OPERATION AND MAINTENANCE MANUAL FOR POST CONSTRUCTION ACTIVITIES RICHARDSON HILL ROAD LANDFILL SITE Sidney, New York

Prepared For:

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and

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AUGUST 2007

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AUGUST 2007

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LIST OF RECORD DRAWINGS*

* These record drawings, referenced in the main text, are provided as figures. A complete set of record drawings for the site is provided on CD as Appendix I. Hard copy record drawings were also provided separately with the Interim Remedial Action Reports.

LIST OF APPENDICES

SECTION 1

INTRODUCTION

1.1 PURPOSE

The purpose of the Operation and Maintenance (O&M) Manual is to present procedures to authorized personnel for operating and maintaining the Richardson Hill Road Landfill (RHRL) site following completion of remedial construction. This O&M manual has been compiled pursuant to Section X.E of the Statement of Work, 6 New York Code of Rules and Regulations (NYCRR) Part 360-2.15(k)(7), and Considerations for Preparation of Operation and Maintenance Manuals, EPA 68-01-0341. This O&M manual is intended to be a working document that will be updated with pertinent information as required.

1.2 TASKS

As part of this O&M Manual, the following tasks will be completed:

- Inspection and maintenance of the RHRL site including the 6 NYCRR Part 360 landfill cap, Toxic Substance Control Act (TSCA) cell, storm water control features, access structures, groundwater extraction systems, and other site features (Section 2);
- Operation, maintenance, and monitoring of groundwater collection and treatment systems (Section 3);
- Monitoring of groundwater, surface water, sediment, fish, leachate and landfill gases (Section 4); and
- Documentation and reporting of inspections, maintenance, operation, and monitoring activities (Section 5).

This O&M Manual does not include procedures for wetlands maintenance and monitoring, as this component of the remedy is under evaluation. A summary of O&M activities, including schedule and frequency, is provided on Table 1-1.

1.3 PERSONNEL

Amphenol and Honeywell retain responsibility for successful completion of the O&M tasks and have the authority to procure qualified firms and personnel to satisfy the O&M Manual requirements. The O&M activities described in this O&M Plan will be implemented by an O&M contractor procured by Amphenol/Honeywell, unless otherwise indicated. O&M team personnel will include an O&M Manager, an Engineer, a Site Safety Officer (SSO), and field personnel. Amphenol/Honeywell will identify the O&M contractor and personnel by letters of designation; copies of letters of designation will be bound into the front of this O&M Manual. Amphenol/Honeywell may decide that multiple positions can be filled by one

individual provided the responsibilities are met. Prior to O&M services procurement, the following Amphenol/Honeywell personnel will serve as site contacts:

SITE CONTACTS

Richard Galloway, P.E. Honeywell 101 Columbia Road, MEY-4 Morristown, NJ 07962 Phone: 973-455-4640 Fax: 973-455-6446 Email: rich.galloway@honeywell.com	**Joseph Bianchi** Amphenol Corp. 40-60 Delaware Ave. Sidney, NY 13838-1395 Phone: 607-563-5940 Fax: 607-563-5849 Email: jbianchi@amphenol-aao.com

Regarding O&M activities, the following responsibilities and qualifications are required to fulfill each position:

O&M Manager

The O&M Manager shall be responsible for the following activities:

- Coordination of the schedules of the O&M team in order to complete the required activities;
- Documentation and reporting of results from inspections, maintenance, operation, and monitoring; and
- Communication with Amphenol/Honeywell and the regulatory agencies, as required.

Engineer

The Engineer shall be a professional engineer licensed in New York and shall be responsible for the following activities:

- Evaluation of storm water control features if damaged or incapable of conveying storm flows, and review and approval of repairs, replacements, or modifications;
- Evaluation of areas of persistent erosion on the landfill cap or associated features, and review and approval of repairs; and
- Evaluation of areas of subsidence or settling on the landfill cap, and review and approval of repairs.

Site Safety Officer

The SSO must have knowledge and experience with health and safety issues. The SSO has the following responsibilities:

- Review and implementation of the site-specific Health and Safety Plan (HASP);
- Conducting health and safety training for field personnel prior to work on the site; and

- Conducting periodic health and safety audits on site to evaluate compliance with the site-specific HASP.

Field Personnel

Field personnel will be responsible for tasks assigned to them. Personnel including the O&M Manager and SSO must have the following to participate in O&M activities at the site:

- Occupational Safety and Health Administration (OSHA) 40-hour hazardous waste site worker training certification (29 Code of Federal Regulations (CFR) 1910.120) and OSHA 8-hour refresher training certification if required to remain updated;
- An updated medical surveillance exam;
- An updated certification in CPR and First-Aid;
- Knowledge of the site-specific HASP. Training will be conducted by the SSO designated by Amphenol/Honeywell; and
- Knowledge of this O&M Manual and the specific task procedures in which the individual is participating. Training will be conducted by the O&M Manager designated by Amphenol/Honeywell.

1.4 HEALTH AND SAFETY

The contractor who will be performing O&M activities at the site will be responsible for the development of the site-specific HASP. The HASP will be required to comply with 29 CFR 1910.120 and other applicable state and federal regulations for the performance of anticipate ongoing site activities. A copy of the HASP will be provided to EPA under separate cover. A copy of the HASP will also be maintained by the O&M contractor on-site at the groundwater treatment plant.

1.5 CONTINGENCY PLAN

Pursuant to 6 NYCRR Part 360.2.15(k)(7)(v)(a), the following plan is presented to establish procedures for responding to problems that have a reasonable likelihood of occurrence, including, but not limited to, major erosion, significant differential settlement, and fire. All corrective actions, where appropriate, will be executed in a timely fashion after notifying the appropriate regulatory agencies.

1.5.1 Fire or Explosion

Fires or explosions at the site will be immediately reported to the local fire department by calling 911 or by using the pull box stations located in the GWTP at the exit doors. Response measures will be taken by the fire department. Damage to site improvements or systems will be repaired where these systems have been compromised.

1.5.2 Major Erosion and Compromise of Cap Integrity

Section 2 of this O&M Plan includes procedures for inspecting the landfill for erosion. Severe erosion of the landfill cap or the storm water management system will be corrected as

soon as practicable after discovery. The cause of severe erosion will be investigated and remedial measures, if required, will be developed and implemented in accordance with Sections 2.2.4 and 2.2.6.

1.5.3 Significant Differential Settlement / Cap Subsidence

Section 2 of this O&M Plan includes procedures for inspecting the landfill for differential settlement. Significant differential settlement / cap subsidence of the landfill cap will be corrected as soon as practicable after discovery. The cause of differential settlement / cap subsidence will be investigated and remedial measures, if required, will be developed and implemented in accordance with Section 2.2.6 this O&M Plan.

1.5.4 Landfill Gas

Section 4.5 of this O&M Plan includes procedures for monitoring landfill gas. As described in Section 4.5:

- If methane concentrations exceed the LEL in any of the gas vents, the results will be reviewed and the potential for the LEL to be exceeded at the property boundary will be evaluated. If methane concentrations at or beyond the property boundary are found to exceed the LEL, pursuant to 6 NYCRR Part 360-2.17(f)(3), USEPA and NYSDEC will be notified within 7 days and a remediation plan will be prepared and submitted within 45 days.
- If methane concentrations exceed 25% of the LEL in any structures, pursuant to 6 NYCRR Part 360-2.17(f)(3), USEPA and NYSDEC will be notified within 7 days and a remediation plan will be prepared and submitted within 45 days.

1.5.5 Vandalism

Vandalism will be reported to the local law enforcement authorities. If vandals have gained entry to the landfill site, appropriate measures will be taken to eliminate or restrict future access. Vandalism to monitoring wells will be repaired as appropriate on a case-specific basis. Damage caused by off-road vehicles will be repaired where the damage is determined to have compromised the integrity of the cap or the function of the surface drainage system.

1.5.6 Unauthorized Dumping or Disposal

Unauthorized dumping or waste disposal will be reported to the NYSDEC and local enforcement officials. Appropriate measures will be taken to determine the waste characteristics, containment requirements and the necessary removal and disposal techniques. The waste will be removed and disposed of at an approved disposal facility, as appropriate. Efforts will be taken to eliminate further dumping and to restrict subsequent entry to the site.

1.6 PLANNED USE OF PROPERTY

Pursuant to 6 NYCRR Part 360.2.15(k)(7)(viii), Amphenol and Honeywell have no planned use for the property currently occupied by the landfill (i.e., as generally shown within the perimeter fence line on Record Drawing C-6), other than operation and

maintenance activities generally described in this O&M manual. The status of institutional controls and planned future land use will be provided to USEPA by separate communication by Amphenol and Honeywell.

Table 1-1
O&M ACTIVITIES SUMMARY

	Inspection Item	Task	Frequency of Inspection
General Site Inspection	Access Structures	Inspect site security fencing, gates, and locks	Quarterly
		Inspect signage	Quarterly
		Inspect site access roads	Quarterly
		Inspect security fencing and protective panels for the extraction system	Quarterly
		Inspect the groundwater extraction building doors, locks and alarms	Quarterly
	Landfill Cap	Monitor vegetation progress, check for woody plant material	Quarterly
		Check for cap erosion, subsidence or settling	Quarterly and after major rainfall events (i.e., 5-year storm (3.7 inches for 24-hr, 5-yr storm)).
		Monitor for animal burrows or dens	Quarterly
		Inspect gas vent pipes	Quarterly
		Mow cap vegetation	Annually
	Storm Water Control Features	Inspect perimeter drainage ditches, interceptor trenches, landfill reaches, toe drains, and culverts	Quarterly and after major rainfall events (i.e. five-year storm)
	TSCA Cell	Monitor leachate collection and leachate detection sumps	Quarterly
Groundwater Extraction Trench Monitoring	Water Levels	Record water elevations in each well/piezometer pair	Weekly for a minimum of one year. After one year, a review will be conducted to determine if frequency should be modified.
	Water Recovery Volume	Record volume of the recovered groundwater from each of the three sump totalizers	Monthly
	Weather Data	Record precipitation readings, snow cover, and snow melt observations	Daily
	Sump #1	Inspect for light non-aqueous phase liquids (LNAPL) with an oil water interface probe	Monthly

Table 1-1
O&M ACTIVITIES SUMMARY

	Inspection Item	Task	Frequency of Inspection
North Area Recovery Wells	Water Levels	Record water elevations in monitoring wells NMW-1 through NMW-10, and MW-9D	Weekly for a minimum of one year. After one year, a review will be conducted to determine if frequency should be modified.
Groundwater Treatment Plant	Inspections	Flow rate, flow totals, process pH, line pressures, and equipment checks	Daily
		Operational reports summarizing operational activities and observations	Weekly
	Influent Monitoring	BOD, TSS, metals (including aluminum and arsenic), oil and grease, PCBs, VOCs, total phosphates, TDS	Monthly
		SVOCs	Quarterly
	Effluent Monitoring	Collect pH sample and record flow measurements	Daily
		Collect BOD, TSS, metals, PCBs, VOCs, total phosphates, oil and grease samples	Weekly
		Collect TDS samples	Monthly
		Collect SVOCs samples	Quarterly
	Liquid Phase GAC monitoring	Collect VOCs sample	Monthly

Table 1-1
O&M ACTIVITIES SUMMARY

	Inspection Item	Task	Frequency of Inspection
Groundwater Sampling	Groundwater Collection Trench Monitoring Wells	Collect water samples and submit samples on a rotating basis for routine, VOC, and PCB analyses; or for baseline and PCB analyses	Quarterly. The groundwater sampling program will be re-evaluated after one year and periodically after thereafter. Based on the evaluations, adjustments to the program may be proposed to the USEPA for approval
	Monitoring Well MW-12 Cluster		
	North Area Monitoring Wells	Collect samples from sample taps located in the groundwater treatment plant and submit for VOC analysis	
Surface Water Sampling	Surface Water Monitoring Locations	Collect water samples and submit for PCB analysis	Annually
Landfill Gas	Gas Vents, Maintenance Building, Leachate Collection Sumps, and Pull Boxes	Monitor for landfill gas with field explosimeter	Quarterly. After one year, a review will be conducted to determine if frequency should be modified.

SECTION 2

SITE INSPECTION AND MAINTENANCE

2.1 INSPECTIONS

The RHRL site is shown on Record Drawings C-1 and C-2. The Site, including access structures, the landfill cap, storm water controls, TSCA cell, and groundwater extraction systems will be inspected quarterly. The landfill cap and storm water control features will also be inspected after major rainfall events (i.e., 5-year storm (3.7 inches for 24-hr 5-year storm)); in the event of a major rainfall event, on-site personnel will make observations of the landfill for significant erosion and damage on the first business day following the major rainfall event, followed by a formal inspection to be conducted within 1 week of the major rainfall event. Field personnel will utilize the inspection form (Appendix A) to record the following:

- Date, time, name of inspector, weather conditions;
- Excessive debris or litter on the site;
- Indications of vandalism;
- Condition of the access roads and site fences/signage;
- Condition of storm water controls;
- Condition of landfill cap including:
  - Gas vent pipes;
  - Drainage channels;
  - Areas of subsidence, large puddles, or ponding water; and
  - Vegetative cover.
- Condition of collection system of the TSCA cell;
- Observations of animal borrows on the landfill cap;
- Condition of vegetative cover along the extraction trench; and
- Condition of monitoring wells, extraction wells, extraction trench manholes/piping.

2.2 MAINTENANCE

2.2.1 General

Based on the quarterly inspections, the O&M Manager will make recommendations to Amphenol/Honeywell for site maintenance including housekeeping issues, access structures, stormwater controls, monitoring wells, extraction systems, collection system of TSCA cell, and landfill cap. Anticipated maintenance activities are presented in this section.

2.2.2 Housekeeping Issues

Miscellaneous debris (e.g., litter and fallen trees/branches) will be disposed of off site at a location identified by Amphenol/Honeywell. Signage removed or vandalism noted will be repaired or replaced as appropriate.

2.2.3 Access Structures

The following access structures will be repaired, as required, to maintain their intended function:

- Security fencing, gates and locks;
- Signage;
- Site access roads;
- Security fencing and protective panels for the extraction trench system; and
- The groundwater treatment building doors, locks, and alarms.

2.2.4 Storm Water Controls

Elements of the storm water controls, including perimeter drainage ditches, interceptor trenches, landfill reaches, toe drains, and culverts will be maintained as required to maintain their intended function. Debris or obstructions will be removed to allow free flow of surface water run-off. Areas where erosion is noted will be regraded and vegetated.

In the event that erosion is persistent or any of the structures are found to be significantly damaged or incapable of conveying storm flows, repairs, replacement, or modifications will be made as soon as practicable. The repairs, replacement, or modifications will be reviewed by the Engineer prior to implementation, including review for potential impact on other site features.

2.2.5 Monitoring Wells/Extraction Wells/Extraction Trench

Monitoring wells that are damaged, such that representative groundwater samples cannot be obtained, will be repaired or replaced. Wells may need occasional redevelopment due to siltation, or well screens may need to be cleaned with acids or other chemicals due to mineral deposits and encrustation. Repair measures will be based on case-specific evaluation. If the elevation of the top of well casing or surrounding ground surface should change, these elevations will be re-surveyed. A well damaged beyond repair or rendered inoperative will be replaced with a new well of similar depth and construction. If a damaged well is abandoned, the procedures outlined in Specification 02085 (Groundwater Monitoring Well Abandonment) should be followed. A copy of Specification 02085 is included in Appendix B.

The extraction wells and extraction trench manholes will be inspected for damage or blockage and maintained as required.

2.2.6 Landfill Cap

Record Drawing C-7 presents a topographic survey of finished grade for the landfill cap, including the survey benchmark. Inspection and maintenance of the landfill cap will include the following:

- Monitoring vegetation progress in the spring, summer, and fall to confirm adequate coverage and reseed local spots if the target vegetation fails to become established. Spots barren of vegetation in the final cap will be reseeded and fertilized. Topsoil may also be added if erosion in these areas is noted. Seed and fertilizer will be of the same type and quality as originally specified. Information pertaining to seed and fertilizer installed at the site is included in Appendix C.
- Conducting ground inspections to determine the status of woody plant species on the landfill cap, including surface and side slope areas. Woody plant species located within the limits of the landfill cap will be removed annually.
- Mowing of the landfill cap surface once a year to control woody vegetation and to promote the growth of short grass species.

During inspection and maintenance activities, vehicle traffic on landfill areas will be limited to the landfill access road, with the exception of mowing equipment.

Erosion of the cap or other site maintenance problems detected during quarterly inspections or following particularly heavy storm events (i.e., 5-year storm (3.7 inches for 24-hr 5-year storm)) will be corrected as soon as practicable. Repairs of eroded areas will be made with materials and methods described below. Information regarding materials for repair is included in Appendix C. If an eroded topsoil layer is encountered, repair actions may include, but are not limited to, the following:

- Covering with topsoil to minimum thickness (6-inches) and design grades; and
- Reseeding, fertilizing, and installation of erosion control mats.

If erosion is persistent in certain areas, alternate methods for maintaining soil and vegetative cover or erosion protection will be evaluated by the Engineer on a case-specific basis.

Areas where subsidence or settling is observed will be reviewed by the Engineer to determine whether the function of the cap in the affected area has been impaired. Those areas where it has been determined that the function has been impaired will be repaired such that the integrity of the cap is maintained. Repairs will be as advised by the Engineer and may include, but are not limited to:

- Stripping and stockpiling topsoil from the affected area;
- Regrading the affected area in accordance with the grading plan shown on the record drawings; and
- Replacing topsoil, reseeding, fertilizing, and installation of erosion control matting to reestablish vegetative cover.

For animal control, the following procedures will be followed:

- If den or burrow entrances are found, a program will be developed to trap or otherwise remove the burrowing animal(s) which will be implemented on a case-specific basis. Following removal of the burrowing animal(s), the entrances will be plugged and the bare areas will be reseeded. Removal of animals or plugging burrow entrances will be conducted in accordance with applicable regulations.

The gas vent pipes will be maintained as required.

2.2.7 TSCA Cell Collection System

The leachate collection and leachate detection sumps will be monitored at a minimum on a monthly basis for a minimum of one year after completion of the cover system. The level of leachate will be recorded during each monitoring event. If the level of leachate is observed to be greater than 1 ft above the invert elevation of the drain pipe to the sump (i.e., approximately 48 inches below the manhole lip), the leachate will be removed via a temporary sump pump, contained (e.g., NYSDOT container), and brought to the groundwater treatment system for treatment. The volume of leachate removed from each sump will be recorded. During removal of leachate, indications of biological growth will be noted.

The leachate production rates will be reviewed annually. Based on the reviewed information, recommendations will be made regarding the frequency of the monitoring and leachate removal.

2.2.8 Landfill Gas Venting System

Landfill gas vents will be maintained free of obstructions and will be promptly repaired if damaged (e.g., during mowing operations). Section 4.5 provides procedures for monitoring landfill gas.

SECTION 3

GROUNDWATER COLLECTION AND TREATMENT SYSTEM OPERATIONS & MAINTENANCE

3.1 INTRODUCTION

The purpose of this section is to present O&M procedures for post-remedial construction operations and maintenance of groundwater collection and treatment systems, including the groundwater extraction trench, the north area recovery wells, and the groundwater treatment system.

3.2 GROUNDWATER EXTRACTION TRENCH

3.2.1 Geology and Hydrogeology

A Remedial Investigation (RI) was conducted between 1988 and 1996 to evaluate the nature and extent of contamination at the RHRL site (O'Brien & Gere, 1996). The RI findings that pertain to the groundwater extraction trench are summarized herein.

The subsurface geology of the site is characterized by unconsolidated glacial deposits overlying bedrock. The unconsolidated deposits consist of soil (mixed with municipal refuse in the landfill) underlain by a dense reddish brown to gray glacial till. The till is a heterogeneous mixture of sand, silt, clay and rock fragments. Bedrock beneath the till consists of interbedded layers of shale, siltstone, and sandstone. The depth to bedrock varies from 18 ft to 39 ft below ground surface (bgs).

Groundwater at the site is encountered in the overburden, shallow bedrock (18 to 70 ft bgs), and the deeper bedrock (greater than 70 ft bgs). The overburden and shallow bedrock flow regimes appear to be hydraulically connected and isolated from the deeper bedrock groundwater flow system. Groundwater in the overburden and shallow bedrock follows the slope of the surface topography and flows east towards the South Pond in the center of the valley.

During the RI, the groundwater in the overburden contained detectable levels of volatile organic compounds (VOCs) and polychlorinated biphenyls (PCBs). The most prevalent VOCs in the overburden groundwater were trichloroethene (TCE), tetrachloroethene (PCE), and 1,1,1-trichloroethane (1,1,1-TCA), and their breakdown products, 1,2-dichloroethene (1,2-DCE), 1,1-dichloroethene (1,1-DCE), 1,1-dichloroethane (1,1-DCA) and vinyl chloride. The highest VOC concentrations were detected in monitoring wells adjacent to and downgradient of the former waste oil disposal pit. The VOC and PCB plumes emanate from the landfill materials and former waste oil disposal pit and extend in an easterly direction towards the South Pond. The PCB plume is less extensive than the VOC plume and is centered around the former waste oil disposal pit.

VOCs and PCBs were also detected in the shallow bedrock groundwater in the landfill area. However, the VOC and PCB plumes generally had concentrations about an order of magnitude less than in the overburden groundwater. As described in the RI, contaminant concentrations in the medium and deeper bedrock groundwater were below New York State Department of Environmental Conservation (NYSDEC) drinking water standards and did not require collection.

The groundwater model for the RHRL (Parsons, October 2000) indicated that a pumping rate of approximately 30 gallons per minute (gpm) would be required to intercept the groundwater in the shallow overburden aquifer during average water table and recharge conditions (0.03 inches per day). The model also indicated that that a pumping rate of approximately 80 gpm would be required to intercept the groundwater in the shallow overburden aquifer during peak water table and recharge conditions (2.0 inches per day) as in a heavy rain period with spring snowmelt. Based upon the model water balance, approximately 90 percent of the water entering the trench would come from the west (RHRL) and 10 percent from the east (South Pond). The model predicted that groundwater in the upper 25 ft of bedrock would also enter the trench. The model simulations also predicted a capture zone no wider than the length of the extraction trench due to the steep hydraulic gradients.

3.2.2 Groundwater Extraction Trench Description

Record Drawing C-9 presents a drawing of the groundwater extraction trench. As constructed, the extraction trench is approximately 1,150 ft long by 3 ft wide. Trench bottom elevations range from 1728.5 ft to 1742.4 ft with the northern half of the trench an approximate average of 10 ft deeper than the southern half. As described in the Interim Remedial Action Report for Remedial Element II (Parsons, 2007), the trench bottom is keyed a minimum of 2 ft into dense till/bedrock. An 80-mil high density polyethylene (HDPE) barrier wall with hydrophilic joints was installed on the downgradient side of the trench prior to backfilling with clean, uniform gradation, pea gravel-sized stone.

Three collection sumps were installed along the length of the trench, one each at stations 1+55, 5+45 and 9+70, as measured from the north end of the trench. The north sump (Sump S1) and south sump (Sump S-3) are located 155 and 180 ft from the ends of the trench respectively. The third sump (Sump S-2) is located near the center of the trench, not quite equidistant between sumps S-1 and S-3. Each sump consists of a 24-inch perforated vertical HDPE pipe that extends to the bottom of the trench. A Grundfos Model Redi-Flo4 submersible pump was installed in each sump to pump groundwater to the treatment plant. Each collection sump is also equipped with a pressure transducer to measure the water level in the sump. Manufacturer's specifications and manuals for equipment installed are included in Appendix D. Record Drawing C-102 presents further information regarding the sumps.

The water level in each sump is recorded in and displayed by the system computer located in the groundwater treatment plant (GWTP). Each pump is turned on or off depending upon the water surface elevation in the corresponding sump (i.e., each pump is controlled independently by a separate level measuring system in the sump). The individual

high/low on/off elevation set points are based on the level transducer signal from each sump and can be adjusted via the GWTP computer. Flow is measured from each pump by a flow meter located at the exterior of each pit on a unistrut rack inside the perimeter fence. The flow meters must be manually read at each sump location. A single underground pipeline carries the combined flow from the three sumps to the treatment plant. A flow meter at the groundwater treatment plant measures combined flow and reports it to the system computer in the GWTP.

Each collection sump is equipped with a dilute acid (10 percent H_2SO_4) feed pipeline for injecting acid into the sump in the vicinity of the pump inlet. The purpose of the acid injection is to depress the pH and maintain iron in solution so that clogging of the pipeline carrying the extracted groundwater to the treatment plant is reduced. Although use of the system has not been necessary to date, it is anticipated that a pH of 4.5 would be targeted to control iron scaling in the pipelines. The three chemical feed pumps are located in the treatment plant. Use of the system would require the operator to manually set the rate of acid delivery by adjusting the chemical feed pump output.

3.2.3 Groundwater Extraction Trench Monitoring Well Network

Six monitoring well/piezometer pairs were installed along the length of the trench to monitor groundwater elevations both inside and downgradient of the trench. Well locations and elevation data are shown on Record Drawings C-9 and C-103; well construction diagrams are provided in Appendix B. Each pair has either an 8-inch or 4-inch diameter well installed inside the trench, upgradient of the HDPE barrier wall, and a 2-inch diameter well installed approximately 5 ft downgradient of the trench. The well/piezometer pairs are located at the following stations as measured from the north end of the trench:

Station	Well Inside Trench	Well Downgradient of Trench
0+56	TMW-1	TMW-2
2+83	SSC-1	TMW-3
4+39	SSC-2	TMW-4
7+12	SSC-3	TMW-5
8+59	SSC-4	TMW-6
11+12	TMW-8	TMW-7

The in-trench wells are screened in both the in-trench backfill and the underlying shallow bedrock to monitor water levels in the trench and to facilitate the extraction of shallow bedrock groundwater. Four of the in-trench wells (SSC-1 through SSC-4) were constructed with 8-inch diameter stainless steel screens to allow for the installation of groundwater extraction pumps at a later date, if required, to increase the overall pumping rate from the trench. The wells downgradient of the trench extend to approximately the same depth into the till as the adjacent portion of the trench. Further information regarding the trench monitoring wells is provided in Record Drawing C-103.

3.2.4 Extraction Trench Operation and Monitoring

As described in Section 3.2.2, a submersible pump located in each of the three collection sumps transfers groundwater to the groundwater treatment system (Section 3.4). Operation of the trench sump pumps is described in the Groundwater Treatment System Operation and Maintenance Manual, located in Appendix F. The pumps, appurtenances, and related instrumentation are shown in Record Drawing I-103.

Each pump has a HAND / OFF / AUTO (HOA) switch located in the groundwater treatment building motor control center (MCC). In AUTO mode, the sump pumps will cycle on and off automatically in response to the level in the sump. A transducer in each well monitors level. When the level exceeds a high set-point, the submersible pump is actuated and transfers water to the equalization tank (T-1) at the head of the groundwater treatment system. When the level drops below a low set-point, the pump turns off. When the pumps are in AUTO mode, alarm conditions within the groundwater treatment system can cause the pumps to cut off. For example, a high alarm in the equalization tank will automatically shut off the sump pumps when they are in AUTO mode.

In HAND mode, the pumps run continuously regardless of levels or alarm conditions. For example, in HAND mode, the automatic shut off of the sump pumps due to a high level alarm in T-1 would not occur, which could cause T-1 to overtop. For these types of reasons, the HOA switches should never be left in the HAND position unattended.

A flow meter located in each sump, as shown on Record Drawing I-103, measures the flow rate from that sump. Additionally, the flows from the three trench sumps are combined ahead of the equalization tank. A flow meter (FQI-303) measures and records this combined flow. A pH indicator (AI-404) monitors the pH of the combined sump flow ahead of the equalization tank. The combined-flow instruments are shown on Record Drawing I-104.

As described in Section 3.2.2, each collection sump is fitted with the means to deliver 10% sulfuric acid (H_2SO_4) to the sump. The acid feed pumps (CP-S-1, CP-S-2, and CP-S-3) and 10% H_2SO4 tank (T-11) are located in the groundwater treatment building. A standard operating procedure addendum has been developed that prescribes a method for adding 10% H_2SO4 acid to the sumps to maintain a pH around 4.5. Standard operating procedure addenda for the groundwater treatment system are located in Appendix F, Section 11.

In order assess the effectiveness of the groundwater extraction trench, groundwater elevations inside and downgradient of the trench will be monitored by the six monitoring well/piezometer pairs. Groundwater elevation readings in the each well/piezometer pair will be taken weekly for a period of 1 year to be representative of all seasons. Based on the results of the groundwater elevation readings, adjustments to the pump sequencing, pumping elevations, or both, may be implemented. After 1 year, review of the groundwater elevation measurements, in conjunction with assessment of groundwater quality data, will be conducted to assess trench effectiveness and whether the frequency of water level monitoring can be reduced to bi-weekly or monthly. To measure the volume of recovered groundwater, each of the three sump totalizers will be read monthly.

Weather data such as daily precipitation readings, snow cover and observations regarding snow melt will be recorded by the GWTP operator to correlate weather to the pumping rates and groundwater elevations. The weather data will allow the GWTP operator to better anticipate forthcoming changes to the system operation.

Sump #1 should be inspected for light non-aqueous liquids (LNAPL) using an oil water interface probe once per month. Should a measurable thickness of LNAPL be observed, provisions to remove the LNAPL such as pumping or installation of a belt skimmer system should be made. Provisions to pre-characterize or store the removed LNAPL prior to characterization should be coordinated with the disposal facility. It should be noted that prior to trench construction, former well MW-5S adjacent to the trench had an LNAPL layer several inches thick with a PCB-1248 concentration of 3,600 mg/kg (Parsons Pre-Design Investigation Report, March 2000). MW-5S was located immediately downgradient of the former waste oil disposal pit in the landfill, the likely source of the LNAPL layer. The design for Sump 1, therefore, initially included an oil skimmer. However, observations during construction indicated that the skimmer may not be necessary, and the skimmer was not installed, although provision for the future installation of the skimmer, if necessary, was retained.

The pre-construction groundwater elevations along the extraction trench alignment varied from approximately 1748 ft on the north to 1750 ft on the south. The trench is to be operated at extraction rates that will keep water levels measured in the in-trench piezometers at least 1 ft below the pre-construction groundwater levels and at least 1 ft above the transducer elevations. Within this range, a target groundwater elevation of 1 to 2 ft above the transducers will maximize groundwater recovery.

During the July 2006 through July 2007 period of trench operation, the water level elevations along the extraction trench met the operational criteria. Water levels were within the range of 1740 ft to1748 ft depending on water table and recharge conditions. An elevation of 1741 ft elevation was observed during low water table and recharge conditions and was approximately 7 ft below the pre-construction groundwater elevation. The 1748 ft elevation was observed during peak water table and recharge conditions and was approximately 2 ft below the pre-construction water level on the south side of the trench.

3.3 NORTH AREA RECOVERY WELLS

3.3.1 Geology and Hydrogeology

An RI was conducted between 1988 and 1996 to evaluate the nature and extent of contamination at the RHRL site (O'Brien & Gere, 1996). The RI findings that pertain to the North Area are summarized herein. Additionally, a constant-rate pumping test was conducted in the North Area during the predesign investigation (Parsons, 2000).

The North Area is located approximately 1,000 ft north of the RHRL on a topographically raised area in the center of the valley, which is the drainage divide between the Susquehanna and Delaware River basins. Surface water drains mainly towards the

Susquehanna basin. Water from the North Pond drains northwards through a series of beaver dams and into Carr's Creek, a tributary of the Susquehanna River.

The subsurface geology of the site is characterized by unconsolidated glacial deposits overlying bedrock. The unconsolidated deposits in the North Area consist of a dense reddish brown to gray glacial till. The till is a heterogeneous mixture of sand, silt, clay and rock fragments. Bedrock beneath the till consists of interbedded layers of shale, siltstone, and sandstone. The depth to bedrock in the North Area is approximately 30 ft bgs.

Groundwater at the site is encountered in both the overburden and bedrock, but the overburden and bedrock flow regimes appear to be poorly connected. Groundwater in the North Area overburden appears to flow mainly to the south-southwest toward the South Pond with a hydraulic gradient of about 0.03. Some groundwater from the northernmost portion of the North Area flows north towards the North Pond. Groundwater flow in the bedrock in the North Area is south-southeast, towards the center of the valley, with an average hydraulic gradient of 0.02. Aquifer parameters for the bedrock in the North Area were calculated using data from the constant-rate pumping test. One groundwater extraction well and two new observation wells were installed in the bedrock for the pumping test. Transmissivity values ranged from 47 ft^2/day (PW-1, recovery) to 124 ft^2/day (O1-1, drawdown). The geometric mean transmissivity was 70 ft^2/day for both the drawdown and recovery tests. Storativity values ranged from 0.004 to 0.00005, typical values for a confined aquifer. The North Area groundwater contains VOCs.

The groundwater model for the RHRL (Parsons, October 2000) indicated that control of the bedrock groundwater at the North Area could be achieved with four wells located in the center of the North Area, spaced approximately 67 ft apart and pumping at a combined rate of 10 gpm.

3.3.2 Recovery Well System Description

North Area recovery and monitoring wells are shown on Record Drawing C-201. Four groundwater recovery wells were installed in the bedrock using an air-rotary drilling rig. The extraction wells were installed on an approximately north-south alignment at the downgradient edge of the VOC plume identified during the RI. The extraction wells were spaced between 62 and 67 ft apart and installed at depths ranging from 71 to 77 ft. The wells were constructed of 6-inch diameter stainless steel risers and a 25-ft long, 0.30-inch slot, continuous wire-wound screen. A 3-inch diameter Grundfos submersible pump (Model Redi-Flo3-250) was installed in each well to pump groundwater to the treatment plant. Each well was equipped with a pressure transducer to measure the water level in the well. Each well head was constructed with a pitless adaptor, stickup risers, cap and reinforced concrete pad. Manufacturer's specifications and manuals for installed equipment and well construction diagrams are included in Appendix E. Further information regarding the recovery wells is provided on Record Drawing C-102.

The water level in each recovery well is recorded in and displayed by the system computer located in the groundwater treatment plant (GWTP). Each pump is turned on or off depending upon the water surface elevation in the corresponding well (i.e., each pump is

controlled independently by a separate level measuring system in the well). The individual high/low on/off elevation set points are based on the level transducer signal from each well and can be adjusted via the GWTP computer. Flow is measured from each well by individual flow meters located in the GWTP. Separate pipelines carry the flow from each recovery well to the treatment plant.

High density polyethylene (HDPE) carrier pipes were installed from the GWTP to each recovery well to accommodate installation of an acid feed system. The system would be used to inject dilute acid (10 percent H_2SO_4) into each well in the vicinity of the pump inlet in the future, if necessary. The purpose of the acid injection would be to depress the pH and maintain iron in solution so that clogging of the pipeline carrying the extracted groundwater to the treatment plant would be minimized. Although installation and use of the system has not been necessary to date, it is anticipated that a pH of 4.5 would be targeted to control iron scaling in the pipelines.

3.3.3 Recovery Well Monitoring Well Network

Prior to construction, the following wells existed within the North Area: MW-8, MW-9, MW-9D, MW-15, MW-16, PW-1, O1-1, and O1-2. Monitoring wells MW-9D, PW-1, O1-1, and O1-2 were screened in bedrock. During the construction, PW-1 was cut down and capped to meet final grades. The casing for OW-1 was lengthened and capped to meet final grades. MW-9S, MW-9D and MW-15 were not altered. Wells MW-8 and MW-16, located adjacent to the North Pond access road, were abandoned as part of the well abandonment program.

A total of ten monitoring wells were installed to monitor groundwater elevations in the vicinity of the recovery wells. Three monitoring well pairs were installed along the alignment of the groundwater extraction wells to monitor groundwater elevations between and downgradient of the extraction wells. One monitoring well of each pair was installed half-way between two extraction wells. The second monitoring well of each pair was installed approximately 20 ft downgradient of the first monitoring well. In addition, a pair of monitoring wells was installed at distances of approximately 15 ft and 35 ft from each end of the well alignments. The monitoring wells are constructed of 2-inch diameter PVC with a 30-ft long well screen. The monitoring wells were installed to approximately the same depth into the bedrock as the recovery wells. A bedrock monitoring well, MW-9D, installed during the RI, is located downgradient of the extraction well alignment and will also be used to monitor groundwater elevations. Well construction diagrams are included in Appendix B. Additional information regarding the north area monitoring wells is shown on Record Drawing C-103.

3.3.4 North Area Recovery Well Operation and Monitoring

Operation of the North Area recovery well network was initiated in July 2004. The four North Area recovery wells, RW-1 through RW-4, were initially intended to operate at 2.5 gpm each, for a combined total of 10 gpm. However, actual recovery rates have varied based on formation yield and maintenance of hydraulic control.

Between September 27, 2006 and October 4, 2006, the network was shutdown to conduct a well recovery test. The following non-pumping depths to water were observed on October 2, 2006:

NON-PUMPING WATER DEPTHS

Well ID	Depth to Water
NMW-1	33.55
NMW-2	32.93
NMW-3	20.63
NMW-4	34.14
NMW-5	28.21
NMW-6	39.49
NMW-7	34.01
NMW-8	32.72
NMW-9	39.28
NMW-10	41.69
MW-9D	34.29

Data are for 10/2/06, towards the end of the recovery test.

In order to assess the effectiveness of the North Area recovery well network, groundwater elevations will be measured monthly in monitoring wells NMW-1 through NMW-10 and monitoring well MW-9D. Water elevations for the eleven monitoring wells will be calculated by subtracting the depth to water from the elevation of the top of the inner well casing. A drawdown table will also be constructed using the data from the eleven monitoring wells. The depth to water for the eleven monitoring wells will be subtracted from the non-pumping levels in the table presented above. The drawdown table will be used to evaluate the effectiveness of the North Area recovery well network; a drawdown of a minimum of 1 ft in each of the eleven monitoring wells will be indicative of groundwater control. If necessary, the pumping rates will be adjusted to maintain effectiveness. After 1 year, review of the groundwater elevation measurements will be conducted to determine if the frequency should be modified.

Weather data such as daily precipitation readings, snow cover, and observations regarding snow melt will be recorded by the GWTP operator to correlate weather to the pumping rates and groundwater elevations. The weather data will allow the GWTP operator to better anticipate forthcoming changes to the system operation.

The north area wells will be operated at rates such that a drawdown of at least 1 ft in each of the eleven monitoring wells will be maintained. If necessary, the pumping rates will be adjusted to maintain the drawdowns. A target drawdown in the recovery wells of 1 to 2.5 ft above the transducers will maximize groundwater recovery. After 1 year, review of the groundwater elevation measurements will be conducted to determine if the frequency should be modified. Based on water level data collected between August 2006 and June 2007, drawdowns in the monitoring well have averaged 4.9 feet.

3.4 GROUNDWATER TREATMENT

3.4.1 Groundwater Treatment System Description

The Richardson Hill Road Landfill (RHRL) Groundwater Treatment Plant (GWTP) is designed to treat groundwater recovered from the RHRL site. The primary groundwater constituents of concern are iron, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). The system is designed to remove oils (if present), suspended solids, iron and dissolved metals, VOCs, and SVOCs through a series of physical-chemical treatment processes, to meet the limits specified in the site's State Pollution Discharge Elimination System (SPDES) discharge permit. A process schematic is presented as Figure 1. The system is designed to treat up to 100 gallons per minute (gpm).

Groundwater is pumped from four recovery wells (RW-1 through RW-4) in the North Area of the site and from three sumps along a groundwater extraction trench (S-1 through S-3) adjacent to the landfill to an Equalization Tank (T-1). The equalization tank provides flow balancing to dampen variations that result from the on/off cycling of the groundwater extraction wells and sumps. The groundwater is pumped from T-1 by lead/lag centrifugal pumps (P-1/P-2) to the oil water separator (OWS-1). Concentrated sulfuric acid (98% H_2SO_4) may be added to the first chamber of OWS-1 to lower the pH below 2.0 to crack oil/water emulsions, if present. Recovered oil would be separated from the groundwater in the second compartment and drained by gravity to the oil tank (T-10). After oil/water separation, the groundwater flows to the third chamber where the pH is adjusted to 8.5-9.0 with 50% sodium hydroxide (caustic).

The groundwater then flows by gravity into the Reaction Treatment Unit (RTU) consisting of the Polyaluminum Chloride (PAC) mix tank (T-2), polymer flash mix tank (T-3), and flocculation tank (T-4). PAC is added to the groundwater in T-2 to co-precipitate dissolved metals. Polymer is added to the PAC-treated groundwater in T-3 to enhance particle growth for solids separation. The groundwater then enters the flocculation tank (T-4), where the particles agglomerate into large, settleable flocs. The groundwater then flows by gravity into the Inclined Plate Clarifier (IPC-1), in which the suspended particles settle. The settled solid material is pumped from the bottom of IPC-1 by a Sludge Pump (P-7) to the Sludge Tank (T-6). The clarified groundwater flows by gravity to the Clearwell Tank (T-5).

Clarified groundwater is pumped from T-5 by lead/lag pumps (P-3/P-4) through bag filters (BF-1 and BF-2) to the shallow tray Air Stripper (AS-1). The bag filters remove fugitive suspended solids ahead of the air stripper. The filtered water flows down a series of trays in AS-1 while a blower (B-1) pulls air through the water to remove volatile compounds.

Treated water collects in the AS-1 sump and is pumped by lead/lag pumps (P-5/P-6) through bag filters (BF-3 and BF-4) to the granular activated carbon beds (GAC-1 and GAC-2). GAC-1 and GAC-2 are installed in series to remove residual volatile and semivolatile compounds from the treated water. The GACs have a flow manifold which allows the series order to be reversed. The bag filters BF-3 and BF-4 are utilized to reduce particle fouling in the carbon beds. GAC-treated water is pumped through a bag filter (BF-5), to remove fugitive carbon particles, on to the Effluent Tank (T-14). T-14 serves as a wet well for the plant water system and as a reservoir for the GAC backwash system. Treated effluent is discharged to Herrick Hollow Creek by gravity. T-14 is equipped with an open-channel flow element (Parshall flume) that serves as the primary discharge flow element. Effluent is periodically sampled from a slip stream using an autosampler (e.g., ISCO sampler).

Sludge collected in T-6 is processed through a filter press (FP-1). T-6 is equipped with decant valves to remove supernatant from the settled sludge prior to filter press processing. Sludge is fed to FP-1 by the Filter Press Sludge Feed Pump (P-8). A diatomaceous earth pre-coat slurry is prepared in the Pre-Coat Tank (T-7) and fed to the inlet side of FP-1 by the Pre-Coat Pump (P-9). The pre-coat slurry enhances the binding capacity of the sludge in the filter press, enhancing its dewaterability. The dewatered sludge is collected in a skip for off-site disposal. Filtrate from FP-1 drains to the GWTP floor sump. The Building Sump Pump (P-10) pumps all water collected in the floor sump to the equalization tank T-1 for treatment.

3.4.2 Groundwater Treatment System Operations, Maintenance, and Monitoring

3.4.2.1 Overview

Samco, which constructed the groundwater treatment system in 2002 and 2003 and operated the groundwater system from 2003 through 2005, prepared a System Operation and Maintenance Manual for the groundwater treatment plant. This manual is included in Appendix F. OMI, which began operation of the groundwater treatment plant in January 2006, has prepared an addendum to that manual, also included in Appendix F. The groundwater treatment plant will be operated and maintained in accordance with these documents. These documents will be revised and updated as required based on observations of system performance and operational requirements.

3.4.2.2 Treated Groundwater Effluent and Water Discharge Limits

Treated groundwater effluent monitoring will be conducted in accordance with a letter dated August 9, 2001 from the New York State Department of Environmental Conservation (NYSDEC), or subsequent updates issued by NYSDEC. Effluent monitoring will consist of daily pH and flow measurement, weekly sampling for BOD, TSS, metals, oil and grease, PCBs, VOCs and total phosphates, monthly sampling of TDS, and quarterly sampling of SVOCs. The initial approval letter, with the complete list of sampling requirements and discharge limits, is included in Section 2 of the System Operations and Maintenance Manual, presented in Appendix F. The most recent update to this letter, dated December 1, 2005, is included in Appendix F. Per the approval letter, effluent sampling results will be forwarded to the Regional Water Engineer and the NYSDEC. A copy of the Daily Effluent pH Record form is also included in Appendix F.

In addition to effluent monitoring, influent monitoring will include monthly sampling of BOD, TSS, metals (including aluminum and arsenic), oil and grease, PCBs, VOCs, total phosphates, TDS, and quarterly sampling of SVOCs. Performance sampling on the liquid phase GAC units will consist of monthly VOC sampling. All sampling results will be maintained on site and forwarded to the Regional Water Engineer and NYSDEC as required.

3.4.2.3 Start-up

System start-up procedures are included in Section 4 of the System Operation and Maintenance Manual, included in Appendix F.

3.4.2.4 Routine Inspections

Periodic inspections of the groundwater treatment system will be performed. Daily inspections will be performed by the system operator and will include records of flow rate, flow totals, process pH, line pressures, and equipment checks. A copy of the Daily Inspection Report form is included in Appendix F (updated from the version included in the System Operations and Maintenance Manual). In addition, weekly operational reports summarizing operational activities and observations will also be completed by the operator and maintained on-site. A copy of the Weekly GWTP Operation Report form is also included in Appendix F.

3.4.2.5 Supplemental Procedures

As described in Section 3.4.2.1 above, Samco, which contracted the groundwater treatment system in 2002 and 2003 and operated the treatment system from 2003 through 2005, prepared a System Operation and Maintenance Manual for the groundwater treatment plan, included in Appendix F. As described in Section 1.1, this site-wide O&M manual is intended to be a working document that will be updated with pertinent information as required. As such, the following supplemental procedures and information are also included in Appendix F for implementation:

- Subsurface Treatment System Determination . This June 26, 2003 letter from New York City Department of Environmental Protection (NYCDEP) presents information and requirements regarding the groundwater treatment plant septic system.
- Groundwater Treatment Plan Effluent Discharge Criteria. This December 1, 2005 letter from NYSDEC presents five-year effluent discharge criteria effective March 1, 2006 through February 28, 2011.
- Richardson Hill Road Landfill – Groundwater Treatment System – System Operating and Maintenance Addendum. This addendum, prepared by OMI in August 2006, provides information and procedures regarding setpoints, inspections, inspection forms, and equipment status as of August 2006.
- Standard Operating Procedure – Operating During Freezing Conditions. Standard Operating Procedure – Switching Equalization Tank to Recirculation Mode. The Equalization Tank (T-1) and associated piping are outdoors. These SOPs, prepared

by OMI in November 2006, provide procedures for operating the GWTP during freezing weather.

- Standard Operating Procedure – Emergency Diesel Generator (EDG) Pad Inspections. This SOP, prepared by Parsons in January 2007, provides procedures for inspecting the EDG pad for potential settlement.

Additional procedures and information will be incorporated into the O&M Manual by addendum over the operation of the system as required.

3.4.2.6 Troubleshooting

System troubleshooting procedures are included in Section 6 of the System Operation and Maintenance Manual, included in Appendix F.

3.4.2.7 Shutdown

System shutdown procedures are included in Section 4 of the System Operation and Maintenance Manual, included in Appendix F.

3.2.4.8 Waste Handling

Waste from the groundwater treatment system will be staged in an open top roll-off or closed 55-gallon containers inside the treatment building. The roll-off will be used for dewatered sludge storage from the filter press. The 55-gallon drums will be used for other potentially hazardous waste generated during the operation of the groundwater treatment system (i.e., bag filters, waste oil, spent carbon, and solids from the filters and equalization tank). Non-hazardous waste will be stored in a standard refuse container. The sludge roll-off and DOT-approved drums will be transported to a permitted facility for disposal.

For the purposes of RCRA compliance, the groundwater treatment building will be considered an initial accumulation point (sometimes referred to as a satellite accumulation point) which is the initial accumulation area at or near the point of hazardous waste generation under the control of the operator of the process generating the waste. Hazardous waste material will be managed per 40 CFR 262.34 and 6 NYCRR 372.2(a)(8).

O&M personnel will be responsible for properly labeling each drum and coordinating with the waste disposal contractor for waste pickup and additional containers and supplies. The waste disposal facility will be approved by Amphenol/Honeywell. Amphenol/Honeywell will sign the manifest as the generator.

3.5 GROUNDWATER TREATMENT PLANT SEPTIC SYSTEM

The GWTP contains a single occupancy restroom with one toilet and one sink. The restroom uses water from the clean water tank located inside the GWTP. A septic system to service the GWTP restroom was constructed pursuant to a Subsurface Treatment System Determination issued by NYCDEP on June 26, 2003, included in Appendix F, which was based on a design prepared by Parsons dated June 13, 2003. The septic system was designed based on a loading rate of 40 gallons per day.

As shown on Record Drawing C-01, the system includes a 1,000-gallon pre-cast concrete septic tank, installed northwest of the GWTP between the edge of the asphalt pavement and the perimeter fence. A riser with a 24-inch diameter cover was installed from the top of the tank to final grade to provide for pumping of the tank. A 4-inch diameter PVC discharge pipe was installed from the GWTP to the septic tank. The 4-inch diameter PVC pipe was installed inside a 6-inch diameter cast iron pipe to provide protection beneath the access road. From the septic tank, a 4-inch diameter PVC pipe runs to a distribution box located approximately 100 ft northwest of the GWTP. Perforated PVC pipes (4-inch diameter, 15-ft long) were installed from the distribution box to distribute sewage within the leach field.

The following provisions of the Subsurface Treatment System Determination apply to the operation of the Septic System:

- The system must be operated, maintained and monitored in accordance with the approved plans, the Watershed Regulations and all other regulations and standards applicable to the system. Any proposed alternation or modification of any SSTS requires the review and approval of the Department.
- The system shall receive only the domestic sewage from the structures shown on the plans. The nature or composition and quality of flow from the structures shall not be changed without prior approval of the Department.
- In no case will sewage or sludge be allowed to be exposed, or any other unsanitary or unsafe condition to be created because of the use of the system. Whenever sludge and scum accumulates in the septic tank so as to occupy together at any point more than one-fourth of the distance between the bottom and the flow line, the tank shall be cleaned. Whenever sludge, scum or soil is removed from any part of the system, it shall be done in such a manner as to cause no nuisance, and the material shall be disposed of in accordance with applicable regulations.

In addition to the above, mowing of the leach field will be conducted on a periodic basis (e.g., annual) to prevent the establishment of deep rooting, woody vegetation that could interfere with operation of the leach field.

SECTION 4

MONITORING

4.1 GENERAL

This section contains a description of the long-term post-remediation monitoring program, which will include monitoring of groundwater, surface water, leachate, and landfill gas. Appendices G and H present the Sampling, Analysis, and Monitoring Plan (SAMP) and Quality Assurance Project Plan (QAPP) for post remedial activities, respectively. The SAMP and QAPP are intended to supplement monitoring program by providing applicable procedures.

4.2 GROUNDWATER

Groundwater samples will be collected from each of the six groundwater collection trench monitoring wells (i.e., TMW-2, TMW-3, TMW-4, TMW-5, TMW-6, and TMW-7) shown on Record Drawing C-9 on a quarterly basis. Samples will be collected using the USEPA Region 2 (1998) Low Stress (Low-Flow) Purging and Sampling Procedure for Collecting Groundwater Samples for Monitoring Wells. As shown on the table below, samples will be submitted on a rotating basis for routine or baseline analysis as specified in 6 NYCRR Part 360-2.11, PCBs, and VOCs during those sampling events when baseline parameters are not being analyzed. In addition, samples will be collected from monitoring wells MW-12S, MW-12D, and MW-12DD using modified low-flow procedures (See SAMP) and analyzed for VOCs. The post-closure sampling schedule is presented on the following table:

Post-Closure Groundwater Sampling Schedule
Richardson Hill Landfill

Sampling Schedule for Trench Monitoring Wells[1,2,3]				
Post-Closure Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1 (2007)		Baseline+PCBs	Routine+VOCs, PCBs	Routine+VOCs, PCBs
2 (2008)	Routine+VOCs, PCBs	Routine+VOCs, PCBs	Baseline+PCBs	Routine+VOCs, PCBs
3 (2009)	Routine+VOCs, PCBs	Routine+VOCs, PCBs	Routine+VOCs, PCBs	Baseline+PCBs
4 (2010)	Routine+VOCs, PCBs	Routine+VOCs, PCBs	Routine+VOCs, PCBs	Routine+VOCs, PCBs
5 (2011)	Baseline+PCBs	Routine+VOCs, PCBs	Routine+VOCs, PCBs	Routine+VOCs, PCBs
6 (2012)	Routine+VOCs, PCBs	Baseline+PCBs	Routine+VOCs, PCBs	Routine+VOCs, PCBs

1. Trench monitoring wells are TMW-2, TMW-3, TMW-4, TMW-5, TMW-6, and TMW-7.
2. See NYSDEC Subpart 360 for list of Baseline and Routine analyses.
3. In addition, monitoring wells MW-12S, MW-12D, and MW-12DD will be sampled for VOCs.

Monitoring well locations are shown on Record Drawing C-101. Groundwater sampling and analysis procedures are described in the SAMP (Appendix G). Quality assurance procedures are described in the QAPP (Appendix H); Table 2.3A of the QAPP also provides a list of groundwater analytes.

Samples will also be collected from the North Area recovery wells on a quarterly basis and analyzed for VOCs. Samples will be collected from the sample taps located in the groundwater treatment plant.

The scope of the groundwater sampling program (i.e., number of wells, frequency of sampling, analytical program) will be re-evaluated in detail after the first four quarters of data collection, and periodically thereafter based on quarterly sampling results. Based on the evaluations conducted, adjustments to the program (e.g., reducing the frequency of sampling certain monitoring wells or analyzing for certain parameters which are consistently not detected or are detected at concentrations low relative to regulatory standards or guidelines) will be proposed to USEPA for approval.

4.3 SURFACE WATER

Surface water samples will be collected on an annual basis from three monitoring locations as shown on Figure 2. A total of three surface water grab samples will be collected and analyzed for PCBs. Surface water sampling and analysis procedures are described in the SAMP (Appendix G). Quality assurance procedures are described in the QAPP (Appendix H).

4.4 LEACHATE

As described in Section 2.2.7, monitoring of leachate elevations within the two TSCA cell leachate collection sumps will be conducted during the quarterly landfill cap inspections. Sampling and analysis of leachate will not be conducted. Leachate collected in the sumps will be brought to the groundwater treatment building for treatment.

4.5 LANDFILL GAS

The landfill cap is intended to collect landfill gases, including explosive gases, if present beneath the geomembrane, and route them within the venting layer to the gas vents. The site history and the nature and extent of the waste disposed at the site indicated that the landfill is likely to be in the decelerated methane production phase.

Landfill gas monitoring will consist of quarterly gas monitoring events using a field explosimeter at the ten gas vents shown on Record Drawing C-7. 6 NYCRR Part 360-2.17(f)(1) indicates that the concentration of methane and other explosive gases generated by the landfill facility must not exceed: 25% of the lower explosive limit (LEL) for gases in structures on or off-site; and must not exceed the LEL for the gases at or beyond the property boundary. The LEL for methane is 5.3% by volume of air. It is expected that the readings within the gas vents would exceed the LEL if the landfill still has significant potential for methane gas production. If methane concentrations exceed the LEL in any of the gas vents,

the results will be reviewed and the potential for the LEL to be exceeded at the property boundary will be evaluated. If methane concentrations at or beyond the property boundary are found to exceed the LEL, pursuant to 6 NYCRR Part 360-2.17(f)(3), USEPA and NYSDEC will be notified within 7 days and a remediation plan will be prepared and submitted within 45 days.

In addition to monitoring at the gas vents, monitoring will be conducted within the following structures: the maintenance building at the toe of the landfill and at the two leachate collection sumps on the landfill as shown on Record Drawing C-7, at each of the three groundwater extraction system sumps shown on Record Drawing C-9, and at the pull boxes (PB-1A, PB-1B, PB-2 through PB-6) shown on Record Drawing C-101 If methane concentrations exceed 25% of the LEL in any of these structures, pursuant to 6 NYCRR Part 360-2.17(f)(3), USEPA and NYSDEC will be notified within 7 days and a remediation plan will be prepared and submitted within 45 days.

The scope of the landfill gas monitoring program will be re-evaluated after the first four quarters of data collection. If the results indicate that the landfill is no longer a significant potential methane gas source, adjustments may be proposed to USEPA for approval.

SECTION 5

DOCUMENTATION

5.1 INTRODUCTION

As part of the post-remediation O&M activities, documentation of inspections, maintenance, operation, and monitoring activities will be conducted. The operation and effectiveness of the groundwater treatment system and other site data and evaluations will be summarized in O&M reports submitted to USEPA. These reports and the ongoing protectiveness of the remedy will be the basis for the five-year review of the site. Specific documentation will include the following:

Documentation	Description and Schedule
Quarterly Inspection Form	Includes observations, O&M activities conducted, and recommendations.
Chain of Custody	Records sample tracking.
Laboratory Analysis Reports	Documents laboratory analysis results. Preliminary data to be submitted to USEPA within 5 business days of receipt.
Quarterly O&M Report	Includes inspections, available laboratory analyses, and discussion/recommendations. To be submitted to USEPA within 60 days of the end of the quarter.
Annual O&M Report	Summary of the year's O&M activities. Presents statistical trend evaluation of data collected during the year and discussion/recommendations. To be submitted to USEPA within 90 days of the end of the year.
5-Year O&M Report	Summary of the O&M activities for five years. Presents statistical trend evaluation and discussion/recommendations. To be submitted to USEPA within 90 days of the end of the 5-year period.

5.2 RECORDKEEPING

During the post-remediation O&M period, activities related to operation, maintenance, and monitoring at the site will be documented as discussed below:

- A master copy of the O&M Manual will be kept on-site. Changes or additions to the manual will be directly marked, initialed, and dated by the field personnel. Major changes to procedures will be submitted to the project team including USEPA for approval.

- A field logbook will be kept on-site and utilized by field personnel to document day-to-day activities.
- Quarterly inspection forms (Appendix A) will be utilized by the field inspector to document inspections/maintenance activities for USEPA submittal.
- Laboratory analysis results and gas monitoring measurements will be attached to quarterly reports for USEPA submittals.
- Chain-of-custody forms will be used to document environmental samples.
- Records of delivered equipment and materials will be kept on site.
- Records of equipment and materials leaving the site will be kept.

Records of documentation concerning O&M activities completed at the RHRL site will be kept on file within the on-site GWTP for at least five years. Copies will be sent to Amphenol/Honeywell for their files.

5.3 QUARTERLY REPORT

A quarterly report will be prepared to summarize the O&M activities including inspections and analytical results from the previous quarter. The quarterly reports will also include tables with groundwater elevation data. Groundwater elevation data will also be presented on maps depicting the direction of decreasing hydraulic head. The quarterly reports will be submitted to USEPA.

5.4 ANNUAL REPORT

An annual report will be prepared to summarize the O&M activities including inspections and analytical results from the previous four quarterly reports. The annual reports will be submitted to USEPA and present statistical trend evaluations based on analytical results including maps depicting the direction of decreasing hydraulic head, hydrographs of monitoring wells showing water level trends, and groundwater recovery system data. The statistical trend evaluations will support discussion and recommendations related to operation, maintenance, and monitoring.

5.5 FIVE-YEAR REVIEW REPORT

A five-year review report will be submitted to USEPA. The report will summarize the first five years of O&M activities, and provide recommendations for continued O&M, and, where appropriate, modifications to various components of the O&M Manual.

APPENDIX A

INSPECTION FORM

APPENDIX B

GROUNDWATER MONITORING WELLS

(Appendix B on CD)

APPENDIX C

LANDFILL CAP

(Appendix C on CD)

APPENDIX D

GROUNDWATER EXTRACTION TRENCH

(Appendix D on CD)

APPENDIX E

GROUNDWATER RECOVERY WELLS

(Appendix E on CD)

APPENDIX F

GROUNDWATER TREATMENT SYSTEM

F-1a

Groundwater Treatment Plant
System Operation and Maintenance Manual
Prepared By Samco Technologies, Inc.
Volume 1

(Section 10 of Volume 1 on CD)

F-1b

Groundwater Treatment Plant
System Operation and Maintenance Manual
Prepared By Samco Technologies, Inc.
Volume 2

(Volume 2 on CD)

F-2

Subsurface Treatment System Determination

F-3

Groundwater Treatment Plant Effluent Discharge Criteria

F-4

System Operating and Maintenance Addendum

F-5

Operations During Freezing Conditions

F-6

Emergency Diesel Generator (EDG)
Pad Inspections

APPENDIX G

SAMPLING, ANALYSIS, AND MONITORING PLAN (SAMP)

APPENDIX H

QUALITY ASSURANCE PROJECT PLAN (QAPP)

APPENDIX I

RECORD DRAWINGS

(Appendix I on CD)