REMEDIAL ACTION CONSTRUCTION REPORT

PFOHL BROTHERS LANDFILL SITE
CHEEKTOWAGA, NEW YORK

Volume I - Main Report and Appendices A to J
Volume II - Appendices K to S
Volume III - Drawings

Viacom Inc.
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Via Certified Mail – Return Receipt Requested

February 24, 2003

Peter Buechi, P.E.
New York State Department of Environmental Conservation
Region 9
270 Michigan Avenue
Buffalo, NY 14203-2999

Re: Remedial Action Construction Report
Pfohl Brothers Landfill Site, Cheektowaga, New York, NYSDEC Site No. 9-15-043

Dear Mr. Buechi:

The Pfohl Brothers Landfill Site Steering Committee hereby submits four copies of the document entitled "Remedial Action Construction Report" (RA Report) dated February 2003 to the New York State Department of Environmental Conservation pursuant to the requirements of Paragraph I.D. of the Order on Consent and Settlement Agreement for the Pfohl Brothers Landfill Site, NYSDEC Site No. 9-15-043, in Cheektowaga, New York. Distribution of the RA Report is pursuant to the requirements of Paragraph XII.B of the Order.

Please note that the property survey of the cleared areas and the Final Declaration of Covenants and Restrictions are not included in the Report. It is anticipated that they will be available by March 7, 2003 at which time they will be submitted.

We trust this submittal satisfies your requirements at this time. If you have questions regarding the RA Report, please contact us.

Respectfully submitted,

Leo M. Brausch
Project Coordinator

cc: Director, Bureau of Environmental Exposure Investigation (NYSDOH, 2 copies)
M. J. Ryan, P.E. (NYSDEC, 1 copy)
J. P. Ryan, Esquire (NYSDEC, 1 copy)
Jaspal Walia, P.E. (NYSDEC, 1 copy)
Pfohl Brothers Site Steering Committee (Executive Summary, Main Report, Figures, Tables and Drawings)
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REMEDIAL ACTION CONSTRUCTION REPORT

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EXECUTIVE SUMMARY

The Pfohl Brothers Landfill Site (the "Site") was a former municipal, commercial, and industrial landfill that operated from the late 1920s into the 1960s. The Site is located along both the north and south sides of Aero Drive, just west of Transit Road, in the Town of Cheektowaga, New York. While it was in operation, the landfill received waste from a variety of local communities, businesses, and industries and disposed of this material in shallow trenches excavated over an area of about 130 acres.

The New York State Department of Environmental Conservation (NYSDEC) conducted a series of environmental investigations of the Site beginning in the early 1980s, leading to the NYSDEC's issuance of a Record of Decision (ROD) in February 1992. The ROD identified the need for an Interim Remedial Measure (IRM) to remove drummed wastes from the Site and identified the final remedial action plan for the Site .

In summary, the final remedial action components included the following:

i) excavation of waste materials from perimeter areas of the landfill and consolidation of the waste in the center of the Site;

ii) construction of a perimeter barrier system (consisting of a groundwater collection system and a low-permeability barrier wall) that encircles the consolidated waste;

iii) construction of a landfill cap that is attached to the perimeter barrier system;

iv) construction of an interior groundwater collection system;

v) discharge of collected groundwater to the Town of Cheektowaga sanitary sewer system for treatment by the Buffalo Sewer Authority (BSA);

vi) a surface water management program;

vii) a wetlands mitigation plan;

viii) institutional controls; and

ix) an operation, maintenance, and monitoring plan to ensure safe and effective implementation, operation, and maintenance of the remedial action.

In 1993 NYSDEC initiated the drum removal IRM. This work was subsequently completed by a group of companies that were alleged to be potentially responsible parties at the Site and that had organized themselves as the Pfohl Brothers Landfill Site Steering Committee (the "Committee").

In April 2001, the Committee entered into a consent order with NYSDEC to implement the remedial action. On behalf of the Committee, Conestoga-Rovers & Associates (CRA) prepared the remedial design, which NYSDEC approved in April 2001. The Committee selected Sevenson Environmental Services, Inc. (Sevenson) as its remedial construction contractor. Remedial construction began in March 2001 and was completed in November 2002. CRA provided oversight of remedial construction activities.

The following sections briefly describe the components of the final remedial action at the Site.

Waste Excavation and Consolidation

Approximately 540,000 cubic yards of Site wastes and soil were excavated from approximately 36 acres in the perimeter areas shown on Figure ES-1. The excavated wastes were placed directly into off-road dump trucks, which then passed through an on-Site high-sensitivity portal monitor to check for radiological material before the waste/soil was placed in the central fill area. No waste loads triggered the portal alarms, which were set at three times the daily radiation background levels.

The excavated soils and wastes were consolidated on-Site except for drummed waste materials. One hundred and ninety-two drums were encountered during remedial construction and were disposed off-Site at the Chemical Waste Management facility located in Model City, New York.

The wastes in the excavated areas were initially over-excavated up to 0.5 feet beneath the limit of visible waste. Once the wastes were removed, confirmatory soil samples were collected from the base of the excavation and analyzed for Target Compound List volatile organic compounds, semi-volatile organic compounds, polychlorinated biphenyls, and Target Analyte List metals.

In those cases where the initial chemical results showed that the exposed soil exceeded the soil cleanup criteria, which were based on NYSDEC standards for industrial/commercial property, further excavation was performed. Thereafter, additional confirmatory samples were collected from the re-excavated areas and analyzed for those compounds that showed exceedances in the initial samples. This sequence of excavation and sampling was repeated where necessary, until the entire excavated area met the soil cleanup criteria acceptable to NYSDEC.

In addition to the chemical testing, a radiological close-out survey was performed over the entire exposed excavation area. The radiological survey showed that the areas

cleared during waste consolidation activities have no radiological impact above background and are suitable for unrestricted use.

The areas from which waste were removed were backfilled with either imported pit run sand or clay soils. Pit run sand was used in the excavated waste area located outside of the perimeter barrier system, and clay soils were used in the excavated waste area located within the perimeter barrier system adjacent to Aero Drive. Clay was used in this area to reduce precipitation infiltration that would reach the perimeter groundwater collection system.

Perimeter Barrier System

The perimeter barrier system encircles the consolidated wastes. The purpose of the perimeter barrier system is to minimize the migration of overburden groundwater to off-Site areas and into the bedrock. This will be achieved by maintaining an inward gradient across the perimeter barrier system and, to the extent practical, an upward gradient from the bedrock to the overburden within the perimeter barrier system. The alignment of the perimeter barrier system is shown on Drawing ES-1.

The 10,000-foot long perimeter barrier system consists of a hydraulic barrier composed of a groundwater collection drain supplemented with a physical vertical barrier along the outside of the hydraulic barrier. Three typical cross-sections of the system are shown on Figures ES-2, ES-3, and ES-4. Figure ES-2 shows a typical cross-section along Aero Drive within the area contained by the perimeter barrier system. Figure ES-3 shows a typical cross-section outside of the area contained by the perimeter barrier system, and Figure ES-4 shows a typical cross-section along Aero Creek.

The vertical barrier is constructed of 40-mil very flexible polyethylene (VFPE), which is connected to the landfill cap VFPE liner to create a continuous barrier. The VFPE is anchored in the bottom of the trench. After excavation of the trench and before VFPE placement, the outer trench sidewall against which the VFPE liner was to be placed was inspected and any sharp objects which could potentially puncture the liner were removed. A geotextile was placed against the inner side of the liner to prevent damage to the liner by the crushed stone drainage media used for the groundwater collection system. A geotextile was also placed on top of the drainage media to prevent infilling of the drainage media with the soils used to backfill the trench above the drainage media.

The groundwater collection system consists of:

i) 10,000± feet of collection drain;

ii) 6 wet wells;

iii) 26 manholes; and

iv) a forcemain system.

The collection drain was installed in a common trench with the barrier wall and was constructed using an 8-inch diameter perforated high-density polyethylene (HDPE) pipe bedded in stone drainage media. The pipe and bedding collect the groundwater and channel it to the wet wells from which it is pumped via an HDPE forcemain to the meter chamber. From the meter chamber, it is monitored and then discharged via forcemain to MH-1 on Aero Drive, which is part of the Town of Cheektowaga sanitary sewer system. The sewer transports the water to the BSA wastewater treatment plant.

Interior Groundwater Collection System

The purpose of the interior groundwater collection system is to dewater a central area of the Site to provide an upward gradient in an area where the perimeter system by itself would not likely achieve an upward gradient. The location of the drain is shown on Figure ES-1. The drain consists of an 8-inch diameter HDPE pipe bedded in a 24-inch wide by 4-foot deep granular trench that drains by gravity to the perimeter barrier system. Access cleanouts are provided at the mid-point and termination point of the interior groundwater collection system.

Sanitary Sewer Extension

A 15-inch diameter sanitary sewer was extended to the Site area starting from the existing Town of Cheektowaga sewer manhole located on the east side of Rein Road approximately 230 feet south of the intersection of Rein Road and Aero Drive. The sewer extension runs northward to the intersection and then eastward on the south side of Aero Drive approximately 480 feet terminating at MH-1 where the forcemain from the Site ties in. Construction of this extension required the relocation of the National Fuel gas line.

Groundwater Treatment

Groundwater generated by on-Site construction dewatering and collected by the perimeter barrier system and the interior collection system from June 1 to October 9,

2001 was discharged to the BSA after treatment using an on-site temporary treatment system. Between October 12 and November 14, 2001, the treated water was discharged to either the BSA or Aero Creek. Discharge of treated water to Aero Creek occurred intermittently from October 12 to December 19, 2001. Given the minimal chemical concentrations for the influent to the temporary system, BSA and Town approvals for direct discharge without pretreatment were received on November 1 and 8, 2001, respectively, and such discharge started on November 14, 2001. After December 19, 2001, all waters were discharged directly to the BSA without the need for pretreatment.

Wetlands Construction

Hydric soils and wetland plantings were placed in selected areas between the north landfill property line and Aero Creek to create wetland areas. To reduce plant predation by Canadian geese, a fence consisting of 3/4-inch square open mesh black polyethylene was installed. Sevenson will perform monitoring and maintenance of the wetland plantings until September 2004.

Landfill Cap System

The landfill cap was placed over the 94 acres of consolidated wastes at the Site to:

i) reduce infiltration of precipitation into the landfill;

ii) prevent erosion of landfill materials; and

iii) eliminate direct contact with the landfill materials.

Before installing the cap, pregrading was performed using the excavated Site wastes and soil to grade the Site to the design elevators.

The landfill cap consists of:

i) a 6-inch gas venting layer;

ii) overlain by a 40-mil VFPE liner;

iii) overlain by a 24-inch soil protection layer; and

iv) overlain by a 6-inch layer capable of supporting vegetation.

A typical cap detail is shown on Figure ES-5. This capping system was only used in those areas where wastes are still present. In the perimeter areas of the Site from which the wastes were removed, one of the following two capping systems were used:

i) Areas Outside of Perimeter Barrier System

- Excavated areas were backfilled with clean imported sandy soil overlain by;
- 4-inch layer of soil capable of supporting vegetative growth.

ii) Areas along Aero Drive inside of Perimeter Barrier System

- Excavated areas were backfilled with clean imported clayey soil overlain by;
- 4-inch layer of soil capable of supporting vegetative growth.

The clayey soils used along Aero Drive inside the Perimeter Barrier System were used to minimize the amount of precipitation infiltration that would occur. Precipitation infiltrating in this area would end up being collected by the Perimeter Barrier System. Future development in this area will be required to maintain the low permeable nature in this area.

Forty-nine gas vents were installed and connected with the gas venting layer. The gas venting layer transmits any gas that may be generated within the landfill to the vents which convey such gas to the atmosphere.

Approximately 94 acres of VFPE liner cap were installed. The VFPE liner cap is attached to the vertical barrier wall to provide a continuous barrier to surface water infiltration/exfiltration. The 24-inch soil protection layer is comprised of clean imported soil. This layer provides both physical and frost protection for the VFPE liner. The overlying 6-inch soil layer was placed to support a vegetative cover and provide additional physical and frost protection for the VFPE liner. The vegetation cover, consisting of a mixture of grasses and clover, was developed to:

i) stabilize the soil against erosion;

ii) minimize percolation of precipitation;

iii) promote evapotranspiration of soil moisture; and

iv) increase the aesthetics of the cap.

The vegetative cover will be maintained by appropriate mowing by the Town of Cheektowaga such that roots will not penetrate to the depth of the VFPE liner.

Surface Water Management Program

The consolidated wastes were graded and capped as described in the previous section. Positive surface water drainage was provided through engineered drainage swales, ditches, and culverts. The on-site swales and ditches have been sized to accommodate a 25-year storm peak flow. Wetland LA-5 has been incorporated into the remedial action to naturally retain storm runoff.

Site Facilities

As part of the Site cap, on-Site roadways were constructed to provide access to components of the perimeter barrier system.

A control building was erected to house the permanent electrical power and control equipment for the groundwater collection system.

Groundwater monitoring wells and surface water staff gauges were installed to monitor the effectiveness of the constructed remedy.

Institutional Controls

Institutional controls have been developed for those properties over which the Steering Committee has control. In summary, the principal controls are:

A. **Entire Site**

i) On-Site groundwater is not to be used for any purpose other than monitoring for the remedial action; and

ii) No on-site surface water cisterns or similar structures are to be constructed.

B. **Capped Areas**

i) No access to or use of the capped area without prior written approval of NYSDEC;

ii) No excavation, removal, or disturbance of any soil except with NYSDEC written approval; and

iii) No planting of trees and shrubs whose roots may breach the cap.

C. **Cleared Portion Within the Perimeter Barrier System**

i) Commercial and industrial development is allowed subject to:

- no residential buildings, schools, or childcare facilities;
- no basements or underground usable space;
- no foundation requiring passive or active systems for water management;
- active or passive soil gas controls are required;
- surface water systems to convey water to existing systems are required; and
- all parking areas must be paved; and

ii) No excavation, removal, or disturbance of any soil within 15 feet of the perimeter barrier system.

D. **Cleared Portion Outside of Perimeter Barrier System**

i) Commercial and industrial development is allowed subject to:

- no residential buildings, schools, or child care facilities;
- no basements or underground usable space; and
- no foundations requiring passive or active systems for water management; and

ii) No excavation, removal, or disturbance of any soil within 15 feet of the perimeter barrier system.

The components of the remedial action have been constructed in accordance with the NYSDEC-approved design documents and approved modifications issued during progress of the works. The work was completed in advance of the originally proposed schedule and completed with no safety issues or incidents.

Preliminary monitoring of the groundwater collection system indicates that the remedy is achieving the Remedial Action Objectives. The Town of Cheektowaga will manage the long-term maintenance of the Site.

The Site is now suitable for redevelopment with the noted limitations.

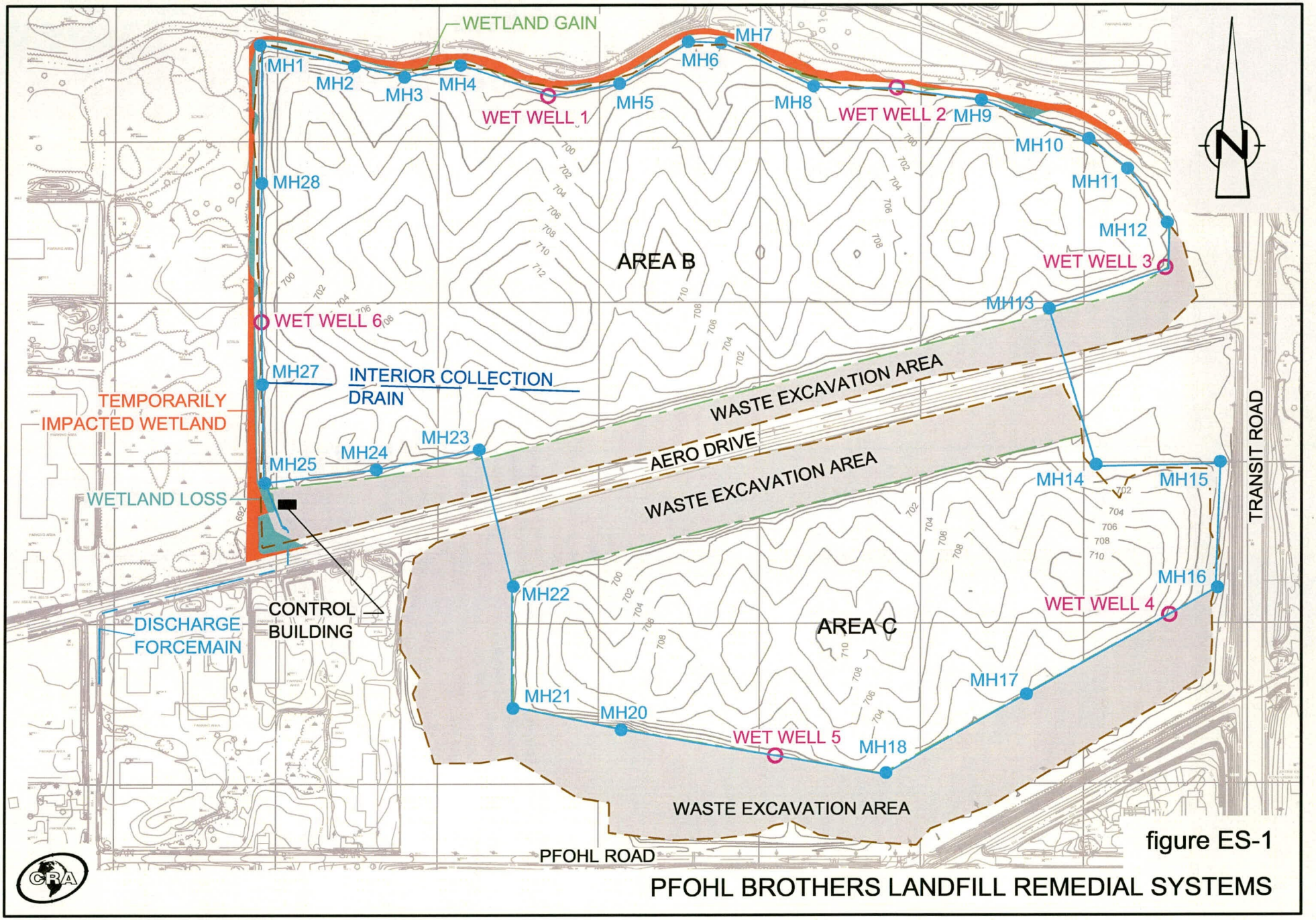

figure ES-1

PFOHL BROTHERS LANDFILL REMEDIAL SYSTEMS

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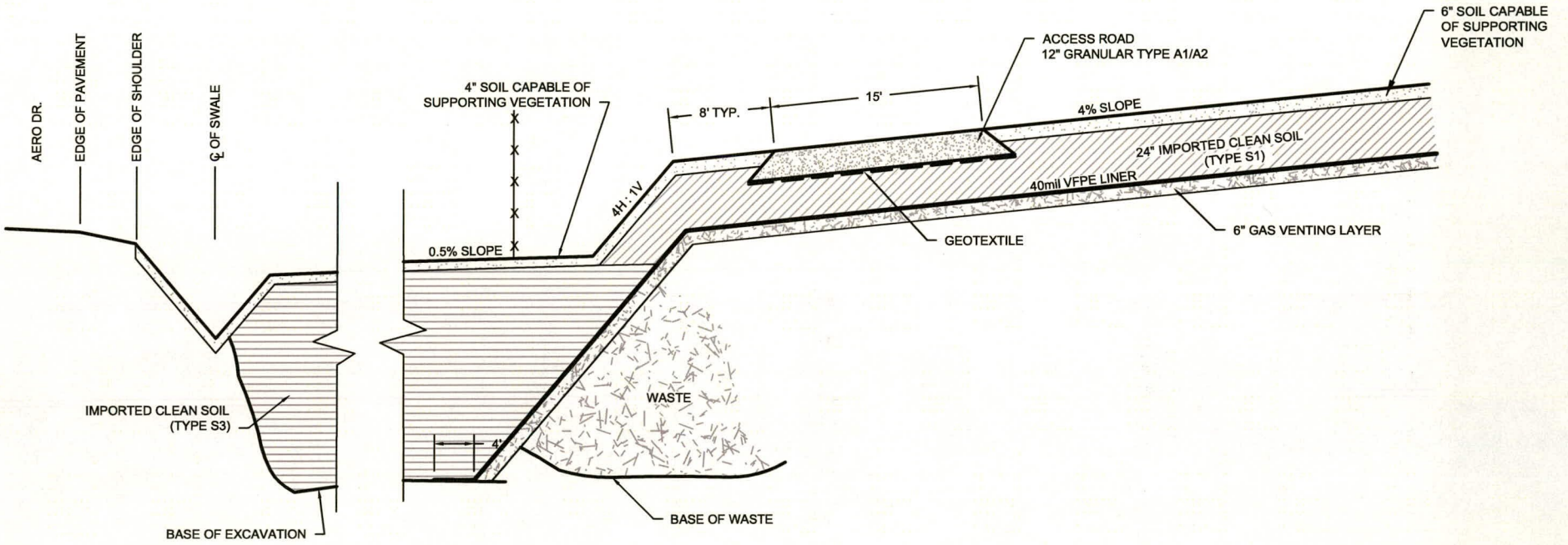
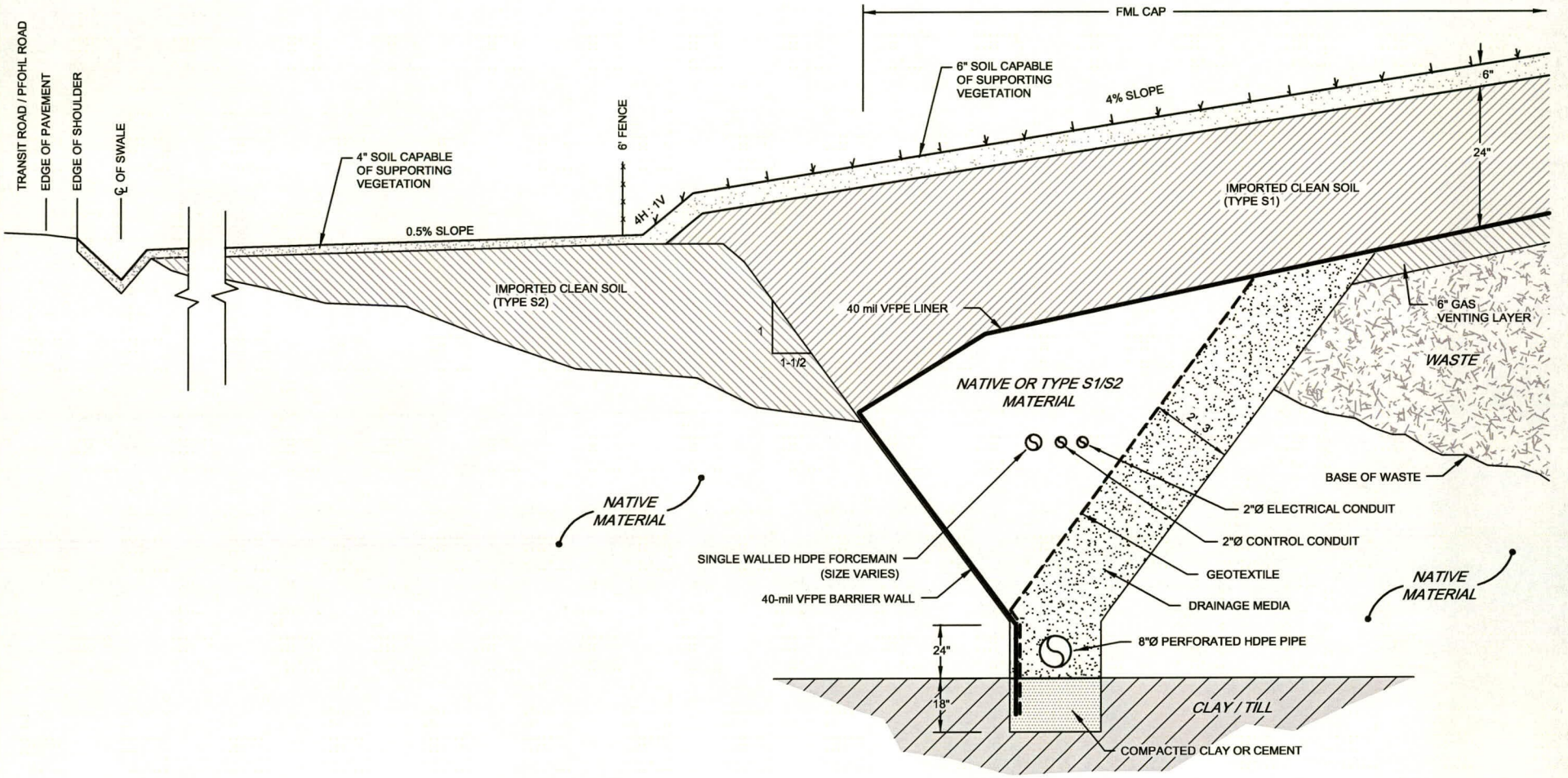


CROSS-SECTION IN AREA CONTAINED WITHIN
PERIMETER BARRIER SYSTEM ALIGNMENT

figure ES-2

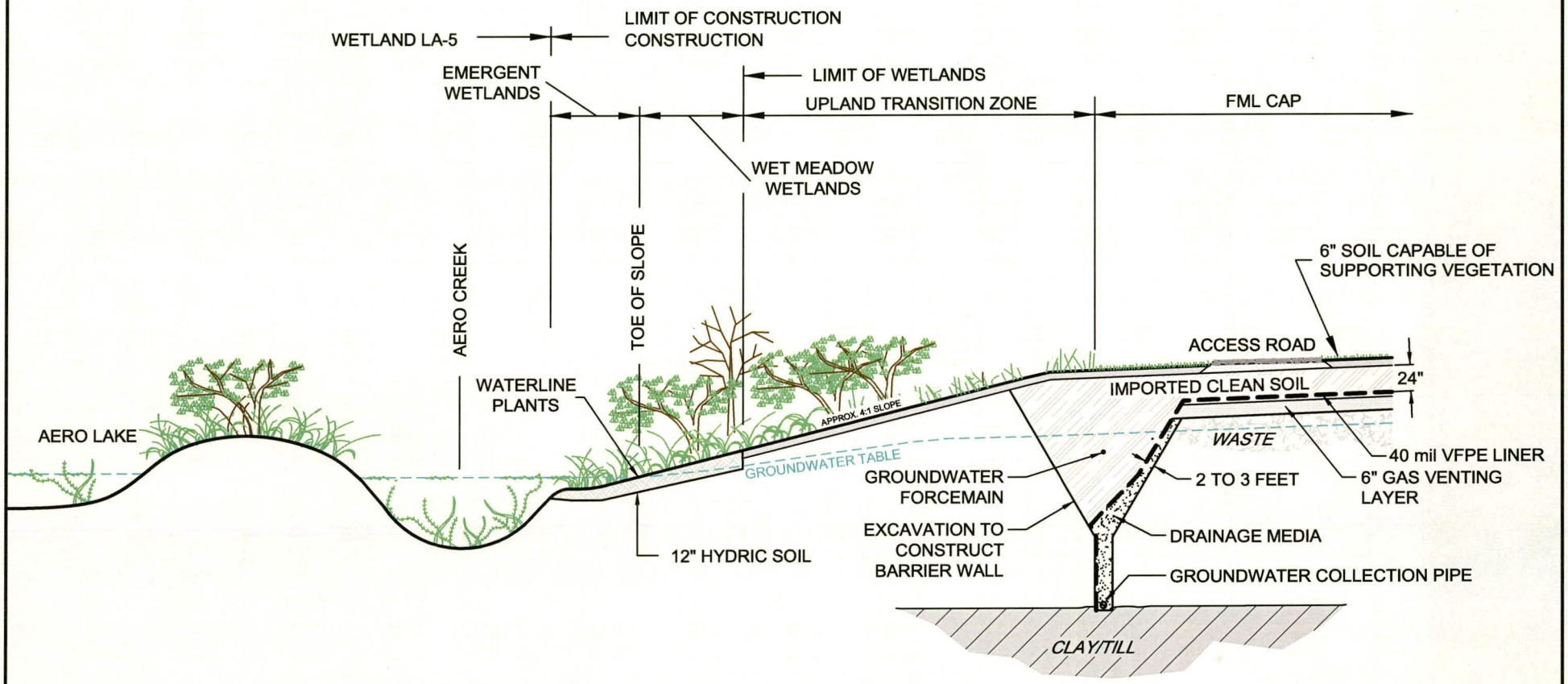
PFOHL BROTHERS LANDFILL REMEDIAL SYSTEMS



CROSS-SECTION IN AREA OUTSIDE OF PERIMETER BARRIER SYSTEM ALIGNMENT

figure ES-3

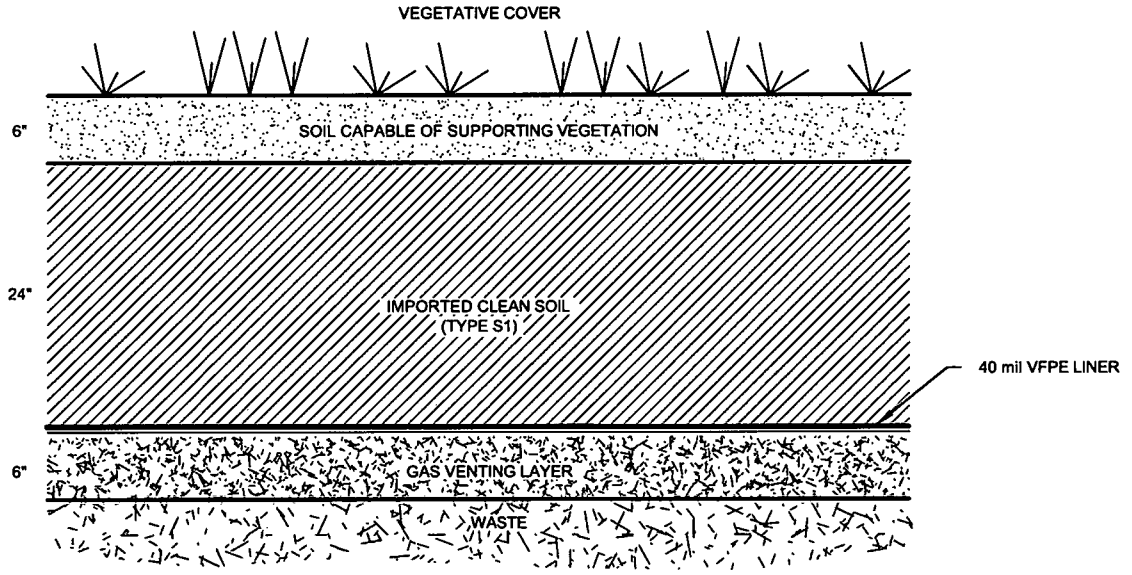
PFOHL BROTHERS LANDFILL REMEDIAL SYSTEMS



TYPICAL SECTION THROUGH WETLAND
ALONG NORTH LIMIT OF AREA B

figure ES-4

PFOHL BROTHERS LANDFILL REMEDIAL SYSTEMS



TYPICAL CAP

N.T.S.

figure ES-5

PFOHL BROTHERS LANDFILL REMEDIAL SYSTEMS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES
(Following Report)

LIST OF TABLES

LIST OF DRAWINGS
(Bound Separately)

GENERAL	
G-01	COVER SHEET AND DRAWING INDEX
G-02	PRE-CONSTRUCTION CONDITIONS
G-03	SITE PLAN AND REMOVALS
G-04	AREAS OF WASTE REMOVAL - AREA 'B'
G-05	AREAS OF WASTE REMOVAL - AREA 'C'
G-05	MONITORING NETWORK LOCATIONS
G-07	CONTROL BUILDING SITE PLAN
G-08	FENCE ALIGNMENT PLAN
G-09	MISCELLANEOUS DETAILS
CIVIL	
C-01	PLAN VIEW OF PERIMETER BARRIER SYSTEM (PBS)
C-02	PBS - PLAN AND PROFILE STA. 0+00 TO STA. 14+50
C-03	PBS - PLAN AND PROFILE STA. 14+50 TO STA. 29+00
C-04	PBS - PLAN AND PROFILE STA. 29+00 TO STA. 43+50
C-05	PBS - PLAN AND PROFILE STA. 43+50 TO STA. 58+00
C-06	PBS - PLAN AND PROFILE STA. 58+00 TO STA. 72+50
C-07	PBS - PLAN AND PROFILE STA. 72+50 TO STA. 87+00
C-08	PBS - PLAN AND PROFILE STA. 87+00 TO STA. 99+71
C-09	OFF-SITE SANITARY SEWER EXTENSION PLAN AND PROFILE
C-09A	OFF-SITE SANITARY SEWER MANHOLE & TRENCH DETAILS
C-10	INTERIOR COLLECTION TRENCH
C-11	PBS - MANHOLE DETAILS AND TYPICAL SECTIONS
C-12	PBS - WET WELL DETAILS
C-13	UNDERSIDE OF CAP BASE OF EXCAVATION
C-14	CAP - FINAL GRADE CONTOUR PLAN
C-15	CAP - N-S SECTIONS AT 456,500E, 466,750E, 467,000E
C-16	CAP - N-S SECTIONS AT 467,250E, 467,500E, 467,750E
C-17	CAP - N-S SECTIONS AT 468,000E, 468,250E, 468,500E
C-18	CAP - N-S SECTIONS AT 468,750E, 469,000E, 469,250E
C-19	CAP - SECTIONS AT 1,071,500N, 1,071,750N, 1,072,000N
C-20	CAP - SECTIONS AT 1,072,250N, 1,072,500N, 1,072,750N
C-21	CAP - SECTIONS AT 1,073,000N, 1,073,250N, 1,073,500N
C-22	CAP - GAS VENT LAYOUT
C-23	CAP - ACCESS ROAD LAYOUT
C-24	CAP DETAILS, SHEET 1 OF 2
C-25	CAP DETAILS, SHEET 2 OF 2
C-26	STORMWATER MANAGEMENT - SITE LAYOUT
C-27	STORMWATER MANAGEMENT - DETAILS
C-28	FINAL CAP PANEL LOCATION PLAN

LIST OF DRAWINGS
(Bound Separately)

LANDSCAPING	
L-01	LANDSCAPING PLAN, SHEET 1 OF 2
L-02	LANDSCAPING PLAN, SHEET 2 OF 2
L-03	LANDSCAPING DETAILS
ARCHITECTURAL/STRUCTURAL	
A-01	BUILDING FOUNDATION, FLOOR PLAN AND ELEVATIONS
MECHANICAL	
M-01	WET WELL AND MH25 DETAILS
M-02	METER CHAMBER DETAILS
INSTRUMENTATION AND CONTROL	
IC-01	INSTRUMENTATION AND CONTROL LEGEND
IC-02	PROCESS FLOW DIAGRAM
IC-03	ENGINEERING FLOW SHEET, SHEET 1 OF 2
IC-04	ENGINEERING FLOW SHEET, SHEET 2 OF 2
ELECTRICAL	
E-01	ELECTRICAL LEGEND
E-02	ELECTRICAL ONE LINE DIAGRAM
E-03	PUMP CONTROL PANEL (PCP) WIRING SCHEMATIC
E-04	PLC ANALOG INPUTS, SHEET 1 OF 2
E-05	PLC ANALOG INPUTS, SHEET 2 OF 2
E-06	PLC DIGITAL INPUTS
E-07	PLC DIGITAL OUTPUTS
E-08	MOTOR WIRING DIAGRAM FOR WET WELL 1 & 2
E-09	MOTOR WIRING DIAGRAM FOR WET WELL 3 & 4
E-10	MOTOR WIRING DIAGRAM FOR WET WELL 5 & 6
E-11	CONTROL BUILDING ELECTRICAL EQUIPMENT LAYOUT AND GROUNDING
E-12	CONTROL BUILDING LIGHTING PLAN AND DETAILS
E-13	MANHOLE AND WET WELL ELECTRICAL DETAILS
E-14	PUMP CONTROL PANEL (PCP) ARRANGEMENT AND BILL OF MATERIAL
E-15	HEAT TRACING SCHEMATIC DIAGRAM, ISOMETRIC DIAGRAM AND DETAILS
E-16	FENCE GROUNDING PLAN

LIST OF APPENDICES

LIST OF APPENDICES

LIST OF ACRONYMS

µg/kg	microgram per kilogram
BGS	Below Ground Surface
BSA	Buffalo Sewer Authority
cm/sec	centimeter per second
cpm	Counts per minute
CPVC	Chlorinated Polyvinyl Chloride
CQAP	Construction Quality Assurance Plan
CRA	Conestoga-Rovers & Associates
CWM	Chemical Waste Management
$DCGl_w$	Derived Concentration Guideline Level
Earth Sciences	Earth Sciences Consultants, Inc.
EMC	Elevated Measurement Comparison
FEMA	Federal Emergency Management Agency
Final Design Report	Final (100 percent) Design Report Remedial Action dated March 2001
FIRM	Flood Insurance Rate Maps
FML	Flexible Membrane Liner
HASP	Health and Safety Plan
HDPE	High Density Polyethylene
IRM	Interim Remedial Measure
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Survey
MDL	Method Detection Level
mg/kg	milligram per kilogram
NaI	Sodium Iodine
ng/g	nanogram per gram
NMPC	Niagara Mohawk Power Corporation
NTU	Nephelometric Turbidity Unit
NYSDEC	New York State Department of Environmental Conservation
NYSEG	New York State Electric and Gas
O&M	Operation and Maintenance
PAH	Polyaromatic Hydrocarbon
PCBs	Polychlorinated Biphenyls
PCDDs	Polychlorinated Dibenzo-dioxins
PCDFs	Polychlorinated Dibenzofurans

LIST OF ACRONYMS

ppb	parts per billion
PPE	Personnel Protective Equipment
PVC	Polyvinyl Chloride
QA	Quality Assurance
RA	Remedial Action
RAOs	Remedial Action Objectives
RD/RA Work Plan	Remedial Design/Remedial Action Work Plan dated December 1994
ROD	Record of Decision dated February 1992
Site	Pfohl Brothers Landfill Site
SSFSRSP	Surface Soil Final Status Radiological Survey Plan
SSO	Site Safety Officer
SSPL	Site Specific Parameter List
Steering Committee	Pfohl Brothers Landfill Site Steering Committee
SVOCs	Semi-Volatile Organic Compounds
SWMP	Stormwater Management Plan
TAGM	Technical and Administrative Guidance Memorandum
TAL	Target Analyte List
TCL	Target Compound List
TEDE	Total Effective Dose Equivalent
TEQ	Toxicity Equivalent
Town	Town of Cheektowaga
USEPA	United States Environmental Protection Agency
VFPE	Very Flexible Polyethylene
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

This report has been prepared on behalf of the Pfohl Brothers Landfill Site Steering Committee (Steering Committee) by Conestoga-Rovers & Associates (CRA) to present the as-recorded details of the construction of the remedy for the Pfohl Brothers Landfill Site (Site) located in Cheektowaga, New York. The Site location is shown on Figure 1.1.

The Site was divided into three areas designated as Areas A, B, and C (see Figure 1.2). In February 1992 the New York State Department of Environmental Conservation (NYSDEC) issued a Record of Decision (ROD) for Areas B and C selecting a final remedial alternative for the Pfohl Brothers Landfill Site. In 1994, a ROD was issued in which the NYSDEC concluded that no action was required to remediate Area A. The NYSDEC Registry of Inactive Hazardous Waste Disposal Sites was revised to remove Area A from consideration as part of the Site. Thus, hereinafter "Site" refers to only Areas B and C. The ROD for the Site outlined the remedial action objectives (RAOs) for the Site which are:

i) reduce organic and inorganic contaminant loads to the surface water streams from leachate seeps and groundwater to assist in meeting Class B and D stream standards;

ii) reduce carcinogenic and non-carcinogenic risks caused by dermal exposure to leachate seeps;

iii) reduce carcinogenic risks caused by dermal adsorption and ingestion of sediments;

iv) prevent migration of contaminants from sediments that could result in surface water exceedance of Class B or D stream standards;

v) reduce carcinogenic and non-carcinogenic risks caused by ingestion and dermal contact of landfill soils;

vi) reduce risk or exposure to groundwater via ingestion and dermal contact; and

vii) minimize migration of contaminants into uncontaminated groundwater.

The document entitled "Remedial Design/Remedial Action Work Plan" (RD/RA Work Plan) was developed and submitted to the NYSDEC by the Steering Committee on December 1994. The remedial components were designed and submitted in the report entitled "Final (100 percent) Design Report, Remedial Action", (Final Design Report) dated March 2001, which was prepared in accordance with the RD/RA Work Plan. The Final Design Report, which included Specifications and Drawings, were approved by NYSDEC on April 11, 2001 (see Appendix A).

The final design was based on:

- the results of the predesign investigations and evaluations and the verification of existing conditions which were presented in the "Predesign Activity Report", October 1994 (as revised March 1995);
- the preliminary design presented in the "Preliminary (30 percent) Design Report", July 1995, and
- the additional predesign test pits excavated in September 1998, and the "Pre-Final (95 percent) Design Documents, Remedial Action", dated November 1998. The design incorporates relevant NYSDEC comments and the results of meetings between the NYSDEC and the Steering Committee and meetings between the NYSDEC, Buffalo Sewer Authority (BSA), Town of Cheektowaga (Town) and the Steering Committee.

The major components of the Remedial Action (RA) for the Site include design, construction, and operation and maintenance activities associated with the following:

i) Interim Remedial Measures (IRM);

ii) Excavation and Consolidation of Landfill Areas;

iii) Perimeter Barrier Containment and Collection System;

iv) Landfill Cap;

v) Interior Groundwater Collection System;

vi) Groundwater Treatment by the BSA;

vii) Wetlands Mitigation;

viii) Institutional Controls; and

ix) Post RA Construction Operation, Maintenance, and Monitoring.

In 1993 NYSDEC initiated the drum removal IRM. This work was subsequently completed by a group of companies that were alleged to be potentially responsible parties at the Site and that had organized themselves as the Steering Committee. The IRM consisted of the removal of 4786 drums of waste and 1382 cubic yards of visibly impacted soils and was completed in 1995. NYSDEC approval of the document entitled "Interim Remedial Measures Report", dated October 1995 was received on November 17, 1995.

The specific remedial components of the final remedial action components that are described in this report included the following:

i) excavation of waste materials from perimeter areas of the landfill and consolidation of the waste in the center of the Site in order to establish appropriate grades to construct the final landfill cap;

ii) construction of a perimeter barrier containment system (consisting of a groundwater collection system and a low-permeability/barrier wall constructed of 40-mil very flexible polyethylene (VFPE)) that encircles the consolidated waste;

iii) construction of a flexible membrane liner (FML) landfill cap composed of a gas venting layer, a 40-mil VFPE liner, a barrier protection layer, a topsoil layer and a vegetative cover, that is attached to the perimeter barrier system;

iv) construction of an interior groundwater collection system to achieve, to the extent practical, an upward gradient from the bedrock to the overburden within the confines of the perimeter barrier containment system;

v) discharge of collected groundwater to the Town of Cheektowaga sanitary sewer system for treatment by the BSA;

vi) a surface water management program;

vii) a wetlands mitigation plan to address impacts that the RA may have on adjacent wetlands;

viii) institutional controls; and

ix) an operation, maintenance, and monitoring plan to ensure safe and effective implementation, operation and maintenance of the RA.

The above remedial components are consistent with the remedy presented in the ROD. However, some of the components have been modified based on the results of the Predesign Activities and design discussions with the NYSDEC. The modifications are technically equivalent and/or superior to the remedy presented in the ROD. The modifications include:

i) a hydraulic barrier (collection drain) with a physical vertical barrier was selected over a slurry wall and groundwater collection system because the collection drain/ wall provides the same degree of effectiveness, is more suited to the hydrogeologic conditions of the Site, and provides less interference with adjacent wetlands;

ii) a separate drainage layer was not required for the cap because evaluations showed that the barrier protection layer could perform as both a drainage layer and a barrier protection layer;

iii) the topsoil layer in the cap design was modified to consist of soil capable of supporting vegetative growth to allow the beneficial use of compostable materials;

iv) groundwater collected during the initial portion of the RA construction period was treated using a temporary treatment system and then discharged to the BSA. Based on the data obtained during the RA, it was determined that it was not necessary to pretreat groundwater prior to discharge to the BSA and all waters were discharged directly to the BSA without the need for pretreatment after December 19, 2001; and

v) An interior collection system was added to the RA based on modeling efforts presented in the Preliminary Design. The interior collection system addresses areas where an upward hydraulic gradient may not be created by the perimeter barrier system. There are other interior areas where the modeling has shown that it is physically not possible to create an upward gradient. Given that there has been no significant chemical migration to the bedrock and that installation of the perimeter barrier system, the interior collection system, and the cap will further reduce the potential for chemical migration, achievement of an upward gradient has been deferred subject to continued monitoring.

The remedial action construction contract was awarded to Sevenson Environmental Services on March 15, 2001. Certified for Construction documents were issued in March 2001. The construction of the remedial action was initiated on March 19, 2001 and was completed on November 20, 2002. CRA was retained by the Steering Committee to perform construction management oversight.

This report provides a summary of the activities performed during the construction of the Site remedy and is organized as follows:

- Section 1.0 provides an introduction to the report.
- Section 2.0 provides a description of Site preparation activities.
- Section 3.0 provides a description of the waste excavation and consolidation.
- Section 4.0 provides a description of activities performed for installation of the perimeter barrier containment system.
- Section 5.0 provides a description of activities performed for the extension of the sanitary sewer to serve the Site.

- Section 6.0 provides a description of the temporary groundwater treatment.
- Section 7.0 provides a description of the wetlands restoration.
- Section 8.0 provides a description of the surface water management program.
- Section 9.0 provides a description of the Site cap construction.
- Section 10.0 provides a description of the Site facilities that were constructed as part of the Site restoration activities.
- Section 11.0 provides a description of drum removal activities during RA construction.
- Section 12.0 provides a description of the radiological monitoring activities that were performed.
- Section 13.0 provides a description of health and safety protocols implemented during the construction of the remedial action.
- Section 14.0 provides a description of institutional controls implemented at the Site.
- Section 15.0 provides a description of operation and maintenance (O&M) activities to be implemented at the Site.
- Section 16.0 provides a description of the Pre-Final and Final Inspections.
- Section 17.0 provides a summary statement of the RA construction activities.
- Section 18.0 provides certification by a Professional Engineer licensed in the State of New York.

2.0 SITE PREPARATION

2.1 CLEARING AND GRUBBING

Prior to initiating the remedial activities at the Site, it was necessary to remove the trees and brush covering the entire Site. Trees were felled with chainsaws or by excavator. Tree trunks and branches less than 18 inches in diameter and brush were chipped on-site. The resulting wood chips were used for on-site haul road stabilization. Tree trunks too large to chip were laid on the ground without cross-over to a depth not exceeding 1 foot or one-log thickness, whichever was greater, in the waste consolidation areas of the Site and covered with the excavated waste fill.

In general, tree roots were left in place, except in areas that had to be excavated to meet the proper subgrade elevations. When tree roots were removed, they were also placed in the waste consolidation areas of the Site along with the excavated waste fill.

2.2 TRAILER COMPLEX

A Site support area was established in the southwest corner of the intersection of Aero Drive and Transit Road. The Site support area included offices, storage, and shower/break facility areas.

2.3 WASTEWATER TREATMENT PLANT

A temporary wastewater treatment plant was constructed at the southwest corner of Area B to provide treatment for water accumulated or generated during the remedial activities prior to discharge to the Town of Cheektowaga sanitary sewer system.

Wastewater treatment consisted of polymer addition, settling of solids, bag filtration, carbon treatment through two 20,000 gallon granular activated carbon tanks (in series), polish filtration, and discharge to the sanitary sewer.

A temporary discharge permit was obtained from the BSA. This permit established the flow restrictions and monitoring for Site discharges to the sewer (see Appendix B for the permit application and permit).

2.4 REMOVAL OF EXISTING STRUCTURES

During remedial activities, a few existing buildings and structures had to be removed to allow excavation of the soil and/or waste located beneath these structures.

Buildings removed included two metal sided/roofed Quonset hut buildings on concrete pads located on the south side of Aero Drive and a pole barn located on the Zelasko property. Building materials from these structures were buried in the waste consolidation areas.

The two decontamination area concrete slabs and the three concrete slabs that were used to stage drums excavated during the IRM were also removed, broken up, and buried on-Site.

2.5 MONITORING WELL ABANDONMENT

Fifteen overburden wells, one bedrock well, and five gas probes were abandoned prior to the start of RA activities. One gas probe (GP-3) and two overburden wells (GW-10S and GW-13S) could not be located and were presumed to have been destroyed during Site clearing operations. A listing of the abandoned gas probes and wells is provided in Table 2.1. The abandonment of the wells was performed in April and May 2001, after Site clearing and grubbing was mostly complete.

The wells and gas probes were abandoned in accordance with NYSDEC monitoring well decommissioning procedures dated October 1996 presented in the document entitled "Groundwater Monitoring Well Decommissioning Procedures".

The overburden wells were abandoned by pulling the protective casings and well casings from the ground and filling the borehole with cement grout. The grout contained three percent bentonite to control shrinkage. The grout was pumped into the borehole using a tremie tube until grout return was observed at the ground surface.

The bedrock wells were abandoned by pulling the protective casings, cutting the well riser off at, or just below, ground surface, and filling the well with cement bentonite grout. The grout was pumped into the well using a tremie tube until grout return was observed at the ground surface.

Table 2.1 lists the wells abandoned during the RA. All debris and well materials resulting from well abandonment were placed into the waste consolidation areas of the Site.

2.6 SECURITY FENCING

The perimeter of the Site was already secured by an existing 6-foot high chain link fabric fence. Throughout the RA, this existing fence and/or temporary 6-foot chain link panel fence or 4-foot plastic snow fence were used to restrict access to the Site.

2.7 EROSION CONTROLS

Erosion and sedimentation controls were installed and maintained as required during the RA. Erosion/sediment control consisted of silt fencing, hay bales, ditches and berms, and/or jute fabric as appropriate.

Maintenance of the erosion/sediment controls required regular inspection to verify these controls were in place and functioning properly.

Turbidity measurements were made daily throughout the duration of the RA to insure that Aero Creek and the related surface water ditches were not impacted by the performance of RA. A description of the turbidity monitoring program is provided in Section 8.2.

2.8 PROJECT MEETINGS

Project meetings were held before and during remedial activities as described below. Informal daily progress meetings were held to review daily work schedule progress and health and safety issues. Formal minutes were not kept for these daily meetings.

2.8.1 PRE-CONSTRUCTION MEETING

A pre-construction meeting was held on February 28, 2001 to discuss design specifications and drawings, to review the levels of responsibility, reporting and quality assurance (QA) requirements, and health and safety requirements.

2.8.2 PROGRESS MEETINGS

Progress meetings were held to identify and discuss progress, the work schedule, health and safety issues, and to review the proposed work activities for the upcoming time period. The progress meetings were generally held weekly for the 2001 construction season during which period construction activities were intensive. Due to the less intensive construction activities, the meetings in 2002 were held approximately once every two weeks. The frequency selected was with the concurrence of NYSDEC. Formal minutes of these progress meetings were kept and distributed to all meeting attendees and contractor, CRA, Steering Committee, and NYSDEC representatives.

2.9 PERMITS

The permits listed below were required for construction of the remedial action:

i) discharge permit with the Town and BSA;

ii) electrical service hookup (New York State Electric and Gas - NYSEG);

iii) road cut permit (Erie County);

iv) permit for construction on Niagara Mohawk Power Corporation (NMPC) property;

v) water service permit; and

vi) road closure permit (Erie County).

Copies of these permits are available in the on-Site control building.

3.0 SITE WASTE EXCAVATION AND CONSOLIDATION

The grading plan designed for the Site used a multi-peak subgrade to comply with the minimum grade of 4 percent as imposed by the ROD. The subgrade contours prior to installation of the final cap are shown on Drawing C-13. The grades and areas of fill placement were adjusted from those shown on the Final Design Drawings due to field conditions described below.

To establish sufficient grades to construct the final landfill cap, existing Site wastes from select perimeter areas were excavated and consolidated on Site. The existing wastes were excavated from areas where the waste thickness was generally on the order of 6 feet and less. The excavated areas, encompassing approximately 36 acres, were backfilled with clean imported soils. The excavated wastes were consolidated into the remaining central core areas of approximately 94 acres to meet the grades necessary for the final grading plan.

Based on the design grading plan, approximately 370,000 cubic yards of existing waste were to be excavated and consolidated to bring the Site to subgrade. This volume was based on the expectation that 1 cubic yard of waste excavated would provide 1 cubic yard when placed in the consolidation area. During waste excavation/consolidation, it was observed that the excavated waste, when placed and compacted, was providing only 0.7 cubic yards. To maintain the design grades, and to eliminate the need to import additional soil, wastes were excavated from additional areas. The total volume of waste excavated was approximately 540,000 cubic yards. Revised drawings showing the areas of additional waste consolidation were submitted to the NYSDEC on July 20, 2001.

In summary, the principal additional areas from which waste was removed were:

i) in the southern part of Area C in the vicinity of MH-18 to MH-20;

ii) in the southwest corner of Area B in the vicinity of MH-23 to MH-26; and

iii) in the northern part of Area B in the vicinity of MH-8 and MH-9.

The waste excavation and consolidation component required the movement of a significant volume of Site wastes from Area C to Area B. To accomplish this waste consolidation safely and efficiently, it was necessary to close Aero Drive during the time period when waste from Area C was being transported to Area B. The reasons for closing Aero Drive were as follows:

i) to prevent tracking of potentially contaminated soils from the truck crossings by public vehicles traversing the crossings;

ii) to prevent vehicular accidents and personal injuries;

iii) to allow waste excavation/consolidation to continue without interruptions due to traffic thereby decreasing the time needed to complete the remedial action; and

iv) to allow ease of constructability.

The construction of the perimeter barrier and groundwater collection system, and the landfill cap presented in Sections 4.0, and 9.0, respectively, also considered that the impacts to NYSDEC regulated wetlands would be minimized. To achieve these objectives, perimeter landfill areas adjacent to the wetlands/creeks were excavated.

The landfill areas requiring excavation and consolidation to minimize wetland encroachment were determined based on the following design criteria:

i) a minimum 20-foot buffer zone was established between the perimeter barrier system and the existing fence line or the existing/proposed limit of NYSDEC regulated wetlands;

ii) the limit of the final landfill cap extends no further than the existing fence line or the existing/proposed limit of NYSDEC regulated wetlands; and

iii) no net loss of NYSDEC regulated wetlands occurred (as agreed to by NYSDEC in its letter dated April 5, 1995) as a result of the remedial activities performed at the Site.

Based on the above criteria, the landfill areas excavated and consolidated to minimize wetland encroachment are delineated on Drawing G-04.

The excavated wastes were placed directly into an off-road dump truck, which then passed through an on-Site high-sensitivity portal monitor to check for radiological material before the waste and soil were placed in the central fill area. No waste loads triggered the portal alarms, which were set at three times the daily radiation background levels. When placed in a fill area, the material was graded in an approximately 24-inch lift and compacted with a four passes of a sheeps-foot roller or landfill type compactor with knobbed wheels.

A report was submitted by Earth Sciences Consultants, Inc. (Earth Sciences) on June 5, 2001 (see Appendix A) describing the incorrect alarm settings on the portal monitors for

the time period from May 7 to 30, 2001. (i.e., the alarm that was to be set at three times local background was inadvertently deactivated). A work plan to survey the wastes already excavated and placed that had passed through the portals during the May 7 to 30, 2001 time period was developed and concurrence was received from NYSDEC. The survey was performed on June 11, 2001. None of the survey readings exceeded three times the local background (see Appendix A).

The excavated soil and wastes were consolidated on Site, with the exception of any encountered drummed wastes. Empty drum carcasses and parts were consolidated on-Site. Drums were handled and disposed of off Site in accordance with the protocols presented in Attachment D of the Project Specifications. See Section 11.0 for additional details.

The wastes in the excavated areas were initially over-excavated up to 0.5 feet beyond the limit of visible waste. Once the wastes were removed, confirmatory soil samples were collected from the base of the excavation and analyzed for a list of all the chemicals that may have been present at the Site. The samples were analyzed for the Target Compound List (TCL) volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and Target Analyte List (TAL) metals to verify waste removal.

Four discrete confirmatory samples were collected from each acre of excavation base along Aero Drive and in Area C and submitted for chemical analysis. Six discrete samples per acre were collected from the excavation base along Transit Road. The samples were collected from equidistant locations except when field conditions required otherwise. For the perimeter wetland areas in Area B, a discrete confirmatory sample was collected at 100 foot intervals from the excavation base. Each location was selected in the field with concurrence of the NYSDEC field representative. A summary of the analytical results and drawings showing sample locations are included in Appendix D.

In those cases where the initial chemical results showed that the exposed soil exceeded the soil cleanup criteria, further excavation was performed. Thereafter additional confirmatory samples were collected from the re-excavated areas at the same frequency described above. The additional samples were collected and analyzed only for those compounds that showed exceedances in the initial samples. This was repeated where necessary, until the entire excavated area met the soil cleanup criteria acceptable to NYSDEC.

In addition to the chemical testing, Earth Sciences performed a radiological close-out survey over the entire exposed excavation area. The survey was designed to incorporate

the general guidance found in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) U.S. Environmental Protection Agency (USEPA), 1997. The final status survey plan dated March 2001 was submitted to NYSDEC and approved as a separate document. The survey showed that the areas cleared during waste consolidation activities have no radiological impact above background and are suitable for unrestricted use (see Section 12.0).

During excavation of the waste from the Zelasko property, it was observed that a layer of solid waste up to 3 feet thick and comprised of cinders, glass, brick, and similar materials is located beneath small portions of three non-residential buildings. The solid waste is located beneath a 2 to 4 foot layer of imported sand and gravel fill. No chemical odors or visual chemical presence was observed, and radiological scanning of the vertical faces of the waste showed no levels above criteria. Based on the above and the desire not to impact the structural integrity of the three buildings, NYSDEC verbally gave its concurrence to leave the waste in place.

On June 14 and 15, 1999, ten samples of the native soil in the area of planned excavation were collected and submitted for analysis of polychlorinated dibenzo-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). This sampling rate provided one discrete sample for every 3 acres of excavation. The reason that the samples were collected and analyzed prior to the start of construction was so that the extended time period needed for dioxin and furan analyses would not slow down the progress of waste excavation and consolidation. These samples were collected from 0.5 to 1.0 foot below bottom of the waste interval. This interval was selected because it was the minimum depth to which the excavation of wastes was to occur and therefore was representative of worst case conditions that would remain following excavation. The locations of the dioxin confirmatory samples are shown on Drawings G-04 and G-05.

The analytical results were submitted to the NYSDEC on August 26, 1999. The Toxicity Equivalent (TEQ) is calculated by multiplying a congener's concentration by its Toxicity Equivalent Factor and summarizing the results. The greatest TEQ value calculated was 0.078 nanogram per gram (μg/g) or parts per billion (ppb). NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 entitled "Determination of Soil Cleanup Objectives and Cleanup Levels" dated January 24, 1994 does not provide a recommended soil cleanup objective for PCDDs/PCDFs. TAGM 4046 does provide an allowable soil concentration of 0.6 ppb and a soil cleanup objective of 60 ppb to protect groundwater for 2,3,7,8-tetrachloro-dibenzo-p-dioxin. Because the highest TEQ is significantly less than these levels, dioxins are not present at concentrations of concern in the native soils deeper than 0.5 feet below base of waste and no further confirmatory

soil sample collection and analysis of dioxins in the waste excavation areas was performed following waste excavation.

The analytical results from the confirmatory soil samples were compared to the cleanup objectives presented in the NYSDEC TAGM4046 and to the radiological close-out survey levels to ensure that waste materials had been removed. A summary of the chemical cleanup objectives for the preliminary Site Specific Parameter List (SSPL) for soils are presented in Table 3.1 of the Final Design Report. The chemical results and radiological close-out survey levels were submitted to NYSDEC for approval prior to backfilling. Additional details regarding the radiological close-out surveys and survey levels are provided in Section 12.0.

In summary, soil samples were collected and analyzed for chemical parameters from 212 locations. No VOCs were detected above the TAGM level except for one low-level exceedance of acetone in one sample (i.e., B6-1 at 190 micrograms per kilogram [µg/kg] versus the TAGM level of 110 µg/kg). PCBs were not detected in any of the final confirmatory soil samples above the TAGM 4046 level of 1 milligram per kilogram (mg/kg).

Six of the seven SVOCs detected in the final confirmatory soil samples at concentrations above their TAGM 4046 levels were polyaromatic hydrocarbons (PAHs). The PAHs were detected slightly above the TAGM 4046 levels in 13 of the 212 samples. The PAH compounds with exceedances are those that have very low TAGM 4046 levels, in fact so low that the TAGM 4046 level gives as an option the analytical method detection level (MDL). Review of the final PAH exceedances, shows that only 2 of the 13 exceedances were greater than the MDL, and the greatest of these was benzo(a)pyrene at 380 µg/kg (versus the TAGM 4046 level of 61 µg/kg or MDL) in sample K12-1. The other SVOC compound detected at concentrations above its respective TAGM 4046 level was phenol (1 of 212 samples, C6-4 at 58J µg/kg). Because the SVOC concentrations are low level and these soils are covered with clean imported soil, the exceedances are believed not to be of concern. NYSDEC concurrence of this belief was obtained on an ongoing basis for each set of sample results received during the time period of the waste excavation and backfilling.

The metals with exceedances were principally calcium and magnesium, which are common metals in the soil in the local area due to the geology (i.e., dolomitic rock). The metals with the next greatest number of exceedances are thallium (70 of 212 samples) and zinc (93 of 212 samples). In general, the exceedances are low level ranging from 2 to 3 times greater than the respective TAGM 4046 level. For thallium, the exceedances are

so low-level that 35 of the 70 exceedances were below the laboratory reporting limit. The remaining metals with exceedances are summarized below.

Metal	*TAGM 4046 Level (mg/kg)*	*Maximum Concentration (mg/kg)*	*No. of Exceedances of 212 samples*
Arsenic	12	12.7	2
Cadmium	1	5.1	13
Copper	50	138	5
Cyanide	0.58	1.2	1
Mercury	0.2	0.32	3
Nickel	25	48.1	16

It is believed that the noted metals exceedances are not of concern, for the following reasons:

i) calcium and magnesium are metals common to the area;

ii) zinc and thallium exceedances are low level;

iii) the remaining metals listed above had infrequent and low-level exceedances; and

iv) the soils have been covered with several feet of clean imported soils.

NYSDEC concurrence of this belief was obtained on an ongoing basis for each set of sample results received as the waste excavation and testing progressed.

The areas from which waste were removed were backfilled with either Type S2 or S3 soils. Type S2 soils (pit run sand) were used in the excavated waste area located outside of the perimeter barrier system and Type S3 soils (clay) were used in the excavated waste area located within the perimeter barrier system adjacent to Aero Drive.

The excavated areas were backfilled with 299,000 cubic yards of clean imported soil with a grade of 0.5± percent to the adjacent roadway/Site boundary. The backfill consisted of approximately 191,500 cubic yards of Type S2 material and approximately 107,500 cubic yards of Type S3 material. The permeability of the imported clean soil along Aero Drive, within the perimeter barrier system (i.e., Type S3), is 5×10^{-6} centimeters per second (cm/sec), or less, to reduce precipitation infiltration through the backfilled areas to the perimeter groundwater collection system.

To further reduce precipitation infiltration from the area backfilled with S3 and subsequently migrating to the groundwater collection system, the designed cross section

was modified so that the S3 would be placed directly against the perimeter barrier system, rather than installing a 2-foot thick layer of more permeable Type S1 material adjacent to the barrier section (see submittal dated June 12, 2001 in Appendix A).

Material Types S2 and S3 were chemically and geotechnically tested at the required frequencies. The testing results for the materials were provided to NYSDEC as received and thus are not included in this report. NYSDEC approvals for Type S2 are included in Appendix E and for Type S3 in Appendix F. The clean imported soil was covered with 4 inches of soil capable of supporting vegetative growth and a vegetative layer. It is noted that the testing requirements were modified so that hydrometer testing of the S2 soils was not performed. NYSDEC approval for this modification was received on April 4, 2001 (see Appendix A).

4.0 PERIMETER BARRIER CONTAINMENT AND GROUNDWATER COLLECTION SYSTEMS

The perimeter barrier containment and groundwater collection systems (perimeter barrier system) encircles the consolidated Site wastes in Areas B and C. The purpose of the perimeter barrier system is to minimize the migration of overburden groundwater to off-Site areas and into the bedrock. This hydraulic control will be achieved by maintaining an inward gradient across the perimeter barrier system and, to the extent practical, an upward gradient from the bedrock to the overburden within the perimeter barrier system. The perimeter barrier system consists of a hydraulic barrier composed of a collection drain supplemented with a physical vertical barrier along the outside of the hydraulic barrier.

The waste excavation and consolidation described in Section 3.0 removed the sources of chemicals to the groundwater from the area outside of the perimeter barrier system. Historical groundwater analytical results have shown that the Site has had limited impact on the groundwater outside of the existing waste footprint. This limited impact is expected to decrease through natural attenuation processes because the source has been removed. Groundwater sampling and analysis, described in the O&M Plan, will be used to monitor the fate of the groundwater in the areas from which the waste has been removed.

The alignment of the perimeter system is shown on Drawing C-01. Existing Site wastes previously located outside of the perimeter barrier system have been placed within the perimeter barrier system. Details of the perimeter barrier system are presented in the following subsections.

4.1 EXCAVATION

Excavation for the installation of the perimeter barrier system was performed using a trackhoe. Excavated material was placed directly into an off-road dump truck and placed in a fill area on the Site. When placed in the fill area, the placed material was graded in lifts not exceeding 24 inches and compacted with a sheeps-foot roller or landfill type compactor. Excavation continued to the designed sub-grade elevations. The elevation of the excavation was monitored daily by a surveyor using a laser level. The Final Design Report specified surveying at a spacing of 20 feet. A variance to perform surveying at a 50-foot spacing was verbally granted by NYSDEC on May 17, 2001. Excavation activities proceeded from one manhole to either the upgradient or downgradient manhole. The vertical barrier wall and groundwater collection drain

piping, wet wells, and manholes were then installed prior to continuing excavation to the next manhole/wet well.

4.2 VERTICAL BARRIER

The purpose of the vertical barrier is to prevent the collection drain system from collecting clean off-Site groundwater and prevent the dewatering of adjacent wetlands. The vertical barrier material is constructed of 40-mil very flexible polyethylene (VFPE). The base of the VFPE liner was placed in the bottom of the collection drain trench. The VFPE wall liner was anchored in to the bottom of the trench with a minimum of 2 feet of compacted clay (except from MH-20 to MH-21 where cement was used). The VFPE wall is connected to the landfill cap VFPE liner to create a continuous barrier. Drawing C-11 presents a typical detail of the barrier wall.

The liner was installed by unrolling individual panels which were either 34.5 feet or 22.5 feet wide. Liner panels were overlapped approximately 6 inches, and seams were welded in accordance with the manufacturer's specifications. Any soil or debris was removed from the seams to ensure proper sealing. The liner panels and seams were tested in accordance with the Construction Quality Assurance Plan (CQAP). The testing results are included in Appendix K.

Because of the minor folds and wrinkles that were being created in the liner due to the irregular nature of the trench, a request was submitted July 10, 2001 to allow horizontal cuts to remove the folds/wrinkles and to reseal the liner using double wedge welding. This change was approved by NYSDEC on July 20, 2001 (see Appendix A).

After excavation and before VFPE placement, the outer trench sidewall against which the VFPE liner was to be placed, was inspected and any sharp objects that could potentially puncture the liner were removed. A geotextile was placed against the inner side of the VFPE to prevent damage to the liner by the crushed stone drainage media (Type A3) used for the groundwater collection system. The original design specified that the entire excavation located beneath the liner would be filled with the crushed stone drainage media. To reduce the quantity of crushed stone required, it was proposed on May 24, 2001 to place a minimum thickness of 3 feet of the drainage media from above the HDPE collection pipe to the gas venting layer, thereby providing a continuous layer of highly permeable material against the placed waste. The remaining space above the 3-foot thick layer to the elevation at which the VFPE liner was to be placed was backfilled with native soils or Type S2 soils. To prevent infilling of the drainage media with these soils, a geotextile was placed on top of the drainage media

prior to placement of the native or S2 soils. This modification was approved by NYSDEC on May 31, 2001 (see Appendix A). This modification was further revised by reducing the minimum thickness from 3 feet to 2 feet on or about June 25, 2001, with NYSDEC verbal concurrence.

4.3 GROUNDWATER COLLECTION SYSTEM INSTALLATION

The groundwater collection system consists of approximately 10,000 feet of a groundwater collection drain with 6 wet wells, 26 manholes, and a forcemain system. The collection drain was installed in a common trench with the barrier wall. The wet wells were constructed using 6-foot diameter pre-cast concrete units to provide sufficient area for the installation of the pumping systems. The manholes were installed within the alignment of the collection drain for maintenance purposes. The access manholes are 4-foot diameter pre-cast concrete units. Plan and profile drawings of the collection system are shown on Drawings C-02 to C-08.

The groundwater collection drain was constructed using an 8-inch diameter perforated high-density polyethylene (HDPE) pipe bedded in stone drainage media. The pipe and bedding collect the groundwater and channel the groundwater to the wet wells. Water is pumped from the wet wells to a meter chamber from which it is pumped via a 6-inch diameter HDPE forcemain for discharge to Town of Cheektowaga's sanitary sewer system, which subsequently transports the water to the City of Buffalo's wastewater treatment plant (BSA). The wet well chambers were equipped with platforms, a forcemain connection, isolation valves, submersible pumps, and electrical and control cables. Local instrumentation in each wet well includes a flowmeter and level transmitter which transmits signal information to the control panel.

4.3.1 GROUNDWATER COLLECTION DRAIN INSTALLATION

The installation of the groundwater collection drain was performed following excavation for the barrier wall liner. Once the wall liner was keyed into the underlying clay, the excavation for a wet well, manhole, or collection drain piping was backfilled to reach the design pre-grade elevation. Bedding stone for the manhole/wet wells was fine graded by hand. Once the placement of the bedding stone was completed, the pre-cast concrete sections were set in place using a trackhoe.

Bedding stone for the collection drain piping was rough graded by the trackhoe performing the excavation operation. The HDPE pipe sections were welded together by

electronic fusion to the approximate length of the run between each of the manholes. In the case where the pipe was to be installed into a wet well, a 10-foot length of solid pipe was welded onto that end of the pipe. The natural flexibility of the pipe allowed for the placement of the pipe in the trench as excavation progressed. The welding of the pipes was performed on the adjacent ground surface rather than in the trench for ease of construction. Pipe placement into the trench followed approximately 100 feet behind the excavation activities. As the wet wells and manholes were installed, the pipe was cut to length and installed in the wet well/manhole. Pipe penetrations in the manholes and wet wells were sealed using hydraulic cement waterplug from the exterior. Additional waterplug on the interior was placed in the spring of 2002. This method was used to keep sediment and other solids from entering the manhole but was not intended to be watertight. Pipes are installed sloping toward the wet wells. The minimum allowable slope of the collection drain pipe is 0.3 percent. A significant portion of the flow in the collection drain will, however, occur in the granular media as a result of the hydraulic gradient along the collection drain trench. Drawing C-11 presents a typical collection drain trench detail.

Once the pipe was in place, the excavation was backfilled to the specified elevation with engineered stone backfill (Type A3). The drain trench was backfilled with granular material to the gas venting layer located below the flexible membrane liner (FML). The granular media has a minimum hydraulic conductivity of 1×10^{-2} cm/sec and a maximum of 5 percent fines passing a number 200 sieve. This backfill was not compacted to maximize the pore space in the stone for maximum hydraulic conductivity. The geotextile was then placed over the stone backfill prior to placing the native and S2 soils to complete back filling. After backfilling had been completed, the collection drain piping was tested and described in Section 4.6.

Access manholes for inspection and maintenance purposes were installed at each significant change in direction of drainage system alignment as presented on Drawing C-01. A total of 26 access manholes were installed and constructed of standard precast concrete with a nominal barrel diameter of 4 feet and equipped with vented manhole covers and a rung ladder for maintenance access. Ladder rungs were constructed of galvanized steel or coated with polypropylene for corrosion resistance. The top of the access manholes extends approximately 1 foot above final grade. Drawing C-11 presents a typical manhole detail. It is noted that MH-19 and MH-26 were deleted because the additional waste excavation decreased the length of the perimeter barrier system.

The Final Design Report specified chemical testing for material Types A1 to A5. Because this material is not soil but quarried crushed rock from a licensed quarry, it was agreed

that chemical testing of these materials would not be necessary. NYSDEC approval to eliminate the chemical testing was received on April 5, 2001 (see Appendix A).

The original design included the installation of benching in the manholes. The design was modified to delete the benching. By eliminating the benching, each manhole is now available for use as a sump from which accumulated sediment can be removed. This should assist in preventing the perforated pipes from becoming plugged. NYSDEC approval for this modification was received by letter dated July 20, 2001 (see Appendix A).

Six wet wells were installed in the collection drain alignment at the low-point locations shown on Drawing C-01. The wet wells were constructed of standard precast concrete, with a nominal barrel diameter of 6 feet. The wet wells are equipped with manhole covers and polypropylene coated rung ladders and safety platforms for maintenance access. Each wet well has a sump that extends 2 feet below the lowest pipe invert entering the wet well. Drawings C-12 and M-01 present typical wet well details.

Approximately 12 inches of No. 2 crusher run gravel was placed under the base of the manholes and wet wells for support. The excavation above the base of the manhole or wet well was backfilled with compacted clay to the elevation matching the surrounding confining unit.

A meter chamber was installed adjacent to access manhole No. 25 as shown on Drawing C-09. The meter chamber houses the flow meter and sample collection port to monitor off-Site groundwater discharge. The chamber is constructed of standard precast concrete and is 10 by 6 feet in size. Details of the meter chamber are shown on Drawing M-02.

The wet wells and access manholes also provide access for the forcemain and serve as pullboxes for electrical conduit wiring. All electrical connections made within the wet wells/manholes meet the requirements of an explosion proof environment.

After backfilling the collection drain piping, the forcemain was installed between the wet wells and the meter chamber. The forcemain was constructed of butt-fused 3-inch and 4-inch piping with a 6-inch diameter HDPE pipe run from MH-25 to the meter chamber and continuing to the 15-inch diameter sanitary sewer extension constructed from the existing end of the sewer line on Rein Road to a location on Aero Drive opposite the Site discharge point (see Section 5.0). The piping was installed at a minimum depth of 5 feet below ground surface (BGS) for frost protection.

The section of forcemain between the temporary wastewater treatment plant and the point of discharge at sanitary sewer MH #1 of the sanitary sewer extension was installed prior to the installation of the other sections of forcemain. This section of forcemain was installed to enable its use during construction dewatering operations as described in Section 4.4.

The forcemain was backfilled with imported clean soil (Type S2). The clean soil was placed in 24-inch lifts and compacted with a smooth drum roller. After installation and backfilling, the forcemain was pressure tested as described in Section 4.6.

A pre-engineered building has been erected at the Site to house the electrical and control panels for the system. The building was installed at the location shown on Drawing C-09. Details of the building are shown on Drawing A-01.

4.3.2 INTERIOR GROUNDWATER COLLECTION SYSTEM

The purpose of the interior groundwater collection system is to dewater a central area of the Site where the groundwater modeling in the Preliminary Design Report showed that an upward hydraulic gradient may not be achieved by the perimeter barrier system.

There were two areas where the model showed that an upward gradient would not be established by the perimeter barrier system. One of these areas (i.e., in Area B) was addressed by the installation of the collection drain in the location shown on Drawing C-10. Approximately 985 feet of interior collection drain was installed in the southwestern portion of Area B. The other area (i.e., in Area C) was addressed by the revised alignment of the perimeter groundwater collection system.

The interior collection drain consists of a 24-inch wide (minimum) by 4-foot deep granular trench and 8-inch diameter perforated HDPE collection tile. The trench was installed as close to the confining unit surface as possible while maintaining a constant grade. The granular media has a minimum hydraulic conductivity of 1×10^{-2} cm/sec and a maximum of 5 percent fines passing the number 200 sieve. The remainder of the trench was backfilled with excavated materials of adequate grain-size to reduce the potential for clogging of the granular media. The interior collection drain was installed at a slope of 0.3 percent and drains by gravity to the perimeter barrier system where it is connected to the perimeter collection drain at MH-27. The interior collection drain is installed at depths ranging from 8 to 14 feet BGS. The interior collection system plan and profile is presented on Drawing C-10. Access cleanouts are provided at the mid-point and termination point of the interior system.

4.4 DEWATERING

To install the groundwater collection drain it was necessary to dewater the excavation. The groundwater collected from the dewatering operation was treated prior to discharge to the BSA. Analytical data summaries and data validations for samples collected and analyzed in accordance with the BSA discharge permit were provided to the BSA and NYSDEC on a monthly basis and thus are not included in this report. In summary, analytical results indicated that no exceedances of the discharge permit occurred during the construction dewatering activities.

4.5 WET WELL MECHANICAL AND ELECTRICAL COMPONENTS

Wet well construction included the installation of the mechanical and electrical components of the collection system. Mechanical details are shown on Drawings M-01 and electrical details are shown on Drawings E-08 to E-10. A working platform consisting of grating and supports was installed in each of the wet wells at 3 feet - 10 inches below the top of manhole. The working platform provides a stable and safe working surface from which to install the remaining mechanical and electrical components in the wet well and from which to perform future maintenance activities. Also, the working platform eliminates confined space entry requirements for work performed at or above the depth of the platform.

The pumping system in each wet well consists of a submersible sump pump connected to a guide rail system. The pump is connected to the forcemain using a quick connect coupling. The combination of the slide rail and the quick connect allows the pump to be removed for maintenance purposes without the need to dewater the wet well or having personnel enter the confined space area of the wet well chamber.

Forcemain piping within the wet well is constructed of chlorinated polyvinyl chloride (CPVC) pipe. The pipe is supported using stainless steel brackets and concrete anchors. A check valve and a ball valve are installed in the forcemain within the wet well to provide localized flow isolation to assist with O&M activities.

The forcemain was constructed in continuous runs between manholes. At each manhole/wet well, flexible hoses were used to join the sections of forcemain. The flexible hoses are made of stainless steel to allow for misalignment and/or expansion of the lengths of forcemain. The resulting system consists of one forcemain for the north

side (from Wet Well 3 to MH-25) and one for the south side (from WW-4 to MH-25). The two forcemains are connected together inside MH-25 and the combined flow is fed into a 6-inch forcemain to the meter chamber.

The 6-inch forcemain enters the meter chamber and reduces down to 3 inches. It then goes through a magnetic flowmeter (which provides instantaneous flow and flow totalization), expands back to 6 inches, and then exits the chamber. The forcemain continues under Aero Drive where it discharges into sanitary sewer Manhole #1 (Drawing C-09).

Power and control cables were run to each wet well from the control building. The cables consisted of separate conductors inside two separate 2-inch plastic-coated steel conduits (one for 480 volt power, one for 4-20 milliamp signal). The cable was installed adjacent to the area of the excavation for the groundwater collection drain. Sand was used as bedding for the cable and to backfill the excavation above the cable. In the wet wells, the cables were terminated in junction boxes. Separate conduit and junction boxes were used for power and control applications. All pump controls, power sources, and alarm systems are located in the control building.

The six wet well pumps turn on and off based on individual level controls in each of the wet wells. Wet Wells 4 and 5 flow into the southern forcemain, and Wet Wells 1, 2, 3, and 6 flow into the northern forcemain. The level transmitters are loop-powered 4-20 ma signals, which feed level data to a PLC-based controller in the control building panel. Each wet well has a 2-inch magnetic flowmeter, which is 110 volt powered, which transmits a 4-20 ma flow signal to the control panel indicating instantaneous flow for each pump and allows total flow for each pump to be compiled.

The well pumps are submersible Goulds Model 3885 of two different sizes, as listed below.

Wet Well Number	*Pump Horsepower*
1, 2 and 5	0.75
3, 4 and 6	1.5

Electrical ground testing results are provided in Appendix H. All tests were acceptable.

4.6 SYSTEM TESTING

Following completion of the installation of the forcemain piping, pressure testing of the piping was performed to verify the integrity of the pipe and the welded joints. Testing consisted of filling the forcemain with water and pressurizing the pipeline to approximately 100 psi gauge pressure. The pressure was held for two hours. Tests maintained the required pressure, accounting for the allowable pressure drop due to the expansion of HDPE pipe per the manufacturer's literature. Pressure test results are included in Appendix G.

To check that the groundwater collection drain piping was not crushed and that no blockage was present within the pipe, each section was evaluated by pulling a ball approximately 5-inch diameter through the piping to confirm that no restrictions were present within the bore of the pipe. The ball was pulled from manhole to manhole. The CRA Site representative witnessed the pulling of the ball through each section of the groundwater collection drain piping. No restrictions were identified in any section of the groundwater collection drain piping. A summary of the dates the ball was pulled through each section of the groundwater collection drain piping is included in Appendix G. The stainless steel cable used to pull the ball through the collection pipe was left in place with each end tied to the ladder in the manhole/wet well.

4.7 WET WEATHER OPERATING PLAN

A wet weather operating plan was developed using flow data provided by the Town. Pursuant to the plan, discharge of Site waters to the sanitary sewer is to be temporarily shutdown during extreme storm events, to prevent discharge of Site groundwater which could bypass the BSA treatment facilities. The perimeter barrier system has been designed such that the shut-down/start-up of the perimeter barrier and collection system can be performed at a remote location. This enables the Town to shutdown and restart the pumping system as necessary. A copy of this plan was included in the O&M Plan.

During a storm event shutdown or other shutdown required for system maintenance, the storage volume available in the dewatered materials within the contained Site will be used to store the infiltration occurring during the shutdown. If a shutdown were to occur for 48 hours, approximately 0.1 feet of waste/fill would be resaturated. This small thickness would not result in the creation of an outward gradient. It is noted that the existing uncontrolled Site conditions have not significantly impacted off-Site areas. Thus, a short term shutdown of the controlled Site is expected to have no adverse impact on off-Site areas. It is also believed that a 48-hour shutdown will be an infrequent event and the resaturated materials will quickly dewater upon restart of the pumping system.

5.0 SANITARY SEWER EXTENSION

Approximately 810 feet of 15-inch diameter polyvinyl chloride (PVC) pipe was installed as an extension of the existing Town of Cheektowaga sanitary sewer system. This extension began at the existing sewer at a manhole located approximately 230 feet south of the intersection of Rein Road and Aero Drive. The sewer extension runs northward on the east side of Rein Road to a new manhole (MH-3) at the southeast corner of the Rein Road and Aero Drive intersection, then runs eastward along the south side of Aero Drive for approximately 600 feet, terminating at a newly installed manhole (MH-1) where the permanent 6-inch diameter HDPE forcemain from the Site ties in. The installed elevations and plans are shown on Drawing C-09.

The water from the sewer on Rein Road flows southward to a pumping station (lift station) operated by the Town at Rein Road and Genesee Street.

Excavated material was placed directly into dump trucks and placed in a fill area in Area C. As the excavation advanced, stone bedding was placed in the bottom of the excavation. The stone bedding was graded using the backhoe. Dewatering, required during excavation and stone bedding placement activities, was performed by pumping water to the local ditches.

Two 6-inch diameter branch tie-in points were installed to allow future connection for the Leone property and to the auto body shop building as requested by the Town. Prior to the sewer installation, National Fuel relocated the gas line paralleling Aero Drive from the Rein Road connection to the Leone property. This 2-inch gas line was moved southward approximately 12 feet and now runs approximately 8 feet south of the 70-foot Aero Drive right of way (see Drawing C-09A).

During construction of the sewer extension, all the existing 24-inch diameter storm culvert and catch basins were removed along Aero Drive and the existing swales were eliminated. New 24-inch diameter culvert was run along Aero Drive and a section of 12-inch was added along Rein Road. This culvert addition eliminated all the grass (marsh) swales along the eastern shoulder of this section of Rein Road and the southern shoulder of Aero Drive.

Topsoil and seed were added along the Buffalo Trucking property to replace green space pursuant to a request from the Town. After installation, the newly installed 6-inch diameter forcemain and 15-inch diameter sanitary sewer were tested.

All tests were completed and accepted by the Town of Cheektowaga including pressure testing of the 6-inch forcemain, pressure testing of the 15-inch sanitary sewer, an exfiltration test, and a deflection test. Results of the tests are included in Appendix G.

All fencing and landscaping was returned to the prior condition or better after the installation.

Written certification was submitted in September 21, 2001 to the Erie County Health Department that the sanitary sewer was constructed in accordance with the approved plans (see Appendix A).

6.0 GROUNDWATER TREATMENT

All of the groundwater generated by on-Site construction dewatering and collected by the perimeter barrier system and the interior collection system during RA construction from June 1 to October 9, 2001 was discharged to the BSA after pretreatment using an on-Site temporary treatment system constructed and operated by Sevenson. Between October 12 and November 14, 2001, the treated water was discharged to either the BSA or Aero Creek. The reason for the discharge to Aero Creek was that the BSA permit limit for discharge of Site water to the sanitary sewer was 250 gpm. Because of intensive precipitation in the Fall of 2001, a higher flow rate was needed to dewater the Site for construction. A request to discharge treated water to Aero Creek was approved on October 9, 2001 by NYSDEC. Discharge of treated water to Aero Creek occurred from October 12 to December 19, 2001 with a total volume of approximately 7,773,000 gallon.

Based on the chemical concentration history for the influent to the temporary system, an application was made to discharge water from the Site directly to the BSA without the need for pretreatment. This request was made due to the low level concentrations of the collected waters. This request was approved by the BSA and the Town on November 1 and 8, 2001, respectively. After November 14, 2001, some of the water was discharged directly to the BSA without pretreatment and some of the water was treated for discharge to Aero Creek. A total of approximately 21,787,000 gallons of treated water had been discharged to the BSA by that date. After December 19, 2001, all waters were discharged directly to the BSA without pretreatment. A summary of discharge volumes for 2002 is presented in Appendix I.

The discharge location from the Site to the sanitary sewer system was the eastern most manhole MH1 of the 15-inch sanitary sewer extension on Aero Drive as shown on Drawing C-09.

A permanent (3-year) permit was obtained from the BSA for this discharge (see Appendix B). Monitoring of the discharge during the life of the initial permanent permit is being conducted on a monthly basis.

Analytical data summaries and data validations were provided to the BSA and NYSDEC on a monthly basis and thus are not included in this report. In summary, the analytical results indicated that no exceedances of the discharge permit occurred during construction of the remedy.

7.0 WETLANDS CONSTRUCTION

Figure 9.1 of the Final Design Report showed the creation of small areas of wetland along the west and north sides of Area B. Based on the revised grading plan along the west side, it was determined, with NYSDEC concurrence, that the planned wetlands in this area need not be constructed. Thus, hydric soils and wetland plantings were placed only in the areas between the north landfill property line and Aero Creek to create wetland areas. The following sections describe the activities performed to construct these areas.

7.1 INTERIM HYDRAULIC MONITORING/ROUGH GRADING

Following removal of the wastes along the Site's northern boundary, the south shoreline of Areo Creek was rough graded and water levels were measured. The water levels were measured at six staff gauges to confirm the elevations necessary to support wetland and plantings. The water levels, monitored from July 17 to August 21, 2002, were used to evaluate the acceptability of the rough grade elevations to ensure that the hydric soils, when placed, would alternate between submerged and non-submerged conditions during a year. The rough grading was found to be acceptable.

7.2 HYDRIC SOIL PLACEMENT

Hydric soils were placed in the areas between the landfill and Aero Creek on the north side of the landfill to enhance the re-establishment of wetland vegetation along the shoreline. Hydric soil was obtained from the Buckhorn Marsh on Grand Island. Prior to transporting the hydric soil to the Site, existing analytical chemical results were used to meet the specification requirement to perform one chemical analysis for each 2,000 cubic yards of material imported to the Site. The analytical results showed that no compounds were present in the hydric soil above regulatory concentrations. Laboratory reports for these chemical analyses are included in Appendix J. The results also showed that the Total Organic Carbon (TOC) was lower than the project specification of 12 to 20 percent. Compost material was chosen to supplement the hydric soil to increase the TOC of the soil. Compost material from the Town of Amherst was tested and approved by NYSDEC and NYSDOH despite low levels of volatile compounds and mercury. The approval was given because the planned mixture ratio of 11 parts hydric soil to 1 part compost would decrease these low level concentrations. This mixture produced a TOC of 17.5 percent by weight.

The results of analysis of the compost material and the hydric soil/compost material mixture are included in Appendix J.

The hydric soil was transported to the Site and placed into stockpiles along the alignment. After mixing with the compost, the hydric soil was placed an approximately 12-inch thick lift in the area.

7.3 WETLANDS PLANTINGS

The planting of wetlands vegetation was performed in the fall of 2002. The area of the plantings is shown on Drawing L-01. Wetland plantings involved the planting of rootstock of the specified species. The different species of plants were randomly interspersed along the length of Aero Creek within each of the appropriate planing zones. Rootstock was placed by hand to ensure that the rootstock was properly embedded in the hydric soil.

To reduce plant predation by Canadian geese, a goose fence consisting of 3/4-inch square open mesh black polypropylene material was installed to a height of approximately 2 feet adjacent to Aero Creek from approximately 15 feet east of the northwest corner of Area B to 100 feet west of MH-10.

Sevenson will perform monitoring and maintenance of the wetland plantings for two years (i.e., until the end of September 2004).

8.0 SURFACE WATER MANAGEMENT PROGRAM

This section of the report presents the implementation of the Surface Water Management Plan (SWMP) for the remediation of the Site. The design constraints were identified in the Final Design Report.

The consolidated wastes were graded and capped as described in Section 9.0. Positive drainage was provided through engineered drainage swales, ditches, and culverts. The SWMP was developed to mitigate the potential impacts of the Site remedy on the overall surface water flow regime. The on-Site ditches and swales have been sized to accommodate a 25-year storm peak flow without flooding or erosion, consistent with Town, County, State, and Federal criteria. Site perimeter ditches have been designed as grass-lined V-notch and trapezoidal channels.

Wetland LA-5 has been incorporated into the RA to naturally retain storm runoff. Runoff in excess of the wetland retention will ultimately discharge to Aero Creek.

To prevent water from Aero Creek flowing southward into the drainage swale, the grades for the drainage swale running from the southwest corner of Area B north to Aero Creek were raised uniformly by 16 inches. This modification in the design was performed on October 31, 2001.

A revised SWMP for Area C was submitted to the NYSDEC on June 7, 2002 to incorporate the grading changes needed because of the extra waste consolidation in Area C and to revise the surface water flow divide (i.e., high point) from approximately the mid-point of the Site along the south side of Aero Drive to the intersection of Aero Drive and Transit Road. The revision of the flow divide location allowed better use of the natural topography and reduced the depth of the excavation needed to construct surface water drainage ditches along Transit Road from the Aero Drive/Transit Road intersection to the ConRail tracks located to the south and along Aero Drive from the intersection to the initial flow divide location. The revised SWMP was approved by NYSDEC by letter dated June 18, 2002 (included in Appendix A).

8.1 FLOOD PROOFING

The only on-Site building is the Control Building. The control building was constructed with a floor elevation of 700.5 feet (AMSL), which is above the 100-year flood line elevation of 696.8 feet (AMSL). Thus no permanent flood proofing is required.

8.2 SEDIMENT AND EROSION CONTROL MEASURES

Sediment and erosion control measures, as described in the Final Design Report SMOP for the waste excavation and consolidation and landfill cap, were implemented to address sediment and erosion control during construction. The sediment and erosion control measures were implemented to satisfy the substantive requirements of NYSDEC in conformance with the document "New York Guidelines for Sediment and Erosion Control" (Urban Soil Erosion and Sediment Control Committee, October 1991).

Turbidity monitoring on the perimeter of the Site was performed during excavation and consolidation activities. A HACH Model 2100P turbidity meter was used in 3 to 4 locations typically 4 times a day during construction along Aero Creek. The frequency was increased during periods of precipitation or when working in areas adjacent to the creek. The frequency was decreased to 2 times a day in dry periods (i.e., late summer) and to 1 time a week during periods when no construction activities were occurring. These readings were taken to evaluate the effectiveness of the silt fence, hay bales, and other related measures to stop construction materials from migrating into the creek. No exceedances of the allowable turbidity (≤100 NTU above background) were measured during the project.

Results from daily testing was included in the Sevenson daily reports and thus is not included in this report.

8.3 APPROVALS

The Final Design Report stated that construction of the landfill cap within the Ellicott Creek flood plain may require modifications to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). Discussions with FEMA's technical contractor have indicated it is not necessary to go through the approvals process to modify the existing FEMA mapping or to notify FEMA regarding RA activities due to the following:

i) the Site is not in the Ellicott Creek Floodway;

ii) changes to the flood elevation in Ellicott Creek did not occur due to construction of the RA; and

iii) there are no insurable structures existing or proposed within the floodway, flood fringe or 100-year floodplain (the control building was constructed at an elevation greater than the 100-year flood elevation).

9.0 LANDFILL CAP SYSTEM

The final landfill cap was placed over the consolidated Site wastes in Areas B and C of the Site to:

i) reduce infiltration of precipitation into the landfill;

ii) prevent erosion of landfill materials; and

iii) eliminate direct contact with the landfill materials.

The final landfill cap covers the consolidated Site wastes and extends just beyond the perimeter barrier system to limit introduction of surface water runoff into the groundwater collection system.

The final cap was installed in two campaigns, one for Area B and one for Area C. The construction of the landfill cap is presented in the following report sections.

9.1 SITE PREGRADING

Before installing the Site cap, pregrading of the Site was performed to shape the Site to the design grades. Pregrading was performed throughout the duration of work activities as excess material (waste/soil) was generated from the installation of the barrier wall, groundwater collection drain, and the waste excavation activities. Excess materials generated from these activities were placed in designated fill areas of the Site. These fill areas were designated on the design drawings based on the differences between existing Site elevations and the proposed final design elevations of the Site cap.

Soils generated from the waste excavation and groundwater collection drain installation were loaded directly into off-road dump trucks, which were driven through radiation portals, and then hauled to fill areas. These fill materials were graded in lifts not exceeding 24 inches in height and compacted with four passes of a sheeps-foot roller or landfill type compactor.

9.2 LANDFILL CAP

The final cap is a FML cap system, consisting of:

i) a 6-inch gas venting layer;

ii) overlain by a 40-mil thick VFPE liner;

iii) overlain by a 24-inch soil protection layer; and

iv) overlain by a 6-inch layer of soil capable of supporting vegetation.

Details of the constructed cap are presented on Drawing C-24. Drawing C-24 presents a typical section through the sideslope and toe of the cap where the perimeter barrier and collection system is located and a section through the toe of the landfill cap along Aero Drive.

The 40-mil VFPE liner is attached to the vertical barrier wall to minimize potential infiltration from surface drainage courses from directly entering the perimeter collection system.

9.3 LIMITS OF THE LANDFILL CAP

Drawing C-14 presents the limits of the landfill cap. The approximate area of the final landfill cap is 94 acres. The limit of the landfill cap was constructed such that it does not extend further than the existing fence line, waste limit, or the existing or proposed limit of adjacent wetlands.

9.4 FINAL CAP CONTOURS

Drawings C-13 and C-14 present the subgrade and final contours for the landfill cap. The subgrade contours were prepared to the same slope as the final contours of the landfill cap. The contours were constructed with a minimum slope of 4 percent as specified in the ROD. The slopes around the perimeter of the landfill cap are 4H:1V or less.

9.5 SURFACE WATER DRAINAGE

Surface water drainage off the landfill cap is controlled by slopes promoting surface water flow toward existing water courses and drainage ditches along the Site perimeter. The contours of the subgrade layer were constructed to maintain and promote drainage until final cap construction commenced. The final cap drainage plan maintains the same configuration as the subgrade layer. Specific details of surface water drainage are presented in Section 8.0.

9.6 LANDFILL CAPPING MATERIALS

The following sub-sections present the construction details of each landfill cap component.

9.6.1 LANDFILL GAS VENTING SYSTEM

The 6-inch thick gas venting layer was constructed over the placed waste and consists of clean imported 3/8-inch minus washed stone. The stone had a minimum hydraulic conductivity of 1×10^{-3} cm/sec with less than 10 percent passing the No. 200 sieve (i.e., Type A4). Pursuant to the NYSDEC approvals received on April 5 and 18, 2001, chemical testing and hydrometer testing of Type A4, respectively, was not required (see Appendix A) for the gas venting material.

Approximately 71,200 cubic yards of material were used to construct the gas venting layer.

Forty-nine gas vents (one vent per 2 acres) were installed. The gas vent locations are shown on Drawing C-22. The vents convey any landfill gas that may be generated from beneath the low permeability layer of the cap to the atmosphere. The gas venting layer transmits any gas produced to the vents.

The gas vents are constructed of 6-inch diameter solid wall HDPE pipe which is perforated beneath the VFPE cap liner. The gas vents were installed by welding the VFPE collar around the vent to the VFPE cap liner to prevent water infiltration through and around them. A typical detail of the gas vent is shown on Drawing C-24.

9.6.2 LOW PERMEABILITY LAYER

The low permeability layer of the FML cap consists of a 40-mil VFPE liner. Approximately 94 acres of liner were used to construct the FML cap.

Field tests consistent with the CQAP were conducted to ensure appropriate sub-base conditions existed prior to placement of the liner (see Appendix K).

The liner was installed by unrolling individual panels of either 34.5 feet or 22.4 feet wide. Liner panels were overlapped approximately 6 inches and seams were welded in accordance with the manufacturer's specifications. Penetration seals using VFPE collars were used around manholes, wet wells, monitoring wells, gas vents, and around cuts and punctures caused during installation in accordance with the manufacturer's specifications. Any soil or debris was removed from the seams to ensure proper sealing.

The installation and on-Site testing of the VFPE liner were completed consistent with the manufacturer's specifications and guidelines and the CQAP (see Appendix K). After installation, no regular maintenance of the liner is required.

9.6.3 CLEAN IMPORTED SOIL LAYER

A 24-inch clean imported soil layer (Material Type S1) was placed over the FML cap in one lift and compacted using a smooth drum roller. The clean imported soil layer provides both physical and frost protection for the low permeability layer. The clean imported soil layer overlying the low permeability layer is clean imported soil free of materials containing loams, roots or organic matter, contaminants, and debris. The thickness of the clean imported soil layer is sufficient to protect the VFPE liner from the roots of vegetation and from burrowing animals. The clean imported soil was tested for TCL/TAL parameters prior to receipt at the Site. One test was performed every 10,000 cubic yards. The Type S1 material was also tested for geotechnical parameters at the required frequency. The results were provided to NYSDEC as received and thus are not included in this report. Copies of NYSDEC approvals are included in Appendix E. It is noted that the testing requirements were modified so that hydrometer testing of the S1 soils was not performed. NYSDEC approval for this modification was received on April 4, 2001 (see Appendix A). The quantity of clean imported soil required for the landfill cap was approximately 532,000 cubic yards.

9.6.4 SOIL CAPABLE OF SUPPORTING VEGETATIVE GROWTH

A 6-inch layer of soil capable of supporting vegetative growth was placed over the clean imported soil layer to support a vegetative cover. This required approximately 72,600 cubic yards of soil material. The soil consists of 6 inches of tilled, uncompacted soil containing organic material. The soil provides additional frost protection for the low permeability layer. The soil was free of unsuitable materials or debris. The soil has a maximum aggregate size of 1 inch and contains organic matter at 3 to 20 percent with a pH of 5.5 to 7.5. The soil is suitable as a turf growing medium. The soil was tested for pH, organic content, and TCL/TAL parameters prior to receipt at the Site. The results were provided to NYSDEC as received and thus are not included in this report. Copies of the NYSDEC approvals are included in Appendix L.

9.6.5 VEGETATIVE LAYER

The vegetative layer was developed on the surface of the landfill cap. The soil layer will support the growth of the vegetation. The vegetative layer is integral in maintaining the long-term effectiveness of the final landfill cap. The vegetative layer serves to:

i) stabilize the soil against erosion;

ii) minimize percolation of precipitation;

iii) promote evapotranspiration of soil moisture; and

iv) increase the aesthetics of the cap.

The vegetative layer for the cap was developed by seeding and consists of hardy, shallow rooted grasses consisting of 25 percent Creeping Red Fescue Grass, 20 percent Kentucky Blue Grass, 40 percent Perennial Rye Grass, 10 percent Annual Rye Grass, and 5 percent Red Clover. The seed mixture was applied at a rate of 100 lbs per acre. The seed mixture includes a fast germinating grass to prevent erosion of the soil layer.

The vegetative layer was developed and maintained by appropriate mowing such that root penetration remains within the soil layers and will not penetrate to the depth of the low permeability layer.

10.0 SITE FACILITIES

10.1 SITE ACCESS ROADS

As part of the Site cap, on-Site roadways were constructed to provide access to components of the perimeter barrier system. The roadways were constructed with an 8-inch layer of 2-inch minus crushed stone (Type A2) overlain with a 4-inch layer of 1-inch minus crushed stone (Type A1) totaling 12 inches in thickness. Prior to stone placement, a geotextile was placed to help support the roadway. The roadway material was placed prior to the placement of the topsoil. As a consequence, the roadway material received additional compaction effort from the truck traffic hauling the topsoil. It was observed in the field that little or no deflection of the roadway occurred when fully loaded dump trucks moved along the roadway, providing further confirmation of the adequacy of the compaction of the roadway material.

A revision of the layout of the Site roads was submitted to NYSDEC by letter dated November 22, 2001. The revision provided three additional access points from Aero Drive, two approximately 600 west of the Aero Drive/Transit Road intersection and one from Aero Drive to the Control Building. The revision was approved by NYSDEC on November 26, 2001 (see Appendix A).

10.2 CONTROL BUILDING

A pre-engineered building was erected to house the permanent electrical power and control equipment for the groundwater collection system. This control building is detailed on Drawing A-01. The building is approximately 12 feet wide by 20 feet long by 10 feet high, with a slab-on-grade foundation.

The steel building was manufactured by Butler Manufacturing Company (Model PL-1) and includes metal walls with 3 ½-inch fiberglass insulation with an interior metal wall liner and a 3-inch thick Thermaroof system which include 3-inches of insulation board with a metal interior liner and a metal roof. A single 3-foot mandoor and a 6-foot wide double door are installed. A 5-kilowatt electric heater and a 11,500 BTU/hr air conditioner are installed to maintain building temperature.

10.3 WELL INSTALLATIONS

Groundwater monitoring wells and surface water gauges were installed to monitor the effectiveness of the construction remedy. All existing monitoring wells outside of the landfill cap will remain in service except for GW-8S which was abandoned and replaced by an on-Site well and GW-9S which was abandoned and replaced by GW-35S. Drawing G-06 presents the locations of all of the monitoring wells and piezometers required for performance monitoring as described in the O&M Plan. Details of the installed wells are presented on the stratigraphic and well installation logs included in Appendix C. A summary of the well details is presented in Table 10.1.

10.4 UTILITY POLES

There are several locations at the Site where utility poles owned by NYSEG or NMPC could have been impacted by capping activities. These locations are as follows:

i) the north side of Aero Drive within the road allowance;

ii) the north side of Pfohl Road within the road allowance;

iii) the west side of Transit Road; and

iv) the NYSEG easement north of the Consolidated Rail Corporation (Conrail) easement between Pfohl Road and Transit Road.

The actual impact of remedial action construction around the utility poles in these areas is described in the following paragraphs.

For the NYSEG poles located on the north side of Aero Drive, no excavation was performed around these poles. The final ground surface in this area matches existing grade or is raised slightly by, no greater than two feet. Given the minimal change in ground elevation, the RA construction activities did not adversely affect these poles.

For the NYSEG poles located on the north side of Pfohl Road and the west side of Transit Road, only minimal grading (a grade increase of one to two feet or a decrease of approximately one-foot) occurred. Thus, the poles were not adversely affected.

For the NYSEG poles located north of the Conrail right-of-way, the difference between the existing and final grades are 2 feet or less. Thus, these poles were not adversely impacted by the change in grade. However, during waste excavation, approximately 5 feet of landfill waste was removed from around one power pole. This pole was

temporarily supported during excavation and backfill activities. This work was coordinated with the NYSEG.

For the line of NMPC utility poles along the west side of Area B, remedial activities occurred within NMPC's easement. However, the utility poles are situated outside the area of RA construction as shown on Drawings C-07 and C-08 and were not impacted. The activities that were performed in the NMPC easement included regrading and swale construction.

11.0 DRUM REMOVAL

During the excavation/consolidation activities (May 9, 2001 to September 12, 2001), 192 drums, 4 compressed gas cylinders, and portions of drums and related impacted material were found and excavated.

The 192 drums were sampled, overpacked in some cases, and put into rolloff containers. The rolloff containers were shipped to the Chemical Waste Management (CWM) facility located in Model City, New York. Of the 192 drums, 4 were identified to contain hazardous waste and were shipped separately. The other nine shipments were non-hazardous. The hazardous waste manifest is included in Appendix M and the non-hazardous waste manifests are included in Appendix N.

The summary of shipments was as follows:

Shipment Number	*Date Shipped*	*Total Drums*
1	07/17/01	54
2	07/25/01	15
3	08/01/01	15
4	08/08/01	14
5	08/08/01	17
6	08/08/01	14
7	10/03/01	41
8	11/26/01	9
9	11/26/01	9
10	12/21/01	4
		192

CRA submitted a letter to NYSDEC on June 26, 2001 providing information obtained from local compressed gas cylinder suppliers, which indicated that the four cylinders found on Site most probably contained carbon dioxide. Information from Kidde, a cylinder manufacturer, was provided to NYSDEC on July 2, 2001 and supports that the cylinders most likely contained carbon dioxide. Based on safety considerations and the likely contents of the cylinders, the preferred method of handling these cylinders was determined to be reburial on Site. NYSDEC verbally approved CRA's request for reburial on July 6, 2001, and the four cylinders were reburied on Site on July 11, 2001.

12.0 FINAL STATUS RADIOLOGICAL SURVEY PLAN

A final status radiological survey of the 36± acres from which the wastes were removed was performed to document the "as-left" radiological condition of the cleared area and to demonstrate compliance with the approved acceptance criteria. This survey was conducted in accordance with the NYSDEC-approved Surface Soil Final Status Radiological Survey Plan (SSFSRSP) (Earth Sciences Consultants, Inc. 2001) incorporating the technical approach of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) U.S. Environmental Protection Agency [USEPA], 1997). Acceptance criteria developed in the final status radiological survey plan tiered directly to the dose-based criteria (10 millirem [mrem] Total Effective Dose Equivalent [TEDE] per year of exposure) promulgated in NYSDEC TAGM 4003 (1993). As an additional protective measure, the NYSDEC issued a directive (NYSDEC, 2001) limiting separately the residual soil activity concentrations of certain nuclides of radium, thorium, and uranium. Actions demonstrating compliance with these separate limits were also performed in conjunction with the MARSSIM surveys.

The primary objective of the final status survey was to demonstrate that the open land areas cleared during waste consolidation activities are suitable for unrestricted release in accordance with the dose-based criteria of TAGM 4003 and the separate limits provided by the NYSDEC (NYSDEC, 2001).

No modifications were made to the survey plan other than to add additional survey units within Areas B and C to ensure that each Class 2 survey unit was within the 10,000 m^2 land area constraint.

After the waste was excavated from an area of appropriate size (maximum of 10,000 square meters), final status surveys were performed on the exposed open land areas.

12.1 OVERVIEW OF SURVEY RESULTS

The final status survey results (see Appendix Q) were obtained by extensive field and laboratory radiological profiling of "as-left" soil conditions in Study Areas B1 and C1 including the following:

- collection of 249 soil samples, 209 of which were used to document the average Derived Concentration Guideline Level ($DCGL_W$) value for all survey units assessed.

- completion of 498 soil sample radionuclide searches in the laboratory (alpha and gamma spectroscopy), requiring at least 663 detector-hours of viewing time, to acquire the emissions spectra of the 8 radionuclides that could potentially be identified in each soil sample.
- viewing 1,579,064 square feet (ft^2) (36± acres) of soil surfaces with NaI scintillation detectors. Table 1.1 of the Final Static Survey Report in Appendix Q lists the viewed, or "scanned", distribution of land areas within the two Pfohl Brothers Landfill site study areas.

Status based on the statistical tests performed and summarized in Tables 1.2 and 1.3 of the Final Survey Report, the survey units meet the acceptance criteria for unrestricted release.

With the exception of one small radium light fixture, no material exceeded the background activity concentration by the value listed in Section 2.2 of the Final Status Survey Report. The dial was removed off Site and is to be curated by the Bureau of Radiation Protection of the Pennsylvania Department of Environmental Protection (PADEP).

Another component of the radiological close-out survey was that if a measurement results was at or above the applicable $DCGL_W$, an Elevated Measurement Comparison (EMC) was to be performed. When evaluating the final status survey data for each survey unit, no measurement result was at or above the applicable DCGLw. Therefore, no EMC was performed.

Furthermore, the survey was to identify other radionuclides, if identified. No additional man-made radionuclides were identified by analyses or suspected based on the gross gamma scan results.

13.0 HEALTH AND SAFETY

13.1 GENERAL

Sevenson maintained control of the Site throughout the implementation of the RA and therefore was responsible for the development and implementation of the Site specific health and safety plan (HASP). The HASP was reviewed and approved for use prior to initiation of activities at the Site. Sevenson provided a full time Site Safety Officer (SSO) to perform monitoring and oversight activities as outlined in the HASP.

Personal protective equipment (PPE) was used in accordance with the requirements established in the HASP. During the performance of ground intrusive activities, Site personnel within the exclusion zone were initially required to don respiratory equipment. As intrusive work proceeded, respiratory protection was downgraded by the SSO based on the air monitoring results.

During the excavation and consolidation of wastes at the Site, Level C PPE was used by all personnel entering the exclusion zone. Used PPE was placed in lined overpack drums. The used PPE was disposed of with the excavated soils.

13.2 AIR MONITORING

Air monitoring was performed to evaluate the presence of air borne contaminants to ensure that proper PPE was being worn and to ensure that excessive levels of volatile organic compounds and dust did not migrate beyond the Site perimeter. Air monitoring consisted of real-time monitoring in the breathing zone, area air monitoring, and perimeter air monitoring.

Real time air monitoring was performed on a continuous basis for volatile organic compounds and for dust. Air monitoring for volatile organic compounds was performed using a Mini-RAE photoionization detector (PID). Dust monitoring was performed using a PDM-3 digital dust indicator. Real time air monitoring was performed in the work zone and at three downwind and one upwind locations during the performance of ground intrusive activities.

Area air monitoring was conducted at the perimeter of the Site whenever waste materials were exposed. Area air monitoring was performed at the perimeter of the Site at three downwind and one upwind locations. Sampling locations were established approximately equidistant from the active work area and marked with high visibility

flagging. Area air monitoring was conducted twice a week during the performance of ground intrusive activities and at the initiation of new phases of work. Area air monitoring was conducted for volatile organic compounds and dust using personal sampling pumps equipped with the appropriate filters. PVC collection filters were used for dust and charcoal tubes were used for volatile organic compounds. The filters were sent to an independent laboratory for analysis after sample collection. Analysis included NIOSH methods 7300 (nickel, cadmium, and arsenic) and 32 (phenol).

As a result of odor complaints received by the NYSDEC from neighbors adjacent to the Site, a Site perimeter air sampling program was conducted in July, August and September, 2001. Samples were collected from four locations and analyzed for VOCs and SVOCs by USEPA Method TO-14 and TO-13, respectively. The results were submitted to the NYSDEC and showed that some chemicals were present above their odor threshold however, the air quality did not pose any health risks to the construction area or the neighboring areas.

13.3 RADIOLOGICAL MONITORING

Radiological monitoring was performed on personnel involved with the waste excavation and consolidation. The scope and results of the monitoring activities performed are described in the document entitled "Radiological Health and Safety Activities, Summary Report", dated July 2002 and included as Appendix O. In summary, there were no personnel or equipment contamination events above the acceptance criteria recorded during the remedial construction activities.

13.4 SAFETY MEETINGS

Prior to working on Site, personnel were required to attend a Site indoctrination meeting to receive Site-specific hazard training. The indoctrination training was conducted by the SSO. Topics discussed included lines of authority, Site hazards, health and safety protocols, selection and use of PPE, decontamination procedures, contaminants at the Site and related health effects, sign-in procedures, and emergency evacuation procedures.

During the course of the work, health and safety meetings were held on a weekly basis. Relevant general health and safety topics were presented along with Site specific issues. A record of attendance at these meetings was maintained by the SSO.

13.5 REPORTING

Sevenson published a daily report describing the health and safety activities performed during each day including results of all air monitoring, a summary of inspection activities, and other activities. Some exceedances of established action levels were measured at the perimeter of the Site during the performance of the RA. These exceedances were all dust exceedances caused by wind-driven clean material (Types S1/S2). Water trucks were utilized to lessen the dust levels.

14.0 INSTITUTIONAL CONTROLS

A copy of the institutional controls proposed to be implemented for those properties over which the Steering Committee has control to ensure the integrity of the RA and prevent or eliminate the frequency of trespass onto the Site are presented in Appendix P. In summary, the principal controls are:

A. Entire Site

i) On-Site groundwater is not to be used for any purpose other than monitoring for the remedial action; and

ii) No on-site surface water cisterns or similar structures are to be constructed.

B. Capped Areas

i) No access to or use of the capped area without prior written approval of NYSDEC;

ii) No excavation, removal, or disturbance of any soil except with NYSDEC written approval; and

iii) No planting of trees and shrubs whose roots may breach the cap.

C. Cleared Portion Within the Perimeter Barrier System

i) Commercial and industrial development is allowed subject to:

- no residential buildings, schools, or childcare facilities;
- no basements or underground usable space;
- no foundation requiring passive or active systems for water management;
- active or passive soil gas controls are required;
- surface water systems to convey water to existing systems are required; and
- all parking areas must be paved; and

ii) No excavation, removal, or disturbance of any soil within 15 feet of the perimeter barrier system.

D. **Cleared Portion Outside of Perimeter Barrier System**

i) Commercial and industrial development is allowed subject to:

- no residential buildings, schools, or child care facilities;
- no basements or underground usable space; and
- no foundations requiring passive or active systems for water management; and

ii) No excavation, removal, or disturbance of any soil within 15 feet of the perimeter barrier system.

15.0 OPERATION AND MAINTENANCE PLAN

A Site-specific Operation and Maintenance Plan (O&M Plan) has been developed to ensure the safe and effective implementation, operation, and maintenance of the RA. The draft O&M Plan was submitted as a separate document to the NYSDEC on July 25, 2002 (revised October 22, 2002). The final O&M Plan will be submitted as a separate document.

16.0 PRE-FINAL AND FINAL INSPECTION

16.1 PRE-FINAL SITE INSPECTION

The Pre-Final Site Inspection of non-wetland areas was held on August 29, 2002. Representatives of the Steering Committee, NYSDEC, Town, CRA and Sevenson participated in the inspection. A list of the identified punch list tasks is included in Appendix R.

16.2 FINAL SITE INSPECTION

The Final Site Inspection was held on September 26, 2002. Representatives of the Steering Committee, NYSDEC, Town, CRA and Sevenson participated in the inspection. A list of the identified punch list tasks is included in Appendix S.

17.0 SUMMARY

All of the components of the RA were constructed in accordance with the NYSDEC approved design documents and approved modifications issued during progress of the works. The works were completed in advance of the originally proposed schedule and were completed with no safety issues or incidents.

Preliminary monitoring of the groundwater collection system indicates that the remedy is achieving the RAOs.

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18.0 CERTIFICATION

I, Richard J. Snyder, a Professional Engineer in the State of New York, and an employee of R&D Engineering, Inc., certify, based on reviews of record documents submitted with this report, and interviews with persons directly responsible for management of the work that the activities performed for the Pfohl Brothers Landfill Site Remedial Program, with the exception of punch list items still to be completed as described in Appendix S, were performed in accordance with the approved design documents and approved modifications issued during progress of the work.

The certification of this document has been performed by R&D Engineering, Inc. R&D Engineering, Inc., is a member of the CRA family of companies, and is licensed to provide professional engineering services in New York State.

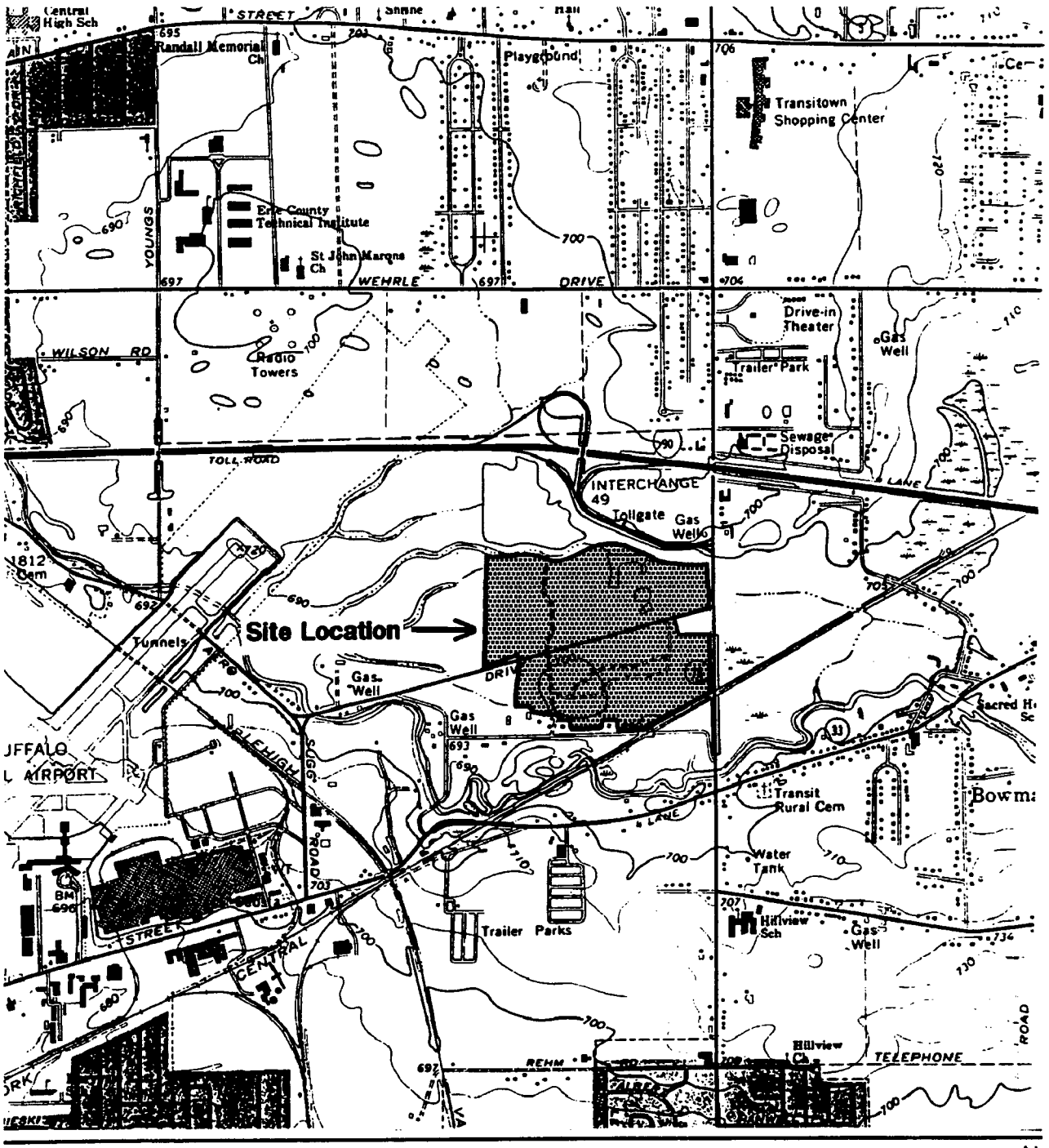
_____

Signature

_____

Date

Buffalo: 268 Main Street, Suite 600, Buffalo, New York 14202
Pittsburgh: 460 William Pitt Way, Pittsburgh, Pennsylvania 15238



Base Map: USGS Lancaster Quadrangle (1965)

Prepared By: Environmental Design & Research, P.C.

figure 1.1

SITE LOCATION

Cheektowaga, New York

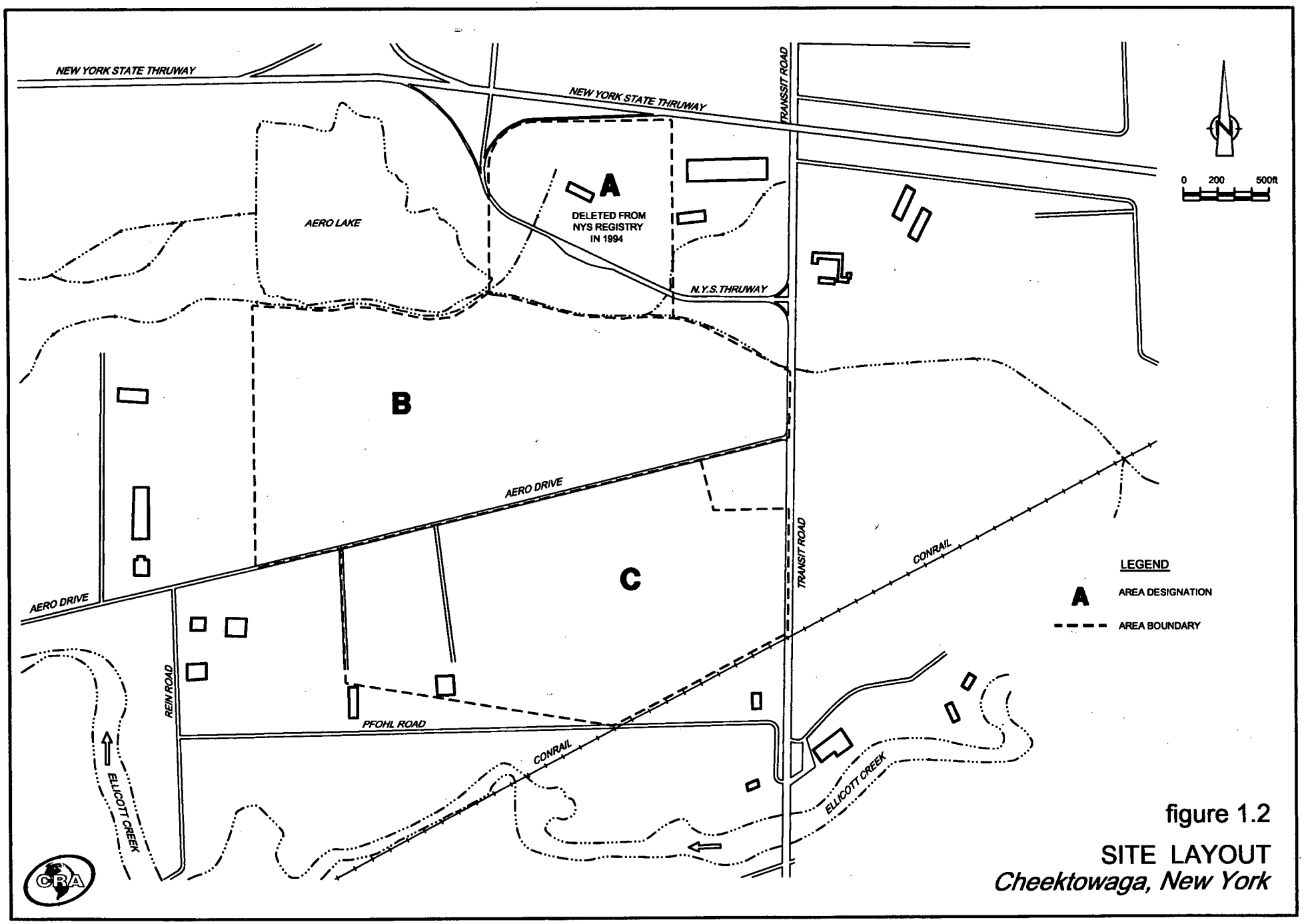


figure 1.2

SITE LAYOUT

Cheektowaga, New York

01979-00(037)GN-WA007 JAN 09/2003

TABLE 2.1

MONITORING WELLS AND GAS PROBES ABANDONED
PFOHL BROTHERS LANDFILL SITE
CHEEKTOWAGA, NEW YORK

Wells Abandoned	*Gas Probes Abandoned*	*Wells Not Found*	*Gas Probes Not Found*
GW-2S	GP-1	GW-10S	GP-3
GW-5S	GP-2	GW-13S	
GW-5D	GP-4		
GW-8S	GP-5		
GW-9S	GP-6		
GW-14S			
GW-15S			
GW-16S			
GW-17S			
EW-1			
EW-2			
EW-3			
MW-1			
MW-2			
MW-3			

TABLE 10.1

WELL INSTALLATION DETAILS
PFOHL BROTHERS LANDFILL
CHEEKTOWAGA, NEW YORK

Well Number	*Date Installed*	*Zone Monitored*	*Elevation Top of Riser*	*Elevation Ground Surface*	*Top of Confining Layer Ft. BGS*	*Installed Depth of Well Ft. BGS*	*Monitored Interval*				*Well Diameter (inches)*
							Top		*Bottom*		
							Ft. BGS	*Ft. AMSL*	*Ft. BGS*	*Ft. AMSL*	
GW-1S	Existing	Overburden	696.19	694.53	12.50	13.6	6.0	688.5	14.0	680.53	2
GW-3S (1)	Existing	Overburden	693.80	692.60	6.30	11.8	4.0	688.6	12.0	680.60	2
GW-4S (2)	Existing	Overburden	699.63	696.91	4.00	16.5	9.0	687.9	17.0	679.91	2
GW-7S	Existing	Overburden	699.51	697.47	32.70	33.3	25.5	672.0	33.0	664.47	2
GW-8SR	August-2002	Overburden	697.50	695.08	10.40	10.5	4.5	690.6	10.5	684.58	2
GW-21S	Existing	Overburden	697.40	695.50	10.00	13.1	5.0	690.5	14.0	681.50	2
GW-28S	August-2002	Overburden	700.95	698.60	13.40	13.4	6.4	692.2	13.4	685.20	2
GW-29S	October-2001	Overburden	699.63	697.50	17.50	18.0	11.0	686.5	18.0	679.50	2
GW-30S	October-2001	Overburden	696.58	693.67	12.00	15.0	9.0	684.7	15.0	678.67	2
GW-31S	October-2001	Overburden	698.62	695.84	6.00	6.5	3.9	691.9	6.5	689.34	2
GW-32S	October-2001	Overburden	698.37	696.19	7.00	7.0	4.0	692.2	7.0	689.19	2
GW-33S	October-2001	Overburden	698.24	695.94	5.50	6.0	2.5	693.4	6.0	689.94	2
GW-34S (3)	August-2002	Overburden	694.77	692.51	2.80	7.5	2.0	690.5	7.5	685.01	2
GW-35S	October-2001	Overburden	697.39	696.19	5.00	5.5	2.8	693.4	5.5	690.69	2
GW-1D	Existing	Bedrock	696.12	694.41	12.50	38.3	18.0	676.4	39.0	655.41	4
GW-3D	Existing	Bedrock	693.88	692.35	6.30	34.5	15.0	677.4	35.0	657.35	4
GW-4D (4)	Existing	Bedrock	699.60	696.43	4.00	45.6	23.0	673.4	43.0	653.43	4
GW-7D (5)	Existing	Bedrock	699.94	697.15	32.70	58.3	38.0	659.2	58.0	639.15	4
GW-8D	August-2002	Bedrock	697.79	695.28	10.90	33.8	13.8	681.5	33.8	661.48	3.875
GW-21D	Existing	Bedrock	697.40	695.36	10.00	38.5	18.0	677.4	38.0	657.36	4
GW-26D	October-2001	Bedrock	698.50	696.10	4.00	38.5	18.0	678.1	38.5	657.60	3.875

Notes:

(1) Obstruction at 7.7 feet BTOC.
(2) Protective casing replaced and well riser repaired August 9, 2002.
(3) Well installed to monitor two wet sandy zones at 2.5 - 2.8 ft. and 6.6 - 7.0 ft.
(4) Protective casing replaced and well riser repaired September 13, 2002.
(5) Protective casing replaced and well riser repaired August 9, 2002.