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REMEDIAL ACTION REPORT
DUPONT NECCO PARK SITE
NIAGARA FALLS, NEW YORK

Date: August 2007

Project No.: 507641
18984684.06002

DUPONT

CORPORATE REMEDIATION GROUP
An Alliance between
DuPont and URS Diamond

Buffalo Avenue & 26th Street
Niagara Falls, New York 14302

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FIGURES

APPENDICES

LIST OF ACRONYMS

ACO	Administrative Consent Order
AGM	alternative grading material
AMSL	above mean sea level
AO	Administrative Order
AOA	Analysis of alternatives
BFI	Browning-Ferris Industries
BL	barrier layer
BPL	Barrier Protection Layer
CAMP	Community Air Monitoring Plan
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (Superfund)
CL	clay
CM	Construction Manager
CQA	Construction Quality Assurance
CQAPP	Construction Quality Assurance Project Plan
CRG	DuPont Corporate Remediation Group
DCS	distributive control system
DERS	DuPont Environmental Remediation Services
DNAPL	dense nonaqueous-phase liquid
ECO	engineering change order
ECR	electrical control room
EPP	Environmental Protection Plan
ESCP	Emergency Spill Control Plan
GDC	geosynthetic drainage composite
GM	geomembrane
gpm	gallons per minute
GWTF	Groundwater Treatment Facility
HASP	Health and Safety Plan
HDPE	high-density polyethylene
IDS	investigation derived soils
ITPP	initial testing program plan
ITS	interim treatment system
LLDPE	Linear low-density polyethylene
LGMP	Long-Term Groundwater Monitoring Plan
MCC	motor control center
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
O&M	operations and maintenance
OU	Operable Unit
oz/sy	ounces per square yard
PCE	tetrachloroethene
PDI	pre-design investigation

PE	Professional Engineer
PG	Professional Geologist
PM	Project Manager
POTW	publicly owned treatment works
PPE	personal protective equipment
PSM	Process Safety Management
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	remedial action
RAR	Remedial action report
RAC	Remedial Action Contractor
RAWP	remedial action work plan
RCRA	Resource Conservation and Recovery Act
RDWP	remedial design work plan
ROD	Record of Decision
ROW	Right of Way
RPM	remedial project manager
SFR	Subsurface Formation Repair
SOW	Statement of Work
TCE	trichloroethylene
UO	unexpected occurrence
URS	URS Corporation
URSD	URS Diamond Group – DuPont CRG Alliance Contractor
USCS	Unified soil classification system
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WCC	Woodward Clyde Consultants
WMP	Waste Management Plan

EXECUTIVE SUMMARY

This Remedial Action Report (RAR) has been prepared pursuant to Administrative Order (AO) Index No. II CERCLA-98-0215, dated September 28, 1998, and issued by the United States Environmental Protection Agency (USEPA). This report documents the construction of the USEPA approved final remedy that was presented in the *Final 100% Design Report, Bedrock and Overburden Source Area Hydraulic Controls,* dated March 17, 2004, and the *Final 100% Design Submittal, Cap Upgrade,* dated September 30, 2003, for the DuPont Necco Park Superfund Site located in Niagara Falls, New York.

The approved remedy includes construction of the Bedrock and Overburden Source Area Hydraulic Controls and the Landfill Cap Upgrade. This report will demonstrate that the remedial action phase of both projects have been completed as designed, and within the schedule previously agreed upon between DuPont and the USEPA.

Bedrock and Overburden Source Area Hydraulic Controls Project

The groundwater hydraulic controls portion of the remedy, including construction and startup of an on-site groundwater treatment system, was substantially completed on April 5, 2005. All components of the groundwater hydraulic controls were constructed as designed and as approved by the USEPA. The groundwater treatment system (on-site treatment option) was constructed to support the hydraulic controls remedy and operates within the standards of the AO.

Since April 5, 2005, the groundwater hydraulic controls and treatment system have been operating with 94 percent process uptime. Currently, the groundwater hydraulic controls are being operated in accordance with the September 22, 2006 DuPont Necco Park, *Operations and Maintenance Plan* (O&M Plan), (CRG 2006)

This RAR will present the performance standards as detailed in the Statement of Work (SOW); however, the evaluation of current system operation against the performance standards will be completed as part of the Long-Term Monitoring Plan (Appendix B of the O&M Plan) requirements. Specifically, the first evaluation of system operation against the performance standards was presented in the April 7, 2006 DuPont Necco Park 2005 Annual Groundwater Monitoring Report (CRG,2006a).

Currently, DuPont is evaluating the effectiveness of the groundwater hydraulic controls system, and any future improvements to the hydraulic controls will be addressed as part of Operations and Maintenance.

Landfill Cap Upgrade Project

The Landfill Cap Upgrade construction project was officially started in March 2002 when DuPont began importing non-hazardous alternate grading materials (AGM) for use as grading fill. The AGM work (landfill subgrade construction) was completed in accordance with New York State regulations (6NYCRR part 360). A significant body of correspondence including a variety of AGM proposals and agency approvals occurred between the initial AGM use petition on November 21, 2001 through the end of AGM accumulation in July 2005. All accumulated materials were managed on-site to establish minimum design slopes in accordance with the final design.

The final phase of the Landfill Cap Upgrade project (geosynthetic placement) began in August 2005 and was substantially completed on November 29, 2005, as verified by a Pre-Final Inspection site walk involving the USEPA, NYSDEC, and DuPont. This RAR will document that the landfill cap upgrade project was constructed as designed and as approved by the USEPA and that the performance standards have been obtained.

1.0 INTRODUCTION

This Remedial Action Report (RAR) will provide documentation, in the form of descriptions, data, and drawings, of construction of the final remedy that was presented in the *Final 100% Design Report, Bedrock and Overburden Source Area Hydraulic Control,* [DuPont Corporate Remediation Group (CRG), 2004] and the *Final 100% Design Submittal, Cap Upgrade* (CRG, 2003) for the DuPont Necco Park Superfund Site located in Niagara Falls, New York. The Groundwater Hydraulic Control construction contract was awarded on July 28, 2004, and construction was substantially complete on April 5, 2005. The Final Cap Upgrade construction contract was awarded on July 20, 2005, and construction was substantially completed on November 18, 2005.

This remedial action (RA) was conducted, and this report was prepared pursuant to Administrative Order (AO) Index No. II CERCLA-98-0215, dated September 28, 1998, and issued by the United States Environmental Protection Agency (USEPA). Section 5 of the Statement of Work (Remedial Action Report) and USEPA guidance Document USEPA 540-R-98-016, Close Out Procedures for National Priorities List Sites (January 2000), were used to develop the outline of this report. Specifically, this report describes the following:

- The construction activities performed
- Organization of the remedial action team
- The design changes approved and implemented during the construction
- Performance standards requirements and achievements
- Construction quality control activities
- Presentation of as-built conditions
- An engineering certification for both remedial actions

This report has been organized as follows:

- Section 1.0 provides an overall summary of the project including operational history, regulatory history, site investigation results, prior RAs, and operable unit designation.
- Section 2.0 describes the operable unit background including the Record of Decision (ROD), remedial design summary, and ROD amendments
- Section 3.0 describes the construction activities associated with each RA and includes descriptions of design changes implemented.
- Section 4.0 describes the chronology of events for each RA.
- Section 5.0 describes the RA performance expectations (performance standards), and construction quality control and documentation.
- Section 6.0 describes the results of the Pre-Final and Final Inspections conducted for each RA and documentation of satisfactory Final Inspection(s).

- Section 7.0 presents a summary of the operations and maintenance activities for each RA.
- Section 8.0 presents a summary of project cost for each RA.
- Section 9.0 describes the current status of operations as well as lessons learned during startup of the hydraulic controls and the construction of the landfill cap upgrade.
- Section 10.0 presents the operable unit contact information.
- Section 11.0 provides an engineering certification indicating that the RA was performed in accordance with the approved design and other project requirements.
- Section 12.0 presents a list of references cited in the report.

1.1 Operational History

1.1.1 Location and Setting

The DuPont Necco Park site is located approximately 1.5 miles north of the Niagara River in a predominantly industrial area of Niagara Falls, New York. Necco Park is located off Niagara Falls Boulevard, partly within in the City of Niagara Falls (Parcel 296, Liber 138, page 571) and partly within the Town of Niagara (southwest part of Lot 13, Township 13, Range 9), New York (see Figure 1). The site is located approximately ½ mile northwest from the Niagara Falls Boulevard exit off Interstate Highway I-190.

Necco Park is bounded on three sides by waste disposal facilities. Immediately north and east of the site lies the Newco solid waste landfill, an active Subtitle D facility owned by Browning-Ferris Industries/Allied (BFI/Allied). Immediately south of the site are three inactive hazardous waste landfill cells and a wastewater pre-treatment facility owned by CECOS International, Inc. An access road and a Conrail (Niagara Junction Railway Company) right-of-way bound the site to the west. Land in the vicinity of the site is almost exclusively zoned for commercial or industrial use. Manufacturing facilities located within one mile of the site include the Niacet Company and Durez Chemical Company located 1,800 feet west and 1,100 feet north from the site, respectively. Other non-active industrial facilities near Necco Park include the former SGL Carbon facility to the south and Carbide-Graphite Group facility to the west. The nearest residential neighborhoods are located approximately 2,000 feet to the south and 2,500 feet to the west.

Local topography at and around the site has been modified significantly by landfill activities and industrial operations. Prior to disposal activities at Necco Park, BFI/Allied, and CECOS, average natural ground surface elevation was about 575 feet above mean sea level (AMSL). The natural local gradient was southeast toward the Niagara River. Local topography is now dominated by a number of topographic highs coincident with the BFI sanitary landfill to the north and east of the site, and the CECOS secure hazardous waste landfill cells directly south of the site. The peak elevations of the BFI and CECOS landfills are approximately 665 feet and 630 feet AMSL, respectively.

Prior to placement of alternate grading material (AGM) for the landfill cap upgrade, ground surface at Necco Park sloped from two topographic highs near the center of the landfill (peak elevations of 595 and 593 feet AMSL) to the edges of the site (average 580 feet AMSL). A system of drainage swales along the edges of Necco Park collects surface runoff from Necco Park and, to a greater degree, adjacent landfills north, east, and south of Necco Park.

1.1.2 History

Necco Park is a 24-acre inactive industrial waste disposal site that was originally used as a recreational park by the Niagara Electrochemical Company (from which Necco is derived). The site was sold to DuPont in 1930.

As part of the initial investigations conducted at the site, an operational history for the site from the mid-1930s to 1977 was developed based on DuPont records and an interpretation of historic aerial photographs. During that period, the site received a number of liquid and solid wastes generated from a variety of processes operated at the nearby DuPont Niagara Plant. These wastes included flyash, sodium salts and cell bath residue (i.e., barium, calcium, and sodium chlorides), cell and building rubble, chlorinolysis wastes, and off-grade products. Liquid wastes were generally disposed of in shallow earthen lagoons on the southeastern portion of the site; the remainder of the site functioned primarily as a solid waste landfill.

Documentation of activities at Necco Park prior to 1964 is limited. Based upon the limited disposal data from Necco Park and the Niagara Plant, the following wastes were disposed of in the largest quantities:

- Flyash
- Building demolition and miscellaneous plant debris
- Sodium sludge waste salts, cell bath, and floor sweepings (i.e., barium, calcium, and sodium chloride)
- Sodium cell rubble (i.e., thermal brick, corroded steel)
- Polyvinyl acetate solids and stilling bottoms (i.e., vinyl acetate with high boiling tars)
- Chlorinolysis wastes (i.e., high boiling residues including hexachlorobenzene, hexachlorobutadiene, and hexachloroethane)
- Liming residues [i.e., sludge saturated with trichloroethylene and tetrachloroethene (TCE and PCE)]
- Scrap organic mixtures, off-grade products
- Glycol polymer (Terathane®) scrap (i.e., filter press cloth, filter press sludge)
- Refined adiponitrile wastes (high boiler wastes)

In 1977, Necco Park was identified as a potential source of groundwater contamination in the area and disposal activities were promptly discontinued.

1.2 Regulatory History

In February 1977, New York State Department of Environmental Conservation (NYSDEC) requested that DuPont take action to remediate groundwater contamination at Necco Park. The site was closed, and groundwater investigations were initiated in September 1977. In January 1988, DuPont and the USEPA agreed to a Consent Decree that specified additional investigations, reporting requirements, and other legal issues pertaining to the site. In October 1989, DuPont and the USEPA signed an Administrative Order on Consent.

In March 1998, DuPont and the USEPA agreed upon a Statement of Work (SOW), (USEPA, 1998a) defining the scope and performance standards for remedial design and remedial action (RD/RA) activities at the site. On September 18, 1998, a ROD was issued by the USEPA for the Source Area Operable Unit (USEPA, 1998b). Details of the ROD contents and requirements are presented in Section 2.1.

On September 28, 1998, the USEPA subsequently issued the final AO, Index No. II CERCLA-98-0215 (USEPA, 1998), requiring DuPont to conduct the RD/RA program at the site. Pursuant to the AO, the work to be performed was to, at a minimum, achieve the requirements of the SOW and be performed in a manner consistent with the AO.

1.3 Site Investigation Results

In February 1977, NYSDEC requested that DuPont take action to remediate groundwater contamination at Necco Park. The site was closed and groundwater investigations were initiated in September 1977. Subsequently, numerous investigations and remedial studies were conducted. Preliminary investigations focused primarily on assessing the conditions in the immediate vicinity of Necco Park and establishing a groundwater recovery network. In 1982 two wells were converted to recovery wells (see Section 1.4 for description of previous remedial actions). A number of supplemental investigations and remedial studies needed to design and implement a remediation program were conducted from 1984 to 1988.

By February 1989, DuPont had completed all of the investigation work required by the January 1988 Consent Decree. Descriptions of the investigations and their results were presented in the *Necco Park Interpretive Report* [Woodward-Clyde Consultants (WCC), 1991].

In October 1989, DuPont and the USEPA signed an Administrative Consent Order (ACO). This order specified additional investigations beyond those pursuant to the 1988 Consent Decree. The work began in May 1991 and was completed in September 1992. The results of these investigations are presented in the *Investigation Report for Necco Park* (WCC, 1993), which was approved by the USEPA in May 1994.

An analysis of remedial alternatives was then conducted to identify, develop, screen, and evaluate response action alternatives to address the extent of the off-site contamination identified in the *Investigation Report for Necco Park.* This analysis of remedial alternatives was presented in the *Analysis of Alternatives (AOA) Report* [DuPont Environmental Remediation Services (DERS), 1995] for the Necco Park site. The AOA Report was approved by the USEPA in June 1996.

In March 1998, DuPont and the USEPA agreed upon a scope of work (SOW), defining the proposed remedial approach, the scope, and the performance standards for RD/RA activities at the site. In compliance with the September 1998 AO, the DuPont CRG submitted a *Remedial Design Work Plan* on February 9, 2000 (CRG, 2000). This remedial design work plan (RDWP) was subsequently approved on July 20, 2000. The RDWP outlined multiple pre-design investigations (PDIs) to collect hydro-geologic and engineering data to facilitate detailed design of the final remedy. The PDIs focused on the following:

- Evaluation of the existing landfill cap
- Hydraulic testing and evaluation of overburden source area control (A-Zone)
- Hydraulic testing and evaluation of bedrock groundwater flow zones (B- to F-Zones)
- Development of a hydraulic monitoring program
- Evaluation of treatment alternatives for extracted groundwater
- Development of a chemical monitoring program
- Development and evaluation of dense nonaqueous-phase liquid (DNAPL) monitoring and recovery options

The PDI activities were performed in a phased approach to optimize the location and number of recovery wells, which would serve to achieve hydraulic control of the respective groundwater flow zones. These PDIs were conducted in three phases. Dates of the PDI work can be located in Section 4.0.

1.3.1 Phase 1 PDI

Phase 1 PDI results were reported to the USEPA in the February 26, 2002 *Preliminary (30%) Design Report* (CRG, 2002). Phase 1 PDI activities established the basis for the extraction system for the three flow zones defined for remediation at the site:

- Overburden (A-Zone)
- Upper bedrock (B/C-Zones)
- Lower bedrock (D/E/F-Zones).

Phase 1 PDI activities included installing and testing two B/C-Zone extraction wells (TRW-4 and TRW-5), one D/E/F extraction well (TRW-8), and 17 new monitoring wells needed for source area refinement and hydraulic and chemical monitoring. This preliminary design report also contained recommended additional investigations to be included in the subsequent PDI for source area hydraulic controls. Results of the Phase 1 PDI as they relate to the source area refinement and hence extraction well locations, were presented in the April 24, 2001 *DuPont Necco Park Source Area Report* (CRG, 2001).

1.3.2 Phase 2 PDI

Phase 2 PDI activities included installation of additional pumping and monitoring wells to establish well locations for the final pumping system. Phase 2 investigations included installing and testing two new B/C-Zone extraction wells (TRW-6 and TRW-7), installing and testing one new D/E/F-Zone extraction well (TRW-9), and installing 16 new groundwater monitoring wells focused on further source area refinement and pumping test/hydraulic and chemical monitoring. Phase 2 investigation results and recommendations to conduct further PDIs were reported to the USEPA/NYSDEC in the January 8, 2003 *Pre-Final (95%) Design Memorandum: Overburden and Bedrock Source Area Hydraulic Controls* (CRG, 2003a).

1.3.3 Phase 3 PDI

Phase 3 PDI activities included installation of additional pumping and monitoring wells to complete the extraction and monitoring system regarding hydraulic control of the bedrock within the source area and to further investigate the hydraulic influence that B/C-Zone pumping has upon the A-Zone (overburden). Another objective of the Phase 3 PDI was to determine how to improve hydraulic control of the B-Zone in the western portion of the site. Fourteen new wells were installed during the Phase 3 PDI, including one new B/C-Zone extraction well (TRW-10) and twelve new monitoring wells. Seven of the new monitoring wells were installed in the A-Zone overburden to gain a better representation of the effect that B/C-Zone pumping has upon the A-Zone along the downgradient site perimeter. Phase 2 and Phase 3 PDI results were reported to the USEPA/NYSDEC in the September 10, 2003 *Pre-Final (95%) Design Submittal Bedrock and Overburden Source Area Hydraulic Controls* (CRG, 2003b).

On March 17, 2004, DuPont submitted the *Final (100%) Design Report Bedrock and Overburden Source Area Hydraulic Controls* (CRG, 2004). The 100% design submittal presented a summary of all the PDIs completed to support the remedial design of the Source Area Hydraulic Controls. The USEPA approved the 100% design submittal on April 8, 2004, thus officially completing the site investigation work.

1.4 Prior Removal and Remedial Activities

Several interim response actions were implemented to mitigate the impact and potential spread of contamination. These remedial actions are described in the following paragraphs.

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 [Unified Soil Classification System (USCS) Class SC and CL soil]. A 6-inch topsoil/vegetated soil layer overlay the clay cap.

In 1982, two existing monitoring wells (D-12 and D-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). Wells RW-1 and RW-2 were used as groundwater recovery wells from 1982 to 2005. Under normal conditions, wells RW-1 and RW-2 were pumped at an average rate of 10 to 15 gallons per minute (gpm) and 4 to 8 gpm, respectively. In 1992, a third recovery well, RW-3, was put into operation at Necco Park. Well RW-3 penetrated the D-, E-, and F-Zones; was located at the center of the southern site boundary; and was pumped at an average rate of 3 to 4 gpm. Initial evaluations of the recovery well network's effectiveness indicated that continuous operation of the wells created a hydraulic barrier across the entire southern perimeter of the site in the first two bedrock water-bearing zones, the B- and C-Zones (Weston, 1982). However, after additional wells were installed during subsequent investigations, a re-evaluation of the recovery well system's effectiveness revealed that some off-site flow from these two zones was occurring, particularly along the eastern site boundary in the C-Zone (WCC, 1984). 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 effectiveness of the groundwater pumping system, the Subsurface Formation Repair (SFR) project, consisting of a construction of a bedrock grout curtain, was implemented from July 1988 through September 1989. The grout curtain was installed using a single line of pressure-grouted borings, spaced 10 feet on center, and installed, in general, from the top of the bedrock to a depth of 80 feet below grade. The southeastern and southern perimeters were left ungrouted to allow for the recovery of contaminated groundwater that had migrated beyond the property boundary. To reduce the potential for upgradient increase in the water-table elevation in the overburden, the upper 10 feet of bedrock were not grouted on the northern side of the SFR.

The hydraulic impact of the SFR was evaluated by comparing hydraulic conditions prior to and for several months following installation of the grout curtain. The *SFR Interim Performance Report* (WCC, 1990) concluded that the SFR was performing as designed. When operating continuously, the cones of depression associated with wells RW-1 and RW-2 (at rates comparable to pre-SFR) were found to have been significantly enhanced, effecting a nearly complete hydraulic barrier extending along the entire southern boundary of Necco Park in the B- and C-Zones. Therefore, the grout curtain should enhance effectiveness of the B- and C-Zone hydraulic controls for the final remedy.

A DNAPL recovery program was initiated in 1989, which included the removal of DNAPL from wells where a recoverable thickness of DNAPL was observed. DNAPL recovery rates varied widely from April 1989 through December 1990, ranging from approximately 100 to 400 gallons per month. However, near the end of 1990, a fairly consistent drop in DNAPL recovery rates was observed. Current monthly DNAPL recovery rates have typically been between 15 and 20 gallons with a total of 7,481 gallons of DNAPL recovered as of December 2005.

Between 1982 and April 2004, extracted groundwater was pumped to the adjacent CECOS facility where it was treated and discharged to the Niagara Falls publicly owned treatment works (POTW). DuPont installed an interim treatment system (ITS) in August 2004. The ITS used a skid-mounted air stripping equipment to remove volatile organic compounds (VOCs) prior to discharging to the Niagara Falls POTW. The ITS system operated until the new permanent on-site system started up in April 2005.

1.5 Operable Unit Designation

The USEPA has established two operable units (OUs) for Necco Park: the Source Area and the Far-field area. The source area is an area associated within Necco Park acting as a continuing source of constituent migration to the downgradient aqueous environment. The primary criterion for defining the source area was the areal extent of free-phase or residual DNAPL. To be conservative, in addition to areas where DNAPLs were observed to be present, areas where aqueous constituent levels might theoretically indicate the presence of DNAPLs were included using various solubility criteria. Therefore, the source area includes the 24-acre Necco Park Landfill, areas where DNAPLs have been observed to be present, and areas of concentrations of aqueous phase contaminants in the groundwater indicate that DNAPL may be present. The current source area defining limits were presented to the USEPA on September 10, 2003 in the *Pre-Final (95%) Design Submittal Bedrock and Overburden Source Area Hydraulic Controls* (CRG, 2003b).

The far-field area is the area outside the source area where chemical constituents attributable to the Necco Park site have been found in groundwater. The far field aqueous plume is defined as the plume of dissolved contaminants downgradient of the source area.

This RA and RAR is applicable only to the Necco Park Source Area as stated in the ROD.

2.0 OPERABLE UNIT BACKGROUND

2.1 Record of Decision

In March 1998, DuPont and the USEPA agreed upon a SOW, defining the scope and performance standards for RD/RA activities at the site. On September 18, 1998, a ROD was issued by the USEPA for the Source Area Operable Unit. Prepared by the USEPA to be consistent with the SOW, the ROD includes the following:

- Containing the Source Area by upgrading the existing cap
- Utilizing hydraulic measures (pumping of wells and treating groundwater) and/or physical containment to prevent the movement of contaminated groundwater in the overburden
- Utilizing hydraulic measures to prevent contaminated groundwater in the bedrock from migrating beyond the Source Area boundary
- Treating extracted groundwater
- Providing long-term operation and maintenance of the constructed systems

The USEPA subsequently issued the AO requiring DuPont to conduct the RD/RA program at the site. Pursuant to the AO, the work to be performed was to, at a minimum, achieve the requirements of the SOW and be performed in a manner consistent with the AO.

The key components of the remedial actions for the site were summarized in the ROD (USEPA, 1998b). The major components are as follows:

1. *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 Necco Park property boundaries; and*
    - *Using hydraulic measures in the bedrock (B- to F-Zones) to maintain an inward gradient within the Source Area and prevent the movement of contaminated groundwater beyond the Source Area boundary.*

    The control of the contaminated groundwater will be achieved through the installation, operation, and maintenance of the groundwater extraction wells (and, optionally, a physical barrier in the overburden). The exact number, size, depth, and pumping rates of these wells will be determined in the remedial design of the selected remedy.

2. *Treatment of the contaminated 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 will be determined during the design.

3. *Collection of DNAPL in the Source Area by:*
   - *Utilizing the existing monitoring wells network;*
   - *Utilizing 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.

4. *Operation and maintenance (O&M) of the existing systems and the systems constructed under this selected remedy.*
5. *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. Existing monitoring wells on the Necco Park property will be used to monitor the performance of the groundwater extraction system and establish that sufficient control occurs. Additional monitoring wells may be required. The need for such additional wells will be determined during the design and implementation of the groundwater extraction system.*
6. *Additional characterization of the site to assess whether natural attenuation will be effective in addressing far-field contamination.*
7. *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.*

2.2 Remedial Design Summary

PDIs were completed to obtain data to support design of an extraction system capable of achieving and maintaining control of the A through F groundwater flow zones beneath the landfill. In addition, regulatory research and data gathering activities were conducted to support the design of a landfill cap capable of meeting the substantive requirements of Title 6 of New York Codes, Rules and Regulations (NYCRR), Part 360. The remedial design components were designed to meet the objectives and performance standards presented in the SOW.

The design of the remedy, as discussed previously, was performed in two distinct parts. The following design reports contain the remedial design of the cap and hydraulic controls portions of the remedy, as approved by the USEPA:

- ❑ *Remedial Design Work Plan*, DuPont Necco Park Remedial Program, Niagara Falls, New York, submitted as final February 9, 2000 and approved by the USEPA on July 20, 2000 (CRG, 2000).

- *Final (100%) Design Submittal, Cap Upgrade,* DuPont Necco Park site, Niagara Falls, New York, submitted as final September 12, 2003, and approved by the USEPA on September 30, 2003 (CRG, 2003).
- *Final (100%) Design Report, Bedrock and Overburden Source Area Hydraulic Controls*, DuPont Necco Park Landfill, Niagara Falls, New York, submitted as final March 17, 2004, and approved by the USEPA on April 8, 2004 (CRG, 2004).

With the approvals of the Final (100%) Design Submittals for the Cap Upgrade and Bedrock and Overburden Source Area Hydraulic Controls, remedial design requirements described in the SOW were fulfilled. The construction sequence for the remedy-included installation of the hydraulic controls first, followed by the cap upgrade. A detailed description of the construction activities was provided in the Remedial Action Work Plan (RAWP) (CRG, 2004a).

The drawings and specifications included in the contract for the groundwater hydraulic controls were of sufficient detail to allow construction of the hydraulic controls and treatment systems in accordance with the SOW. Construction of the hydraulic control portion of the remedy began in August 2004 and was completed in April 2005. Initial testing of the hydraulic controls portion of the remedy was conducted in accordance with the Initial Testing Program Plan (ITPP) (CRG, 2005). On September 2, 2005, DuPont submitted the *Necco Park Initial Testing Program Report* (CRG, 2005a), that was prepared in accordance with the ITPP.

Data collected during the PDIs indicated that hydraulic control of the A-Zone overburden including the AT-Zone (see section 5.1.1), may be achieved through pumping of the upper bedrock (B/C-Zone) wells, thus eliminating the need to construct a physical barrier to control the A-Zone overburden. Hydraulic head monitoring of the A-Zone is ongoing (for the existing system) and will continue during long-term monitoring to further assess the effectiveness of A-Zone control by pumping the B/C-Zone wells.

DuPont elected to construct a treatment facility on the Necco Park site to pretreat groundwater from the new extraction system. Construction of the groundwater treatment facility was performed as part of the hydraulic controls contract completed in April 2005. The Niagara Falls POTW issued DuPont a discharge permit for acceptance of the pre-treated groundwater (Niagara Falls Water Board Wastewater Facilities: Discharge Permit SIU #64, March 2005).

The cap upgrade portion of the remedy started in 2002 with placement of subgrade materials (AGM) to achieve the minimum slopes specified in the approved design. Placement of cap subgrade materials was completed in August 2005. Upon completion of construction activities for the hydraulic controls, the final phase of the cap upgrade portion of the remedy was initiated. Cap upgrade activities were significantly completed in November 2005, and the USEPA provided documentation of Final Inspection for both phases of the Final Remedy on December 9, 2005.

2.3 Planned Future Land Use

Necco Park is a 24 acre inactive hazardous waste landfill unit that has been closed and capped. Future land use options are extremely limited. The site is zoned industrial, is physically surrounded by other waste management units and public access is restricted. The site will be maintained in compliance with the Operations and Maintenance Plan and will be managed as a closed landfill for the foreseeable future.

3.0 CONSTRUCTION ACTIVITIES

3.1 Summary of Construction – Hydraulic Controls and Treatment System

The contract for construction of the groundwater extraction and treatment systems was offered for competitive bid to a list of general contractors (approved by the USEPA) on April 1, 2004. Mark Cerrone Inc. was awarded the contract based on the results of the competitive bid. Mobilization for construction of these portions of the RA began in August 2004. Two distinct work segments (Hydraulic Controls and Treatment System) were managed separately but simultaneously to achieve the overall project schedule. Both activities were started at the same time.

The hydraulic controls phase of the remedial work consisted of work activities including site preparation, excavation of trenches, installation of above/below ground piping, installation of above/below ground conduits, quality assurance/quality control (QA/QC) testing, bedding of trenches, backfilling, pouring of pump shed concrete structures, erection of pump sheds, piping within pump sheds, and electrical and instrumentation wiring for operation of the extraction system.

3.1.1 Project Organization and Responsibilities

To assist in completing construction of the RA, DuPont contracted URS Corporation to provide several key project team members, including the Project Manager (PM), the Construction Manager (CM), as well as several key QA team members, including the Resident Engineer, Construction Quality Assurance (CQA) Official, the CQA Certifying Engineer, and CQA Monitors/Inspectors. An organizational chart displaying the arrangement of the RA project team for the Hydraulic Controls and Treatment Systems project is presented as Figure 3-1 and discussed below:

- Mr. Paul Mazierski served as Site Project Coordinator for implementation of the RA. Mr. Mazierski was the primary point of contact for DuPont in communications with the USEPA Remedial Project Manager (RPM).
- The DuPont Construction Project Director was Mr. Ed Lutz, P.E. Mr. Lutz worked in conjunction with the CM to ensure that the remedial actions were implemented as designed.
- The Project Manager, Mr. Joseph M. McCarthy, P.E., was responsible for overall project implementation. Mr. McCarthy had overall responsibility for ensuring that the product meets the USEPA's objectives and the DuPont quality standards. The Project Manager reported directly to the Site Project Coordinator and was responsible for technical quality control and project oversight.
- Mr. Gary Britt served as CM and was the point of contact for the construction projects. Responsibilities of the CM included chairing progress meetings, reviewing construction submittals, conducting quality control (see also CQA Official), documenting construction activities, and approving construction work

on behalf of DuPont. The CM also served as liaison between DuPont, agency representatives, utility companies, adjacent property owner, and subcontractors.

- The Remedial Action Contractor (RAC) for the Hydraulic Controls and Treatment System was selected based on competitive bidding. The RAC Project Manager had overall responsibility for completion of the construction activities including managing daily project activities for his employees as well as those of his subcontractors. The RAC provided a full-time Site Superintendent who directed daily operations. The Site Superintendent met daily with the CM to discuss work to be completed. All RAC personnel attended daily tailgate safety meetings.

USEPA

The lead agency for the remedial projects was the USEPA. Ms. Gloria Sosa replaced Mr. Tom Taccone as the USEPA's Remedial Project Manager for the RD/RA work in May 2005.

Earth Tech, under contract with the USEPA, served as the USEPA site representative and provided periodic, up to full-time, oversight of the work. The USEPA and Earth Tech were kept abreast of construction status and progress through weekly progress reports prepared by the CM and the respective RAC. The Project Manager for Earth Tech was Mr. James Kaczor, PG.

NYSDEC

The NYSDEC provided support to the USEPA, and provided local agency representation in the remedial projects. Mr. Mike Hinton, PE was the NYSDEC representative for the RA.

3.1.2 Meetings

As required by the Final 100% Design Report (Final Design), a pre-construction project kick-off meeting was completed on July 15, 2004. The pre-construction meeting agenda was developed in accordance with the Final 100% design. All key project personnel including agency representatives were invited to attend the pre-construction meeting.

Project status meetings were conducted weekly during the project at DuPont Necco Park. The first project status meeting was conducted on August 5, 2004, and the last project status meeting (Week #32) was conducted on April 7, 2005. The URS CM was responsible for assembling the weekly status meeting minutes and distributing them prior to each weekly meeting. Meeting minutes were distributed to key RAC personnel and to all of the project personnel listed in Section 3.1.1. Over the duration of the project, a total of 32 status meetings were conducted, and 32 meeting minutes were published. Appendix A contains a copy of all the weekly status meeting minutes.

3.1.3 Mobilization and Site Preparation

Mobilization for the Groundwater Hydraulic Controls and Treatment System project occurred in August 2004. Existing site access roads were used during mobilization and construction. When needed, existing access roads were extended or improved with the addition of gravel material. Contractor parking areas and employee break areas were designated at the southwest corner of the landfill [Niagara Mohawk Right of Way, (ROW)] during Groundwater Treatment Facility (GWTF) construction. Each of these parking areas was dressed and maintained with crushed stone.

Access to the Necco Park site for normal traffic was through the BFI/Allied entrance south of the site. All RAC employees, subcontractors, vendors, and site visitors documented their visit, by signing in at the contractor office trailer on a daily basis. Regulatory personnel documented their visit by signing in at the DuPont construction trailer.

A traffic control plan was prepared and implemented for the RA. The traffic control plan illustrated existing roadways, parking areas, traffic flow patterns, delivery routes for various types of material deliveries, signage, and traffic barriers.

Existing site security measures and requirements (making BFI/Allied security aware when entering the site, securing site entrance gate and support trailer) were maintained throughout RA construction. Additional contractor-specific security measures that were employed during construction included the following:

- Locked job boxes and equipment storage sheds.
- Secured portable equipment such as generators to stationary objects.
- Removed unneeded equipment from the site to prevent theft or vandalism.
- Performed daily inspection of equipment before use.
- Locked all heavy equipment at the end of each day.

There were no reports or notifications of theft or vandalism during the RA.

Various measures were implemented during construction activities to minimize adverse impact to personnel on-site and the environment, including the following:

- Thoroughly inspected all equipment brought on-site to ensure that equipment did not contain fluid leaks or other defects that could affect the environment or site safety.
- Placed protective concrete barriers where required (interim treatment system, storage tanks, utility meters, wells).
- Wetted dry roads and work areas to minimize dust emissions.
- Covered stockpiled trench spoils as needed.
- Maintained trenches free of groundwater and prevented surface-water runoff from entering excavations.
- Installed and provided upkeep of erosion control structures (silt fences and hay bales).
- Installed temporary fencing to identify work zones and prevent access to work areas and open excavations.
- Repaired site roads, as needed.

3.1.4 Site Work

The Groundwater Hydraulic Controls and Treatment System were constructed as designed, to the extent practical based upon field observations. Minor design changes were implemented during the construction based upon field observations. There were no major design changes made that affected the designed operational effectiveness of the hydraulic controls. Design changes are summarized in Section 3.1.5.

Pump sheds were erected, and groundwater pumps were installed in B/C-Zone wells RW-4, RW-5, and RW-10. These pumping wells were designed to provide hydraulic controls for the source area in the overburden and in the B and C fracture zones. Pump sheds were also erected and groundwater pumps were installed in D/E/F-Zone wells RW-8 and RW-9. These pumping wells were designed to provide hydraulic controls for the source area in the D, E, and F fracture zones. Wells, pumps, motors, piping, and all components shown in the 100% design package were installed as designed and were set to operate within the design flow rate parameters to achieve hydraulic control of the source area in all of the affected zones listed in the scope of work.

Construction as-built drawings, updated to show all design changes were submitted in advance of this report to the USEPA on September 22, 2005. The following table shows the designed pumping rates and expected drawdown at each recovery well location as shown in the Final 100% design. Currently the operations and maintenance group is operating the hydraulic controls attempting to achieve these parameters. The 2005 annual groundwater monitoring report provided the first evaluation of pump rates as well as how well the system is accomplishing the desired hydraulic controls.

Extraction Well (Fracture Zone)	Design Drawdown (elevation - AMSL)	Expected Sustainable Pumping Rate (gpm)
RW-4 (B/C)	549	0.4
RW-5 (B/C)	560	4
RW-10 (B/C)	556	8
RW-8 (D/E/F)	558	13
RW-9 (D/E/F)	565	15

3.1.5 Design Changes

Throughout implementation of the Groundwater Hydraulic Controls portion of the RA, various changes were made to the RD and incorporated into the project. The design changes were generally made due to a conflict identified in the field, identification of an improved or preferred alternative to the design, or unexpected field conditions dictating a change in design. Each of the changes were discussed thoroughly at the regular weekly status meetings where engineer, contractor, affected subcontractors, agencies, and others in attendance could detail and review the change in scope, schedule, price, and determine the best path forward. Once approved in conceptual scope, price and schedule, the design changes were incorporated into the design drawings, and the detailed scope and drawings were returned to the contractor for incorporation into the project.

The following paragraphs provide a list of the design changes:

- Design Bulletin No. 1: The forcemain extension between the forcemain chamber (directly south of the treatment building) and RW-9 was changed to an aboveground installation. The need for this design change was based on the unexpectedly high groundwater table in the vicinity of the forcemain chamber and anticipated difficulties in construction. All utilities involved in the operation of RW-9 were brought aboveground, heat traced, and placed on railroad tie supports within cable tray to provide continuous pipe support. The design change is clearly represented on the as-built drawings.
- Design Bulletin No. 2: This design bulletin provided for necessary changes to the treatment facility, enhance handicap accessibility to facility restrooms, relocate electrical receptacles in close proximity to the safety showers, addition of a drinking fountain, and addition of reducers on the piping around pumps 101 and 102. This bulletin also clarified some minor questions on the drawings and added pump labels.
- Design Bulletin No. 3: This change provided a revised acid pipe alignment and routing to better fit field conditions. The designed alignment presented a conceptual layout of the acid line, and when laid out in the field, the contractor discovered that in several locations, the ditch alignment interfered with the acid pipe alignment. The change also involved construction of vehicular access points between the access roadway to the south and the monitoring wells on the north side of the new acid line.
- Design Bulletin No. 4: This design bulletin contained several electrical and instrument clarifications, additions, and changes. The primary changes consisted of extension of the telephone system from the control room to the process area of the treatment building, relocation of the motor control center (MCC) units within the electrical control room (ECR), and addition of two circuits (and receptacles) for the air strippers and Experion/internet computers.
- Design Bulletin No. 5: This design bulletin provided the addition of flow transmitter 8030FT to the sanitary discharge line within the treatment building. In addition, moisture sensor trouble inputs 8028XA and 8029XA were added to the Distributive Control System (DCS), which indicate wet conditions in the forcemain utility chamber as well as utility chamber #1 (installed during the 2004 Utility Installation Project). Also contained in this design bulletin is the upgrade of equalization tank effluent pump P-301 from 10 horsepower (hp) to 20 hp. The pump type installed is Goulds model 3196, 3500 revolutions per minute (rpm), 3 phase, 60 hertz, 460 Volts, with a 7.5-inch impeller.
- Design Bulletin No. 6, 7, and 8: The changes affected in these design bulletins were very minor. Bulletin 6, for example, changed the air stripper DCS inputs from DCS cabinet #91 front, chassis #1, FTA #1 to DCS cabinet #91 rear, chassis #4, FTA #1. Bulletin 7 provided instruction for wiring the sanitary sewer pump, and Bulletin 8 incorporated the addition of battery extension modules and redundancy status inputs to the DCS.

- Design Bulletin No. 9: This design bulletin provided for the addition of motor operated valves to tanks T-101, T-102, and T-301. These tanks are the influent tanks for the groundwater streams (air stripper feed tanks) and the main effluent tank.
- Design Bulletin No. 10: This design bulletin was generated to provide DuPont-supplied power (previously purchased from BFI/Allied) at the HCL tank and telephone and power to the construction trailers that were moved to a location south of Necco Park to facilitate cap construction efforts. This change was implemented to allow DuPont Necco Park to be self-sufficient regarding electric and telephone services.

In addition to Design Bulletins, various changes were made in the field and implemented immediately when no additional design rework was necessary. The significant field changes made to the design are as follows:

- The treatment building was moved approximately 22 feet to the east of the originally designed location. The move was made to create more buffers between the west building wall and the Niagara Mohawk ROW. All of the public utilities to the north of the building, installed earlier in 2004, were also subsequently extended to enter the building in the same bay as designed. The forcemain manhole south of the treatment building was moved as well, to enter the building at the design location. The depth of this manhole was also increased to facilitate installation of the conduits and piping below the south ditch and up the slope into the building.
- During construction of the groundwater conveyance system between the treatment building and the B/C-Zone extraction wells (RW-10, RW-5, and RW-4), groundwater was encountered at a higher than expected elevation. Based on this observation, the depth of the trench extending to these wells was reduced to minimize groundwater handling. In order to provide adequate backfill depth (frost protection), a layer of imported material was placed along the entire south side of the landfill above the conveyance system. This material was graded to provide positive drainage toward the perimeter ditch.
- Trench between RW-10 and RW-4/5 is reversed. The electrical and instrument conduits were placed on the South side of the trench rather than the north. This change was made in the field at the contractor's request to facilitate running the conduits to RW-4 and to RW-5 and minimize the number of conduit/trench crossings.

Several minor additional engineering change orders were issued during construction for non-specific tasks such as general electrical support and general mechanical support.

3.1.6 Pollution Control and Mitigation

Construction operations were structured, and various measures were implemented to prevent off-site release of dusts, pollutants, contaminants, and sediment-laden stormwater during the RA.

Work plans prepared during the RD and implemented during the RA, which specified actions intended to prevent off-site migration of contaminants included the following:

- Necco Park Health and Safety Plan (CRG, 2000b) and task-specific addenda
- Investigation and Remediation Waste Management Plan (CRG, 2000c)
- Remedial Action Work Plan, DuPont Necco Park (CRG, 2004a)

As part of the contractual requirements, the RAC prepared and submitted an Environmental Protection Plan (EPP) prior to beginning work. The plan described procedures to maintain environmental protection and to monitor and minimize creation and dispersion of dust, vapor, and odor. The EPP was reviewed and approved by DuPont and subsequently implemented by the RAC.

As described in the Necco Park SOW, this section outlines preventive measures and processes employed during the RA and integrates protective measures described in the documents listed above.

Dust Control

Off-site release of air-borne contaminants was controlled throughout the project by wetting roads and surfaces on a nearly continuous basis during dry periods. In addition, any soil and debris buildup was frequently scraped or washed off of paved roadways. As described in the Health and Safety Plan (HASP), real-time air monitoring for total dust was conducted during construction activities. Exceedance of the action level for total dust was not observed during periods of excessive visible dust. However, visible dust conditions were used as an indication of the need for dust suppression measures and were implemented. Site perimeter monitoring in compliance with NYSDEC's Community Air Monitoring Plan (CAMP) as described in the HASP, was never triggered into operation due to the low levels of dust and contaminants measured during construction in the work areas.

Vapor Emission Control

In accordance with the HASP, real-time monitoring for VOCs was conducted during intrusive activities, in particular, activities that penetrated the existing site clay cap. In the uncommon event that the action level for VOCs (1 ppm) was exceeded, work was temporarily halted, and construction operations were modified to minimize the disturbance (i.e., slower excavation rate to reduce VOC emission rate). Active VOC emission suppression was never deemed necessary. Action levels at the exclusion zone perimeter (work zone perimeter) were never exceeded; therefore, the CAMP was not triggered.

Site Control

Consistent with procedures described in the HASP, control measures were implemented in the form of work zone delineation, when handling potentially contaminated materials, and to minimize the potential for uncontrolled contaminant migration. Establishment of three distinct work zones accomplished site control: Support Zone, Contamination Reduction Zone, and Exclusion Zone. Decontamination of equipment and removal of used personal protective equipment (PPE) was performed in the Contamination

Reduction Zone, thus controlling migration of potentially contaminated material outside the work zones.

Sediment and Erosion Control

Consistent with procedures described in the RD and RAWP, sediment and erosion controls measures were implemented and maintained throughout the course of construction activities. In general, sediment transport was controlled using silt fences. Silt fence was installed along the toes of slopes that had been disturbed during the work, as well as in windrows near areas of concentrated work.

In addition to silt fence, hay bales were used to prevent sediment and silt from leaving the site at the southwest corner. The hay bales were placed and maintained on a regular basis.

Spill Response

The procedures described in the Necco Park Waste Management Plan (WMP) and addenda were used to address the potential for release of non-hazardous and hazardous substances during remedial construction. The following materials were used or generated during construction:

- Petroleum products
- Groundwater from excavations, wells, and piping

In general, the RAC performed its work in a manner that prevented contamination of soil, surface water, groundwater, atmosphere, structures, and equipment. As part of the contractual obligations, the RAC prepared an Emergency Spill Control Plan (ESCP) that was reviewed and approved by DuPont prior to mobilization of heavy equipment. The ESCP included locations of cleanup and absorbent equipment, a contingency plan, decontamination procedures, and reporting requirements.

On one occasion, an unexpected occurrence (UO) (DuPont Standards), consisting of a diesel fuel spill occurred. By DuPont standards, the fact that any petroleum product came in contact with the ground, a UO was investigated. The volume of the release was less than a quart (far below standards triggering the ESCP); therefore, once the OU was addressed to the satisfaction of DuPont, the issue was closed.

3.1.7 Remedial Waste Management

Consistent with waste management procedures specified in the WMP, soils not suitable for backfill (i.e., contaminated materials) were moved directly to a temporary holding area of the Necco Park Landfill, for permanent placement below the final landfill cap. The location for temporary placement of remedial wastes and investigation derived soils (IDS) was identified in the RAWP. The final location of waste placement was dependent upon the volume of waste accumulated and the final cap grades. In general, all remediation wastes generated during the final remedy construction were temporarily covered with 60-mil high-density polyethylene (HDPE) liner in a temporary staging area. Ultimately, these wastes were moved to an active filling area during landfill cap upgrade construction activities compacted and placed below the final landfill cap.

Prior to demobilization, all equipment that came in contact with potentially contaminated material was decontaminated using a high-pressure water cleaner. Decontamination of equipment was normally conducted immediately outside of the contamination area allowing drainage to runoff into the contaminated area. Solids generated from the cleaning operation were collected and placed in the temporary staging area. Decontamination water was either pumped to the CECOS industrial wastewater treatment plant, to the interim groundwater pretreatment system, or to the newly constructed on-site groundwater pre-treatment facility. In each case, sediment precipitation was allowed to occur in place, prior to pumping.

As part of the landfill cap upgrade, existing leachate lines and other structures and materials associated with the previous groundwater extraction system were decontaminated, size-reduced, and placed beneath the final landfill cap as detailed and approved in the RAWP.

3.1.8 System Operation and Monitoring

Operation and maintenance activities are necessary to assure that the remedial actions meet performance standards defined in the SOW. The primary objectives of the Necco Park O&M program are as follows:

- Maintain effectiveness of cap upgrades and surface water controls.
- Operate and maintain the groundwater extraction and treatment systems.
- Operate and maintain the DNAPL recovery program.
- Develop and implement a long-term groundwater and DNAPL monitoring program.
- Implement institutional controls.

The Necco Park O&M Plan (CRG 2006) describes the elements of the O&M program.

3.1.9 Operating Parameters

The are multiple operating parameters of the groundwater hydraulic controls and treatment system which are described in detail in the O&M Plan. Hydraulic and chemical monitoring of the contaminant source and far-field areas is covered in the Long-Term Groundwater Monitoring Plan (LGMP) provided as Appendix B in the O&M Plan. The LGMP was included with the *Final (100%) Design Submittal for Bedrock and Overburden Source Area Hydraulic Controls* (CRG, 2004a), and was approved by the USEPA on December 1, 2004.

The O&M manual for the on-site GWTF is provided as Appendix C in the O&M Plan. This O&M manual has been prepared in accordance with DuPont Process Safety Management (PSM) guidelines and includes a technology description and standard operating procedures for the groundwater extraction and treatment system.

The groundwater O&M manual, in conjunction with vendor O&M manuals, describes normal operation and shut-down procedures, emergency shut-down procedures, alarm conditions, and trouble-shooting and preventative maintenance procedures for the treatment system and hydraulic controls.

The plan for DNAPL Monitoring and Recovery is provided as Appendix D in the O&M Plan. The DNAPL monitoring and recovery, and disposal procedures have been in effect since the 1990s and were updated in the fall of 2005.

Institutional controls have been developed, implemented, and maintained to: limit and control site access, prevent the use of, and exposure to, fill materials and groundwater beneath the Necco Park facility, and prevent the development and/or transfer of the Necco Park facility for any use incompatible with the remedy selected.

Institutional controls have been in place for the Necco Park site since the 1970s and will remain in effect throughout the O&M phase. Site security is maintained through site control measures in place at the surrounding facilities. Groundwater and deed restrictions are also in place. These land-use deed restrictions will remain in effect if the property is transferred to another party.

Other supporting work plans specified in Section K.2.a of the SOW are provided in the following O&M Plan appendices:

- Site Management Plan
- Sampling Analysis and Monitoring Plan
- Quality Assurance Project Plan
- Health and Safety Plan
- Waste Management Plan
- Emergency Action and Contingency Plan

DuPont is currently operating the hydraulic controls and treatment system as designed on a continuous basis. If any well in the pumping system is not operating ("down") for a period of more than 48 hours consecutively or five days in a 30-day period; DuPont shall notify the USEPA and NYSDEC. The notification will include a plan for restoring system operation as quickly as possible. Documentation of system downtime will be provided in the Necco Park Quarterly Data Packages.

In the event that operation of the remedial system(s) is discontinuous, or if, based on the review of the hydraulic monitoring data, chemical monitoring data, or DNAPL monitoring data, any of the following conditions occur:

- The hydraulic containment systems do not establish hydraulic control as defined in the performance standards, on a consistent basis.
- Free phase DNAPL is encountered in areas outside the area of hydraulic control, or contaminant concentrations in the groundwater in areas outside the area of hydraulic control indicate that DNAPL may be present on a consistent basis.
- Chemical monitoring indicates that: 1) the estimated total contaminant mass in the groundwater beyond the area of hydraulic control increases with time or, 2) retarded contaminants that were previously restricted to the containment area are detected in perimeter monitoring wells on a consistent basis or, 3) concentrations of contaminants in groundwater downgradient of the hydraulic/physical containment systems do not show a decrease over time.

- After installation, the remedial systems do not consistently achieve the Performance Standards, as specified in the SOW.

Then, complete source area containment will be in question and additional assessment of the above condition(s) will be warranted. The scope of the assessment to address potential modifications to the remedial system may include installation of additional monitoring wells, test extraction wells, and pumping tests.

Following such assessment, DuPont will submit to the USEPA details of the assessment, including a contingency plan for modification of the system as constructed and for the implementation of further actions determined necessary to meet the performance standards. Modifications may include the redefinition of the source area, additional groundwater extraction, or other measures.

The USEPA will either approve the contingency plan, or will require modification of such plan, in accordance with the procedures set forth in the AO. Following the USEPA approval of the contingency plan, DuPont will implement the modifications to the remedial measures to meet the performance standards as outlined in the plan.

Based on the full-scale system operation start date of April 5, 2005, the following monitoring has been conducted in 2005.

Task	Duration
Comprehensive DNAPL Survey	April 25th to April 28th (Completed)
First 2005 Semi-Annual Groundwater Sampling Event	May 4th to May 13th (Completed)
Second 2005 Semi-Annual Groundwater Event	October 24th to November 4th (Completed)

In addition to the key events included above, monthly water levels and DNAPL observations were conducted in 2005 and will continue in 2006.

Quarterly data packages, to be submitted 30 days after the end of each quarter, will include the following:

- Water levels
- Potentiometric surface maps contoured at one foot intervals
- DNAPL observation and removal summary
- Summary of system operations

The first quarterly data package (2Q05) was submitted to the USEPA on October 12, 2005. The second quarterly data package (3Q05) was submitted to the USEPA on Nov 16, 2005 and the third quarterly data package (4Q05) was submitted on January 25, 2006. The first annual groundwater monitoring report was submitted to the USEPA on April 7, 2006 (CRG, 2006a).

3.2 Summary of Construction – Landfill Cap

The Landfill Cap Upgrade construction project was officially started in March 2002 when DuPont began importing non-hazardous AGM for use as grading fill. The AGM work (landfill subgrade construction) was completed according to the regulation of 6NYCRR Part 360-1.15. The materials were managed on-site to establish minimum design slopes in accordance with the final design. Between March 12, 2002 and July 19, 2005 approximately 72,000 tons of AGM were managed on-site as shown in Table 1. Figure 3-2 shows the topography of Necco Park in 2000 prior to any landfill subgrade AGM work. DuPont CRG managed the AGM accumulation/consolidation using Mark Cerrone Inc., as the general subcontractor.

The contract for construction of the Final Landfill Cap Upgrade project (Geosynthetics) was offered to a list of the USEPA-approved general contractors for competitive bid on May 9, 2005. The competitive bid process resulted in award of the contract to Mark Cerrone Inc., on July 20, 2005. Mobilization for construction of the Final Landfill Cap Upgrade began in August 2005.

The Landfill Cap upgrade project included the following:

- Completed the subgrade to ensure minimum design slopes.
- Installed a 40-mil linear-low density polyethylene (LLDPE) geomembrane.
- Installed geosysnthetic drainage composite (GDC) on slopes greater than 12 percent.
- Installed cushion geotextile fabric on the geomembrane.
- Installed a 1-foot thick layer of barrier protection soil.
- Installed a drainage stone detail at the toe of the slopes around the landfill.
- Installed a 6-inch thick vegetative soil layer.

The cap construction upgrade project was substantially completed by the end of November 2005. Some work items were not completed in 2005 before the end of the construction season. A punch list was developed for incomplete work items, and this work was completed by then end of the summer of 2006.

3.2.1 Project Organization and Responsibilities

To assist in completing construction of the RA, DuPont contracted URS Corporation to provide several key project team members, including the PM, the Design Engineer, the CM, as well as several key QA team members, including the Resident Engineer, CQA Official, the CQA Certifying Engineer, and CQA Monitors/Inspectors. An organizational chart of the RA project team for the Landfill Cap Upgrade project is presented as Figure 3-3 and discussed below:

- Mr. Paul Mazierski served as Site Project Coordinator for implementation of the RA. Mr. Mazierski was the primary point of contact for DuPont in communications with the USEPA RPM.
- The DuPont Construction Project Director was Mr. Ed Lutz, P.E. Mr. Lutz worked in conjunction with the CM to ensure that the remedial actions were implemented as designed.
- The Project Manager, Mr. Gary E. Britt was responsible for overall project implementation. He had overall responsibility for ensuring that the USEPA's

objectives and the DuPont quality standards were met or exceeded. The PM reported directly to the Site Project Coordinator and was responsible for technical quality control and project oversight.

- Mr. Gary Britt also served as CM and was the point of contact for the construction projects. Responsibilities of the CM included chairing progress meetings, reviewing construction submittals, conducting quality control activities (see also CQA Official), documenting construction activities, and certifying construction. The CM also served as liaison between DuPont, agency representatives, utility companies, adjacent property owner, and subcontractors.
- The RAC for the Landfill Cap Upgrade was selected based on competitive bidding. The RAC Project Manager had overall responsibility for completion of the construction activities including managing daily project activities for his employees as well as those of his subcontractors. The RAC provided a full-time Site Superintendent who directed daily operations. The Site Superintendent met daily with the CM to discuss work to be completed. All RAC personnel attended the daily tailgate safety meetings.

USEPA

The lead agency for the remedial projects was the USEPA. Ms. Gloria Sosa was USEPA's RPM for the RD/RA work.

Earth Tech, under contract with the USEPA, served as the USEPA site representative and provided periodic, up to full-time, oversight of the work. The USEPA and Earth Tech were kept abreast of construction status and progress through weekly progress reports prepared by URS and the respective RAC. The Project Manager for Earth Tech was Mr. James Kaczor, PG.

NYSDEC

The NYSDEC provided support to the USEPA, and provided local agency representation in the remedial projects. Mr. Mike Hinton, PE was the NYSDEC representative for the RA.

3.2.2 Meetings

DuPont began significant subgrade construction work in late May 2005. During this timeframe, the USEPA/NYSDEC and DuPont agreed to have subgrade status meetings every other week. For the geosynthetic phase of the project, a pre-construction project kick-off meeting was completed on July 3, 2005 in accordance with the approved final design. The pre-construction meeting agenda was developed in accordance with the approved Final Design. All key project personnel including agency representatives were invited to attend the pre-construction meeting. In addition, project status meetings were conducted weekly during the geosynthetic phase of the project at DuPont Necco Park.

The first subgrade project status meeting was conducted on June 9, 2005, and the last subgrade project status meeting was conducted on August 4, 2005. The first project status meeting for the geosynthetic phase of the project was conducted on August 11, 2005, and the last project status meeting (Week #15) was conducted on November 17, 2005. The URS CM was responsible for assembling all status meeting minutes and distributing them prior to each subsequent meeting. Meeting minutes were distributed to key RAC personnel and to all of the project organization personnel listed in Section 3.2.1. For the subgrade phase of the project, five status meetings were conducted, and five meeting minutes were published. For the geosynthetic phase of the project, 15 status meetings were conducted, and 15 meeting minutes were published. Appendix B contains all of the project status meetings minutes for both the subgrade and geosynthetic phases of the project.

3.2.3 Mobilization and Site Preparation

Mobilization for the Landfill Cap Upgrade project occurred in early August 2005. Existing site access roads were used during mobilization and construction; however, central management operations (construction trailers) were moved from Necco Park to within an easement area, just south of Necco Park. Existing access roads were eventually abandoned as subgrade and geomembrane deployment activities encroached upon old infrastructure. A contractor parking area was established on BFI/Allied easement through an agreement with the property owner. A material laydown area was established south of Necco Park in the Niagara Mohawk ROW. At the conclusion of the project these areas were restored.

Access to the Necco Park site for normal traffic was through the BFI/Allied entrance south of the site. All RAC employees, subcontractors, vendors, and site visitors documented their visit by signing in at the contractor office trailer on a daily basis. Regulatory personnel documented their visit by signing in at the shared DuPont/Agency construction trailer.

A traffic control plan was prepared and implemented for the RA. The traffic control plan illustrated existing roadways, parking areas, traffic flow patterns, delivery routes for various types of material deliveries, signage, and traffic barriers.

Existing site security measures and requirements (making BFI/Allied security aware when entering the site, securing site entrance gate and support trailer) were maintained throughout RA construction. Additional contractor-specific security measures that were employed during construction included the following:

- Locked job boxes and equipment storage sheds.
- Secured portable equipment such as generators to stationary objects.
- Removed unneeded equipment from the site to prevent theft or vandalism.
- Performed daily inspection of equipment before use.
- Locked all heavy equipment at the end of each day.

There were no reports or notifications of theft or vandalism during the RA.

Various measures were implemented during construction activities to minimize adverse impact to site workers and the environment, including the following:

- Thoroughly inspected all equipment brought on-site to ensure that equipment did not contain fluid leaks or other defects that could affect the environment or site safety.

- Placed protective concrete barriers where required (Niagara-Mohawk transmission towers, acid line, storage tanks, utility meters, and wells).
- Wetted dry roads and work areas to minimize dust emissions.
- Installed and provided upkeep of erosion control structures (check dams, silt fence, and hay bales).
- Installed temporary fencing to identify work zones and prevent access to work areas and open excavations.
- Repaired site roads, as needed.

3.2.4 Site Work

The Landfill Cap Upgrade project was constructed as designed. Some design modifications were implemented during the construction after a better understanding of the work to be constructed was observed during field activities. Landfill design changes are summarized in Section 3.2.5.

For the cap upgrade project the following items were completed:

- Prepared the subgrade for geomembrane deployment in accordance with design specifications.
- Installed 1,023,642 SF of 40 mil LLDPE Textured Geomembrane (GM).
- Installed 126,999 SF of GDC.
- Installed 914,571 SF of 8-oz/sy geotextile fabric.
- Installed 87,900 SY of barrier protection layer.
- Installed 1,113 CY of drainage stone.
- Placed 49,775 SY of pre-existing on-site topsoil.
- Installed 54,265 SY of contractor-supplied topsoil.
- Permanently seeded/stabilized 25.6 acres, including disturbed areas outside cap limits.
- Installed 44 monitoring well extensions/concrete collars.
- Installed a permanent stone access road.
- Installed a permanent asphalt access road/parking/staging area and an asphalt off-loading pad for the acid tank.

Subgrade

The subgrade was prepared in accordance with design specification 02210 – Site preparation. A clarification to the specifications concerning rock particle size was communicated to the USEPA/NYSDEC in the URS June 23, 2005 memorandum. The memorandum clarified that the 3/8-inch particle size restriction in the specification applies to protrusions in the subgrade surface greater than 3/8 inches and not the maximum particle size. Rocks, other objects, and protrusions that would have potentially damaged the cap components were removed by the RAC prior to installation of the GM.

The subgrade was prepared by the RAC, inspected by URS and the RAC GM subcontractor and accepted by the GM subcontractor. Copies of all the certificates for acceptance of soil subgrade are located in Appendix D (Daily Submittals). A NY licensed surveyor surveyed the sites final subgrade conditions prior to GM deployment. A final conditions as-built subgrade/existing conditions drawing was prepared and previously submitted to the USEPA/NYSDEC.

Geomembrane

The 40 mil textured LLDPE GM was installed in accordance with design specification 02371 Geomembrane and was manufactured by POLY-FLEX, Inc. As required by specification 02371, the GM was sampled and tested for multiple parameters detailed further in Section 5.2.3.

A total of 68 rolls of textured 40-mil LLDPE GM were delivered to the site and inspected/logged by URS. The delivery checklists can be found in Appendix D.

GM was transported and deployed with a spreader bar attached to a forklift from the stockpile location to the deployment area. The GM was deployed by laborers and positioned with hand clamps to ensure a 3- to 6-inch overlap with adjacent panels and then temporarily secured in place using sandbags. The deployed panels were labeled P-1 through P-305. Panel placement documentation is provided in Appendix D.

The GM was seamed and tested as detailed in Section 5.3.2. The LLDPE GM panel seaming proceeded concurrently with the panel deployment. The majority of the seams were made using dual hot-wedge fusion welding apparatus. Repairs and short seam segments were made using an extrusion welding apparatus. All seaming operations were observed and documented by URS as shown in Appendix D.

All protrusions to the GM were fitted with a boot and a skirt. This occurred for monitoring wells, gas vents, guard rail posts, utilities, and any other protrusion to the GM. In addition the GM was battened to all structures on the landfill including the GWTF facility, the Acid Tank Concrete Footer, and the Niagara Mohawk Transmission Tower footers.

GM limits, seam locations, repair locations, and destructive sample locations were all surveyed by a NY licensed surveyor during the GM installation. The GM panel map was provided to the USEPA/NYSDEC as part of the as-built submittals that were previously submitted to the agencies.

Geosynthetic Drainage Composite (GDC)

GDC was installed in accordance with design specification 02376 Geosynthetic Drainage Composite and was placed on all slopes greater than 12 percent. The GDC placed at Necco Park was manufactured by TENEX. GDC testing was performed and is detailed in Section 5.2.3.

The subgrade slopes (as-built) were verified by a NY licensed surveyor, and GDC limits (greater than 12 percent slopes) were field marked by the surveyor prior to placement. GDC seams were overlapped by a minimum of 4 inches and the geonet was secured by tying with plastic fasteners. The top layer geotextile was then seamed by stitching/sewing using polymeric tread. All GDC, seams, and geotextile stitching were inspected by URS prior to covering with BPL. The limits of GDC placed were surveyed by a NY licensed surveyor and shown on the GDC as-built drawing that was previously submitted to the agencies.

Geotextile Fabric

Geotextile fabric was installed in accordance with design specification 02375 Geotextiles and was placed on top of all of the GM excluding where GDC was placed. Because of the physical properties of the BPL, an approved design change allowed for the placement of an 8-oz/sy fabric instead of the 16-oz/sy specified in the design specification. This landfill cap design modification is presented in Section 3.2.5. In addition, the 8-oz/sy geotextile fabric was placed in a double layer on the cap in areas where 1-inch minus crushed stone was used (in areas that received asphalt). All geotextile was placed with overlapping seams and temporarily secured in place using sandbags. All geotextile seams were stitched/sewed using polymeric thread and inspected by URS prior to covering with BPL. Any defects were corrected with an additional seam that was sewn to repair the defective area. Where stitching was not possible, the geotextile was overlapped and heat bonded using a manufacturer approved hot air gun.

Barrier Protection Layer (BPL)

A minimum 1-foot of barrier protection layer (BPL) was placed on top of all geosynthetics placed at Necco Park in accordance with design specification 02210 Filling and Grading. Prior to placement, the BPL was tested for multiple parameters as described in Section 5.3.2. The limits of BPL placed were surveyed by a NY licensed surveyor and were shown on the BPL as-built drawing that was previously submitted to the agencies.

Drainage Stone

Drainage stone was installed as designed to allow for effective GDC drainage into the drainage ditch that was constructed around Necco Park. During construction, a design modification to terminate the GDC in the drainage stone was proposed by URS, (in the September 15, 2005 memorandum) and was approved by the USEPA/NYSDEC (as documented in meeting minutes #7, dated September 22, 2005). This modification resulted in the removal of the GDC vertical termination detail because of long term transmissivity and performance concerns as well as constructibility issues. The vertical termination of the GDC was included in the design with the intention of providing additional slope stability. However, during construction it was determined that the vertical termination was unnecessary. Drainage stone was used to terminate the GDC and consisted of a bottom layer of 1-inch drainage stone overlain by a coarser 3-inch stone.

Pre-existing On-Site Topsoil

Early in the remedial design process, the USEPA/NYSDEC approved the reuse of the sites pre-existing topsoil for final cover on the new landfill cap. Topsoil stripping at Necco Park began in 2002 with the start of the first AGM cell construction. All topsoil that was stripped from the site between 2002 and 2005 in advance of AGM work was stockpiled in one central location. During the final capping of the site, the RAC was responsible to excavate, move, place, and grade the sites pre-existing topsoil from the stockpile location into a 6- inch thick lift on top of the BPL. The sites pre-existing topsoil covered approximately 10 acres during the final phase of capping.

Contractor Supplied Topsoil

To complete the installation of the vegetative soil layer at the site, the RAC imported topsoil in accordance with design specification 02900 Vegetative Soil and Seeding. Importation of topsoil began after the site's pre-existing topsoil supply was exhausted. Prior to placement, the imported topsoil was tested as described in Section 5.3.2. The topsoil was graded into a 6-inch lift to establish final grades. A NY licensed surveyor performed a record survey of the completed topsoil layer. A final conditions as-built drawing was prepared and previously submitted to the USEPA/NYSDEC.

Seeding

All topsoil placed on the cap and areas disturbed outside the cap were seeded, stabilized with mulch applied by a hydroseeder, and fertilized. Seed was applied to most areas of the cap using a mechanical drill seeder towed by a tractor. The drainage ditch and a few other inaccessible areas were seeded using a hand operated drop seeder. The seed mixture specified was altered slightly by the RAC to replace some of the warm weather germinating grasses with colder weather germinating grasses because the seed was applied late in the construction season (October 2005).

Monitoring Wells

Monitoring wells were extended during the subgrade phase of the project by a NY licensed well driller (Nothnagle Drilling) to elevations approximately 3 feet above the final landfill design elevations. Subgrade materials were compacted in place around wells using hand operated "jumping jack" compactors. The geomembrane was secured to each well on the cap using a fabricated boot and skirt and tested. To complete the monitoring wells, geotextile was wrapped around the geomembrane and seamed using a hot air gun. BPL was then placed and each well was fitted with a new concrete collar.

Stone Access Road

A stone access road was installed at Necco Park for future access to the site. A separation geotextile fabric was placed on top of the BPL in the stone road area prior to placement of 2-inch crusher stone material. The stone material was graded into a 6-inch lift with a dozer and compacted in place using a 10-ton vibratory compactor. The limits of the stone road were surveyed by a NY licensed surveyor and are shown on the final conditions as-built drawing that was previously submitted to the USEPA/NYSDEC.

Asphalt Road

An asphalt access road was installed from the site's entrance on the south-west corner, to approximately 200 feet west of the groundwater treatment facility. In addition, an asphalt off-loading pad was constructed adjacent to the acid tank. Asphalt was placed in accordance with specification 02741 Hot-Mix Asphalt Paving. Because the asphalt was to be placed late in the season and weather conditions were unfavorably wet during late fall, the stone road base was thickened from 6 inches to 14 inches. The thicker stone road base was used instead of the thin BPL layer that was in the design to ensure that compaction of the road base would be achieved prior to placement of asphalt. To protect the GM from the 1-inch minus stone, a double layer of 8-oz/sy geotextile fabric was placed in asphalt areas. Final limits of the completed asphalt were surveyed by a NY licensed surveyor and are shown on the final conditions as-built drawing previously submitted to the USEPA/NYSDEC.

3.2.5 Design Modifications

The Landfill Cap Upgrade project was constructed as designed, including design revisions proposed by DuPont and approved by the USEPA. Throughout implementation of the RA, various changes were made to the RD and incorporated into the project. The design changes were generally made due to a conflict identified in the field, identification of an improved or preferred alternative to the design, or unexpected field conditions dictating a change in design. Each of the changes were discussed thoroughly at the regular weekly status meetings where the Resident Engineer, CM, RAC, affected subcontractors, agencies, and others in attendance could detail and review the change in scope, schedule, price, and determine the best path forward. In addition, several design change memoranda were drafted by URS/DuPont and were approved by the USEPA either in writing or in documentation with the weekly status meeting minutes. Once approved, the design changes were incorporated into the project and surveyed after construction was completed. All design modifications are reflected in the as-built drawings that were submitted to the USEPA under separate cover on February 9, 2006.

The following paragraphs provide a list of the design changes:

- ECO-001: Engineering Change Order (ECO)-001 was generated to eliminate the placement of geomembrane in a section of the North ditch due to heavy groundwater flow interference. On August 9, 2005 URS Corporation prepared a memorandum of North Ditch Construction Modifications. On August 11, 2005 EPA responded to DuPont via e-mail requesting a permanent solution. This memorandum was conditionally approved by the USEPA as documented in the August 18, 2005 weekly status meeting. In addition DuPont installed (5) AT zone piezometers and (1) AT-Zone monitoring well as detailed in the DuPont September 13, 2005 letter to EPA and completed the monitoring as described in the September 12, 2005 letter. As described in the approved August 9, 2005 memorandum, geomembrane was not placed in the North ditch between ditch stations 31+75 and 23+50. The alternate design (placement of low permeability clay instead of geomembrane in the ditch and termination of geomembrane in an anchor trench) was constructed in the North ditch area and is shown on the as-built drawings. As part of ECO-001, an additional design change was communicated, approved, and then implemented. This secondary design change in ECO-001 was the elimination of the geomembrane flap that runs up the slope on the outer edge of the North ditch to provide better long-term soil stability of the steep slope. The geomembrane was terminated at the outer edge of the flat ditch channel bottom. Although seasonally some water enters the north east ditch area from the adjoining property, landfill cap inspections have not identified any groundwater seepage issues directly into sections of the north ditch modified during final remedy construction. The design changes implemented during construction in the north ditch are functioning as a permanent solution.
- ECO-002: This ECO was generated to change the geotextile thickness specified in the design from 16 ounces per square yard (oz/sy) to 8-oz/sy due to the nature

of the contractor supplied barrier protection layer soil (absence of stones/rocks). On August 10, 2005, URS prepared a memorandum of Geotextile Thickness Requirement Evaluation. This memorandum was approved by the USEPA as documented in the August 18, 2005 weekly status meeting, and 8-oz/sy geotextile fabric was used on the project.

- ECO-003: This ECO was generated to allow use of some of the contractor supplied barrier protection layer materials as a supplemental subgrade material source (under the geomembrane). This was approved by the USEPA after a separate shear test of the barrier protection layer (BPL) materials was completed as described for subgrade materials in the 100% design specifications.
- ECO-004: This ECO was generated to provide funding for miscellaneous out of scope construction changes for contract purposes. Included in this change order are the following items:
  - ECO-004-1: In areas of the site where asphalt was to be placed, a double layer of 8 ounce geotextile fabric was placed on the geomembrane and #1 run of the crusher stone was used as base materials instead of the contractor supplied barrier protection layer soils. The stone materials were used to ensure compaction of the subbase at the end of the construction season when wet weather events were routinely occurring.
  - ECO-004-2: Concrete catch basins were installed in two locations, one on the east side of the GWTF facility and one on the north side of the Acid Tank. These catch basins were installed on top of the geomembrane and to direct upgradient surface water flow through corrugated metal pipe to rip-rap aprons, and then to the drainage ditch.
  - ECO-004-3: Three rip rap aprons were installed on the north side of the north ditch system to slow down the velocity of stormwater discharges from adjacent properties into the newly establish Necco Park drainage ditch system.

Other minor design modifications implemented consisted of the following:

- Termination of the geomembrane in an anchor trench on the south east corner of the cap adjacent to the asphalt
- Destruct sampling frequency variance based upon quantity of passing destructs
- Verification (survey) of 12 percent subgrade slopes and placement of geosynthetic drainage composite only in areas with 12 percent slope or greater.
- Changing the 5 percent subgrade design slope to 4 percent between well cluster 129 and western limits of the acid tank off-loading pad to avoid drum carcasses that were discovered in the subgrade in this area during subgrade construction.

3.2.6 Pollution Control and Mitigation

Construction operations were structured, and various measures were implemented to prevent off-site release of dusts, pollutants, contaminants, and sediment-laden stormwater during the landfill cap upgrade RA. Work plans prepared during the RD and implemented during the RA, that specified actions intended to prevent off-site migration of contaminants included:

- Necco Park Health and Safety Plan (CRG, 2000b) and task-specific addenda
- Investigation and Remediation Waste Management Plan (CRG, 2000c)
- Remedial Action Work Plan, DuPont Necco Park (CRG, 2004a)
- Sediment and Erosion Control Practices – Subgrade cutting and Filling (CRG, 2005b)

As part of the contractual requirements, the RAC prepared and submitted an Environmental Protection Plan (EPP) prior to the work. The plan described procedures to maintain environmental protection and to monitor and minimize creation and dispersion of dust, vapor, and odor. The EPP was reviewed and approved by DuPont, and subsequently implemented by the RAC.

As described in the Necco Park SOW, this section outlines preventive measures and processes employed during the RA and integrates protective measures described in the documents listed above.

Dust Control

Off-site release of air-borne contaminants was controlled throughout the project by wetting roads and the landfill surface on a nearly continuous basis during dry periods. In addition, any soil and debris buildup was frequently scraped or washed off of roadways. As described in the HASP, real-time air monitoring for total dust was also conducted during construction activities. Exceedance of the action level for total dust was not observed, even during periods of excessive visible dust. However, excessive visible dust conditions were used as an indication for the need of dust suppression measures and were implemented. Site perimeter dust monitoring, in compliance with NYSDEC's CAMP as described in the HASP, was implemented throughout all phases of the landfill project.

Vapor Emission Control

In accordance with the HASP, real-time monitoring for VOCs was conducted during intrusive activities; in particular, activities that penetrated the existing site clay cap. In the uncommon event that the worker protection action level for VOCs (1 ppm) was exceeded, work was temporarily halted, and construction operations were modified to minimize the disturbance (i.e., slower excavation rate to reduce VOC emission rate) and PPE was upgraded. Active VOC emission suppression was never deemed necessary. On several occasions, an upgrade in PPE was implemented since VOC readings exceeded worker breathing-Zone action levels. During the start-up of landfill cuts into historical waste, during the subgrade phase of the project, personal air sampling and analysis was performed on project personnel who entered the exclusion zone. In addition, air sampling and analysis was performed upgradient and downgradient of the work areas. The analytical data were evaluated and no significant chemical releases to the environment or to workers were observed. Action levels in the exclusion zone were never exceeded and a downgrade to PPE (Modified Level D) was initiated after multiple rounds of air sampling were collected and evaluated.

Site Control

Consistent with procedures described in the HASP, control measures were implemented in the form of work zone delineation, when handling potentially contaminated materials, and to minimize the potential for uncontrolled contaminant migration. Establishment of three distinct work zones accomplished site control: Support Zone, Contamination Reduction Zone, and Exclusion Zone. Decontamination of equipment and removal of used PPE was performed in the Contamination Reduction Zone; thus controlling migration of potentially contaminated material outside the work zones.

Sediment and Erosion Control

Consistent with procedures described in the RD and RAWP, sediment and erosion controls measures were implemented and maintained throughout the course of construction activities. In general, sediment transport was controlled in the drainage ditch system using check dams. Silt fence was installed as needed in areas away from the drainage ditch system.

In addition to silt fence, hay bales were used to prevent sediment and silt from leaving the site at the southwest corner and through catch basins.

Spill Response

The procedures described in the WMP and addenda were used to address potential for release of non-hazardous and hazardous substances during remedial construction. The following materials were used or generated during construction:

- Petroleum products

In general, the RAC performed its work in a manner that prevented contamination of soil, surface water, groundwater, atmosphere, structures, and equipment. As part of the contractual obligations, the RAC prepared an Emergency Spill Control Plan (ESCP) that was reviewed and approved by DuPont prior to mobilization of heavy equipment. The ESCP included locations of cleanup and absorbent equipment, a contingency plan, decontamination procedures, and reporting requirements.

3.2.7 Remedial Waste Management

Consistent with waste management procedures specified in the WMP, contaminated soil/fill materials were moved directly to an active filling area of the landfill, for permanent placement below the final landfill cap. The permanent location for remedial wastes were dependent upon the volume of wastes accumulated and the final cap grades. All remediation wastes generated during the excavation/cut phase of the landfill cap upgrade construction were disposed of on-site in areas requiring fill to meet minimum subgrade slope designs. The contaminated soil/fill materials were managed to ensure that they were covered as soon as possible with clean fill materials from the site (reused existing clay cap materials or imported stockpiled clay materials). Careful attention was paid to weather forecasts to ensure soil/fill materials could be managed on a daily basis to ensure compaction of both the fill materials and the daily cover materials.

Prior to demobilization, all equipment that came in contact with potentially contaminated material was decontaminated using high-pressure water from a water truck. Decontamination of equipment was normally conducted immediately outside of the contamination area allowing drainage to runoff into the contaminated area. Solids generated from the cleaning operation were placed in the active filling area. Decontamination water was contained in the active filling area, was absorbed by the landfill, and ultimately placed beneath the final landfill geomembrane.

As part of the landfill cap upgrade, existing leachate lines and other structures and materials associated with the previous groundwater extraction system were decontaminated, size-reduced, and placed beneath the final landfill cap.

4.0 CHRONOLOGY OF EVENTS

4.1 Summary

The chronology for the start up of remedial action at Necco Park started with agency approval of the initial AGM petition and approval of the remedial designs. Although the final cap design was approved prior to the approval of the hydraulic design, the hydraulic controls construction phase of the RA occurred prior to the landfill cap work. This occurred because AGM activities were in operation during the construction of Hydraulic Controls and Treatment system project to accumulate sufficient volume of AGM to construct the landfill subgrade and because DuPont preferred to construct the GWTF facility prior to the final placement of the cap. The USEPA approved the *Final (100%) Design Submittal for Cap Upgrade for the DuPont Necco Park site in Niagara Falls, New York* on September 30, 2003 (CRG, 2003). However, since the final landfill minimum design slopes were based upon an undetermined volume of AGM materials that were to be transported to Necco Park, the cap slopes were not finalized until March 2005. The slope revisions to the final design occurred within agency approved design parameters.

Final (100%) Design Report, Bedrock and Overburden Source Area Hydraulic Controls, DuPont Necco Park Landfill, Niagara Falls, New York, submitted as final March 17, 2004 (CRG, 2004) was approved by the USEPA on April 8, 2004. This timeframe officially started the RA construction work at Necco Park. Figure 4-1 contains a final chronology of events for the remedial action phase of Necco Park.

4.2 Significant Milestones

Below is a summary of significant milestones for the remedial action at Necco Park.

Date	Milestone
September 18, 1998	Signature of Record of Decision
December 31, 2001	Agency Approval of the initial AGM petition
March 15, 2002	1st Shipment of AGM to Necco Park
March 20, 2002	Agency approval of the Amended AGM petition
September 30, 2003	Agency approval of the (100%) Design Submittal for Cap Upgrade
April 8, 2004	Agency approval of the (100%) Design Submittal for Bedrock and Overburden Source Area Hydraulic Controls
May 1, 2004	List of Qualified Remedial Action Contractors (RACs) to the USEPA (Hydraulic Controls)
July 28, 2004	Contract award to RAC (Hydraulic Controls)
August 2, 2004	RAC Mobilization (Hydraulic Controls)
March 21, 2005	Final Revision to Landfill Cap Upgrade Drawings
April 5, 2005	Start up of Hydraulic Controls and Treatment System
April 5, 2005	Notification of Hydraulic Controls Significant Completion
April 26, 2005	Hydraulic Controls – USEPA Site Visit - Pre-Final Inspection

May 9, 2005	List of Qualified RACs to USEPA(Landfill Cap)
Date	**Milestone**
July 20, 2005	Contract award to RAC (Landfill Cap)
July 25, 2005	Final AGM shipment to Necco Park
August 8, 2005	RAC Mobilization (Landfill Cap)
September 22, 2005	Final Engineering Construction Drawings (Hydraulic Controls)
November 18, 2005	Notification of Completion for Remedial Action
November 29, 2005	Pre-Final/Final Inspection (Hydraulic Controls and Landfill Cap)
February 6, 2006	Final Engineering Construction Drawings (Landfill Cap)

5.0 PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

5.1 Hydraulic Controls and Treatment System

This section discusses the design and construction of the overburden and bedrock groundwater hydraulic control system in comparison to the performance standards presented in the SOW.

5.1.1 Performance Standards

Performance standards for hydraulic control of the overburden (A-Zone) from Section A.7.b. of the SOW are as follows:

> *"Contaminated groundwater in the overburden (a.k.a. the A-Zone) shall be prevented from migrating away from the source area to the far-field….. "*
>
> *"Contaminated groundwater in the overburden (A-Zone) shall be prevented from migrating from the source area through hydraulic (e.g., installation and operation of a groundwater extraction system) and/or physical (e.g., sheet pile, slurry wall) methods. If a hydraulic system is employed, it shall be demonstrated that contaminated groundwater does not flow from the source area into the far-field by establishing hydraulic control. (For all zones, hydraulic control is defined as: the containment or control of the contaminated source area groundwater in such a manner as to prevent movement or migration of the contaminated source area groundwater beyond the downgradient boundary of the source area to the far-field. Success in obtaining hydraulic control will be defined as: the achievement of hydrodynamic control at the outer limits of the contaminated source area groundwater such that hydraulic gradients are inward toward the pumping system(s). Methods for verifying that an inward gradient has been established are identified in the appropriate sections below). Evidence of source area hydraulic control in the overburden shall be established through the installation, operation, maintenance and monitoring of groundwater extraction wells, monitoring wells/piezometers and/or other means. If a physical barrier system is employed, it shall be… "*

Performance standards for hydraulic control of the bedrock (B-Zone through F-Zone) from Section A.7.c. of the SOW are as follows:

> *"Contaminated groundwater in the upper and lower bedrock flow zones (a.k.a. B/C and D/E/F zones) shall be prevented from migrating from the applicable source area (the source areas shall be defined as per Section A.7.b) by hydraulic methods. It shall be demonstrated that contaminated groundwater flow does not occur from the source area to the far field. Evidence of source area hydraulic control shall be established through the installation, operation, maintenance and monitoring of groundwater extraction wells, monitoring wells/piezometers and/or other means."*

As described in the Remedial Design, enhancement of the existing bedrock hydraulic control system was performed in a phased approach allowing interpretation of the findings of each phase of the PDI to be done prior to implementing a succeeding phase. The phased approach facilitated identification of data gaps and optimization of the field efforts. The ultimate goal of this approach was to construct a remedial system that meets the hydraulic control objectives of the SOW, early in the process.

Though not included in the Phase 3 PDI scope, an evaluation of a perched water zone in the eastern portion of the site was completed during the Phase 3 PDI. The perched water is contained in the fill materials above the native clay. The evaluation was conducted in response to Agency comments raised just prior to the start of field activities. The evaluation entailed the installation of a top-of-clay (later termed the AT-Zone) piezometer near then operating extraction well RW-2. As part of the evaluation, a groundwater sample was collected from the piezometer (designated 180AT). Results of the perched water zone evaluation was included in the Phase 3 Pre-Design Investigation Memorandum: Overburden and Bedrock Hydraulic Controls. To enhance the perched water zone monitoring network, thirteen additional AT-Zone piezometers, paired with existing A-Zone piezometers, were installed in March 2004 in accordance with the Long Term Groundwater Monitoring Plan that was provided with the December 2003 Final (100%) Design Report: Bedrock and Overburden Source Area Controls.

Successful well placement, verified through pump testing and evaluation, was the primary key to the remedy's ability to meet the performance objectives of hydraulic control of the source area. As demonstrated in the *Final (100%) Design Report, Bedrock and Overburden Source Area Hydraulic Controls*, a series of three PDIs were performed in a phased manner ensuring that potential pumping was evaluated against the performance objectives prior to developing and initiating the subsequent phases. Using this approach, well influence area could be assessed helping to determine appropriate locations for additional pumping wells, which might be necessary to create overlapping hydraulic influence.

The well network was subsequently designed and installed. Based on the testing performed optimum pumping rates were established for each well. The optimum pumping rates for startup and operation of the pumping wells were developed during the RD and are as follows: RW-4 (0.4 gpm), RW-5 (4 gpm), RW-10 (8 gpm), RW-8 (13 gpm), and RW-9 (15 gpm). Optimization, which is creating a balance between extraction rate and effectiveness, is currently underway. During optimization, well pumping rates and/or drawdown levels will be adjusted to determine the settings at which the pumping rates will be adjusted and the remedial objectives will be met.

The operation, monitoring, testing, and evaluation process, as required by the SOW, will continue as part of the LGMP. The results, conclusions, and recommendations of the evaluations, will be presented in annual reports. The first evaluation of performance standards was presented to the USEPA in the DuPont Necco Park, *2005 Annual Groundwater Monitoring Report,* (CRG, 2006a).

5.1.2 Sampling and Analysis

Hydraulic and chemical monitoring of the contaminant source and far-field areas is covered in the LGMP provided in the O&M Plan. The LGMP was included with the *Final (100%) Design Submittal for Bedrock and Overburden Source Area Hydraulic Controls* (CRG, 2004b) and was approved by the USEPA on December 1, 2004.

The LGMP was developed for groundwater monitoring of the A-Zone overburden and bedrock flow zones (B- through F-Zones). Specifically, the plan describes the monitoring required to evaluate the effectiveness of the groundwater extraction system in meeting the Performance Standards included in the SOW, Appendix B to the AO. In accordance with Section F.2.f of the SOW, the objective of the long-term monitoring is to evaluate groundwater quality in the source area and far field through chemical analysis of groundwater samples and monitoring of hydraulic gradients to determine extraction effectiveness. The LGMP activities were initiated in April 2005 with the start up of the hydraulic controls.

The LGMP includes the following:

- Description of performance monitoring specific to assessing the effectiveness of B/C-Zone pumping in controlling the A-Zone source area
- Description of performance monitoring, consisting of hydraulic and chemical monitoring components, to evaluate the effectiveness of the extraction system in achieving source area control in the A- through F-Zones
- Description of the ongoing DNAPL observation and removal program

The existing Necco Park well/piezometer network was determined to meet the objectives of the LGMP. The hydraulic and chemical data collected throughout implementation of the LGMP will be used to assess the extent of hydraulic control.

Details of the field and laboratory QA/QC programs and analytical methods are described in the Necco Park Quality Assurance Project Plan (QAPP). The QAPP was provided as Appendix G of the O&M Plan (CRG, 2006).

This LGMP is dynamic in that modifications to monitoring locations may be made based on monitoring results and or performance of the extraction system.

5.1.3 Quality Assurance Project Plan

A Construction Quality Assurance Project Plan (CQAPP) was prepared to ensure, with a reasonable degree of certainty, that the completed remedy would meet or exceed all design criteria, plans, and specifications. The CQAPP was included in the *Final 100% Design Report Bedrock and Overburden Source Area Hydraulic Controls* (approved by the agencies in their April 8, 2004 correspondence) and included the following elements:

- CQA project organization
- Requirements for project meetings
- Inspection and testing requirements
- Requirements for project documentation

A description of the project organization and the QA/QC roles and responsibilities of those that were involved in this project are described in the following paragraphs.

Project Owner – As Owner, the DuPont CRG was ultimately responsible for the successful completion of the RA at the site. The following individuals provided Owner representation during project performance:

- Mr. Paul Mazierski – Site Project Coordinator
- Mr. Edward Lutz, P.E. – Construction Project Director

Design Engineer – URS Corporation – The principal function of the Design Engineer during remedial action was to provide interpretations and clarifications of the RD.

Resident Engineer – Mr. Kevin Sullivan, P.E. – The Resident Engineer was primarily responsible for reviewing and approving all submittals furnished by the Contractor, performing site inspections, maintaining continuous contact with the CQA team throughout the project to ensure quality, and ensuring that implementation of the RA was in accordance with the RD. The Resident Engineer also managed all proposed design changes by reviewing and approving or rejecting (civil) or routing the proposed change to the appropriate design lead (electrical, structural, or mechanical) for review and approval or rejection.

CQA Official – Mr. Gary Britt – The CQA Official was responsible for observing, testing, and documenting all construction activities related to the specified remedial work. The CQA Official was also responsible for collecting all documentation supporting the project implementation, to be used in preparing this RAR.

The primary function of the CQA Official was to ensure that the CQA program was implemented in accordance with the approved CQAPP.

CQA Certifying Engineer – Mr. James Lanzo, P.E. – The primary responsibility of the CQA Certifying Engineer was, through continuous communication and coordination with the CQA team, to ensure that the RA was completed in accordance with the RD. As a licensed engineer in the State of New York, the CQA Certifying Engineer was also responsible for providing professional certification that the RA was completed in accordance with the RD. The certification statement is presented in Section 11.0.

CQA Monitor/Construction Inspector – Mr. Donald Gwizdowski – The CQA Monitor was located on-site full time, and his duties included monitoring and documenting the following operations:

- Verifying that completed areas of work were inspected and approved before backfill materials were placed
- Verifying all pipe testing
- Verifying and documenting Contractor's QC and QA activities
- Documenting all on-site activities that could result in damage to components of the remedial work
- Reporting all critical observations as soon as possible to the Contractor and CQA Official

Informal project meetings were completed daily to communicate safety and work objectives. Formal project status meetings were completed weekly and are summarized in Section 3.1.2. Inspections and testing requirements are discussed in Section 5.1.4, and project documentation is presented in Section 5.3.

5.1.4 Testing

The RA Contractor provided all necessary supervision, labor, equipment, materials, and resources to perform the specified work and to demonstrate the quality of the work. The Contractor was responsible for all quality control testing and performance related quality control items that were specifically listed in the design specifications or on the construction drawings. The testing and inspection that the Contractor completed under the CQAPP included the following:

- Materials and placement testing for grading fill, general fill, structural fill, trench bedding and backfill, and aggregate materials
- Concrete materials and installation
- Buried piping materials and installation
- Electrical and instrument materials, installation, and operation
- Aboveground piping materials and installation

The Owner and Engineer performed continuous construction quality evaluations to ensure that the design and remedial objectives were being met.

The RAC was responsible for concrete materials and installation. In compliance with the design specifications, the RAC was responsible for all concrete testing on the project. Copies of all the laboratory concrete test reports are on file at the DuPont Niagara Plant.

All pipe materials were pressure tested in accordance with the design specifications to ensure that there were no leaks. Depending upon each pipe material specification, different tests procedures were performed. In general, all pipe materials were tested with both air (initial screen) and then water (final approved test). Appendix C contains copies of all Quality Assurance reports for the Hydraulic Controls portion of the remedy.

In addition to the CQAPP, DuPont implemented other QA/QC procedures on the groundwater treatment portion of the hydraulic controls that are typically used by DuPont during construction and startup of new product process operations. DuPont CRG implemented two additional programs on the hydraulic controls: Equipment Functionality Testing and Pre-Startup Safety Reviews. Equipment Functionality Testing was performed to ensure that the hydraulic controls operated as designed. These tests ensured that all materials and instruments specified were installed and operated as designed. The phases of equipment functionality testing included:

- Phase 1: An inspection was performed to ensure that all materials and instruments specified were installed.
- Phase 2: All instruments that operated using computer driven controls (Experian System) were tested and operated by the central computer to ensure proper operation.
- Phase 3: All hydraulic controls and treatment systems components (with the exception of the well pumps) were pre-tested prior to full-scale startup. The pre-test was conducted using potable water drawn from the City of Niagara Falls water supply system and was run for several days.
- Phase 4: The system went live and groundwater was pumped from each pumping well to the treatment system for processing.

Simultaneously, during Phase 1 and Phase 2 equipment functionality testing, DuPont CRG also performed pre-startup safety reviews. This was an in depth evaluation conducted on all components of the hydraulic controls and treatment system focusing on safety. Appendix C contains copies of the pre-startup safety reviews and equipment functionality testing forms. In summary, QA/QC processes were implemented on the hydraulic controls and treatment system that enabled the final remedy for overburden and bedrock hydraulic controls to start up on schedule. In addition, the system was run at approximately 93% uptime for 2005, demonstrating the value of the QA/QC program implemented.

5.2 Landfill Cap

This section discusses the design and construction of the landfill cap upgrade in comparison to the performance standards presented in the SOW. DuPont will document in this RAR that the performance standards for the landfill cap have been achieved.

5.2.1 Performance Standards

Performance standards for the landfill cap upgrade from Section A.7.a. of the SOW is as follows:

"The existing cap shall be upgraded to satisfy the substantive requirements of NYCRR Part 360 standards to the satisfaction of the NYSDEC and USEPA."

In accordance with the SOW, DuPont prepared and submitted the *Final 100% Design Submittal, Cap Upgrade*. The 100% design was approved by the USEPA and NYSDEC on September 30, 2003. DuPont constructed the landfill cap upgrade as designed or as modified and approved during construction; therefore, the performance standards have been achieved. Future cap maintenance activities will be completed as part of the O&M Plan.

5.2.2 Quality Assurance Project Plan

Appendix E of the *Final 100% Design Submittal, Cap Upgrade* contains the CQAPP. The agencies approved the CQAPP in their September 30, 2003 correspondence to DuPont approving the 100% Design submittal. The purpose of this CQAPP was to establish the minimum standards for independent QA observation that were used to verify Contractor's conformance with the material and construction QC requirements for the cap upgrade work. A description of the project organization and the QA/QC roles and responsibilities of those that were involved in this project are described in the following paragraphs.

Project Owner – As Owner, DuPont CRG was ultimately responsible for the successful completion of the RA at the site. The following individuals provided Owner representation during project performance:

- Mr. Paul Mazierski – Site Project Coordinator
- Mr. Edward Lutz, P.E. – Construction Project Director

Design Engineer – URS Corporation – The principal function of the Design Engineer during remedial action was to provide interpretations and clarifications of the RD.

Resident Engineer – Mr. Kevin Sullivan, P.E. – The Resident Engineer was primarily responsible for reviewing and approving all submittals furnished by the Contractor, performing site inspections, maintaining continuous contact with the CQA team throughout the project to ensure quality, and ensuring that implementation of the RA was in accordance with the RD. The Resident Engineer also managed all proposed design changes by reviewing and approving or rejecting (civil) or routing the proposed change to the appropriate design lead (electrical, structural, or mechanical) for review and approval.

CQA Official – Ms. Dawn Walczak – The CQA Official was responsible for observing, testing, and documenting all construction activities related to the specified remedial work. The CQA Official was also responsible for collecting all documentation supporting the project implementation, to be used in preparing this RAR.

The primary function of the CQA Official was to ensure that the CQA program was implemented in accordance with the approved CQAPP.

CQA Certifying Engineer – Mr. James Lanzo, P.E. – The primary responsibility of the CQA Certifying Engineer was, through continuous communication and coordination with the CQA team, to ensure that the RA was completed in accordance with the RD. As a licensed engineer in the State of New York, the CQA Certifying Engineer was also responsible for providing professional certification that the RA was completed in accordance with the RD. The certification statement is presented in Section 11.0.

CQA Monitor/Construction Inspector – Mr. Donald Gwizdowski – The CQA Monitor was located on-site full time. The CQA Monitor's duties (shared with CQA Official) included monitoring and documenting the following operations:

- Subgrade preparation
- Geomembrane placement
- Geosynthetic drainage composite placement
- Geotextile placement
- BPL placement
- Vegetative soil layer placement

All work activities were constructed as designed and documented in the Cap Construction Quality Assurance Report (see Appendix D). Informal project meetings were completed daily to communicate safety and work objectives. Formal project status meetings were completed weekly and are summarized in Section 3.2.2. Inspections and testing requirements are discussed in Section 5.2.3 and project documentation is presented in Section 5.4.

5.2.3 Testing

The RAC maintained the ultimate responsibility for all QC activities necessary to manage, control, and document that the cap complies with the requirements established by the drawings and specifications. Quality assurance, separate from but coordinated with QC, was used to verify that the level of quality required by the drawings and specifications was achieved by the Contractor. URSD provided QA.

The testing activities that occurred during construction of each definable feature of the final cap are listed below:

- ❑ Direct Shear Interface Friction tests (ASTM D 5321)
  - BPL and GDC
  - BPL and Cushion Geotextile
  - Cushion Geotextile and 40-mil Textured GM
  - GDC and 40-mil Textured GM
  - 40-mil Textured GM and subgrade soil (1) Existing Site Clay
  - 40-mil Textured GM and subgrade soil (2) Wheatfield Clay
  - 40-mil Textured GM and subgrade soil (3) BPL soils used as subgrade
- ❑ Geosynthetic drainage composite transmissivity (ASTM D 4716)
- ❑ Geomembrane tests
  - Conformance Testing (see below)
  - Destructive Testing
- ❑ Analytical fill testing (imported topsoil and BPL)

The GM was conformance tested prior to delivery to the site by an independent third-party at a minimum frequency of one sample per 25,000 square feet. The samples were tested for the following:

- ❑ Thickness (ASTM D 5994)
- ❑ Tear Resistance (ASTM D 1004)
- ❑ Asperity Height (GRI GM 12)
- ❑ Puncture Resistance (ASTM D4833)
- ❑ Carbon Black Content (ASTM D1603)
- ❑ Tensile Properties (ASTM D 638)

GM daily trial seams were conducted each morning and after each break that resulted in equipment shutdown. Trial seam weld QA documentation is provided in Appendix D. The LLDPE GM panel seaming proceeded concurrently with the panel deployment. The majority of the seams were made using dual hot-wedge fusion welding apparatus. Repairs and short seam segments were made using an extrusion welding apparatus. All seaming operations were observed and documented by URS. All non-destructive GM testing was completed by the RAC GM subcontractor and observed by URS. Three types of non-destructive tests were performed on the GM:

- ❑ Air pressure testing
- ❑ Vacuum box testing
- ❑ Spark testing

GM destructive seam sampling test samples were initially obtained on an average of one test for every 500 linear feet of seam for each welding apparatus. A variance was proposed by URS and approved by the USEPA/NYSDEC to decrease the destructive seam test frequency based upon cumulative passing destructs. Towards the end of the project, destructive sampling were collected at a rate of one test per 700 linear feet. There was a 100% passing destructive sampling/testing rate for the entire project.

BPL was tested chemically for Target Compound List VOCs, SVOCs, pesticides, PCBs, Target Analyte List metals, cyanide, and pH and compared to the USEPA Region III residential risk-based concentrations. No exceedances to the criteria were detected. In addition the BPL was tested for the following geotechnical parameters:

- Particle Size Analysis (ASTM D 422)
- Moisture Density Relationship (ASTM D 698)
- Moisture Content (ASTM D 2216)
- Liquid Limit, Plastic Limit, and Plasticity Index (ASTM D 44318)
- Direct Shear Interface Friction (ASTM D 5321)

Once placed, the BPL was graded and compacted using a 10-ton compactor and tested for in place density by the RAC subcontractor. All in place density tests documented the minimum 90 percent compaction requirement. Copies of all in place density tests are provided in Appendix D.

Contractor supplied topsoil was tested chemically for Target Compound List VOCs. SVOCs, pesticides, PCBs, Target Analyte List metals, cyanide, and pH and compared to the USEPA Region III residential risk-based concentrations. No exceedances to the criteria were detected.

All QC testing by the RAC was completed as specified in the design documents, prepared as an official submittal, and ultimately approved by the Resident Engineer on the project. Copies of all approved submittals were provided to the USEPA and NYSDEC during the construction project. QA representatives were responsible for observing and documenting all of the construction activities. QA field activities are documented in the Cap Construction Quality Assurance Report (QAR) (see Appendix D).

5.3 Documentation – Hydraulic Controls and Treatment System

5.3.1 Field Logbook

A field logbook was used on a continuous basis to record daily information such as weather, work crew size, work locations, and general production, as well as specific observations, actions, QA tests conducted, field discussions, and other information related to daily QA activities. The field logbook was prepared in great detail, enabling the CQA Official to reconstruct each day's activities and decisions for inclusion in the appropriate QA reports. The field logbook was also instrumental in preparing this RAR.

Based on the information contained in the field logbook, daily QA reports were prepared for each day QA inspections or testing occurred. For days on which no QA testing or inspections were performed, a summary of the day's activities was presented in the field logbook only.

5.3.2 Photographic Records

Continuous documentation of the RA using digital photography was considered an important aspect of project documentation. Photographs were taken at least weekly and sometimes several times during the same week at critical milestones or during periods of high construction activity. All photographs are dated and have been saved to a series of compact discs. The electronic copies of select photographs are contained in Appendix E.

5.3.3 Daily Quality Assurance Reports

The Daily QA Reports were used to document daily activities when required QA testing and/or inspections were performed. In order to minimize unnecessary repetition, general construction activities were documented only in the field logbook. The Daily QA Reports were completed by the CQA Official, and a copy was maintained at the Resident Engineer's field office. Periodically, the completed reports were compiled for distribution to the Owner and Engineer. Since these reports contain documentation of the required QA testing and inspections, copies of the QA reports are contained in Appendix C of this report.

5.4 Documentation – Landfill Cap

5.4.1 Field Logbook

A Daily Field Report form was used on a continuous basis during the landfill cap construction to record daily information such as weather, work crew size, work locations, and general production, as well as specific observations, actions, QA tests conducted, field discussions, and other information related to daily QA activities. The Daily Field Report Form was completed daily on the project and are compiled and presented in Appendix D.

5.4.2 Photographic Records

The RAC was responsible for obtaining ground photographs on a bi-monthly basis on the landfill project to document construction progress. The RAC selected a unique view of select portions of the site and revisited those views every two weeks on the project. In addition the contractor was required to obtain aerial photographs during the project. The aerial photos were collected prior to deployment of the geomembrane, half way through the project and at the end of the project. A CD of all the RAC photographs is contained in Appendix F.

5.4.3 Daily Quality Assurance Reports

The Daily QA Reports were utilized to document daily activities when QA testing and/or inspections were performed. The Daily QA Reports were completed by the CQA official, and a copy was maintained at the Resident Engineer's field office files. Periodically, the completed reports were compiled for distribution to Owner and Engineer. Since these reports contain documentation of the required QA testing and inspections, a copy of the QA reports is contained in Appendix D of this report.

6.0 PRE-CERTIFICATION AND FINAL CERTIFICATION INSPECTIONS

6.1 Pre-Certification/Final Certification Inspection

On November 29, 2005, the USEPA, Earth Tech (USEPA's contractor), NYSDEC, DuPont, and URS Corporation (the DuPont Engineers/Consultants) conducted a pre-certification inspection of the RA construction for DuPont Necco Park. The inspection was conducted on both the groundwater hydraulic controls and the landfill cap.

The USEPA did not require any corrective measures subsequent to the pre-certification inspection and subsequently declared that pre-certification inspection held on November 29, 2005 shall be considered the Final Certification Inspection as noted in the USEPA correspondence, dated December 9, 2005 (see Appendix G).

6.2 Health and Safety

A health and safety plan (HASP) was developed for the Necco Park Remedial Action. Specific addendum's (for each construction phase) were prepared to supplement the HASP and submitted to the agencies in the *Final (100%) Design Report, Bedrock and Overburden Source Area Hydraulic Controls* and the *Final 100% Design Submittal, Cap Upgrade.* The HASP and addendum's were used to guide the safety for construction activities for both the Hydraulic Controls and the Landfill Cap. Health and Safety was managed in compliance with the HASP and no injuries or incidents occurred.

7.0 OPERATION AND MAINTENANCE ACTIVITIES

7.1 Hydraulic Controls and Treatment System

The O&M plan, governs all activities associated with the Hydraulic Controls and Treatment System to maintain compliance with the AO. There are multiple operating parameters of the Hydraulic Controls and Treatment System, which are described in detail in the O&M Plan. Hydraulic and chemical monitoring of the contaminant source area and far-field areas is covered in the LGMP provided in the O&M Plan. The LGMP was included with the Final (100%) Design Submittal for Bedrock and Overburden Source Area Hydraulic Controls (CRG, 2004b), which was approved by the USEPA on December 1, 2004.

The O&M manual for the on-site GWTF is provided in the draft O&M Plan. This O&M manual has been prepared in accordance with DuPont PSM guidelines and includes a technology description and standard operating procedures for the groundwater extraction and treatment system.

The groundwater O&M manual, in conjunction with vendor O&M manuals, describes normal operation and shutdown procedures, emergency shutdown procedures, alarm conditions, and trouble-shooting and preventative maintenance procedures for the Hydraulic Controls and Treatment System.

The plan for DNAPL Monitoring and Recovery is also provided in the O&M Plan. The DNAPL monitoring, recovery, and disposal procedures have been in effect since the 1990s and were updated in the fall of 2005.

Institutional controls have been developed, implemented, and maintained to limit and control site access, prevent the use of, and exposure to, fill materials and groundwater beneath the Necco Park facility, and prevent the development and/or transfer of the Necco Park facility for any use incompatible with the remedy selected.

Institutional controls have been in-place at the Necco Park site since the 1970s and will remain in effect throughout the O&M phase. Site security is maintained through site control measures in place at the surrounding facilities. Groundwater and deed restrictions are also in place. These land-use deed restrictions will remain in effect if the property is transferred to another party.

Other supporting work plans specified in Section K.2.a of the SOW are provided in the following O&M Plan appendices:

- ❑ Site Management Plan
- ❑ Sampling Analysis and Monitoring Plan
- ❑ Quality Assurance Project Plan
- ❑ Health and Safety Plan
- ❑ Waste Management Plan
- ❑ Emergency Action and Contingency Plan

DuPont is currently operating the Hydraulic Controls and Treatment System as designed on a continuous basis. If any well in the pumping system is not operating ("down") for a period of more than 48 hours consecutively or five days in a 30-day period, DuPont shall notify the USEPA and NYSDEC. The notification will include a plan for restoring system operation as quickly as possible. Documentation of system uptime will be provided in the Necco Park Quarterly Data Packages.

Complete source area containment will be in question and additional assessment will be warranted in the event that operation of the remedial system(s) is discontinuous, or if, based on the review of the hydraulic monitoring data, chemical monitoring data, or DNAPL monitoring data any of the following conditions occur:

- The hydraulic containment systems do not establish hydraulic control as defined in the performance standards, on a consistent basis.
- Free phase DNAPL is encountered in areas outside the area of hydraulic control, or contaminant concentrations in the groundwater in areas outside the area of hydraulic control indicate that DNAPL may be present on a consistent basis.
- Chemical monitoring indicates that: 1) the estimated total contaminant mass in the groundwater beyond the area of hydraulic control increases with time or, 2) retarded contaminants that were previously restricted to the containment area are detected in perimeter monitoring wells on a consistent basis or, 3) concentrations of contaminants in groundwater downgradient of the hydraulic/physical containment systems do not show a decrease over time.
- After installation, the remedial systems do not consistently achieve the Performance Standards, as specified in the SOW.

The scope of the assessment to address potential modifications to the remedial system may include installation of additional monitoring wells and pumping tests.

DuPont will submit the assessment to the USEPA, including a contingency plan for modification of the system as constructed and for the implementation of further actions determined necessary to meet the performance standards. Modifications may include the redefinition of the source area, additional groundwater extraction, or other measures.

The USEPA will either approve the contingency plan, or will require modification of such plan, in accordance with the procedures set forth in the AO. Following the USEPA approval of the contingency plan, DuPont will implement the modifications to the remedial measures to meet the performance standards as outlined in the plan.

Quarterly reports will be submitted to EPA 30 days after the end of each quarter. A Groundwater Monitoring Annual report will be submitted to the USEPA by the end of March of the following year.

7.2 Landfill Cap

The USEPA is currently reviewing a draft Cap Maintenance and Monitoring Plan included as Appendix A of the Necco Park O&M Plan submitted to the USEPA in September 2006. This Cap MMP describes in detail the activities required to ensure that the cap and surface water controls for the site are properly maintained. O&M activities for the landfill cap include the following:

- ❑ General maintenance and inspections
- ❑ Mowing
- ❑ Landfill cap system evaluations
- ❑ Vermin control
- ❑ Stone drainage apron evaluations
- ❑ Gas venting system inspections
- ❑ Visual surveys for leachate seeps
- ❑ Disposal of used material and waste
- ❑ Reporting

Once this plan is approved by the USEPA, it will be fully implemented. A summary of Cap O&M activities will be included in the annual report. Currently, DuPont is inspecting the newly constructed landfill cap twice per month in accordance with the winter stabilization plan, which was prepared at the end of cap construction in 2005. The November 14, 2005 Winter Stabilization Plan was reviewed by the USEPA at the end of the cap construction project and addresses management of the sparsely vegetated site over the 2005-2006 winter months. Appendix H contains the Winter Stabilization Plan.

8.0 SUMMARY OF PROJECT COSTS

8.1 Hydraulic Controls and Treatment System

The total cost for the hydraulic controls and treatment system for Necco Park was $5,848,510. These costs occurred between 2002 and 2006. A brief breakdown of these costs are summarized below:

- $1,574,012 - Remedial Design/Recovery Well Installation
- $4,274,498 – Construction*

* Includes utilities and groundwater treatment system needed to support the remedy.

8.2 Landfill Cap

The total cost for the landfill cap upgrade for Necco Park was $5,287,081. These costs occurred between 2001 and 2006. A brief breakdown of these costs are summarized below:

- $629,160 - Remedial Design
- $4,657,921 - Construction

8.3 Record of Decision

Capital cost for the selected remedy presented in the Record of Decision was estimated at $7,837,136. Final remedy construction costs were $8,932,419. This total amount was calculated from actual RD/RA costs incurred from 2001 through 2006. Operations and Maintenance costs projected for 2007 are forecasted at $700,000. Using this figure, a 30 year O&M present worth cost is estimated at $8,686,300 for a total project cost of $17,618,719. The record of decision estimated a $4,614,775 annual O&M cost and a 30-year O&M present worth cost of $57,264,743 for a total project cost of $65,102,000. Additionally, DuPont reimbursed USEPA approximately $915,822 for agency oversight costs corresponding to the RD/RA timeframe of 2001 through 2006.

9.0 OBSERVATIONS AND LESSONS LEARNED

9.1 Hydraulic Controls and Treatment System

There was one site-specific observation noted and lesson learned on the hydraulic control construction project: shallow depth of groundwater was observed in the slag unit south of Necco Park. The slag unit was observed in all areas south of Necco Park where trenches were excavated for the installation of the hydraulic control forcemains. Because of the shallow groundwater surface south of Necco Park, DuPont raised the forcemain trench from the utility chamber south of Necco Park to RW-9 to an aboveground forcemain with heat tracing. In addition, the trench for the forcemains for RW-4, RW-5, and RW-10 was excavated to a shallower depth, and fill was brought in to raise the surface elevation for frost protection and to avoid pumping groundwater during construction. These items were covered in change orders on the construction project.

9.2 Landfill Cap

There were two site-specific observations noted and lessons learned on the landfill cap project during construction. One observation was the presence of groundwater seeps in the north ditch of Necco Park emanating from an adjacent property. During landfill subgrade construction limey ditch sediments were excavated down to a slag unit interface in the north ditch of the landfill. It was during this activity that the groundwater seeps were observed. The interim plan to stop the flow was to place low permeability clay over the whole area, in an attempt to temporarily eliminate the presence of the groundwater seeps. These seeps ultimately forced DuPont to implement an alternate design by removing the placement of geomembrane in this area and placing additional low permeability clay in the drainage ditch system to an elevation that was 6 inches below final ditch grade. The ditch was competed by adding in a 6-inch thick vegetative soil layer to design elevations. This alternate design was submitted to the USEPA in a design memorandum and approved by the USEPA and NYSDEC as documented in status meeting minutes.

A second observation was the presence of smashed drum carcasses on a section of the south slope of the landfill, between well clusters 119 and 129 that was identified during landfill subgrade construction. To avoid disturbing this area, the slope of the landfill subgrade surface was changed from 5 percent (designed), to the minimum allowable slope of 4 percent. This enabled a minimum of a 1.5-foot layer of low permeability clay to be placed on top of the old landfill clay surface during the subgrade construction prior to the geomembrane placement. DuPont provided the USEPA and NYSDEC revised grading plans for this area and all work was documented as it occurred in the weekly status meeting minutes provided in Appendix B. Final landfill grades are also at 4 percent.

10.0 OPERABLE UNIT CONTACT INFORMATION

DuPont CRG currently operates and maintains the source area operable unit at Necco Park. Project contacts are as follows:

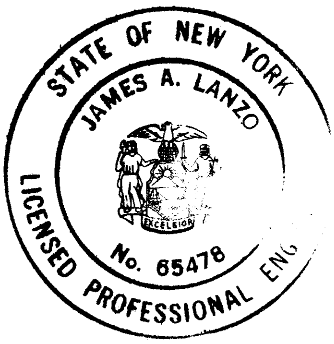
- DuPont Necco Park – GWTF Control Room – DuPont Necco Park, 5600B Niagara Falls Boulevard, Niagara Falls, NY 14302 – (716) 282-1755
- DuPont Project Director – Paul F. Mazierski – DuPont Niagara Plant, Buffalo Ave and 26th Street, Niagara Falls, NY 14302 (716)-278-5496 (paul.f.mazierski@usa.dupont.com)
- URS Necco Park O&M Project Manager – Tim Pezzino – DuPont Niagara Plant, Buffalo Ave and 26th Street, Niagara Falls, NY 14302 (716) 278-5239 (timothy.j.pezzino@usa.dupont.com)
- URS O&M Technician – Jerry Shepard - DuPont Niagara Plant, Buffalo Ave and 26th Street, Niagara Falls, NY 14302 (716) 278-5149 (gerald.m.shepard@usa.dupont.com)
- URS O&M Technician – Don Gwizdowski - DuPont Niagara Plant, Buffalo Ave and 26th Street, Niagara Falls, NY 14302 (716) 278-5321 (don.j.gwizdowski@usa.dupont.com)
- USEPA – Ms. Gloria Sosa – U.S. Environmental Protection Agency, Region II 290 Broadway, 20th Floor New York, NY 10007-1866 P/ (212) 637-4283, (Sosa.Gloria@epamail.epa.gov)
- NYSDEC – Michael Hinton, Division of Environmental Remediation New York State Department of Environmental Conservation 270 Michigan Avenue Buffalo, New York 14203-2999 (716) 851-7220 (mjhinton@gw.dec.state.ny.us)
- TAMS Consultants, an Earth Tech company – James Kazcor –100 Corporate Parkway, Suite 341 Amherst, NY 14226, ph. (716) 836.4506, ext 11 (james.kaczor@earthtech.com)

11.0 ENGINEERING CERTIFICATION

To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate, and complete. Based upon my familiarity with the Necco Park Site (the Site), my review of relevant design documents, observations during construction, and review of construction reports and record drawings, I, James A. Lanzo, PE, certify that the Remedial Action at the Site has been fully performed in accordance with Administrative Order (the Order) No. II CERCLA-98-0215, the attached statement of work (SOW) and other items developed pursuant to the Order.

(seal)

3/9/06
(signature/date)



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To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate, and complete. Based upon my familiarity with the Necco Park Site (the Site), my review of relevant design documents, observations during construction, and review of construction reports and record drawings, I, James A. Lanzo, PE, certify that the Remedial Action at the Site has been fully performed in accordance with Administrative Order (the Order) No. II CERCLA-98-0215, the attached statement of work (SOW) and other items developed pursuant to the Order.

(seal) 3/9/06
(signature/date)

12.0 REFERENCES

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