Engineering Report

Former Landfill IRM
Former IFG Facility
(Site No. 7-34-057)
Syracuse, NY

General Motors Corporation
Syracuse, NY

November 2006

4966/34126

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November 2006

O'BRIEN & GERE
ENGINEERS, INC.

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List of acronyms and abbreviations located within the text

ASTM	American Standard Test Method
CBR	California bearing ratio
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CQA	Construction quality assurance
CQC	Construction quality control
CRA	Conestoga-Rovers & Associates
CWM	Chemical Waste Management
DUSR	Data usability summary report
ESA	Environmental site assessment
fbg	Feet below grade
FTMS	Federal Test Method Standard
GM	General Motors Corporation
IFG	Inland Fisher Guide
IRM	Interim remedial measure
IWTP	industrial wastewater treatment plant
LLDPE	Linear low-density polyethylene
MQA	Manufacturer's quality assurance
MQC	Manufacturer's quality control
NCP	National Oil and Hazardous Substances Contingency Plan
NIMO	Niagara Mohawk – A National Grid Company
NPL	National Priorities List
NSF	National Sanitation Foundation
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
PAOC	Potential area of concern
PCBs	Polychlorinated biphenyls
PDI	Pre-design investigation
RI/FS	Remedial investigation/feasibility study
RCP	Reinforced concrete pipe
ROD	Record of decision
SARA	Superfund Amendments and Reauthorization Act
SPDES	State pollutant discharge elimination system
SVOC	Semivolatile organic compound
TCLP	Toxicity characteristic leaching procedure
TSCA	Toxic Substance Control Act
TSDF	Transportation, storage and disposal facility
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound

1. Introduction

This engineering report documents the construction of the Interim Remedial Measure (IRM) for the Former Landfill at the General Motors Corporation (GM) Former Inland Fisher Guide (IFG) Facility and Ley Creek Deferred Media (collectively designated the Site). This report has been prepared by O'Brien & Gere Engineers, Inc. in accordance with the requirements set forth in paragraph VI. C of the Administrative Order on Consent (Index # D-7-0001-97-06; Order) between GM and the New York State Department of Environmental Conservation (NYSDEC), which became effective September 25, 1997.

Between August of 2001 and December of 2005, three large-scale IRMs were designed and implemented at the Former IFG Facility under the Order. These IRMs addressed environmental media investigated as part of a Remedial Investigation/Feasibility Study (RI/FS) being conducted under the Order. The IRMs were the Former Landfill IRM, the Former Drainage Swale IRM, and the SPDES Treatment System IRM. These programs were performed as IRMs prior to completion of the RI/FS with the objective of accelerating facility remediation to accommodate redevelopment of the facility. The Former Landfill IRM consisted of the construction of a landfill cover to address a former landfill located in the northwestern portion of the facility property. The Former Drainage Swale IRM consisted of the removal of polychlorinated biphenyl (PCB) containing subsurface material. The SPDES Treatment System IRM consisted of the construction of a large retention basin and treatment system to treat facility storm water for PCBs and volatile organic compounds (VOCs) prior to discharge off-site. Construction work for the Former Drainage Swale and the SPDES Treatment System IRMs was largely co-located in the central northern portion of the facility property. The Former Drainage Swale IRM and SPDES Treatment System IRMs are documented in separate Engineering Reports both dated January 20, 2006 (O'Brien & Gere 2006a, 2006b).

1.1. Site description

The Former IFG Facility and the Ley Creek Deferred Media Site is located at 1 General Motors Drive in the Town of Salina, Onondaga County, New York. A location map is provided as Figure 1-1. The Former IFG Facility comprises approximately 65 acres of property. Structures include the main manufacturing building, the attached administration building, the primary switch house, the powerhouse, the industrial wastewater treatment plant (IWTP), mold storage (former tank farm) building, and bulk handling building. Various paved parking lots

and undeveloped areas are present on the property. A facility plan is provided as Figure 1-2.

The facility is bounded to the south by Conrail railroad tracks and a wood pallet recycling facility; to the east and northeast by Military Circle (formerly GM Circle) and Townline Road; to the west by a Niagara Mohawk – A National Grid Company (NIMO) electrical transfer station; and to the north by Factory Avenue and an undeveloped area adjacent to Ley Creek. New York State Wetland SYE – 6 is located north and west of the electrical transfer station.

The facility is currently being redeveloped for tenant use. To date, ten tenants occupy space or are preparing to occupy space in the building.

The facility is located in an area zoned for industrial use in the Town of Salina; a small portion of the facility (entrance gate area and a portion of the parking lot) is located in the Town of Dewitt. The area surrounding the facility can generally be characterized as highly urbanized. The area is also characterized by a high degree of industrial activity, as evidenced by the presence of manufacturing facilities such as Carrier Corporation, Syracuse China Corporation, Magna International New Process Gear, Inc., and Bristol-Myers Squibb Company. Numerous small industrial businesses are present along Factory Avenue and in nearby areas of the City of Syracuse. Syracuse International Airport-Hancock Field is located approximately 1½ miles north of the facility.

The Ley Creek PCB Dredgings site is located directly north of the facility and Factory Ave. The Ley Creek PCB Dredgings site consists of the area between Factory Avenue and Ley Creek, extending west from Townline Road for approximately 4,300 ft. Ley Creek Deferred Media include ground water underlying the Ley Creek PCB Dredgings site and surface water and sediment in Ley Creek between Townline Road and Route 11.

1.2. Site history

Historically, the facility was used for the manufacture of metal automotive trim components such as bumpers, grills, wheel disks and hubcaps. More recently, the facility was used for the manufacture of interior and exterior plastic trim components such as bumpers, grills and door panels. The facility began operations in 1952 as the Brown-Lipe-Chapin Division of GM. Operations conducted at the facility included metal die casting; nickel, chromium and copper cyanide electroplating; stamping; polishing; buffing; painting and machining. The products of these operations were the metal automotive parts as previously mentioned. In 1961 Brown-Lipe-Chapin merged with another GM division, Ternstedt, and subsequently became part of GM's Fisher Body Division in 1968. During the early 1960's injection molding operations

were added to the existing metal operations. Metal finishing and die casting were subsequently reduced and replaced by injection molding by the early 1970's. The facility operated as the Fisher Body Division until 1984, when it became the Fisher Guide Division until 1989. The facility then operated as the Inland Fisher Guide Division of GM from 1989 until the facility ceased manufacturing operations in December 1993. In 1992, prior to ceasing of manufacturing operations, the facility was operating 127 injection molding machines. After the facility ceased manufacturing operations in 1993, the facility was reassigned to GM's North American Operations Property Management Group, which was later re-designated the Worldwide Facilities Group.

An on-site landfill, occupying approximately 7 acres, is located northwest of the manufacturing building, as shown on Figure 1-2. The landfill was used from 1952 to 1961 or 1962 for the disposal of boiler fly ash and bottom ash, paint and buffing sludges, plating wastes (estimated 10 cu yd per year), general trash, and construction debris. Six to eight feet of general fill material (consisting of brown, fine silty sands mixed with cobbles, gravel, and concrete) was reportedly placed on the landfill in 1962 or 1964. Disposal of boiler fly ash and construction debris continued until about 1970.

GM and NYSDEC entered into an Administrative Order on Consent (Index # D-7-0001-97-06; Order) on September 25, 1997. The Order called for the development and implementation of a Remedial Investigation/Feasibility Study (RI/FS) at the site located at 1 General Motors Drive in the Town of Salina, Onondaga County, New York. The Order also provided for the performance of IRMs. The Former IFG Facility and Deferred Media site is classified as a Class 2 site on NYSDEC's Registry of Inactive Hazardous Waste Disposal Sites (Site No. 7-34-057). The Ley Creek Deferred Media include ground water underlying the Ley Creek PCB Dredgings site, which is also a Class 2 site on NYSDEC's Registry (Site No. 7-34-044), as well as surface water and sediment in Ley Creek between Townline Road and Route 11. The Former IFG Facility and the Ley Creek PCB Dredgings sites were also designated as sub-sites of the Onondaga Lake National Priorities List (NPL) site by NYSDEC and the United States Environmental Protection Agency (USEPA).

A Preliminary RI/FS Report was developed by O'Brien & Gere on behalf of GM for the Former IFG Facility and Ley Creek Deferred Media and submitted on October 24, 1997 (O'Brien & Gere 1997). NYSDEC issued comments on the Preliminary RI/FS Report on March 13, 1998 (Benjamin 1998). GM's responses were submitted to NYSDEC on May 18, 1998 (Hartnett 1998). As a result of NYSDEC's comments regarding additional data needs, a Supplemental RI was conducted for the site in 1998 and 1999 by O'Brien & Gere in accordance with the approved Final Supplemental RI/FS Work Plan (O'Brien & Gere 1999), the provisions of the Order, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), the USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies Under

CERCLA (USEPA 1988), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 CFR Part 300). A Supplemental RI Report was submitted to NYSDEC on April 20, 2000 in accordance with the Order (O'Brien & Gere 2000a).

Sufficient data were collected as part of the previous investigations and the Supplemental RI to allow for development of an IRM for the former landfill at the Former IFG Facility. GM, in a letter dated May 23, 2001, proposed implementation of an IRM for the former landfill (Hartnett 2001a). NYSDEC agreed with the approach, as documented in its letter of August 13, 2001 (Benjamin 2001b).

1.3. Summary of historic and pre-design investigative activities

Several environmental investigations have included the sampling and analysis of landfilled material and soil in the vicinity of the former landfill. These investigations are summarized in the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a). A brief description of the investigations is provided below.

1.3.1. Historic investigations

1991 Onondaga County Ley Creek Relief Interceptor Sewer Area Sampling Program. As part of the installation of the Ley Creek Relief Interceptor Sewer in 1991, Onondaga County's contractors collected subsurface soil samples along the pipeline route (Onondaga County 1991). Soil samples LC-3, 122.0, 123.4, 123.43, 123.87, 124.0 were collected as part of this effort. Following completion of construction of the sewer, Onondaga County's contractors collected seven surface soil samples in the vicinity of the former landfill. These samples were indicated by station intervals (*e.g.*, 120+42-121+20).

Soil borings BFA-5 and BFA-7 were installed north of the former landfill and south of Factory Avenue prior to construction of the Ley Creek Relief Interceptor Sewer as part of the geotechnical investigation (Blasland, Bouck, & Lee 1989). No analytical data were collected from soil borings completed as part of the geotechnical investigation.

1993 O'Brien & Gere storage cell confirmation sampling program.
O'Brien & Gere collected ten confirmatory surface soil samples (S1 to S10) from an area on the northwestern portion of the former landfill in 1993. Samples were collected in the former location of a storage cell used for PCB-contaminated soil excavated during the Ley Creek Relief Interceptor Sewer Area IRM. These confirmatory soil samples were collected with a hand trowel and analyzed for PCBs (O'Brien & Gere 1994).

1995 – 1996 Conestoga – Rovers & Associates (CRA) Phase II Environmental Site Assessment (ESA). A Phase II ESA was performed

by CRA in August 1995, subsequent to a Phase I ESA, to evaluate the presence of contaminant releases into the environment that may have occurred at potential areas of concern (PAOC) at this facility. Additional Phase II ESA activities were conducted at the facility in April 1996 to address data gaps and to characterize the extent of contamination at certain PAOCs where the August 1995 Phase II ESA activities had indicated the presence of a contaminant release. The former landfill was identified during the Phase I ESA as a PAOC. Sampling activities in the vicinity of the former landfill associated with the Phase II ESA included the installation of three soil borings (BH-1, BH-2, and BH-3), collection of one soil sample from each boring, and analysis of the samples for VOCs, SVOCs, PCBs, RCRA metals (arsenic, barium cadmium, chromium, lead, mercury, selenium, and silver) and cyanide.

1996 NIMO Factory Avenue soil sampling. NIMO installed soil borings along the north and south sides of Factory Avenue to evaluate soil conditions at proposed power pole locations. Borings were designated by proposed pole location numbers. Borings installed north of the former landfill include 37E, 37C, 37W, 38, and 39 (NIMO 1996). Soil samples were collected from each boring and analyzed for PCBs.

1.3.2. Supplemental remedial investigation

The former landfill was investigated as part of the Supplemental RI. In November 1999, four test trenches were excavated by backhoe in the former landfill area. These test trenches were completed to evaluate the limits of the former landfill and characterize its contents (O'Brien & Gere 2000a). Test trench samples T1-1, T1-2, T1-3, T1-4, T2-1, T2-2, T2-3, T2-4, T3-1, T3-2, T3-3, T3-4, T3-5, T3-6, T4-1, T4-2, and T4-3 were collected based on visual observations during trench installation and analyzed for VOCs, SVOCs, PCBs, site-related metals (arsenic, chromium, copper, lead, nickel, and zinc), cyanide, and mercury.

In addition to the test trenching activities, eight surface soil samples (SS-99-06, SS-99-07, SS-99-08, SS-99-09, SS-99-10, SS-99-11, SS-99-12, and SS-99-13) were collected from the former landfill area to characterize surface conditions for risk assessment purposes.

1.3.3. Miscellaneous sampling events

Debris pile sampling. Several debris and concrete piles were located on the former landfill. Five composite samples (NW concrete #1, NW debris #1, NW concrete #2, NW debris #2, and NW concrete #3) were collected from the debris and concrete piles.

Storm Sewer Cleaning/Televising IRM sampling. As part of the Storm Sewer Cleaning/Televising IRM, a new catch basin A2B was installed. Based on PCB concentrations detected downstream of this location, a surface soil sample (A2A Soil) was collected in the vicinity of the future catch basin A2B.

1.3.4. Pre-design investigations

As part of the pre-design investigations performed for the former landfill IRM between May 2001 and June 2002, additional subsurface and survey information was obtained. In addition to those between 5/01 and 6/02 pre-design investigations were performed, as documented in the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a).

Geotechnical borings. In May 2001, six geotechnical borings were installed within the landfill limits to a depth of approximately 10 ft. The purpose of the geotechnical borings was to provide geotechnical information to be used in the design of the proposed parking area. The six geotechnical borings were installed with continuous sampling performed for the entire depth as described in the May 23, 2001 letter outlining pre-design investigation activities (Hartnett 2001a).

2001 Test pit excavation. In June 2001, ten test pits (Test Pits 13 through 23) were installed to evaluate the northern and northwestern extent of the former landfill. Seven of the ten test pits were installed between trench 4 and trench 12, which were installed during the 1999 Supplemental RI test trench activities described in Section 2.1.2, and four of the ten test pits were installed in the northwest corner of the former landfill. The test pits were installed at approximately 200 foot intervals, perpendicular to the approximate landfill limit as described in the May 23, 2001 letter outlining pre-design investigation activities (Hartnett 2001a). During these activities, soil samples were collected from test pits 13, 16, 20, and 21 at depths of 5 to 6 ft below grade based on visual observation of landfill material and were analyzed for PCBs. Test pit logs for these test pits are presented in Appendix A of the Former Landfill IRM Revised Work Plan.

2002 Test pit excavation. In May 2002 three test pits (TP-1, TP-2, and TP-3) were excavated to further evaluate the northwestern extent of the former landfill. These were conducted in accordance with the June 14, 2001 letter to Sue Benjamin (Hartnett 2001b). Photographs of these test pits are included in Appendix A.

Soil borings and surface soil samples. To further evaluate the limits of the landfill hot spots associated with 1999 Supplemental RI sample locations SS-99-06, SS-99-08 and SS-99-10, nine soil borings (OBG-TB-48, OBG-TB-49, OBG-TB-50, OBG-TB-51, OBG-TB-52, OBG-TB-53, OBG-TB-54, OBG-TB-55, and OBG-TB-56) were completed in July 2001 in accordance with the June 14, 2001 letter to Sue Benjamin (Hartnett 2001b), and subsequent discussions with NYSDEC (Benjamin 2001). The results of this sampling event are summarized in the Former Landfill IRM Revised Work Plan. The Data Usability Summary Report (DUSR) for these results is included in Appendix B.

Based on the results of soil boring OBG-TB-51, six direct push borings (OBG-TB-57, OBG-TB-58, OBG-TB-59, OBG-TB-60, OBG-TB-61 and OBG-TB-63) were completed in June 2002, consistent with the May 6, 2002 letter to Sue Benjamin (Hartnett 2002a). The results of this

sampling were documented in the Former Landfill IRM Revised Work Plan. The DUSR for these results is included in Appendix B.

In May 2002, six surface soil samples (SS-02-01, SS-02-02, SS-02-03, SS-02-04, SS-02-05 and SS-02-06) were collected to the west of GM's western property boundary in conjunction with the three test pits excavated in 2002. These samples were collected in accordance with the March 14, 2002 letter to Sue Benjamin (Hartnett 2002b), the March 18, 2002 from Sue Benjamin to Jim Hartnett (Benjamin 2002), and the Former Landfill IRM Draft Work Plan (O'Brien & Gere 2002a). All six samples were analyzed for PCBs and three samples (SS-02-01, SS-02-02, and SS-02-03) were analyzed for VOCs. The results of this sampling event were not available for the Former Landfill IRM Revised Work Plan, but were provided in the August 26, 2003 (Hartnett 2003d) letter to NYSDEC. This letter also included a DUSR for this data.

Survey. A ground topographic survey of the former landfill area and areas adjacent to the landfill was performed in June 2001. The survey consisted of one-foot topographic contour intervals with surveyed locations including boring and test pit locations, utilities, structures, and property lines.

1.4. Summary of pre-construction investigations

1.4.1. NIMO power structure sampling

In accordance with the letter provided to NYSDEC on April 14, 2003, sixteen soil borings (TB-01-03 through TB-16-03) were advanced on April 21, 2003 and April 22, 2003 to a depth of approximately 16 feet below grade (fbg) in the vicinity of the existing 115 kV H-structures located within the limits of the former landfill for emergency and future structure replacement (Hartnett 2003a). These sampling efforts yielded concentrations of PCBs greater than 50 ppm in seven locations, thus GM proposed in its letter of June 2, 2003, to install seven more borings (at locations of previously installed TB-02-03, TB-10-03, TB-11-03, TB-12-03, TB-13-03, TB-14-03, and TB-16-03) (Hartnett 2003b). These new borings were designated TB-02-03A, TB-10-03A, TB-11-03A, TB-12-03A, TB-13-03A, TB-14-03A, and TB-16-03A. Three additional soil borings (TB-17-03, TB-18-03, and TB-19-03) were added to this scope in the vicinity of two 115 kV poles located on the southern limits of the former landfill as described in GM's letter to NYSDEC of July 1, 2003 (Hartnett 2003c). The June 2, 2003 and July 1, 2003 letter work plans were approved by the NYSDEC on June 6, 2003 and July 14, 2003 (Benjamin 2003a and 2003b). The additional borings were completed in July 2003. PCB data from these boring samples indicated variable PCB concentrations ranging from less than detectable to 6,200 mg/kg. This data was summarized in the August 26, 2003 letter to NYSDEC (2003e).

1.5. Summary of data

Based on the investigations conducted in the former landfill, PCBs, metals, VOCs and Semivolatile organic compounds (SVOCs) were detected in surface and subsurface soil samples. Limits of the former landfill were estimated based on physical observations. Limits of hazardous material (i.e. PCB concentrations larger than 50 mg/kg) were designated as hot spots and were to be removed based on analytical results. The extent of fill and estimated limits of hot spots are described below.

1.5.1. Extent of fill

The estimated areal limits of fill material, based on the Supplemental RI test trench and pre-design investigation test pit observations are indicated on Figure 1-2. Based on test trenching activities performed as part of the Supplemental RI and IRM pre-design investigation, ash-like material was observed to extend to the northern fenceline and the northern portion of the western fenceline. Along the northern fenceline, the ash-like material was observed to be present from depths of 1 to 5 ft below grade. Since the ash-like material appeared to taper off at the northern fenceline, further field activities to define the extent of fill in this area were not proposed. In addition, soil boring logs for BFA-5 and BFA-7, which were installed north of the northern fenceline, did not show that fill material was present. Soil boring logs for BFA-5 and BFA-7 and for trenches installed during the Supplemental RI were included in the Former Landfill IRM Revised Work Plan.

In the northern portion of the western fenceline, the ash-like material was observed to be present from 4 to 6 ft below grade in trench 13 and from 0 to at least 10 ft below grade in trench 14. Further test trenching activities to investigate the extent of the ash-like material west of the western fenceline and east of the NIMO access road were performed in May 2002, as described in the Former Landfill IRM Revised Work Plan. An evaluation of the test pitting results was conducted and recommendations were developed with respect to landfill material management in the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a).

Landfill materials, including paint sludge, fly ash material, metal gears, general trash, and grey-blue sludge-like material, were observed in test trenches installed during the 1999 Supplemental RI. These materials were observed to be mixed with other landfill material, rather than present as distinct layers. Paint sludge was observed in all four test trenches at depths ranging from 4 to 12 ft below grade. Ash-like material was observed in all four test trenches at depths ranging from 1 to 10 ft below grade. In trench 3 the ash-like material was mixed with general trash such as paper and rags. Metal gears were encountered in trenches 1, 2, and 4 at depths ranging from 5 to 10 ft below grade. Greyish-blue sludge-like material was observed in trenches 2 and 3 at depths ranging from 5 to 8 ft below grade. Native soil was a brownish grey silt to fine sand with intermittent clay seams and was observed throughout each trench at depths ranging from 7 to 16 ft below grade. The existing

surface of the former landfill consisted of brown, fine, silty sands mixed with cobbles, gravel, and concrete. This material was observed as deep as 10 ft in trench 4.

1.5.2. Extent of hot spots

Two evaluations of sampling results in or in the vicinity of the former landfill were performed with respect to the horizontal and vertical extent of hot spots as documented in the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a) and in a letter from GM to NYSDEC dated August 26, 2003 (Hartnett 2003d). The extent of these hot spots was based on analytical results from sampling conducted as part of the 1991 Onondaga County post construction interceptor sewer sampling, the 1999 Supplemental RI sampling, 2002 pre-design investigations and 2003 pre-construction investigations.

The evaluations concluded that surface hot spots and subsurface hot spots warranted removal. These were:

Surface hot spots. Three surface hot spots were identified in the vicinity of samples SS-99-08 and SS-99-06 along the western edge of the former landfill, and along the northern limits of the former landfill between stations 4+05 and 6+20. The estimated areas were 10 ft by 10 ft (SS-99-08), 10 ft by 10 ft (SS-99-06), and 215 ft by 20 ft (stations 4+05 and 6+20). These hot spots were assumed to be 1 ft in depth. Their locations are identified on Sheet G-3 of the Record Drawings, contained in Appendix D.

In addition to these surface hot spots identified on the site, four surface hot spots on the adjacent NIMO property were also identified for removal. Two were located between the property boundary and the NIMO access road and in the vicinity of samples 6+10 Bank and SM-101. The approximate extent of each of these hot spots was 10 ft by 10 ft by 1 ft deep. The third hot spot was located between the GM western property boundary and the NIMO access road, extending approximately 650 linear ft by approximately 10 ft wide. The fourth was located between the GM western property line and the NIMO access road in the vicinity of sample SS-02-05 and was approximately 10 ft by 10 ft by 1 ft deep. These hot spots are identified on Sheet G-3 of the Record Drawings, contained in Appendix D.

Subsurface hot spots. Six subsurface hot spots were identified in the vicinity of samples T4-1, OBG-TB-51, OBG-TB-53, the former drainage swale lying within the landfill work limits, TB-02-03A, and TB-11-03A. The estimated extent for each hot spot was 10 ft by 10 ft at depth of 2 ft to 3 ft (T4-1), 10 ft by 10 ft at a depth of 0 to 8 ft (OBG-TB-51), 10 ft by 10 ft at a depth of 0 to 2 ft (OBG-TB-53), 50 ft by 10 ft at a depth of 5 ft to 6 ft (former drainage swale), and 10 ft by 10 ft at a depth of 0 to 2 ft (TB-11-03A). In its letter of October 1, 2003, NYSDEC also required that a subsurface hot spot be removed in the vicinity of TB-02-03A (Benjamin 2003c). The estimated extent of this hot spot was 10 ft by 10

ft at a depth of 10 ft to 16 ft. These hot spots are identified on Sheet G-3 of the Record Drawings, contained in Appendix D.

1.5.3. Geotechnical data

Six geotechnical borings (B-1 through B-6) were installed within the landfill limits to a depth of approximately 10 ft. Boring logs were generated based on visual observations of the material layers encountered during the boring installations and are attached as Exhibit A. Standard penetration blow counts (n-values) were recorded at 2 ft intervals and varied from 3 to 39. The blow counts were used in estimating a California Bearing Ratio (CBR) for use in the pavement thickness calculations used in the cover design.

1.6 Interim remedial measure objectives

The Former Landfill IRM work plan included the following remedial objectives developed for the former landfill:

- Minimize potentially unacceptable human health risks associated with direct contact and incidental ingestion of soil
- Eliminate or mitigate, to the extent feasible, existing and potential adverse impacts to fish and wildlife resources from the landfill.

1.7. Interim remedial measure summary

The Former Landfill IRM included the following major components:

- Hot spot excavation
- Off-site disposal
- Site grading
- Access roads
- Low permeability cover system
- Vegetative cover
- Storm water conveyance system.

1.8. Interim remedial measure documents

The work plan prepared to implement the Former Landfill IRM comprised the following documents:

- Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a)
- Reuse of soil spoils from excavation of proposed storm water retention basin - April 26, 2002 (Hartnett 2002c)

- Proposal for hot spot removal – May 6, 2002 (Hartnett 2002a)
- Construction quality control plan (Royal Environmental 2002a)
- Revised perimeter and on-site air monitoring and dust control plan (Royal Environmental 2002b)
- Storm water pollution prevention plan (O'Brien & Gere 2002b)
- Construction water management plan (Royal Environmental 2002c)
- Soil characterization plan around existing H-structures submitted for NYSDEC's information – April 14, 2003 (Hartnett 2003a)
- Additional Soil Characterization in the Vicinity of NIMO H-structures – June 2, 2003 (Hartnett 2003b)
- Addendum to Additional Soil Characterization in the Vicinity of NIMO 115 kV H-structures – July 1, 2003 (Hartnett 2003c)
- Proposed Hot Spot Removal on NIMO Property – August 26, 2003 (Hartnett 2003d)
- Proposed on-site Hot Spot Removal – August 26, 2003 (Hartnett 2003e)
- Proposed Hot Spot Removal on NIMO Property and Reconfiguration of Drainage Depression on NIMO Property – August 2, 2004 (Hartnett 2004).

1.9. Interim remedial measure chronology of events

The following table, Table 1-1, includes a chronology of events that occurred as part of the IRM, starting with the proposal of the Former Landfill IRM to NYSDEC and ending with NYSDEC soil reuse approvals.

Table 1-1. *Former Landfill IRM Chronology of Events*

Date	Event
May 23, 2001	Letter to NYSDEC to propose Former Landfill IRM
May 23, 2001	Letter to NYSDEC proposing geotechnical borings, test pit excavation, and survey
June 14, 2001	Letter to NYSDEC with hot spot evaluation and delineation approach
July 9, 2001	Letter to NIMO submitting outline of the Proposed Landfill IRM
August 8, 2001	Transmittal to Town of Salina submitting Former Landfill IRM Work Plan
August 8, 2001	Transmittal to NIMO submitting Former Landfill IRM Work Plan for review
August 8, 2001	Letter to County submitting Former Landfill IRM Work Plan for review
August 8, 2001	Letter to NYSDEC submitting Former Landfill IRM Work Plan for review
August 8, 2001	Redevelopment letter to NYSDEC regarding use of Landfill area for Resun Leasing, Inc.

Table 1-1. *Former Landfill IRM Chronology of Events*

Date	Event
August 13, 2001	Letter from NYSDEC approving Mach 23, 2001 Former Landfill IRM scope and approach
September 4, 2001	Letter from County with comments on August 2001 Landfill IRM submittal
November 8, 2001	Letter from NYSDEC with comments on August 2001 Landfill IRM submittal
March 14, 2002	Letter to NYSDEC requesting approval of PDI on NIMO property and May 23, 2001 PDI work.
March 18, 2002	Letter from NYSDEC approving PDI work listed in March 14, 2002 letter
April 26, 2002	Letter to NYSDEC requesting approval on Former Drainage Swale IRM being a part of both the Landfill and SPDES Treatment System IRMs
April 26, 2002	Letter to NYSDEC proposing reuse of soil from SPDES Treatment IRM for use in Landfill IRM
May 6, 2002	Letter to NYSDEC requesting additional PDI borings and review of hot spot excavation approach
May 2, 2002	Memorandum from NYSDEC approving reuse of soils as described in the April 26, 2002 letter. (BUD No. 721-7-34)
May 14, 2002	Letter to NYSDEC clarifying level of data validation for NIMO PDI sampling and that some was SRI data
May 14, 2002	Letter from NYSDEC approving additional PDI borings and hot spot excavation approach
May 17, 2002	Letter to NYSDEC containing responses to November 8, 2001 comment letter
June 21, 2002	Letter to NYSDEC requesting approval of certain IRM activities prior to final NYSDEC approval of the work plan
June 27, 2002	NYSDEC letter approving Former Drainage Swale IRM approach, and requesting additional information
June 28, 2002	Letter from NYSDEC approving IRM activities to commence prior to final work plan approval
July 17, 2002	Letter to NYSDEC consolidating Former Drainage Swale IRM into one document
July 18, 2002	Revised Former Landfill IRM WP transmitted to NYSDEC
August 6, 2002	Letter to NYSDEC clarifying soil reuse from the SPDES Treatment System IRM as part of the Landfill IRM
August 7, 2002	NYSDEC approval of TCL/TAL total analysis as a substitute for TCLP testing during SPDES Treatment System IRM progress meeting for all IRMs

Table 1-1. *Former Landfill IRM Chronology of Events*

Date	Event
September 3, 2002	NYSDEC approval of August 6, 2002 letter for soil reuse
September 13, 2002	Letter to NYSDEC for pipe abandonment plan- use of RCP as fill in landfill
September 19, 2002	Reuse form submitted for use of OB-6 and OB-8 as fill underneath low permeability cover/restricted fill
September 30, 2002	NYSDEC approval of September 19, 2002 reuse form
October 2, 2002	NYSDEC approval of September 12, 2002 pipe abandonment plan- use of RCP as fill in landfill
October 2, 2002	Reuse form submitted for use of OB-11 and OB-12 as fill underneath low permeability cover/restricted fill
October 3, 2002	NYSDEC approval of October 2, 2002 reuse form
October 22, 2002	Reuse form submitted for use of OB-17 and abandoned pipe bedding material as fill underneath low permeability cover/restricted fill
October 28, 2002	NYSDEC approval of revised Landfill IRM, dated July 12, 2002 and incorporating other plans into work plan
October 29, 2002	NYSDEC approval of October 22, 2002 reuse form
December 4, 2002	Reuse form submitted for use of OB-20, RCP-1, and IAPB as fill underneath low permeability cover
December 6, 2002	NYSDEC approval of December 4, 2002 reuse form
April 14, 2003	Soil characterization plan around existing H-structures submitted for NYSDEC's information
May 14, 2003	Modification #1 submitted for approval
May 20, 2003	NYSDEC approval of Modification #1 Sheets G-2, G-4 through and including G-10
May 27, 2003	NYSDEC approval of Modification #1 Sheets E-1 and E-2
June 2, 2003	Letter to NYSDEC requesting approval of additional Soil Characterization in the Vicinity of Niagara Mohawk H-structures
June 6, 2003	NYSDEC approval of the June 2, 2003 Soil Characterization in the Vicinity of Niagara Mohawk H-structures
July 1, 2003	Letter to NYSDEC providing Addendum to Additional Soil Characterization in the Vicinity of Niagara Mohawk 115 kV H-structures submitted for review
July 23, 2003	Storm Water Pollution Prevention Plan – Updated Notice of Intent submitted to NYSDEC
July 14, 2003	NYSDEC approval of July 1, 2003 addendum to

Table 1-1. *Former Landfill IRM Chronology of Events*

Date	Event
	Additional Soil Characterization in the Vicinity of Niagara Mohawk 115 kV H-Structures.
August 26, 2003	Former Landfill IRM – Proposed approach to the Former Landfill IRM submitted to NYSDEC (on-site hot spots)
August 26, 2003	Former Landfill IRM Work Plan – Proposed Hot Spot Removal on Niagara Mohawk Property submitted to NYSDEC
September 2, 2003	Technical Variance # 1 (soil bedding layer) submitted to NYSDEC
September 4, 2003	NYSDEC approval of August 26, 2003 Former Landfill IRM Work Plan– Proposed Hot Spot Removal on Niagara Mohawk Property.
September 12, 2003	NYSDEC approval of Technical Variance # 1 (soil bedding layer)
October 1, 2003	NYSDEC approval of August 26, 2003 proposed approach to the Former Landfill IRM
August 2, 2004	Proposed hot spot removal and construction activities on NIMO property
September 1, 2004	NYSDEC approval of hot spot removal and construction activities on NIMO property
November 17, 2004	Submittal of Technical Variance #5 (seed mixture variance)
December 15, 2004	Final inspection with GM, NYSDEC, OBG, and Royal
December 22, 2004	NYSDEC approval of Technical Variance #5 (seed mixture variance).
February 11, 2005	Reuse form submitted for use of soil piles OB-21, OB-22, COB-1, COB-8, COB-9, COB-10 and COB-11 as fill underneath low permeability cover/restricted fill
March 7, 2005	NYSDEC approval of soil reuse of soil piles OB-21, OB-22, COB-1, COB-8, COB-9, COB-10 and COB-11.

Source: O'Brien & Gere

2. Interim remedial measure

The IRM comprised the following major components:

- Hot spot removal
- Off-site disposal
- Site grading
- Access roads
- Low permeability cover system
- Vegetative cover
- Storm water conveyance system.

Details associated with each of these components are presented below.

2.1. Hot spot removal

A total of thirteen hot spots were excavated in accordance with the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a) and various letter work plans, as described in Section 1.5.2 at the locations shown on Sheet G-3 of the Record Drawings, contained in Appendix D. This included former drainage swale material that was also removed from within the work limits of the Former Landfill IRM. Excavation of each hot spot is described below. Confirmation sample analytical results are summarized in Table 1. Where hot spot removal was not completed due to the presence of utilities, informational samples were collected. Results for informational samples are also summarized in Table 1.

2.1.1. Surface soils

Surface soil hot spots along the northern fence line. One surface hot spot was excavated along the northern fenceline. As described in the May 6, 2002 letter to Sue Benjamin (Hartnett 2002a) and the Landfill IRM Revised Work Plan (O'Brien & Gere 2002a) a surface hot spot was identified in the ditch line between the Former IFG Facility property and Factory Avenue and between stations 4+05 to 6+20. This hot spot was excavated in accordance with Drawing Note 2 on Contact Drawing G-3. Excavated soil was transported off-site, and confirmation samples were collected in accordance with SP-17. The limits of the excavations are depicted on Sheet G-3 of the Record Drawings, contained in Appendix D.

Material was excavated until floor confirmation samples indicated less than detectable concentrations of PCBs. Northern wall samples at stations 4+40, 4+85, 5+40, 5+85, 5+90 along Factory Avenue, indicated PCB detections in excess of the criterion of 50 ppm which were not

removed due to the presence of the NIMO gas line. Confirmation sample results are summarized in Table 1. Electronic copies of analytical results are included in Appendix C. The limits of the excavations are depicted on Sheet G-3 of the Record Drawings, contained in Appendix D.

Surface soil hot spots along the western fence line. As described in the May 6, 2002 letter to Sue Benjamin (Hartnett 2002a) and the Landfill IRM Revised Work Plan (O'Brien & Gere 2002a) two surface hot spots were identified along the western fence line of the site. These were in the vicinity of surface soil samples SS-99-08 and SS-99-06. Following excavation in accordance with Contact Drawing G-3, confirmation samples indicated the need for additional excavation activities. The additional excavation activities conducted for these hot spots were described in the August 26, 2003 letter to Sue Benjamin (Hartnett 2003d). Further excavation was also proposed in the August 26, 2003 letter.

Based on confirmation sampling, the excavation at SS-99-08 was extended approximately an additional 1 ft in depth, an additional 3 ft to the east, and an additional 14 ft to the north. Confirmation samples indicated that material from the SS-99-08 hot spot was excavated until sample results were below the criterion of 50 ppm PCBs. The western extent of the hot spot at SS-99-08 extended west onto NIMO property. In accordance with the August 26, 2003 letter to Sue Benjamin, excavation proceeded approximately an additional 1 ft to the west to a depth of approximately 2 ft. No confirmation was required for this excavation to the west. Confirmation sample results are summarized in Table 1. Electronic copies of analytical results are included in Appendix C. The limits of the excavations are depicted on Sheet G-3 of the Record Drawings, contained in Appendix D. Consistent with the May 6, 2002 letter to Sue Benjamin, excavated soils with PCB concentrations greater than 50 ppm were disposed off-site.

The excavation at SS-99-06 extended approximately an additional 2 ft in the north and west directions. Confirmation samples indicated that material from the SS-99-06 hot spot was excavated until sample results were less than the criterion of 50 ppm PCBs. The extent of the hot spot at SS-99-06 did not extend off site. Confirmation sample results are summarized in Table 1. Electronic copies of analytical results are included in Appendix C. The limits of the excavations are depicted on Sheet G-3 of the Record Drawings, contained in Appendix D. Consistent with the May 6, 2002 letter to Sue Benjamin, excavated soils with PCB concentrations greater than 50 ppm were disposed off-site.

Surface soil hot spots on NIMO property. As described in the August 26, 2003 letter to Sue Benjamin (Hartnett 2003d), two surface hot spots were identified between the GM western property line and the NIMO access road. One surface hot spot extended from the western GM property line to the NIMO access road for an approximate length of 650 ft starting at the entrance to NIMO property for Factory Avenue and extending

towards the south. The other hot spot was located in the vicinity of sample SS-02-05.

In accordance with the August 26, 2003 letter to Sue Benjamin (Hartnett 2003d) and NYSDEC's letter of September 4, 2003 (Benjamin 2003d), the hot spot between the GM property line and the NIMO access road was excavated approximately 10 ft wide and to 1 ft in depth. Excavated material was placed under the low permeability cover on GM property. Following excavation, four floor confirmatory samples (NIMO DITCH MH, NIMO 1+74, NIMO 2+88, and NIMO 4+85) were collected in accordance with NYSDEC's letter of September 4, 2003 (Benjamin 2003d). With the exception of sample 4+85, each sample result was less than 1 ppm PCBs, well below the criterion of 50 ppm PCBs. Based on discussions with NYSDEC in the field, a 10 ft by 10 ft by 1 ft deep excavation was completed around sample location 4+85. The confirmation samples exhibited 35 ppm PCBs (4+85-F), 32 ppm PCBs (4+85-N), and 27 ppm PCBs (4+85-S) for the floor, northern and southern walls, respectively. Confirmation samples contained concentrations greater than 50 ppm PCBs at the western and eastern walls. Excavation extended approximately an additional 2 ft to the west and 2 ft to the east. The final confirmation samples on NIMO property showed 20 ppm PCB (4+85-W2) and 2.7 ppm PCBs (4+85-E3) to the west and east, respectively. The excavated material was shipped off-site for disposal. Woven geotextile fabric was placed as an indicator layer on the western wall and on the bottom of the excavation prior to backfilling. Backfilling was accomplished using imported clean fill. Analytical results are summarized in Table 1. Electronic copies of analytical results are included in Appendix C. The limits of the excavation are depicted on Sheet G-3 of the Record Drawings, contained in Appendix D.

The second hot spot identified in the August 26, 2003 letter to Sue Benjamin (Hartnett 2003d) was located at surface soil sample SS-02-05. Based on confirmation sampling, the excavation at SS-02-05 was extended approximately an additional 7 ft to the north. In addition, the excavation was extended approximately 4 ft to the west, until the NIMO access road was encountered, an additional 7 ft to the south, and approximately 2 ft deeper until the NIMO duct back was encountered. The westernmost sample on NIMO property contained 17 ppm PCBs (SS-02-05-W3) and the deepest sample collected over the duct bank contained 14 ppm PCBs (SS-02-05-F3), the southernmost sample showed 42 ppm PCBs (SS-02-05-S2). Woven geotextile fabric was placed as an indicator layer on the western wall and on the bottom of the excavation prior to backfilling. Backfilling was accomplished using imported clean fill. Electronic copies of the analytical results are included in Appendix C. Analytical results are summarized in Table 1. The limits of the excavation are depicted on Sheet G-3 of the Record Drawings, contained in Appendix D.

As identified in the August 2, 2004 letter to Sue Benjamin (Hartnett 2004), in addition to the surface hot spot between the western property boundary and the NIMO access road and at SS-02-05, two other surface hot spots were identified within a drainage depression on the NIMO

property. They were in the vicinity of samples 6+10 Bank and SM-101. The 6+10 Bank sample was located at on the eastern bank of the drainage depression, and the SM-101 sample was located towards the bottom of the northern end of the drainage depression.

Based on confirmation sampling conducted for these two hot spots, the two excavations extended to become one excavation. The excavation at 6+10 Bank extended approximately 25 additional feet to the south, approximately 2 additional feet to the east until reaching the NIMO duct bank, and approximately 2 ft to the north reaching the SM-101 excavation. In addition, the 6+10 Bank hot spot excavation was extended approximately 2 feet deeper. The SM-101 hot spot excavation was extended approximately an additional 4 ft to the east and 1 ft in depth. The westernmost confirmation samples contained concentrations less than 1 ppm PCBs. The southernmost (6+10-S2 and 6+10-S3) and westernmost confirmation samples (6+10-F3 and SM-101-E2) along the eastern bank of the drainage depression exhibited concentrations less than 1 ppm PCBs and 2.1 ppm PCBs, respectively. The northernmost confirmation sample (SM-101-N) within the drainage depression contained PCB at a concentration less than 1 ppm. The easternmost samples (6+10-F3 and SM-101-E2) on the eastern bank of the drainage depression exhibited PCB concentrations of less than 1 ppm and 2.1 ppm, respectively. The southernmost sample (SM-101-S) at the bottom of the drainage depression contained PCBs at a concentration of 15 ppm. Backfilling of this hot spot excavation was performed during the construction activities associated with the pipe reconfiguration within this drainage depression described in Section 2.8. Confirmation sample results are summarized in Table 1. Electronic copies of analytical results are included in Appendix C. The limits of the excavation are depicted on Sheet G-3 of the Record Drawings, contained in Appendix D.

2.1.2. Subsurface soils

Subsurface soil hot spots along western fencelines. As described in the May 6, 2002 letter to Sue Benjamin (Hartnett 2002a) and the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a), two subsurface hot spots were identified along the western property boundary in the vicinity of OBG-TB-51 and OBG-TB-53. The hot spot in the vicinity of OBG-TB-51 was removed in October 2002 in accordance with the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a). The hot spot in the vicinity of OBG-TB-53 was excavated in accordance with the Former Landfill IRM Revised Work Plan and the August 26, 2003 letter to Sue Benjamin (Hartnett 2003d) between August 2002 and October 2003.

Based on confirmation samples associated with the hot spot removal at OBG-TB-51, the excavation was extended approximately an additional 2 ft in depth. Excavated material was disposed off-site. Confirmation sample results are summarized in Table 1. Electronic copies of analytical results are included in Appendix C. The limits of the excavations are depicted on Sheet G-3 of the Record Drawings, contained in Appendix D.

Based on confirmation samples associate with the hot spot removal at OBG-TB-53, the excavation was extended approximately an additional 1 ft in depth, 2 ft to the north, and 4 ft to the east and south. To the west, the excavation extended approximately 1 ft onto NIMO property where the hot spot was excavated to a depth of 4 ft until reaching the NIMO duct bank. The westernmost sample on NIMO property (TB-53-W) contained PCBs at a concentration of 19 ppm. Prior to backfilling with imported clean fill on NIMO property, woven geotextile fabric was placed as an indicator layer on the western wall and bottom of the excavation. Material excavated from on site was disposed off-site. Material excavated from the NIMO property was disposed off-site. Confirmation sample results are summarized in Table 1. Electronic copies of analytical results are included in Appendix C. The limits of the excavation are depicted on Sheet G-3 of the Record Drawings, contained in Appendix D.

Subsurface soil hot spots on-site. Three subsurface hot spots in the vicinity of sample locations T4-1, TB-11-03A, TB-02-03A were identified within the limits of the former landfill. The hot spot in the vicinity of T4-1 was excavated between August 2002 and October 2002, in accordance with the May 6, 2002 letter to Sue Benjamin (Hartnett 2002a) and the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a). Based on confirmation sample results, the hot spot in the vicinity of T4-1 was extended approximately 2 ft to the west. Excavated material was disposed off-site.

The hot spot in the vicinity of TB-11-03A was excavated in accordance with the August 26, 2003 letter to Sue Benjamin (Hartnett 2003e) and discussions with NYSDEC in the October 22, 2004 progress meeting (O'Brien & Gere 2004a). Excavated material was disposed off-site.

The hot spot in the vicinity of TB-02-03A was excavated as requested by NYSDEC in its letter of October 1, 2003 (Benjamin 2003c). Due to the depth of excavation, sheeting was used during excavation of this hot spot. Sheeting was cut to approximately 3 ft below grade and left in place following backfill of this hot spot. Consistent with discussions with NYSDEC during the October 22, 2004 progress meeting (O'Brien & Gere 2004a), no confirmation sampling was collected for this hot spot, however, one informational sample was collected from the hot spot material. Analytical results are summarized in Table 1. Electronic copies of analytical results are included in Appendix C. The limits of the excavations are depicted on Sheet G-3 of the Record Drawings, contained in Appendix D.

Former drainage swale material. The former drainage swale material was observed during trenching activities conducted at the site during the Supplemental RI at depths of 5 to 6 ft below grade having a thickness of approximately 6 to 12 inches. The excavation and confirmatory sampling was conducted in accordance with the Former Drainage Swale IRM Work Plan (Hartnett 2002d), and documented in the Draft Former Drainage Swale IRM Engineering Report (O'Brien & Gere 2005a).

The overburden material with PCB concentrations greater than 10 mg/kg and less than 50 mg/kg that was excavated from areas outside the limits of the cover was consolidated beneath the low permeability cover system. The overburden material was sampled for PCBs prior to being used as backfill. Overburden material having PCB concentrations greater than or equal to 50 mg/kg was disposed of off-site as discussed in Section 2.3. This approach was consistent with the NYSDEC-approved work plan (Hartnett 2000) for the Ley Creek PCB Dredgings Site where a portion of the former drainage swale was excavated for off-site disposal. The limits of the excavation are depicted on Sheet G-3 of the Record Drawings, contained in Appendix D. Confirmation sample results are summarized in Table 1. Analytical results are included in Appendix C.

2.1.3. Northwest Debris Pile #2 (NW DP-2)

NW-DP2 was excavated to approximately 1 ft below existing grade and disposed of off-site in accordance with Section 2.2. Post-excavation confirmatory sampling was conducted in accordance with the Former Landfill IRM Revised Work Plan, and indicated that PCB concentrations were below the criterion of 50 ppm. Confirmatory results are summarized in Table 1.

2.2. Off-site disposal

Soil/debris contaminated with PCBs at concentrations greater than or equal to 50 mg/kg designated for off-site disposal was loaded into dump trailers for off-site disposal in accordance with the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a). The dump trailers were transported to the Chemical Waste Management (CWM) Transportation, Storage, and Disposal Facility (TSDF) in Model City, New York. The CWM TSDF is a Toxic Substance Control Act (TSCA)-permitted facility.

An estimated 2,703 tons (approximately 4,054 CY) of hot spot material were disposed of at the CWM TSDF. A summary table and the manifests and certificates of disposal for the hot spot material disposed of at the CWM TSDF are included in Exhibit B.

2.3. Site grading

Grading was conducted using standard construction equipment (*i.e.,* dozers) to establish the grades presented in Sheets G-2 of the Record Drawings, contained in Appendix D. Consistent with the proposal for placement of additional fill materials beneath the low permeability cover system from the SPDES Treatment System IRM and the Former Drainage Swale IRM documented in a letter dated April 26, 2002 (Hartnett 2002c), overburden material originating on-site and between the property boundary and Factory Avenue was used during site grading. In addition, consistent with soil reuse requests and subsequent approvals from NYSDEC, soil and debris from various redevelopment activities was also used during site grading. A summary of soil originating on-site that was used in construction of the Former Landfill IRM is contained in Tables 2, 3, and 4. Dates associated with soil reuse requests and corresponding NYSDEC approval are included in Tables 2, 3, and 4. During grading activities concrete debris was buried at a minimum of 3 ft below the cover system, consistent with the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a).

2.4. Access roads

2.4.1. Gravel access roads

Two gravel access roads were constructed at the site to facilitate operation or maintenance procedures that may be necessary. The gravel access roads are shown on Sheet G-5 of the Record Drawings, contained in Appendix D. The cross-sections are illustrated on Sheet G-7 of the Record Drawings, contained in Appendix D.

Northern/western gravel access road. This gravel access road is located along the northern and western sides of the asphalt parking lot and runs parallel to Factory Avenue and the western property boundary. This gravel access road ties into the paved access road described in the following sub-section. With the following exceptions, this gravel access road was constructed in accordance with the Former Landfill IRM Revised Work Plan (O'Brien & Gere, 2002a).

- Approximately 320 linear ft was constructed as follows, consistent with Technical Variance # 4 and as shown on Sheet G-7 of the Record Drawings, contained in Appendix D:
  - Top layer: 18 inches run-of-crusher
  - Second layer: Mirafi S1200 fabric
  - Third layer: triplanar geonet
  - Fourth layer: 40 mil low linear density polyethylene (LLDPE) geomembrane
  - Fifth layer: Mirafi S1200 fabric.

- Approximately 300 liner ft were constructed as follows, consistent with Technical Variance # 4 and as shown on Sheet G-7 of the Record Drawings, contained in Appendix D.:
  - Top layer: 12 inches run-of-crusher
  - Second layer: Mirafi 500X fabric
  - Third layer: 8 inches crushed stone
  - Fourth layer: triplanar geonet
  - Fifth layer: 40 mil LLDPE geomembrane
  - Sixth layer: Mirafi S-1200 fabric.

Technical Variance # 4 is contained in Exhibit C-4. Record Drawings are included in Appendix D.

Eastern gravel access road. This gravel access road is located along the eastern edge of the vegetated cover and runs from the north edge of pavement to the vicinity of the SPDES Treatment System IRM treatment building. Construction of this gravel access road was discussed during a field tour that followed a project progress meeting conducted on October 6, 2004, as documented in the corresponding meeting minutes (O'Brien & Gere 2004b) and in meeting minutes of November 3, 2004 (O'Brien & Gere 2004c). As agreed in the field by representatives of GM, NYSDEC, the IRM Contractor and O'Brien & Gere, this gravel access road was constructed using 40 mil textured LLDPE geomembrane, tri-planar geonet, woven geotextile fabric, and then crushed stone, from the bottom to the top surface.

2.4.2. Asphalt access road

An asphalt access road was constructed at the site to serve as a tie-in to Factory Avenue. The access road was constructed consistent with the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a), with the following exception:

- The edges of pavement were constructed of asphalt instead of the run-of-crusher stone and concrete valley gutter. This change was discussed by O'Brien & Gere and the IRM Contractor in the field on November 8, 2004, and was performed with Owner and NYSDEC concurrence.

The asphalt access road is shown on Sheet G-5 of the Record Drawings, contained in Appendix D. The cross-section is illustrated on Sheet G-8 of the Record Drawings, contained in Appendix D.

2.5. Low permeability cover system

The low permeability cover system installed over the former landfill area consisted of five separate cross-sections. The five cross-sections are described in the following sub-sections.

2.5.1. Low permeability vegetative cover

The low permeability vegetative cover cross section was constructed consistent with the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a), with the exception of the soil bedding layer. The soil bedding layer was constructed using Mirafi S1200 in lieu of the 6-inch soil bedding layer called for in the Former Landfill IRM Revised Work Plan, in accordance with Technical Variance #1. Technical Variance #1 was approved by NYSDEC on September 12, 2003 (Benjamin 2003e). Technical Variance #1 is included in Exhibit C-1.

Following installation of the Mirafi S1200, a 40-mil textured LLDPE geomembrane and tri-planar geonet was placed in that order on top of the Mirafi S1200 layer. This was covered with a minimum 12-inch layer of barrier protection material, followed by a minimum of 6 inches of topsoil. The topsoil was fertilized and seeded. The seeding was conducted in accordance with Technical Variance #5. Technical Variance #5 was approved by NYSDEC (Benjamin 2004), and is included in Exhibit C-3. The areas covered using a vegetative cover are illustrated on Sheet G-6 of the Record Drawings, contained in Appendix D.

To accommodate future relocation of four 115 kV power line structures, the following was performed in accordance with Design Modification #1:

- Excavation of approximately 20 ft by 190 ft by approximately 13 ft deep of former landfill material, and replacement with a minimum of approximately 6 ft of compacted embankment material.

- Installation of a minimum of 24 inches of low permeability. Installation of a minimum of 12 inches of barrier protection material.

This area is illustrated on Sheet G-3 of the Record Drawings, included in Appendix D.

To accommodate relocation of one 34.5 kV power pole, the following was performed in accordance with Design Modification #1:

- Excavation of approximately 10 ft by 10 ft by 10 ft deep of former landfill material, and replacement with a minimum of 6 ft of compacted embankment material.

- Installation of a minimum of 24 inches of low permeability material overlain by a minimum of 12 inches of barrier protection material and a minimum of 6 inches of topsoil.

This area is illustrated on Sheet 3 of the Record Drawings, included in Appendix D. Design Modification # 1 was approved by NYSDEC in its letter of May 20, 2003 (Benjamin 2003f).

2.5.2. Asphalt parking lot

The asphalt parking lot cross section was constructed consistent with the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a), with the exception of the soil bedding layer. The soil bedding layer was constructed using Mirafi S1200 in lieu of the 6-inch soil bedding layer called for in the Former Landfill IRM Revised Work Plan, in accordance with Technical Variance #1. Technical Variance #1 was approved by NYSDEC on September 12, 2003 (Benjamin 2003e) and is included in Exhibit C-1.

A 40-mil smooth LLDPE geomembrane and tri-planar geonet was placed in that order on top of the Mirafi S1200 layer. This was covered with a minimum 10-inch layer of run-of-crusher stone followed by minimum of 6 inches of bituminous base course, and then by a minimum of 2 inches of bituminous wear course. As required in the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a), the bituminous base course was NYSDOT Asphalt Concrete Type I Item No. 403.11 and the bituminous wear course was NYSDOT Asphalt Concrete Type 6F Item No. 403.1701. Documentation regarding the specifications of the concrete asphalt mixes is included in Exhibit D-12.

As documented in the progress meeting minutes of November 18, 2003, during a field meeting conducted also on November 18, 2003, it was agreed between the IRM Contractor, O'Brien & Gere, GM and NYSDEC that the asphalt testing would consist of nuclear density testing for compaction on a test strip installed that day, while cores would be collected for thickness and compaction testing (O'Brien & Gere 2003). It was also agreed that the asphalt base course would be installed in a single 6 inch lift instead of two 3-inch lifts, with the compaction testing providing documentation that compaction was achieved in the single lift. During subsequent communication with NYSDEC, it was decided that the cores would be omitted (Benjamin 2003g). Compaction results are provided in Exhibit D-12. The area covered with the asphalt cover is illustrated on Sheet G-6 of the Record Drawings, contained in Appendix D.

To accommodate the potential replacement of two 115 kV power poles near the southern boundary of the landfill, the following was performed in accordance with Design Modification #1 with exceptions noted as such:

- Excavation of former landfill material around the two 115 kV power poles. The eastern pole and western pole excavations were approximately 10 ft by 10 ft by 2 ft deep and 10 ft by 10 ft by 4 ft deep, respectively. The eastern excavation was backfilled with a minimum 2 ft of low permeability material. The western excavation was backfilled with approximately 2 ft of compacted embankment material followed by a minimum 2 ft of low permeability material.

- The low permeability material was overlain by a minimum of 10 inches of run-of-crusher stone, minimum of 6 inches of bituminous

base course, and then a minimum of 2 inches of bituminous wear course.

To accommodate relocation of two 34.5 kV power poles, the following was performed in accordance with Design Modification #1:

- Excavation of a minimum of 10 ft by 10 ft by 10 ft deep of former landfill material, and replacement with a minimum of 6 ft of compacted embankment material.

- Installation of a minimum of 24 inches of low permeability material overlain by a minimum of 10 inches of run-of-crusher stone and a minimum of 6 inches of bituminous base course, and then a minimum of 2 inches of bituminous wear course.

This area is illustrated on Sheet G-3 of the Record Drawings, included in Appendix D. Design Modification # 1 was approved by NYSDEC in its letter of May 20, 2003 (Benjamin 2003f).

2.5.3. Access roads

The access roads described in Section 2.4 serve as a functional portion of the low permeability cover system. The locations of the access roads are illustrated on Sheet G-6 of the Record Drawings, contained in Appendix D.

2.5.4. Asphalt resurfacing

A portion of the former landfill area (1.29 acres), which was originally covered with asphalt, was resurfaced with the following from subgrade to final grade, consistent with the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a): tri-planar geonet, 4 to 10 inches of run-of-crusher stone, as required to meet final grade, and 6 to 8 inches of asphalt. The area that was resurfaced is illustrated on Sheet G-6 of the Record Drawings, contained in Appendix D. At the northern interface of the asphalt resurfacing and the vegetative low permeability cover, the Mirafi S1200 fabric, 40-mil textured LLDPE geomembrane, and tri-planar geonet were placed on the original asphalt with an approximately 3-ft overlap.

2.5.5. Rip-rap slopes

The rip-rap slope cross section was constructed consistent with the Former Landfill IRM Revised Work Plan (O'Brien & Gere 2002a), with the exception of the soil bedding layer and the geotextile layer. The soil bedding layer was constructed using Mirafi S1200 in lieu of the 6-inch soil bedding layer called for in the Former Landfill IRM Revised Work Plan, in accordance with Technical Variance #1. Technical Variance #1 is included in Exhibit C-1.

For a 185 ft portion of the western rip-rap slope, the geotextile layer was constructed using Typar SF65 Spunbonded Polypropylene nonwoven geotextile fabric in lieu of the Mirafi 500X specified in the Former Landfill IRM Revised Work Plan, in accordance with Technical Variance #2. Technical Variance #2 is included in Exhibit C-2.

2.6. Vegetative cover

Outside the northern limits of the landfill, a vegetative cover was installed to address peripheral surface contamination, consistent with the Former Landfill IRM Revised Work Plan (O' Brien & Gere 2002a). The vegetative cover consisted of the following from subgrade to final grade: a minimum of 12 inches of barrier protection material, which was fertilized and seeded. The seeding was conducted in accordance with Technical Variance #5. Technical Variance #5 was approved by NYSDEC and is included in Exhibit C. The areas covered with the vegetative cover are illustrated on Sheet G-6 of the Record Drawings, contained in Appendix D.

2.7. Storm water conveyance system

The storm water conveyance system at the site consisted of the following:

- Grading of the drainage ditch between Factory Ave. and the site to promote storm water runoff drainage to the culverts that run under Factory Ave. across to the Ley Creek PCB Dredgings Site and to Ley Creek.
- Use of existing structure A2A (along the 003 storm sewer line).

Catch basins in the southeastern portion of the low permeability cover were omitted, as discussed during the November 4, 2003 progress meeting. The location of the storm water conveyance system is illustrated on Sheet G-5 of the Record Drawings, contained in Appendix D.

2.8. Ditch restoration on Niagara Mohawk property

In accordance with the August 2, 2004 letter to Sue Benjamin (Hartnett 2004), a pipe was installed within a depression on the NIMO property to connect two drainage pipes. The depression was subsequently backfilled. Prior to the connection of the drainage pipes, hot spots associated with two samples, 6+10 Bank and SM-101, were excavated as described in Section 2.1.1. Following removal of the hot spots, the pipe

connection and backfilling was conducted in accordance with the August 2, 2004 letter, with the exception of the following:

- Woven geotextile fabric was not installed prior to installation of the stone bedding.

3. Health and safety requirements

The IRM Contractor supplied a health and safety plan for its employees that was followed during implementation of the Former Landfill IRM Revised Work Plan. A copy of the health and safety plan and supporting documentation is retained at the Former IFG Facility. No OSHA recordable injuries or other significant health and safety issues occurred during the implementation of the Former Landfill IRM.

4. Sampling and analysis requirements

Post-excavation confirmatory sampling for surface and subsurface hot spots that were excavated were collected in accordance with the Former Landfill IRM Revised Work Plan. In addition, informational samples were collected in instances where removal of hot spots was hindered by the presence of utilities.

Post-excavation confirmatory sampling related to excavation of the former drainage swale within the Former Landfill IRM Revised Work Plan work limits was performed in accordance with the Former Landfill IRM Revised Work Plan. In addition, informational samples were collected in instances where removal of the former drainage swale material was hindered by the presence of utilities.

The excavated overburden material was sampled for PCBs prior to being utilized for grading, at a frequency of one sample per approximately 500 cu yd, with the exception of the surface hot spot between 4+5 and 6+20 along Factory Avenue. Consistent with the Former Landfill IRM Revised Work Plan, the surface 1-ft in this area was excavated and used for grading under the low permeability cover without prior sampling.

Table 1 presents a summary of the results of confirmatory and informational samples. A DUSR for this data was prepared by O'Brien & Gere for the sampling activities during construction. The DUSR is included in Appendix B. The DUSR concluded that overall data usability with respect to completeness was 100 percent for the PCB data. In addition, based on the review performed the data were determined to be usable for qualitative and quantitative purposes.

5. Construction quality assurance/construction quality control (CQA/CQC)

This section provides a discussion regarding the CQA/CQC and MQA/MQC activities conducted during implementation of the Former Landfill IRM. The Engineer was O'Brien & Gere and the IRM Contractor was Royal Environmental, Inc. (Royal Environmental). Liner installation was performed by New England Liner Systems, Inc., a subcontractor to Royal Environmental. Third party CQA/CQC was performed by Atlantic Testing, a subcontractor to Royal Environmental. Destructive testing of seams was performed by GeoTesting Express, Inc., a subcontractor to Royal Environmental.

5.1. Soil bedding layer

In accordance with Technical Variance #1 submitted by the IRM Contractor, Mirafi S1200 non-woven geotextile fabric was installed in lieu of the 6-inch soil bedding layer called for in the Former Landfill IRM Revised Work Plan. O'Brien & Gere reviewed this technical variance, found the Mirafi S1200 geotextile fabric to be an acceptable substitute, and submitted the technical variance to NYSDEC for approval. Technical Variance #1 was approved by the NYSDEC. A copy of the technical variance and associated NYSDEC correspondence is included in Exhibit C. No testing was required for this material.

5.2. Geomembrane

In accordance with the Former Landfill IRM Revised Work Plan , 40-mil textured/smooth LLDPE geomembrane was utilized as a component of the low permeability cover system. The following sections discuss CQA/CQC and MQA/MQC procedures for installation of the geomembrane.

MQC of geomembrane raw materials by the manufacturer at the plant. The IRM Contractor provided the following documentation from the geomembrane manufacturer regarding quality control of raw materials used to manufacture the geomembrane.

- Certification that the polyethylene resin is new, first quality resin manufactured in the United States from virgin, uncontaminated ingredients and is free of contaminants
- Origin, identification, and shipping date(s) of the raw materials used to manufacture the geomembrane

- Quality control certificates of raw materials used to manufacture the geomembrane
- This documentation is included in Exhibit D-1.
- Reports of tests conducted to verify the quality of the raw materials as follows:

Table 5-1. *MQC of geomembrane raw materials by the manufacturer at the plant.*

Parameter	***Standard***	***Frequency***	***Criteria***
Density	ASTM D792 or ASTM D1505	One sample from each resin batch	0.912 to 0.925 g/cm^3
Melt Index	ASTM D1238	One sample from each resin batch	0.1 to 1.0 g/10 minutes

Notes:

(1) ASTM D792 *Test Method for Specific Gravity (Relative Density) and Density of Plastics by Displacement*
(2) ASTM D1505 *Test Method for Density of Plastics by the Density-Gradient Technique*
(3) ASTM D1238 *Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer*
(4) ASTM D3015 *Practice for Microscopical Examination of Pigment Dispersion in Plastic Compounds*

The IRM Contractor provided O'Brien & Gere with certified copies of the factory test results for resin density and melt index. Test results for carbon black content and carbon black dispersion for the resin were not provided by the IRM Contractor. Test results are included in Exhibit D-1.

MQC of geomembrane physical properties by the manufacturer at the plant. The IRM Contractor provided the following documentation from the geomembrane manufacturer regarding quality control of physical properties of the geomembrane.

Samples of the production run of the geomembrane material were obtained and tested and the results certified in accordance with the following performance standards:

Table 5-2. *MQC of geomembrane physical properties by the manufacturer at the plant.*

Parameter	***Standard***	***Criteria***
LLDPE Smooth and Textured		
Gauge (Nominal)	ASTM 5199	40 mils
Thickness (absolute minimum)	ASTM D5199	36 mils
Density (minimum)	ASTM D1505	0.920 g/cm^3
Carbon black content (maximum)	ASTM D1603	2% by weight
Carbon black dispersion	ASTM D5596	Note 10
Minimum tensile properties	ASTM D638 (as modified by NSF54)	--
1. Tensile strength @ break 2. Elongation @ break	Type IV specimen @ 2 in./minute G.L. = 2 in (51 mm)	160 lb./in. width 500%
Tear resistance (minimum)	ASTM D1004	22 lb (98N).
Puncture resistance	FTMS 101C 2065	48 lb. (214N)

Notes:

(1) ASTM D2663 *Test Method for Carbon Black Dispersion in Rubber.*
(2) ASTM D638 *Test Method for Tensile Properties of Plastics.*
(3) ASTM D1004 *Test Method for Initial Tear Resistance of Plastic Film and Sheeting.*
(4) Federal Test Method Standard (FTMS) – 101C 2065.
(5) ASTM D746 *Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.*
(6) ASTM D1204 *Test Method for Linear Dimensional Changes of No rigid Thermoplastic Sheeting of Film at Elevated Temperature*
(7) ASTM D1693 *Test Method for Environmental Stress-Cracking of Ethylene Plastics*
(8) NSF *National Sanitation Foundation*

The geomembrane sheets were randomly sampled and tested a minimum of once every 50,000 square ft for the above physical properties. The IRM Contractor provided O'Brien & Gere with certified copies of the factory test results from the geomembrane manufacturer. A stress rupture curve was not provided by the IRM Contractor. The test results received by O'Brien & Gere are included in Exhibit D-1.

CQC prior to geomembrane installation. Prior to placement of the geomembrane, the Geosynthetic Installer provided a copy of its Quality Control Program Manual to O'Brien & Gere regarding the installation of the geomembrane. The Quality Control Program Manual included:

- Installation procedures
- Field seaming procedures
- Procedures for repair
- Documentation procedures.

The IRM Contractor performed laboratory friction tests using the American Standard Test Method (ASTM) D5321 - Direct Shear Test Method, as approved by O'Brien & Gere. This was performed to document if a minimum factor of safety of 1.5 could be obtained for the steepest slopes proposed between the following cap system components: soil and tri-planar geonet, textured geomembrane and tri-planar geonet, textured geomembrane and geocushion, textured geomembrane and stabilization fabric, soil and stabilization fabric. and tri-planar geonet drainage layer. O'Brien & Gere evaluated the results of the friction tests. Friction testing was performed with a direct shear box having minimum dimensions of 12 inches by 12 inches and applied normal stresses of 1.0, 2.0, 4.0, and 8.0 psi for each cap system interface. Displacement rates were less than 0.04 inches per minute. The low permeability cap system components were tested in a saturated condition.

The geomembrane was oriented such that the shear force was parallel to the downslope orientation of the geomembrane in the field. A minimum of one test per cap system interface was performed. Test results are presented in Exhibit D-2.

The Geosynthetic Installer provided O'Brien & Gere with verbal acceptance of the subgrade prior to geomembrane installation. Daily subgrade acceptance forms are included in field notes provided in D-2. Written acceptance is also included in Exhibit D-3. No installation of the geomembrane commenced until the surface was accepted by the Geosynthetic Installer. The IRM Contractor was required to repair or re-work any area of the prepared surface requested by O'Brien & Gere, CQC Inspector, or Geosynthetic Installer. In accordance with the geomembrane manufacturer, no special storage was required for the geomembrane stored on-site.

As documented in field notes, the Geosynthetic Installer provided one minimum 18-inch wide by 18-inch long sample of geomembrane to the IRM Contractor for each lot number of geomembrane that arrived at the site for fingerprinting. The Geosynthetic Installer provided O'Brien & Gere with a geomembrane panel layout showing the proposed locations of field seams to be installed. The as-built geomembrane panel layout is provided in Exhibit D-4.

CQC during geomembrane installation. Prior to seaming, the Geosynthetic Installer observed the areas to be seamed to determine that they were free from dirt, dust, moisture, debris, and foreign material. No seaming was performed when the air temperature or sheet temperature was below 32 degrees Fahrenheit (°F), when the sheet temperature exceeds 158 °F, when the air temperature was above 120 °F, during periods of precipitation, or when winds were in excess of 20 miles per hour.

All seaming material was of a type recommended and supplied by the manufacturer and was delivered in the original sealed containers, each with an indelible label bearing the brand name, manufacturer's mark number, and complete directions as to proper storage.

Seams were made using double wedge welding as the primary method. Extrusion welding was used only for patching and seaming around appurtenances. The minimum finished overlap of the panels of the geomembrane was 5 inches maximum for wedge welding and 3 inches minimum for extrusion welding.

Test seams were made at the start of each seaming period, at the CQC Inspector's discretion, whenever there was a change in seaming personnel or equipment, if significant changes in geomembrane temperature was observed, and at least once every four hours for each seamer and seaming equipment used that day. The field test weld was a minimum of 2 ft long by 1 ft wide with the seam centered lengthwise and was made for each welding machine. Test weld samples were labeled with:

- Date and time
- Roll/panel number
- Seam number
- Ambient temperature
- Welding apparatus
- Temperature and pressures
- Welder's initials
- Top sheet.

Five test strips approximately 1-inch wide were cut from each opposite end of test weld samples by the Geosynthetic Installer and subjected to shear and peel tests at the site, as described in the following sections for destructive testing. When the field tests failed to meet the minimum specified seam requirements, the entire operation was repeated. If the additional test seam fails, the seaming apparatus or seamer was not accepted or used until the deficiencies were corrected and two consecutive successful full test seams were achieved. No seaming personnel began work until his test weld had passed the on-site shear and peel tests as indicated by the CQC Inspector. Seam testing data is included in Exhibit D-6.

CQA prior to geomembrane installation. O'Brien & Gere reviewed submittal information provided by the Geosynthetic Installer.

CQA during geomembrane installation. The CQC Inspector inspected delivery tickets and the geomembrane manufacturer's quality control documentation to verify that the geomembrane rolls received on-site met the project specifications. During installation of the geomembrane, the CQC Inspector determined that the geomembrane was installed in accordance with the requirements of the approved engineering plans, reports, and specifications.

The CQC Inspector also inspected the geomembrane visually for the following:

- Uniformity

- Damage
- Imperfections
- Tears
- Punctures
- Nodules
- Contaminants
- Blisters.

Imperfections, such as those noted above, were repaired and reinspected. Non-destructive tests were performed on 100 percent of the field seams using either the vacuum test or pressurized dual seam test methods.

The CQC Inspector performed the following during non-destructive seam testing:

- Observed non-destructive testing

- Recorded location, date, test unit number, name of tester, and results of all testing

- Informed the Geosynthetic Installer of required repairs.

Destructive seam testing was performed as the seaming work progresses and not at the completion of seam fabrication. Destructive seam testing was performed at the locations established as follows:

- A minimum frequency of one test for approximately every 500 ft of seam length and for each seaming machine per day.

The samples were a minimum of 18 inches wide by 72 inches long with the seam centered lengthwise. Each sample was cut into three pieces (18 inches x 24 inches) with one piece retained by the Geosynthetic Installer, one piece given to the CQC Geosynthetic Laboratory. Each sample was tagged to identify:

- Roll/panel number
- Seam number
- Date and time cut
- Ambient temperature
- Seaming unit
- Name of seamer
- Welding apparatus temperature and pressures
- Top sheet.

The Geosynthetic Installer cut six 1-inch wide replicate specimens from his sample with the appropriate ASTM cutting tool. Three specimens were tested for shear strength and three for peel adhesion. No seams delaminated or failed in the adjacent sheet material on either side of the seam in a film tear bond.

If the field tests pass, testing was performed by the CQC Geosynthetic Laboratory on duplicate samples as follows:

Table 5-3. *CQC of geomembrane if field tests pass.*

Parameter	***Standard***	***Criteria***
Fusion Seaming		
Shear Strength (minimum) Film Tear Bond	ASTM D4437 (as modified by NSF 54)	56 lb/in
Peel Adhesion (minimum) Film Tear Bond	ASTM D4437 (as modified by NSF 54)	48 lb/in
Extrusion Seaming		
Shear Seaming (minimum) Film Tear Bond	ASTM D4437 (as modified by NSF 54)	56 lb/in
Peel Adhesion (minimum) Film Tear Bond	ASTM D4437 (as modified by NSF 54)	48 lb/in

Notes:
(1) ASTM D4437 *Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes.*

If the field tests failed, the seam was reconstructed between the failed location and passed test location. Seam reconstruction was achieved by cutting out the existing seam and seaming in a replacement strip or adding a cap strip. In lieu of this, the seaming path was retraced to an intermediate location at least 10 ft in each direction from the location of the sample, which failed the test. At each location a minimum 12 inch by 12 inch size sample was taken for two additional shear strength tests and two additional peel adhesion tests using an approved field tensiometer. If these tests passed, then the remaining sample portion was sent to the CQC geosynthetic laboratory for two shear strength and two peel adhesion tests. If these tests failed, then the process was repeated. After reconstruction, the entire reconstructed seam was non-destructively tested. In any case, acceptable seams were bounded by two passed test locations and included one test location along the reconstructed seam.

The geomembrane surface was cleaned by the Geosynthetic Installer prior to examination of seams and non-seam areas by the CQC Inspector. The CQC Inspector identified defects, holes, blisters, undispersed raw materials and sign of contamination by foreign materials.

Each suspect location in seam and non-seam areas was non-destructively tested, as appropriate. Locations that failed the non-destructive testing were documented by the CQC Inspector and repaired by the Geosynthetic Installer according to the following methods:

- Patching was used to repair holes, tears, blisters, undispersed raw materials, or contaminated areas by foreign materials. Patches and caps were extended a minimum of 6 inches beyond the edge of the defect and were made of the same geomembrane. Corners of patches were rounded with a radius of approximately 3 inches. If extrusion materials were used, the surface of the geomembrane was repaired and abraded no more than one hour prior to the repair

- Spot welding or seaming was used to repair small tears or other localized flaws

- Failed seams were reconstructed. Seams were required to pass non-destructive testing as appropriate.

Records of testing performed during installation are included in Exhibit D-5.

5.3. Tri-planar geonet

Construction quality control. The Contractor's CQC Manager provided documentation regarding quality control of physical properties of the tri-planar geonet. The tri-planar geonet consisted of a geonet bonded on each side with a non-woven, needle-punched geotextile. Samples of the production run of the tri-planar geonet were obtained and tested and the results certified in accordance with the following minimum average roll values:

Table 5-4. *CQC of tri-planar geonet prior to construction.*

Parameter	***Standard***	***Criteria***
Geonet		
Peak tensile strength – MD	ASTM D4595	40 ppi
Mass per unit area	ASTM D3776	24.5 oz/yd^2
Thickness	ASTM D5199	200 mils
Carbon black	ASTM D4218	2% by weight
Geotextile		
Weight	ASTM D5261	6.0 oz/ yd^2
Grab tensile strength	ASTM D4632	110 lbs
Grab tensile elongation	ASTM D4632	50%
Trapezoid tear strength	ASTM D4533	80 lbs
Mullen burst strength	ASTM D3786	335 psi
Puncture strength	ASTM D4833	85 lbs
Permittivity	ASTM D4491	2.3 sec^{-1}

Parameter	***Standard***	***Criteria***
UV resistance (500 hrs)	ASTM D4355	85%
Finished Tri-planar geonet		
Peel adhesion	ASTM F904	4.54 g/in
Transmissivity at normal pressure of 500 psf and hydraulic gradient of 1.0	ASTM D4716	2.0 x 10^{-3} m^2/sec

Notes:

(1) ASTM D3776	*Test Method for Mass per Unit Area (Weight) of Woven Fabric.*
(2) ASTM D5199	*Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.*
(3) ASTM D4632	*Test Method for Grab Breaking Load and Elongation of Geotextiles.*
(4) ASTM D4533	*Test Method for Trapezoid Tearing Strength of Geotextiles.*
(5) ASTM D3786	*Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method.*
(6) ASTM D4833	*Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.*
(7) ASTM D4491	*Test Methods for Water Permeability of Geotextiles by Permittivity.*
(8) ASTM D4355	*Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).*
(9) ASTM F904	*Test Method for Comparison of Bond Strength or Ply Adhesion of Similar Laminates made from Flexible Materials.*
(10) ASTM D4716	*Test Method for Constant Head Hydraulic Transmissivity (In-Plane Flow) of Geotextiles and Geotextile Related Products.*

The Contractor's CQC Manager provided O'Brien & Gere with certified copies of the factory and laboratory test results. In addition, the IRM Contractor's CQC Manager provided the manufacturer's certification that the tri-planar geonet met the chemical, physical, and manufacturing requirements. Records of test results and certifications are included in Exhibit D-6.

Construction quality assurance. Prior to procurement of material and during construction, O'Brien & Gere reviewed and verified submittal and sample information from the IRM Contractor's CQC Manager. The information was reviewed to determine if the proper information was submitted. Results of the testing were provided to O'Brien & Gere for acceptance.

During installation of the tri-planar geonet, the CQC Inspector:

- Monitored that the tri-planar geonet was installed in accordance with the requirements of the Contract Documents and as shown on the Record Drawings, contained in Appendix D.
- Made observations that the geonet was not damaged during the installation process.

5.4. Barrier protection layer

Construction quality control. The barrier protection layer consisted of a minimum 12-inch thick soil layer installed on top of the tri-planar geonet drainage layer. The barrier protection layer was generally uniform in composition and texture. Prior to installation of the barrier protection layer, the IRM Contractor's CQC Manager collected samples of the proposed soils and submitted the samples to the CQC Geotechnical Laboratory for testing as follows:

Table 5-5. *CQC of barrier protection layer prior to construction*

Parameter	***Standards***	***Criteria***	
Particle Size Analysis	ASTM D422	Material proposed for 12-inch lift of barrier protection layer:	
		% Passing	Sieve
		100	2-inch
		20-30	No. 200
Compaction Characteristics	ASTM D698	Develop compaction characteristics	

Notes:
ASTM D422 *Method for Particulate Size Analysis of Soil*
ASTM D698 *Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600kN-m/m^3)*

Construction quality assurance. Prior to procurement of material and during construction, O'Brien & Gere reviewed and verified submittal and sample information from the IRM Contractor's CQC Manager. The information was reviewed to determine if the proper information was submitted. O'Brien & Gere returned the submittals to the IRM Contractor, and depending on the review (acceptance or non-acceptance), the IRM Contractor proceeded with ordering the materials. Results of these tests are included in Exhibit D-7.

The IRM Contractor submitted an affidavit from the owner of the source of barrier protection material stating that to the best of his knowledge, the site of the source material was never used as a dump site for chemical, toxic, hazardous or radioactive materials and it was not then, or ever had been, listed as a suspected depository for chemical, toxic, hazardous, or radioactive materials by any federal, state, or other governmental agency, department, or bureau. In addition, the IRM Contractor provided analytical results for TCLP testing of the barrier protection material that indicated that it was not hazardous waste. A copy of this documentation is included in Exhibit D-7.

During installation of the barrier protection layer, material from the borrow source was tested by the Contractor's CQC Geotechnical Testing Laboratory in accordance with the following:

Table 5-6. *CQC of barrier protection layer during construction.*

Parameter	***Standard***	***Minimum frequency***	***Criteria***
In-Place Density	ASTM D1556 or ASTM D2922 or ASTM D2167	5 tests per acre per lift of soil placed (Results for 7 tests provided)	95% of the Standard Proctor Compaction as determined by ASTM 698
In-Place Moisture Content	ASTM D3017	5 tests per acre per lift of soil placed (Results of only 7 tests provided)	Monitor compaction

Notes:
(1) ASTM D1556 *Test Method for Density and Unit Weight of Soil In Place by the Sand-Cone Method*
(2) ASTM D2922 *Test Methods for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)*
(3) ASTM D2167 *Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method*
(4) ASTM D3017 *Test Method for Water Content of Soil and Rock in Place by Nuclear methods (Shallow Depth)*

Test results for in-field particle size analysis and liquid limit/plastic limit/plasticity index to monitor material consistency were not provided by the Contractor. A total of seven results of in-place density and moisture content testing were submitted to O'Brien & Gere for acceptance. Results of the testing are included in Exhibit D-7.

5.5 Topsoil

Construction quality control. Topsoil used at the site originated from on-site, therefore, topsoil CQC testing was omitted. Electronic copies of analytical results for the topsoil are included in Appendix C. Dates of soil reuse requests and corresponding NYSDEC soil use approvals are summarized in Table 4.

The topsoil used during construction of the vegetated cover was visually inspected by O'Brien & Gere. O'Brien & Gere performed inspections to evaluate the placement of topsoil in accordance with the Contract Documents. The Contractor was required to place a minimum 6-inch thickness of topsoil as shown on the Record Drawings or as specified in the Contract Documents.

5.6. Fertilization and seeding

Construction quality control. As part of CQC, the Contractor's CQC Manager submitted the following information to O'Brien & Gere for acceptance prior to fertilization and seeding activities:

- Seed vendor's certified statement for the grass seed mixture required, stating common name, scientific name, percentage by weight, and percentages of purity and germination
- Fertilizer vendor's certified statement for the fertilizer required stating guaranteed statement of analysis

- Documentation providing data concerning hydroseeding equipment (if used), including material application rates.

The grass seed was of commercial stock of the current season's crop and was delivered in unopened containers bearing the guaranteed analysis of the mix. The mix was in accordance with the requirements of the approved engineering plans and specifications.

Fertilizer was a standard quality commercial carrier of available plant food elements. Fertilizer was a complete, prepared, and packaged material and contained a minimum of 10% nitrogen, 10% phosphoric acid, and 10% potash.

Construction quality assurance. O'Brien & Gere performed inspections to evaluate that fertilization and seeding materials met the requirements of the Contract Documents. O'Brien & Gere also inspected the application rates of seed and fertilizer and mulch with respect to the specifications. Seed and fertilizer information are included in Exhibit D-11.

5.7. Rip-rap

Rip-rap used during construction was NYSDOT Item 620-2.02 Stone Filling. The characteristics of NYSDOT Item 620-2.20 Stone Filling generally are consistent with the Former Landfill IRM Revised Work Plan Technical Specification 02271 Dumped Rip-rap, therefore, no testing was performed for rip-rap characteristics. The IRM Contractor submitted an affidavit from the owner of the source of the rip-rap stating that to the best of his knowledge, the site of the source material was never used as a dump site for chemical, toxic, hazardous or radioactive materials and it was not now, then or ever had been, listed as a suspected depository for chemical, toxic, hazardous, or radioactive materials by any federal, state, or other governmental agency, department, or bureau. Documentation regarding rip-rap is included in Exhibit D-8.

Construction quality assurance. The IRM Contractor placed a minimum thickness of rip-rap as shown on the Record Drawings or as specified in the Contract Documents

5.8. Geotextile filter fabric

Construction quality control. Prior to installation of the geotextile filter fabric, the IRM Contractor's CQC Manager provided documentation regarding quality control of physical properties of the geotextile filter fabric. The geotextile filter fabric consisted of a nonwoven, needle-punched geotextile. Samples of the production run of the geotextile

material were obtained and tested and the results certified in accordance with the following minimum average roll values:

Table 5-7. CQC *for geotextile filter fabric prior to construction.*

Parameter	***Standard***	***Criteria***
Mass per unit	ASTM D5261	Minimum 4.0 oz/yd^2
Permittivity	ASTM D4491	Minimum of 1.95 sec^{-1}
Grab Tensile Strength	ASTM D4632	Minimum 180 lbs
Grab Tensile Elongation	ASTM D4632	Minimum 50%
Trapezoid Tear Strength	ASTM D4533	Minimum 45 lbs
Puncture Strength	ASTM D4833	Minimum 65 lbs
Mullen Burst Strength	ASTM D3786	Minimum 240 psi
UV Resistance	ASTM D4355 (after 150 hours)	70% strength retained
Apparent Opening Size	ASTM D4751	Maximum No. 70 U.S.

Notes:
(1) ASTM D4491 *Test Methods for Water Permeability of Geotextiles by Permittivity*
(2) ASTM D4632 *Test Method for Grab Breaking Load and Elongation of Geotextiles*
(3) ASTM D4533 *Test Methods for Trapezoidal Tearing Strength of Geotextiles*
(4) ASTM D4833 *Test Methods for Index Puncture Resistance of Geotextiles and Geomembranes*
(5) ASTM D3786 *Test Method for Hydraulic Bursting Strength of Knitted Goods*
(6) ASTM D4355 *Test Method for Deterioration of Geotextiles from UV Exposure and Water (Xenon-Arc)*
(7) ASTM D4751 *Test Method for Determining the Apparent Opening Size of a Geotextile*

The IRM Contractor's CQC Manager provided O'Brien & Gere a cut sheet for the filter fabric used. The cut sheet is included in Exhibit D-9.

Construction quality assurance. O'Brien & Gere reviewed and verified submittal and sample information from the IRM Contractor's CQC Manager. The information was reviewed to determine if the proper information has been submitted.

The geotextile filter fabric was installed in accordance with the requirements of the Contract Documents and as shown on the Record Drawings, contained in Appendix D.

During the installation phase, the geotextile filter fabric was visually inspected for the following:

- Defects
- Rips
- Holes
- Flaws
- Deterioration
- Damage.

O'Brien & Gere performed inspections to evaluate the construction of the storm water drainage facilities in accordance with the Contract Documents.

5.9. Geotextile stabilization fabric

Construction quality control. The IRM Contractor's CQC Manager provided documentation regarding quality control of physical properties of the geotextile stabilization fabric.

The geotextile stabilization fabric conformed to the following minimum average roll values:

Table 5-8. CQC *of geotextile stabilization fabric prior to construction.*

Parameter	***Standard***	***Criteria***
Puncture Strength	ASTM D4833	Minimum 120 lbs
Mullen Burst Strength	ASTM D3786	Minimum 600 psi
Trapezoid Tear Strength	ASTM D4533	Minimum 115 lbs
Grab Tensile Strength	ASTM D4632	Minimum 300 lbs
Grab Tensile Elongation	ASTM D4632	Minimum 15%
Wide Width Tensile Strength	ASTM D4595	Minimum 180 lbs MD and XD
Wide Width Tensile Elongation	ASTM D4595	Minimum 10% MD and XD
UV Resistance	ASTM D4355 (after 150 hours)	70% strength retained

NOTES:
(1) ASTM D4595 *Test Method for Tensile Properties of Geotextiles by Wide Width Strip Method*
(2) ASTM D4632 *Test Method for Grab Breaking Load and Elongation of Geotextiles*
(3) ASTM D4533 *Test Methods for Trapezoidal Tearing Strength of Geotextiles*
(4) ASTM D4833 *Test Methods for Index Puncture Resistance of Geotextiles and Geomembranes*
(5) ASTM D3786 *Test Method for Hydraulic Bursting Strength of Knitted Goods*
(6) ASTM D4355 *Test Method for Deterioration of Geotextiles from UV Exposure and Water (Xenon-Arc)*

The IRM Contractor's CQC Manager provided O'Brien & Gere with a cut sheet for stabilization fabric used. The cut sheet is included in Exhibit D-11.

Construction quality assurance. O'Brien & Gere reviewed and verified submittal and sample information from the IRM Contractor's CQC Manager. The information was reviewed to determine if the proper information was submitted. O'Brien & Gere returned the submittals to the Contractor. Upon delivery of the rolls of geotextile stabilization fabric, O'Brien & Gere visually inspected the material.

The geotextile stabilization fabric was installed in accordance with the requirements of the Contract Documents and as shown on the Record Drawings, contained in Appendix D.

During the installation phase, the geotextile stabilization fabric was visually inspected for the following:

- Defects
- Rips
- Holes
- Flaws
- Deterioration
- Damage.

O'Brien & Gere performed inspections to evaluate the construction of the access road in accordance with the Contract Documents. As discussed in Section 2.5, the IRM Contractor submitted Technical Variances related to the access roads. The access roads were consistent with the Technical Variances. Technical Variances are included in Exhibit C.

5.10. Low permeability material

As part of Modification #1 to the design, the use of low permeability material was added in connection with the construction of clean areas for future installation of 115 kV power line structures and for the replacement of single 34.5 kV power poles.

Prior to installation of the low permeability material, the IRM Contractor's CQC Manager collected samples of the proposed soils and submitted the samples to the CQC Geotechnical Laboratory for testing as follows:

Table 5-9. *CQC of low permeability material layer prior to construction.*

Parameter	***Standards***	***Minimum Frequency***	***Criteria***	
Particle Size Analysis	ASTM D422	Once per 200 cy of material delivered and/or when material changes	% Passing 100	Sieve 1-inch
Atterberg liquid and plastic limits, plasticity index	ASTM 4318	Once per 200 cy of material delivered and/or when material changes	Monitor soil composition	
Hydraulic conductivity	ASTM D05084	Once per 200 cy of material delivered and/or when material changes	Equal to or less than $1x10^{-6}$ cm/sec	
Compaction Characteristics	ASTM D698		Develop compaction characteristics	

Notes:

ASTM D422 *Method for Particulate Size Analysis of Soil*

ASTM D698 *Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600kN-m/m^3)*

One test was performed for the low permeability material prior to delivery to the site. Results of these tests are included in Exhibit D-13.

During installation of the low permeability material, material from the borrow source was tested by the Contractor's CQC Geotechnical Testing Laboratory in accordance with the following:

Table 5-10. *CQC of low permeability material layer during construction.*

Parameter	***Standard***	***Minimum frequency***	***Criteria***	
Particle Size Analysis	ASTM D422	Once per 200 cy of material delivered and/or when material changes were noted	% Passing 100	Sieve 1-inch
Liquid Limit, Plastic Limit, Plasticity Index	ASTM D 4318	Once per 200 cy of material delivered and/or when material changes were noted	Monitor soil composition	
Moisture Content	ASTM D2216	Once per 200 cy of material delivered and/or when material changes were noted	Monitor placement	
Soil Moisture Density Relationship	ASTMD698 Method D	Once per 200 cy of material delivered and/or when material changes were noted	Monitor soil composition	
Permeability	ASTM D5084-90	Once per 200 cy of material delivered and/or when material changes were noted	Maximum 1.0×10^{-6} cm/sec	

Notes:
ASTM D422 *Method for Particulate Size Analysis of Soil*
ASTM D4318 *Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.*

Results of all testing were submitted to O'Brien & Gere for acceptance. Test results are presented in Exhibit D-13.

The IRM Contractor submitted an affidavit from the owner of the source of low permeability material to be imported to the site stating that to the best of his knowledge, the site of the source material was never used as a dump site for chemical, toxic, hazardous or radioactive materials and was not then, or ever had been, listed as a suspected depository for chemical, toxic, hazardous, or radioactive materials by any federal, state, or other governmental agency, department, or bureau. In addition, the IRM Contractor provided analytical results for TCLP testing of the low permeability material that indicated that it was not a characteristic hazardous waste.

Following installation of the low permeability material, material was tested by the Contractor's CQC Geotechnical Testing Laboratory in accordance with the following:

Table 5-11 *CQC of low permeability material layer during construction.*

Parameter	***Standard***	***Minimum frequency***	***Criteria***
Permeability	ASTM D5084	Minimum 2 tests for the project	Maximum permeability of 1.0×10^{-6} cm/sec
Undisturbed Shelby Tube Sample	ASTM D1587	Minimum 2 tests for the project	3 inch diameter minimum
In-Place Density	ASTM D1556 or ASTM D2922 or ASTM D2167	Minimum of 4 tests per lift of soil placed	Within the acceptable range determined by testing prior installation
In-Place Moisture Content	ASTM D3017	Minimum of 4 tests per lift of soil placed	Within the acceptable range determined by testing prior installation

Notes:
ASTM D1556 *Test Method for Density and Unit Weight of Soil In Place by the Sand-Cone Method*
ASTM D2922 *Test Methods for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)*
ASTM D2167 *Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method*
ASTM D3017 *Test Method for Water Content of Soil and Rock in Place by Nuclear methods (Shallow Depth)*

Results for two tests were provided to O'Brien & Gere. A copy of this documentation is included in Exhibit D-13.

5.11. Electrical/materials/equipment

Construction quality control. The electrical subcontractor performed the electrical work in accordance with the applicable electrical codes and standards. One deviation was noted, related to backfill around conduits.

The electrical subcontractor submitted shop drawings and samples to O'Brien & Gere. The electrical subcontractor also prepared, for final submission the following items:

- Updated as-built shop drawings and plans
- Wiring diagrams with updated field directed changes.

These are included in Exhibit D-14.

Construction quality assurance. CQA consisted of O'Brien & Gere evaluating the electrical work and submittals for compliance with the Record Drawings, contained in Appendix D.

6. Inspections

A final inspection of the Former Landfill IRM was conducted on December 15, 2004. Representatives of NYSDEC, O'Brien & Gere, and the IRM Contractor were present. No significant deficiencies or punch list items regarding the Former Landfill IRM were noted during the final inspection, therefore NYSDEC considered the Former Landfill IRM complete, with the exception of addressing the minor punch list items

The minor punch list items included placement of additional rip-rap along the northern edge of the low permeability cover system and placement of additional barrier protection material in the area around the existing 115 kV power poles. The majority of the punch list items were completed during 2005, including the additional rip-rap placement. The additional barrier protection material was placed around the existing 115 kV power poles to complete the low permeability vegetative cover in November 2006. In November 2006, the NYSDEC inspected the site and concurred that the punch list items were completed.

7. Institutional controls

The Former IFG Facility Site is currently located in the Town of Salina in an industrial zone (I-1 District), which allows for industrial use such as heavy manufacturing. The scope of the remediation conducted in this area of the Site will allow for both future industrial and commercial use.

As the last component of the Former Landfill IRM, a deed restriction should be recorded that limits the future use of this IRM-remediated area of the Site to commercial and industrial use (the "Use Restriction") and imposes such other post-remediation operation, maintenance and monitoring (OM&M) restrictions that are necessary to protect human health and the environment, including but not limited to, a restriction on the use of Site ground water without the prior written consent of GM and NYSDEC.

There would also be an easement conveyed to NYSDEC (and reserved to GM in the event of a future transfer of the Site) that would allow access to confirm that all OM&M restrictions are being observed, including the Use Restriction.

The deed restriction and easement would be recorded following NYSDEC's issuance of a final Record of Decision for the Site.

8. Record drawings/as-builts

Following completion of the construction, Record Drawings and as-builts were compiled. The Record Drawings show the areas where hot spots were excavated, where the low permeability cover system was installed, and miscellaneous details. The as-builts show the final grading plan for the vegetative cover system and the details of the work completed on-site. The Record Drawings are presented in Appendix D and the as-builts are provided in Exhibit E.

9. Summary of project costs

The estimated capital cost to complete the project was approximately $2.5 Million. The final construction and engineering cost was approximately $3.6 Million. Annual OM&M costs for the Former Landfill IRM cover system are estimated at $23,000.

10. Observations and lessons learned

During implementation of the Former Landfill IRM, observations were made and the following lessons were learned:

- Pre-characterization and up-front regulatory agreement on hot-spot extent (and subsequent omission of confirmatory sampling) for certain hot spots significantly improved on the time needed to perform hot spot excavations.

- More frequent surveying would have helped to provide more comprehensive records related to material volumes.

- Substantial site-wide cost savings were realized through the concurrent scheduling of the SPDES Treatment System IRM and the Former Drainage Swale IRM, since following regulatory approval, spoils from these other IRMs were used during construction of the Former Landfill IRM. This resulted in decreased overall off-site disposal costs as well as decreased costs associated with importation of grading material.

11. Remedial action contact information

The Project Manager for GM was:

James F. Hartnett
Remediation Project Office
One General Motors Drive STE2
Syracuse, NY 13206-1127
Phone: 315-463-2391

The Project Manager for the Design Engineering firm and Construction Observation firm was:

Douglas M. Crawford, P.E.
O'Brien and Gere Engineers Inc.
5000 Brittonfield Parkway
P.O. Box 4873
Syracuse, NY 13221
Phone: 315-437-6100

The Project Manager for the IRM Contractor used by GM was:

David Woodruff
Royal Environmental, Inc.
P.O. Box 15719
Rochester, NY 14615
Phone: 585-254-1840

The NYSDEC Project Manager was:

Susan L. Edwards, P.E.
NYSDEC Project Manager
NYS Department of Environmental Conservation
625 Broadway, 12th Floor
Albany, New York 12233-7016
Phone: 518-402-9767

The USEPA Project Manager was:

Robert Nunes
Onondaga Lake Project Manager
U.S. Environmental Protection Agency, Region II
290 Broadway, 20th Floor
New York, New York 10007-1866
Phone: 212-637-4254

The liner installer used by the IRM Contractor was:

New England Liner Systems Inc.
35 Wooster Court
Bristol, CT 06010

The CQC Geosynthetic Laboratory used by the IRM Contractor was:

Gary Torosian
GeoTesting Express, Inc.
1145 Massachusetts Avenue
Boxborough, MA 01719

The third party CQA/CQC inspector used by the IRM Contractor was:

Atlantic Testing
5866 State Route 31
Cicero, NY 13039

The surveyor used by the IRM Contractor was:

C. T. Male Associates, P.C.
200 Gateway Park Drive, Bldg. C
P.O. Box 3246
North Syracuse, NY 13212-3246

12. Operation, maintenance and monitoring

An OM&M Manual has been developed for the Former Landfill IRM under separate cover. The OM&M Manual addresses post-IRM site monitoring and maintenance activities for the following IRM components:

- Low permeability cover system
- Vegetative cover
- Storm water conveyance system
- Utilities (buried and overhead)
- Ground water monitoring wells.

In addition, the OM&M Manual provides the following:

- A monitoring plan
- Record keeping and reporting requirements
- Health and safety requirements
- Institutional restrictions.

13. Certification

Based on field observations made during the implementation of the NYSDEC-approved Former Landfill IRM Revised Work Plan, O'Brien & Gere hereby certifies, as required by the Order on Consent (Site No. 7-34-057), that construction of the IRM was completed in accordance with the NYSDEC-approved Former Landfill IRM Revised Work Plan with exceptions as discussed in this Engineering Report.

By: _____ Date: 11/1/06

Douglas M. Crawford, P.E.
Vice President
O'Brien & Gere Engineers, Inc.

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Benjamin, Susan, P.E (NYSDEC). 2003a. Letter to Jim Hartnett (GM) regarding approval of soil characterization around the Niagara Mohawk H-structures. June 6, 2003.

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