and operation of the HCS. Typically there was a decrease in hydraulic head after start-up followed by a long-term decline or depressed level, depending on the hydrogeologic properties of the unit.

Potentiometric surface-contour maps included in this report were selected from maps prepared and presented in the 2011 Quarterly Data Packages. Unless otherwise noted, a Kriging algorithm with a linear semi-variogram model and a slope of 1 was used as the standard method to interpolate groundwater elevations between wells.

3.2 Hydraulic Control Assessment

As described in the 2008 Annual Report (DuPont CRG 2009), measures were taken in 2008 to improve B/C-Zone hydraulic control in the western portion of Necco Park. These measures included installation of a recovery well in a blast fractured bedrock trench (BFBT) and the replacement of Recovery Well RW-10 with RW-11. Assessment results indicate improved hydraulic control through the operation of recovery well RW-11. A detailed discussion of the hydraulic influence of well RW-11 was provided in the Post-Construction Monitoring 2008 Annual Report for the Site (DuPont CRG 2009).

3.2.1 AT-Zone and A-Zone

The overburden materials comprising the A-Zone are generally characterized by high clay content and low hydraulic conductivity. The AT-Zone (also known as the top-of-clay zone) is a thin, presumably perched, zone of saturation above the A-Zone. It is a discontinuous zone and is absent in the western portion of the site where the overburden thickness diminishes and within portions of the Necco Park property footprint where excavation and landfilling activities have eliminated any AT/A-Zone distinction. Groundwater flow in the AT-Zone is primarily downwards to the A-Zone, as expected in a low permeability formation of silts and clay (Cherry et. al. 2006). Groundwater flow in the A-Zone is primarily downward to the more transmissive fractured bedrock, also expected in this low permeability formation.

Figures 3-2 and 3-3 demonstrate the long-term drawdown from groundwater extraction. Figures 3-9 through 3-12 present AT-Zone and A-Zone potentiometric surface contours and vertical gradient maps. These figures, derived from November 2011 data, demonstrate the effects of continuous operation of the HCS and are discussed below.

As discussed in the November 17 meeting between DuPont and USEPA and subsequent correspondence, the AT-Zone is an insignificant zone that is effectively monitored by monitoring the A-Zone. Therefore, future reports will not discuss the AT-Zone, and hydraulic monitoring is being suspending in these locations. Measurements from 2011 further support this action.

AT- and A-Zone Hydraulic Control

The AT-Zone is a discontinuous and perched zone that is substantially monitored by the A-Zone (as discussed in correspondence and during the presentation to USEPA on November 17, 2011). Furthermore, where the AT-Zone exists, the hydraulic gradient is downward to the A-Zone. A combination of potentiometric surface maps, hydrographs and vertical gradient plots depict a hydrogeological assessment that demonstrated the HCS was effectively controlling groundwater.

The primary evidence of hydraulic control is the potentiometric surface maps shown in Figures 3-9 and 3-10. The potentiometric maps clearly show the groundwater flow was toward the capture systems. The cone of depression surrounding recovery wells RW-5 and RW-11 are significant, ranging from 3 to 5 feet of closed contours in the A-Zone (Figure 3-3). The November cone of depression surrounding RW-11 is spatially larger and deeper in elevation than previous quarters in 2011. This is due to the successful rehabilitation of RW-11, which returned well yield to near initial levels.

Figures 3-2 and 3-3 demonstrate the long-term decreasing trend of water levels in the AT- and the A-Zones. These decreases in the water elevations are due to the combined effect of the impermeable landfill cap and continuous groundwater extraction from the recovery wells. The decreasing hydrographs represent long-term drawdown in an unconfined low-permeability unit and storage depletion. The water content of the unit continued to decrease by reductions in infiltration from the cap and groundwater recovery in the underlining water bearing unit (B Zone). While there are fluctuations in the hydrographs, the overall trend is a clear decrease in the water elevations.

Vertical gradients are generally downward (negative) between both the AT/A-Zones and A/B-Zones as presented in Tables 3-2 and 3-3 (2011 average gradients) and shown in Figures 3-11 and 3-12 (November 9, 2011, gradients). In Table 3-2, the cases where the gradients nearly flat but slightly upward are likely due to large drawdowns in the A- and AT-Zones, slightly overlapping well screens, and the absence of any appreciable AT-Zone.

3.2.2 B and C Bedrock Water-Bearing Zones

Groundwater flow directions in the B-Zone and C-zone were consistent throughout 2011 (Figure 3-13). Hydraulic controls in the B-Zone and C-Zone were maintained throughout 2011, which is attributable to high recovery well up time. Additionally, long-term monitoring demonstrates the continuation of capture zone improvements in the area of RW-11. The improvements were the result of installation of the BFBT and the hybrid recovery well RW-11.

B-Zone

Groundwater elevation hydrographs, along with potentiometric surface contour maps, illustrate the hydraulic effects of the HCS in the B-Zone. RW-4, RW-5 and RW-11 have induced inward (toward the recovery wells) hydraulic gradients over a large area (Figures 3-4 and 3-13), capturing site groundwater in the source area. Figure 3-4 is a plot of well hydrographs from wells in the area near and surrounding RW-11. This plot demonstrates the improved effectiveness of capturing groundwater from installation of the BFBT and RW-11. Water level reductions are initially noticed after start-up of RW-10, then a further reduction is observed once RW-11 replaced RW-10. Detail observations that support the improved hydraulic control of the BFBT are as follows:

- Wells near or in the trench area (201B and PZ-B) show significant decreases after the transition of groundwater recovery from RW-10 to RW-11.
- Wells upgradient and downgradient (BZTW-2, 137B and 111B) show significant decreases after the transition of groundwater recovery from RW-10 to RW-11.
- The water level at well 130B (between RW-11 and RW-5) appears to slightly decrease after the transition from RW-10 to RW-11. Furthermore, water levels at 130B demonstrate a long term declining trend, indicating that this location is controlled by HCS.
- Well D-14 shows a slight decrease in water level and variability, suggesting the change may be realized to the west at this location as well.
- The seasonal variability in water level appears to be dampened in most of the wells surrounding RW-11, after the well began recovery. This reduction in variability suggests improved hydraulic control.
- Short-term increases in water level were noted in the 2Q2011 event which corresponds to observations that well yield was less than optimal. Actions taken prior to and after the 3Q11 (lowered set-point and well rehabilitation) resulted in lower hydraulic heads for these events.

These changes in water levels are notable, not only due to the actual change in water level, but also in context to the set point of RW-11 compared with RW-10. The water level set-up for recovery in RW-11 has been maintained approximately five feet higher than RW-10 (Figure 3-4). Thus, the installation of the BFBT was of such hydraulic significance that lower water levels in and around the BFBT area are achieved even with a higher water level in the actual recovery well. This is due to the change in hydraulic conductivity of the rock formation from the BFBT.

Evidence of groundwater control is also observed in the potentiometric contour map provided in Figure 3-13. The contour map demonstrates large cones of depression established for each of the recovery wells. Those related to the BFBT and RW-11 are relatively wider and shallower than RW-4 and RW-5, due to the increased transmissivity in and near the BFBT. The overlay of the source areas lines and the groundwater contours demonstrates that the HCS is hydraulically controlling the source areas.

C-Zone

Groundwater elevation hydrographs and potentiometric surface-contour maps illustrate the hydraulic effects of the HCS in the C-Zone. The C-Zone influence attributed to RW-4, RW-5, and RW-11 extends north to 115C, 123C, and 159C, and west to 136C. The southern extent of influence extends to 137C and is obscured by the CECOS Landfill between the recovery wells and monitoring wells 150C, 160C and 168C (Figures 3-5 and 3-14). Beginning in 2008, hydraulic control in the C-Zone was improved significantly with the rehabilitation of RW-5 and the start-up of RW-11. In 2011, RW-5 was rehabilitated twice and RW-11 was rehabilitated once (for the first time since installation). The rehabilitation of RW-5 is a preventative action taken prior to well loss; therefore, the effect is relatively small in the short-term scale of one year. The improvement in capture in the C-Zone near RW-11 is less significant indicating the decreases in well yield were related more hydraulic connection to the B-zone than the C-Zone.

3.2.3 D, E, and F Bedrock Water-Bearing Zones

Groundwater elevation hydrographs and potentiometric surface-contour maps illustrate the effectiveness of the HCS in maintaining hydraulic control in the D-, E-, and F-Zones (Figures 3-6 through 3-8 and 3-15 through 3-17). The hydrographs clearly indicate the initial and sustained drawdown of groundwater elevation in the recovery wells and the surrounding monitoring wells. Potentiometric maps demonstrate the consistent cone of depression and associated hydraulic gradients were toward the recovery wells throughout 2011, indicating the HCS is effectively controlling groundwater migration. This is further demonstrated in the spatial relationship of the source area depiction and the flow patterns depicted in Figures 3-15 through 3-17.

3.3 Groundwater Chemistry Monitoring

3.3.1 Background

Extensive monitoring has been conducted at Necco Park dating back to the early 1980s. These include (but are not limited to) pre-design investigations, remedial investigations, geologic investigation, analysis of remedial alternatives, and source area investigations. (Groundwater monitoring continues to meet the following objectives as defined in the SOW:

- Monitor reductions in aqueous chemistry in zone-specific source area wells as a consequence of the hydraulic control from recovery well pumping.

- Monitor the far-field groundwater chemistry to determine if the recovery system is controlling off-site migration of chemical constituents associated with the Necco Park site.
- Monitor for the presence of DNAPL.
- Monitor natural attenuation and intrinsic bioremediation in the source area and far-field.
- Continue to evaluate the effectiveness of the remedial action.

The 2005 Annual Report, the first annual status report following completion of hydraulic control elements of the Necco Park remedy, included an extensive discussion of the first monitoring results and how these results compared to source area criteria introduced in the AOA report. This 2011 report provides an update of groundwater chemistry trends in relation to the long-term remedy for groundwater.

The list of wells used for long-term monitoring was prepared and is included in the LTGMP. In accordance with the LTGMP, chemical monitoring was conducted on a semi-annual basis during the first three years of system operation. Since the beginning of the fourth year of system operation, sampling has been annual. Monitoring completed in 2011 represents the fourth year of annual sampling. Locations of monitoring wells used for long-term monitoring are shown in Figure 3-1. Implementation of the long-term chemistry monitoring is discussed in Section 3.3.3. In 2010 DuPont proposed to reduce the number of wells monitored annually based on existing data showing either very low concentrations or concentrations decreasing over time. USEPA agreed to the changes in a letter dated July 16, 2010 but is requiring that the full list of wells be sampled on a three or five year schedule to monitor source area groundwater chemistry trends.

3.3.2 Sample Collection and Analysis

In accordance with the LTGMP, annual groundwater sampling following three years of semi-annual sampling began in 2008. Collection of groundwater samples from a reduced number of locations compared to the LTGMP began in 2010, as approved by the USEPA (July 2010). The annual sampling event was completed between August 15 and August 19, 2011. TestAmerica of Amherst, New York completed sampling with oversight by URS and Parsons for DuPont. Samples and associated quality assurance/quality control (QA/QC) samples were analyzed by TestAmerica located in North Canton, Ohio.

As described in the Necco Park SAMP, groundwater sampling was conducted using USEPA low-flow sampling methodology. Air-driven bladder pumps equipped with disposable Teflon© bladders were used for sample collection. The pumps were fitted with dedicated Teflon©-lined high-density polyethylene (HDPE) tubing. All monitoring wells were purged and sampled at flow rates between 100 and 600 milliliters per minute to minimize potential volatilization. Geochemical parameters (pH, temperature, dissolved oxygen, oxidation/reduction potential, specific conductivity, and turbidity) were recorded at 5-minute intervals throughout the entire purging period to determine when stabilization was achieved. Geochemical parameters were considered stable when all parameter values were within 10 percent of the previously recorded value with the exception of plus or minus 0.2 units for pH.

Samples were collected at 26 monitoring well locations during the annual event. The well locations are listed in Table 3-7. Analytical indicator parameters are listed in Table 3-8. Analytical results for the sampling event conducted in 2011 are provided as

Appendix A. For reporting purposes, the results are discussed as TVOCs. This is consistent with historic reporting where TVOCs are indicator compounds used to assess groundwater contamination and trends over time. Results for the respective flow zones are discussed below.

3.3.3 Source Areas Delineation

Original source area limits were included in the 1995 Analysis of Alternatives (AOA) Report (DuPont Environmental Remediation Services 1995). As described in the Final (100%) Design Report for Bedrock and Overburden Source Area Hydraulic Controls (DuPont CRG 2003), source area limits for the A-Zone, B/C-Zones, and D/E/F-Zones were reassessed using results from the 2000 baseline groundwater sampling event. Sample results from the baseline event, in conjunction with historical DNAPL observations, were used to estimate source area limits as provided in the Source Area Report (SAR) (DuPont CRG 2001). Source area limits presented in the report were used to determine PDI groundwater recovery well locations.

For the purposes of remedial design, the 2000 baseline and Phase 2 PDI groundwater sampling results were used to interpolate source area limits. One of the objectives of the Phase 2 PDI was to refine the southeast limits of the B/C-Zone source area based on Phase 1 PDI observations. Because refinement of the B/C-Zone source area required additional groundwater sampling and analysis, DuPont elected to include sampling of the lower bedrock to also refine the D/E/F-Zone source area limits. Pumping tests conducted during the PDIs and subsequent full-scale operation have shown that the HCS will achieve and maintain hydraulic control of flow-zone specific source areas defined in the 100% design submittal.

The 2011 groundwater sampling results have been compared to the same historically employed criterion to evaluate source area limits. Consistent with the AOA, any location where DNAPL was observed at least once was included in the source area. Groundwater chemistry data for the 2011 sampling events were also compared to solubility criteria to evaluate source area extent. Consistent with previous assessments, these included effective solubility for a given compound and one percent of a given compound’s pure-phase solubility.

Effective solubility is defined as the theoretical upper-level aqueous concentration of a constituent in groundwater in equilibrium with a mixed DNAPL. Effective solubility is equal to pure-phase solubility of a given constituent multiplied by the mole fraction of that component in DNAPL. Use of effective solubility criteria is believed to be more representative of sites with DNAPL that consist of relatively complex mixtures of organic compounds (Feenstra et al. 1991), such as those that are found at the Necco Park site. Calculated solubility criteria for DNAPL compounds evaluated during this study are presented in Table 3-4. A comparison of 2005 through 2011 data to the effective solubility and one percent of pure-phase solubility criteria are provided in Tables 3-5 and 3-6, respectively. Refinement of the monitoring program reduced the number of wells in Tables 3-5 and 3-6 because most of these wells are in the source area and have exhibited little change over time. Therefore, the usefulness of presenting the data from these wells in the tables is limited. Future reports will shift the discussion to key source area boundary wells, and the complete tables will be updated when these wells are sampled again (every 3-5 years).

Due to the qualitative nature of using the one percent pure phase solubility in a transient flow field, this solubility criteria was established to be used with other lines of evidence for determining source areas. The “observed DNAPL” criterion and effective solubility criteria identify source area wells absolutely. The 1% pure phase solubility criteria was never intended to have the same weighting as the other criteria. As noted in the November 17, 2011, meeting and associated correspondence between DuPont and the USEPA, the observed DNAPL criteria and the effective solubility criteria have the most merit than the 1% pure phase solubility. Meeting the one-percent criteria alone (for example) does not absolutely define a well as a source area well. While the one-percent “rule-of-thumb” may infer DNAPL presence, with more or less certainty depending on the strength of the overall data (Cohen and Mercer 1993), it does not identify the distance upgradient where the DNAPL is located. This is due to such elements as the complexities of groundwater transport and well location in reference to the plume centerline. The one percent “rule-of-thumb” should not be used in isolation to determine DNAPL presence (Kueper., B.H. et al. 2003); therefore, the original (and present) intension of the solubility criteria were to assist in determining source areas in conjunction with other converging lines of evidence.

A discussion of the source area results by flow zone is provided below. It should be noted that some of the wells which are within the source area will be sampled in the 3 to 5 year cycle and therefore are not sampled annually.

A-Zone

The A-Zone source area has been defined as the Necco Park property and a limited area south of the property line. The A-Zone source limits have not changed from those provided with the 100% design submittal. The 2011 sample results indicate no exceedance of the solubility criteria. There has been only one exceedance of the solubility criteria since long term monitoring began. The 2005 first round results for well D-11 reported hexachlorobutadiene (HCBD) above the one percent solubility criteria.

Monthly DNAPL observations conducted at A-Zone well locations in 2011 indicated no DNAPL present at the annual monitoring locations. The most recent DNAPL observation at an A-Zone well was at well 131A in May 2006. This well is located on the landfill.

Groundwater flow in the A-Zone is predominantly downward. Therefore, hydraulic control of the upper bedrock groundwater flow will capture flow from the A-Zone. As discussed in Section 3.3, the installation of the BFBT and recovery well RW-11 (November 2008) enhanced degree of A-Zone hydraulic control. Based on the results of the 2011 HCS monitoring, the system is effective in controlling the A-Zone source area.

B/C-Zone

The B-Zone source limits have not changed from those provided with the 100% design submittal. Results for the B-Zone wells indicated no exceedances of the effective solubility criteria.

The only B/C-Zone well in the annual program which exceeded the more conservative one percent criteria in 2011 was 172B. Exceedances of the one percent solubility criteria at well location 172B for HCBD represent the limit of the B-Zone source area. As discussed in Section 3.5, TVOC concentrations have significantly decreased since 2002 at location 172B.

As discussed in Section 3.7, the frequency of DNAPL observations in B/C-Zone wells has decreased. In 2011, the only B/C-Zone well where DNAPL was identified was RW-5. In 1Q11 70 gallons of DNAPL were removed from RW-5, 48 gallons were removed in

2Q11, and 45 gallons were removed in 4Q11. Trace DNAPL was noted at RW-5 in 3Q11. At well 204C, installed in November 2008, trace DNAPL was observed during eleven of twelve months in 2011. Trace DNAPL was found in 139C in the June monitoring event (monitored semi-annually).

Operation of recovery wells RW-4, RW-5, and RW-11 has achieved and maintained hydraulic control of the B/C-Zone source area. As discussed in Section 3.3, improved B/C-Zone hydraulic control in the western portion of the site from the operation of recovery well RW-11 is apparent.

Cleaning recovery well RW-5 in June and September 2011 improved short-term well yield. However, as discussed, RW-5 yields appeared to return to its low pre-cleaning yield likely due to the preventative nature of the rehabilitation. The routine rehabilitation of RW-5 typically improves the pumping rate by approximately 1 gpm for approximately one month.

D/E/F-Zone

Analytical results for 2011 from well 146E indicate no exceedances for either solubility criteria since long term chemistry monitoring began in April 2005. Prior to the LTGMP, a sample in 2002 at 146E resulted in trichloroethene (TCE) above the more conservative one percent solubility criterion. These observations suggest that the 2002 exceedance at this location was indicative of aqueous constituents. Although the solubility criterion was met, this criterion is only an inference and should be used with other information to determine source area delineation. In this case, the decrease in concentrations after pumping at RW-9 and the observations at 165E suggest that 146E is outside the source area.

Based on exceedance of the more conservative one percent of pure phase solubility criteria for HCBD and TCE at well location 165E, the southwest limit of the D/E/F-Zone source area limit lies between well locations 165 and 137. This is consistent with the previous sampling results.

Monitoring conducted during 2011 confirms that the operation of recovery wells RW-8 and RW-9 has achieved and maintained hydraulic control of the D/E/F-Zone.

3.4 Groundwater Chemistry Results and Trends

An analysis of 2011 chemistry results and trends has been completed to assess the effectiveness of the HCS and the former extraction system in reducing organic compound concentrations in groundwater. This analysis used TVOC concentration data from monitoring wells to identify chemistry trends in the flow zone units. The evaluation also serves to identify locations where TVOC concentrations exhibit significant changes (generally, changes greater than an order of magnitude). Where applicable, historic TVOC data were used to assess long-term chemistry trends. TVOC concentration versus time plots for A-Zone overburden and bedrock B- through F-Zone monitoring wells are presented in Appendix B.

In general, operation of the HCS and the former groundwater recovery system, combined with the presence of the landfill cap and Subsurface Formation Repair (SFR), have contributed to an overall trend of declining TVOC concentrations in the A-Zone overburden and bedrock fractures zones. More recently, TVOC concentration decreases at several near source area and far-field wells are significant and coincide strongly with the onset of HCS operations in April 2005, thereby demonstrating the effectiveness of containments and remediation of site groundwater. Natural attenuation processes are also contributing to the reduction in chemical mass in the bedrock fracture zones.

A-Zone Overburden

Results from the four LTGMP A-Zone wells indicate TVOC concentrations are all below 250 μg/l. Sampling results for well 137A (235.4 μg/l) represents the location of the highest reported A-Zone TVOCs. TVOC concentrations were below 2 μg/l for the three other A-zone wells that were sampled, wells 145A, 146AR, and 150A. Furthermore individual concentrations of VOCs and SVOCs were below their respective NYSDEC groundwater standards. The 2011 results are consistent with historical results in that they show no significant off-site horizontal chemical migration in the overburden.

Three of the four wells used to monitor A-Zone chemistry, 145A, 146AR, and 150A exhibit consistently low (<10 μg/l) TVOC concentrations without a discernable trend over the years that they have been sampled. At 145A, concentrations since 2006 have been less than 2 μg/l. Location 146AR has had concentrations below 7 μg/l since 2000. At 150A concentrations have been below 1.2 μg/l. In 2011, the TVOC concentration of these three wells, located south of the landfill, ranged from 0.27 to 1.09 μg/l. Closer to the landfill, well 137A has shown the greatest decline of the A-Zone wells with concentrations ranging close to 1,200 μg/l in 2005 to as low as 100.2 μg/l in 2009. A downward trend between 2005 and 2011 is evident at 137A, and may suggest groundwater extraction in the RW-10/RW-11 area is effectively treated groundwater in this location. The 2011 results are consistent with historical results in that they demonstrate an insignificant downgradient plume in the overburden.

B-Zone

Results from the eight LTGMP B-Zone wells indicate TVOC concentrations generally below 5,000 μg/l, with two wells exceeding 5,000 μg/l. TVOC concentrations at two of the locations were below 100 μg/l. Seven of the eight wells exhibit large decreases in TVOC overtime thereby demonstrating effective groundwater capture by the recovery wells.

Source area limit wells 171B and 172B show a continued overall TVOC declining trend. This trend is indicative of effective groundwater control, where source area concentrations are being captured by the extraction wells, thereby preventing downgradient transport of VOCs. These wells give supporting evidence to the demonstration hydraulic control in these areas. Additionally the concentrations suggest that there is an active natural attenuation component to the VOCs. Biogenic degradation compounds including cis-1,2-dichloroethene (cis-DCE) and vinyl chloride (VC) dominate TVOC results at these well locations. The trend towards increased degradation compounds coupled with an absence of source area constituents is evident at well location 171B based on the 2007 through 2011 VOC results.

Far-field well 150B, also demonstrates the effectiveness of the groundwater control system. Concentrations have decrease by greater than two orders of magnitude, since 2000. While TVOC levels were greater than 2,000 μg/l prior to 2005, concentrations have steeply decreased to near or below the groundwater standard for the individual VOCs. Since 2007 the TVOCs values have ranged from ND to 42.8 μg/l. The most significant decreases began immediately after start-up after competition of the remedy, in 2005. This decrease is likely attributed to the groundwater extraction system preventing impacted groundwater from flow to well 150B, in addition to an active natural attenuation mechanism. Additionally well 145B also gives evidence of hydraulic control as concentration have decreased by significant concentrations.

C-Zone

Results from the four LTGMP C-Zone wells indicate TVOC concentrations in two of the wells are below 30 μg/l and two of the wells are over 14,000 μg/l. Consistent with previous long term monitoring results, TVOC concentrations at well locations outside the source area limits were less than 100 μg/l and ranged from 13.13 to 28.9 μg/l.

Wells 146C and 150C are downgradient of the source area under ambient groundwater flow conditions, and therefore key locations to understand groundwater flow with respect to the groundwater extraction system. Samples collected at 146C found TVOC concentrations over 20 μg/l prior to 2006, however; since 2006 concentrations have remained below 15 μg/l. Since sampling began at 150C in 2005, this location has shown a 95% decline in TVOC concentrations from near 250 μg/l to below 15 μg/l in 2010. A slight increase to 28.9 μg/l was observed in 2011 at this location, however this change is insignificant. Steep declines in 150C and 146C are readily apparent in the 2005 – 2006 time period. This suggests that the groundwater recovery system is capturing the source area plume and reducing concentrations in the downgradient.

Similarly, historical C-Zone chemical results indicate a decrease in TVOC at source area well 145C. This well has been historically used to define the C-Zone source area limit. The long-term decreasing TVOC trend may be associated with the long term reduction in off-site migration resulting from hydraulic gradient reversal across the source area limits (as described above for the B-Zone). Although the data demonstrate a large variability in TVOC concentrations, an overall trend of decreasing TVOC since HCS startup is evident.

A marked decrease in TVOC concentration at well locations 145C and 146C was observed shortly after completion of the SFR in 1989. The SFR increased the capture zones of the former groundwater recovery wells and reduced off-site chemical migration. Based on the widespread drawdown observed since it began operation, it is expected that the HCS will further enhance the C-Zone capture zone.

TVOC trend plots for the declining C-Zone wells show an apparent relationship between HCS startup and decreasing TVOC concentrations. TVOC results for wells146C, 150C and 168C illustrate that the hydraulic effects of the HCS extend to the southeastern portions of the source limits.

D-Zone

Results from the four LTGMP D-Zone wells indicate TVOC concentrations within the source area of 31.7 μg/l (165D), with 165D being the only sample collected within the source area in 2011. TVOC concentrations outside of the source area ranged from 3.82 μg/l (148D) to 1,719 μg/l (145D). Consistent with previous long-term monitoring results, biogenic degradation compounds including cis-DCE and VC dominate TVOC results for wells 136D, 145D, 148D, and 165D. With the exception of 145D (1,719 μg/l), TVOC concentrations at well locations outside the source area limits were less than 600 μg/l. TVOC concentrations at well 136D have been trending downward since the 2000 baseline sampling, with the lowest concentration in the well found in 2009. Monitoring has shown hydraulic control from the HCS extends beyond the D/E/F-Zone source area limits.

TVOC results for well 145D, located outside the source area limits, show a downward trend since 2000, with the lowest TVOC concentration since 2000 found in 2009, discounting the low TVOC concentration for the 2005 second round event. TVOC concentrations at near source area well 165D indicate a return to historically lower TVOC levels.

Groundwater concentrations in D-Zone wells demonstrate that the HCS is effectively controlling groundwater flow as designed.

E-Zone

Results from the three LTGMP E-Zone wells indicate TVOC concentrations were below 10,000 μg/l, with the exception of one well (165E, 62,630 μg/l). Degradation products including cis-DCE and VC dominate TVOC results for all the E-Zone wells. As discussed in Section 3.6, the presence of these biogenic degradation compounds is indicative of natural attenuation processes occurring.

TVOC results for well 146E located outside the source area limits have been trending lower, with concentrations typically over ten thousand μg/l prior to 2009 and between 5,100 and 6,300 μg/l the last three years. Well 150E is also located outside of the source area limits with concentrations ranging from 486 μg/l (2000) to 6,590 μg/l (1996) and typically between 500 and 1,300 μg/l. TVOC concentrations at this location in 2011 (844 μg/l) were lower than the previous two years. Well 165E is a source area well and had shown a decreasing trend from 2007 through 2010, dropping from near 41,000 μg/l to 5,730 μg/l, but increased to 62,630 μg/l in 2011. This well is directly controlled by the pumping at RW-9, being in close proximity. Results of future sampling will determine if the 2011 result is anomalous or if concentrations are returning to a level similar to those observed in 2007.

Groundwater concentrations in E-Zone wells demonstrate that the HCS is effectively controlling groundwater flow as designed.

F-Zone

Results from the three LTGMP F-Zone wells indicate TVOC concentrations below 600 μg/l for two of the three wells. The one TVOC concentration over 10,000 μg/l was location 146F where the TVOC concentration was 15,450 μg/l. Similar to the results from the E-Zone wells TVOC results for all the F-Zone wells are dominated by biogenic degradation compounds cis-DCE and VC. TVOC concentrations at near source well 136F have steadily declined since HCS startup from 8,458 μg/l in 2005 to 239 μg/l in 2008, increasing slightly in 2009 to 674.9 μg/l, dropping further in 2010 to 171.5 μg/l, and increasing slightly in 2011 to 215 μg/l. TVOC concentrations at location 150F have shown a fairly steady trend lower since 1998, with concentrations dropping from over 4,500 μg/l to near 569 μg/l in 2011, the lowest observed TVOC concentration at this location to date.

TVOC trend plots for far-field wells 146E and 146F show an overall decrease in TVOCs. The recent short-term TVOC increases at these locations (post-HCS start-up results) are attributed to the increased concentrations of cis-DCE and VC that currently dominate the TVOCs.

TVOC concentration trends for the D/E/F-Zone wells also correlate to the startup of the HCS, as illustrated on the trend plots for wells 136D, 136F, and 150F. TVOC concentrations have apparently decreased at these locations in response to the startup of the HCS.

Groundwater concentrations in F-Zone wells demonstrate that the HCS is effectively controlling groundwater flow as designed.

3.5 Monitored Natural Attenuation (MNA) Assessment

In 2010, DuPont submitted a request to the USEPA for modifications of the LTGMP. DuPont requested that the frequency of MNA sampling be reduced to every five years and several wells be removed from the annual sampling list. The USEPA agreed (USEPA, July 16, 2010) to the reduction in the number of wells sampled annually, but required MNA monitoring to be completed next in 2013. The 2013 results will then be used to evaluate the feasibility of expanding to a five year time frame for MNA sampling. Additionally, USEPA is requiring that all wells included in Table 3-12 of the 2009 Annual Report be sampled on a three or five year schedule to monitor source area groundwater chemistry trends.

In correspondence and during the meeting with the USEPA on November 17, 2011, the MNA program questioned in terms of the effectiveness in the far field. In the 2009 Annual Report (last formal MNA evaluation), DuPont provided a thorough discussion of MNA at Necco Park. The discussion included five pages of text and a full appendix of tables and figures (over 26 time series plots alone). The conclusion of the analysis was that site data strongly supports the interpretation that natural attenuation is actively degrading site compounds. This type of analysis was conducted annually from 2005 to 2008 with similar conclusions. Furthermore, Lee et al. (1993) also determined that natural attenuation is occurring at the site via biological anaerobic dechlorination. The next MNA event in 2013 will be similar in depth to the study presented in the 2009 report.

3.6 DNAPL Monitoring and Recovery

As described in the LTGMP and the DNAPL Monitoring and Recovery Plan, monitoring for the occurrence of DNAPL has been conducted routinely at the Necco Park site since the early 1980s. A monitoring and recovery program was instituted in 1989 to remove free-phase DNAPL from monitoring and groundwater recovery wells. The historically established monitoring program was modified based on results of the PDIs. The 2011 monthly DNAPL monitoring results are summarized in Table 3-9.

In 2011, 130 gallons of DNAPL was recovered from RW-5 (70 gallons in March, 12 gallons in April, 20 gallons in May, 16 gallons in June, and 12 gallons in November). Trace DNAPL was noted at RW-5 in 3Q11. At well 204C, installed in November 2008, trace DNAPL was observed during eleven of twelve months in 2011. Trace DNAPL was found in 139C in the June monitoring event (monitored semi-annually). The total quantity of DNAPL recovered since the program has been in place is approximately 8,555 gallons.

3.7 Quality Control/Quality Assurance

The 2011 annual groundwater samples were submitted to TestAmerica Laboratories in North Canton, Ohio for all chemical analyses.

3.7.1 Sample Collection

The samples were collected in accordance with the scope and technical requirements defined in the project Work Plan and Quality Assurance Project Plan (DuPont CRG 2005c). Samples were submitted in five delivery groups received at the laboratories between August 16, 2011, and August 20, 2011. Based on laboratory receipt records, all samples were received in satisfactory condition and within USEPA holding time and temperature requirements (<4 degrees centigrade). Field QC samples collected during the sampling round included two field duplicate pairs, five daily equipment blank samples, and five trip blanks (volatile organics).

In-House Data Collection

The quality of the data set was evaluated by the URS ADQM Group, using the analytical results provided in hard-copy CLP-type data packages in conjunction with an automated data evaluation of the electronic data deliverables (the DuPont Data Deliverable Review [DDR] process described below). The laboratory data packages presented a review of the QA/QC procedures conducted by the laboratory and included case narratives identifying any significant issues associated with sample receipt, preparation, and analysis.

The electronic data was processed through an automated program developed by DuPont, referred to as the DDR, where a series of checks were performed on the data, resulting in essentially a summary level validation. The data were evaluated against holding time criteria, checked for laboratory blank, equipment blank, and trip blank contamination, and assessed against the following:

- Matrix spike(MS)/matrix spike duplicate (MSD) recoveries
- Relative percent differences (RPDs) between MS/MSD samples
- Laboratory control sample (LCS)/control sample duplicate (LCSD) recoveries
- RPDs between LCS/LCSD
- RPDs between laboratory replicates
- Surrogate spike recoveries
- RPDs between field duplicate samples

The DDR also applied the following data qualifiers to analysis results, as warranted:

Default qualifiers

Qualifier	Definition
B	Not detected substantially above the level reported in the laboratory or field blanks.
R	Unusable result. Analyte may or may not be present in the sample.
J	Analyte present. Reported value may not be accurate or precise.
UJ	Not detected. Reporting limit may not be accurate or precise.

All sample analyses were completed within the USEPA recommended holding times. The target analytes barium and chloride were detected in the equipment blanks at low concentrations; most samples with concentrations in the same range were B qualified as unreliable detections. In addition, the volatile analyte methylene chloride was detected in the laboratory blank; the methylene chloride detection in well sample VH-171B was B qualified as unreliable.

The semi-volatile targeted tentatively identified compound (TIC 01) detections are considered estimated concentrations since they are identified and semi-quantitative via library search, and have been J qualified. As noted on the DDR report, TIC 01 was also detected in one of the laboratory method blanks, and the DDR process applied B qualifiers to the TIC 01 detections in the associated samples. During the independent validation, the Environmental Standards reviewer applied J qualifiers to these samples,

Several volatiles in the BLIND1-DUP samples (field duplicate of NEC-VH-136D) were J qualified (detections) /UJ qualified (non-detects) due to a low surrogate recovery. Additionally, the non-detect result for the semi-volatile hexachlorobenzene in the same sample was also qualified due to low surrogate recoveries. The detections in this sample may be low-biased, and the reporting limits for the non-detects may be higher than shown in the report.

All analytes reported between the method detection limit (MDL) and practical quantitation limit (PQL) were J qualified as estimated concentrations.

3.7.2 Independent Data Validation

In addition to the in-house evaluation, approximately 10% of the sample locations and associated field and laboratory QC samples were submitted for independent data validation by Environmental Standards, Inc., of Valley Forge, Pennsylvania. The wells were selected for validation based on their importance to the program (key perimeter wells) and include well locations VH-136D, VH-136 matrix spike, VH-136 matrix spike duplicate, VH-145C, VH-146E, and VH-172B. A copy of the Data Validation Summary report is included in Appendix C as an electronic file.

A number of validation qualifiers were applied to the samples due to low surrogate recoveries, high percent drift in continuing calibration verification analysis, low internal standard area counts, field duplicate imprecision, quantitation of TIC results, quantitation below the PQL, or blank contamination. No sample results were qualified as unusable.

4.0 CAP MAINTENANCE

The cap was substantially completed in 2005, and all remedial items were completed by August 2006. A lawn maintenance contractor maintains both the landfill cap and ditch vegetation. Landfill cap maintenance activities are conducted in accordance with the Cap Maintenance and Monitoring Plan (CMMP). Results of the landfill cap maintenance inspection conducted on November 16, 2011, are provided in Appendix D.

As part of the cap maintenance program, sediment accumulation was removed from the perimeter drainage ditch in October 2011. Sediment was mechanically removed from approximately 3,200 linear feet along the northeast, east and southeast sections of the ditch.

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5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Hydraulic Control Effectiveness

5.1.1 Conclusions

The HCS continues to be effective at controlling source area groundwater at the DuPont Necco Park Site. The following observations support this conclusion:

- Water levels in the AT- and A-Zone continue a long-term decreasing trend due to the in-place remedial measures including the impermeable landfill cap, and groundwater extraction. The AT- and A-Zones are dewatering vertically from the hydraulic depression created by the HCS. This is evident in vertical gradients, the drawdown calculations, and the time series plots of water level elevations.
- Groundwater potentiometric contour maps depict a capture zone encompassing the source area in the B-, C-, D-, E- and F-Zones.
- Groundwater chemistry results indicate decreasing or stable trends for VOCs in multiple zones. These trends provide supporting evidence that the HCS is effective in controlling the source areas.

The addition of RW-11 and the associated B-Zone BFBT in 2008 has led to improved A-, B-, and C-Zone hydraulic control in the southwestern part of the Site. The increases in flow zone transmissivities by *in-situ* blasting have resulted in an increase in recovery well pumping rates, an increase in the extent of hydraulic influence, and measureable drawdowns in distant wells. Water levels within and surrounding the BFBT at RW-11 decreased after the transition from RW-10 to RW-11. This is direct evidence of the increased capture zone resulting from installation of the BFBT. Additionally, between 2008 and 2009, there was significant improvement in the hydraulic control of the A-Zone as shown in the A-Zone potentiometric contours compared to previous A-Zone contours. This improvement, likely due to the BFBT, was maintained during 2011.

5.1.2 Recommendations

Based on the site history, years of monitoring, and observation in 2011 the following recommendations are made:

- Continue to rehabilitate RW-5 on a semiannual basis
- Monitor RW-11 yield and total depth to develop an understanding of the proper maintenance schedule needed for this location
- Review and present options for continual or permanent rehabilitation or modification of RW-5

5.2 Groundwater Chemistry Monitoring

5.2.1 Conclusions

The 2011 and historical chemistry monitoring results indicate the following:

- TVOC concentrations decrease overall for all groundwater flow zones in the source area and far-field.

- A-Zone chemistry results are consistent with historical results in that they show no significant off-site horizontal chemical migration in the overburden.
- TVOC decreases have occurred at key B/C-Zone source area limit wells including 171B and 172B. In 2011, both of these wells had lower TVOC concentrations than previously found.
- TVOC concentrations in the D/E/F-Zone are either stable or decreasing. TVOC concentrations at wells 136F and 150F have shown declining concentration trends over the last several years. The TVOC concentration in 150F was the lowest found at this location in 2011.
- Analytical results for 2011 would not significantly change the A-Zone and B/C-Zone source area limits as delineated in the SAR.
- Analytical results for 2011 (including well 146E) support the 2005 Annual Report conclusion of a reduced source area limit for the D/E/F-Zone as delineated in the SAR based on the analytical results from well 146E.
- The 2008 through 2011 sample rounds indicate an increase in groundwater pH at select overburden and upper bedrock monitoring locations that requires further monitoring to determine the significance of the increases.
- Results from groundwater sampling events completed since the startup of the HCS show that the HCS is effectively controlling zone-specific source areas.
- Development and rehabilitation of RW-11 had a significant impact on well yield at Necco Park and response was observed in the potentiometric surface around RW-11 and the BFBT.

5.2.2 Recommendations

The 2011 sampling results represent the tenth groundwater sampling event in the long-term monitoring program. It is recommended that the long-term monitoring program continue in its current form, including the revisions from 2010 and 2011. It is also recommended that the pre-2009 well sampling program, which is required to occur every 3 to 5 years, be scheduled in 2013 along with the MNA sampling event.

5.2.3 Conclusions and Recommendations

As discussed above, MNA was not completed in 2011 as agreed to by the USEPA. The next sampling event for MNA monitoring is scheduled to be completed in 2013. Analytical results, such as concentration of degradation products, and geochemical conditions, from 2011 continue to support the recommendations of conducting MNA assessments every five years.

5.3 DNAPL Monitoring and Recovery

5.3.1 Conclusions

Results of the 2011 DNAPL monitoring and historical recovery efforts indicate the following:

- Monitoring for the presence of DNAPL was completed monthly during 2011.
- A total of 130 gallons of DNAPL was removed from RW-5 in 2011.

- Approximately 8,555 gallons of DNAPL have been recovered since the recovery program was initiated in 1989.

5.3.2 Recommendation

Continue DNAPL monitoring and recover DNAPL where encountered.

5.4 Landfill Cap

5.4.1 Conclusions and Recommendations

With establishment of a continuous vegetative cover, the landfill cap construction is complete and will be now be maintained in accordance with the CMMP.

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TABLES

Table 2-1

HCS Recovery Well Performance Summary
2011
DuPont Necco Park

	B/C-ZONE						D/E/F-ZONE			
	RW-4		RW-5		RW-11		RW-8		RW-9	
	Total Gallons Pumped	**Uptime°**	**Total Gallons Pumped**	**Uptime°**	**Total Gallons Pumped**	**Uptime°**	**Total Gallons Pumped**	**Uptime°**	**Total Gallons Pumped**	**Uptime°**
JANUARY	9,287	82.7%	124,302	87.4%	261,694	93.0%	365,750	92.9%	442,416	92.9%
FEBRUARY	6,377	99.4%	127,993	91.9%	514,638	97.6%	363,492	99.4%	442,227	99.4%
MARCH	9,534	100.0%	135,371	88.1%	278,710	97.3%	401,705	100.0%	459,551	100.0%
APRIL	14,958	100.0%	129,510	97.1%	218,479	91.4%	407,807	94.7%	528,568	100.0%
MAY	14,002	87.5%	129,876	87.4%	171,914	84.0%	389,380	91.7%	404,872	91.7%
JUNE	5,983	76.0%	106,375	71.6%	128,416	75.7%	367,972	96.0%	351,954	96.0%
JULY	8,784	96.7%	125,888	97.7%	113,833	92.6%	379,420	98.1%	365,114	98.1%
AUGUST	10,400	97.0%	111,950	85.7%	108,685	80.6%	380,140	95.5%	363,930	95.5%
SEPTEMBER	16,639	89.5%	102,136	76.8%	170,473	95.4%	407,666	99.9%	473,817	99.9%
OCTOBER	7,906	100.0%	88,847	70.8%	197,181	69.9%	421,766	100.0%	410,862	100.0%
NOVEMBER	4,883	90.4%	98,001	90.4%	293,618	87.6%	346,456	99.8%	259,410	99.8%
DECEMBER	6,686	69.0%	100,008	70.5%	315,249	64.7%	356,175	92.3%	260,796	92.3%
TOTAL / AVG.	115,439	90.7%	1,380,257	84.6%	2,772,890	85.8%	4,587,729	96.7%	4,763,517	97.1%
2005	70,814	94.0%	1,966,338	93.0%	799,663*	95.0%	2,950,786	93.0%	3,881,318	93.0%
2006	92,358	90.0%	2,184,288	93.9%	701,579*	87.8%	4,581,348	95.0%	5,236,043	94.4%
2007	109,853	95.1%	1,391,339	83.6%	362,994*	92.6%	3,857,693	96.2%	5,506,023	95.9%
2008	103,262	90.9%	1,101,634	71.4%	1,149,746**	69.0%	3,680,999	96.9%	6,210,570	96.2%
2009	106,849	93.7%	1,447,179	88.7%	5,585,699	90.8%	4,639,060	97.8%	4,397,025	97.6%
2010	144,749	90.3%	1,437,736	86.1%	3,327,973	86.0%	4,091,555	90.8%	4,772,745	90.6%

°Time taken for routine maintenance was not calculated as down-time

*RW-10

** RW-10 and RW-11 Combination

Table 2-2
GWTF Process Sampling Results
2011
DuPont Necco Park
Niagara Falls, NY

		B/C INFLUENT				D/E/F INFLUENT				COMBINED EFFLUENT			
Analyte		2/8/11	6/3/11	8/31/11	11/9/11	2/8/11	6/3/11	8/31/11	11/9/11	2/8/11	6/3/11	8/31/11	11/9/11
Field Parameters													
SPECIFIC CONDUCTANCE	µmhos/cm	14030	11590	12260	10460	4479	4644	4172	4626	6343	6055	6558	7568
TEMPERATURE	^{o}C	10	14.2	16.2	14.8	10.6	15.1	13.5	13.7	10.6	17.1	17.5	15.1
COLOR	ns	GREY/BLUE	GREY/BLUE	GREY/BLUE	GREY/BLUE	GREY	GREY	GREY	GREY	GREY/BLUE	GREY/BLUE	GREY/BLUE	GREY/BLUE
ODOR	ns	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	SLIGHT	SLIGHT	SLIGHT	Slight
PH	std units	5.55	5.76	5.45	5.84	7.12	6.9	6.92	6.78	8.02	6.91	7.37	6.91
REDOX	mv	-201	-179	-95	-157	-298	-275	-210	-255	3	-15	-61	-51
TURBIDITY	ntu	76.7	122	179	325	55.8	97.8	51.9	137	116	101	84.5	124
Inorganics													
BARIUM, DISSOLVED	µg/l	146000	120000	77000	48000	77 J	79 J	73 J	88 J	470	400	290	1.6 J
BARIUM, TOTAL	µg/l	218000	190000	230000	160000	63 J	62 J	60 J	62 J	34400	27000	29000	42000
SULFATE	µg/l	3900	1400	3500	2300	885000	1000000	770000	880000	519000 J	530000	420000	370000
CYANIDE, TOTAL	µg/l	2600	2600	4200	3200	30	68	42	26	360	670	830	1500 J
Volatile Organics													
1,1,2,2-TETRACHLOROETHANE	µg/l	3000	3600	4300	2900	1200	1900	1500	1600	700 J	920 J	980	840
1,1,2-TRICHLOROETHANE	µg/l	2800	2300	4600	4100	2200	2900	2400	3000	530 J	540	560	540
1,1-DICHLOROETHENE	µg/l	350 J	320	380	490	310 J	340	300	260	<4.8	<0.63	<0.76	<0.48
1,2-DICHLOROETHANE	µg/l	530 J	360	680	460	220 J	240	180	240	34	28	32	30
CARBON TETRACHLORIDE	µg/l	1400	1100	1500	1700	1000	1700	1200	1500	<3.2	1.2 J	2.1 J	1.7 J
CHLOROFORM	µg/l	15000	12000	24000	17000	3500	4200	4100	4600	97	110	140	130
CIS-1,2-DICHLOROETHENE	µg/l	5800	5600	6600	4800	11000	13000	11000	11000	210	150	140	76
METHYLENE CHLORIDE	µg/l	2600	1800	3000	2200	5200	5900	5100	5600	200	120	140	78
TETRACHLOROETHENE	µg/l	4200	4000	5300	6400	1300	1900	1300	1500	8.4 J	8.7	34	15
TRANS-1,2-DICHLOROETHENE	µg/l	370 J	310	410	340	670	800	640	650	<4.8	2.2 J	1.9 J	1.1 J
TRICHLOROETHENE	µg/l	14000	11000	17000	18000	6200	7500	6400	7500	44	42	43	41
VINYL CHLORIDE	µg/l	1900	1400	1300	950	2500	2400	2500	1500	<5.5	<0.73	<0.88	<0.55
Semivolatile Organics													
2,4,5-TRICHLOROPHENOL	µg/l	28 J	<5.7	40 J	<5.7	370	300	360	370	270	280	290 J	270
2,4,6-TRICHLOROPHENOL	µg/l	<16	<15	15 J	<15	170	140 J	180	180	120 J	130 J	130 J	120 J
3-METHYLPHENOL & 4-METHYLPHENOL	µg/l	150 J	<14	41 J	<14	17 J	15 J	14 J	16 J	49 J	<7.1	<14	<7.1
HEXACHLOROBENZENE	µg/l	<2	<1.9	5.4 J	3.5 J	<1.2	<1.9	<1.2	<1.2	<1	<0.95	<1.9	<0.95
HEXACHLOROBUTADIENE	µg/l	410	480	580	520	31 J	34 J	32 J	34 J	20 J	5.2 J	640 J	130 J
HEXACHLOROETHANE	µg/l	160 J	180 J	<15	96 J	10 J	<15	11 J	10 J	<8	<7.6	45 J	13 J
PENTACHLOROPHENOL	µg/l	110 J	69 J	78 J	130 J	760	460 J	210 J	500 J	560	420 J	280 J	460 J
PHENOL	µg/l	190 J	140 J	290	110 J	41 J	36 J	44 J	60 J	79 J	71 J	120 J	60 J
TIC-1	µg/l	1700 J	3200 J	1400 J	2900 J	770 J	800 J	890 J	280 J	900 J	610 J	1500 J	540 J
TOTAL VOLATILES	µg/l	**51,950**	**43,790**	**69,070**	**59,340**	**35,300**	**42,780**	**36,620**	**38,950**	**1,823**	**1,922**	**2,073**	**1,753**

< and ND = Non detect at stated reporting limit
J= Analyte present. Reported value may not be precise.
UJ= Not detected. Reporting limit may not be accurate or precise.
NS= Not sampled
NA= Not applicable

Table 3-1
Hydraulic Monitoring Locations
Long-Term Groundwater Monitoring
DuPont Necco Park

Well ID	Zone	Monitoring Frequency	Well ID	Zone	Monitoring Frequency	Well ID	Zone	Monitoring Frequency
53	A	Quarterly	102B	B	Quarterly	105D	D	Quarterly
111A	A	Quarterly	111B	B	Quarterly	111D	D	Quarterly
117A	A	Quarterly	112B	B	Quarterly	115D	D	Quarterly
119A	A	Quarterly	116B	B	Quarterly	123D	D	Quarterly
123A	A	Quarterly	118B	B	Quarterly	129D	D	Quarterly
129A	A	Quarterly	119B	B	Quarterly	130D	D	Quarterly
131A	A	Quarterly	120B	B	Quarterly	136D	D	Quarterly
137A	A	Quarterly	123B	B	Quarterly	137D	D	Quarterly
139A	A	Quarterly	129B	B	Quarterly	139D	D	Quarterly
140A	A	Quarterly	130B	B	Quarterly	145D	D	Quarterly
145A	A	Quarterly	136B	B	Quarterly	148D	D	Quarterly
146AR	A	Quarterly	137B	B	Quarterly	149D	D	Quarterly
150A	A	Quarterly	138B	B	Quarterly	158D	D	Quarterly
159A	A	Quarterly	139B	B	Quarterly	159D	D	Quarterly
163A	A	Quarterly	145B	B	Quarterly	163D	D	Quarterly
168A	A	Quarterly	146B	B	Quarterly	164D	D	Quarterly
173A	A	Quarterly	149B	B	Quarterly	165D	D	Quarterly
174A	A	Quarterly	150B	B	Quarterly	202D	D	Quarterly
175A	A	Quarterly	151B	B	Quarterly	203D	D	Quarterly
176A	A	Quarterly	159B	B	Quarterly	RW-8	D/E/F	Quarterly
178A	A	Quarterly	160B	B	Quarterly	RW-9	D/E/F	Quarterly
179A	A	Quarterly	161B	B	Quarterly	RW-11	B/C	Quarterly
184A	A	Quarterly	163B	B	Quarterly	129E	E	Quarterly
185A	A	Quarterly	167B	B	Quarterly	136E	E	Quarterly
186A	A	Quarterly	168B	B	Quarterly	142E	E	Quarterly
187A	A	Quarterly	169B	B	Quarterly	145E	E	Quarterly
188A	A	Quarterly	170B	B	Quarterly	146E	E	Quarterly
189A	A	Quarterly	171B	B	Quarterly	150E	E	Quarterly
190A	A	Quarterly	172B	B	Quarterly	163E	E	Quarterly
191A	A	Quarterly	201B	B	Quarterly	164E	E	Quarterly
192A	A	Quarterly	BZTW-1	B	Quarterly	165E	F	Quarterly
193A	A	Quarterly	BZTW-2	B	Quarterly	202E	E	Quarterly
194A	A	Quarterly	BZTW-4	B	Quarterly	203E	F	Quarterly
D-9	A	Quarterly	D-23	B	Quarterly	112F	F	Quarterly
D-11	A	Quarterly	PZ-B	B	Quarterly	123F	F	Quarterly
RDB-3	A	Quarterly	D-10	B/C	Quarterly	129F	F	Quarterly
RDB-5	A	Quarterly	D-14	B/C	Quarterly	130F	F	Quarterly
D-13	A	Quarterly	RW-10	B/C	Quarterly	136F	F	Quarterly
PZ-A	A	Quarterly	RW-4	B/C	Quarterly	142F	F	Quarterly
119AT	AT	Quarterly	RW-5	B/C	Quarterly	145F	F	Quarterly
129AT	AT	Quarterly	105C	C	Quarterly	146F	F	Quarterly
168A	A	Quarterly	112C	C	Quarterly	148F	F	Quarterly
180AT	AT	Quarterly	115C	C	Quarterly	150F	F	Quarterly
184AT	AT	Quarterly	123C	C	Quarterly	163F	F	Quarterly
185AT	AT	Quarterly	129C	C	Quarterly	164F	F	Quarterly
186AT	AT	Quarterly	130C	C	Quarterly	165F	F	Quarterly
187AT	AT	Quarterly	136C	C	Quarterly	202F	F	Quarterly
188AT	AT	Quarterly	137C	C	Quarterly	203F	F	Quarterly
189AT	AT	Quarterly	138C	C	Quarterly	130G	G	Quarterly
190AT	AT	Quarterly	139C	C	Quarterly	136G	G	Quarterly
191AT	AT	Quarterly	141C	C	Quarterly	141G	G	Quarterly
192AT	AT	Quarterly	145C	C	Quarterly	143G	G	Quarterly
193AT	AT	Quarterly	146C	C	Quarterly	TRW-6		Quarterly
194AT	AT	Quarterly	149C	C	Quarterly	TRW-7		Quarterly
PZ-195AT	AT	Quarterly	150C	C	Quarterly			
PZ-196AT	AT	Quarterly	151C	C	Quarterly			
PZ-197AT	AT	Quarterly	159C	C	Quarterly			
PZ-198AT	AT	Quarterly	160C	C	Quarterly			
MW-198AT	AT	Quarterly	161C	C	Quarterly			
PZ-199AT	AT	Quarterly	162C	C	Quarterly			
PZ-200AT	AT	Quarterly	168C	C	Quarterly			
			204C	C	Quarterly			

AT=Top of Clay

Notes: 1. Well 204C installed in 2008 to replace 112C. Water levels began in 1Q09.

2. Piezometers PZ-A, PZ-B, and 168A installed in 2008.

Table 3-2
Average AT-Zone to A-Zone Vertical Gradients
DuPont Necco Park

Well Pair		A	B	C	D	
		2011 Average AT-Zone Head	2011 Average A-Zone Head	AT-Zone Mid-Point of Well Screen	A-Zone Mid-Point of Well Screen	Vertical Gradtient[1,2] (B-A) / (C-D)
119AT	119A	573.17	573.15	570.92	564.73	0.03
129AT	129A	573.13	573.15	567.24	563.25	-0.02
184AT	184A	571.12	571.82	570.46	564.65	-0.02
185AT	185A	571.18	571.56	569.24	566.50	0.18
186AT	186A	571.15	567.88	569.58	561.13	-0.84
187AT	187A	571.40	568.31	570.33	561.99	-0.79
188AT	188A	571.93	565.26	570.43	559.21	-0.96
189AT	189A	571.98	566.51	569.76	559.30	-0.92
190AT	190A	571.94	568.19	569.81	558.23	-0.62
191AT	191A	571.99	571.12	569.48	558.20	-0.27
192AT	192A	571.14	571.13	569.82	556.10	-0.17
193AT	193A	575.36	572.47	572.38	559.76	-0.54
194AT	194A	574.26	571.17	571.12	558.80	-0.38

Note:

1) Unitless (ft/ft).
2) Negative values indicate a downward (from AT-Zone to A-Zone) gradient.
3) Average gradients were used to better reflect typical vertical gradients at the site.

Table 3-3
2011 Average A-Zone to B-Zone Vertical Gradients
DuPont Necco Park

Well Pair		A	B	C	D	
		2009 Average A-Zone Head	2009 Average B-Zone Head	A-Zone Mid-Point of Well Screen	B-Zone Fracture Elevation[1]	Vertical Gradtient[2,3] (B-A) / (C-D)
111A	111B	572.35	571.14	573.94	561.80	-0.10
119A	119B	573.15	571.73	571.63	556.90	-0.10
129A	129B	573.15	567.95	570.10	557.80	-0.42
137A	137B	569.56	570.68	570.10	561.30	0.13
145A	145B	571.21	569.19	564.19	546.30	-0.11
150A	150B	570.86	570.10	564.69	553.18	-0.07
159A	159B	577.65	573.64	580.62	562.90	-0.23
163A	163B	572.81	572.71	572.49	564.96	-0.01
168A	168B	570.44	565.95	555.22	544.90	-0.44

Note:

1) A B-Zone fracture was not observed in the 145B borehole, therefore the midpoint of the open hole was used.
2) Unitless (ft/ft).
3) Negative values indicate a downward (from A-Zone to B-Zone) gradient.
4) Average gradients were used to better reflect typical vertical gradients at the site.

Table 3-4
DNAPL Components and Solubility Criteria Values
DuPont Necco Park

Contaminant	Mole Fraction in DNAPL (%)	Pure-Phase Solubility (ug/l)	One-Percent Pure-Phase solubility (ug/l)	Effective Solubility (ug/l)
Hexachlorobutadiene	59	2,000	20	1,180
Hexachloroethane	9	50,000	500	4,500
Hexachlorobenzene	2	11	0.11	0.22
Carbon tetrachloride	5	800,000	8,000	40,000
Chloroform	1	8,000,000	80,000	80,000
Tetrachloroethene	3	150,000	1,500	4,500
1,1,2,2-Tetrachloroethane	5	2,900,000	29,000	145,000
Trichloroethene	4	1,100,000	11,000	44,000

Table 3-5
2005 - 2011 Annual Sampling
Effective Solubility Concentration Exceedances for DNAPL Compounds
DuPont Necco Park

Well ID	Flow Zone	Analyte	Criteria (ppb)	2005		2006		2007		2008	2009	2010	2011
				1st Event	2nd Event	1st Event	2nd Event	1st Event	2nd Event				
171B	B	Hexachlorobutadiene	1,180	2,100	BC	BC	BC	NS	BC	BC	BC	BC	BC
		Hexachlorobenzene	0.22	BC	4.0	31 J	3.4 J	NS	1.4 J	BC	< 0.4	< 2.5	<0.95

BC: Below Criteria
NS: Not Sampled
Note: Only one well that in the current monitor program exceeds the effective solubility limit
"<" = compound not identified above the detection limit.

Table 3-6
2005 - 2011 Annual Sampling
1% of Pure-Phase Solubility Concentration Exceedances for DNAPL Compounds
DuPont Necco Park

Well ID	Flow Zone	Analyte	Criteria (ppb)	2005		2006		2007		2008	2009	2010	2011
				1st Event	2nd Event	1st Event	2nd Event	1st Event	2nd Event				
171B	B	Hexachlorobutadiene	20	2,100	130	BC	BC	BC	BC	BC	BC	BC	BC
		Hexachlorobenzene	0.11	BC	4.0	3.1 J	3.4 J	BC	1.4 J	BC	< 0.4	<0.5	< 0.95
172B	B	Hexachlorobutadiene	20	140	89	140 J	110	BC	110	54	170	210	20
		Tetrachloroethene	1,500	1,800	BC	BC	BC	BC	BC	BC	BC	BC	BC
168C	C	Hexachlorobutadiene	20	330	64.0	54 J	NS	44 J	BC	BC	NS	<27	21 J
165E	E	Hexachlorobutadiene	20	27.0	BC	32 J	46 J	BC	45 J	91 J	44 J	79 J	26 J
		Tetrachloroethene	1,500	BC	BC	BC	BC	BC	BC	BC	BC	2,000	BC
		Trichloroethene	11,000	BC	BC	BC	BC	BC	BC	BC	BC	11,000	12,000

BC: Below Criteria
NS: Not Sampled
"<" = compound not identified above the detection limit.

Table 3-7
Chemical Monitoring List
Long-Term Monitoring
DuPont Necco Park

MONITORING WELL	ZONE	MONITORING WELL	ZONE
137A	A	136D	D
145A	A	145D	D
146AR	A	148D	D
150A	A	165D	D
136B	B	146E	E
137B	B	150E	E
145B*	B	165E	E
146B	B	136F	F
150B	B	146F	F
168B	B	150F*	F
171B	B		
172B	B		
145C*	C		
146C*	C		
150C*	C		
168C	C		

*Well does not meet bedrock zone water bearing criteria ($k<10^{-4}$ cm/sec).

Table 3-8
Indicator Parameter List
Long-Term Groundwater Monitoring
DuPont Necco Park

INORGANIC AND GENERAL WATER QUALITY PARAMETERS	VOLATILE ORGANIC COMPOUNDS	SEMIVOLATILE ORGANIC COMPOUNDS
pH*	Vinyl chloride	Hexachloroethane
Specific conductivity*	1,1-dichloroethene	Hexachlorobutadiene
Temperature*	Trans-1,2-dichloroethene	Phenol
Turbidity*	Cis-1,2-dichloroethene	2,4,6-trichlorophenol
Dissolved oxygen *	Chloroform	2,4,5-trichlorophenol
Redox potential*	Carbon tetrachloride	Pentachlorophenol
Chloride	1,2-dichloroethane	Hexachlorobenzene
Dissolved barium	Trichloroethene	4-methlyphenol
	1,1,2-trichloroethane	TIC-1
	Tetrachloroethene	
	1,1,2,2-tetrachloroethane	

*Field parameter

Table 3-9
2011 DNAPL Recovery Summary
DuPont Necco Park

Well ID	Frequency	27-Jan		16-Feb		24-Mar		14-Apr		11-May		8-Jun		27-Jul		31-Aug		21-Sep		21-Oct		9-Nov		21-Dec	
		FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS
RW-4	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
RW-5	Monthly	0.0		trace		20.0	70.0	3.0	12.0	4.0	20.0	4.0	16.0	trace		0.0		0.0		0.0		3.0	12.0	0.0	
TRW-6	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
TRW-7	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
D-23	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-117A	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-123A	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-129A	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-129C	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-160B	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-160C	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-161B	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-161C	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-162C	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-190A	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-167B	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-168B	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-168C	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-169B	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-170B	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-171B	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-172B	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
PZ-A	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
PZ-B	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
204C	Monthly	0.0		trace		trace		trace		trace		trace		trace		trace		trace		trace		trace		trace	
RW-11	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-131A	Semi-annually	na		na		na		na		na		0.0		na		na		0.0		na		0.0		na	
VH-139A	Semi-annually	na		na		na		na		na		0.0		na		na		0.0		na		0.0		na	
VH-139C	Semi-annually	na		na		na		na		na		trace		na		na		0.0		na		0.0		na	
CECOS52SR	Semi-annually	na		na		na		na		na		0.0		na		na		0.0		na		0.0		na	
CECOS18SR	Semi-annually	na		na		na		na		na		0.0		na		na		0.0		na		0.0		na	
CECOS-53	Semi-annually	na		na		na		na		na		0.0		na		na		0.0		na		0.0		na	

na - not applicable/not taken
GALS - gallons purged

FIGURES

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Buffalo, NY 14202
(716) 541-0730

Created by: JWS	Date 03-29-11
Checked by: RBP	Date 03-29-11
Approved by: DDT	Date 03-29-11
Project Manager: DDT	Date 03-29-11
Job number: 445356.02020	

FIGURE 1-1
SITE LOCATION MAP
NECCO PARK
NIAGARA FALLS, NY

U:/Necco/HydroGeo/Mapping/gis/Necco_Site_location_map.srf

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BUFFALO, NY 14202
(716) 541-0752

Created by: JWS	Date: 02-27-12
Checked by: JWS	Date: 02-27-2012
Project Manager: Eric Felter	Date: 02-12-2012
Project Number: 445357.02023	

LEGEND

- ✦ 2010 REVISED CHEMICAL MONITORING
- ⬠ RECOVERY WELLS
- ◆ MONITORING WELL
- ┼ RAIL ROADS
- ▨ GROUT CURTAIN

FIGURE 3-1
WELL AND PIEZOMETER LOCATIONS
DUPONT NECCO PARK SITE
NIAGARA FALLS, NY

U:\Necco\hydrogeo\Maps\gis\basemap.mxd

Figure 3-2
Select AT-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2011
DuPont Necco Park

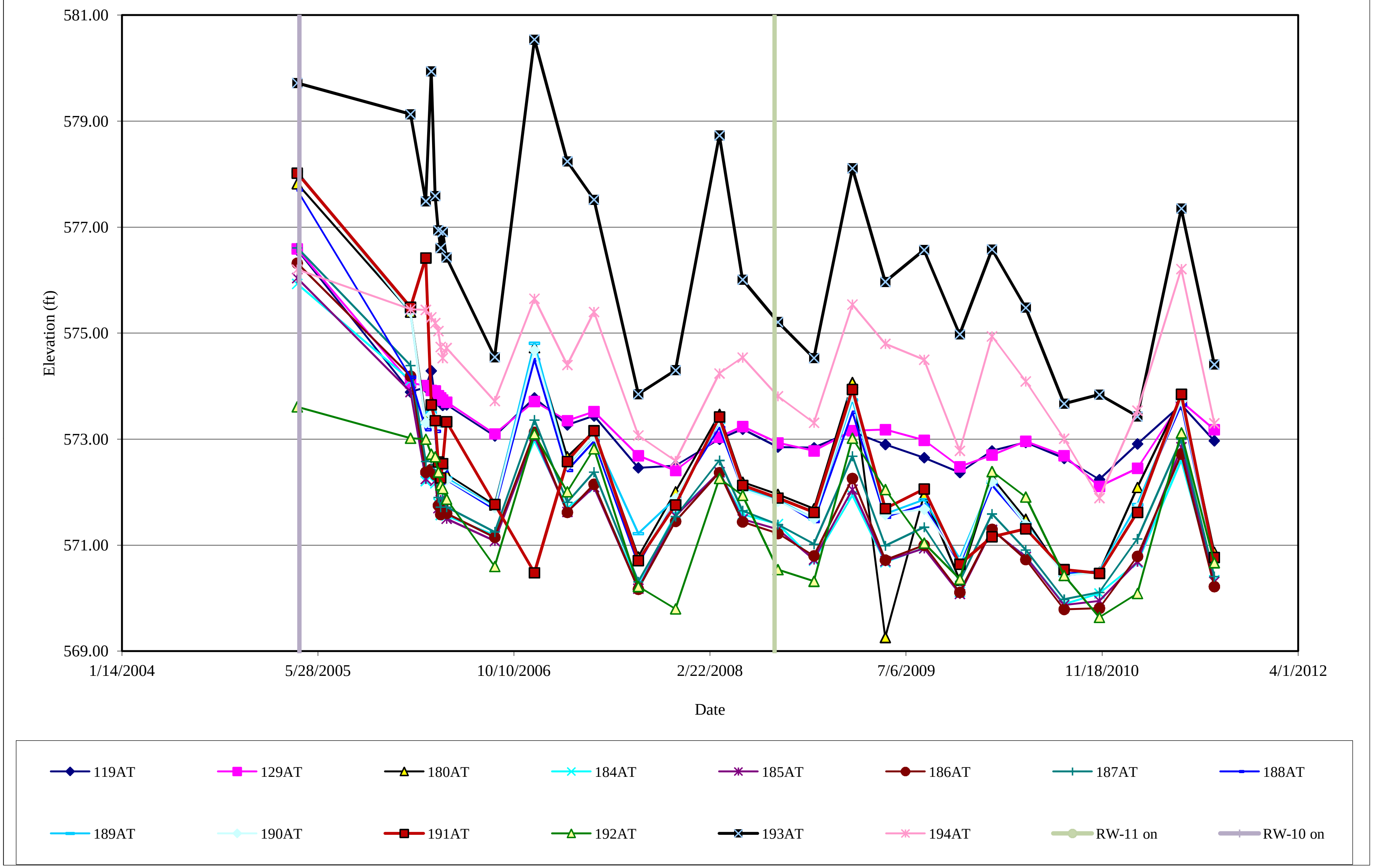


Figure 3-3
Select A-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2011
DuPont Necco Park

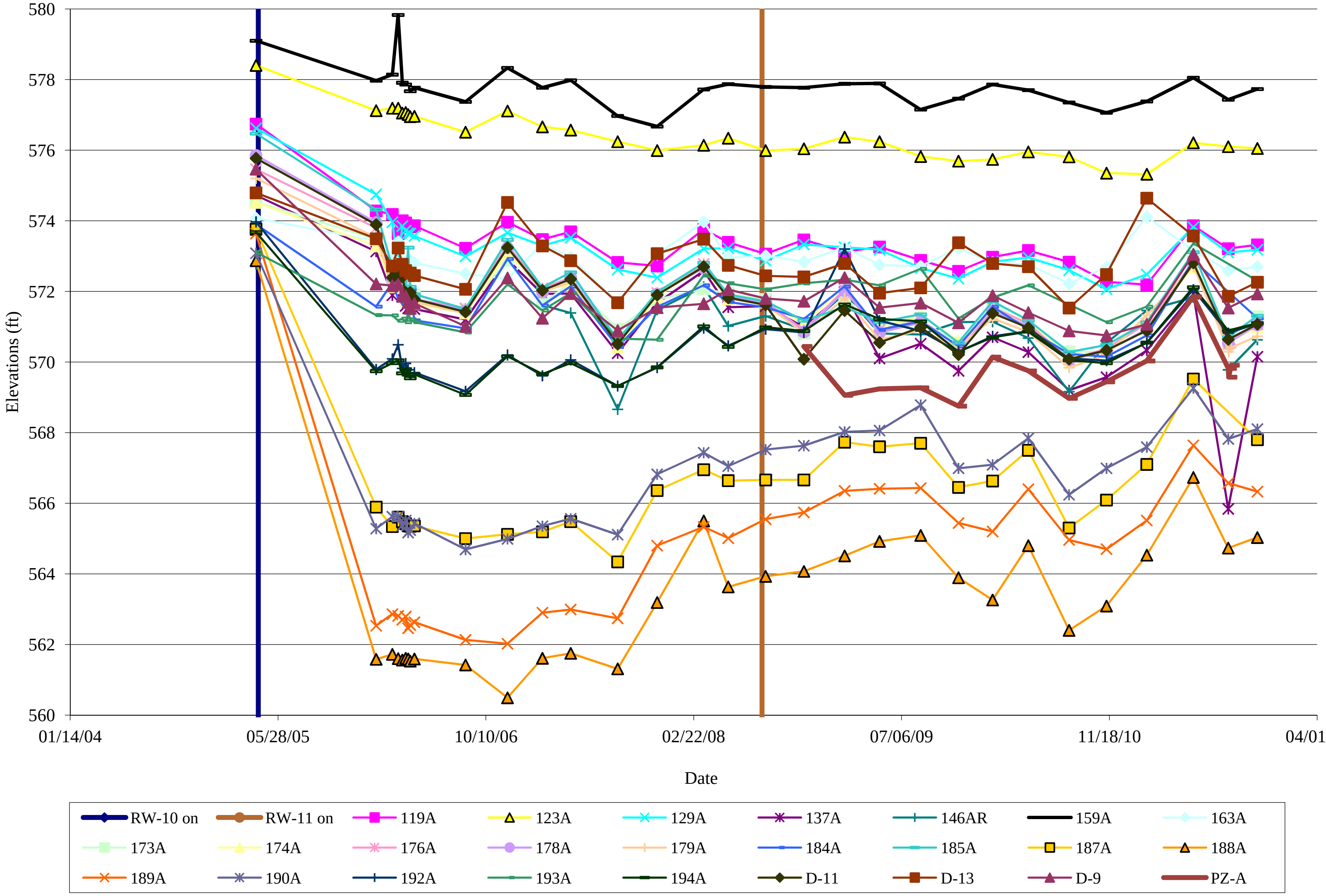
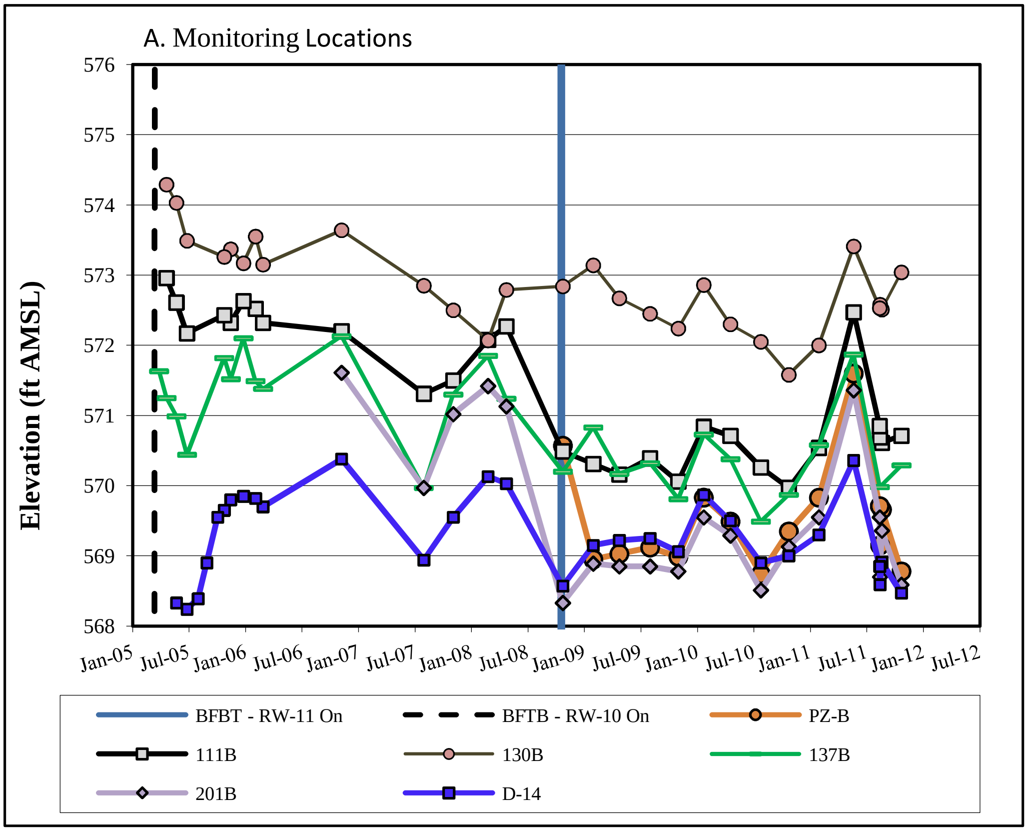
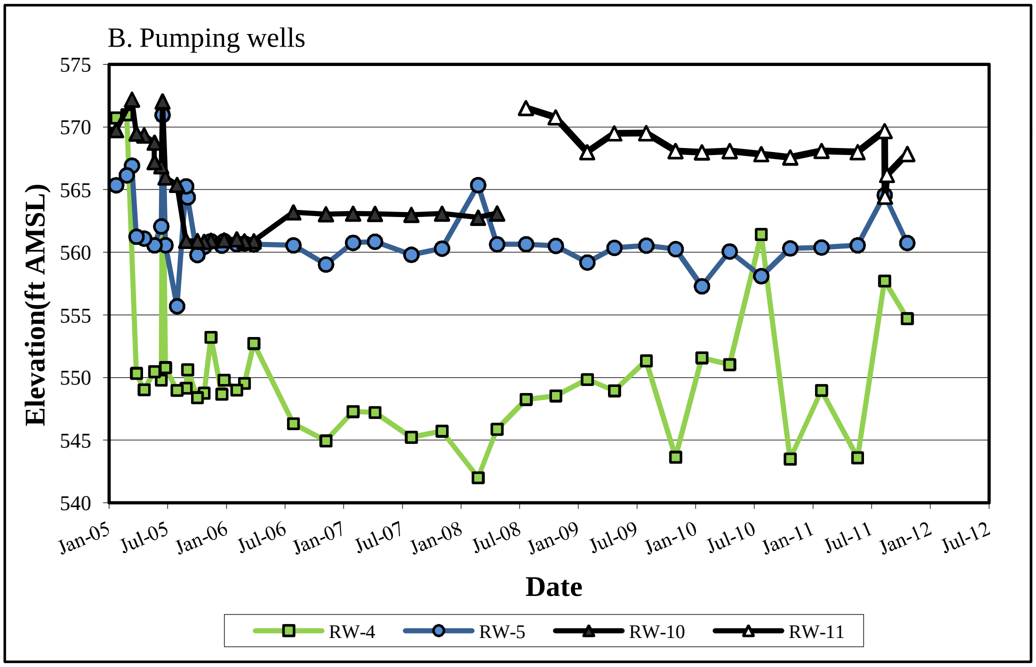


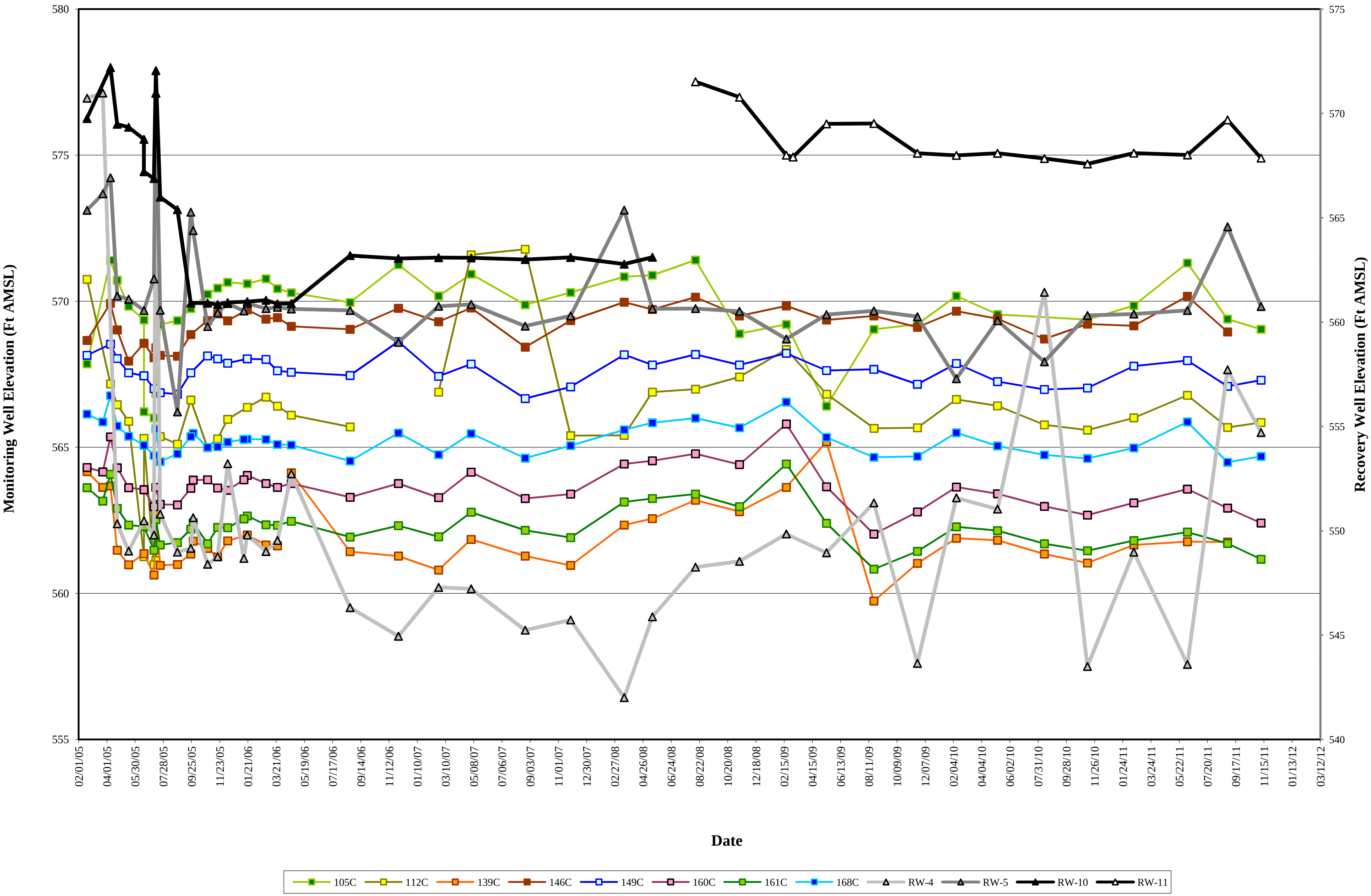
Figure 3-4
Select B-Zone Monitoring Wells
Groundwater Elevations 2005 through 2011


A. Monitoring Locations


B. Pumping wells

Necco 2011 B Zone Water Elev Trends.xlsx

Figure 3-5
Select C-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2011
DuPont Necco Park



3/27/2012
2:52 PM

Necco 2011 C Zone Water Elev Trends.xlsx
Selected

Figure 3-6
Select D-Zone Monitoring Wells
Groundwater Elevations 2005 through 2011
DuPont Necco Park

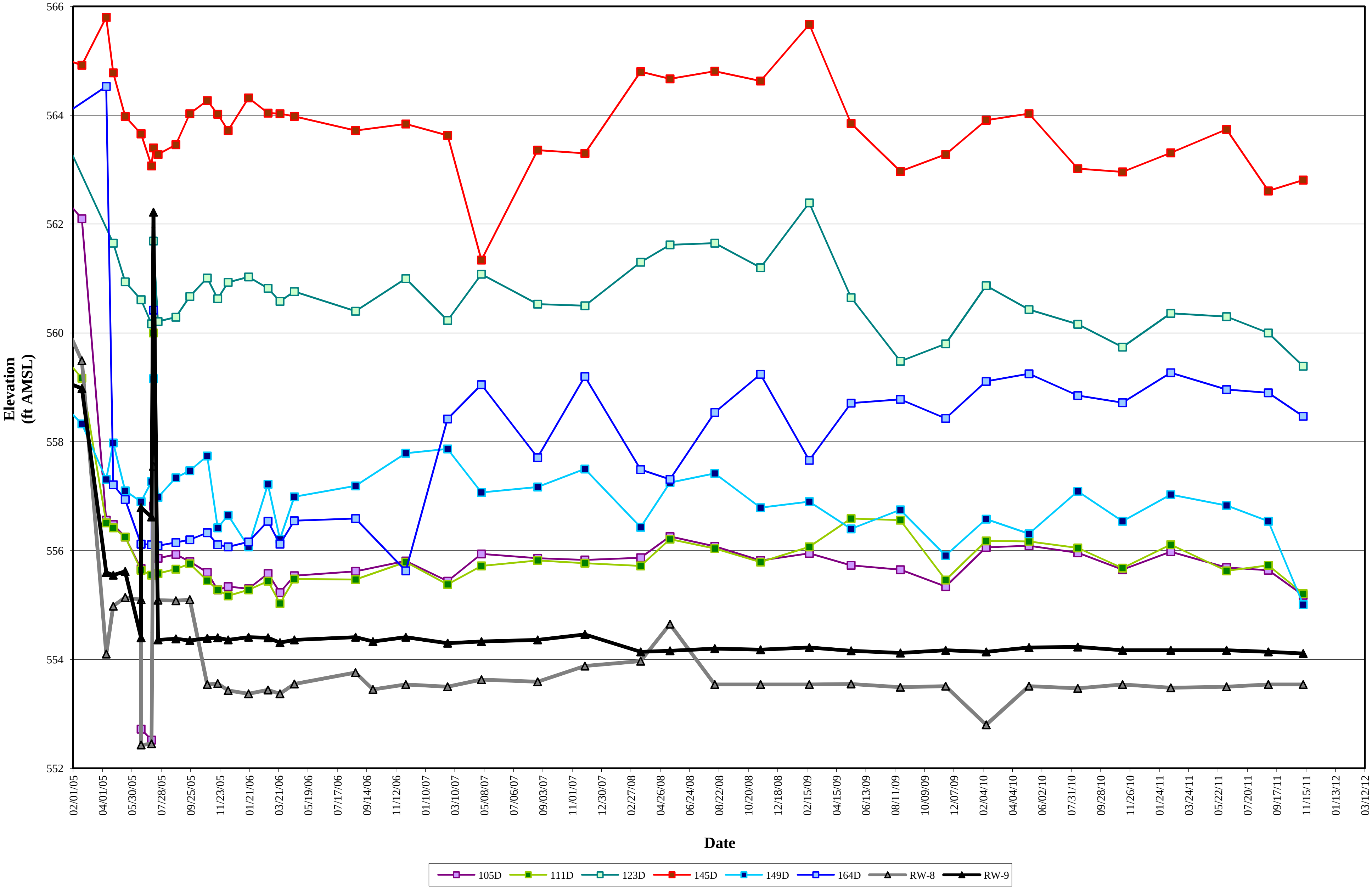


Figure 3-7
Select E-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2011
DuPont Necco Park

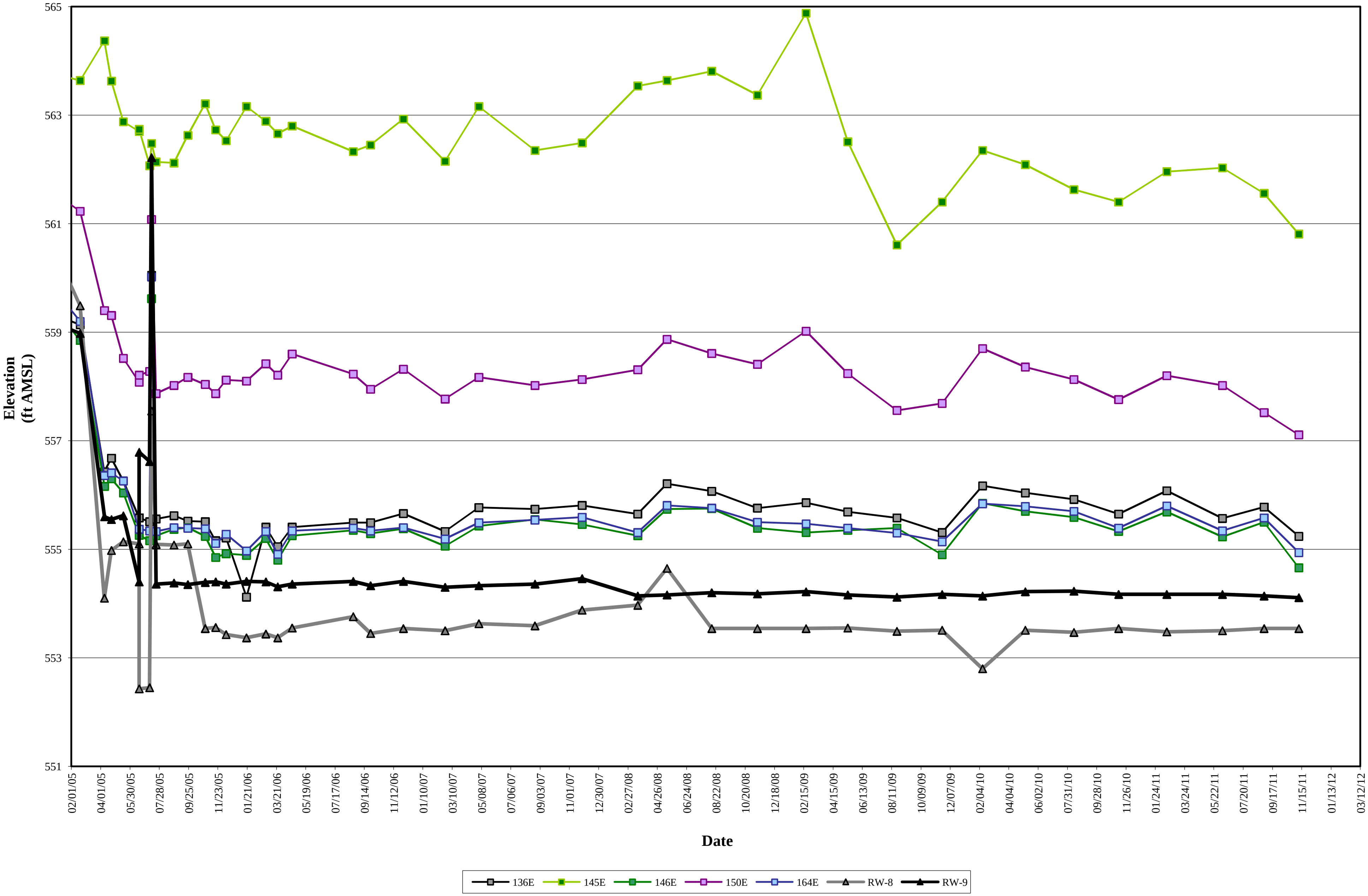
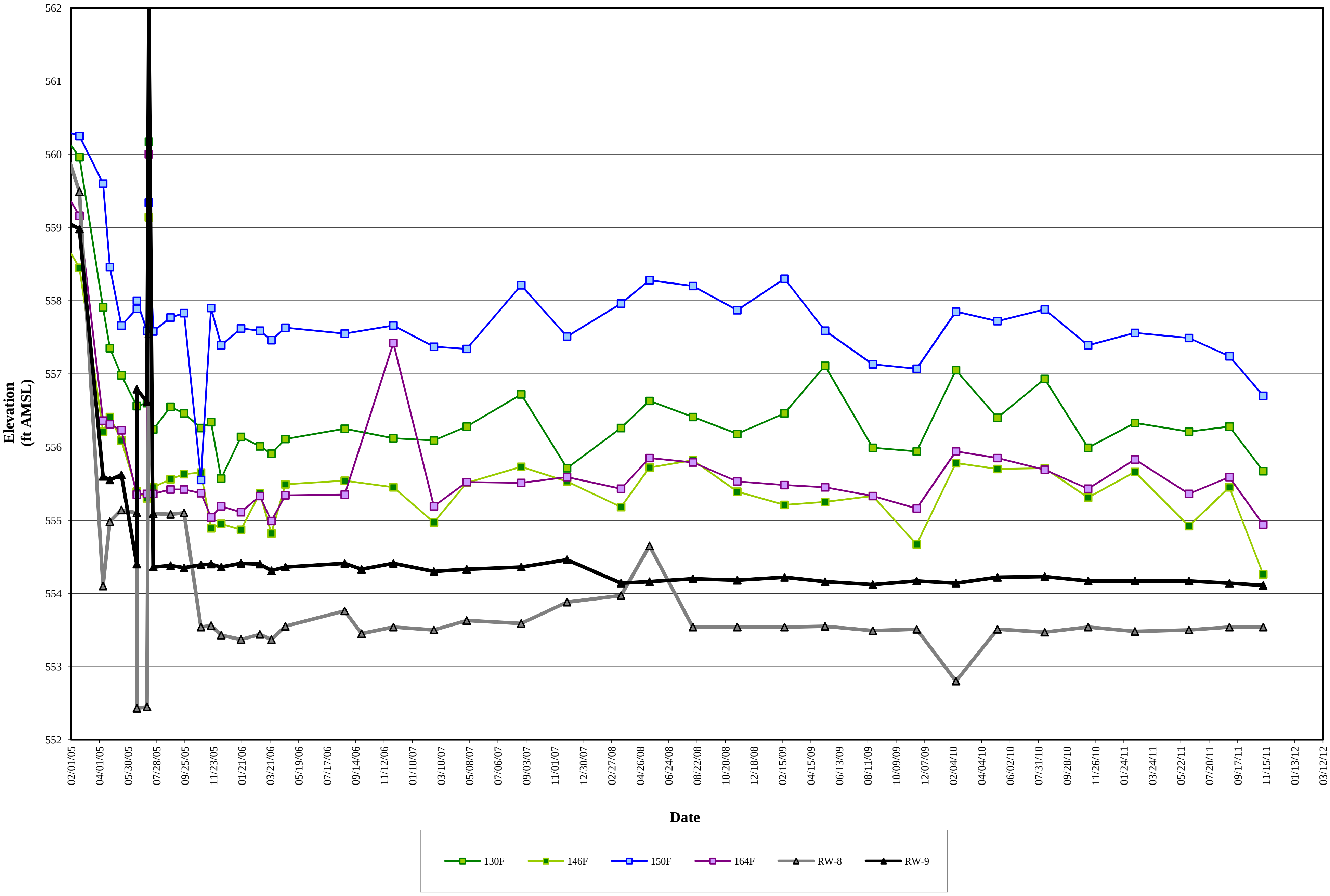
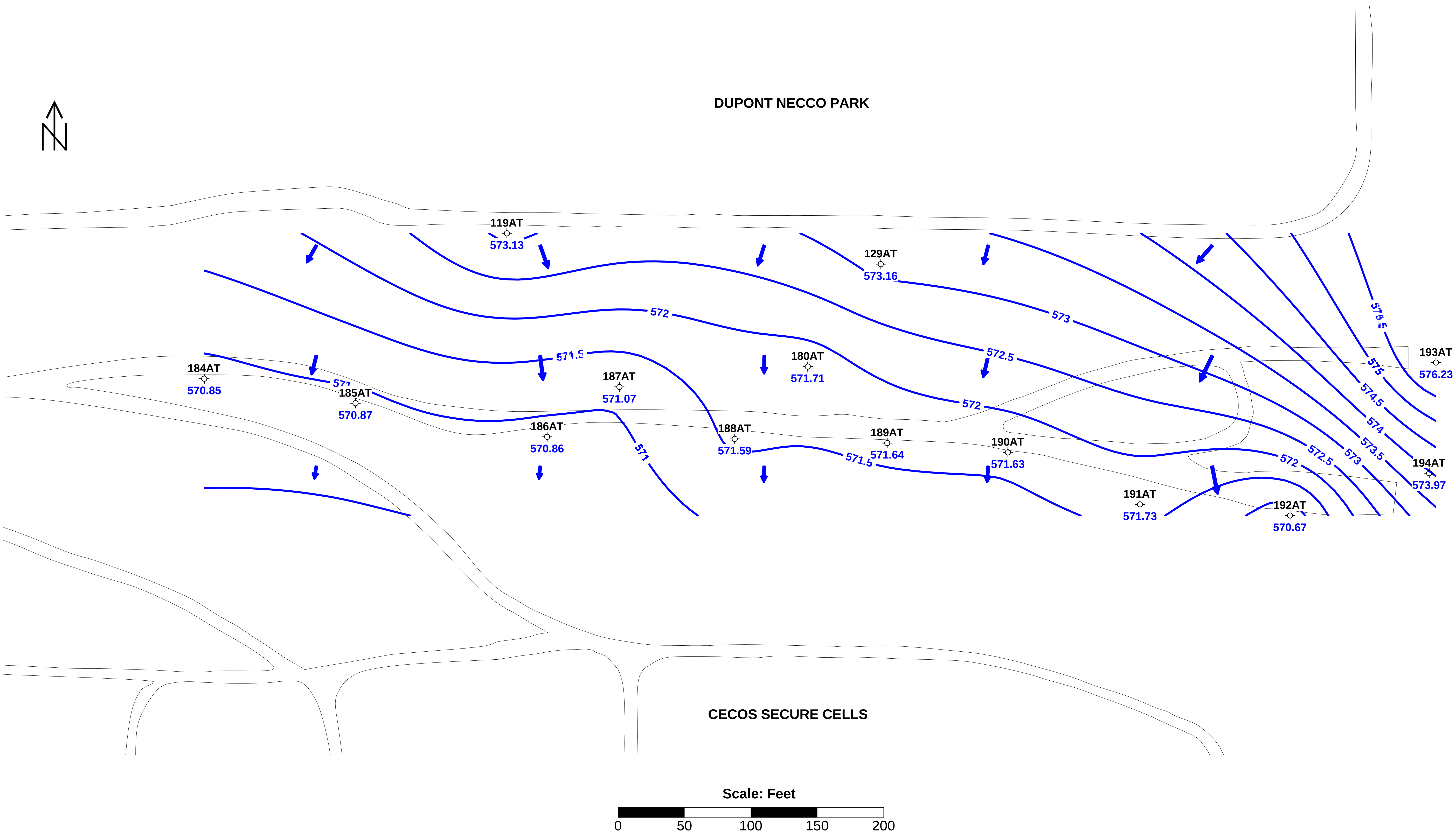


Figure 3-8
Select F-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2010
DuPont Necco Park





Contour Interval = 0.5 feet

Elevation datum feet AMSL

PARSONS

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Buffalo, NY 14202

Created by	RBP
Checked by	JWS
Project Manager	EAF

Job number: 445357.02023

LEGEND

3B Well ID

⌖ Monitoring Well

● Pumping Well

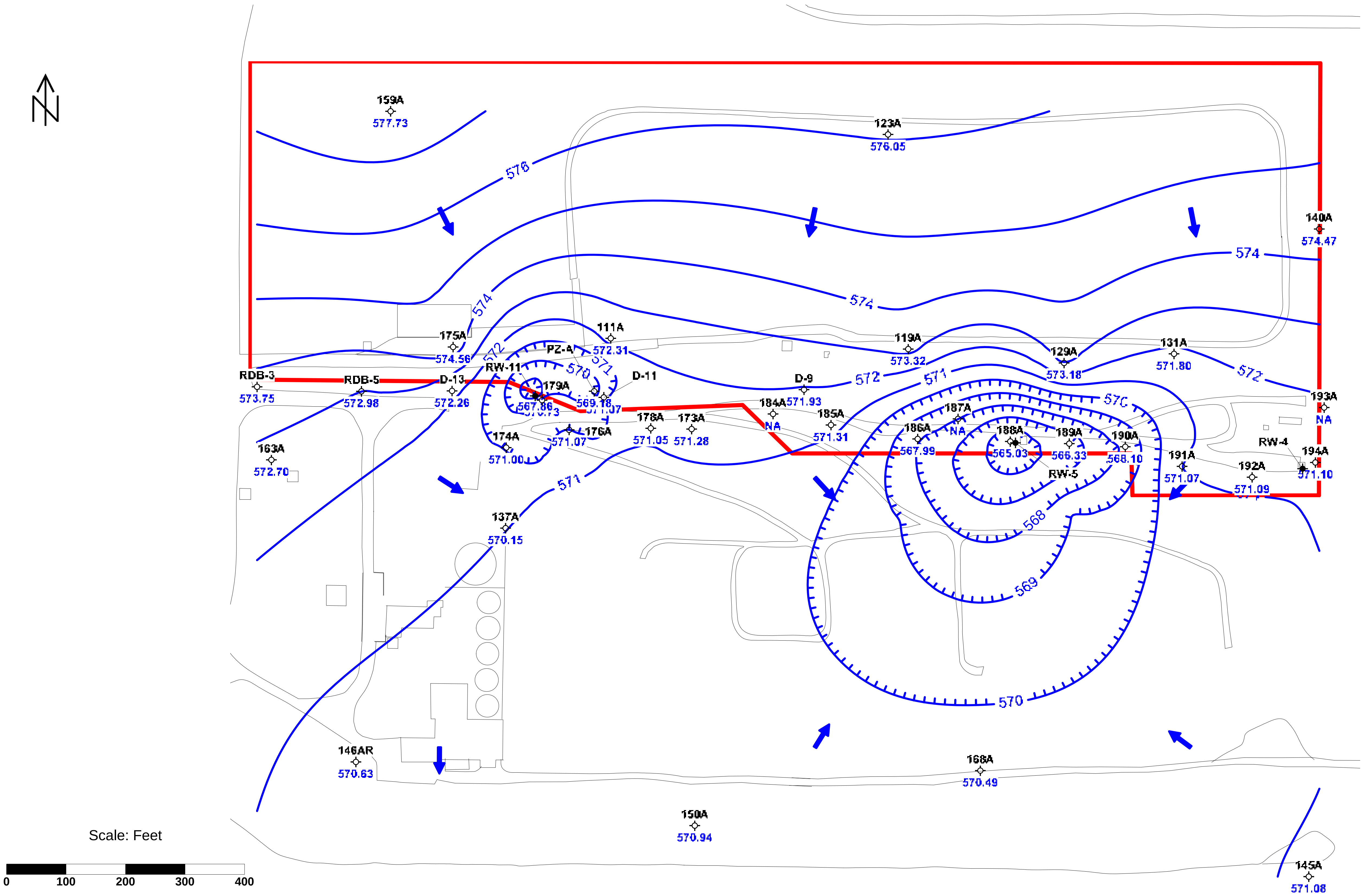
Potentiometric Contour

▭ Structure

Road

Figure 3-9
Potentiometric Surface Map
DuPont Necco Park: AT-Zone
November 09, 2011

U:/Necco/HydroGeo/Hydro/GW_contours/2011-11-09 NEC Contour Tool/2011-11-09 - AT PZ - F1.srf



Contour Interval = 1 foot **Elevation datum feet AMSL**

Note: Wells 117A and 139A were not used in the contouring.

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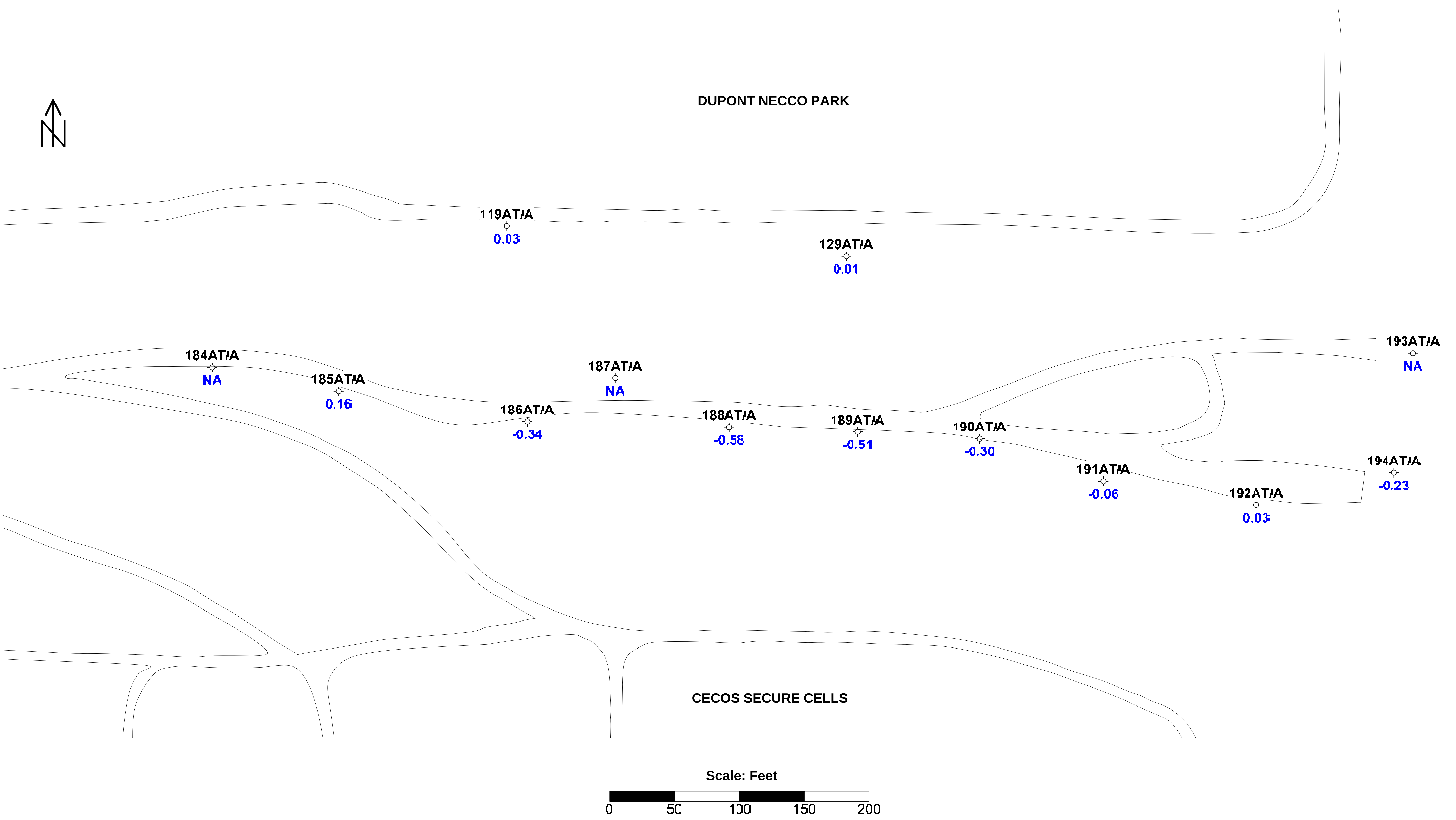
Job number: 445357.02023

LEGEND

3B	Well ID		Potentiometric Contour
⌖	Monitoring Well	▭	Structure
✦	Pumping Well		Road
			Source Area Extent

Figure 3-10
Potentiometric Surface Map
DuPont Necco Park: A-Zone
November 09, 2011

U:\Necco\HydroGeo\Hydro\GW_contours\2011-11-09 NEC Contour Tool\2011-11-09 - A PZ - F4.srf



Negative value indicates downward vertical gradient

Elevation datum feet AMSL

PARSONS

40 La Riviere Dr, Suite 350
Buffalo, NY 14202

Created by:	RBP
Checked by:	JWS
Project Manager:	EAF

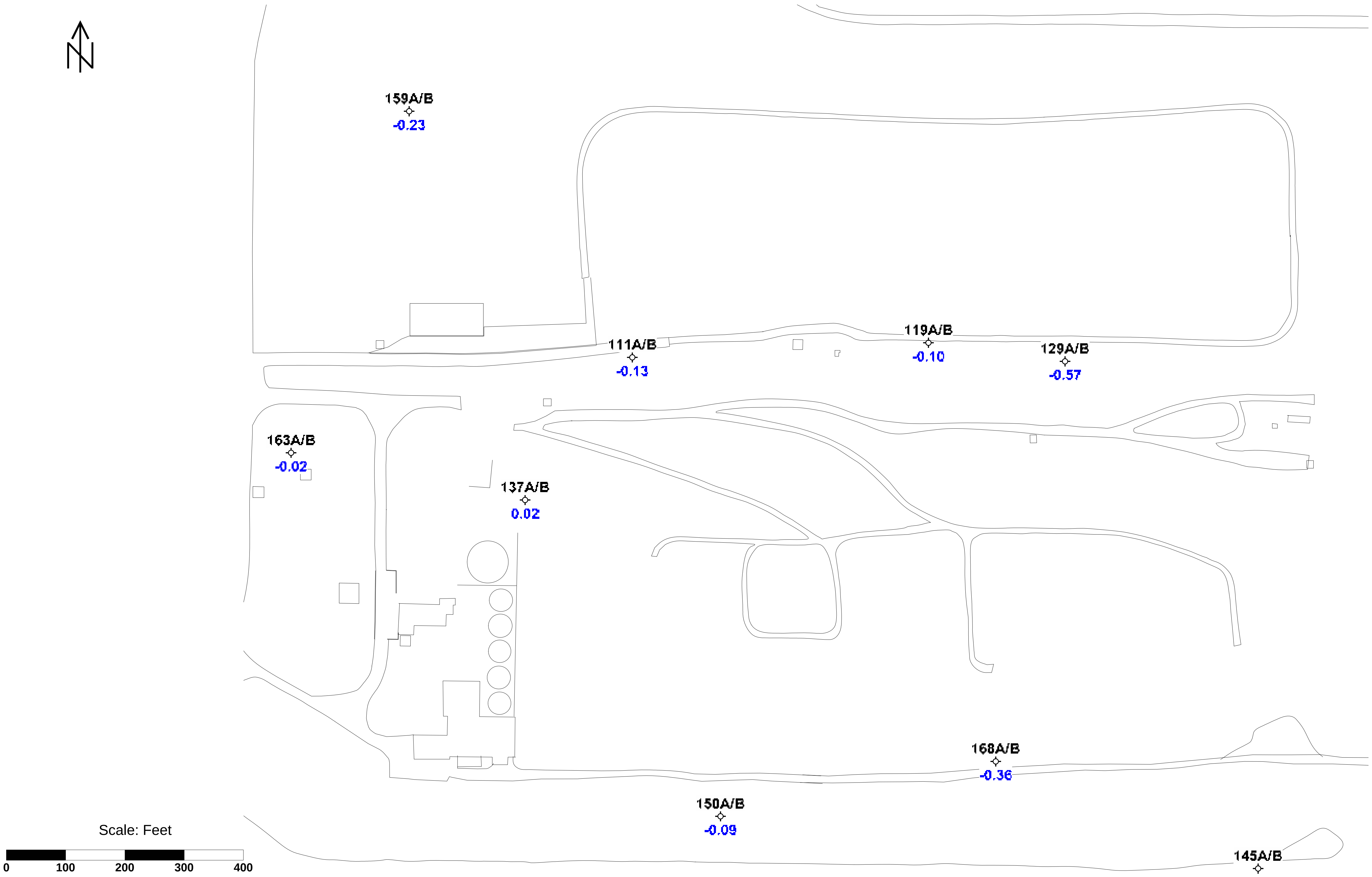
Job number: 445357.02023

LEGEND

3B	Well ID		
⌖	Monitoring Well	▭	Structure
●	Pumping Well		Road

Figure 3-11
Vertical Gradient: AT-Zone to A-Zone
DuPont Necco Park
November 09, 2011

U:/Necco/HydroGeo/Hydro/GW_contours/2011-11-09 NEC Contour Tool/2011-11-09 - ATAvgrad - F2.srf



Negative value indicates downward gradient

Elevation datum feet AMSL

PARSONS

40 La Riviere Dr, Suite 350
Buffalo, NY 14202
(716) 541-0730

Created by: RBF	Date 01-11-12
Checked by: JWS	Date 01-16-12
Project Manager: EAF	Date 1-16-12

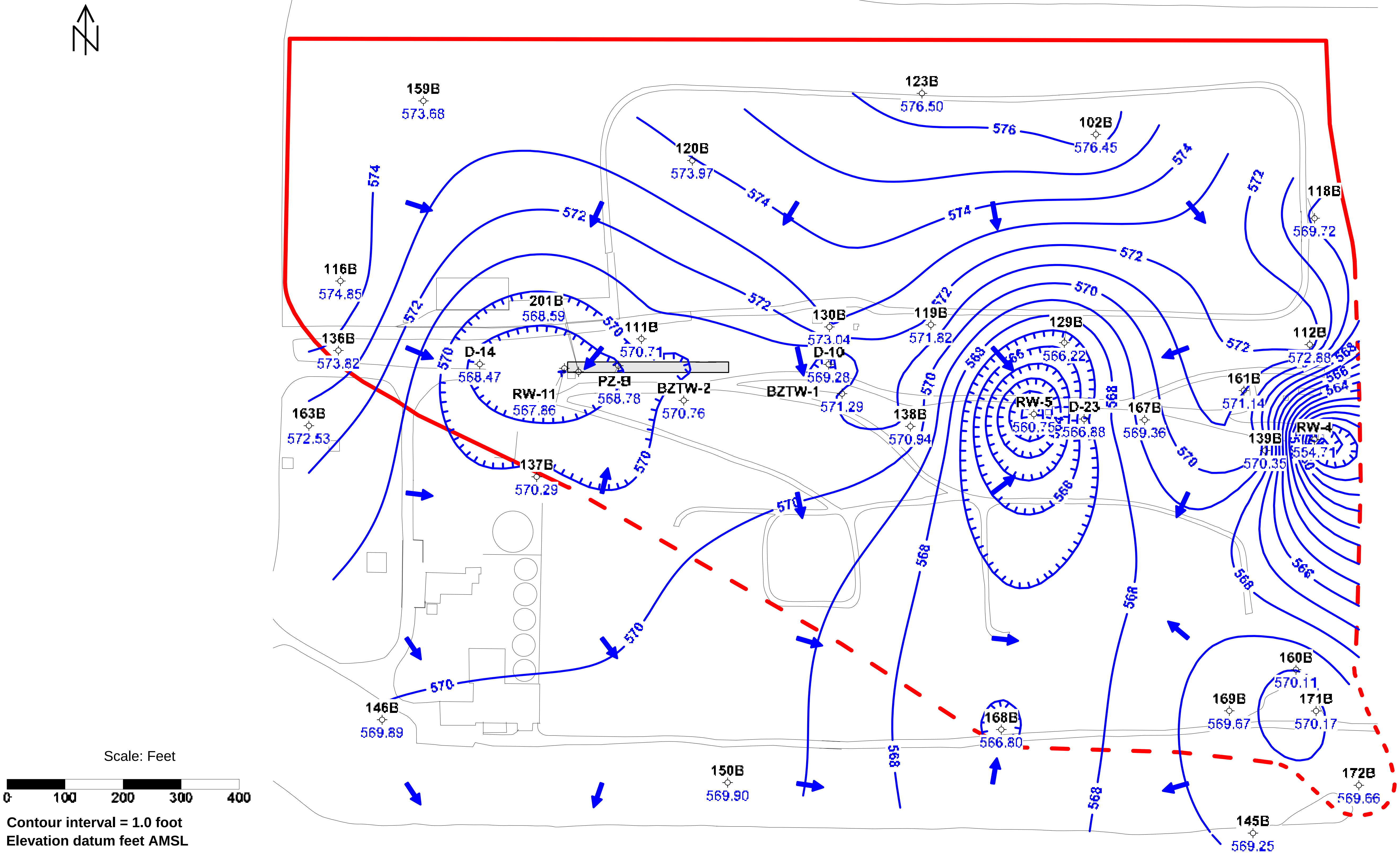
Job number: 445357.02023

LEGEND

3B	Well ID		Potentiometric Contour
⌖	Monitoring Well		Road
✦	Pumping Well	▭	Structure

Figure 3-12
Vertical Gradient: A-Zone to B-Zone
DuPont Necco Park
November 09, 2011

U:/Necco/HydroGeo/Hydro/GW_contours/2011-11-09 NEC Contour Tool/2011-11-09 - ABvgrad - F5.srf



Contour interval = 1.0 foot
Elevation datum feet AMSL

Wells 149B and 151B are outside the area shown, but were used in the contouring.

Wells 170B, TRW-6 and TRW-7 were not used in the contouring.

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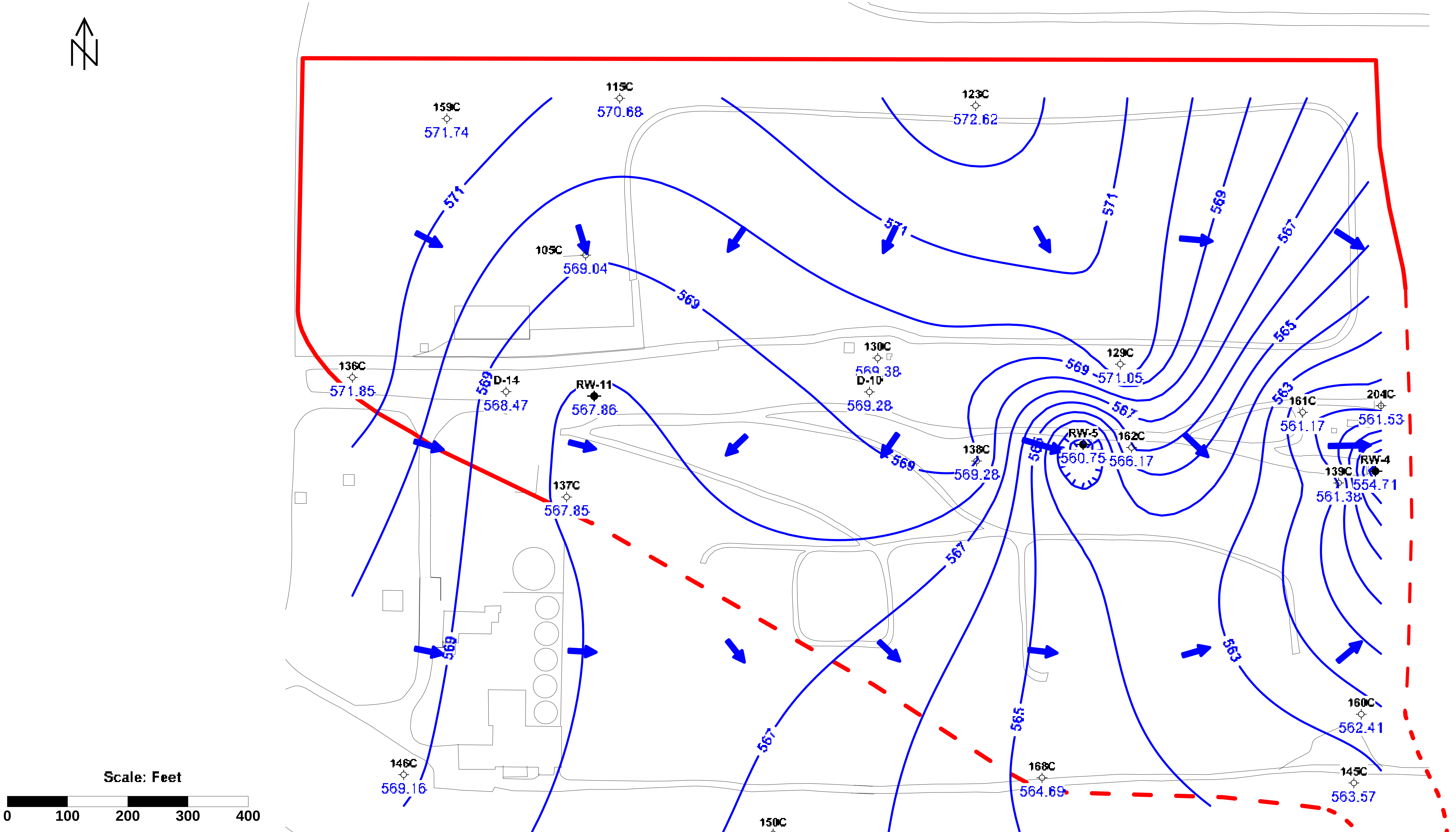
Project Manager: EAF	Date 01-16-12
Job number: 445357.02023	

LEGEND

3B Well ID		Potentiometric Contour	Source Area Extent
⌖ Monitoring Well	▭	Structure	
✦ Pumping Well		Road	▨ Bedrock Fractured Blast Trench

Figure 3-13
Potentiometric Surface Map
DuPont Necco Park: B-Zone
November 09, 2011

U:/Necco/HydroGeo/Hydro/GW contours/ 2011 Annual/2011-11-09 - PZ B - F7.srf



Contour interval = 1.0 foot

Elevation datum feet AMSL

Well 112C was not used in the contouring due to suspect casing.

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Created by: RBF	Date 01-11-12
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Project Manager: EAF	Date 01-23-12

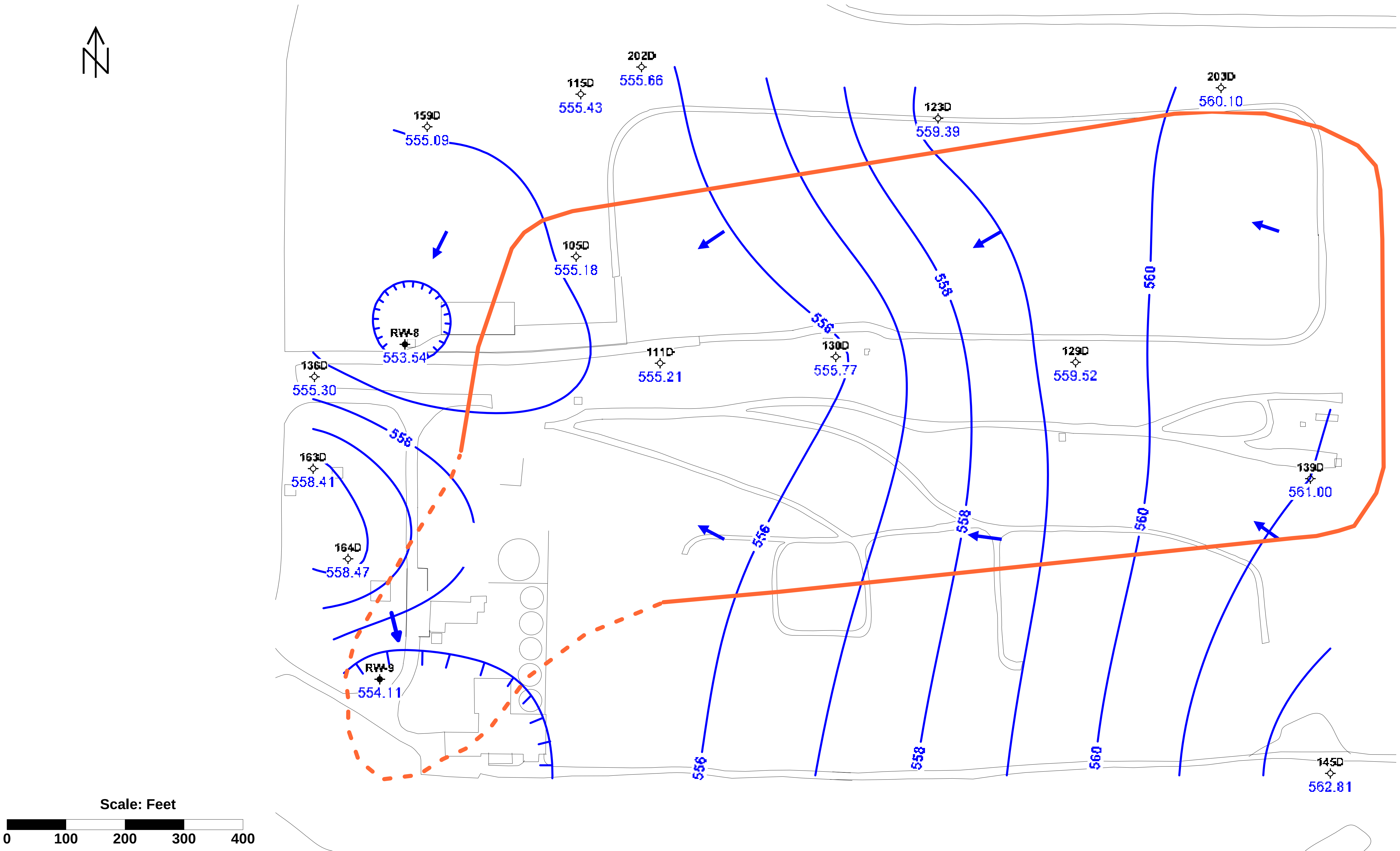
Job number: 445357.02023

LEGEND

3B	Well ID	╱	Potentiometric Contour	- - —	Source Area Extent
✧	Monitoring Well	▭	Structure		
◆	Pumping Well	═	Road		

Figure 3-14
Potentiometric Surface Map
DuPont Necco Park: C-Zone
November 09, 2011

U:\Necco\HydroGeo\Hydro\GW_contours\2011 Annual Report\2011-11-09 - PZ C - F3-14.srf



Contour interval = 1.0 feet
Elevation datum feet AMSL
Well 149, located outside the map area, was used in the contour interpolation.
Well 137D, 148D, 158D, and 165D, were not used in the interpolation.

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Project Manager: EAF	Date 01-23-12

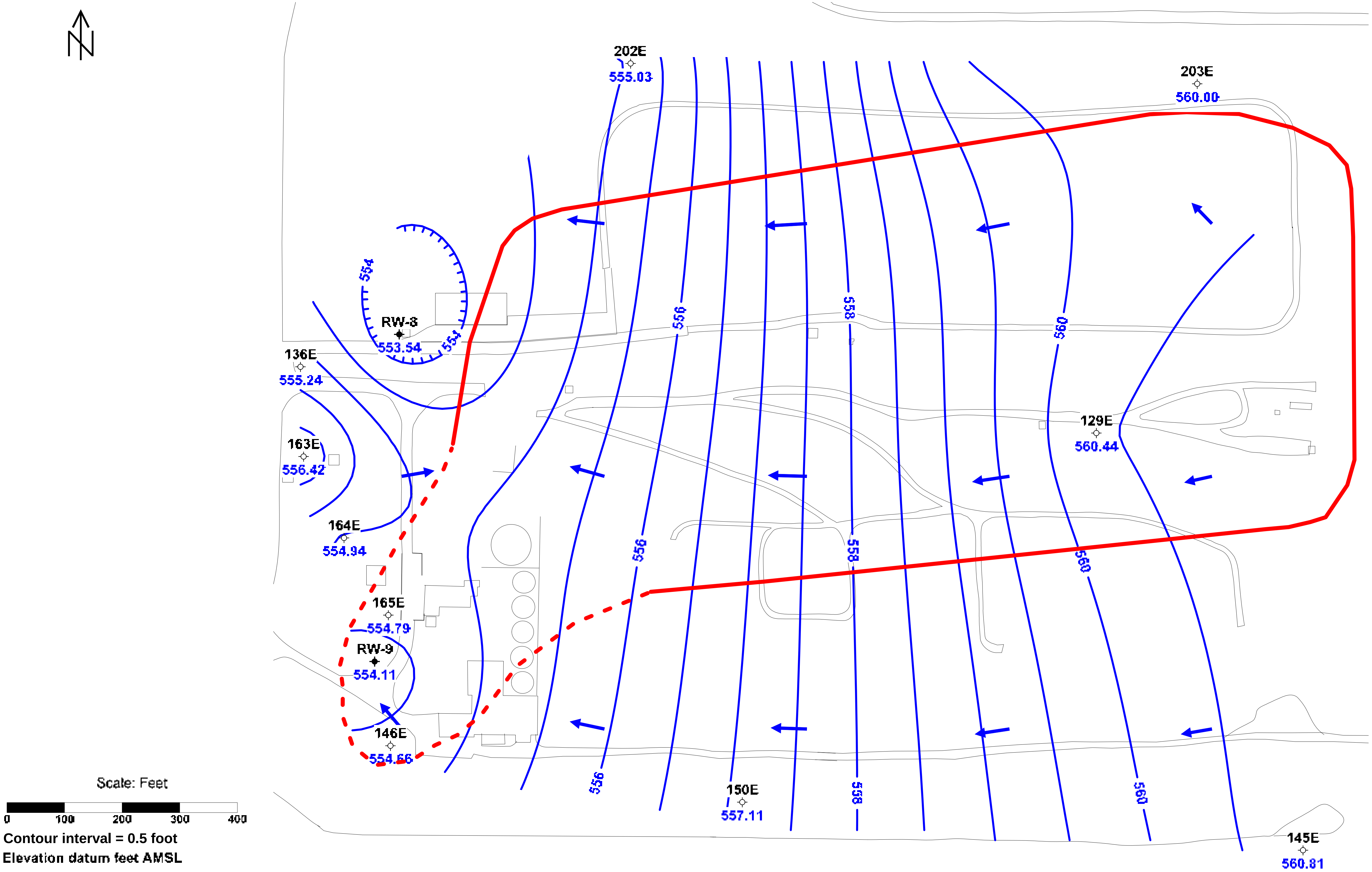
Job number: 445357.02023

LEGEND

3B	Well ID		Potentiometric Contour
✧	Monitoring Well		Structure
✦	Pumping Well		Road
			Source Area Extent

Figure 3-15
Potentiometric Surface Map
DuPont Necco Park: D-Zone
November 09, 2011

U:\Necco\HydroGeo\Hydro\GW_contours\2011-11-09 NEC Contour Tool\2011-11-09 - PZ D - F9.srf



Contour interval = 0.5 foot

Elevation datum feet AMSL

Well 142E was not used in the contouring due to anomalous measurement

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Checked by: JWS	Date 01-16-12
Project Manager: EAF	Date 01-23-12

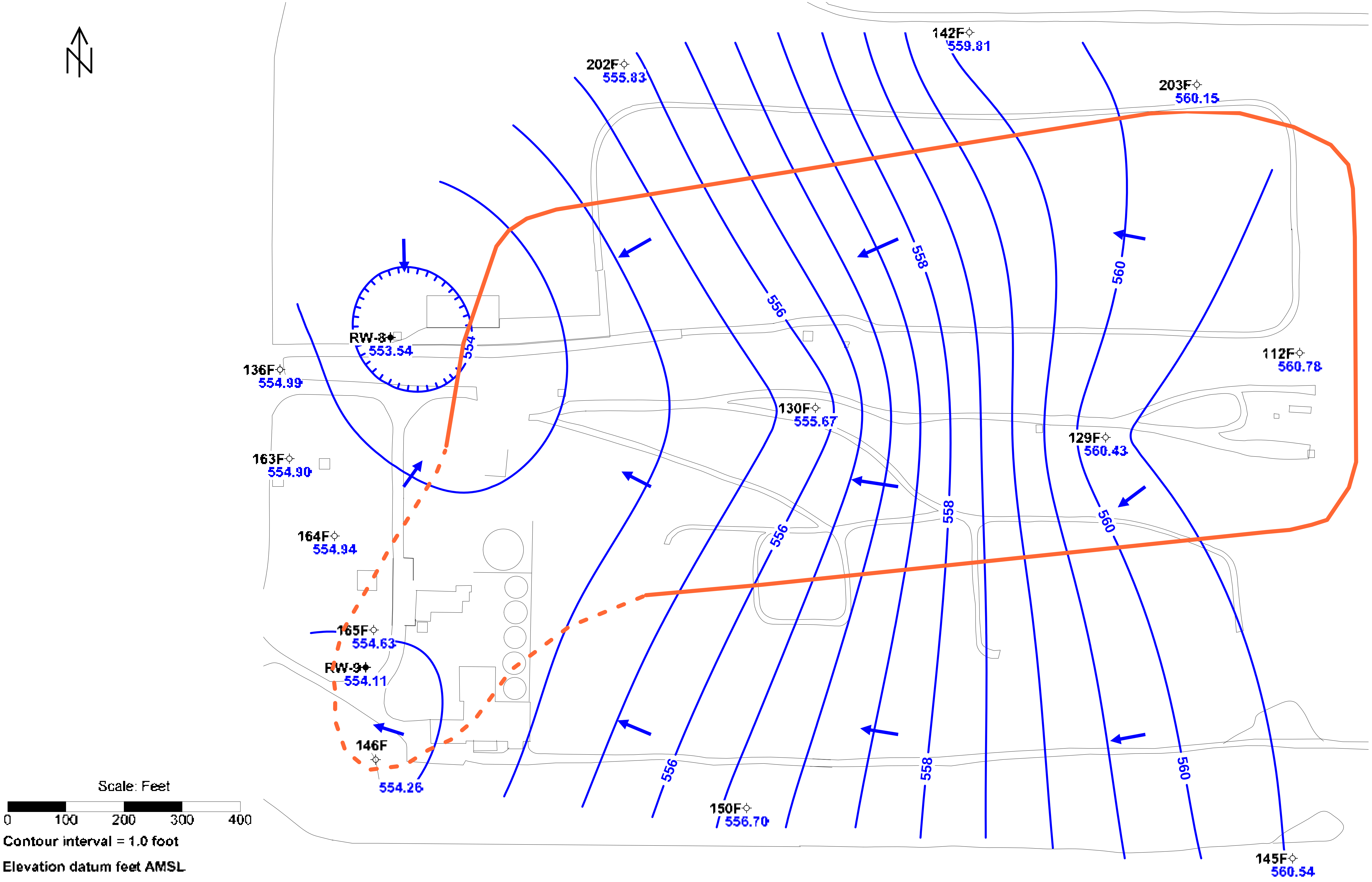
Job number: 445357.02023

LEGEND

3B	Well ID		Potentiometric Contour	- - ━	Source Area Extent
⌖	Monitoring Well	▭	Structure		
✦	Pumping Well		Road		

Figure 3-16
Potentiometric Surface Map
DuPont Necco Park: E-Zone
November 09, 2011

U:/Necco/HydroGeo/Hydro/GW_contours/2011-11-09 NEC Contour Tool/2011-11-09 - PZ E - F10.srf



Contour interval = 1.0 foot

Elevation datum feet AMSL

Wells 123F and 148F were not used in the interpolation

PARSONS

40 La Riviere Dr, Suite 350
Buffalo, NY 14202
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Created by: RBP	Date 01-12-12
Checked by: JWS	Date 01-16-12
Project Manager: EAF	Date 01-23-12
	Date

Job number: 445357.02023

LEGEND

3B	Well ID	╱	Potentiometric Contour	▬ ▬ ▬	Source Area Extent
⌖	Monitoring Well	▭	Structure		
◆	Pumping Well	═	Road		

Figure 3-17
Potentiometric Surface Map
DuPont Necco Park: F-Zone
November 09, 2011

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APPENDIX A
2011 ANNUAL GROUNDWATER SAMPLING RESULTS

APPENDIX A
2011 ANNUAL GROUNDWATER SAMPLING RESULTS - NECCO PARK

	Location	VH-136B	VH-136D	VH-136F	VH-137A	VH-137B	VH-145A	VH-145B	VH-145C	VH-145D	VH-146AR
	Date	8/18/11	8/17/11	8/18/11	8/18/11	8/18/11	8/15/11	8/17/11	8/17/11	8/15/11	8/19/11
Analyte	Units	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
Field Parameters											
COLOR QUALITATIVE (FIELD)	NS	GREY	GREY	GREY	CLEAR	CLEAR	CLEAR	GREY	GREY	CLEAR	CLEAR
DEPTH TO WATER FROM TOC	Feet	8.49	24.34	24.91	8.68	8.31	6.3	6.89	12.23	13.23	7.83
DISSOLVED OXYGEN (FIELD)	UG/L	250	400	740	240	320	800	480	410	400	240
ODOR (FIELD)	NS	NONE	slight	NONE	NONE	NONE	NONE	slight	MODERATE	slight	slight
PH (FIELD)	STD UNITS	8.91	8.41	8.4	11.96	12.11	6.66	8.03	6.4	7.81	9.55
REDOX (FIELD)	MV	-419	-339	-321	-311	-321	-198	-361	-172	-471	-369
SPECIFIC CONDUCTANCE (FIELD)	UMHOS/CM	1930	909	1053	5840	7130	6780	17400	71600	36800	1404
TEMPERATURE (FIELD)	DEGREES C	20	18.1	14.7	19.1	16.2	12.9	15.5	17.2	16	20.9
TURBIDITY QUANTITATIVE (FIELD)	NTU	12.52	5.97	6.14	5.11	8.95	1.65	14.11	3.28	12.78	12.27
Volatile Organics											
1,1,2,2-TETRACHLOROETHANE	UG/L	<1.5	<0.18	<0.18	<0.18	<0.18	<0.18	35	<7.2	<0.45	<0.18
1,1,2-TRICHLOROETHANE	UG/L	<2.2	2.1	0.92 J	<0.27	<0.27	<0.27	48	150	12	<0.27
1,1-DICHLOROETHENE	UG/L	7.8 J	3.5	1	10	27	<0.19	89	96	11	<0.19
1,2-DICHLOROETHANE	UG/L	<1.8	13 J	19	2.8	5.9	<0.22	<4.4	140	12	<0.22
CARBON TETRACHLORIDE	UG/L	<1.1	<0.13	<0.13	<0.13	<0.13	<0.13	<2.6	<5.2	<0.33	<0.13
CHLOROFORM	UG/L	<1.3	2.5	1.8	<0.16	3.4	<0.16	100	<6.4	<0.4	<0.16
CIS-1,2 DICHLOROETHENE	UG/L	450	280	16	46	110	0.41 J	6700	10000	530	<0.17
METHYLENE CHLORIDE	UG/L	<2.7	<0.33	<0.33	38	55	<0.33	87	4600	640	<0.33
TETRACHLOROETHYLENE	UG/L	1400	0.45 J	0.72 J	39	73	<0.29	34	<12	<0.73	<0.29
TRANS-1,2-DICHLOROETHENE	UG/L	14	6.2	11	4.6	8.6	0.24 J	540	210	34	<0.19
TRICHLOROETHENE	UG/L	330	8.1 J	4.3	65	180	<0.17	600	64	<0.43	<0.17
VINYL CHLORIDE	UG/L	13	250	160	30	52	0.44 J	890	5700	480	1
Semivolatile Organics											
2,4,5-TRICHLOROPHENOL	UG/L	3000	7.1 J	<0.29	2.5 J	62 J	<0.29	<0.29	<5.7	<14	1.8 J
2,4,6-TRICHLOROPHENOL	UG/L	580 J	2.6 J	<0.76	<5.1	7.6 J	<0.76	<0.76	<15	<38	<0.76
3- AND 4- METHYLPHENOL	UG/L	<71	<1.8	1.3 J	23 J	26 J	<0.71	11 J	130 J	<36	<0.71
HEXACHLOROBENZENE	UG/L	<9.5	<0.24	<0.095	<0.63	<0.48	<0.095	<0.095	<1.9	<4.8	<0.095
HEXACHLOROBUTADIENE	UG/L	<26	<0.64	<0.26	<1.7	<1.3	<0.26	<0.26	<5.1	<13	<0.26
HEXACHLOROETHANE	UG/L	<76	<1.9	<0.76	<5.1	<3.8	<0.76	<0.76	<15	<38	<0.76
PENTACHLOROPHENOL	UG/L	6800	10 J	<2.3	<15	12 J	<2.3	<2.3	<46	<110	<2.3
PHENOL	UG/L	<57	<1.4	<0.57	170	150	<0.57	<0.57	190	73 J	<0.57
TIC 01	UG/L	9.5 J	11 J	11 J	59 J	56 J	<NS J	5.5 J	300 J	440 J	1.3 J
Inorganics											
BARIUM (DISSOLVED)	UG/L	63 B	89 U	52 B	5000	3800	170 B	41 B	340 U	470	23 B
CHLORIDE	UG/L	17000 B	240000 B	290000 B	590000 B	730000 B	1800000 B	6100000	32000000	16000000	350000 B
Total Volatiles	UG/L	2215 J	566 J	215 J	235	515	1.09 J	9123	20960	1719	1

< and ND = Non detect at stated reporting limit

APPENDIX A
2011 ANNUAL GROUNDWATER SAMPLING RESULTS - NECCO PARK

	Location	VH-146B	VH-146C	VH-146E	VH-146F	VH-148D	VH-150A	VH-150B	VH-150C	VH-150E	VH-150F
	Date	8/19/11	8/19/11	8/17/11	8/19/11	8/15/11	8/16/11	8/16/11	8/16/11	8/16/11	8/16/11
Analyte	Units	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
Field Parameters											
COLOR QUALITATIVE (FIELD)	NS	CLEAR	CLEAR	BLACK	GREY	CLEAR	CLEAR	GREY	CLEAR	GREY	GREY
DEPTH TO WATER FROM TOC	Feet	7.38	7.51	20.94	21.05	9.22	6.89	6.43	9.69	18.67	19.19
DISSOLVED OXYGEN (FIELD)	UG/L	170	560	880	790	480	490	950	480	490	430
ODOR (FIELD)	NS	NONE	slight	MODERATE	slight	NONE	NONE	MODERATE	slight	STRONG	MODERATE
PH (FIELD)	STD UNITS	11.77	8.67	6.96	6.65	9.75	6.94	10.63	8.51	6.4	6.95
REDOX (FIELD)	MV	-463	-327	-403	-392	-344	-89	-282	-385	-408	-242
SPECIFIC CONDUCTANCE (FIELD)	UMHOS/CM	1086	1415	4000	10340	992	2160	2560	5390	17600	25100
TEMPERATURE (FIELD)	DEGREES C	20.9	18.9	13.2	14.3	16	14.8	12.9	14.8	14.8	16.8
TURBIDITY QUANTITATIVE (FIELD)	NTU	6.93	7.9	4.24	10.53	8.53	1.8	9.95	4.73	6.83	1.81
Volatile Organics											
1,1,2,2-TETRACHLOROETHANE	UG/L	<0.26	<0.18	12	<72	<0.18	<0.18	<0.18	<0.18	<0.45	<0.45
1,1,2-TRICHLOROETHANE	UG/L	<0.39	<0.27	13	<110	<0.27	<0.27	<0.27	<0.27	<0.68	<0.68
1,1-DICHLOROETHENE	UG/L	5.3	0.84 J	220	380 J	<0.19	<0.19	2.3	2	8.3	2 J
1,2-DICHLOROETHANE	UG/L	<0.31	<0.22	8.8 J	<88	<0.22	<0.22	<0.22	<0.22	<0.55	<0.55
CARBON TETRACHLORIDE	UG/L	<0.19	<0.13	<1.3	<52	<0.13	<0.13	<0.13	<0.13	<0.33	<0.33
CHLOROFORM	UG/L	<0.23	<0.16	120	<64	<0.16	<0.16	<0.16	<0.16	7.5	<0.4
CIS-1,2 DICHLOROETHENE	UG/L	22	5.9	2200	7300	2.9	0.27 J	10	9.9	460	150
METHYLENE CHLORIDE	UG/L	<0.47	<0.33	16	1200	<0.33	<0.33	1.1	<0.33	14	16
TETRACHLOROETHYLENE	UG/L	<0.41	<0.29	<2.9	<120	0.37 J	<0.29	2.6	1.4	<0.73	<0.73
TRANS-1,2-DICHLOROETHENE	UG/L	1.7	0.99 J	180	640	<0.19	<0.19	1.8	3	14	1.6 J
TRICHLOROETHENE	UG/L	1.4	1.1	430	330 J	0.55 J	<0.17	12	7.5	20	<0.43
VINYL CHLORIDE	UG/L	5.8	4.3	1900	5600	<0.22	<0.22	13	5.1	320	400
Semivolatile Organics											
2,4,5-TRICHLOROPHENOL	UG/L	22	B	15	230	<0.71	<0.29	56	<0.29	<14	<14
2,4,6-TRICHLOROPHENOL	UG/L	5.1 J	<0.76	11	57 J	<1.9	<0.76	<3	<0.76	<38	<38
3- AND 4- METHYLPHENOL	UG/L	4.9 J	<0.71	17 J	62 J	36 J	<0.71	24 J	<0.71	<36	<36
HEXACHLOROBENZENE	UG/L	<0.095	<0.095	<0.095	<0.95	<0.24	<0.095	<0.38	<0.095	<4.8	<4.8
HEXACHLOROBUTADIENE	UG/L	<0.26	0.31 J	<0.26 UJ	<2.6	<0.64	<0.26	<1	<0.26	<13	<13
HEXACHLOROETHANE	UG/L	<0.76	<0.76	<0.76 UJ	<7.6	<1.9	<0.76	<3	<0.76	<38	<38
PENTACHLOROPHENOL	UG/L	29 J	<2.3	<2.3	<23	<5.7	<2.3	16 J	<2.3	<110	<110
PHENOL	UG/L	<0.57	<0.57	1.7 J	360	88	<0.57	160	2.8 J	380 J	320 J
TIC 01	UG/L	2.6 J	5.8 J	42 J	68 J	<NS J	<NS J	<NS J	<NS J	320 J	210 J
Inorganics											
BARIUM (DISSOLVED)	UG/L	21 B	33 B	44 U	38 B	36 B	66 B	3200	69 B	120 B	98 B
CHLORIDE	UG/L	190000 B	160000 B	520000 B	390000 B	120000 B	110000 B	780000 B	1200000	6700000	11000000
Total Volatiles	UG/L	36.2	13.13 J	5100 J	15450 J	3.82 J	0.27 J	42.8	28.9	844	569 J

< and ND = Non detect at stated reporting limit

APPENDIX A
2011 ANNUAL GROUNDWATER SAMPLING RESULTS - NECCO PARK

	Location	VH-165D	VH-165E	VH-168B	VH-168C	VH-171B	VH-172B	VH-BLIND1	VH-BLIND4	EQBLK-1	EQBLK-2
	Date	8/15/11	8/15/11	8/18/11	8/18/11	8/19/11	8/17/11	8/17/11	8/18/11	8/15/11	8/16/11
Analyte	**Units**	FS	FS	FS	FS	FS	FS	UP- VH-136	DUP-VH-137	EB	EB
Field Parameters											
COLOR QUALITATIVE (FIELD)	NS	GREY	GREY	YELLOW	GREY	YELLOW	GREY	GREY	CLEAR	NS	NS
DEPTH TO WATER FROM TOC	Feet	12.82	22.28	10.81	14.83	9.6	8.26	24.34	8.31	NS	NS
DISSOLVED OXYGEN (FIELD)	UG/L	680	470	410	420	250	360	400	320	NS	NS
ODOR (FIELD)	NS	NONE	slight	MODERATE	MODERATE	slight	slight	slight	NONE	NS	NS
PH (FIELD)	STD UNITS	8.84	6.94	7.07	6.32	6.78	7.58	8.41	12.11	NS	NS
REDOX (FIELD)	MV	-188	-454	-339	-378	-272	-363	-339	-321	NS	NS
SPECIFIC CONDUCTANCE (FIELD)	UMHOS/CM	1333	3820	36200	58900	13650	9230	909	7130	NS	NS
TEMPERATURE (FIELD)	DEGREES C	14.8	13.2	15.7	20.2	25.1	16	18.1	16.2	NS	NS
TURBIDITY QUANTITATIVE (FIELD)	NTU	22.8	6.5	6.94	12.83	34.7	15.4	5.97	8.95	NS	NS
Volatile Organics											
1,1,2,2-TETRACHLOROETHANE	UG/L	<0.18	1700	51 J	1300	<1.4	38	<0.18 UJ	<0.18	<0.18	<0.18
1,1,2-TRICHLOROETHANE	UG/L	<0.27	2100	1400	1500	<2.2	4.6	2.6 J	<0.27	<0.27	<0.27
1,1-DICHLOROETHENE	UG/L	0.79 J	520	320	200	<1.5	2.3	3.5 J	27	<0.19	<0.19
1,2-DICHLOROETHANE	UG/L	6.3	400	620	110	<1.8	2	9.8 J	6	<0.22	<0.22
CARBON TETRACHLORIDE	UG/L	<0.13	310	<11	710	<1.0	<0.26	<0.13 UJ	<0.13	<0.13	<0.13
CHLOROFORM	UG/L	0.22 J	4300	140	1300	<1.3	9.7	2.7 J	3.5	<0.16	<0.16
CIS-1,2 DICHLOROETHENE	UG/L	2.4	23000	16000	1300	140	410	260	110	<0.17	<0.17
METHYLENE CHLORIDE	UG/L	<0.33	11000	17000	3800	5.1 B	1.5 J	<0.33 UJ	56	<0.33	<0.33
TETRACHLOROETHYLENE	UG/L	<0.29	1200	80 J	400	<2.3	63	0.56 J	81	<0.29	<0.29
TRANS-1,2-DICHLOROETHENE	UG/L	5.6	700	320	240	3.2 J	31	6.4 J	8.6	<0.19	<0.19
TRICHLOROETHENE	UG/L	0.41 J	12000	360	2900	<1.4	25	11 J	190	<0.17	<0.17
VINYL CHLORIDE	UG/L	16	5400	9300	290	170	98	240	54	<0.22	<0.22
Semivolatile Organics											
2,4,5-TRICHLOROPHENOL	UG/L	68	1300	<14	<14	<2.9	<0.29	3 J	42 J	<0.29	<0.29
2,4,6-TRICHLOROPHENOL	UG/L	<3	230 J	<38	<38	<7.6	<0.76	<0.76	<5.1	<0.76	<0.76
3- AND 4- METHYLPHENOL	UG/L	16 J	56 J	210 J	42 J	<7.1	1.4 J	<0.71	29 J	<0.71	<0.71
HEXACHLOROBENZENE	UG/L	<0.38	<4.8	<4.8	<4.8	<0.95	<0.095	<0.095 UJ	<0.63	<0.095	<0.095
HEXACHLOROBUTADIENE	UG/L	<1	26 J	<13	21 J	<2.6	20	<0.26 UJ	<1.7	<0.26	<0.26
HEXACHLOROETHANE	UG/L	<3	<38	<38	<38	<7.6	<0.76	<0.76 UJ	<5.1	<0.76	<0.76
PENTACHLOROPHENOL	UG/L	<9.1	320 J	<110	<110	<23	<2.3	5 J	<15	<2.3	<2.3
PHENOL	UG/L	5.4 J	77 J	270 J	160 J	<5.7	0.91 J	<0.57	180	<0.57	<0.57
TIC 01	UG/L	<NS J	690 J	6100 J	8800 J	140 J	4.6 J	4.2 J	77 J	<NS J	<NS J
Inorganics											
BARIUM (DISSOLVED)	UG/L	28 B	280 B	610	340 B	65 B	26 U	87 U	3900	70 J	78 J
CHLORIDE	UG/L	410000 B	63000 B	16000000	28000000	580000	3000000 B	230000 B	670000 B	20000	19000
Total Volatiles	UG/L	31.7 J	62630	45591 J	14050	318 J	685 J	537 J	536	0	0

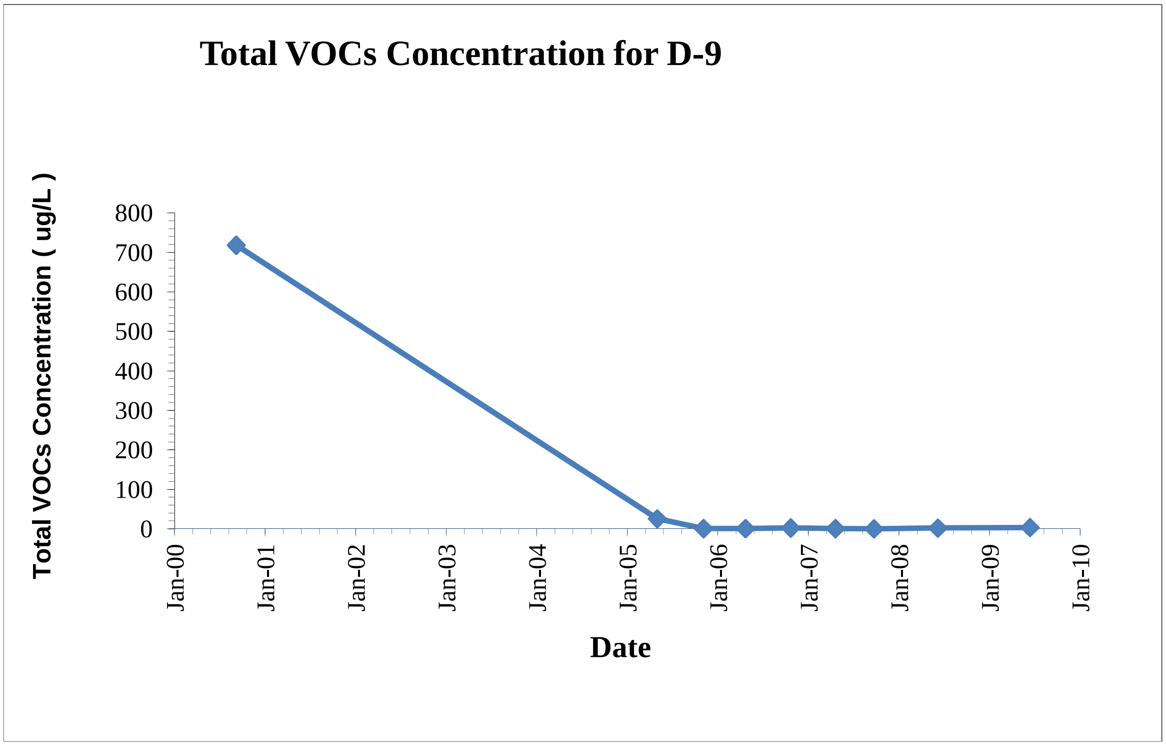
< and ND = Non detect at stated reporting limit

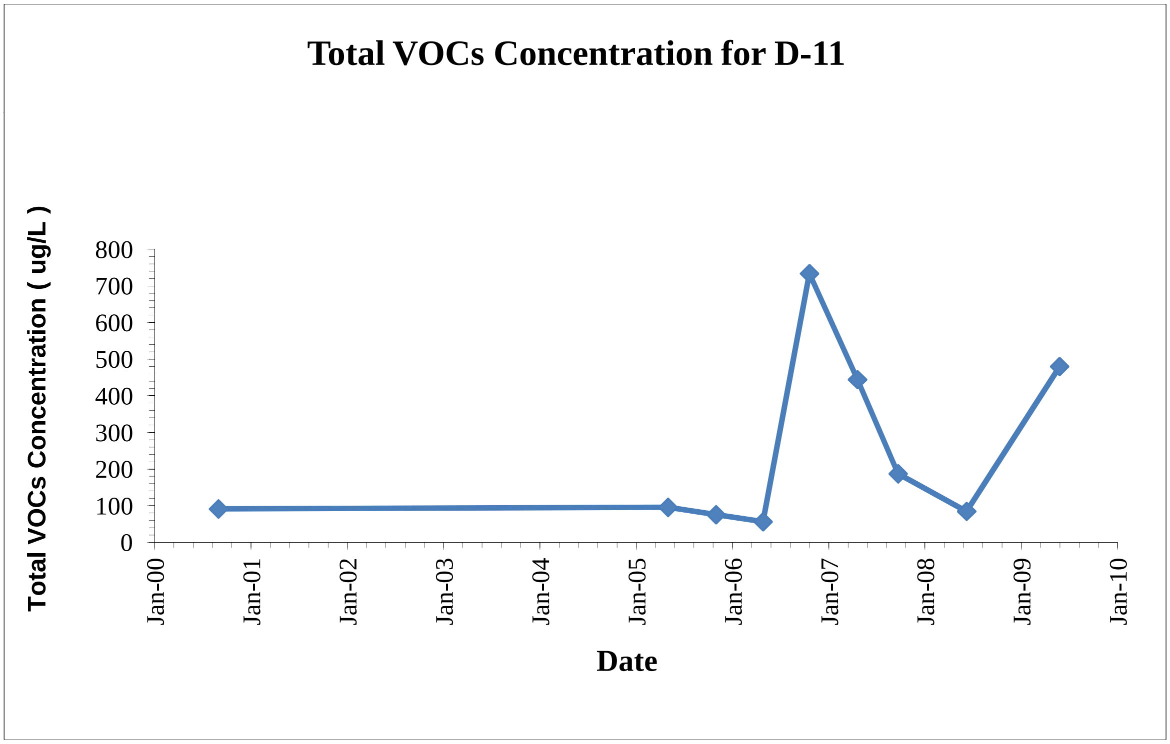
APPENDIX A
2011 ANNUAL GROUNDWATER SAMPLING RESULTS - NECCO PARK

Analyte	**Location** **Date** **Units**	EQBLK-3 8/17/11 EB	EQBLK-4 8/18/11 EB	EQBLK-5 8/19/11 EB	TBLK1 8/15/11 TB	TBLK-2 8/16/11 TB	TBLK3 8/17/11 TB	TBLK4 8/18/11 TB	TBLK5 8/19/11 TB
Field Parameters									
COLOR QUALITATIVE (FIELD)	NS	NS	NS	NS	NS	NS	NS	NS	NS
DEPTH TO WATER FROM TOC	Feet	NS	NS	NS	NS	NS	NS	NS	NS
DISSOLVED OXYGEN (FIELD)	UG/L	NS	NS	NS	NS	NS	NS	NS	NS
ODOR (FIELD)	NS	NS	NS	NS	NS	NS	NS	NS	NS
PH (FIELD)	STD UNITS	NS	NS	NS	NS	NS	NS	NS	NS
REDOX (FIELD)	MV	NS	NS	NS	NS	NS	NS	NS	NS
SPECIFIC CONDUCTANCE (FIELD)	UMHOS/CM	NS	NS	NS	NS	NS	NS	NS	NS
TEMPERATURE (FIELD)	DEGREES C	NS	NS	NS	NS	NS	NS	NS	NS
TURBIDITY QUANTITATIVE (FIELD)	NTU	NS	NS	NS	NS	NS	NS	NS	NS
Volatile Organics									
1,1,2,2-TETRACHLOROETHANE	UG/L	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18
1,1,2-TRICHLOROETHANE	UG/L	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27
1,1-DICHLOROETHENE	UG/L	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19
1,2-DICHLOROETHANE	UG/L	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22
CARBON TETRACHLORIDE	UG/L	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13
CHLOROFORM	UG/L	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
CIS-1,2 DICHLOROETHENE	UG/L	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
METHYLENE CHLORIDE	UG/L	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
TETRACHLOROETHYLENE	UG/L	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29
TRANS-1,2-DICHLOROETHENE	UG/L	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19
TRICHLOROETHENE	UG/L	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
VINYL CHLORIDE	UG/L	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22
Semivolatile Organics									
2,4,5-TRICHLOROPHENOL	UG/L	<0.29	<0.29	<0.29	NS	NS	NS	NS	NS
2,4,6-TRICHLOROPHENOL	UG/L	<0.76	<0.76	<0.76	NS	NS	NS	NS	NS
3- AND 4- METHYLPHENOL	UG/L	<0.71	<0.71	<0.71	NS	NS	NS	NS	NS
HEXACHLOROBENZENE	UG/L	<0.095	<0.095	<0.095	NS	NS	NS	NS	NS
HEXACHLOROBUTADIENE	UG/L	<0.26	<0.26	<0.26	NS	NS	NS	NS	NS
HEXACHLOROETHANE	UG/L	<0.76	<0.76	<0.76	NS	NS	NS	NS	NS
PENTACHLOROPHENOL	UG/L	<2.3	<2.3	<2.3	NS	NS	NS	NS	NS
PHENOL	UG/L	<0.57	<0.57	<0.57	NS	NS	NS	NS	NS
TIC 01	UG/L	<NS J	<NS J	<NS J	NS	NS	NS	NS	NS
Inorganics									
BARIUM (DISSOLVED)	UG/L	81 J	83 J	90 J	NS	NS	NS	NS	NS
CHLORIDE	UG/L	19000	19000	20000	NS	NS	NS	NS	NS
Total Volatiles	UG/L	0	0	0	0	0	0	0	0

< and ND = Non detect at stated reporting limit

APPENDIX B
TVOC TREND PLOTS


Total VOCs Concentration for D-9
Total VOCs Concentration (ug/L)
800
700
600
500
400
300
200
100
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Date


Total VOCs Concentration for D-11
Total VOCs Concentration (ug/L)
800
700
600
500
400
300
200
100
0
Jan-00
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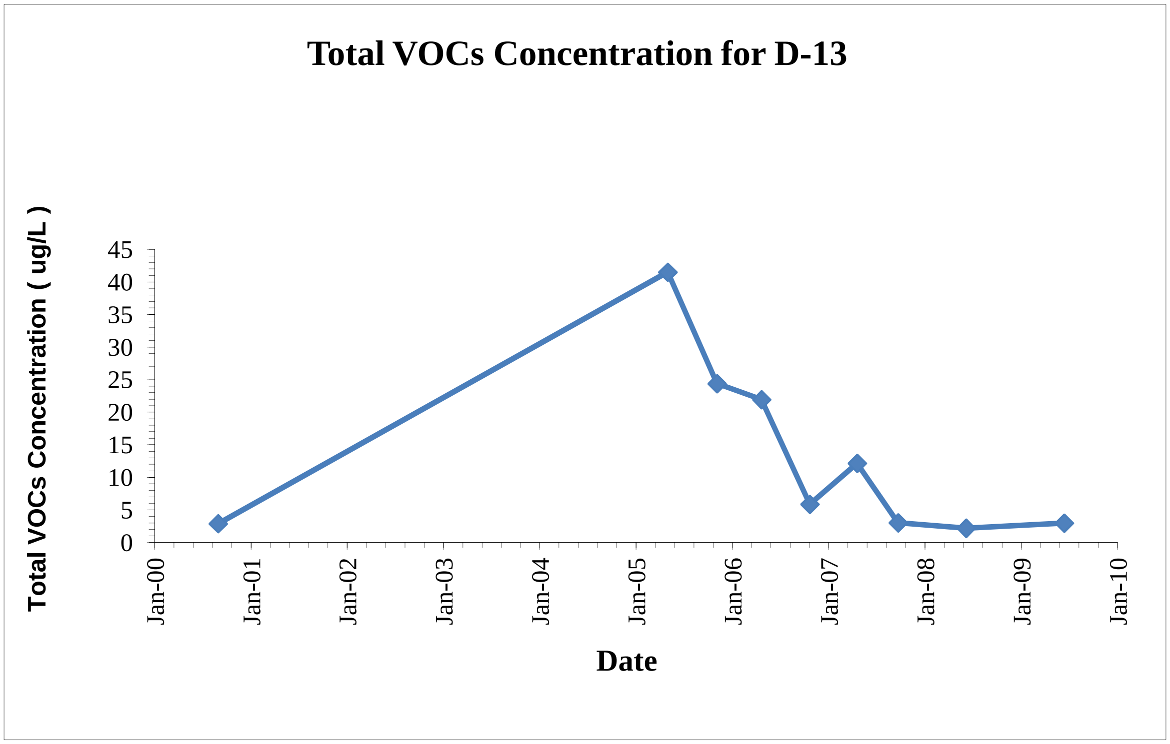
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Date


Total VOCs Concentration for D-13
Total VOCs Concentration (ug/L)
45
40
35
30
25
20
15
10
5
0
Jan-00
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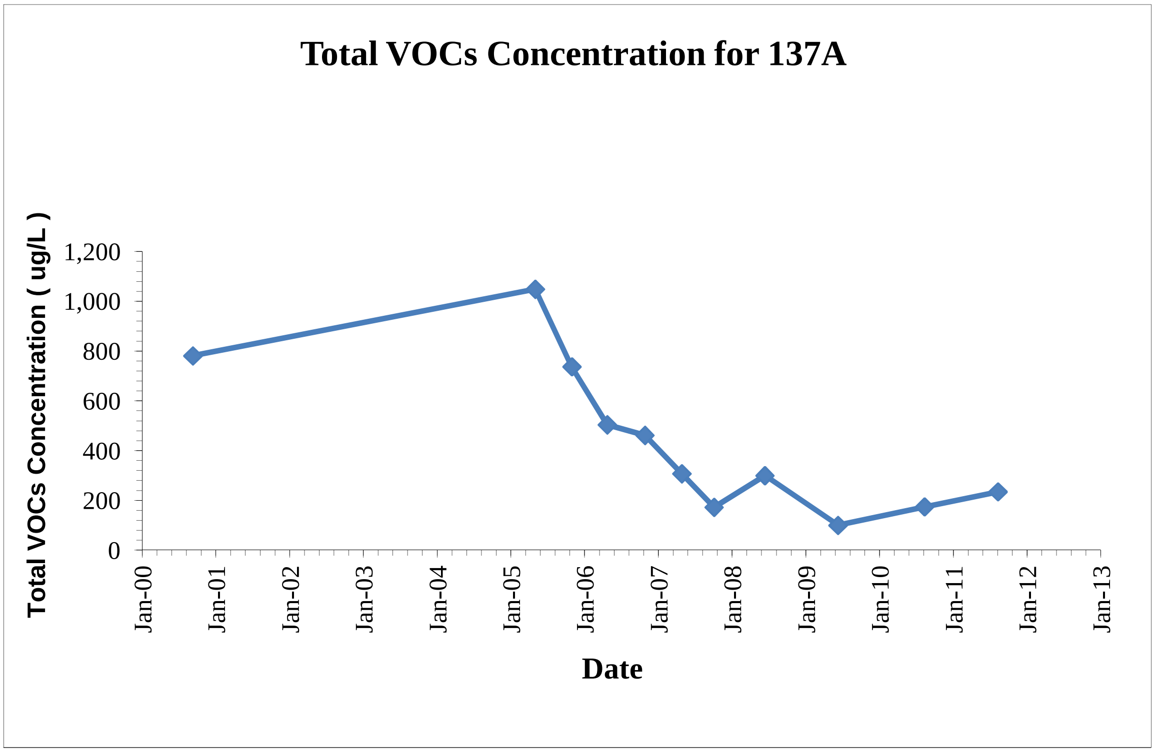
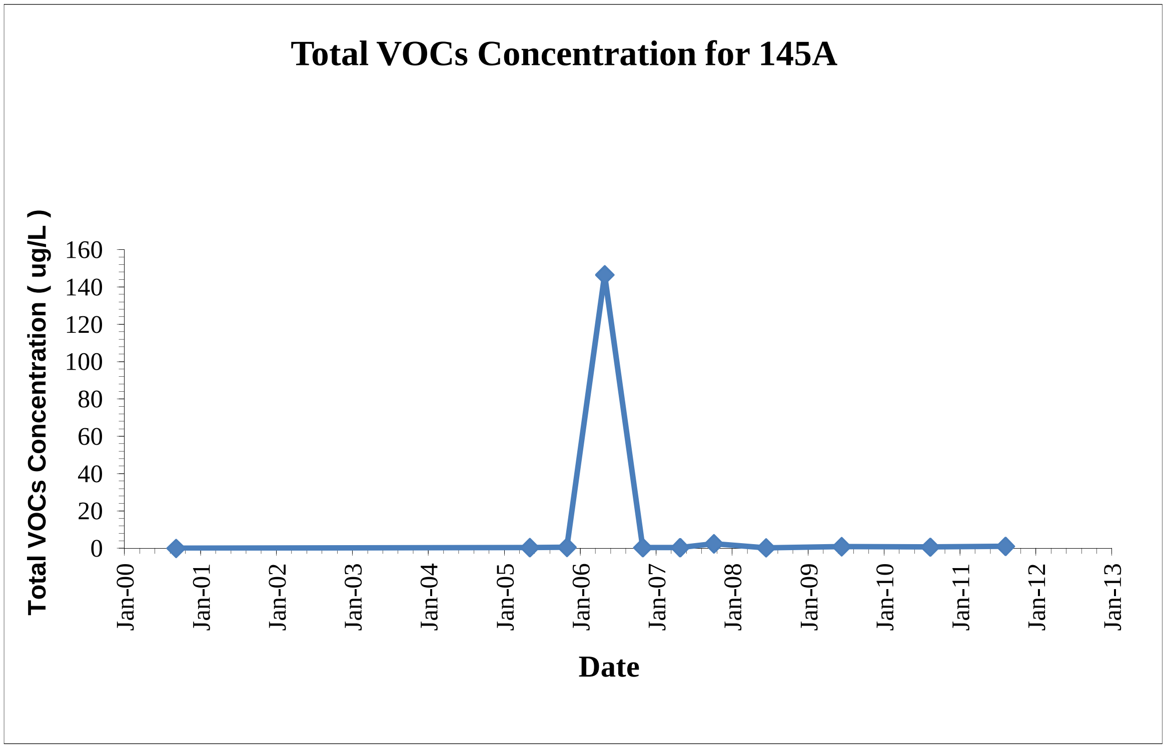
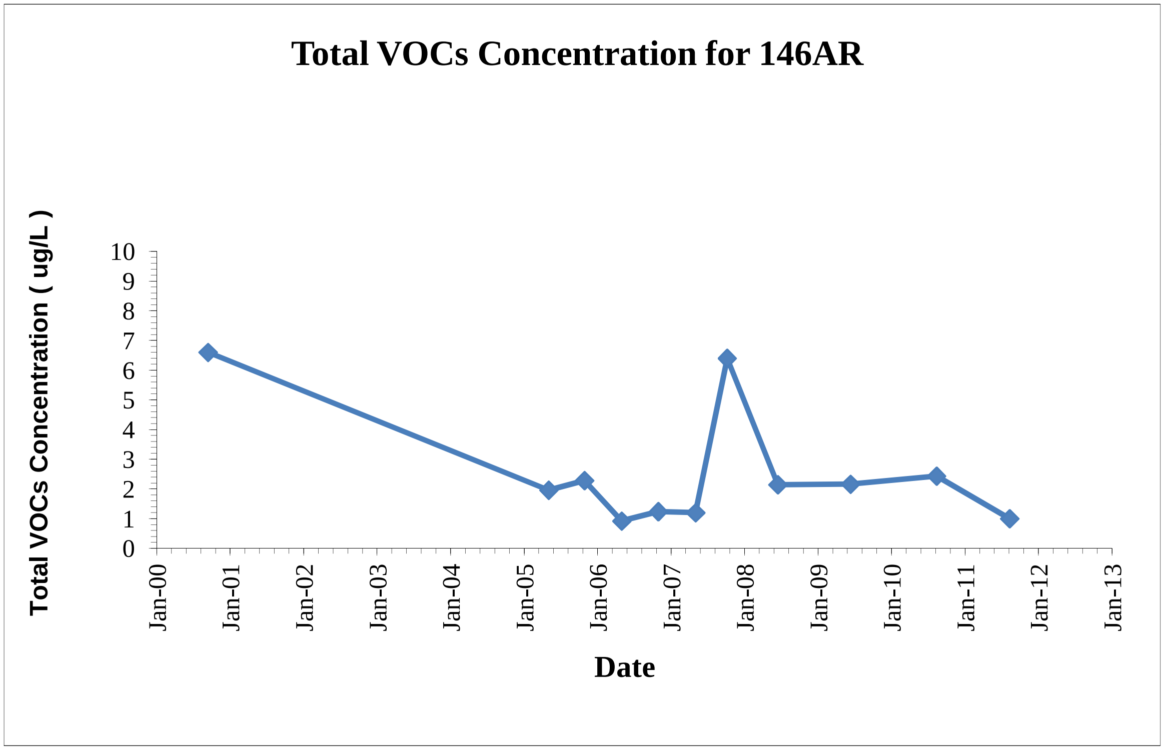
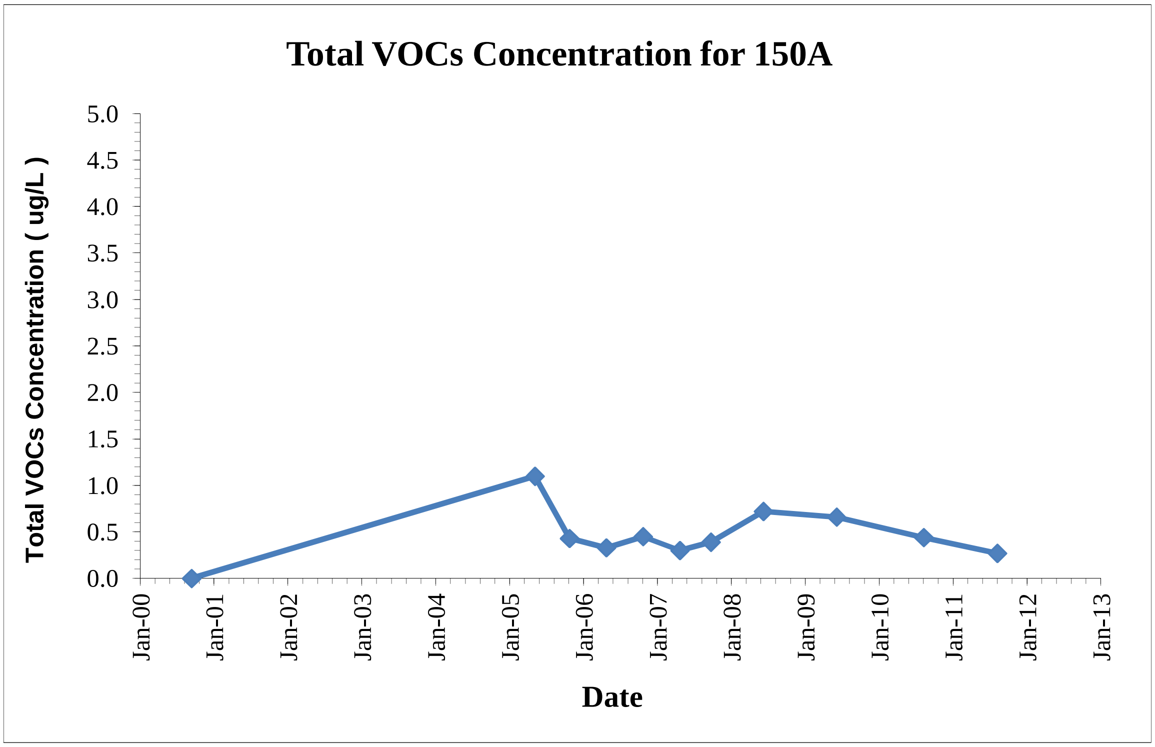
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Date


Total VOCs Concentration for 137A
Total VOCs Concentration (ug/L)
1,200
1,000
800
600
400
200
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date


Total VOCs Concentration for 145A
Total VOCs Concentration (ug/L)
160
140
120
100
80
60
40
20
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date


Total VOCs Concentration for 146AR
Total VOCs Concentration (ug/L)
10
9
8
7
6
5
4
3
2
1
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date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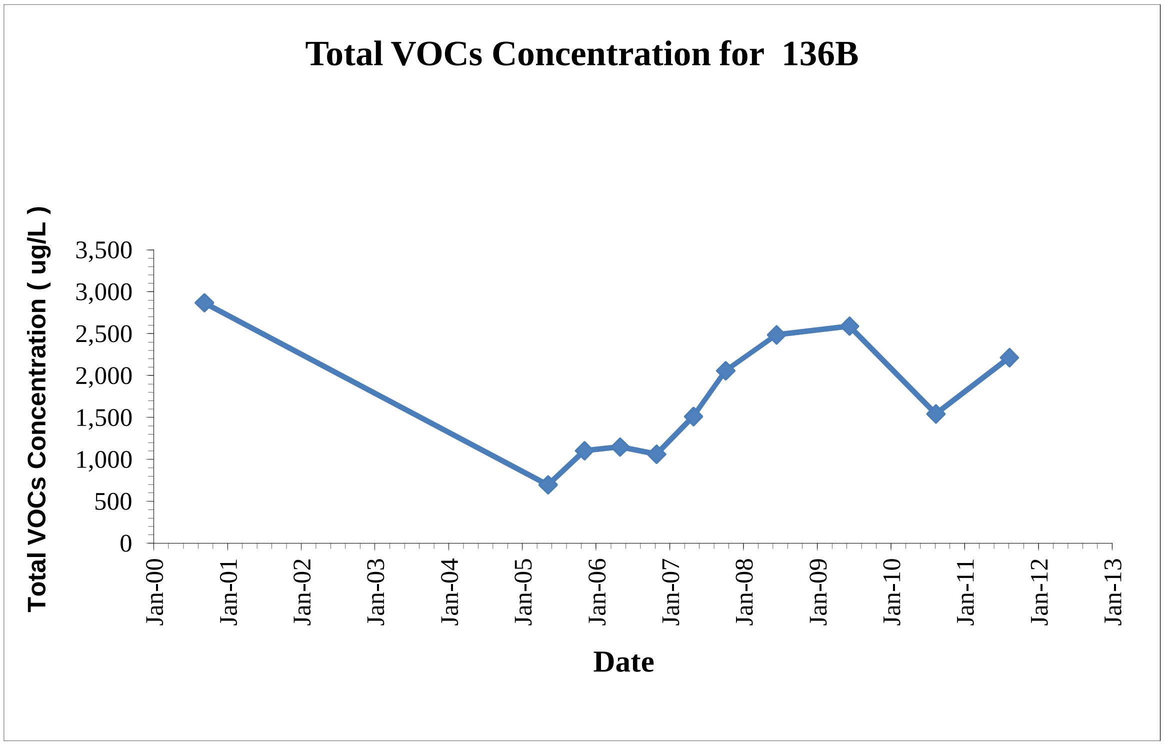
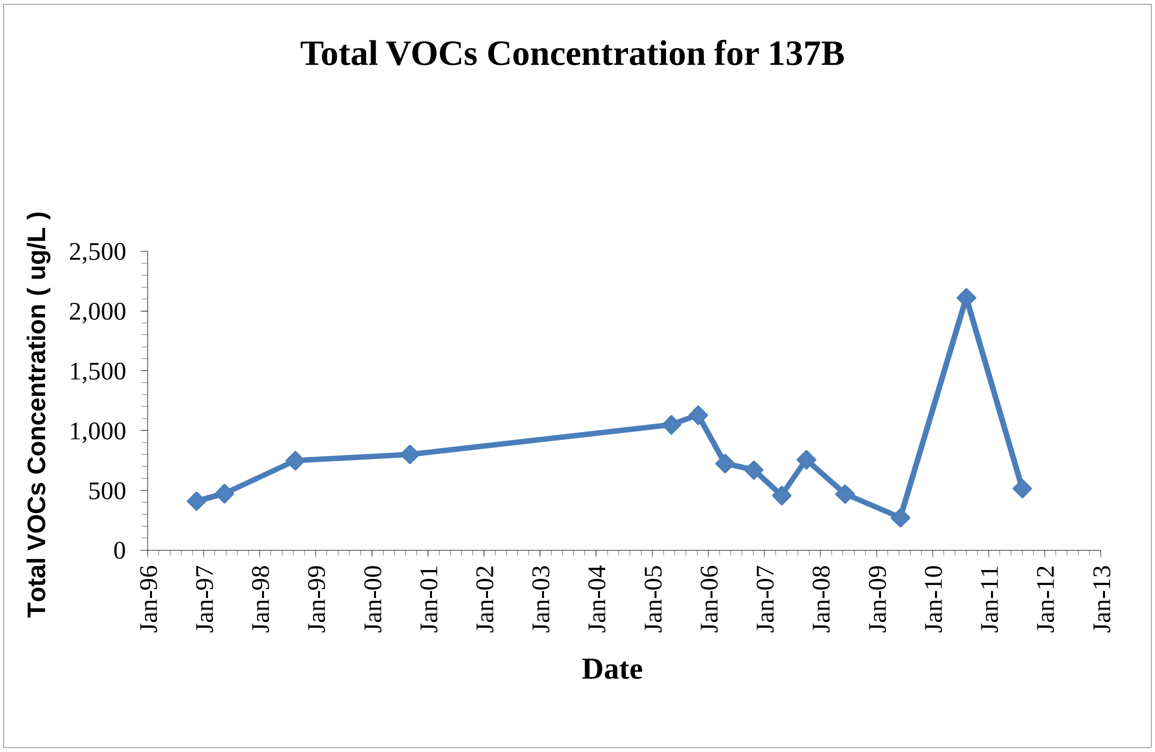
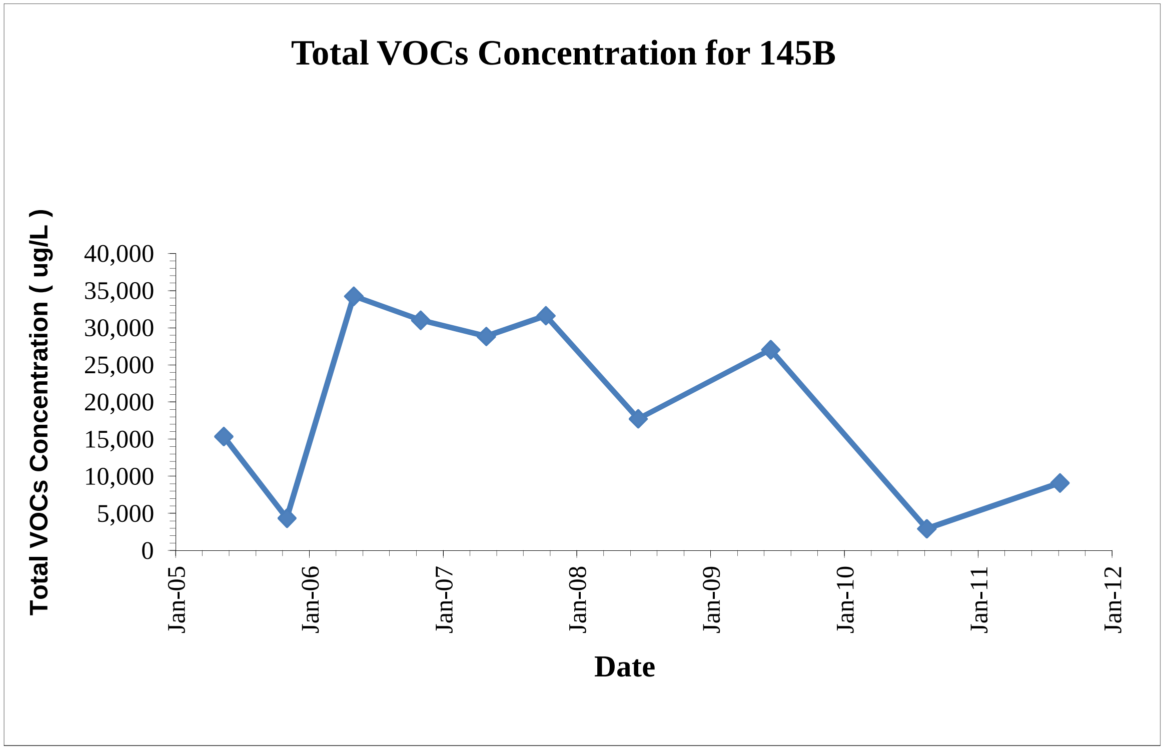
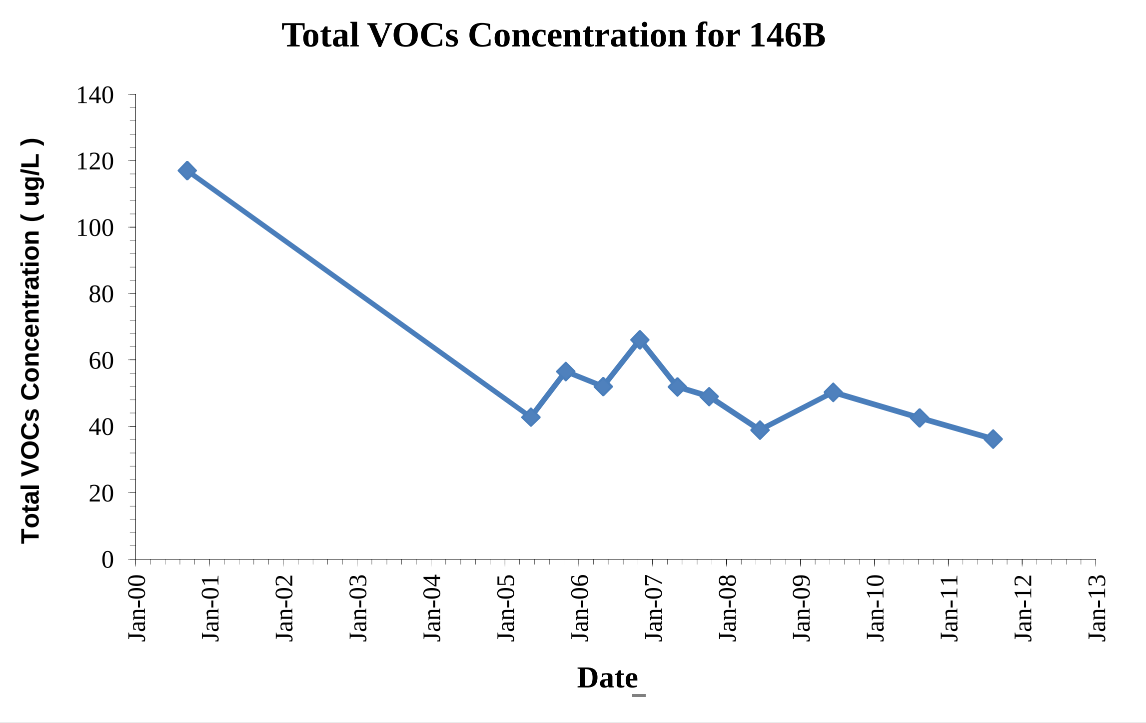
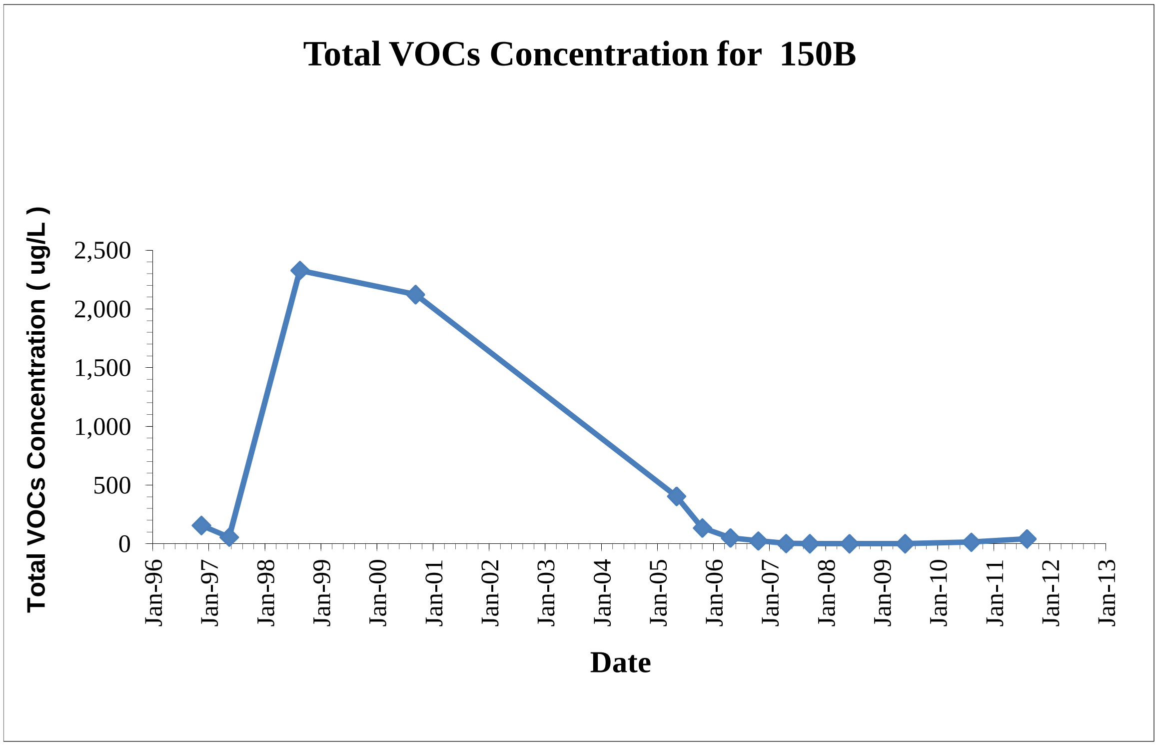
Total VOCs Concentration (ug/L)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date

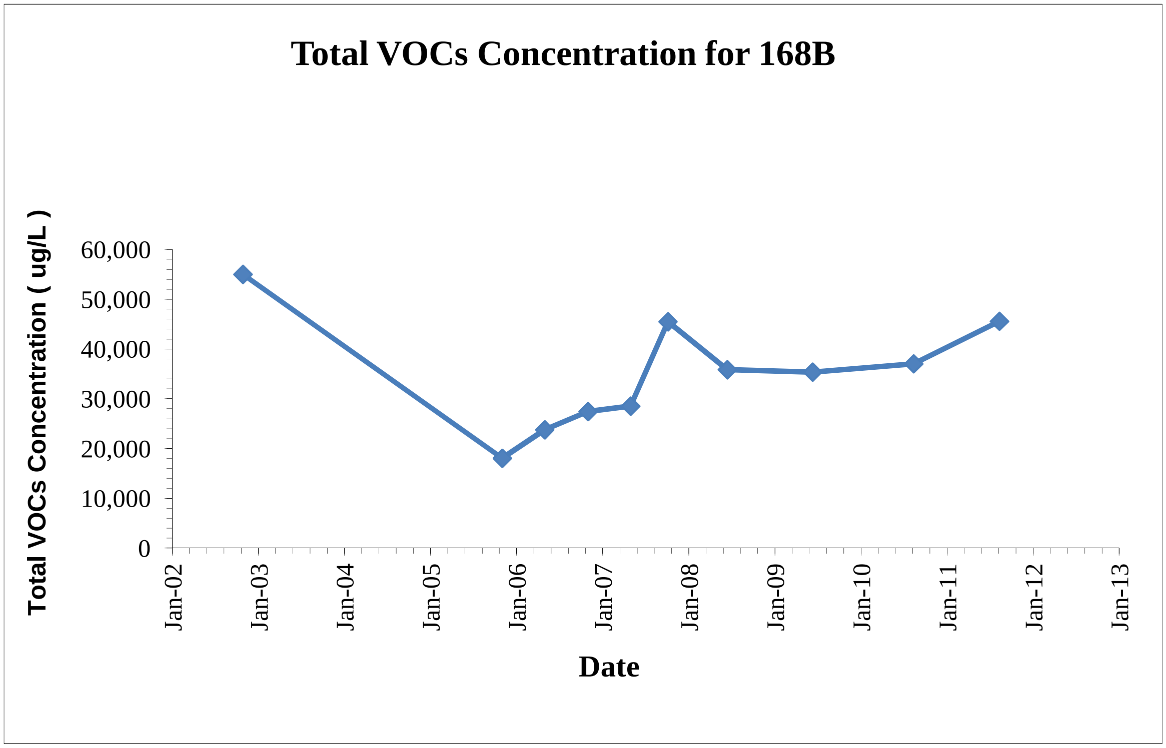

Total VOCs Concentration for 136B
Total VOCs Concentration (ug/L)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date

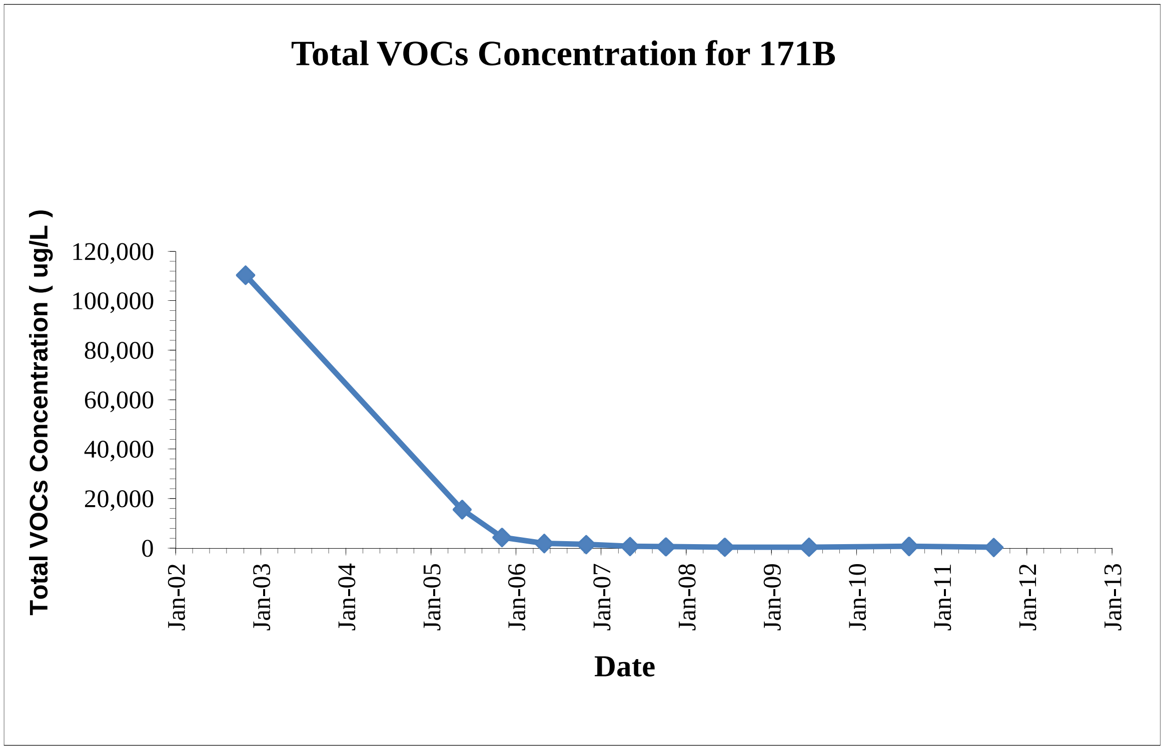

Total VOCs Concentration for 137B
Total VOCs Concentration (ug/L)
2,500
2,000
1,500
1,000
500
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date

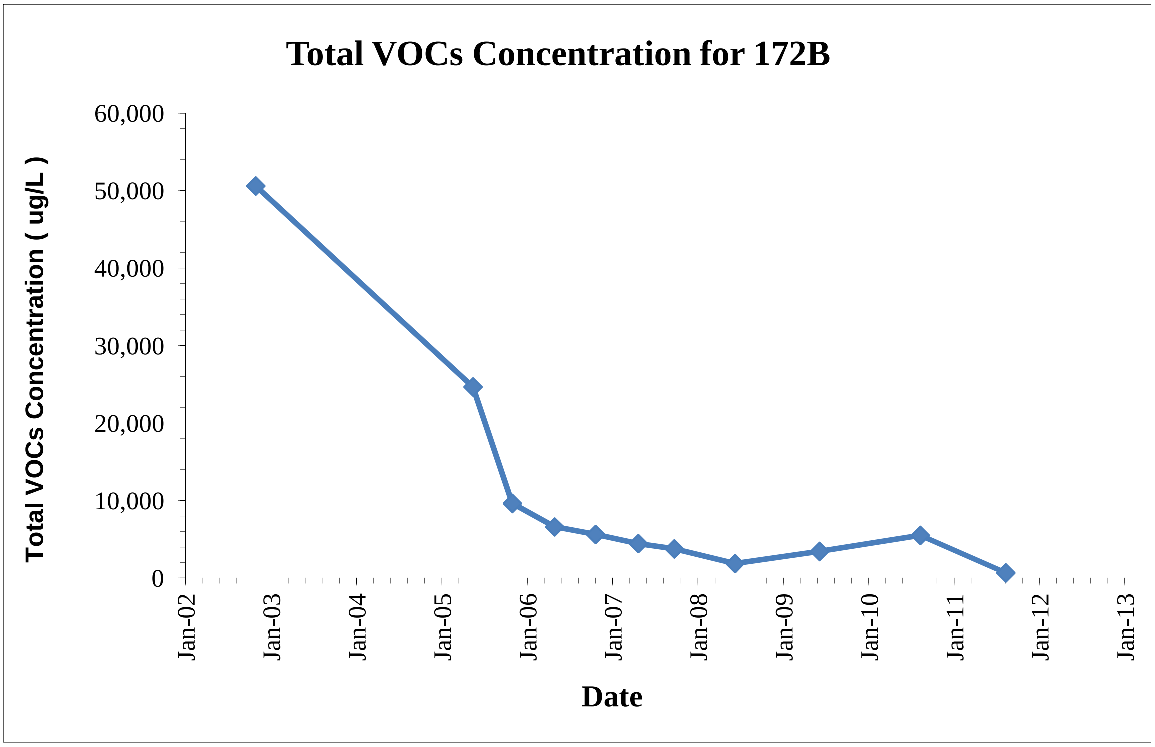

Total VOCs Concentration for 145B
Total VOCs Concentration (ug/L)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Date


Total VOCs Concentration for 146B
Total VOCs Concentration (ug/L)
140
120
100
80
60
40
20
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date_

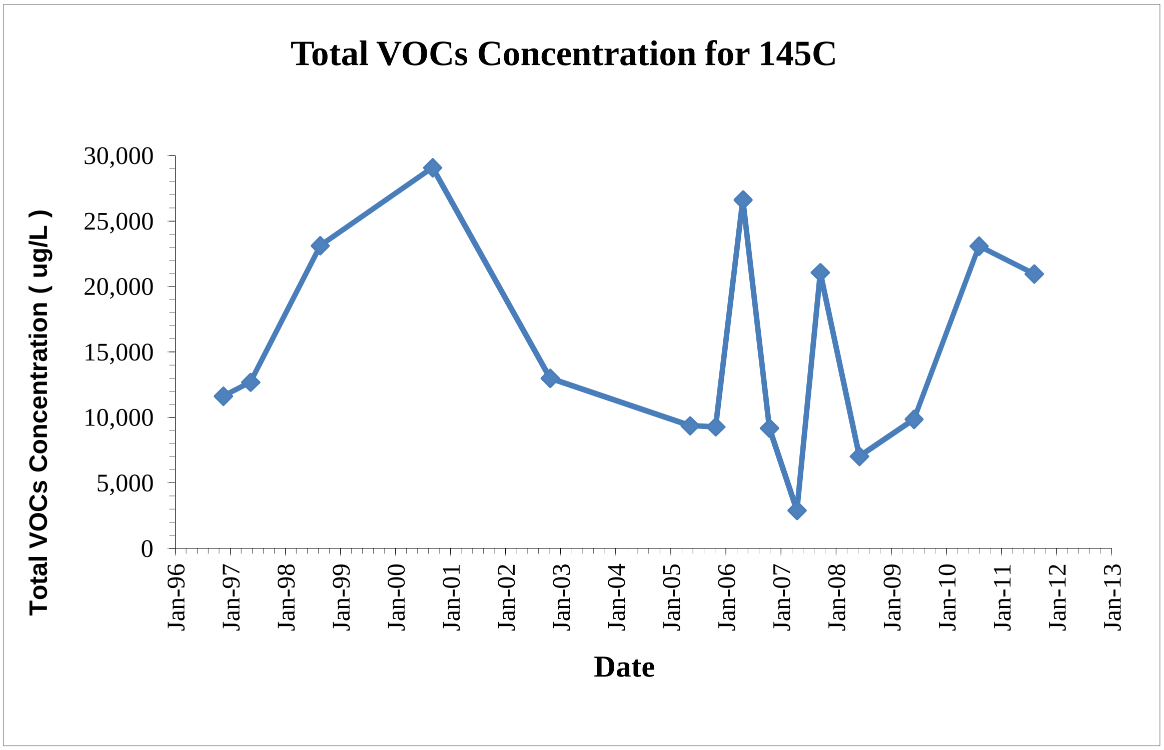

Total VOCs Concentration for 150B
Total VOCs Concentration (ug/L)
2,500
2,000
1,500
1,000
500
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date

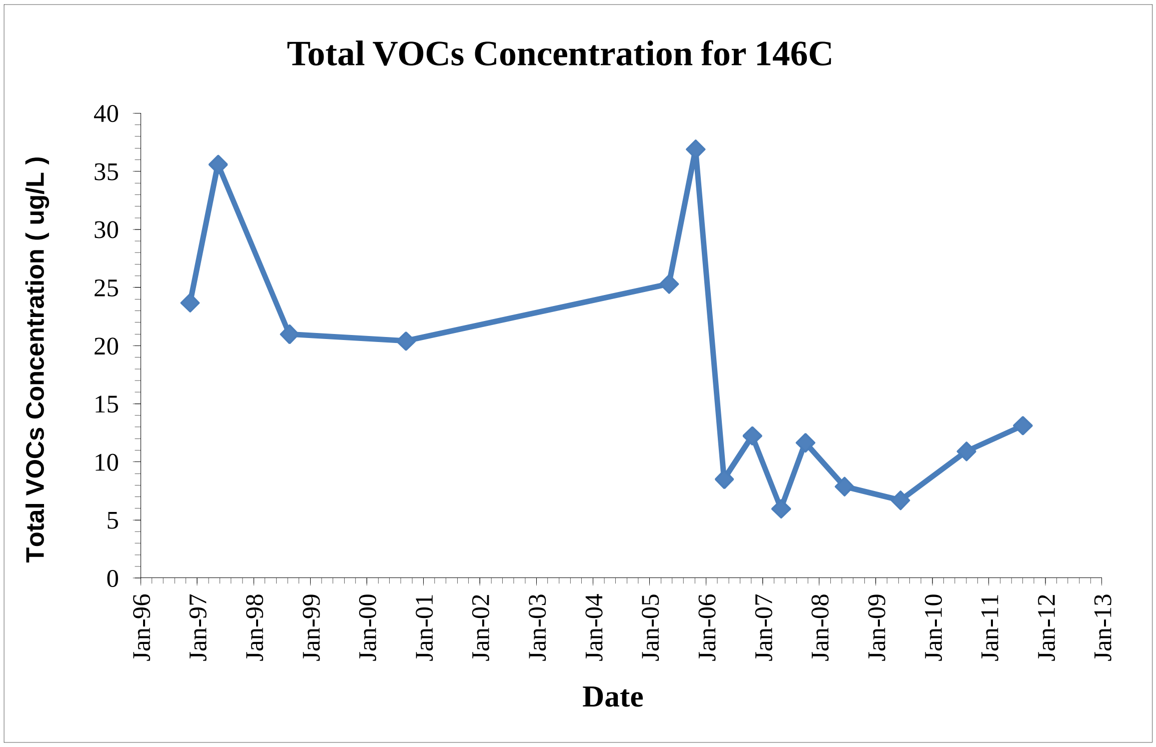

Total VOCs Concentration for 168B
Total VOCs Concentration (ug/L)
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date


Total VOCs Concentration for 171B
Total VOCs Concentration (ug/L)
120,000
100,000
80,000
60,000
40,000
20,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date

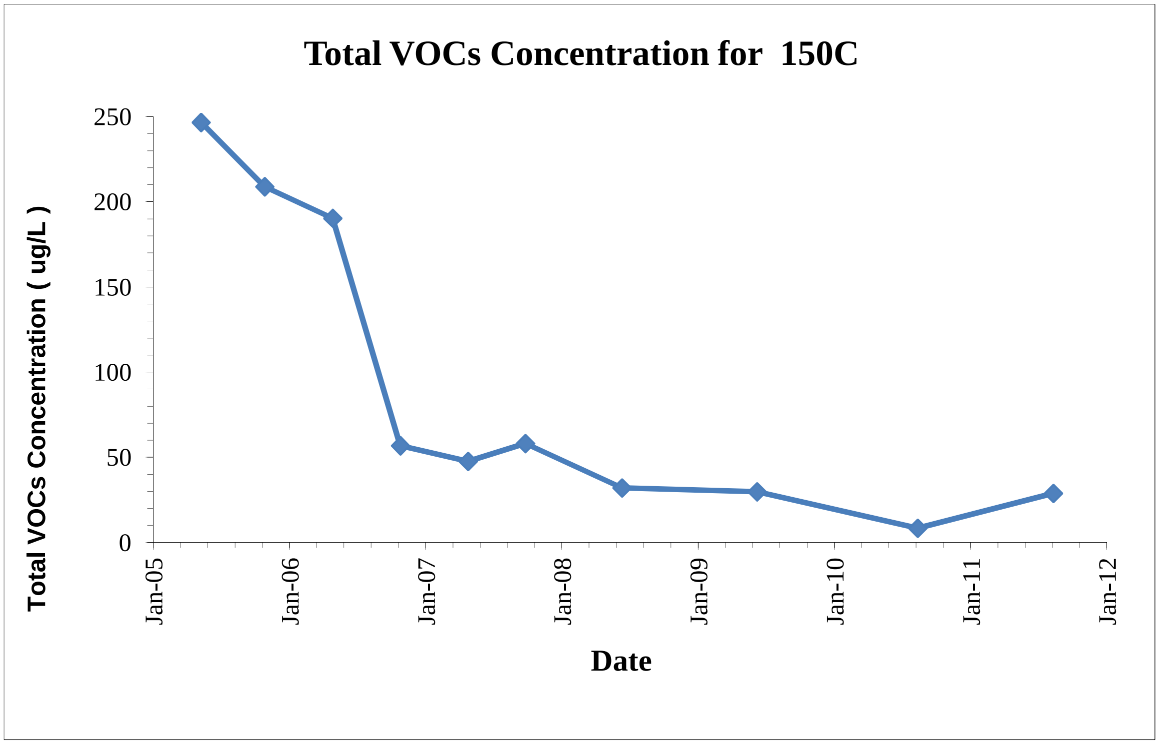

Total VOCs Concentration for 172B
Total VOCs Concentration (ug/L)
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date

Appendix B
C-Zone TVOC Graphs

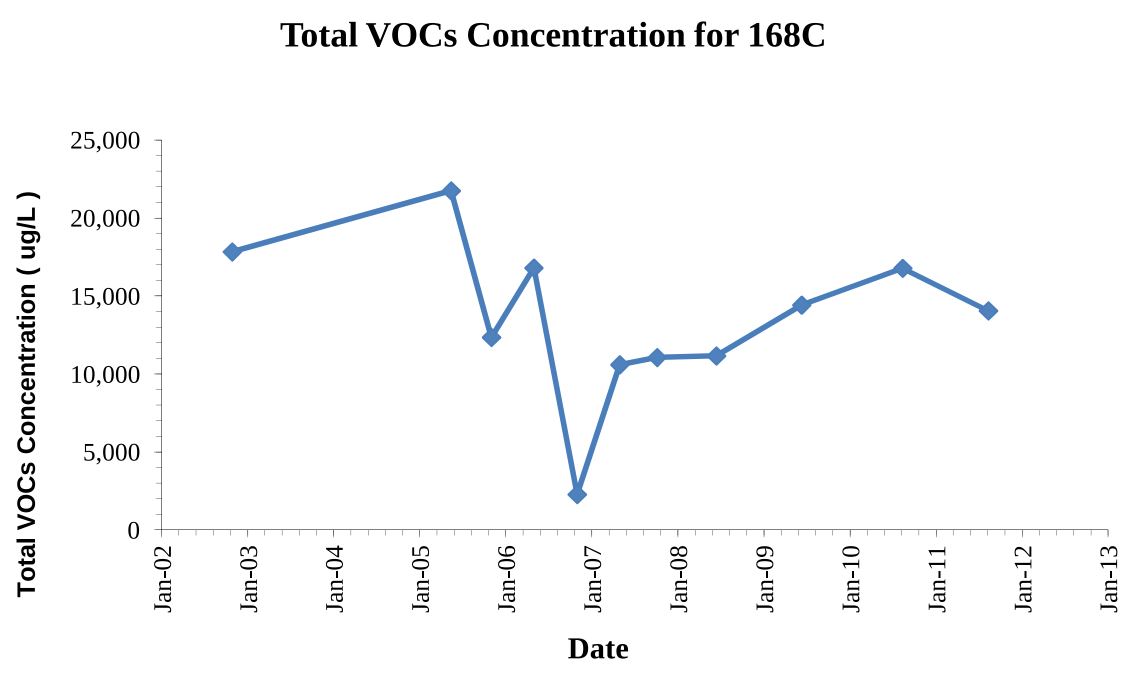




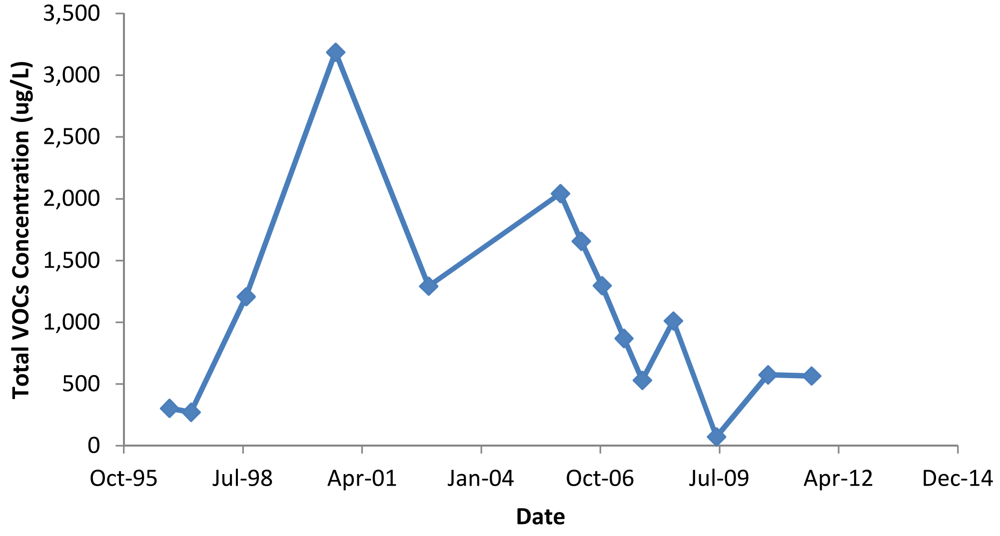
Total VOCs Concentration for 150C



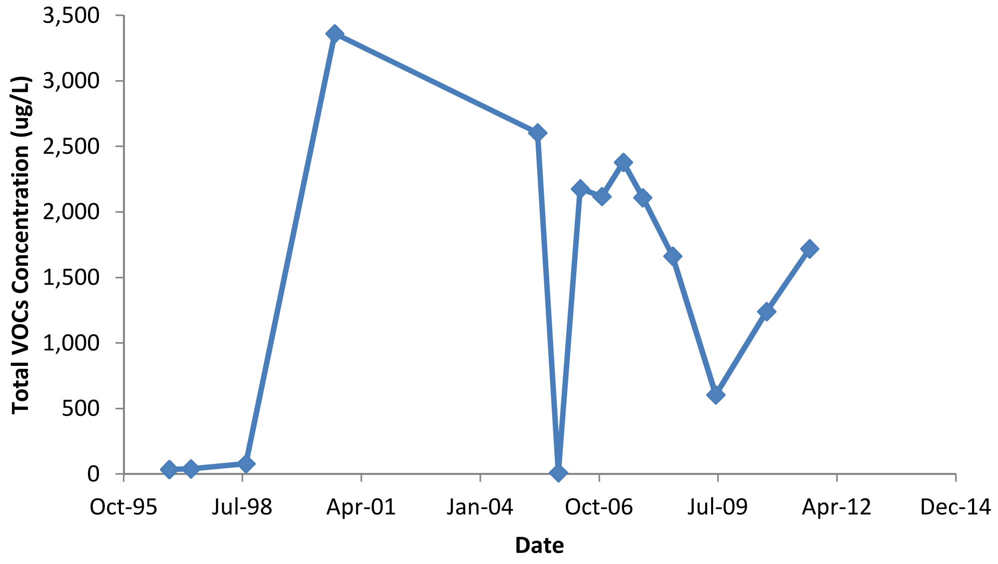
Total VOCs Concentration for 168C

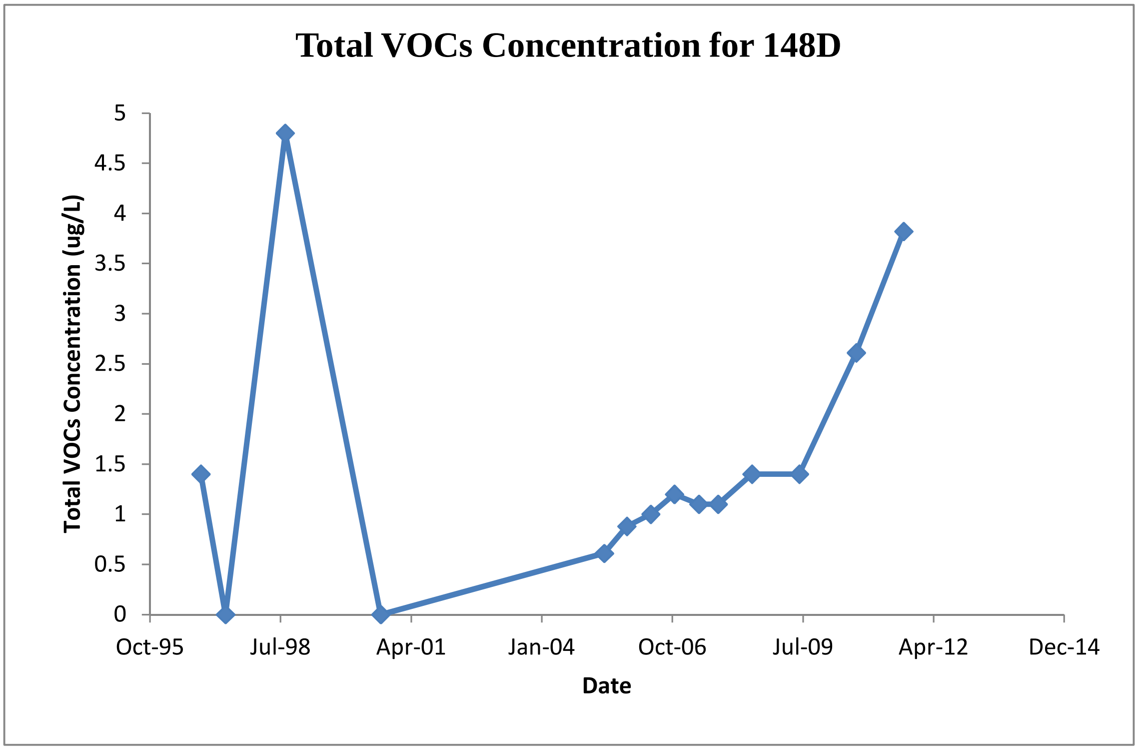


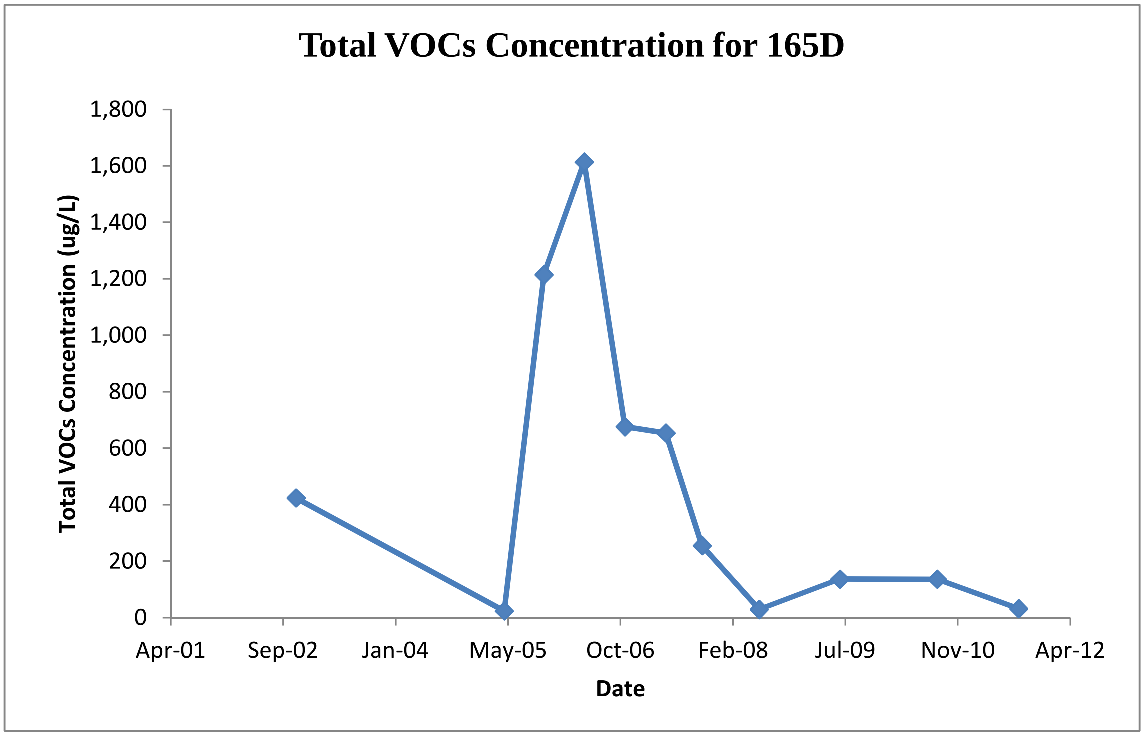
Total VOCs Concentration for 136D

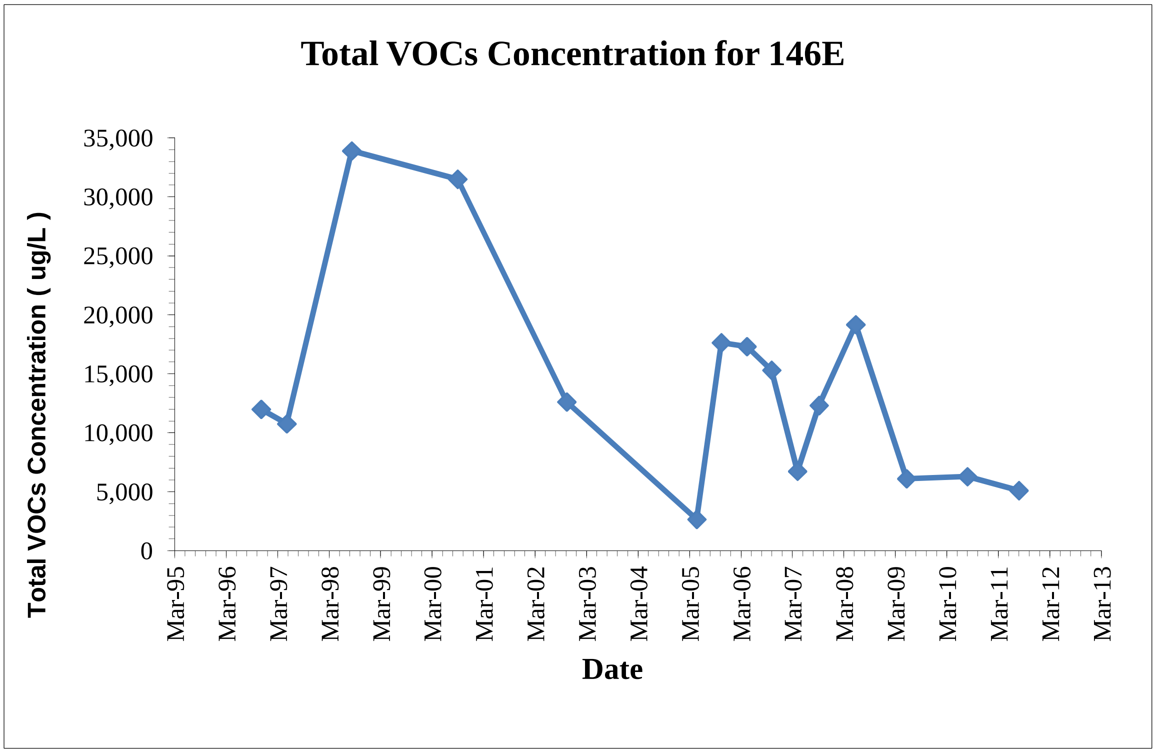


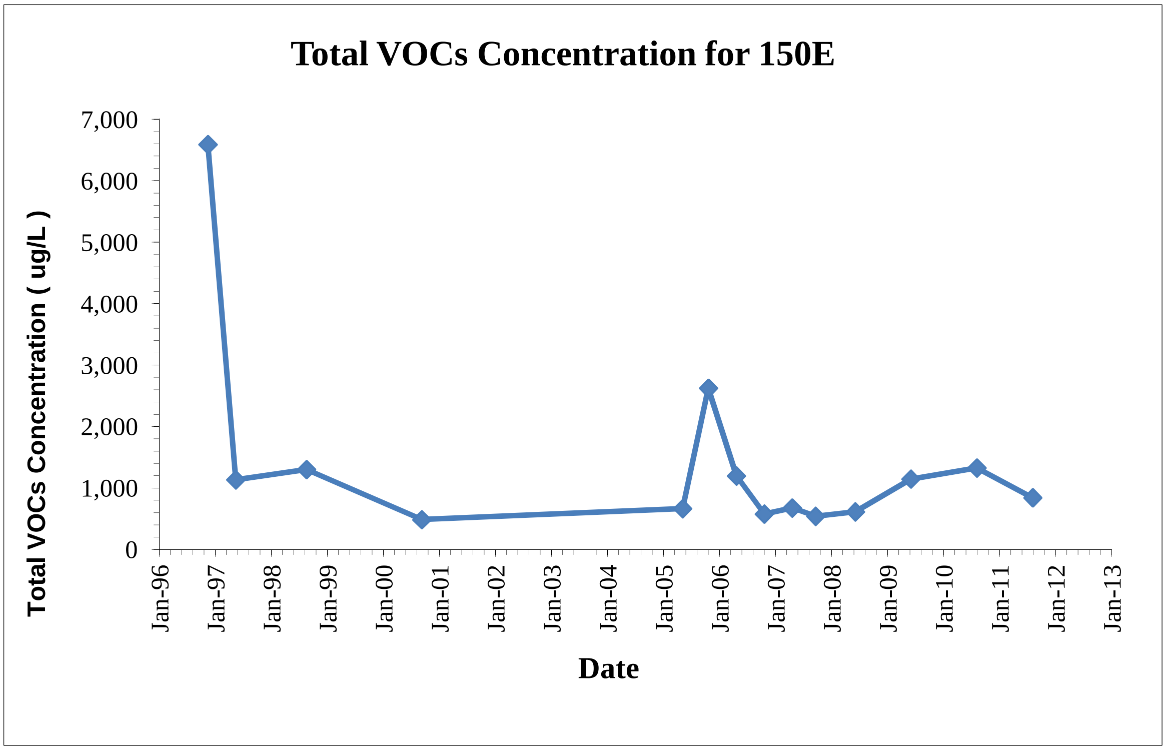
Total VOCs Concentration for 145D

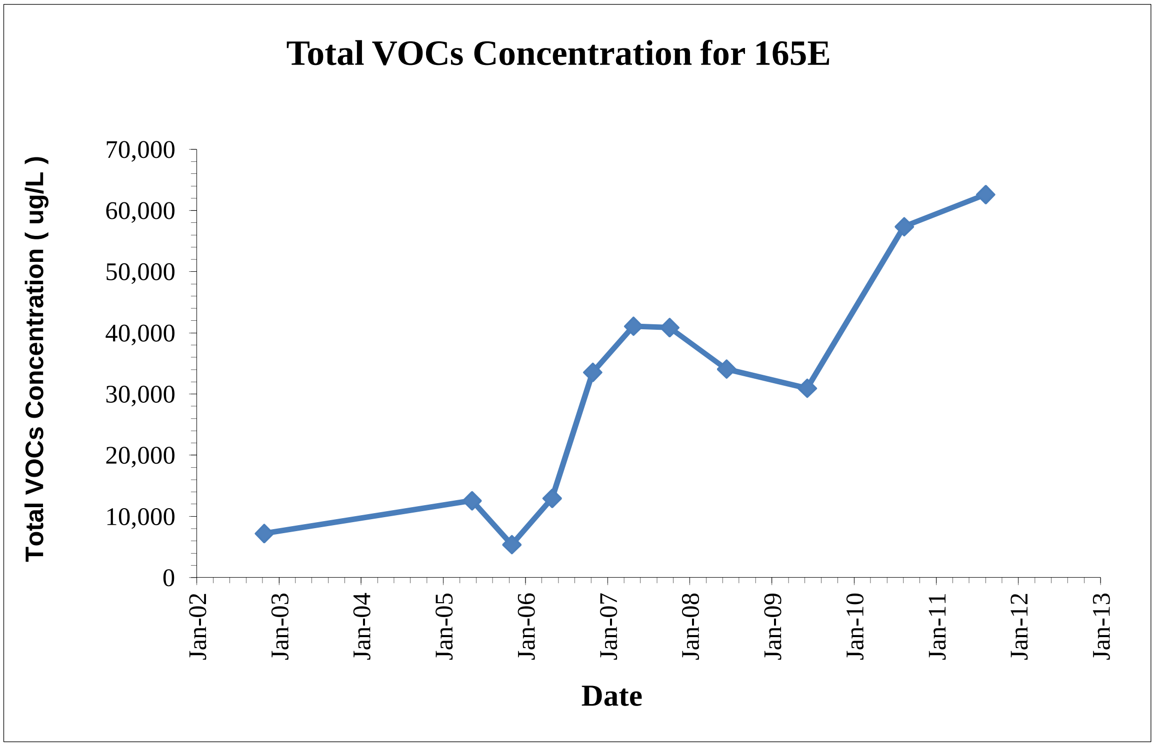


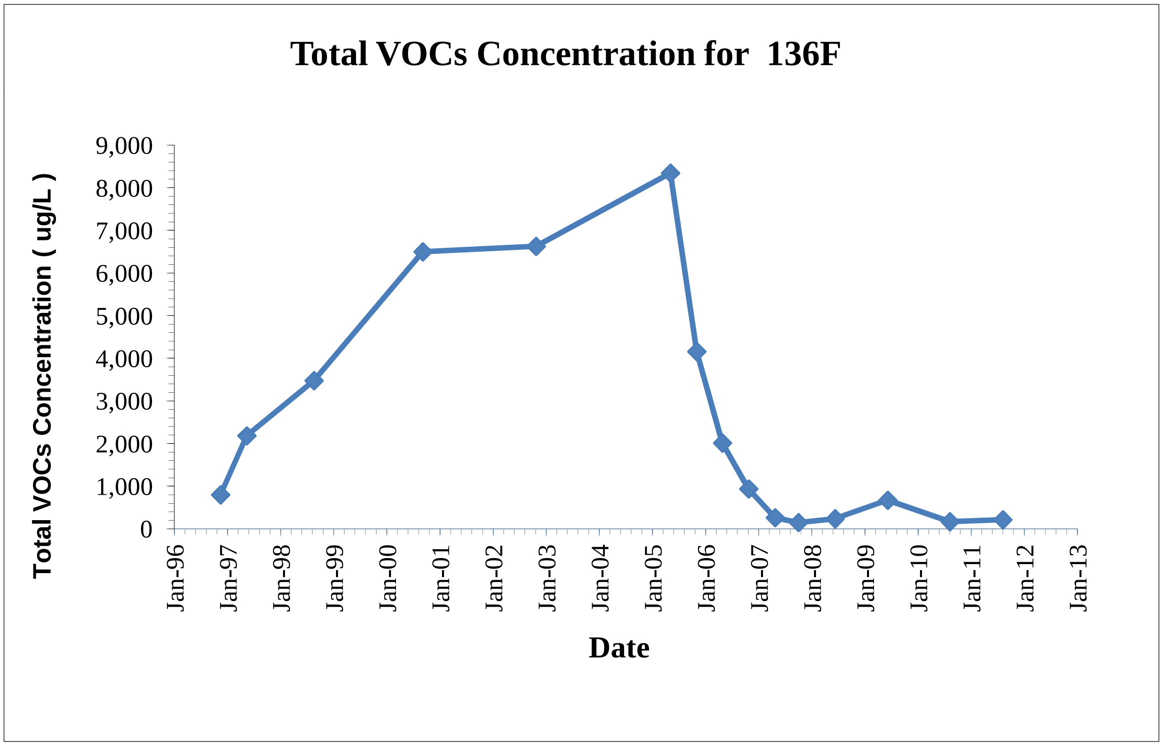

Total VOCs Concentration for 148D
Total VOCs Concentration (ug/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Date

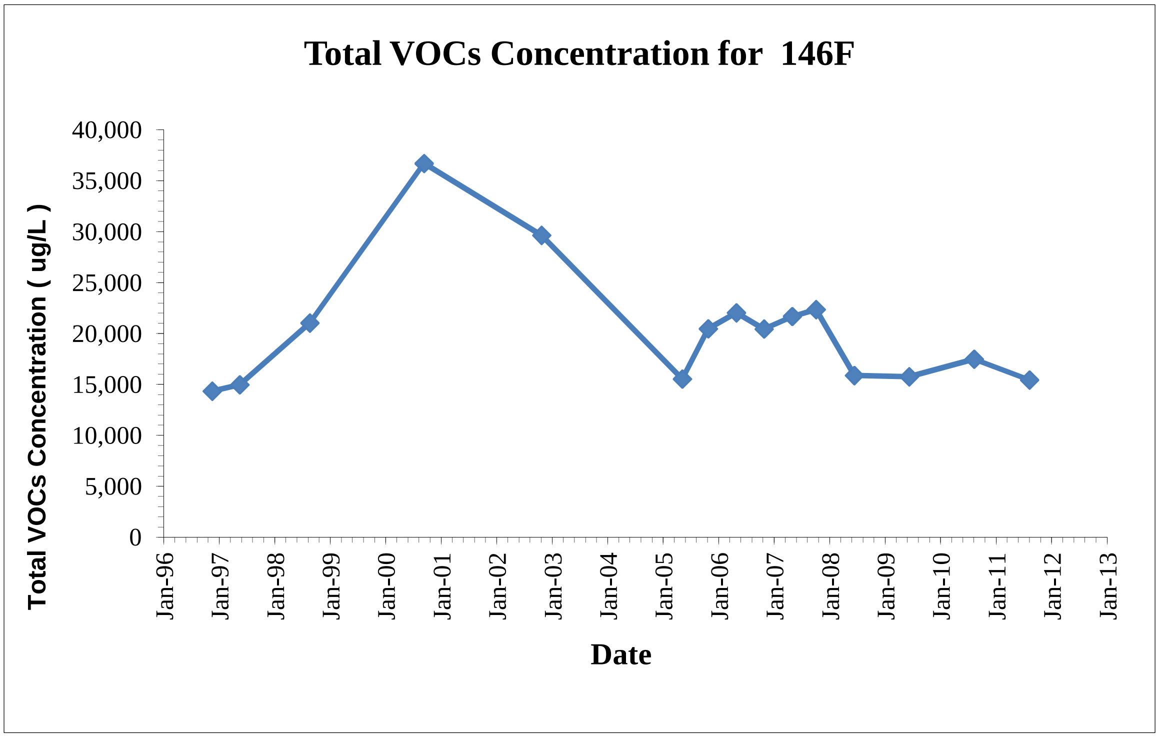

Total VOCs Concentration for 165D
Total VOCs Concentration (ug/L)
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Apr-01
Sep-02
Jan-04
May-05
Oct-06
Feb-08
Jul-09
Nov-10
Apr-12
Date

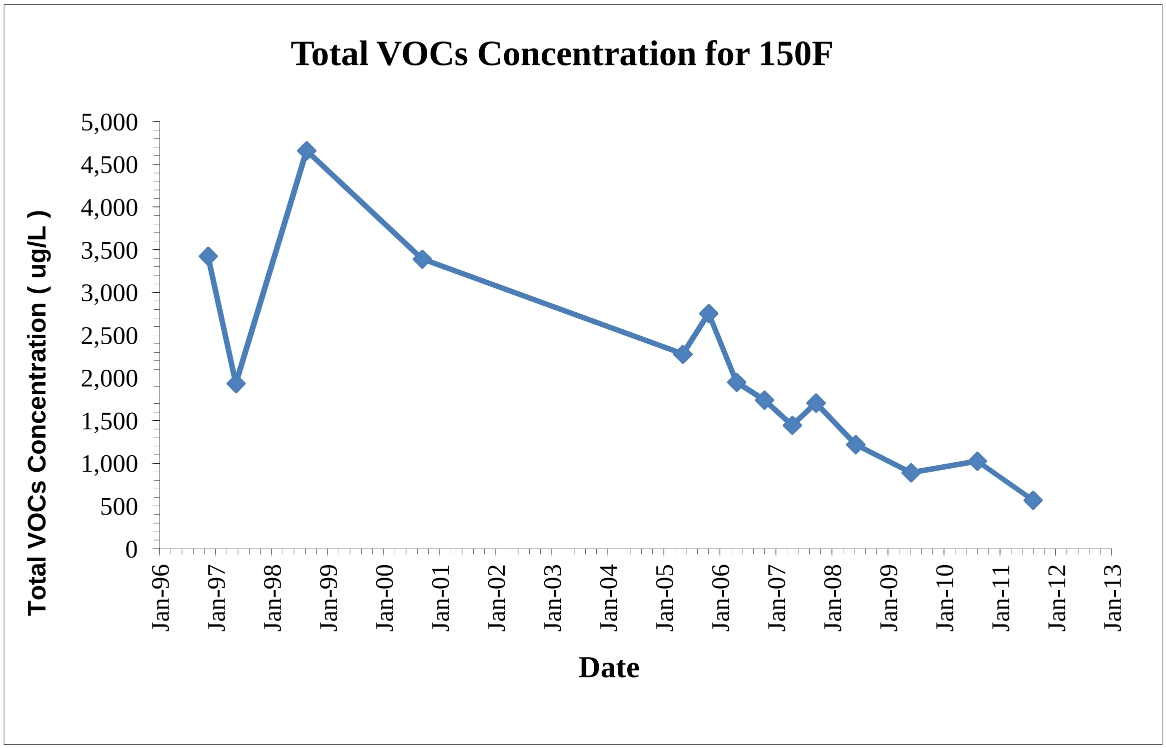

Total VOCs Concentration for 146E
Total VOCs Concentration (ug/L)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Date


Total VOCs Concentration for 150E
Total VOCs Concentration (ug/L)
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date


Total VOCs Concentration for 165E
Total VOCs Concentration (ug/L)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date


Total VOCs Concentration for 136F
Total VOCs Concentration (ug/L)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date


Total VOCs Concentration for 146F
Total VOCs Concentration (ug/L)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date


Total VOCs Concentration for 150F
Total VOCs Concentration (ug/L)
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date

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APPENDIX C
DATA VALIDATION SUMMARY
LABORATORY REPORTS (CD ONLY)

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APPENDIX D
LANDFILL CAP INSPECTION RESULTS
(NOVEMBER 2011)

DuPont - Necco Park Site

EXHIBIT A
CAP AND SURFACE WATER DRAINAGE
INSPECTION CHECKLIST

DATE: 11-16-11
INSPECTOR: Gerald Shepard
WITNESSES:

EMERGENCY CONTACT: Gerald Shepard
Phone # 716-282-1755

CONDITION: (Check) (Not Acceptable or Not Present require comments below)

	Acceptable	Not Acceptable	Present	Not Present	Remarks
1) Vegetative Cover, Ditches, Culverts	X				
a) Sediment Build-Up/Debris				X	
b) Pooling or Ponding				X	
c) Slope Integrity	X				
d) Overall Adequacy	X				
e) Culvert Condition	X				
2) Access Roads	X				
3) Landfill Cover System					
a) Erosion Damage	X				
b) Leachate Seeps				X	
c) Settlement				X	
d) Stone Aprons	X				
e) Vegetation	X				
f) Animal Burrows			X		Minor Mole Burrows
4) Slope Stability					
a) Landfill Top Soil	X				
b) Landfill Side Slope	X				
5) Gas Vents	X				
6) Monitoring Wells	X				

COMMENTS:

DESCRIPTION OF CONDITION:

-Landfill-Recently Cut + Line Trimmed vegetation
-Ditch + Swale integraty acceptable
-Cap and Vegetation Cover Acceptable

DESCRIPTION OF CONCERN:

DESCRIPTION OF REMEDY:

EXHIBIT B
CAP AND SURFACE WATER DRAINAGE MAINTENANCE CHECKLIST

DATE: 11-16-11
INSPECTOR: Gerald Shepard
WITNESSES:

EMERGENCY CONTACT: Gerald Shepard
Phone # 716-282-1755

Maintenance Performed (Check)	Item	Performed by:	Remarks
	1) Vegetative Cover:		
X	a) Seeding	Mark Cerrone Inc.	-Oct 2011
X	b) Fertilizing	Mark Cerrone Inc	-Oct 2011
X	c) Topsoil Replaced	Mark Cerrone Inc.	Oct 2011
X	d) Removal of Undesirable Vegetation	Tug hill Construction	-Oct 2011
	2) Drainage Ditches		
X	a) Sediment Removal	Tug Hill Construction	- Oct 2011
	b) Fill		
	c) Regrading		
	d) Stone Apron Repair		
	e) Vegetative Cover Placement		
	f) Liner Replacement		
	3) Access Road		
	a) Excavation		
	b) Fill		
X	c) Grading	Mark Cerrone Inc.	Oct 2011
X	d) Stone Paving	Mark Cerrone Inc.	Oct 2011
	4) Landfill Cap		
	a) Excavation		
	b) Cover Materials		
	- topsoil		
	- barrier protection layer		
	- drainage composite		
	- geomembrane		
	- geotextile		
	c) Testing		
	d) Barrier Protection Layer		
	e) Vegetative Cover		
	5) Gas Vents		
	- Pipes		
	- Bedding and Adjacent Media		
	6) Other		

DESCRIPTION OF MAINTENANCE ACTIVITIES: Minor Ruts in Cap-placed top Soil + Seeded/-Minor Depressions/Erosion Placed topsoil + Seeded Stone Placed on South Road From Black top Apron to Acid tank Loading Area