SECOND FIVE-YEAR REVIEW REPORT FOR DUPONT NECCO PARK LANDFILL SUPERFUND SITE CITY OF NIAGARA FALLS NIAGARA COUNTY, NEW YORK

Prepared by

U.S. Environmental Protection Agency
Region 2
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Approved by:

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Date: 9/23/2014

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Executive Summary

This is the second five-year review for the DuPont Necco Park Landfill Superfund site, located in the City of Niagara Falls, Niagara County, New York. The purpose of this five-year review is to review information to determine if the remedy is and will continue to be protective of human health and the environment. The triggering action for this statutory five-year review is the completion date of the previous five-year review, which was issued in July 2009.

Based upon the results of this review, the U.S. Environmental Protection Agency concludes that the remedies implemented at this site adequately control exposures of site contaminants to human and environmental receptors to the extent necessary for the protection of human health and the environment. The continued operation and maintenance at the site ensures that there are no site-related exposures of hazardous materials to human or environmental receptors.

SITE IDENTIFICATION		
Site Name: DuPont Necco Park Site		
EPA ID: NYD980532162		
Region: 2	**State:** NY	**City/County:** Niagara County

SITE STATUS	
NPL Status: Non-NPL	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**
Author name (Federal or State Project Manager): Gloria M. Sosa
Author affiliation: EPA R2 RPM
Review period: 7/22/2009 - 7/14/2014
Date of site inspection: 5/7/2014
Type of review: Statutory
Review number: 2
Triggering action date: 7/22/2009
Due date *(five years after triggering action date)*: 7/22/2014

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
01

Protectiveness Statement(s)		
Operable Unit: 01	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* N/A
Protectiveness Statement: The implemented remedy is protective of human health and the environment.		

Sitewide Protectiveness Statement	
Protectiveness Determination: Protective	*Addendum Due Date (if applicable):* N/A
Protectiveness Statement: The implemented remedy is protective of human health and the environment.	

Introduction

The purpose of a five-year review is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment and is functioning as intended by the decision documents. The methods, findings, and conclusions of reviews are documented in the five-year review. In addition, five-year review reports identify issues found during the review, if any, and document recommendations to address them.

This is the second five-year review for the DuPont Necco Park Landfill Superfund Site (site), located in City of Niagara Falls, Niagara County, New York. This five-year review was conducted by the United States Environmental Protection Agency (EPA) Remedial Project Manager (RPM) Gloria M. Sosa. The review was conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. §9601 *et seq.* and 40 CFR 300.430(f)(4)(ii), and in accordance with the *Comprehensive Five-Year Review Guidance*, OSWER Directive 9355.7-03B-P (June 2001). This report will become part of the site file.

The triggering action for this statutory review is the completion date of the previous five-year review. A five-year review is required at this site due to the fact that hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The site consists of one operable unit which is addressed in this five-year review.

Site Chronology

See Table 1 for the site chronology.

Background

Physical Characteristics

The 24-acre site is an inactive hazardous and industrial waste landfill located approximately 1.5 miles north of the Niagara River in the City of Niagara Falls and the Town of Niagara, Niagara County, New York. The site, located off Pine Avenue near 56th Street in Niagara Falls, was sold to E. I. du Pont de Nemours and Company (DuPont) in 1930.

The site is bounded on all sides by landfill disposal facilities and former manufacturing areas. Immediately north and east of the site lies the Newco solid waste landfill, an active Subtitle D facility owned by Republic Services. Immediately south of the site are three inactive hazardous waste landfill cells and a wastewater pre-treatment facility owned by CECOS International, Inc. Farther south, beyond the hazardous waste landfill, is a large area of former industrial use (formerly Great Lakes Carbon), most of which has been abandoned and the buildings have been demolished, with the exception of the Ashland Advanced Materials property which produces graphite products. An access road and a CSX right-of-way bound the site to the west. Farther west, beyond the rail line is a large mostly abandoned manufacturing area (Formerly Airco Speer or Carbide/Graphite Group) which is being used for metal recycling (Niagara Metals). (see *Figure 1*).

The site was used for the disposal of industrial and process wastes generated at the DuPont Niagara Plant from the mid-1930s until 1977. Wastes from the site have migrated in the overburden and bedrock underneath the landfill and now extend underneath the CECOS facility and a portion of the Allied Waste facility. Groundwater monitoring systems are currently in place at the CECOS and Allied Waste facilities, in accordance with state and federal regulations, to assure protection of human health and the environment as a result of operation of those facilities.

Site Geology/Hydrogeology

The Lockport Dolomite is characterized by horizontal and vertical fractures through which groundwater flows generally toward the Niagara Gorge and the lower Niagara River. The aquifers underlying the site have been classified as class GA groundwaters, a source of potable water supply. The site hydrogeology can be generalized by seven units relevant to site remediation. The A zone refers to saturated overburden and the B, C, D, E, F and G zones refer to identified Lockport Formation bedding-plane fracture zones which act as separate water-bearing units.

The Niagara River downstream of Niagara Falls receives discharge from the bedrock groundwater flow system. The Niagara River upstream of Niagara Falls acts as a groundwater recharge area. However, studies demonstrate that the New York Power Authority (NYPA) conduits and several sewers/tunnels act as regional groundwater sinks. Groundwater entering the conduit drainage system near the site may flow either to the south where a portion infiltrates the Falls Street tunnel where these structures intersect, or to the north where the water may eventually discharge to the Forebay Canal through bedrock fractures. The dry weather flow of the Falls Street tunnel discharges to the Niagara Falls Publicly Owned Treatment Works (POTW), where the effluent is treated.

Groundwater in the overburden, defined as the A zone, tends to flow vertically downward to the more transmissive bedrock units.

Groundwater in the B and C zones generally flows to the south in areas beyond the radius of influence of the operational recovery well system. Although the Falls Street tunnel is located southwest of the site and flow in the study area is to the south, the hydraulic influence of the Falls Street tunnel may extend some distance east of the Falls Street tunnel/John Street sewer intersection. Therefore, although insufficient information is available to determine the exact flow path, a portion of B and C zone groundwater ultimately discharges to the Falls Street tunnel.

Groundwater in the D, E and F zones generally flows in a westerly direction toward the NYPA power conduits. This groundwater is intercepted by the conduit drain system.

The piezometric map for the G zone generally indicates that hydraulic gradients are low. The primary flow direction appears to be west/northwest toward the groundwater discharge boundary at the NYPA conduits.

Land and Resource Use

The site is located in an area zoned for industrial use.

The population of the City of Niagara Falls is approximately 62,000. The population of Niagara County is approximately 221,000 and the population of the Town of Niagara is approximately 10,000.

A municipal water system serves the City of Niagara Falls. General land use and drinking water sources in the vicinity of the site have not changed since the 1998 Record of Decision (ROD). There are no drinking-water wells within the area impacted by the site. No new drinking-water wells are expected to be installed in the future because the Niagara County Department of Health imposes restrictions on the drilling and usage of wells in the county. These restrictions ensure that drinking-water wells are not installed in areas of contaminated groundwater.

History of Contamination

The Necco Park landfill was used for the disposal of industrial and process wastes generated at the DuPont Niagara Plant from the mid-1930s until 1977. Specific knowledge of activities at the site prior to 1964 is limited. Available evidence indicates that approximately 186 million pounds of liquid and solid industrial wastes were disposed of at the site, including fly ash, building demolition and miscellaneous plant debris, sodium sludge waste salts, cell bath, floor sweepings, sodium cell rubble (i.e., thermal brick, corroded steel), polyvinyl acetate solids and stilling bottoms, chlorinolysis wastes, liming residues, scrap organic mixtures, off-grade product, glycol polymer scrap, and refined adiponitrile wastes.

As a result of this disposal, soils at the landfill and groundwater beneath and downgradient from the landfill have been contaminated. Contamination at the site is found as aqueous phase liquids (i.e., dissolved in water) and as non-aqueous phase liquids (NAPL, i.e., occurs as a separate phase and does not readily dissolve in water; in this case, dense NAPL or DNAPL, i.e., heavier than water). Areas of soil contamination exist above levels that would be considered protective of groundwater quality. Groundwater contamination is above New York State (NYS) groundwater standards.

In 1977, the site was identified as a potential source of groundwater contamination and the landfill was closed. In February 1977, the State requested that DuPont take action to correct groundwater contamination at the Site. Groundwater investigations were initiated in September 1977. Since that time, several investigations and remedial studies have been conducted.

Initial Response

Several response actions were implemented to mitigate the impact and spread of contamination. During 1978 and 1979, a clay cap was constructed over the 24-acre site. The final compacted cover consisted of a minimum of 18 inches of clay. The average cap thickness is approximately 24 inches. The cap is overlain by a 6-inch cover of topsoil and grass.

In 1982, two existing monitoring wells (D-12 and 52) were converted to recovery wells (RW-1 and RW-2) to control off-site migration of contaminated groundwater in the upper bedrock fracture zones (B and C zones). Extracted groundwater was pumped to the CECOS facility adjacent to the site where it was treated and discharged to the Niagara Falls POTW. Wells RW-1 and RW-2 have been used as recovery wells from 1982 to the present.

Initial evaluations of the recovery well network's effectiveness indicated that under continuous operation, the wells created a hydraulic barrier across the entire southern perimeter of the site property in the first two bedrock water-bearing zones (B and C zones). However, after additional monitoring wells were installed during subsequent investigations, a reevaluation of the recovery well system's effectiveness revealed that some off-property flow from these two zones was occurring, particularly along the eastern property boundary in the C zone. The primary influence of well RW-2 was observed in the B zone and the primary influence of well RW-1 was observed in the C zone.

To enhance the groundwater pumping system's effectiveness, a grout curtain, termed Subsurface Formation Repair (SFR), was constructed from July 1988 through September 1989. The SFR extends along the entire western and northern perimeter of the site property and to just over one-half of the eastern perimeter. The southern perimeter and southern portion of the eastern perimeter were left ungrouted because to the possible presence of DNAPL and to allow for recovery of contamination that had migrated beyond the site property boundary. To reduce the potential for an upgradient increase in the water-table elevation in the overburden, the upper 10 feet of bedrock were not grouted on the northern perimeter.

Data indicates that wells RW-1 and RW-2 and the SFR have reduced off-property migration of contamination in the B and C zones. In 1992, a third recovery well, RW-3, was installed and began operation at the site. Well RW-3 penetrates the D, E and F zones, is located at the center of the southern site property line, and is pumped at an average rate of 3.5 to 4 gallons per minute (gpm). When well RW-3 is pumped continuously, a shallow cone of depression extending throughout the central portions of the site is observed in the D, E and F zones.

Basis for Taking Action

A remedial investigation (RI) was conducted by DuPont, which included the sampling and analysis of all appropriate media, including air, soil vapor, soils, surface water, sediment and groundwater, in identified areas of potential environmental concern. The results of the RI were documented in the *Necco Park Investigation Report*, dated 1993 and approved by EPA in 1994. Several years of annual groundwater sampling and analytical testing was conducted at 38 monitoring wells on or near the site prior to the 1998 ROD.

Based upon the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with the contaminated media under current and potential future site uses. The baseline risk assessment estimates the human health and ecological risk which could result from the contamination at the site if no remedial action were taken. Some of the groundwater contamination from the site has the potential to enter the Niagara River and ultimately Lake Ontario, a source of drinking water.

The human health risk assessment identified contaminants of concern (COCs) which would be representative of site risks. These contaminants included: 1,1,2-trichloroethane, 1,1,2,2-tetrachloroethane, 1,2-dichloroethane, hexachloroethene, 1,1-dichloroethylene, tetrachloroethylene (PCE), trichloroethylene (TCE), trans-1,2-dichloroethene, cis-1,2-dichloroethylene (cis-1,2-DCE), 4-methylphenol, carbon tetrachloride, chloroform, vinyl chloride (VC), hexachlorobenzene, hexachlorobutadiene, pentachlorophenol, phenol, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, barium, and cyanide. Several of the contaminants, including 1,1-dichloroethylene, 1,1,2,2-tetrachloroethane, carbon tetrachloride, chloroform,

hexachlorobenzene, tetrachloroethene, trichloroethene and vinyl chloride, are known to cause cancer in laboratory animals and are suspected or known to be human carcinogens. Potential exposures to site-related contaminants of concern were examined for the following media: groundwater, soils, sediments, surface water, air and biota. Of these media, the exposure to contaminated groundwater was considered for further quantitative analysis of potential health effects.

The baseline risk assessment quantitatively evaluated the health effects which could result from exposure to site contamination as a result of dermal contact ingestion, and inhalation (e.g. from showering) of groundwater. Since groundwater in the bedrock moves in different directions in the various zones, and the levels of contaminants are different in each of these zones, separate risk estimates were developed for the following zones: A (overburden), B and C zones (upper bedrock); D, E and F zones (middle bedrock); and G zone (lower bedrock).

The human-health risk assessment concluded that actual or threatened releases of hazardous substances from the site, if not addressed by the preferred alternative or one of the other active measures considered, may present a potential threat to public health, welfare, or the environment.

The ecological risk assessment was also conducted to evaluate the reasonable maximum environmental exposure. The ecological risk assessment considered all potential exposure media for ecological receptors, but only soil and groundwater media were assessed in detail. Risk characterization-measurement or estimation of both current and future adverse effects risks to ecological receptors was assessed quantitatively by modeling site groundwater contaminant concentrations reaching the area of the Niagara River at two locations: the Forebay Canal adjacent to the Robert Moses Power Plant and the Falls Street tunnel outlet to the river. The ecological risk assessment determined that the contaminated soils and groundwater attributable to the site alone currently do not pose an unacceptable ecological risk; future ecological impacts to the Niagara River may occur however, if remedial actions are not implemented.

Remedial Actions

Remedy Selection

The remedy described in the September 1998 ROD addressed landfill soils and DNAPL in the soils and bedrock which represent continuing sources of contamination to the groundwater. The remedy requires long-term management to maintain the groundwater pump and treat systems and groundwater monitoring to determine the effectiveness of the containment measures in reducing contaminant concentrations in the far-field aquifer.

The major components of the selected remedy as described in the ROD include the following:

- Containment of the source area by:
  - upgrading the existing cap to meet New York State Part 360, or equivalent standards;
  - using hydraulic measures in the overburden (A zone) to maintain an inward gradient within the source area or installing a physical barrier (e.g., slurry wall, sheet pile) on the southern, and portions of the eastern and western site boundaries; and
  - using hydraulic measures in the bedrock (B-F zones) to maintain an inward gradient within the source area and prevent the movement of contaminated groundwater beyond the source area boundary.

- Treatment of the extracted groundwater from the source area, either on-site or off-site, to achieve the appropriate discharge requirements. Currently, groundwater extracted from the Site is treated at the adjacent CECOS wastewater treatment plant. Expansion of the CECOS facility would likely be required to accommodate the increased volume of water to be treated under this remedy. The need to either expand the CECOS facility, build an on-site facility, or utilize another off-site facility for groundwater treatment would be determined during the design.
- Collection of DNAPL in the Source Area by:
  - the utilization of the existing monitoring wells network;
  - the utilization of any groundwater recovery wells placed in the source area; and
  - the installation of additional dedicated DNAPL recovery well(s).
- Collected DNAPL would be disposed of off-site at an appropriate facility.
- Operation and maintenance (O&M) of the existing systems and the systems constructed under this selected remedy.
- Comprehensive monitoring to verify hydraulic control, identify DNAPL occurrence, demonstrate the effectiveness of the remedial measures, and assess the impact of such measures on far-field groundwater quality.
- Additional characterization of the site to assess whether natural attenuation would be effective in addressing far-field contamination.
- Development and implementation of institutional controls to restrict site access, the use of groundwater at the site, and control land use such that it is consistent with site conditions.

The Remedial Action Objectives (RAOs) for groundwater are the reduction of risks to human health associated with potential exposure to site-related compounds by: reducing the quantity of source materials (i.e., DNAPLs) to the extent practicable; controlling the migration of groundwater downgradient from the site and the source area; and attaining the groundwater cleanup criteria.

The RAO of attaining the groundwater cleanup criteria is only being applied to areas outside the source area (i.e., the far-field area). Because of the concentration of DNAPLs and contaminants in the soils and bedrock in the source area, and the complexities associated with remediation of DNAPLs in fractured bedrock, EPA does not anticipate that the RAOs can be achieved within the source area. Since waste materials are being left in place, and it is technically impracticable to achieve the RAOs for groundwater in areas where DNAPL has migrated, the groundwater ARARs are not expected to be met in the source area. EPA issued a technical impracticability waiver of groundwater ARARs in the source area in 1998.

The RAOs for soils at the site are the protection of the groundwater quality, and ultimately human health, through reduction of the source materials (i.e., DNAPLs) to the extent practicable, as well as limiting exposure to surficial soil contaminants.

Remedy Implementation

Source Remediation

Cap

DuPont completed the upgrade to the landfill cap in August 2006, including the installation of following components:

- Forty-mil linear-low density polyethylene geomembrane;
- Geosynthetic drainage composite on slopes greater than 12 percent;

- Cushioned geotextile fabric over the geomembrane;
- One-foot thick layer of barrier protection soil;
- Drainage stone layer; and
- Six-inch thick vegetative layer.

Hydraulic Containment

The Hydraulic Control System (HCS), consisting of a series of extraction wells and associated plumbing, was also upgraded. Groundwater extraction pumps were installed in the B/C zone wells RW-4, RW-5 and RW-10. Pumps were also installed in D/E/F-zone wells RW-8 and RW-9. The HCS system is operated to create an inward hydraulic gradient to ensure that contaminated groundwater is captured in the source area. The remedial design indicated that no additional wells were needed to control the A zone.

A groundwater treatment facility (GWTF) was built on-site to treat water extracted by the HCS. The effluent from the GWTF is discharged to the Niagara Falls Wastewater Treatment Plant. GWTF influent samples are collected and analyzed to ensure that discharge parameters are met.

System Operations/Operation and Maintenance

The HCS is operated in accordance with the EPA approved Operations and Maintenance Plan, dated 2005. Water levels are collected quarterly at approximately 150 wells. Potentiometric surface (level to which water rises in a well) contour maps are created from the water-level data to demonstrate hydraulic capture. Groundwater is sampled and analyzed annually at 56 wells with the purpose of monitoring the effectiveness of the HCS in reducing chemical concentrations within the source area and to monitor the presence of DNAPL. Groundwater sampling indicates a decrease in total volatile organic compounds (TVOC) at the site. In addition, the far-field groundwater chemistry is monitored annually from more than 10 wells to determine if the HCS is controlling off-property migration of contaminants and that natural attenuation is occurring.

The HCS has been operating successfully at the site; the system is online better than 92 percent of the time each year since it became operational. The GWTF has also been operating successfully. DuPont has minimized its downtime by continuously monitoring its operating conditions and accordingly making adjustments to the process or operating systems. The GWTF is online better than 90.9 percent of the time. DuPont extracted approximately 15.6 million gallons (Mgal) of groundwater in 2013 which were treated at the GWTF. Approximately 122 gallons of DNAPL were extracted in 2013. A total of approximately 8,750 gallons of DNAPL have been extracted at the site.

DuPont inspects the site routinely. No activities are occurring which may impact the integrity of the cap. Cap maintenance activities are performed when necessary.

Progress Since Last Five-Year Review

Protectiveness statement from previous five-year review: Based on the current and reasonable anticipated use of the site, the EPA has determined that the remedy protects human health and the environment. There are no current risks present at the site in either groundwater or soils and none are expected, as long as the engineered and access controls are properly operated and maintained.

However, in order for the remedy to be protective in the long term, a vapor intrusion study should be conducted off-property and the natural attenuation potential should be determined in the far-field area.

Recommendations identified in previous five-year review: A more thorough vapor intrusion evaluation should be performed in the far-field area and an investigation should be performed in the far-field area (outside the source-control area) to determine whether natural attenuation has been effective in reducing contaminant levels.

DuPont implemented the recommendations identified above and issued a report discussing the methods and conclusions, *Vapor Intrusion and Far-Field Monitored Natural Attenuation Analysis,* in 2013. The findings of this report indicate that vapor intrusion would not be a concern for any downgradient buildings because the wells in zone A (the shallowest groundwater zone) are largely clean, both because of continued treatment and containment of the source area and because of a predominantly downward gradient in this zone (see *Question B* below). The report also demonstrated that there is strong evidence for anaerobic biodegradation of chlorinated organics in the far-field (see *Natural Attenuation* section below).

Five-Year Review Process

Administrative Components

The five-year review team included Gloria M. Sosa (EPA-RPM), Edward Modica (EPA-Hydrologist), Chloe Metz (EPA-Human Health Risk Assessor), Mindy Pensak (EPA-Ecological Risk Assessor) and Michael Basile (EPA-Community Involvement Coordinator). This is a PRP-lead site.

Community Involvement

The EPA Community Involvement Coordinator for the site, Michael J. Basile sent notification on May 22, 2014, of the initiation of the five-year review process to local elected officials and the City of Niagara Falls, where the notice was posted on the City bulletin board and uploaded to their website. The notice indicated that EPA would be conducting a five-year review of the remedy for the site to ensure that the implemented remedy remains protective of human health and the environment and is functioning as designed.

Once the five-year review is completed, the results will be made available at the local site repository, which is at the EPA Western New York Public Information Office, 86 Exchange Place, Buffalo, New York 14204-2026, telephone: (716) 551-4410, hours: Monday to Friday from 8:30 a.m. to 4:00 p.m. The five-year review will also be uploaded to http://www.epa.gov/region02/superfund/npl/dupontneccopark/.

Document Review

The documents, data and information which were reviewed in completing this five-year review are summarized in Table 3.

Data Review

A monitoring program was established to verify hydraulic control in the source area, identify DNAPL occurrence, evaluate groundwater quality trends within the source area and in the far-field (area outside of the source area), and demonstrate the effectiveness of recovery. Source area and far field monitoring well locations can be found in Figure 1.

Hydraulic monitoring data for the last five-year period indicates that the HCS has consistently maintained control of the source areas in the bedrock fracture zones B through F. Piezometric surface maps show significant drawdown relative to the five extraction wells for each zone, indicating that most groundwater within the established source area limits is hydraulically contained. The A zone (overburden) appears to show significant dewatering and rapid response to extraction. Hydraulic control is also maintained in the B zone of the shallow bedrock, where extraction wells RW-11, RW-5, and RW-4 exert the greatest influence within this zone. Similarly, hydraulic control is maintained in the C zone, due to the effects of extraction wells RW-4 and RW-5 near the east end of the landfill. Water-level data in wells screened through bedrock fracture zones D, E, and F also indicate containment due to the effects of extraction wells RW-8 and RW-9 near the west end of the landfill.

Recovery wells RW-11, RW-5, and RW-4 were rehabilitated in 2012 by removal of sediment to improve yield. In July of 2008, well RW-10 was replaced with RW-11 to correct for yield loses that were occurring at well RW-10 after startup in 2005; also in 2008, a blast fractured bedrock trench was installed to improve performance. These improvements have helped boost system efficiency. During the period 2009 to 2013, an average of 14.8 Mgal of groundwater were extracted and treated at the GWTF annually, with a maximum of 16.3 Mgal extracted in 2009 and a minimum of 13.7 Mgal extracted in 2010. For the same period, TVOCs in the GWTF influent extracted from zones B/C and D/E/F averaged 349,433 parts per billion (ppb) annually, with a maximum of 385,600 ppb reported in 2012 and minimum of 288,158 ppb in 2009. Also, an average of 82.8 gallons of DNAPL were recovered annually, with a maximum of 130 gallons recovered in 2011 and no DNAPL recovery in 2009. The HCS continues to remove contaminants from the on-property plume.

A long-term monitoring plan has been in place since 2005 to assess water quality both within areas defined as source areas of the site and in areas down- and side-gradient of the site defined as the far-field. Since 2008, a network of 26 wells is sampled annually for groundwater quality (following the initial start-up period when sampling occurred biannually). In 2009 and 2013, 20 additional wells were also sampled for added coverage and to evaluate natural attenuation. According to the Source Area Report (SAR) of April 2001, source areas are defined by the distribution of monitoring wells in which DNAPL was observed at least once, or where the concentration of a VOC compound is observed at or above the level of its effective solubility (maximum aqueous concentration of a constituent in groundwater in equilibrium with a mixed DNAPL), or where the concentration of a VOC compound is observed at or above the level of one percent of its pure phase solubility. The extent of the source areas varies with the aquifer fracture zones. Source areas in the fracture zones B and C are larger and show more of an extension to the southeast than in zones A, D, E, and F.

An assessment of data from groundwater chemical monitoring for the past five years indicates that, overall, there continue to be reductions in VOCs for all flow zones both in the source and far-field areas. For example, decreasing VOC concentration trends were observed in bedrock fracture zones

B, C, and F, in source-area wells 171B, 137B, 145C, 168C, and 146F. Decreasing trends were also reported in zones B, D, and F, outside source-area limits in wells 145B, 165D, 150F, and 136F. There have also been some increases observed in wells screened within or near the established source area limits. For example, increasing trends over the long term has been reported in the E zones for source-area well 165E, although its trend has reversed over the last few years. Some increases have also been observed in zones B, C, and D outside the source area in wells 150B, 150C, and 136D. Many of these increases appear to be associated with the occurrence of higher proportions of cis-1,2-DCE and VC, which may suggest degradation effects. Others increases may reflect inter-zone migration of VOCs.

No significant migration of contaminants was detected in the overburden. Water-quality results from A-zone wells located in the far-field (i.e.,146AR, 150A, 145A, 151A, 152A, and others) indicate that VOC concentrations were low and, largely, not detected. Further, based on an analysis of water-quality data conducted in the far-field and on-site groundwater in 2009 and again in 2013 (*Vapor Intrusion and Far-Field Monitored Natural Attenuation Analysis* report), the potential for natural attenuation in the far-field and in on-site groundwater remains high due to anaerobic conditions that persist in these aquifer zones. Consequently, anaerobic biodegradation of chlorinated organics appears to be a factor in reducing contaminant levels at the landfill and in adjacent areas.

There appear to be no or little changes observed in the current extent of source areas for the bedrock-fracture zones compared to those delineated in 2006 as defined in the SAR. However, the demarcation lines established for each zone are rough approximations of source areas based on contaminant data at discrete locations over the field. Consequently, fine-scale changes in source-area extent would be difficult to observe based on the monitoring-well network and, likely, some changes have occurred over time.

A more detailed evaluation of VOC levels and trends derived from analysis of groundwater samples in the 26-well network follows:

A zone

Groundwater in A-zone wells within the source area is not sampled as part of the long-term groundwater monitoring program. TVOC concentrations in well 137A, a well located north of CECOS cell, average about 164 ppb for the last five years and showed no apparent trend. However, concentrations have decreased compared to 2005 when total VOC levels were above 1,000 ppb. A-zone wells 146AR, 150A, and 145A are located in the far-field. Concentrations of TVOC in these wells were found to be low, largely below standards.

B zone

Wells within B-zone source area

B-zone wells 136B, 137B, 168B, 171B, and 172B are located within the source area near its southern extent. Well 168B showed the highest concentrations of this group of wells, where TVOCs averaged about 46,800 ppb for the last five years. cis-1,2-DCE and VC make up the highest proportion of TVOCs (an average of 17,000 ppb and 12,000 ppb, respectively for the period) with TCE and PCE comprising a smaller proportion of TVOCs (an average of 540 ppb and 8 ppb, respectively). TVOC concentrations have increased in this well since 2005. Average

TVOCs observed in wells 136B and 137B were 2,340 ppb and 780 ppb, respectively, with no discernible trend over the five-year period. VOCs concentrations generally increased in this well compared to levels reported in 2005. Wells 171B/172B, located in the southeastern corner of the source area, show average TVOC concentrations of 372 ppb and 2,742 ppb respectively, with a decreasing trend evident in well 171B. Generally, VOCs concentrations have decreased considerably in both wells since 2005.

Wells outside B-zone source area

Well 150B is located about 300 feet south of the source area demarcation. TVOCs reported for this well have averaged 70 ppb, the largest proportion being comprised of cis-1,2-DCE and VC. There appears to have been a steady increase in VOCs for this well since 2009, although compared to historic levels (approximately 2,200 ppb), current levels are much lower. Well 145B is located just outside the B-zone source area near the southeast corner of the site. TVOCs reported for this well have averaged 9,300 ppb, the largest proportion being cis-1,2-DCE and VC. TVOCs appear to have trended downward and are significantly lower than the levels reported in 2006 at 25,000 ppb.

C zone

Wells within C-zone source area

C-zone wells 168C and 145C are located just within the C-zone source area limits. Both wells showed average TVOCs greater than 14,000 ppb. TCE is the dominant VOC constituent in 168C whereas cis-1,2-DCE and VC are the main constituents found in 145C. There is a slight decrease in TVOC concentrations at well 168C over the last five years, although concentrations were greater than 20,000 ppb in 2005. TVOC concentrations reported for well 145C have been erratic over the period of record (starting around 1997) and the VOC concentrations reported in 2013 of approximately 12,000 ppb appear anomalously low compared to the previous four years of this review period.

Wells outside C-zone source area

Wells 146C and 150C are located outside the source area and south of the demarcation area. An average TVOC concentration of about 9.6 ppb was reported for well 146C for the last five years, showing no discernible trend; these concentrations are lower than those reported for the early 2000s. A somewhat greater average TVOC concentration of 108 ppb was reported for well 150C, although the average is biased by a relatively large increase in TVOCs (463 ppb) in 2013 compared to the previous four years.

D zone

Wells within D-zone source area

Well 105D, located within the source area, had a TVOC concentration of approximately 1,250,000 ppb in 2013, which has increased from 800,000 ppb in 2009. TVOC concentrations have decreased in Well 123D, from 450 ppb in 2009 to approximately 10 ppb in 2013. Cis-1,2-DCE and VC are the dominant constituents. TVOC concentrations have increased since 2009 in Well 136D, from below 1 ppb in 2009 to approximately 1,000 ppb in 2013.

Wells outside D-zone source area

Well 145D is located outside the source area near the southeast corner of the site. TVOC concentrations have averaged 1,186 ppb over the last five years, with a relative high of 1,719 ppb in 2011. Cis-1,2-DCE and VC are the dominant constituents. Even though the VOC trend over the long term appears to be erratic, VOC levels have declined since about the year 2000. Well 136D, located west of extraction well RW-8 and outside the source area, shows an average total VOC concentration of about 607 ppb, and consists largely of cis-1,2-DCE and VC. For this well, VOCs appear to be increasing over the last four years. Wells 165D and 148D are located further west of the landfill, with 165D being situated closer to the source area. The average total VOCs for the wells is 65 ppb and 3.2 ppb, respectively. Well 165D shows a reduction in VOCs over the last three years. Well 148D shows a slight increase in VOCs over the same period, but at very low concentrations.

E zone

Wells within E-zone source area

Well 165E is located within the source area near extraction well RW-9. The average TVOC concentrations found in Well 165E was 48,834 ppb with a maximum concentration of 62,630 ppb reported for the year 2011; this is the highest TVOC concentration reported for the well since 2003 (less than 10,000 ppb). However, VOCs have been decreasing over the last two years. For well 146E, also located near RW-9, the average TVOC concentrations was reported as 5,577 ppb, with no discernible trend over the last five years. These concentrations have been considerably lower than in 1998. Well 150E, located south of the designated source area and just south of the Allied Waste Secure Cells, showed average TVOC concentrations of 1,114 ppb for the review period with no trend. The VOCs consist predominantly of cis-1,2-DCE and VCs.

Wells outside E-zone source area

Well 150E, located south of the designated source area and just south of the Allied Waste Secure Cells, showed average TVOC concentrations of 1,114 ppb for the review period with no trend. The VOCs consist predominantly of cis-1,2-DCE and VCs.

F zone

Wells within F-zone source area

Well 146F is located within the source area just south of extraction well RW-9. The average TVOC concentrations were 14,333 ppb, with a slight decreasing trend over the last few years. Again, the dominant VOCs are cis-1,2-DCE and VC. The recent level of VOC contamination in this well represents a sizable decrease compared to a maximum of about 37,000 ppb in the year 2000.

Wells outside F-zone source area

Well 150F, located south of the source area, shows an average TVOC concentration of about 732 ppb with a slight downward trend for the review period. The dominant VOCs are cis-1,2-DCE and VC. Well 136F, located west of extraction well RW-8 and outside the source area, shows an average TVOC concentration of 262 ppb, and shows a declining trend over the last few years.

These concentrations are largely reduced compared to a maximum TVOC value of 8,600 ppb in 2005.

Natural Attenuation

Natural attenuation of chlorinated solvents is an active remediation process downgradient of the site throughout the far-field. Through the process of anaerobic biodegradation and potentially abiotic degradation there are observable decreasing trends in concentrations of contaminants suggesting that the plume is retracting. The source area control is preventing concentrations from migrating into the far-field which allows natural attenuation to decrease concentrations and retract the plume. In the first eight years of source area control the downgradient and side gradient groundwater molar chlorinated VOCs have decreased an average of 65 percent, which is considerable for recalcitrant compounds such as chlorinated solvents. This is supported by the EPA natural attenuation scoring methods (1998), in which, the combined average score was 21 points, for all B/C and D/E/F natural attenuation locations for 2009 and 2013, while omitting wells near or below maximum contaminant levels (MCLs). For the side and downgradient wells only, the average score was 20 points. Both scores indicate that there is strong evidence for anaerobic biodegradation of chlorinated organics.

Site Inspection

The inspection of the site was conducted on May 07, 2014. In attendance were Gloria M. Sosa of EPA, Paul F. Mazierski of DuPont, Tim J. Pezzino of URS, and James Schuetz of Parsons. The purpose of the inspection was to assess the protectiveness of the remedy.

The site conditions have not changed since the last five-year review. The current condition of the cap is excellent. The GWTF is being well maintained. The RPM did not observe any problems or deviations from the ongoing O&M activities being implemented at the Site.

Interviews

No interviews were conducted for this review.

Institutional Controls Verification

The entire property is zoned industrial by the City of Niagara Falls and the Town of Niagara. The site is completely bounded by the Allied Waste facility. Although the site is not completely fenced, the surrounding Allied Waste facility is completely fenced and access to the site is through the Allied Waste facility gate which is staffed 24 hours a day. There are no activities that could interfere with the integrity of the cap. DuPont filed a deed notice on January 13, 1999 with the Niagara County Clerk which provides notification to successors-in-title of the following: the property is part of the DuPont Necco Park site, industrial wastes, including hazardous substances, were disposed of at the site, and DuPont is required to implement the remedy specified in EPA's 1998 ROD. The site is listed on the Registry of Inactive Hazardous Waste Disposal Sites in New York State.

There are no drinking-water wells within the area impacted by the site. No new drinking-water wells are expected to be installed in the future because the Niagara County Department of Health imposes restrictions on the drilling and usage of wells in the county. These restrictions ensure that

drinking-water wells are not installed in areas of contaminated groundwater, effectively preventing exposure to site-related contaminants through ingestion.

Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy at the DuPont Necco Park site is functioning as intended by the decision documents.

The September 1995 ROD calls for the following: implementation of a HCS in overburden and bedrock flow zones, a GWTF, DNAPL collection in the source area, an upgrade to the landfill cap, and a monitoring program for wells in source area and far-field areas. The remedial action is necessary to address the RAOs for the site, which are to establish hydraulic control of contaminated groundwater within the source area and to prevent off-site migration. Remediation of DNAPL, contaminated soils, bedrock, and groundwater within the source area of site was considered technically impracticable. Consequently, the ROD waived federal and state drinking water standards for groundwater in the source area.

The HCS has been effectively controlling groundwater flow in the overburden and in fracture zones of the bedrock. The system consists of five groundwater recovery wells, a recovery trench, and a treatment facility that operates in accord with the established Operation & Maintenance Plan. A barrier wall was also put in place in the north, east, and west sections of the landfill and is designed to maintain an inward flow gradient in the source area in flow zones within bedrock, and to prevent movement of contaminated groundwater beyond source area boundaries. The control system commenced operations in 2005. The treated extracted water is regulated by a Significant Industrial User (SIU) permit with the Niagara Falls publicly owned treatment works. The GWTF discharge at the site is sampled quarterly to verify compliance with the SIU permit. DNAPL is collected in select wells in the Source Area using existing monitoring wells or dedicated DNAPL recovery wells.

The landfill cap was upgraded to comply with the New York State 6 NYCRR Part 360 design standard. All cap landfill construction activities were completed in August 2006. The cap is maintained and is in good repair. The cap area has been seeded over and permanent vegetation has been established over the entire site. Institutional controls have been imposed to restrict site access and use of groundwater, and to control land use.

A monitoring program was established to verify hydraulic control, identify DNAPL occurrence, demonstrate effectiveness of recovery, and evaluate groundwater quality in the far-field (area outside of the source area). Overall, water-levels compared to baseline levels and drawdown data indicate that groundwater in the source area is contained. The overburden aquifer appears to show dewatering and good response to extraction. Hydraulic depression is also maintained in the B zone of the shallow bedrock. Water-level data in wells screened through fracture zones C, D, E, and F also indicate that containment performance is favorable in these zones.

An assessment of data from groundwater chemical monitoring for the past five years indicate an overall decrease in TVOCs for on-site groundwater in the far-field area and, to a lesser degree, within the source areas. No significant off-site migration of contaminant was detected in the overburden. Decreasing or stable trends were observed in the D, E, and F zones in the source area. Some increasing trends have also been observed in zones B, C, and D outside the source area in

wells, although much of this increase appears to be associated with the occurrence of higher proportions of cis-1,2-DCE and VC, which may suggest degradation effects. Others increases may reflect inter-zone migration of VOCs.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

There are no changes in the physical conditions of the site or site uses that would affect the protectiveness of the selected remedy. The landfill cap is intact and contaminated material is not available for contact. Groundwater is not available for drinking since the area is served by a public supply. During the RI, it was noted that contaminated groundwater was migrating via man-made channels associated with the Robert Moses Power Project and impacting the Niagara River. Because of on-site containment, significant contributions of site-related contaminants to the off-site groundwater and the Niagara River are not expected.

The exposure assumptions and the toxicity values that were used to estimate the potential risk and hazards to human health followed the general risk assessment practice at the time the risk assessment was performed 1993. Although the risk assessment process has been updated since 1993 and specific parameters and toxicity values may have changed, the risk assessment process that was used is still consistent with current practice and the need to implement a remedial action remains valid.

The RAO for the source area groundwater was to reduce risks associated with potential exposure. This has been accomplished by preventing off-site migration. The RAO for the far-field area was to comply with groundwater ARARS established in the ROD. The ARARs from the September 1998 ROD are still valid. Although analysis of the data from far-field wells show that concentrations in some wells currently exceed ARARs, continued operation of the groundwater containment system, along with natural attenuation, will likely result in continued decreases in concentrations into the next five-year period.

Vapor intrusion was qualitatively evaluated in the 1993 risk assessment: "Available data indicate that given the shallow water table and the levels of volatiles detected in downgradient wells, volatilization of contaminants and infiltration to in [sic] building spaces cannot be ruled out. The magnitude of risk cannot be determined at present. However, risks may be increased in the future in the event that current remediation efforts at the site are discontinued (TRC, *Final Risk Assessment* (1993), p. 4-42)." The 2009 five-year review identified a recommendation to perform a more thorough vapor intrusion investigation. In 2013, DuPont conducted a vapor intrusion screening evaluation of the far-field area. The conclusion of that effort was that vapor intrusion would not be a concern for any downgradient buildings because the wells in zone A (the shallowest groundwater zone) are largely clean, both because of continued treatment and containment of the source area and because of a predominantly downward gradient in this zone. One shallow well outside the source area (137A) exceeded the vapor intrusion screening levels for TCE with a concentration of 78 ug/L. However, this well is located near the CECOS treatment facility where TCE-containing waste water is processed. Concentrations in other shallow wells outside the source area do not exceed vapor intrusion screening levels.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No human health or ecological risks have been identified, and no weather-related events have affected the protectiveness of the remedy. No other information has come to light that could call into question the protectiveness of the remedy.

Technical Assessment Summary

Based upon the results of five-year review process, including a review of the site data and the site inspection, it has been concluded that the remedy is functioning as intended by the decision documents for the site. No human health or ecological risks were identified.

The recommendation from the last five-year review that a vapor intrusion evaluation should be performed in the far-field area was implemented and the report indicated that vapor intrusion would not be a concern for any downgradient buildings.

The recommendation from the last five-year review that an investigation should be performed in the far-field area (outside the source-control area) to determine whether natural attenuation has been effective in reducing contaminant levels was implemented and the report indicated that natural attenuation is occurring in the far-field.

Issues, Recommendations and Follow-Up Actions

There are no issues, recommendations or follow-up actions.

Protectiveness Statement

Protectiveness Statement(s)		
Operable Unit: 01	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* N/A
Protectiveness Statement: The implemented remedy is protective of human health and the environment		

Sitewide Protectiveness Statement	
Protectiveness Determination: Protective	*Addendum Due Date (if applicable):* N/A
Protectiveness Statement: The implemented remedy is protective of human health and the environment	

Next Review

The next five-year review report for the DuPont Necco Park Superfund site is required five years from the completion date of this review.

TABLES

Table 1: Chronology of Site Events

Event	Date(s)
Waste Disposal	1930-1977
Landfill Closed	1977
Groundwater Investigations Initiated	1977
Clay Cap Placed on Landfill	1979
Two Groundwater Extraction Wells Operating	1983
Consent Decree	01/88
Administrative Order on Consent	10/89
Grout Curtain Installed in Bedrock	1989
Supplemental Groundwater Investigations Conducted	1992
3rd Groundwater Extraction Well Operating	1992
Investigation Report Approved by EPA	1996
Analysis of Alternatives Issued	06/96
Proposed Plan Issued	07/96
Public Meeting	08/96
Revised Proposed Plan Issued	02/98
Second Public Meeting	03/98
Record of Decision	09/98
Cap Remedial Design Approved	09/03
Hydraulic Control System Remedial Design Approved	04/04
Remedial Action Begins	05/04
Groundwater Treatment Facility Operational	04/05
Construction Completed	09/05
Remedial Action Completed	09/07
First Five-Year Review	06/09

Table 2a: Remediation Goals for Soil (all concentrations in µg/kg) From the ROD			
Contaminants of Concern	**Soil - Protection of Groundwater**	**Human Health Risk**	**Remediation Goals**
cis-1,2-Dichloroethylene	500	-	500
Tetrachloroethylene	1,000	100,000	1,000
Trichloroethylene	500	-	500
Vinyl chloride	500	-	500

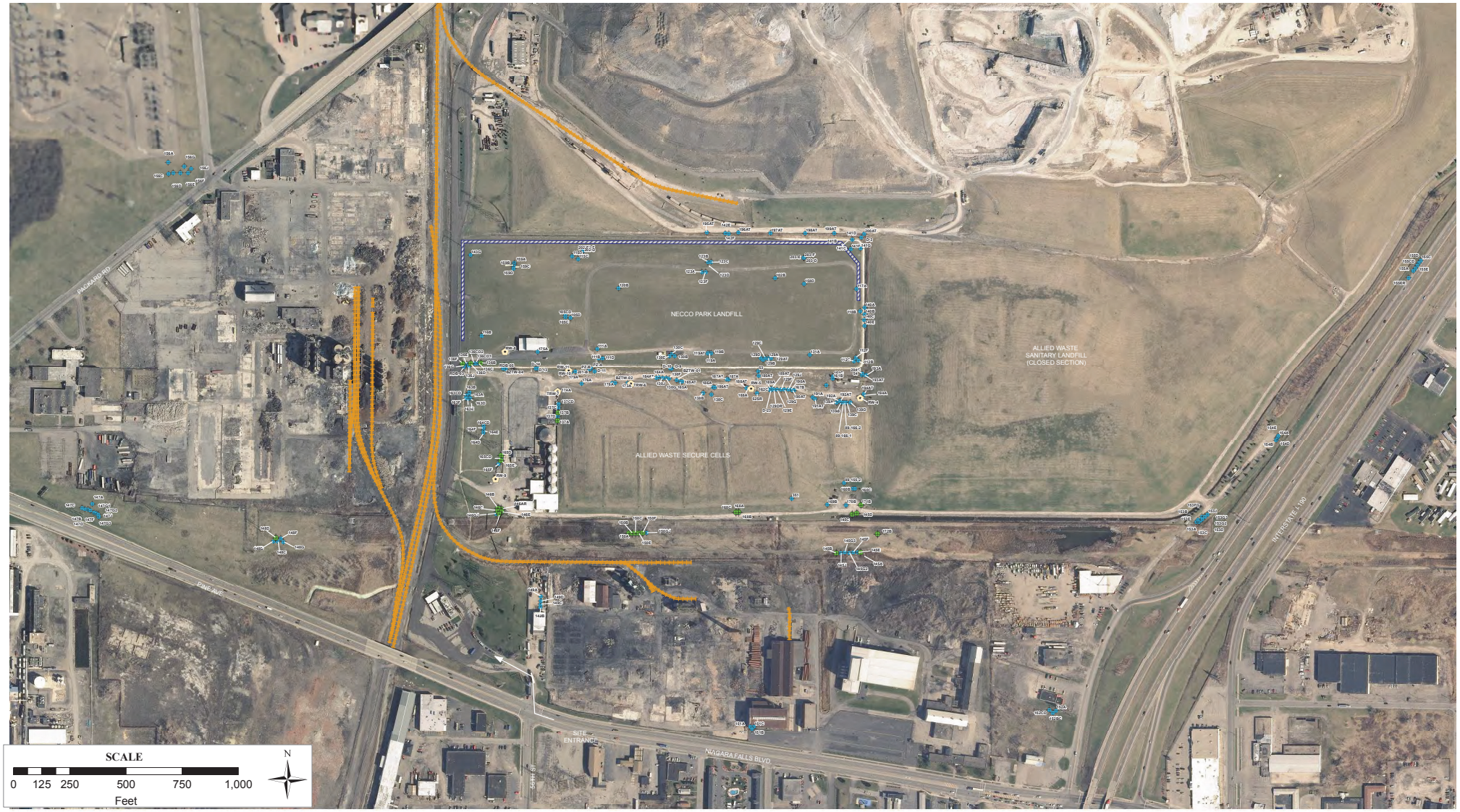
Table 2b: Remediation Goals for Groundwater (all concentrations in µg/L) From the ROD		
Contaminants of Concern	**National Primary Drinking Water Standards (Federal MCLs)**	**Remediation Goals**
cis-1,2-Dichloroethene	70	70
Tetrachloroethene	5	5
Trichloroethene	5	5
Vinyl chloride	2	2

Table 3: Documents, Data and Information Reviewed in Completing the Five-Year Review

Document Title, Author	Submittal Date
Record of Decision, EPA	09/98
2009 Annual Report, Parsons for the E. I. du Pont de Nemours and Company Corporate Remediation Group	03/10
2010 Annual Report, Parsons for the E. I. du Pont de Nemours and Company Corporate Remediation Group	03/11
2011 Annual Report, Parsons for the E. I. du Pont de Nemours and Company Corporate Remediation Group	03/12
2012 Annual Report, Parsons for the E. I. du Pont de Nemours and Company Corporate Remediation Group	03/13
Necco Park: Vapor Intrusion and Far-Field Monitored Natural Attenuation Analysis, Parsons for the E. I. du Pont de Nemours and Company Corporate Remediation Group	12/12
2013 Annual Report, Parsons for the E. I. du Pont de Nemours and Company Corporate Remediation Group	03/14

Attachments

Attachment 1: Site Figure with Well Locations



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

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