O'BRIEN & GERE

November 21, 2008

Ms. Young Chang
Project Manager
USEPA Region 2
290 Broadway, 20th Floor
New York, NY 10007

Re: Response to EPA Comment Letter on Draft Addendum to the Operation and Maintenance Manual for the Richardson Hill Road Landfill Site, Sidney, NY

File: 3729/42138

Dear Ms. Chang:

On behalf of the Richardson Hill Road Landfill Site PRP group (Respondents), please find enclosed responses to the Environmental Protection Agency (EPA) comment letter dated November 13, 2008 based on EPA review of the draft Addendum to the Operation and Maintenance Manual (the Addendum) for Richardson Hill Road Landfill site dated October 2008 prepared by O'Brien and Gere.

Subsequent to EPA approval of the responses provided herein, O'Brien & Gere, on behalf of the Respondents, will revise and finalize the Addendum. As agreed with you on November 20, 2008, O'Brien & Gere will transmit the revised Addendum to EPA, New York State Department of Environmental Conservation (NYSDEC), and EarthTech by December 25, 2008. Per the EPA comment letter, this transmittal will be an electronic version of the document in redline/strikeout format.

Should you have any questions pertaining to this information or the project in general, please do not hesitate to contact me at (315) 437-6100.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

Deborah Y. Wright, CPG
Sr. Managing Hydrogeologist

cc: Joseph Bianchi – Amphenol
Samuel Waldo – Amphenol
Richard Galloway – Honeywell
James Mickam - JTM Associates
Ed Modica USEPA
James Kaczor – EarthTech
Gerrard Burke – NYSDEC

5000 Brittonfield Parkway / East Syracuse, New York 13057
(315) 437-6100 / FAX (315) 463-7554 • http://www.obg.com

Draft Addendum to the Operation and Maintenance Manual
Richardson Hill Road Landfill Site (Dated October 2008)

Specific Comments

Table 1-1 O&M ACTIVITIES SUMMARY

1. Page 2 of 5, typographical: In the Water Levels row, Response Action column, the word "water" between Maintain and ground should be taken out.

Response: *The text will be edited as requested.*

2. Page 4 of 5, Groundwater Sampling: Please include O&M activities for RW-05 in the Table 1-1.

Response: *O&M activities associated with RW-05 will be added to Table 1-1.*

3. Page 5 of 5, Surface Water and Sediment Sampling: Under the Task column for both of these rows refers to Figure 2 which will depict the sampling locations of surface water and sediment. Said Figure 2 was not submitted with the documents in review because the contractor was awaiting completion of the as-built surveys for the Herrick Hollow Creek Restoration (Refer to email from David Carnevale, OBG dated Oct. 23, 08. 11:16 am). The purpose of the sediment and surface water sampling is to insure that the contaminated groundwater is not recontaminating the sediment and surface water. Therefore, the sediment monitoring locations should be biased towards locations where contaminated groundwater may potentially daylight to the sediment and the surface water.

Response: *Review of historic ground water sampling data for PCBs indicates that the area where PCB-impacted ground water has the greatest potential to discharge to sediment and surface water is along the western portion of South Pond downgradient of the ground water collection trench. The highest concentrations of PCBs in ground water were detected in monitoring wells within and immediately downgradient of the collection trench. PCBs have not been detected in monitoring wells located further downgradient of the collection trench (specifically RH-1, RH-2, RH-9D, RH-10D, and RH-11D). Monitoring wells RH-2 and RH-10D are located adjacent to Herrick Hollow Creek south of South Pond. PCBs have not been detected in these wells suggesting that the potential for PCB impacts to Herrick Hollow Creek from ground water discharge is low. In addition, based on a conversation with the treatment plant operator, it is our understanding that PCBs have not been detected at concentrations above the 0.065 µg/L detection limit in effluent samples between January 2006 and the present.*

As followup to our conversation, we also reviewed the fish tissue data provided by Barton & Loguidice. The data indicate that the predominant PCB aroclor observed in the fish was 1254 with 1260 also found in a few of the samples. The predominant aroclor identified at the RHRL Site was 1248 suggesting that the PCBs observed in the fish did not originate from the RHRL site.

Given the above information, it is proposed that three sediment and three surface water samples be collected along the western portion of South Pond as currently described in the draft O&M Addendum. The proposed locations are shown on the attached figure.

4. How and where will the contractor document that the tasks were monitored per tables listed frequency?

Response: *O&M data entry forms will be developed for use by the treatment plant operators to document that the tasks described on Table 1-1 were monitored. These forms will be developed subsequent to discussions with the O&M contractor.*

5. Column under Inspection Item, 3rd row: Monitoring wells RH-8D and RH-8S should be included for sampling of PCBs.

Response: *Monitoring wells RH-08S and RH-08D will be added for PCB sampling.*

O&M Manual Section 5 – DOCUMENTATION

6. Page 5-1, Table: Please submit the preliminary data only in an electronic format, preferably in xcel spreadsheet. The Quarterly O&M Reports are requested only in an electronic format, preferably in pdf. The Annual and 5-yr O&M Reports are requested in hard copy. Any photos included in the reports should be in color, not black and white copies of the photo.

Response: *The O&M Addendum will specify that preliminary quarterly ground water analytical data will be submitted to USEPA in electronic format as an Excel file. Quarterly O&M Reports will be submitted to USEPA in electronic format as a .PDF file. Annual and 5-year O&M Reports will be submitted to USEPA as hardcopy. Photographs that may be included in the quarterly, annual, or 5-year reports will be reproduced in color, or provided as electronic files.*

Post Construction Environmental Sampling and Monitoring Plan (ESMP, Updates to Sections 1,3, and 5 of O&M Manual Appendix G – SAMPLING AND ANALYSIS PLAN)

7. Page 1, Section 1, 2nd sentence: Please insert "Appendix G of" in front of the word Operation.

Response: *Text will be edited as requested.*

8. Page 2, Section 2.1.1: 1st paragraph does not seem to have counted RW-05 and the referenced Table 1 does not include RW-05. Groundwater sampling should include RW-05. Why are the in-trench monitoring wells not planned for sampling? Please explain.

Response: *RW-05 will be mentioned in this section and referenced on Table 1. An accessible sample port will be installed in the discharge piping within Sump 3. Samples from RW-05 will be collected during periods when RW-05 is running on a continuous basis. As such, samples will not be collected from RW-05 during the 4th quarter 2008 or 1st quarter 2009 quarter sampling events.*

9. Page 2, Section 2.1.1, 2nd paragraph and Table 2: Why are the MNA sampling proposed in a staggered manner? If the PRPs want to observe whether MNA is occurring or not then it should be demonstrated by quarterly monitoring for at least next two to three years. And there should be an explanation of the wells being monitored and their function. In brief, there should be an appendix in the ESMP that details the MNA Study Plan.

Response: *Four consecutive quarters of MNA parameter data will have been collected during 2008 after completion of the 4th quarter sampling event. The intent of the proposed MNA monitoring described in the draft O&M Addendum is to collect additional seasonal MNA data extended over a two-year timeframe. It is not expected that these data will vary significantly over a 3-month period to necessitate sampling on a consecutive quarterly basis. The MNA monitoring well network, MNA monitoring objectives, and MNA data uses will be documented in an MNA Study Plan to be included as an appendix to the ESMP.*

10. Page 2, Section 2.1.2: The first sentence should say the "original" O&M Manual rather than "existing." (Also refer to comment #3 above.) In hindsight, I'm not sure if 3 locations would be sufficient. What about the springs? There should be a figure mentioned in the paragraph and figure showing monitoring locations should be added.

Response: *Text will be edited as requested. See response to Comment #3 for rationale associated with proposed surface water sample locations. A figure will be referenced in this section showing the proposed surface water sample locations and will be provided in the ESMP.*

11. Page 2, Section 2.1.3: (Also refer to comment #3 above.) In hindsight, I'm not sure if 3 locations would be sufficient. There should be a figure mentioned in the paragraph and figure showing monitoring locations should be added.

Response: *See response to Comment #3 for rationale associated with proposed sediment sample locations. A figure will be referenced in this section showing the proposed sediment sample locations and will be provided in the ESMP.*

12. Table 1: Please include in the notes and notate on table all wells where a core log is available; wells RH-08D, RH-09D, RH-10D, RH11D, and RH-12D.

Response: *The requested information will be added to Table 1.*

13. Appendix A – Well Construction Logs: Please include well log RW-05.

Response: *The well construction log for RW-05 will be included in Appendix A.*

14. Appendix B, Section 5.3, pages 5-5: As stated above in comment #10 and 11, three sediment sampling locations may not be sufficient. This should be further discussed.

Response: *See response to Comment #3.*

Attachment 1

Table 1-1 O&M Activities Summary

Table 1-1
O&M ACTIVITIES SUMMARY
(Addended December 2008)

	Inspection Item	Task	Frequency of Inspection	Response Action
General Site Inspection	Access Structures	Inspect site security fencing, gates, and locks	Quarterly	Per O&M Manual
		Inspect signage	Quarterly	Per O&M Manual
		Inspect site access roads	Quarterly	Per O&M Manual
		Inspect security fencing and protective panels for the extraction system	Quarterly	Per O&M Manual
		Inspect the groundwater extraction building doors, locks and alarms	Quarterly	Per O&M Manual
	Landfill Cap	Monitor vegetation progress, check for woody plant material	Quarterly	Per O&M Manual
		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)).	Per O&M Manual
		Monitor for animal burrows or dens	Quarterly	Per O&M Manual
		Inspect gas vent pipes	Quarterly	Per O&M Manual
		Mow cap vegetation	Annually	Per O&M Manual
	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)	Per O&M Manual
	TSCA Cell	Monitor leachate collection and leachate detection sumps	Quarterly	Per O&M Manual

Table 1-1
O&M ACTIVITIES SUMMARY
(Addended December 2008)

	Inspection Item	Task	Frequency of Inspection	Response Action
Groundwater Extraction Trench Monitoring	Water Levels	Record water elevations in each well/piezometer pair and compare/verify against sump transducer readings.	Weekly for a minimum of one year. After one year, a review will be conducted to determine if frequency should be modified.	Record weekly water level information on log provided. Maintain ground water elevations within the trench below 1748-ft
	Sump pump run-times	Monitor and document the duration that each sump pump runs. Under normal operating conditions, the sump pumps should cycle on and off.	Daily.	Record sump pump run-times on log provided. If the pumps are not cycling, check flows from each pump totalizer and the plant influent flow totalizer, pump pressures, and trench water levels to evaluate if the problem is related to the pumps or clogging of the conveyance lines. Conduct repairs or cleaning as necessary to restore normal operating pumping conditions.
	Flow totalizer	Calibrate per Manufacturer's Instructions	Per Manufacturer's Instructions	Calibrate when necessary and document each calibration check and re-calibration event
	Influent flow rate from collection trench	Monitor & record flow rate	Daily	Record daily influent flow rates from the collection trench on log provided.
	Water Recovery Volume	Record volume of the recovered groundwater from each of the three individual sump totalizers and the combined influent totalizer	Weekly	Reord water recovery volumes of the log provided. The flow totals of the sumps should equal the flow total. If the total flow from the sumps does not equal the total influent flow to the system, check the flow meters to see if they need to be cleaned and/or recalibrate the flow meters. If the total flow from the sumps is more than the inflow check discharge line for plugging.
	Pressure from each sump pump	Record pump pressure at each of the three individual sump pumps	Weekly	Record operating pressures for each sump pump on log provided. If the individual pump pressures deviate from normal operating pressures, inspect the pump and clean or repair as necessary
	Sump pumps	Pull and clean sump pumps	Semi-annually, or as required based on system performance	
	Discharge line from the collection trench to the treatment facility	Clean discharge line from the collection trench to the treatment facility	Semi-annually; or as required based on system performance	
	Pumping levels within the collection trench	Maintain pumping levels within the collection trench to the lowest levels possible	Daily	Record weekly water level information on log provided. Maintain ground water elevations within the trench below 1748-ft
	Weather Data	Record precipitation readings, snow cover, and snow melt observations	Daily	Per O&M Manual
	Sump #1	Inspect for light non-aqueous phase liquids (LNAPL) with an oil water interface probe	Monthly	Per O&M Manual

Table 1-1
O&M ACTIVITIES SUMMARY
(Addended December 2008)

	Inspection Item	Task	Frequency of Inspection	Response Action
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.	Per O&M Manual
Groundwater Treatment Plant	Inspections	Flow rate, flow totals, process pH, line pressures, and equipment checks	Daily	Per O&M Manual
		Operational reports summarizing operational activities and observations	Weekly	Per O&M Manual
	Influent Monitoring	BOD, TSS, metals (including aluminum and arsenic), oil and grease, PCBs, VOCs, total phosphates, TDS	Monthly	Per O&M Manual
		SVOCs	Quarterly	Per O&M Manual
	Effluent Monitoring	Collect pH sample and record flow measurements	Daily	Per O&M Manual
		Collect BOD, TSS, metals, PCBs, VOCs, total phosphates, oil and grease samples	Weekly	Per O&M Manual
		Collect TDS samples	Monthly	Per O&M Manual
		Collect SVOCs samples	Quarterly	Per O&M Manual
	Liquid Phase GAC monitoring	Collect VOCs sample	Monthly	Per O&M Manual

Table 1-1
O&M ACTIVITIES SUMMARY
(Addended December 2008)

	Inspection Item	Task	Frequency of Inspection	Response Action
Groundwater Sampling	Groundwater Collection Trench Monitoring Wells (TMW-2, TMW-3, TMW-4, TMW-5, TMW-6, and TMW-7)	Collect water samples and submit samples on a rotating basis for routine, VOC, and PCB analyses; or for baseline and PCB analyses	Quarterly.	Per the Post Closure Environmental Sampling and Monitoring Plan
	RW-05	Collect samples and submit for VOC analysis.	Quarterly.	Per the Post Closure Environmental Sampling and Monitoring Plan
	Monitoring Wells: RH-01, RH-02, RH-03, RH-04S, RH-04D, RH-05S, RH-05D, RH-06S, RH-06D, RH-07S, RH-07D, RH-08S, RH-08D, RH-09D, RH-10I, RH-10D, RH-11D, RH-12D, MW-12S, MW-12D, MW-12DD	Collect samples and submit for VOC analysis.	Quarterly.	Per the Post Closure Environmental Sampling and Monitoring Plan
	Monitoring Wells: RH-04S, RH-04D, RH-05S, RH-05D, RH-06S, RH-06D, RH-07S, RH-07D, RH-08S, RH-08D	Collect samples and submit for PCB analysis.	Semi-annually: 3rd Qtr 2008, 1st Qtr 2009, 3rd Qtr 2009, 2nd Qtr 2010, 4th Qtr 2010, 1st Qtr 2011, 3rd Qtr 2011, 2nd Qtr 2012, 4th Qtr 2012	Per the Post Closure Environmental Sampling and Monitoring Plan
	Monitoring Wells: RH-01, RH-02, RH-03, RH-0S, RH-08D, RH-09D, RH-10I, RH-10D, RH-11D, RH-12D, MW-12S, MW-12D	Collect samples and submit for MNA analysis.	Semi-annually: 3rd Qtr 2008, 1st Qtr 2009, 3rd Qtr 2009, 2nd Qtr 2010, 4th Qtr 2010	Per the Post Closure Environmental Sampling and Monitoring Plan
	New Dimatos Residential Well	Collect samples and submit for VOC analysis.	Quarterly - until data shows VOCs within the State drinking water standards for three consecutive years	Per the Post Closure Environmental Sampling and Monitoring Plan
	Haynes and Demetriadou Residential Wells	Collect samples and submit for VOC analysis.	Annually during the second or third quarter	Per the Post Closure Environmental Sampling and Monitoring Plan
	North Area Monitoring Wells	Collect samples from sample taps located in the groundwater treatment plant and submit for VOC analysis	Quarterly.	Per the Post Closure Environmental Sampling and Monitoring Plan

Table 1-1
O&M ACTIVITIES SUMMARY
(Addended December 2008)

	Inspection Item	Task	Frequency of Inspection	Response Action
Surface Water Sampling	Surface Water Monitoring Locations	Collect water samples from locations shown on Figure 2 of ESMP and submit for PCB analysis, obtain GPS coordinates from each location	Annually	Per the Post Closure Environmental Sampling and Monitoring Plan
Sediment Sampling	Sediment Monitoring Locations	Collect sediment samples from locations shown on Figure 2 of ESMP and submit for PCB analysis, obtain GPS coordinates from each location	Annually	Per the Post Closure Environmental Sampling and Monitoring Plan
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.	Per O&M Manual

Attachment 2

O&M Manual Section 4 - Monitoring

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, sediment, 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. Elements of the SAMP have been incorporated into the Post Construction Environmental Sampling and Monitoring Plan (ESMP). The ESMP updates the SAMP with additional ground water monitoring locations, monitoring frequency, and analytical parameters. The SAMP and QAPP are intended to supplement monitoring program by providing applicable procedures.

4.2 GROUNDWATER

Refer to ESMP. 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 AND SEDIMENT

Refer to ESMP. 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.

Attachment 3

O&M Manual Section 5 - Documentation

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 in electronic format as an Excel file.
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 in electronic format as a PDF file.
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 in hardcopy format.
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 in hardcopy format.

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 include the following:

- Reporting of maintenance repairs and inspection activities conducted during the quarter for the following as documented on quarterly inspection forms (Appendix A of the O&M Plan):
  - Access structures
  - Storm water controls
  - Monitoring well, extraction wells, extraction trench
  - Landfill cap
  - TSCA cell collection system
  - Landfill gas venting system
- Reporting of operating periods and down-times for the collection trench and the North Area recovery wells for the quarter
- Reporting of quarterly sampling and/or analytical issues, if any
- Summary table of quarterly ground water quality data and surface water/sediment data for the quarter from which they are collected
- Summary table showing week-ending ground water extraction volumes for the quarter
- Summary table of ground water elevation data from in-trench and downgradient monitoring wells
- Figure showing ground water elevation data measured during the quarterly sampling event
- Recommendations for immediate system enhancements, if necessary

The quarterly reports will be submitted to USEPA in electronic format as a PDF file.

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 will present the following:

- Summary of O&M activities

- Evaluation of performance and effectiveness of the collection trench and North Area recovery wells for the year
  - Summary table showing monthly ground water extraction volumes for the year
  - Summary table and graph ground water elevation data from in-trench and downgradient monitoring wells for the year
  - Figure showing ground water elevation data measured during the quarterly sampling events
- Evaluation of ground water quality data for the year
  - Summary tables of ground water, surface water, and sediment quality data for the year
  - Trend graphs of site-related constituents from the well network.
- Recommendations for system enhancements, if necessary

The annual reports will be submitted to USEPA in hardcopy format.

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.

The 5-year reports will be submitted to USEPA in hardcopy format.

Attachment 4

O&M Manual Appendix H – Quality Assurance Project Plan

Attachment 4

O&M Manual Appendix H – Quality Assurance Project Plan

TABLE 3.1
SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES FOR GROUNDWATER/SURFACE WATER SAMPLES
RICHARDSON HILL ROAD LANDFILL

Parameter	Sample Container	Preservative	Technical Holding Time [1]	Laboratory Holding Time [2]
VOCs	3 40 mL glass vials with Teflon® lined septum caps	pH<2, with HCl, Ice , Cool to 4°C	14 days (7 days-unpreserved)	10 days (5 days-unpreserved)
Non-Halogenated VOCs	2 40-ml glass vials with Teflon® lined septum caps	pH<2, with HCl, Ice , Cool to 4°C	14 days from collection	14 days from collection
PCBs	1 32-oz glass bottle	Ice, Cool to 4°C	7/40 days[a]	5/40 days[a]
Metals	1 500-ml plastic bottle	pH<2, with HNO3, Ice, Cool to 4ºC	180 days	178 days
Mercury	1 500-ml plastic bottle	pH<2, with HNO3, Ice, Cool to 4ºC	28 days	26 days
Hexavalent Chromium	1 500-ml plastic bottle	Ice, Cool to 4ºC	24 hours	24 hours
Cyanide	1 8-oz plastic or glass bottle	Ice, Cool to 4°C, NaOH to pH>12	14 days	12 days
Turbidity, Color	1 1-L plastic bottle	Ice, Cool to 4°C	48 hours	24 hours
Total Kjeldahl Nitrogen (TKN)	1 8-oz plastic bottle	Ice, Cool to 4°C, with H_2SO_4 to pH<2	28 days	26 days
Ammonia	1 8-oz plastic bottle	2 mL H_2SO_4 per liter, ice, cool to 4°C.	28 days	26 days
Inorganic Ions	1 1-L plastic bottle	Ice, Cool to 4°C	Nitrate/Nitrite - 48 hours Chloride, bromide, sulfate – 28 days	Nitrate – 24 hours Chloride, bromide, sulfate – 26 days
Sulfide	500-ml plastic bottle	ZnAc/NaOH; Ice, Cool to 4°C	7 days from collection	5 days from collection
TOC	1 4-oz plastic or glass bottle	Ice, Cool to 4°C, with H_3PO_4 to pH<2	28 days	26 days
COD	1 8-oz plastic bottle	Ice, Cool to 4°C, with H_2SO_4 or HCl to pH<2	28 days	26 days
BOD_5	1 1-L plastic bottle	Ice, Cool to 4°C	48 hours	24 hours
TSS, TDS	1 1-L plastic bottle	Ice, cool to 4°C.	7 days	7 days
Alkalinity	1 4-oz plastic bottle	Ice, Cool to 4°C	14 days	12 days
Hardness	1 500-ml plastic bottle	pH<2, with HNO3, Ice, Cool to 4ºC	6 months	178 days
Phenols	1 32-oz glass bottle	Ice, Cool to 4°C, with H_2SO_4 to pH<2	28 days	26 days

Notes:

1. Technical holding time between sample collection and sample analysis. Based on Region 2 SOPs, NYSDEC (2005) ASP, and method requirements.
2. Laboratory holding time from Verified Time of Sample Receipt (VTSR) at the laboratory. Based on NYSDEC (2005) ASP and technical holding time requirement.

[a] number of days between sample collection and extraction / number of days between extraction and analysis;

[b] Meet the laboratory holding time requirement does not automatically meet the technical holding time requirement. Special arrangement needed to meet the technical holding time requirement.

TABLE 3.2

SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES FOR SEDIMENT SAMPLES
RICHARDSON HILL ROAD LANDFILL

Parameter	Sample Container	Preservative	Technical Holding Time [1]	Laboratory Holding Time [2]
PCBs	1 4 oz wide-mouth glass w/ Teflon-lined cap	Ice, Cool to 4°C	7/40 days[a]	5/40 days[a]
TOC	1 4 oz wide-mouth glass w/ Teflon-lined cap	Ice, Cool to 4°C		14 days from collection

Notes:

1. Technical holding time between sample collection and sample analysis. Based on Region 2 SOPs, NYSDEC (2005) ASP, and method requirements.
2. Laboratory holding time from Verified Time of Sample Receipt (VTSR) at the laboratory. Based on NYSDEC (2005) ASP and technical holding time requirement.

[a] number of days between sample collection and extraction / number of days between extraction and analysis;

Volatile organic compound (GC/MS) quality control requirements and corrective actions
- USEPA method 8260B with NYSDEC ASP Exhibit E requirements

Audit	Frequency	Control Limits	Corrective Action
Holding times	Samples must be extracted and analyzed within holding time.	VOCs: Analyze within 10 days from VTSR.	**If holding times are exceeded for initial or any reanalyses required due to QC excursions, notify QAO immediately since resampling may be required.**
MS Tuning	Once every 12 hours.	BFB key ions and abundance criteria listed in the method must be met for all 9 ions.	1. Tune the mass spectrometer. 2. Document corrective action - samples cannot be analyzed until control limit criteria have been met.
Initial Calibration	Prior to sample analysis and when continuing calibration criteria are not met.	1. Five concentrations bracketing expected concentration range for all compounds of interest. 2. Criteria as listed in NYSDEC ASP 10/95 Exhibit E.	1. Identify and correct problem. 2. If criteria are still not met, recalibrate. 3. Document corrective action - samples cannot be analyzed until calibration control limit criteria are met.
Continuing Calibration	Every 12 hours, following BFB.	Within criteria as listed in NYSDEC ASP 10/95 Exhibit E.	1. Reanalyze. 2. If criteria are still not met, identify and correct problem, recalibrate. 3. Document corrective action - samples cannot be analyzed until calibration control limit criteria are met.
Preparation Blank Analysis	Every 12 hours, following continuing calibration	Common laboratory contaminants less than 5 X PQL; anything else less than PQL.	1. Reanalyze blank. 2. If limits are still exceeded, clean instrument, recalibrate analytical system, and reanalyze all samples if detected for same compounds as in blank. 3. Document corrective action - samples cannot be analyzed until blank criteria have been met.
Field / Equipment Blank Analysis	Every 20 samples as required.	Common laboratory contaminants less than 5 X PQL; anything else less than PQL.	1. Investigate problem, contact QAO. 2. Write an explanation.
Trip Blank	1 per cooler containing VOC samples.	Common laboratory contaminants less than 5 X PQL; anything else less than PQL.	1. Investigate problem, contact QAO. 2. Write an explanation.
Laboratory	Each analytical batch (every 12	Recovery within matrix spike blank limits	1. If recovery failures are above control limits and these compounds

Volatile organic compound (GC/MS) quality control requirements and corrective actions
- USEPA method 8260B with NYSDEC ASP Exhibit E requirements

Audit	Frequency	Control Limits	Corrective Action
Control Sample Analysis	hours). Prepared independently from calibration standards.	(NYSDEC ASP Exhibit E) if available, otherwise within laboratory control limits. Spike must contain all target analytes.	are not detected in the associated samples, contact QAO. 2. Reanalyze LCS and examine results of other QC analyses. 3. If recovery is still outside limits, and other QC criteria are met, contact QAO. 4. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. 5. Document corrective action.
Internal Standards	All samples and blanks (including MS/MSD)	1. Response -50% - +100% of internal standards from continuing calibration of the day. 2. RT must be ≤30 sec. from associated standard.	1. Reanalyze. 2. If still outside of the limits, qualify data. 3. Document corrective action.
Surrogate Spike	All samples and blanks (including MS/MSD)	Recovery within NYSDEC ASP 10/95 Exhibit E control limits.	1. Reanalyze any environmental or QC sample with surrogates that exceed control limits. 2. Qualify the data. 3. Document corrective action.
Matrix Spike/ Matrix Spike Dup. (MS/MSD) Analysis	1 per group of similar concentration and matrix, 1 per case of samples, or 1 in 20, whichever is greater.	Recovery and RPD within NYSDEC ASP 10/95 Exhibit E limits, if available, otherwise within laboratory limits.	1. Reanalyze if <10%. 2. If >10% and LCS criteria are met, document in case narrative; no additional corrective action required. 3. If LCS criteria are exceeded also, examine other QC data for source of problem; *i.e.,* surrogate recoveries for extraction efficiency and calibration data for instrument performance issues. 4. Take corrective action as required, re-extract or reanalyze samples and associated MS/MSD and LCSs as required.
Field Dup. Analysis	1 per matrix and analytical batch and every 20 samples of similar matrix	50% RPD for waters.	If these criteria are not met, sample results will be evaluated on a case by case basis.
Note: Communications with the QAO must be documented and presented in the data package.			

Nonhalogenated volatile organic compound (GC) quality control requirements and corrective actions – Method RSK-175 Modified

Audit	Frequency	Control Limits	Corrective Action
Holding times	Samples must be extracted and analyzed within holding time.	VOCs: Analyze within 14 days from collection.	**If holding times are exceeded for initial or any reanalyses required due to QC excursions, notify QAO immediately since resampling may be required.**
Initial Calibration	Prior to sample analysis and when continuing calibration criteria are not met.	1. Minimally three concentrations for ethylene and ethane and six for methane at concentrations specified in the method.	1. Identify and correct problem. 2. If criteria are still not met, recalibrate. 3. Document corrective action - samples cannot be analyzed until calibration control limit criteria are met.
Continuing Calibration	1. At a frequency of 10%. 2. At mid-range concentrations for all target compounds.	The %difference must be < 20%.	1. Reanalyze. 2. If criteria are still not met, identify and correct problem, recalibrate. 3. Document corrective action - samples cannot be analyzed until calibration control limit criteria are met.
Retention time windows	Retention time windows must be established in accordance with USEPA method 8000B.	Compounds must be within established retention time windows for the succeeding calibration standards.	1. Reanalyze. 2. If criteria are still not met, identify and correct problem, recalibrate. 3. Recalibrate and reanalyze samples back to the last compliant calibration standard.
Preparation Blank Analysis	One per every 20 samples of similar matrix prepared at the same time.	Target compounds must be less than the PQL.	1. Reanalyze blank. 2. If limits are still exceeded, clean instrument, recalibrate analytical system, and reanalyze all samples if detected for same compounds as in blank. 3. Document corrective action and contact QAO - samples cannot be analyzed until blank criteria have been met.
Field / Equipment Blank Analysis	Every 20 samples as required	Target compounds must be less than the PQL.	1. Investigate problem, contact QAO. 2. Write an explanation.
Trip Blank	1 per cooler containing VOC samples.	Target compounds must be less than the PQL.	1. Investigate problem, contact QAO. 2. Write an explanation.
Identification	Samples, blanks, and QC samples.	Retention times must be within	1. Investigate problem.

Nonhalogenated volatile organic compound (GC) quality control requirements and corrective actions – Method RSK-175 Modified

Audit	Frequency	Control Limits	Corrective Action
		established retention time windows.	2. Reanalyze calibration standards to check for retention time shift.
Quantitation	Samples, blanks, and QC samples.	External standard method of quantitation.	NA
Field Dup. Analysis	1 per matrix and analytical batch and every 20 samples of similar matrix.	50% RPD for waters.	If these criteria are not met, sample results will be evaluated on a case by case basis.
Note: Communications with the QAO must be documented and presented in the data package.			

Sulfide, alkalinity, sulfate, chloride, dissolved total organic carbon, nitrate, nitrite quality control requirements and corrective actions - USEPA methods 376.1, 310.1, 300.0, 375.4, 325.2, 415.1, 353.2

Audit	Frequency	Control Limits	Corrective Action
Holding Times	Samples must be digested and analyzed within holding time.	Nitrate, Total Organic Carbon (TOC), Chloride, sulfate: analyze within 28 days of collection. Nitrite: analyze within 48 hours of collection. Alkalinity: Analyze within 14 days of collection. Sulfide: Analyze within 7 days of collection.	**If holding times are exceeded for initial or any reanalyses required due to QC excursions, notify the QAO immediately since resampling may be required.**
Initial Calibration	Nitrate, nitrite, TOC, sulfate, and chloride: Prior to sample analysis and when criteria for continuing calibration are exceeded. Alkalinity and sulfide: Standardize titrant monthly and verify normality of titrant prior to sample analysis with reference standard or LCS.	Nitrate, nitrite, sulfate, and chloride: Five standard calibration, one of the calibration standards must be at the PQL concentration. TOC: Two standard calibration in accordance with manufacturer's requirements. Alkalinity and sulfide: Standard check used to verify normality of titrant must be within 5% of the true value.	1. Identify and correct problem. 2. Recalibrate. 3. Document corrective action – samples cannot be analyzed until calibration control limit criteria have been met.
Continuing calibration	Nitrate, nitrite, TOC, sulfate, and chloride: Midpoint calibration standard is analyzed every ten samples.	Percent recovery must be 85 to 115%.	1. Reanalyze 2. If criteria are still not met, identify and correct problem. 3. Recalibrate 4. Reanalyze samples back to the last compliant reference standard or continuing calibration standard. 5. Document corrective action – samples cannot be analyzed until calibration control limit criteria have been met.
Preparation Blank	1 per batch of samples of similar	Analytes must be < PQL.	1. Reanalyze blank. 2. If limits are still exceeded, clean instrument and recalibrate

Sulfide, alkalinity, sulfate, chloride, dissolved total organic carbon, nitrate, nitrite quality control requirements and corrective actions - USEPA methods 376.1, 310.1, 300.0, 375.4, 325.2, 415.1, 353.2

Audit	Frequency	Control Limits	Corrective Action
Analysis	matrix prepared.		analytical system and reprep and reanalyze affected samples if detected. 3. Document corrective action – samples cannot be analyzed until blank criteria are met.
Field / Equipment Blank Analysis	Every 20 samples, where applicable	Analytes must be < PQL.	1. Investigate problem, contact QAO. 2. Write an explanation.
Laboratory Control Sample Analysis	1. Analyzed following initial calibration and every 20 samples of similar matrix analyzed at the same time. 2. Prepared independently from calibration standards.	Recovery within laboratory control limits.	1. Reanalyze LCS and examine results of other QC analyses. 2. If recovery is still outside limits, and other QC criteria are met, contact QAO. 3. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. 4. Document corrective action.
Matrix Spike/Matrix Spike Duplicate (Laboratory Duplicate for alkalinity) Analysis	1 per matrix type and every 20 samples.	Recovery/RPD within laboratory control limits.	1. Reanalyze. 2. Document corrective action.
Field Dup. Analysis	1 per matrix and analytical batch and every 20 samples of similar matrix	50% RPD for waters .	If these criteria are not met, sample results will be evaluated on a case by case basis.
Note: Communications with the QAO must be documented and presented in the data package.			

PCB quality control requirements and corrective actions
- USEPA method 8082

Audit	Frequency	Control Limits	Corrective Action
Holding Times	Samples must be extracted and analyzed within holding time.	Extract within 5 days from VTSR. Analyze extracts within 40 days from extraction.	**If holding times are exceeded for initial or any reanalyses required due to QC excursions, notify the QAO immediately since resampling may be required.**
Initial Calibration	Prior to start up and when criteria are exceeded for continuing calibration.	1. Minimally 3 concentrations, one calibration standard for multi component compounds. 2. For PCBs as listed in NYSDEC ASP criteria. 3. For other methods, %RSD must be <10%	1. Identify and correct problem. 2. Recalibrate. 3. Document corrective action – samples cannot be analyzed until calibration control limit criteria have been met.
Calibration Verification	Calibration standards must contain target compounds at mid-range concentration.	1. For PCBs as listed in NYSDEC ASP criteria. 2. For other methods, %D <15%	1. Reanalyze 6. If criteria are still not met, identify and correct problem, recalibtrate; reanalyzed samples back to last compliant calibration standard. Samples must be bracketed by compliant calibration standards.
Retention Time Windows	Retention time windows must be established in accordance with NYSDEC ASP criteria.	1. Compounds must be within NYSDEC ASP criteria. 2. Retention time shift for surrogate in samples and standards must not exceed 0.3%.	1. Reanalyze non-compliant standards and samples. 2. If criteria are still not met, identify and correct problem, recalibrate; reanalyze samples back to last compliant calibration standard.
Method Blank Analysis	With each extraction batch, of no more than 20 analytical samples, or each 7 calendar day period in which samples are received, whichever is more frequent.	1. Compound concentrations must be <CRQL 2. Surrogate retention times must be within retention time windows.	1. Source of contamination must be investigated and corrected. 2. Clean instrument, recalibrate analytical system and re-extract and reanalyze all associated samples. 3. Document corrective action - samples cannot be analyzed until blank criteria have been met.
Equipment Blank	As required.	1. Compound concentrations must be <CRQL 2. Surrogate retention times must be within retention time windows.	1. Source of contamination must be investigated and contact QAO. 2. Document in case narrative.

PCB quality control requirements and corrective actions
- USEPA method 8082

Audit	Frequency	Control Limits	Corrective Action
Resolution check	For PCBs, analysis at the beginning of every initial calibration, on each GC column and instrument.	Depth of valley between 2 adjacent peaks ≥60.0% of the height of the shorter peak.	1. Investigate problem and correct. 2. Reanalyze. 3. Document corrective action.
Analytical Sequence	For PCB, in accordance with NYSDEC ASP criteria.	Must meet NYSDEC ASP criteria.	1. Reanalyze with correct sequence. 2. Document corrective action.
LCS Analysis	1 per 20 samples of similar matrix extracted at the same time. LCSs must be spiked with target compounds (or Aroclors suspected to be present at the site) at concentration specified in the method.	Percent recoveries must be within laboratory control limits.	1. Only if recovery failures are above control limits and these compounds are not detected in the associated samples, is corrective action not required; document in case narrative. 2. Reanalyze LCS and examine results of other QC analyses. 3. If recovery is still outside limits, and other QC criteria are met, contact QAO. 4. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. 5. Document corrective action.
MS/MSD Analysis	1 per matrix type and every 20 samples of similar matrix. MS/MSDs must be spiked with target compounds (or Aroclors suspected to be present at the site) at concentrations specified in the method.	Recovery and RPD within NYSDEC ASP criteria.	1. Reanalyze if <10%. 2. If LCS criteria are exceeded also, examine other QC data for source of problem; *i.e.,* surrogate recoveries for extraction efficiency and calibration data for instrument performance issues. 3. Take corrective action if other QC data criteria are exceeded; re-extract or reanalyze samples and associated MS/MSD and LCSs as required.
MSB	1 per MS/MSD.	Recovery within NYSDEC ASP criteria.	1. Reprepare, reextract, and reanalyze MSB, MS and MSD. 2. If recovery is still outside limits, and other QC criteria are met, contact QAO. 3. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory MSB. 4. Document corrective action.

PCB quality control requirements and corrective actions
- USEPA method 8082

Audit	Frequency	Control Limits	Corrective Action
Sulfur Blank	For PCBs, if only part of a set of samples required sulfur removal.	Compound concentrations must be ≤CRQL.	Reextract and reanalyze blank and associated samples.
Instrument Blank	For PCBs; the first analysis in the 12 hour analytical sequence.	Compound concentration must be ≤0.5 times the CRQL. Surrogates must be within retention time windows.	1. Stop analysis and correct. 2. Reanalyze. 3. All samples must be associated with acceptable instrument blank.
Surrogate Spike	Samples, blanks, MS/MSD/MSB, and LCSs must be spiked with method specified surrogate compounds.	1. Recovery within NYSDEC ASP criteria. 2. Corrective action is not required if one of the two required surrogates has recovery outside of control limits if the recovery is >10%.	1. Reanalyze. 2. If recovery is still outside control limits but >10%, document in case narrative report. 3. If recovery is <10% with reanalysis, re-extract and reanalyze the sample if the holding time has not elapsed. If holding time has elapsed, notify the QAO immediately prior to proceeding since resampling may be required.
Identification	Samples, blanks, and QC data.	1. Retention times must be within established retention time windows or must meet relative retention time criteria.	1. Investigate problem; reanalyze calibration standards to check for retention time shift.
Quantitation	Samples, blanks, and QC data.	1. Internal or external standard method. 2. Verify concentration is within linear calibration range. 3. Peak areas from three to five PCB peaks unique to the target Aroclor will be used to quantitate the Aroclor concentration. 4. Every effort must be made to meet specified CRQL requirements. 5. Soil samples concentrations must be corrected to dry weight.	1. If concentration is above linear calibration range, dilute sample and reanalyze. Dilution should result in concentration in the upper calibration range of the instrument. 2. Perform appropriate cleanup procedures as necessary to minimize sample matrix effects.
Field Duplicate Analysis	Every 20 samples.	50% RPD for waters and 100% RPD for soil.	No corrective action required of the laboratory since the laboratory will not know the identity of the field duplicate samples. If these criteria are not met, sample results will be evaluated on a case by case basis during the validation process.

PCB quality control requirements and corrective actions
- **USEPA method 8082**

Audit	Frequency	Control Limits	Corrective Action
Dilutions	1. When target analyte concentration exceed upper limit of calibration curve. 2. Prior to diluting, samples will be cleaned up during sample preparation/extraction procedure using appropriate methods when matrix interference is present. 3. Do not dilute for MS/MSD samples.	Not applicable	Not applicable
Confirmation Analysis	Quantitation confirmation will be performed at a 10% per matrix frequency; qualitative confirmation will be performed for positive sample results. If any matrix interference is present, if an altered Aroclor is suspected, or if overlapping Aroclors are present qualitative confirmation will be performed.	Not Applicable	Not Applicable

DRAFT PLAN

Post Construction Environmental Sampling and Monitoring Plan Richardson Hill Road Landfill Site Sidney, New York

Amphenol Corporation
Honeywell International

December 2008

Job No. 3729/42138

DRAFT PLAN

Post Construction Environmental Sampling and Monitoring Plan
Richardson Hill Road Landfill Site
Sidney, New York

Amphenol Corporation
Honeywell International

December 2008

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1. Introduction

This document is the Post Construction Environmental Sampling and Monitoring Plan (ESMP) for the Richardson Hill Road Landfill (RHRL) site located in Sidney, New York. This ESMP supercedes and updates Sections 1, 3, and 5 of the Sampling and Analysis Plan (SAMP) contained in ~~the~~ Appendix G of the Operation and Maintenance Manual for the Post Construction Activities (O&M Manual) dated August 2007 for the RHRL site prepared by Parsons for Amphenol Corporation and Honeywell International (the Respondents).

1.1 Purpose

The purpose of this ESMP is to update and identify the post construction ground water monitoring well network and frequency of sampling, and to describe procedures for the collection and analysis of environmental samples associated with ground water, surface water, and sediment. This ESMP shall be used in conjunction with the O&M Manual, updated portions of the SAMP (provided as an appendix to this ESMP), and the Quality Assurance Project Plan (QAPP) developed by Parsons for the Respondents.

1.2 Objective

The objective of this ESMP is to provide a framework outlining the collection and analysis of field samples to generate data necessary to evaluate the long-term effectiveness of the remedy.

2. Post Construction Environmental Sampling and Monitoring Program

The Post Construction Environmental Sampling and Monitoring Program consists of the collection and analysis of samples from the following environmental media: ground water, surface water, and sediment. In addition, landfill gas and leachate levels will be monitored.

2.1 Environmental Sampling

2.1.1 Ground water sampling

Ground water samples will be collected on a quarterly basis from six collection trench monitoring wells, 21 RHRL site monitoring wells, and one residential well. In addition, ground water samples will be collected from two other residential wells on an annual basis. Samples will also be collected from the North Area recovery wells on a quarterly basis. These samples will be collected from the sample taps located in the groundwater treatment plant. In addition to the North Area recovery wells, samples will be collected from the newly installed recovery well RW-05. Quarterly sampling from RW-05 will be initiated once this recovery well has been placed permanently on-line, which is anticipated to occur during the spring of 2009. The specific wells to be sampled are identified on Table 1 and their locations are shown on Figure 1. Well construction logs for the monitoring wells and the New Dimatos Residential Well are provided in Appendix A.

The ground water sampling procedures are provided Appendix B, which have been excerpted from the existing SAMP (Parsons, August 2007). Analytical requirements are summarized on Table 2. A monitored natural attenuation (MNA) study plan describing the MNA monitoring well network, MNA monitoring objectives, and MNA data uses is provided in Appendix C.

2.1.2 Surface water sampling

In accordance with Section 4.3 of the ~~existing~~ original O&M Manual (Parsons, August 2007), surface water samples will be collected on an annual basis from three monitoring locations within the South Pond. ~~Herrick Hollow Creek restoration area.~~ The proposed surface water sampling locations are shown on Figure 2. Specific locations will be selected with the concurrence of USEPA. Each surface water sampling location will be located using a hand-held global positioning system (GPS) device such that the sampling locations can be replicated for subsequent sampling events. The surface water grab samples will be analyzed for PCBs. Surface water sampling procedures are described in Appendix A. Quality assurance procedures are described in the QAPP (Appendix H of the O&M Manual).

2.1.3 Sediment sampling

Three sediment samples will be collected along the western portion of South Pond at the proposed locations shown on Figure 2. ~~projected from the north and south ends, and central portion of the ground water collection trench.~~ Specific locations will be selected with the concurrence of USEPA. Each sediment sampling location will be located using a hand-held global positioning system (GPS) device such that the sampling locations can be replicated for subsequent sampling events. The sediment samples will be analyzed for PCBs and total organic carbon (TOC). Sediment sampling procedures are described in Appendix A. Quality assurance procedures are described in the QAPP (Appendix H of the O&M Manual).

2.2 Environmental Monitoring

2.2.1 Landfill gas

Landfill gas monitoring is described in Section 4.3 of the existing SAMP.

2.2.2 Leachate

Leachate monitoring is described in Section 4.4 of the existing SAMP.

TABLE 1
POST CONSTRUCTION ENVIRONMENTAL SAMPLING AND MONITORING PROGRAM
RICHARDSON HILL ROAD LANDFILL

MONITORING WELL DATA

WELL	Well Diameter (inches)	BOTTOM OF WELL (FT BGS)	SCREENED and/or OPEN INTERVAL(S) (FT BGS)	DEPTH TO LOWER PUMP INTAKE (FT BGS)	NOTES
Trench Monitoring Wells					
TMW-2	2	25	4.5-24.5	14.5	
TMW-3	2	23	3.5-22.5	13	
TMW-4	2	28	7.5-27.5	17.5	
TMW-5	2	17.5	5-17	11	
TMW-6	2	17	6.5-16.5	11.5	
TMW-7	2	13	2.5-12.5	7.5	
In-Trench Monitoring Wells					
TMW-1	4	41	0-25; 30-40	12.5	Note 1
SSC-1	8	42	0-24; 29-41	12	Note 1
SSC-2	8	47.5	7-29.5; 34.5-46.5	18.25	Note 1
SSC-3	8	41	0-17.5; 22.5-34.5	8.75	Note 1
SSC-4	8	37	0-18.5; 23.5-35.5	9.25	Note 1
TMW-8	4	37	0-19; 24-34	9.5	Note 1
North Area Recovery Wells					
RW-1	6	68	43-65	NA	Note 5
RW-2	6	75	50-75	NA	Note 5
RW-3	6	75	50-75	NA	Note 5
RW-4	6	75	50-75	NA	Note 5
Recovery Well					
RW-05	7	67	37-67	NA	Note 7
Monitoring Wells					
RH-01	2	70	50-70	60	
RH-02	2	88	68-88	78	
RH-03	2	65	45-65	55	
RH-04S	2	17	7-17	12	
RH-04D	2	38	22-38	30	
RH-05S	2	25	5-25	15	
RH-05D	2	48	38-48	43	
RH-06S	2	25	5-25	15	
RH-06D	2	45	35-45	40	
RH-07S	2	25	5-25	15	
RH-07D	2	40	30-40	35	
RH-08S	2	28	8-28	18	
RH-08D*	4	47	32-47	52.5	
RH-09D*	4	64.5	44.5-64.5	54.5	
RH-10I	2	64	54-64	59	
RH-10D*	4	90	69-90	79.5	
RH-11D*	4	45	25-45	35	
RH-12D	2	52	27-52	39.5	
MW-12S	4	33.72	25-33.72	Initial Purge: 24.5; Low Flow: 29	Note 2, 3, and 4
MW-12D*	4	79.76	62.1-78.5	Initial Purge: 61.5; Low Flow:70	Note 3 and 4
MW-12DD*	4	140	130-140	Initial Purge: 129.5; Low Flow: 135	Note 3 and 4
Residential Wells					
New Dimatos Residential Well	6	316	250-316	NA	Note 6
Haynes Residential Well	Unknown	Unknown	Unknown	NA	Note 6
Demetriadou Residential Well	Unknown	Unknown	Unknown	NA	Note 6

Notes:

* - indicates that core log is available (provided in Appendix A)

1. In trench monitoring well. Not anticipated to be routinely sampled. Data provided for reference only.
2. Screened Interval based on recent soundings of well.
3. Initial purge to remove one well volume above the screened interval.
4. Once initial purge has been completed, pump intake will be lowered to comply with low-flow sampling procedures.
5. Samples are collected from taps inside the treatment building.
6. Samples are collected from taps inside the residence.
7. Samples to be collected from tap to be installed when well discharge is permanently installed

Table 2

Ground Water Monitoring Requirements
Post Construction Environmental Sampling and Monitoring Program
Richardson Hill Road Landfill Site

	2008									
	3rdQtr					4thQtr				
Analyses	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA
Well I.D.										
Collection Trench										
TMW-2	X			X			X	X	X	
TMW-3	X			X			X	X	X	
TMW-4	X			X			X	X	X	
TMW-5	X			X			X	X	X	
TMW-6	X			X			X	X	X	
TMW-7	X			X			X	X	X	
Recovery Wells										
RW-1 (North Area)			X					X		
RW-2 (North Area)			X					X		
RW-3 (North Area)			X					X		
RW-4 (North Area)			X					X		
RW-05										
Monitoring Wells										
RH-01		X	X		X			X		X
RH-02		X	X		X			X		X
RH-03		X	X		X			X		X
RH-04S		X	X	X				X		
RH-04D		X	X	X				X		
RH-05S		X	X	X				X		
RH-05D		X	X	X				X		
RH-06S		X	X	X				X		
RH-06D		X	X	X				X		
RH-07S		X	X	X				X		
RH-07D		X	X	X				X		
RH-08S		X	X	X	X			X		X
RH-08D		X	X	X	X			X		X
RH-09D		X	X		X			X		X
RH-10I		X	X		X			X		X
RH-10D		X	X		X			X		X
RH-11D		X	X		X			X		X
RH-12D		X	X		X			X		X
MW-12S		X	X		X			X		X
MW-12D		X	X		X			X		X
MW-12DD		X	X					X		
Residential Wells										
New Dimatos Residential Well			X					X		
Haynes Residential Well *										
Demetriadou Residential Well *										

	2009																			
	1stQtr					2ndQtr					3rdQtr					4thQtr				
Analyses	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA
Well I.D.																				
Collection Trench																				
TMW-2		X	X	X			X	X	X			X	X	X		X			X	
TMW-3		X	X	X			X	X	X			X	X	X		X			X	
TMW-4		X	X	X			X	X	X			X	X	X		X			X	
TMW-5		X	X	X			X	X	X			X	X	X		X			X	
TMW-6		X	X	X			X	X	X			X	X	X		X			X	
TMW-7		X	X				X	X	X			X	X	X		X			X	
Recovery Wells																				
RW-1 (North Area)			X					X					X					X		
RW-2 (North Area)			X					X					X					X		
RW-3 (North Area)			X					X					X					X		
RW-4 (North Area)			X					X					X					X		
RW-05								X					X					X		
Monitoring Wells																				
RH-01			X		X			X					X		X			X		
RH-02			X		X			X					X		X			X		
RH-03			X		X			X					X		X			X		
RH-04S			X	X				X					X	X				X		
RH-04D			X	X				X					X	X				X		
RH-05S			X	X				X					X	X				X		
RH-05D			X	X				X					X	X				X		
RH-06S			X	X				X					X	X				X		
RH-06D			X	X				X					X	X				X		
RH-07S			X	X				X					X	X				X		
RH-07D			X	X				X					X	X				X		
RH-08S			X	X	X			X					X	X	X			X		
RH-08D			X	X	X			X					X	X	X			X		
RH-09D			X		X			X					X		X			X		
RH-10I			X		X			X					X		X			X		
RH-10D			X		X			X					X		X			X		
RH-11D			X		X			X					X		X			X		
RH-12D			X		X			X					X		X			X		
MW-12S			X		X			X					X		X			X		
MW-12D			X		X			X					X		X			X		
MW-12DD			X					X					X					X		
Residential Wells																				
New Dimatos Residential Well			X					X					X					X		
Haynes Residential Well *								X												
Demetriadou Residential Well *								X												

	2010																			
	1stQtr					2ndQtr					3rdQtr					4thQtr				
Analyses	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA
Well I.D.																				
Collection Trench																				
TMW-2		X	X	X			X	X	X			X	X	X			X	X	X	
TMW-3		X	X	X			X	X	X			X	X	X			X	X	X	
TMW-4		X	X	X			X	X	X			X	X	X			X	X	X	
TMW-5		X	X	X			X	X	X			X	X	X			X	X	X	
TMW-6		X	X	X			X	X	X			X	X	X			X	X	X	
TMW-7		X	X	X			X	X	X			X	X	X			X	X	X	
Recovery Wells																				
RW-1 (North Area)			X					X					X					X		
RW-2 (North Area)			X					X					X					X		
RW-3 (North Area)			X					X					X					X		
RW-4 (North Area)			X					X					X					X		
RW-05			X					X					X					X		
Monitoring Wells																				
RH-01			X					X	X	X			X					X	X	X
RH-02			X					X	X	X			X					X	X	X
RH-03			X					X	X	X			X					X	X	X
RH-04S			X					X	X				X					X	X	
RH-04D			X					X	X				X					X	X	
RH-05S			X					X	X				X					X	X	
RH-05D			X					X	X				X					X	X	
RH-06S			X					X	X				X					X	X	
RH-06D			X					X	X				X					X	X	
RH-07S			X					X	X				X					X	X	
RH-07D			X					X	X				X					X	X	
RH-08S			X					X	X	X			X					X	X	X
RH-08D			X					X	X	X			X					X	X	X
RH-09D			X					X		X			X					X		X
RH-10I			X					X		X			X					X		X
RH-10D			X					X		X			X					X		X
RH-11D			X					X		X			X					X		X
RH-12D			X					X		X			X					X		X
MW-12S			X					X		X			X					X		X
MW-12D			X					X		X			X					X		X
MW-12DD			X					X					X					X		
Residential Wells																				
New Dimatos Residential Well			X					X					X					X		
Haynes Residential Well *								X												
Demetriadou Residential Well *								X												

	2011																			
	1stQtr					2ndQtr					3rdQtr					4thQtr				
Analyses	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA
Well I.D.																				
Collection Trench																				
TMW-2	X			X			X	X	X			X	X	X			X	X	X	
TMW-3	X			X			X	X	X			X	X	X			X	X	X	
TMW-4	X			X			X	X	X			X	X	X			X	X	X	
TMW-5	X			X			X	X	X			X	X	X			X	X	X	
TMW-6	X			X			X	X	X			X	X	X			X	X	X	
TMW-7	X			X			X	X	X			X	X	X			X	X	X	
Recovery Wells																				
RW-1 (North Area)			X					X					X					X		
RW-2 (North Area)			X					X					X					X		
RW-3 (North Area)			X					X					X					X		
RW-4 (North Area)			X					X					X					X		
RW-05			X					X					X					X		
Monitoring Wells																				
RH-01			X	X	X			X					X	X	X			X		
RH-02			X	X	X			X					X	X	X			X		
RH-03			X	X	X			X					X	X	X			X		
RH-04S			X	X				X					X	X				X		
RH-04D			X	X				X					X	X				X		
RH-05S			X	X				X					X	X				X		
RH-05D			X	X				X					X	X				X		
RH-06S			X	X				X					X	X				X		
RH-06D			X	X				X					X	X				X		
RH-07S			X	X				X					X	X				X		
RH-07D			X	X				X					X	X				X		
RH-08S			X	X	X			X					X	X	X			X		
RH-08D			X	X	X			X					X	X	X			X		
RH-09D			X		X			X					X		X			X		
RH-10I			X		X			X					X		X			X		
RH-10D			X		X			X					X		X			X		
RH-11D			X		X			X					X		X			X		
RH-12D			X		X			X					X		X			X		
MW-12S			X		X			X					X		X			X		
MW-12D			X		X			X					X		X			X		
MW-12DD			X					X					X					X		
Residential Wells																				
New Dimatos Residential Well			X					X					X					X		
Haynes Residential Well *								X												
Demetriadou Residential Well *								X												

	2012																			
	1stQtr					2ndQtr					3rdQtr					4thQtr				
Analyses	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA	Part 360 Baseline	Part 360 Routine	VOCs	PCBs	MNA
Well I.D.																				
Collection Trench																				
TMW-2		X	X	X		X			X			X	X	X			X	X	X	
TMW-3		X	X	X		X			X			X	X	X			X	X	X	
TMW-4		X	X	X		X			X			X	X	X			X	X	X	
TMW-5		X	X	X		X			X			X	X	X			X	X	X	
TMW-6		X	X	X		X			X			X	X	X			X	X	X	
TMW-7		X	X	X		X			X			X	X	X			X	X	X	
Recovery Wells																				
RW-1 (North Area)			X					X					X					X		
RW-2 (North Area)			X					X					X					X		
RW-3 (North Area)			X					X					X					X		
RW-4 (North Area)			X					X					X					X		
RW-05			X					X					X					X		
Monitoring Wells																				
RH-01			X					X	X	X			X					X	X	X
RH-02			X					X	X	X			X					X	X	X
RH-03			X					X	X	X			X					X	X	X
RH-04S			X					X	X				X					X	X	
RH-04D			X					X	X				X					X	X	
RH-05S			X					X	X				X					X	X	
RH-05D			X					X	X				X					X	X	
RH-06S			X					X	X				X					X	X	
RH-06D			X					X	X				X					X	X	
RH-07S			X					X	X				X					X	X	
RH-07D			X					X	X				X					X	X	
RH-08S			X					X	X	X			X					X	X	X
RH-08D			X					X	X	X			X					X	X	X
RH-09D			X					X		X			X					X		X
RH-10I			X					X		X			X					X		X
RH-10D			X					X		X			X					X		X
RH-11D			X					X		X			X					X		X
RH-12D			X					X		X			X					X		X
MW-12S			X					X		X			X					X		X
MW-12D			X					X		X			X					X		X
MW-12DD			X					X					X					X		
Residential Wells																				
New Dimatos Residential Well			X					X					X					X		
Haynes Residential Well *								X												
Demetriadou Residential Well *								X												

NOTES: VOCs analyzed using SW-846 Method 5030B followed by 8260B
PCBs analyzed using SW-846 Method 8082
MNA Parameters:

- Total organic carbon - Method 415.1
- Nitrate - Method 300.0
- Nitrite - Method 300.0
- Sulfate - Method 300.0
- Sulfide - Method 376.1
- Total iron - Method 6010B
- Total manganese - Method 6010B
- Magnesium - Method 6010B
- Alkalinity - Method 310.1
- Methane - Method RSK 175 Modified
- Ethane - Method RSK 175 Modified
- Ethene - Method RSK 175 Modified
- Chloride - Method 300.0
- Carbon dioxide - Method 4500
- Calcium - Method 6010B
- Potassium - Method 6010B
- Sodium - Method 6010B

* The Haynes and Demetriadou residential wells will be samples during the 2nd or 3rd quarter depending on access to these properties.
See NYSDEC Subpart 360 for list of Baseline and Routine analyses.

PATH: I:\DIV71\Projects\3729.Amphenol\42138.RHRLS Offsite\Doc\GIS\MXD\RHRL_QUARTERLY_WELL_LOCS.mxd

NAME: FreyerPA

UPDATED: 10/1/2008

NOTE: THE HAYNES AND DEMETRIADOU RESIDENTIAL WELLS ARE TO BE SAMPLED ANUALLY RATHER THAN QUARTERLY

N

0 150 300 600 900 1,200
Feet

RICHARDSON HILL ROAD LANDFILL SITE
SIDNEY, NEW YORK

POST-CLOSURE ENVIRONMENTAL SAMPLING AND MONITORING PROGRAM
QUARTERLY WELL SAMPLING LOCATIONS

FILE NO.
3729.42138
DATE
OCTOBER 2008

FIGURE 1

O'BRIEN & GERE

FIGURE 2

PATH: I:\DIV71\Projects\3729.Amphenol\42138.RHRLS Offsite\Doc\GIS\MXD\PROP_SW-SED_SAMP-LOCS.mxd

NAME: CamevDJ

DATE: 11/20/2008 2:49:34 PM

MW-11S
MW-11D
MW-12D
MW-12DD
MW-12S
RH-01
SW-03
RH-02
SED-03
SW-02
SED-01
SW-01
SED-02
RH-05S
RH-05D
RH-07S
RH-07D
TMW-2
SUMP-1
TMW-3
TMW-4
TMW-1
SSC-1
RH-06D
RH-06S
SSC-2
SUMP-2
TMW-5
SSC-3
RH-08S
RH-08D
TMW-6
SSC-4
SUMP-3
TMW-7
TMW-8
RW-05
RH-03
RH-04S
RH-04D

This document was developed in color. Reproduction in B/W may not represent the data as intended.

Legend

- Trench_Line
- MW
- Dual_Zone_Trench
- RW
- SUMP
- PROPOSED SEDIMENT SAMPLE
- PROPOSED SURFACE WATER SAMPLE

RICHARDSON HILL ROAD LANDFILL SITE
SIDNEY, NEW YORK

0 50 100 200 300 400
Feet

PROPOSED SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS

NOVEMBER 2008
3729/42138

O'BRIEN & GERE

Well Construction Logs

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH
WHILE DRILLING Drilled with fluid rotary

BEFORE CASING REMOVED Installed well

AFTER CASING REMOVED 29.9' bgs on 8/27

CASING TYPE

HOLE NO. RH-1
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 08/21/07
DATE COMPLETED: 08/24/07

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							Brown moist SILT and fine to coarse GRAVEL	
5.0							Installed 8" temporary casing to 6', sealed with bentonite chips from 6' to surface.	6.0'
							Started drilling using 7-7/8" mud rotary	
10.0								
								13.0'
15.0							Brown moist CLAY, trace silt	
							At 20' had to change drill mud because it was getting too thick to pump.	
20.0								20.0'
							Gray to brown fine to medium Gravel and CLAY	
25.0								25.0'
							(HARDER DRILLING NOTED)	
30.0								
								32.5'
	32.5'-	S-1		17	49		Brown wet dense fine to coarse GRAVEL,	33.0'
	33.8'			50-.3			some silt, little clay	33.5'
35.0							Brown weathered SANDSTONE	
							33' to 38'- Drilled open hole, No Mud, set Install 6" steel casing in grout at 38'	38.0'
40.0							5-7/8" Air Rotary from 38' to 70'	

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH
WHILE DRILLING Drilled with fluid rotary

BEFORE CASING REMOVED Installed well

AFTER CASING REMOVED 29.9' bgs on 8/27

CASING TYPE

HOLE NO. RH-1
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 08/21/07
DATE COMPLETED: 08/24/07

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							5-7/8" Air Rotary to 38' to 70'	
45.0								
50.0								50.0'
							Gray Hard Sandstone	
55.0								
60.0								
65.0								
70.0							Airlifted borehole for 40 minutes and produced 300 gallons of water	
							BOTTOM OF BORING	70.0'
75.0							Installed 2" PVC Screen from 70' to 50' Installed 2" Riser from 50' to surface Filled from 70' to 48' with #0 sand Sealed with bentonite chips from 48' to 43' Grout from 43' to surface Well is protected with a 6" locking stick up protective casing	
80.0								

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH
WHILE DRILLING Drilled with fluid rotary

BEFORE CASING REMOVED Installed well

AFTER CASING REMOVED 20' bgs on 8/23

CASING TYPE

HOLE NO. RH-2
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 08/09/07
DATE COMPLETED: 08/14/07

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							Brown moist fine to coarse GRAVEL and SILT, trace cobbles Note: Hard Augering	
5.0								5.0'
							Brown wet SILT, some fine to coarse gravel	
							Installed 8" temporary steel casing to 9'	9.0'
10.0							Switched to 7 7/8" fluid rotary 9' to 68'	10.0'
							Red brown moist SILT and fine to coarse GRAVEL, little clay, trace cobbles	
15.0								
20.0								
25.0								25.0'
							Brown moist to dry SILT and CLAY, some fine to coarse gravel, trace cobbles	
30.0								
35.0								
40.0								

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

HOLE NO. RH-2
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 08/09/07
DATE COMPLETED: 08/14/07

GROUNDWATER DEPTH
WHILE DRILLING Drilled with fluid rotary

BEFORE CASING REMOVED Installed well

AFTER CASING REMOVED 20' bgs on 8/23

CASING TYPE

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							7-7/8" Fluid rotary 9' to 68'	
								43.0'
	43.0'- 43.4'	S-1		100-.4			Red brown moist hard CLAY, some silt, little fine to medium gravel	
45.0								
50.0								
55.0								
60.0								
								62.5'
65.0							Gray hard angular SANDSTONE CHIPS brought to the surface with the drill mud (HARDER DRILLING NOTED)	
								68.0'
70.0							Installed 6" steel casing to 68.0' 5- 7/8" air rotary	
75.0							Gray SANDSTONE	
80.0								

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH
WHILE DRILLING Drilled with fluid rotary

BEFORE CASING REMOVED Installed well

AFTER CASING REMOVED 20' bgs on 8/23

CASING TYPE 7 7/8 Air Rotary

HOLE NO. RH-2
JOB NUMBER: 07124A
DATE STARTED: 08/09/07
DATE COMPLETED: 08/14/07

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							Gray SANDSTONE	
85.0								
90.0							BOTTOM OF BORING	88.0'
							Installed 2" PVC Screen from 88' to 68'	
							Installed 2" Riser from 68' to surface	
							Filled from 88' to 66' with #0 sand	
							Sealed with bentonite chips from 66' to 61'	
							Grout from 61' to surface	
							Well is protected with a 6" diamter locking cover	

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH
WHILE DRILLING Drilled with fluid rotary

BEFORE CASING REMOVED Installed well

AFTER CASING REMOVED 19.7' bgs on 8/23

CASING TYPE

HOLE NO. RH-3
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 08/06/07
DATE COMPLETED: 08/20/07

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
						Stone fill material	1.5'
						Brown moist SILT and fine to medium GRAVEL, trace fine sand	
5.0							
						(MUCH HARDER DRILLING NOTED)	8.0'
						Gray brown moist CLAY, some fine to medium gravel, trace silt	
10.0							
						3 1/4" Auger Refusal	12.0'
						Augered to 9' with 8-1/4 augers then created a pilot hole for augers to 16' using a 7-7/8" roller bit and air rotary. Hole	
15.0						collapsed and 8-1/4" augers were set at 15'	16.0'
						Created a pilot hole to 21' using air rotary and a 7-7/8" roller bit. Hole caved and 8 1/4" augers were spun to refusal at 18'. Hole continued to cave using air rotary	
20.0							21.0'
						Switch to 7-7/8" fluid rotary. Installed 8" temporary steel casing to 22'.	22
						Continued drilling using 7-7/8" roller bit and fluid rotary method from 22' to 24'	
25.0						Cobbels and boulders, 22' to 28'	
30.0							
							33.0'
	33.0'- 33.2'	S-1		100-.2		Gray moist very dense SANDSTONE fragments and CLAY	
35.0							38.0'
						Brown moist to dry hard CLAY, little silt, trace small rock fragments	
	38.0'- 38.2'	S-2		100-.2		Note: At 38.0' large amounts of brown and gray clay were attached to the roller bit	
40.0							

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH
WHILE DRILLING Drilled with fluid rotary

BEFORE CASING REMOVED Installed well

AFTER CASING REMOVED 19.7' bgs on 8/23

CASING TYPE

HOLE NO. RH-3
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 08/06/07
DATE COMPLETED: 08/20/07

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							Gray, medium grained SANDSTONE, weathered to fresh	43.0'
							Install 6" steel casing in grout at 43.0'	
							Switched to air rotary 43' to 65'	
45.0								
							Gray, hard, SANDSTONE	
50.0								
55.0								
60.0								
							Small fractures noted during air rotary	61.0'
							Small fractures noted during air rotary	63.0'
65.0								
							BOTTOM OF BORING	65.0'
							Installed 2" PVC Screen from 65' to 45'	
							Installed 2" Riser from 45' to surface	
70.0							Filled from 65' to 43' with #0 sand	
							Sealed with bentonite chips from 43' to 38'	
							Grout from 38.0' to surface	
75.0							Well is protected with a 6" locking cover	
							Note: Developed well with air for 80 minutes prior to setting the 2" PVC well	
80.0								

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH WHILE DRILLING

BEFORE CASING REMOVED: Installed well

AFTER CASING REMOVED: 8.2' bgs on 9/10

CASING TYPE: 4 1/4" Hollow Stem Augers

HOLE NO. RHMW-4S
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 09/07/07
DATE COMPLETED: 09/07/07

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING "/ OR PERCENT CORE RECOVERY

SHEET 1 OF 1

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							Brown moist SILT and fine to coarse GRAVEL, trace clay, trace fine sand	
5.0								
10.0								
15.0							Saturated cuttings to surface	14.0'
							Brown wet SILT and fine to coarse GRAVEL, trace clay, trace fine sand	
20.0							BOTTOM OF BORING Installed 2" PVC Screen from 17' to 7' Installed 2" Riser from 7' to surface Filled from 17' to 5' with #0 sand Sealed with bentonite chips from 5' to 2'. Concrete mix from 2' to surface. Well is protected with locking protective casing and two bollards.	17.0'
25.0								
30.0								
35.0								
40.0								

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

HOLE NO. RHMW-5S
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 09/07/07
DATE COMPLETED: 09/07/07

GROUNDWATER DEPTH WHILE DRILLING

BEFORE CASING REMOVED: Installed well

AFTER CASING REMOVED: 17' bgs on 9/10

CASING TYPE: 4 1/4" Hollow Stem Augers

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING "/ OR PERCENT CORE RECOVERY

SHEET 1 OF 1

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							Brown moist SILT, some fine to coarse GRAVEL, trace clay, trace fine sand	
5.0								
10.0							Note: Much harder auger drilling at this location, no spoons	
15.0								
20.0								20.0'
							Gray moist to wet SILT and CLAY, some fine to coarse gravel, cobbles noted while drilling	
25.0								
							BOTTOM OF BORING	25.0'
30.0							Installed 2" PVC Screen from 25' to 5' Installed 2" Riser from 5' to surface Filled from 25' to 4' with #0 sand Sealed with bentonite chips from 4' to 1'. Concrete mix from 1' to surface. Well is protected with a stick up locking protective cover	
35.0								
40.0								

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH
WHILE DRILLING Drilled with fluid rotary

BEFORE CASING REMOVED Installed well

AFTER CASING REMOVED 7.51' below top of PVC

CASING TYPE

HOLE NO. MWRH-5D
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 08/28/07
DATE COMPLETED: 08/29/07

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
5.0							Brown moist SILT and fine to coarse GRAVEL, trace cobbles while augering	
10.0								9.0'
15.0							Installed 5" temporary casing Drilled with 4-7/8" fluid rotary from 9' to 48'	15.0'
20.0							Cobbles	
25.0								
30.0								29.0'
							Boulders	30.0'
35.0							Brown soft SILT and CLAY, trace cobbles noted	
							(HARDER DRILLING NOTED)	36.0'
40.0							Gray large SANDSTONE fragments in drill fluid	

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

HOLE NO. MWRH-5D
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 08/28/07
DATE COMPLETED: 08/29/07

GROUNDWATER DEPTH
WHILE DRILLING Drilled with fluid rotary

BEFORE CASING REMOVED Installed well

AFTER CASING REMOVED 7.51' below top of PVC

CASING TYPE

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
								42.0'
							Clay covered roller bit	
45.0								45.0'
							Gray SANDSTONE fragments in drill mud	48.0'
50.0							BOTTOM OF BORING	
							Installed 2" PVC Screen from 48' to 38'	
							Installed 2" Riser from 38' to surface	
							Filled from 48' to 37' with #0 sand	
							Sealed with bentonite chips from 37' to 32'	
55.0							Grout from 32' to surface	
							Well is protected with a stick up locking protective cover	
60.0								
65.0								
70.0								
75.0								
80.0								

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH WHILE DRILLING

HOLE NO. RHMW-6S
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 09/07/07
DATE COMPLETED: 09/07/07

BEFORE CASING REMOVED: Installed well

AFTER CASING REMOVED: 16' bgs on 9/10

CASING TYPE: 4 1/4" Hollow Stem Augers

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

SHEET 1 OF 1

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							Brown moist SILT, some fine to coarse gravel, Cobbles noted while drilling	
5.0								
10.0								
15.0								
20.0							Wet cuttings to surface	19.0'
							Gray moist to wet SILT, some fine to medium gravel, trace clay	
25.0								
							BOTTOM OF BORING	25.0'
30.0							Installed 2" PVC Screen from 25' to 5' Installed 2" Riser from 5' to surface Filled from 25' to 4' with #0 sand Sealed with bentonite chips from 4' to 1'. Concrete mix from 1' to surface. Well is protected with a locking stick up cover	
35.0								
40.0								

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH
WHILE DRILLING Drilled with fluid rotary

BEFORE CASING REMOVED Installed well

AFTER CASING REMOVED 16' bgs on 9/11

CASING TYPE

HOLE NO. RH-6D
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 08/30/07
DATE COMPLETED: 09/05/07

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							Brown moist SILT and fine to coarse GRAVEL, little clay, trace cobbles	
5.0								
							5" temporary steel casing installed	9.0'
10.0							4- 7/8" Fluid Rotary 9' to 45'	
15.0								
20.0								20.0'
							Brown moist SILT and CLAY, some fine to coarse gravel, trace cobbles	
25.0								
30.0								
							Lost all fluid circulation. Water level was measured at 18.4' 20 minutes after mud loss	30.5'
								33.5'
35.0							Gray SANDSTONE	
40.0								

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH
WHILE DRILLING Drilled with fluid rotary

BEFORE CASING REMOVED Installed well

AFTER CASING REMOVED 16' bgs on 9/11

CASING TYPE

HOLE NO. RH-6D
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 08/30/07
DATE COMPLETED: 09/05/07

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							Gray SANDSTONE Lost all fluid circulation at 40.5'	
45.0								45.0'
							BOTTOM OF BORING Installed 2" PVC Screen from 45' to 35' Installed 2" Riser from 50' to surface Filled from 45' to 33' with #0 sand Sealed with bentonite chips from 33' to 29.5' Grout from 29.5' to surface Well is protected by a 4" stick up protective casing with a locking top	
50.0								
55.0								
60.0								
65.0								
70.0								
75.0								
80.0								

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH WHILE DRILLING

BEFORE CASING REMOVED: Installed well

AFTER CASING REMOVED: 8' bgs on 9/11

CASING TYPE: 4-1/4" Hollow Stem Augers

HOLE NO. RH-7S
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 09/05/07
DATE COMPLETED: 09/05/07

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

SHEET 1 OF 1

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							Brown moist SILT and fine to coarse GRAVEL, trace clay, trace cobbles noted while drilling	
5.0								
10.0								
15.0								
								18.0'
20.0							Gray wet cuttings to surface while drilling	
25.0								25.0'
							BOTTOM OF BORING, 25.0'	
30.0							Installed 2" PVC Screen from 25' to 5' Installed 2" Riser from 5' to surface Filled from 25' to 4' with #0 sand Sealed with bentonite chips from 5' to 2'. Concrete mix from 2' to surface. Well is protected with a lockable 4" stick up protective casing.	
35.0								
40.0								

parratt wolff inc

TEST BORING LOG

5879 Fisher Road
East Syracuse, NY 13057

PROJECT Richardson Hill Landfill

LOCATION Sydney Center, NY

GROUNDWATER DEPTH
WHILE DRILLING Drilled with fluid rotary

BEFORE CASING REMOVED Installed well

AFTER CASING REMOVED 4.7' bgs on 9/4

CASING TYPE

HOLE NO. RH-7D
JOB NUMBER: 07124A
SURF. EL.
DATE STARTED: 08/30/07
DATE COMPLETED: 08/31/07

N - NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" - ASTM D-1586 STANDARD PENETRATION TEST

C - NO. OF BLOWS TO DRIVE CASING 12" W/140# HAMMER FALLING 30"/ OR PERCENT CORE RECOVERY

DEPTH	SAMPLE DEPTH	SAMPLE NO.	Rec	SAMPLE DRIVE RECORD PER 6"		N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
							Brown moist SILT and CLAY, some fine to coarse sand, little fine to coarse gravel, trace cobbles noted while drilling	
5.0								
								9.0'
10.0							Installed 5" diameter temporary casing Drilled with 4-7/8" fluid rotary from 9' to 40'	
15.0								
20.0								20.0'
							Gray SILT and CLAY, some fine to meduim gravel	
25.0								
30.0							(HARDER DRILLING NOTED)	
35.0							Installed 2" PVC Screen from 40' to 30' Installed 2" Riser from 30' to surface Filled from 40' to 28' with #0 sand Sealed with bentonite chips from 28' to 24'. Grout from 24' to surface. Well is protected with a lockable 4" stick up protective casing.	
40.0							BOTTOM OF BORING, 40.0'	40.0'

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING RH- 08S
Client: Amphenol Proj. Loc: Richard Hill Road Landfill Sidney, NY File No.:	Sampler: 2" split Spoon Hammer: Geoprobe Fall: NA	Page 1 of 1 Location: Richardson Hill Rd RH-08S Start Date: 1/29/08 End Date: 1/30/08
Boring Company: Parratt-Wolff Foreman: Glenn Lansing OBG Geologist: Jon Bone		Screen = \ Grout Riser Sand Pack Grout Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing PID (ppm)	Time
0						Not Sampled 0 - 18' bgs				
2										
6										
8								=		
10								=		
12								=		
16								=		
18	1	18-20		2.0' / 1.5'	6	1.5' Moderate Brown (5YR 3/4) wet FM SILT and SAND. MC angular gravel.	Till	=		
20	2	20-22		2.0' / 1.0'	5	1.0' Dark Yellowish Brown (10YR 2/2) fine wet SILT, MC sand, small Gravel, trace Brown Clay and fine Sand.	Till	=		
22	3	22-24		2.0' / 1.0'	8	1.0' Dark Yellowish Brown (10YR 2/2) wet fine SILT and CLAY w/ Brown MC sand, and trace small gravel	Till	=		
24	4	24-26		2.0' / .75'	8	.75' SAA	Till	=		
26	5	26-28		2.0' / 1.0'	6	1.0' SAA with Grayish Brown (5YR 3/2) FC sand	Till	=	0.0	
28	6	28-30		2.0' / 0.0'		No Recovery, Greenish Gray (5G 6/1) Sandstone in Split Spoon nose.		=	0.0	
						Bottom of boring at 28 ft bgs 2" PVC Screen set from 8-30 ft bgs 2" PVC Riser +3.0-8 ft bgs Sand Pack from 6-30 ft bgs Grouted from 0-6 ft bgs				

Bottome of Boring = 28.0'
Screen Inverval = 8.0' to 28.0' Below Grade
Riser Interval = -2.5' to 8.0'
Sand Pack Interval = 6.0' to 28.0' Below Grade
Bentonite/Grout Pack Interval = 0.0' to 6.0' Below Grade
Protective Casing = -3.0 to 1.5' Below Grade

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING RH- 08D
Client: Amphenol Proj. Loc: Richard Hill Road Landfill Sidney, NY File No.:	Sampler: 2" split Spoon Hammer: Geoprobe Fall: NA	Page 1 of 1 Location: Richardson Hill Rd RH-08S Start Date: 1/30/08 End Date: 2/1/08
Boring Company: Parratt-Wolff Foreman: Glenn Lansing OBG Geologist: Jon Bone		Rock / Open Hole Casing / Sand Pack Grout / Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing PID (ppm)	Time
0						Not Sampled 0 - 25' bgs				
5										
10										
15										
20										
25						No Recovery				
						Spoon Refusal @ 27.5' bgs				
30						Bedrock encountered				
						Drilled to 32' bgs to confirm bedrock				
35						Spoon Refusal at 32' as well				
						Casing set from 32' bgs to grade, and grouted to the surface				
40						Secured with locking stick up				
						Rock Coring started @ 32' bgs				
45										
						Bottom of Boring @ 47 ft bgs				
50						Open bedrock well from 32-47 ft bgs				
						Secured with a 4" locking stick up				
						See RH-08D Corelog for details				

O'BRIEN & GERE ENGINEERS, INC. 5000 Brittonfield Parkway East Syracuse, New York 13057 File: Corelog.xls	**CORE LOG**	Hole No.: RH-8D Sheet 1 of 1	Job No.: 42138.001.177 Date Started: 1/30/08
Project: Richardson Hill Road Landfill	Drilling Contractor: Parratt-Wolff		Date Finished: 2/1/08
Client: Amphenol	Driller: Glenn Lansing		Total Depth: 47'
Purpose: Monitoring well	Geologist: Jon Bone		Ground Elev.:
Location: Sidney, NY	Length of Casing: 32'		S.W.L.:
Hole Location: RH-8D	Casing Size: 4"	Core Size: HQ	Inclination/Bearing:

Formation Member Unit	Run No. Depth	Pen. Rate (min. per foot)	Depth Scale	Lithologic Description (include in order: ROCK TYPE, color, grain size, texture, bedding, fracture & minerals.)	Core Recovery Length	Core Recovery Percent	RQD
	1	2.6	32'	0.0' - SANDSTONE, Greenish Gray (5G 6/1), medium grained, massive, horizontal fractures at 32.6', 32.65', 33.05', 33.75', 34.15', 34.2', 65.0', 35.55', 36.2'. Clay seam at 36.2' fracture. Small water loss after first run	5.0'/4.7'	94%	82%
	2	3	37'	0.0' - As above with horizontal fractures at 37.85', 38.4', 38.9', 39.05', 39.45', 39.8', 40.4', 41.15', 41.4', 41.65', 41.85'. Heavily weathered clay seams at 41.0' and 41.5'. 38.7' - As above with heavy oxidation staining 41.4' - Medium dark gray (N4) SILTSTONE, medium grained, massive, heavy horizontal fractures	5.0'/5.0'	100%	50%
	3	3.2	42'	0.0' - As above, more horizontal fractures, and some vertical fractures, lower RQD. 42.8' - As above, fractured both vertical and horizontal, very incompetent. 45.3' - Shale, grayish green (5G 5/2), horizontal fractures throughout.	5.0'/4.7'	94%	8%
			47'	Bottom of Boring at 47 ft. 4" Steel casing set from 0-32 ft bgs Open bedrock well from 32-47 ft bgs Secured with a 4" locking stick up			

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING RH-09D
Client: Amphenol	Sampler: 2" split Spoon	Page 1 of 1
Proj. Loc: Richardson Hill Rd Landfill	Hammer: Geoprobe	Location: RH-9D
File No.:	Fall: NA	Start Date: 2/15/08
		End Date: 2/20/08
Boring Company: Paratt Wolff Inc.		Rock / Casing / Grout — Open Hole / Sand Pack / Bentonite
Foreman: Doug Richmond		
OBG Geologist: Jonathan Bone		

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing PID (ppm)
5	1	5-7		2.0'/0.8'	8	Brown wet CLAY and SILT, some small gravel.	Till		
10	2	10-12		2.0'/0.6'	8	Gray wet SILT, fine to medium brown sand, some gray clay, and trace gray gravel	Till		
14	3	14-16		2.0'/0.7'	9	Brown wet SILT, medium to large gravel non uniform.	Till		
18.5	4	18.5-20.5		2.0'/0.8'	11	Brown wet SILT, medium to coarse brown sand, trace small gravel.	Till		
24.5	5	24.5-26.5		0.1'/0.1'		No Recovery. Greenish Gray Sandstone piece.	Sandstone		
29.5	6	29.5-31.5		0.6'/0.6'		Brown wet CLAY and SILT, small gravel very dense	Weathered Rock		
34.5	7	34.5-36.5		2.0'/0.9'	10	Brown wet SILTY Clay, some brown small gravel	Weathered Rock		
39.5	8	39.5-41.5		0.1'/0.1'		Greenish Gray Sandstone	Bedrock		
44.5						Run 1			
49.5						Run 2			
54.5						Run 3			
59.5						Run 4			
64.5						Bedrock at 39.5' bgs Bottom of boring @ 64.5' bgs Open bedrock from 44.5' - 64.5' bgs Grouted from 0 - 44.5' bgs 4" Steel Casing Set from +3.0' - 44.5' bgs See RH-09D Corelog for Detail			

O'BRIEN & GERE ENGINEERS, INC. 5000 Brittonfield Parkway East Syracuse New York 13057 File: Corelog.xls	**CORE LOG**	Hole No.: RH-9D Sheet 1 of 1	Job No.: 42138.001.177 Date Started: 2/20/08
Project: Richardson Hill Road Landfill	Drilling Contractor: Parratt-Wolff		Date Finished: 2/20/08
Client: Amphenol	Driller: Doug Richmond		Total Depth: 64.5'
Purpose: Monitoring well	Geologist: Jon Bone		Ground Elev.:
Location: Sidney, NY	Length of Casing: 44.5'		S.W.L.:
Hole Location: RH-9D	Casing Size: 4"	Core Size: HQ	Inclination/Bearing:

Formation Member Unit	Run No. Depth	Pen. Rate (min. per foot)	Depth Scale	Lithologic Description (include in order: ROCK TYPE, color, grain size, texture, bedding, fracture & minerals.)	Core Recovery Length	Core Recovery Percent	RQD
	1	4 3 4 5 5	44.5'	Sandstone, Light Gray (N7), fine grain, massive. Horizontal Fractures at 44.6', 44.8', 45.5', 45.95', 46.35', 48.1'. - 47.0' to 47.9' vertical and horizontal fractures, oxidation and weathering. - 47.1' Brown fine grain clay and silt deposits in horizontal and vertical fracture.	5.0'/4.6'	93%	53%
	2	6 3 3 4 4	49.5'	Light Gray Sandstone (N7), fine grain, massive. Horizontal fractures - 50.7' Medium Light Gray Siltstone, fine grain, massive. Horizontal fractures at 51.2', 51.4', 51.5'. 51.7' to 52.0' Heavy weathering, clay and silt seam deposits in horizontal fractures - 52.1' to 52.8' Vertical fracture - 52.8' to 53.8' Heavy horizontal fractures, incompetant	5.0'/5.0'	100%	17%
	3	4 4 4 3 4	54.5'	Light Gray Sandstone (N7), fine grain, massive. Horizontal fractures at 54.9', 55.35', 56.1', 56.9', 58.85', 58.95', 59.1', 59.2', 59.3', 59.4'. More competant - 58.8' to 59.2' Heavy horizontal fracturing and weathering, brown silt and clay seam deposits.	5.0'/5.0'	100%	81%
	4	4 3 3 4 4	59.5'	Light Gray Sandstone (N7), fine grain, massive. Horizontal fractures at 60.6', 61.5', 61.7', 62.2', 62.4', 62.8', 63.0', 63.1'. - 63.3' to 64.1' Heavily weathered horizontal fractures with clay and silt seam deposits. - Slight water loss ~10 gallons	5.0'/4.6'	92%	52%
			64.5'	Bottom of Boring at 64.5 ft bgs 4" Steel casing set from 0 to 44.5 ft bgs Open bedrock well from 44.5 to 64.5 ft Secured with a locking 4" stick up			

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING RH-10D
Client: RHRL	Sampler: 2" split spoon	Page 1 of 2
Proj. Loc: Sidney, NY	Hammer: 140-lb	Location: RH-10D
File No.:	Fall: 30"	Start Date: 2/7/08 End Date: 2/14/08
Boring Company: Parrat-Wolff Inc. Foreman: Doug Richmond OBG Geologist: Yuri Veliz		Rock / Casing / Grout Open Hole / Sand Pack / Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing PID (ppm)	Time
5	1	7		2/1.7		Moderate brown, moist, stiff, silt and fine sand, some clay and fine to medium subangular to subrounded gravel	silt and sand		1.0	
10	2	11		1/0.5		sandstone piece	sandstone			
14	3	16		2/1.5		Moderate brown, wet, dense, medium to coarse sand, fine gravel, some silt, fine sand, little clay -set 6" casing to 16' bg. - start mud rotary	mc sand gravel		0	
20	4	22		2/1.75		Dark reddish brown, moist, hard, silt some clay, mc sand emmbeded. Zones of coarse gravel (Till)	Till		0	
25	5	27		2/1.75		same as above	Till		0	
30	6	32		2/1.5		Reddish brown, hard, damp, silt some clay, gravel embedded (Till)	Till		0	
35	7	37		2/1.0		same as above very hard	Till		0	
40	8	42		2/1.75		same as above	Till		0.5	
45	9	45.5		0.5/0.5		Olive gray weathered siltstone, some till sediment hard drilling at 43' bg.	weathered rock		0.3	
50	10	50.2		0.2/0.1		sandstone piece - hard drilling from 43' bg to 48' bg. - softer after 48' bg.	sandstone		0	
55	11	55.5		0.5/0.4		Olive gray, damp, soft, weathered siltstone, fine laminations present - penetration rate 12m/f - 300 psi pressure	weathered rock		0	
60	12	60.2		0.2/0.2		Olive brown, moist, stiff, weathered bedrock. Some fine laminations(silt, some clay) - hard drilling from 57' bg (500 psi)	weathered rock		0	
65	13	65.1		0.1/0.1		Medium gray, hard, sandstone piece at the tip of spoon	bedrock		0	
69.4						- drilling from 65 to 69 is hard and steady - Drilling mud brings gray sandstone chips				

O'BRIEN & GERE ENGINEERS, INC. 5000 Brittonfield Parkway East Syracuse, New York 13057 File: Corelog.xls	**CORE LOG**	Hole No.: RH-10D Sheet 1 of 1	Job No.: 42138.001.177 Date Started: 2/14/2008
Project: Richardson Hill Road Landfill	Drilling Contractor: Parratt-Wolff		Date Finished: 2/15/2008
Client: Amphenol	Driller: Doug Richmond		Total Depth: 47'
Purpose: Monitoring well	Geologist: Jon Bone		Ground Elev.:
Location: Sidney, NY	Length of Casing: 32'		S.W.L.:
Hole Location: RH-10D	Casing Size: 4"	Core Size: HQ	Inclination/Bearing:

Formation Member Unit	Run No. Depth	Pen. Rate (min. per foot)	Depth Scale	Lithologic Description (include in order: ROCK TYPE, color, grain size, texture, bedding, fracture & minerals.)	Core Recovery Length	Core Recovery Percent	RQD
	1	6 9 9 9 9	69.4'	Siltstone, medium light gray (N6), fine grain, massive, horizontal fractures at 69.6', 70.05', 70.2', 70.3', 70.5', 70.6', 70.75', 71.1', 71.2', 71.25', 71.45', 72.1', 72.2', 72.3', 72.5', 72.7', 72.8', 73.0', 73.2', 73.4', 73.55'. Heavy weathering at 70.05', 70.2', 70.3', 72.2', 72.3'.	5.1/5.1	100%	31%
	2	15 8 7 7 7	74.5'	Siltstone, medium light gray (N6), fine grain, massive, more competent, horizontal fractures at 74.7', 74.45', 75.0', 75.25', 75.4', 75.5', 75.8', 77.9', 78.35'. Less weathering in fractures.	5.0/5.0	100%	66%
	3	7 7 7 7 7	79.5'	Siltstone, medium light gray (N6), fine grain, massive, very competent. Fractures at 80.2', 83.5'.	5.0/4.3	86%	95%
	4	7 6 6 7 7	83.9'	Siltstone, medium light gray (N6), fine grain, massive, very competent. Note: Could not retrieve the last 1.3' of core when first removed. Core barrel fixed and an attempt was made to retrieve last 1.3'. An addition 1.3' of rock was cored and is called run 5. Fractures in run 4 at 85.8', 86.3', 86.45', 87.1', 87.15', 87.2', 87.75'.	5.1/5.1	100	94%
	5	8	89'	SAA. Fractures at 89.3', 89.9'.	1.3/1.3	100	50%
			90.3'				

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING RH-10I
Client: RHRL Proj. Loc: Sidney, NY File No.:	Sampler: Sonic Rig 4X6" core Hammer: Fall: NA	Page 1 of 1 Location: RH-10I Start Date: 7 16 08 End Date: 7/17 08
Boring Company: Boart Longyear Foreman: Craig Marsh/Greg Halliday OBG Geologist: Nate Kranes		Screen Riser Grout Sand Pack Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	PHOTO
0		5				Moderate brown, moist, stiff, silt and fine sand, some clay and fine to medium subangular to subroundeo gravel	silt f sand	1, 2, 3
5		7				COBBLES	Cobbles	4
7		10				Moderate brown, moist, course to fine COBBLES,GRAVEL and course to fine SAND, some silt, little clay	mc sand, gravel and cobbles	
10		14				SAA - more cohesive		5, 6
14		17				loose SAA saturated		6, 7
17		19				same as above, wet		8
19		27				Reddish brown, hard, wet, SILT and CLAY, some course to fine gravel little course to fine sand embedded (Till)	Till	9, 10 (close)
27		32				SAA top 1.0' saturated from drilling. Wet noted between larger grains thoughout remaining core	Till	11 12 (close-up)
32		37				same as above	Till	13 14
37		44				SAA Driller noted beorock at 44'	Till rock	15
44		47				Medium Gray, hard sandstone with 3" clay seam at 45'. Two inch clay seam at 46'	sandstone	16 (close-up)
47		57				Med gray SANDSTONE with "pulverized" sandsone/siltstone from drilling process. Color changes to Olive gray indicating fracture staining may be present. At 47.5-48.5, 50-50.5, 54.5-57' Fracture observed @ 55 and 56'		17, 18
57		59.5				Olive gray, damp, soft, weathered siltstone, fine laminations present	weathered rock	19
59.5		63.5				Med gray SANDSTONE, massive, med to fine grained. Fracture with staining @ 61.5-63		20 (close up)
63.5		64.5				Med gray SANDSTONE, massive, med to fine grained. Fracture appear mechanical	weathered rock	choke sand
64.5		66				Med gray SANDSTONE, massive, med to fine grained. Fracture appear mechanical	bedrock	choke sand
						Bottom of Boring 66' Installed choke sand 66-64, Screen 64-54 Filter sand 64-52 Choke sand 52-50, grout 50-0 ft bgs.		

Note: After casing TOD, exposed 2' of bedrock (64-66). H2O @ 3.0 ft bgs 7/16/08 H2O @ 3.6 ft bgs @ 0800 on 7/17 08

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING RH-11D
Client: Amphenol	Sampler: 2" split Spoon	Page 1 of 1
Proj. Loc: Richardson Hill Rd Lanfill	Hammer: 140-lb	Location: RH-11D
File No.:	Fall: 30"	Start Date: 2/21/08 End Date: 2/22/08
Boring Company: Paratt Wolff Inc. Foreman: Doug Richmond OBG Geologist: Jonathan Bone		Rock / Casing / Grout — Open Hole / Sand Pack / Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing PID (ppm)
5	1	7		2.0'/0.6'	1	Moderate Brown (5YR 3/4) Silt, trace fine grain sand.	Till		
10	2	12		2.0'/0.5'	3	Moderate Yellowish Brown (10YR 5/4) wet Silt, coarse grain sand and small subangular gravel. Greenish Gray Sandstone in split spoon nose.	Till		
15	3	17		2.0'/0.3'	1	Greenish Gray (5GY 4/1) large sandsonte gravel, trace moderate yellow (10YR 5/4) silt.	Till		
19	4	21		2.0'/0.8'	2	Dark Yellowish Brown (10YR 4/2) Silty Clay, medium to coarse sand and small gravel.	Weathered Rock		
21.5						Sandstone	Bedrock		
25						Run 1			
29.7						Run 2			
34.7						Run 3			
39.7						Run 4			
44.7						Bedrock @ 21.5' bgs Bottom of boring @ 44.7 ' bgs Open Bedrock from 21.5' - 44.7' 4" Steel casing from +3.0' - 44.5' bgs See RH-11D Corelog for detail			

O'BRIEN & GERE ENGINEERS, INC. 5000 Brittonfield Parkway East Syracuse, New York 13057 File: Corelog.xls	**CORE LOG**	Hole No.: RH-11D Sheet 1 of 1	Job No.: 42138.001.177 Date Started: 2/25/2008
Project: Richardson Hill Road Landfill	Drilling Contractor: Parratt-Wolff		Date Finished: 2/25/2008
Client: Amphenol	Driller: Doug Richmond		Total Depth: 44.7'
Purpose: Monitoring well	Geologist: Jon Bone		Ground Elev.:
Location: Sidney, NY	Length of Casing: 25'		S.W.L.:
Hole Location: RH-11D	Casing Size: 4"	Core Size: HQ	Inclination/Bearing:

Formation Member / Unit	Run No. / Depth	Pen. Rate (min. per foot)	Depth Scale	Lithologic Description (include in order: ROCK TYPE, color, grain size, texture, bedding, fracture & minerals.)	Core Recovery Length	Core Recovery Percent	RQD
	1	3 2 3 2 2	25.0'	-Sandstone, Medium Gray (N5), fine grain, massive, water loss approximately 35 gallons. -Horizontal fractures at 25.4', 25.6', 25.9', 26', 26.75', 26.9', 28.4'. Vertical fractures from 25.6' to 26.0'. -Clay seam deposits in vertical fracture from 25.6' to 26.0' and in horizontal fractures at 26.0', 26.75', 26.0'. Heavy weathering at 25.4' to 26.0', 26.75', 26.9'.	4.7'/4.0'	85%	70%
	2	4 3 3 4 3	29.7'	-Sandstone, Medium Gray (N5), fine grain, massive, water loss approximately 40 gallons. -Horizontal fractures at 30.45', 31.2', 32.9', 34.1'. -Small amount of gray clay and silt in fractures -Very competant rock	5.0'/5.0'	100%	100%
	3	4 5 4 4 3	34.7'	-Sandstone, Medium Gray (N5), fine grain, massive, large water loss approximately 150 gallons at 36.0' -Horizontal fractures at 35.0', 36.15', 36.65', 3707', 39.3'. Competant	5.0'/5.0'	100%	84%
	4	5 4 4 5 7	39.7'	-Sandstone, Medium Gray (N5), fine grain, massive, large water loss approximately 100 gallons -Horizontal fractures at 40.0', 40.3', 40.4', 40.5', 40.8', 40.9', 41.0', 41.3', 41.5', 41.85', 42.1', 42.25', 42.3', 42.4'. -Vertical fractures from 40.7' to 41.0' and 42.3' to 42.4'. -Gray Clay seam deposit at 42.2' fracture. Heavy fracturing (Vert.and Horiz.) from 40.2 to 41.1'.	5.0'/4.5'	90%	44%
			44.7'	-Bottom of boring at 44.7' -Total water loss was approximately 300 gallons.			

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING RH-12D
Client: RHRL	Sampler: Sonic Rig	Page 1 of 1
Proj. Loc: Sidney, NY	Hammer:	Location: RH-12D
File No.:	Fall: NA	Start Date: 7/21/08 End Date: 7/22/08
Boring Company: Boart Longyear Foreman: Craig Marsh/Greg Halliday OBG Geologist: Nate Kranes		Screen = Riser Grout Sand Pack Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	PHOTO
0		1				Top Soil		1
1		2				Brown, moist, coarse to medium to fine SAND and SILT, some coarse to fine gravel, little Clay	Till	2
2		7				2.0'-2.5' Cobbles 2.5'- 0' SAA, moist		3
7		17				7.0'-10.0' Cobbles, coarse to fine Gravel, coarse to fine Sand 10.0'-17.0' SAA with 1.0' layer of Reddish Brown coarse to fine GRAVEL in a silt and clay matrix		4
17		27				SAA compact Reddish Brown, moist coarse to fine GRAVEL, some coarse to fine SAND with compact clay and silt matrix	27.0	5 and 6 7 (Close)
27		37				SANDSTONE, medium gray, fine to medium gray, massive	Sandstone	8, 9, 10
37		47				Driller noted fractrures at 42', 44', and 46'		11, 12, 13
47		52				Driller noted fractures at 51'		14 (Close)
						Bottom of boring: 52 ft bgs Well construction completed from 52-0 ft bgs Screen: 27-52 ft bgs #1 Filter Sand: 27-52 ft bgs #00 Choker Sand: 25.5-27 ft bgs Bentonite Pellets. 24.8-25.5 Riser: 0-27 ft bgs Grout: 24.8-0 ft. bgs		

O'BRIEN & GERE ENGINEERS, INC. 5000 Brittonfield Parkway East Syracuse, New York 13057 File: Corelog.xls	**CORE LOG**	Hole No.: RH-12D Sheet 1 of 1	Job No.: 42138.004.471 Date Started: 6/21/2008
Project: Richardson Hill Road Landfill	Drilling Contractor: Boart-Longyear		Date Finished: 6/22/2008
Client: Amphenol	Driller: Rick Tabor		Total Depth: 51
Purpose: Monitoring well	Geologist: Nate Kranes		Ground Elev.:
Location: Sidney, NY	Length of Casing: N/A		S.W.L.:
Hole Location: RH-12D	Casing Size: N/A	Core Size: Sonic Rig 4X6"	Inclination/Bearing:

Formation Member / Unit	Run No. / Depth	Pen. Rate (min. per foot)	Depth Scale	Lithologic Description (include in order: ROCK TYPE, color, grain size, texture, bedding, fracture & minerals.)	Core Recovery Length	Core Recovery Percent	RQD
	1		27	-Sandstone, Medium Gray (N5), fine grain, massive.			
	2		37	-Sandstone, Medium Gray (N5), fine grain, massive. -Horizontal fractures with iron stainig at 42', 44', 46' -Small amount of gray clay and silt in fractures -Very competant rock			
	3		47 51	-Sandstone, Medium Gray (N5), fine grain, massive -Diaganol fracture with prominent orange staining/weathering and Moderate Reddish Orange Clay from 48 to 51 ft bg.			

MALCOLM PIRNIE — TEST BORING LOG — BORING No. MW-12S

PROJECT	SIDNEY LANDFILL	LOCATION	SIDNEY, NEW YORK
CLIENT	U.S. Environmental Protection Agency		
DRILLING CONTRACTOR	HARDIN-HUBER, INC		
PURPOSE	MONITORING WELL		
WELL MATERIAL	STAINLESS STEEL		
DRILLING METHOD(S)	HSA, ROLLER BIT		
DRILL RIG TYPE			
GROUND WATER DEPTH			
MEASURING POINT			
DATE OF MEASUREMENT			

	SAMPLE	CORE	CASING
TYPE	SS	NX	STEEL
DIA.	2"	2.875	6
WEIGHT	140 #		
FALL	30"		

SHEET	1 OF 2
PROJECT No.	8001-05-1
MEAS. PT. ELEV.	
GROUND ELEV.	1759.7 (1763)
DATUM	U.S.G.S.
DATE STARTED	8/7/91
DATE FINISHED	8/13/91
DRILLER	HARDIN-HUBER, INC
PIRNIE STAFF	D. STREET

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. / DEPTH	WELL Constr.	REMARKS
	--	2 2 3 8	--		0.1' of organic material in shoe.			
2	S-1	60 82 100 84	0.3					
4	S-2	8 82 100 84	0.3		light brown silty sand with poorly sorted subangular to rounded pebbles and gravel.			Dry
6	S-3	8 32 60 100	0.3		reddish-brown sandy silt with several subangular cobbles and rounded pebbles/gravel/trace clay.			Slightly Moist
8	S-4	10 18 27 38	0.3		Several thinly bedded pieces of sandstone in shoe.			
10	S-5	5 23 32 40	0.3		Reddish brown sandy silt with rock fragments (trace clay), more moist than above. Augurs cut through a couple of sandstone cobbles/boulders.			Moist
12	S-6	15 29 25 40	0.3		As above with some light brown silty sand with subangular to rounded pebbles and gravel.			Moist
14	S-7	20 11 50 68	0.3		As above with greater percentage of pebbles (approximately 50%) and gravel.			Moist
16	S-8	35 100	0.3		Reddish-brown sandy silt, broken cobbles in spoon. Subrounded pebbles and gravel within silt.			Slightly Moist
18	S-9	25 58 32 30	0.3		Reddish-brown sandy silt, > 50% rock fragments. Angular broken	1739.7		

4 diameter Riser — Cement — Bentonite Seal — Cement/ Bentonite Grout

MALCOLM PIRNIE	TEST BORING LOG	BORING No. MW-12S
PROJECT SIDNEY LANDFILL	LOCATION SIDNEY, NEW YORK	SHEET 2 OF 2
LIENT U.S. Environmental Protection Agency		PROJECT No. 8001-05-1

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. / DEPTH	WELL Constr.	REMARKS
					cobbles, subangular pebbles - gravel, and rounded pebbles / gravel.	20.0		
22								
						23.2		
24								
					SANDSTONE - dark gray, fine to medium grained, massive, one horizontal iron stained fracture at 26.49'			
26								RQD = 61%
28	RUN 1							
30								
32								
					SANDSTONE - dark gray, fine to medium grained, massive, fine horizontal fractures at 34.33', 34.57', 36.01', 36.97' and 37.73'			
34								
								RQD = 90%
36	RUN 2							
38								
40						1719.2		40.5
						40.5		

4 diameter Riser

Cement

Bentonite Seal

Cement/ Bentonite Grout

MALCOLM PIRNIE	TEST BORING LOG	BORING No. MW-12D

PROJECT	SIDNEY LANDFILL	LOCATION	SIDNEY, NEW YORK	SHEET	1 OF 4
CLIENT	U.S. Environmental Protection Agency			PROJECT No.	8001-05-1
DRILLING CONTRACTOR	HARDIN-HUBER, INC			MEAS. PT. ELEV.	1766.39
PURPOSE	MONITORING WELL			GROUND ELEV.	1766.4 (1764)
WELL MATERIAL	STAINLESS STEEL			DATUM	U.S.G.S.
DRILLING METHOD(S)	HSA, ROLLER BIT	SAMPLE	CORE	CASING	DATE STARTED 8/14/91
DRILL RIG TYPE	TYPE	SS	NX	STEEL	DATE FINISHED 8/26/91
GROUND WATER DEPTH	DIA.	2"	2.875	6	DRILLER HARDIN-HUBER
MEASURING POINT	WEIGHT	140 #			PIRNIE STAFF D. STREET
DATE OF MEASUREMENT	FALL	30"			

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. / DEPTH	WELL Constr.	REMARKS
2	--	2 2 3 8	--					
	S-1	60 82 100 84	0.3					
4	S-2	8 82 100 84	0.3					
6	S-3	8 32 60 100	0.3					
8	S-4	10 18 27 38	0.3					
10	S-5	5 23 32 40	0.3					
12	S-6	15 29 25 40	0.3					
14	S-7	20 11 50 68	0.3					
16	S-8	35 100	0.3					
18	S-9	25 58 32 30	0.3			1746.4		

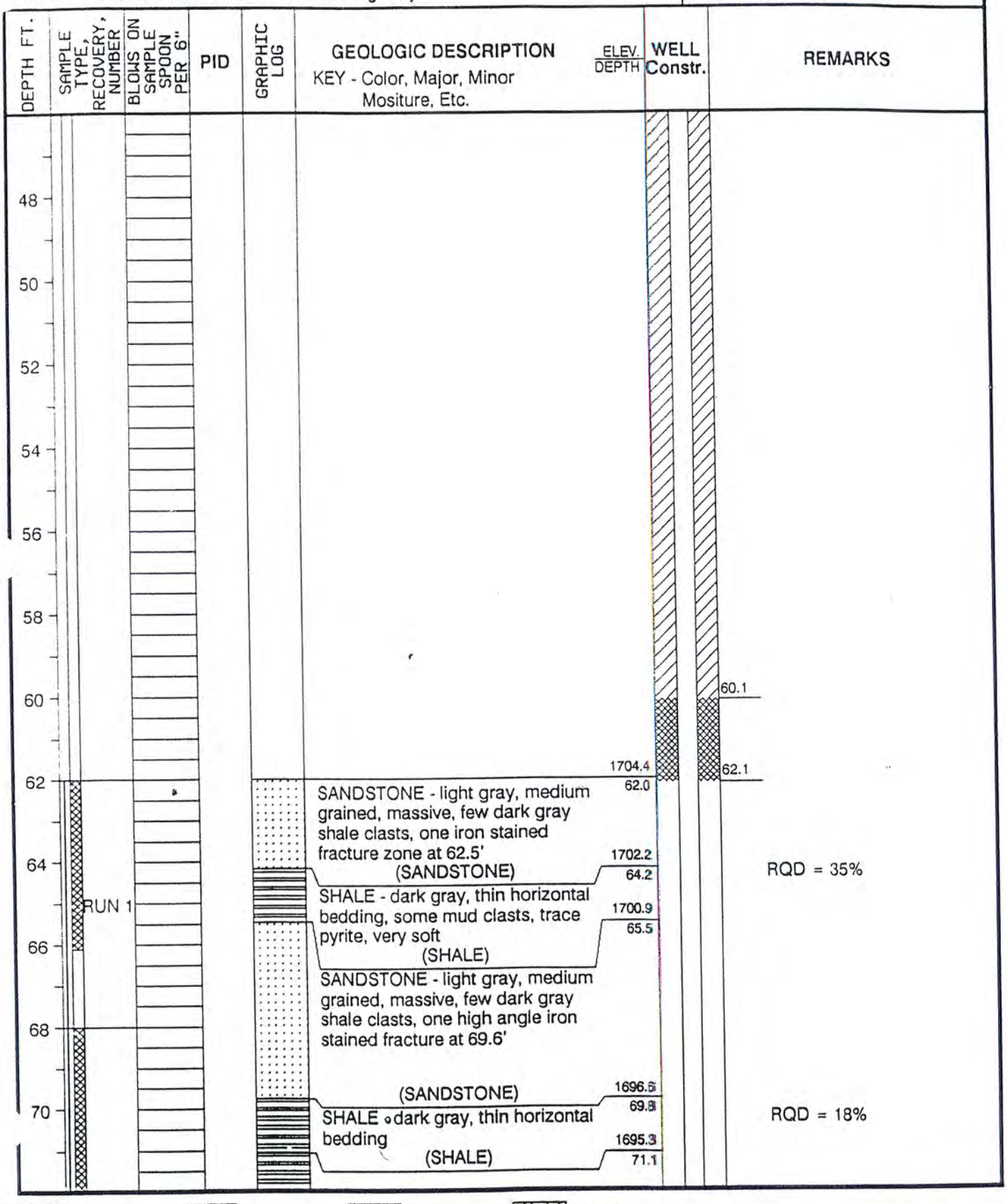
4 diameter Riser | Cement | Bentonite Seal | Cement/ Bentonite Grout

MALCOLM PIRNIE	TEST BORING LOG	BORING No. MW-12D
PROJECT SIDNEY LANDFILL	LOCATION SIDNEY, NEW YORK	SHEET 2 OF 4
LIENT U.S. Environmental Protection Agency		PROJECT No. 8001-05-1

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. DEPTH	WELL Constr.	REMARKS
						20.0		
22								
24								
26					SANDSTONE - dark gray, fine to medium grained, massive, one horizontal iron stained fracture at 26.49'			
28								
30								
32								
34					SANDSTONE - dark gray, fine to medium grained, massive, fine horizontal fractures at 34.33', 34.57', 36.01', 36.97' and 37.73'			
36								
38								
40					(SANDSTONE)	1726.3 40.1		
42								
44								

4 diameter Riser
Cement
Bentonite Seal
Cement/ Bentonite Grout

MALCOLM PIRNIE	TEST BORING LOG	BORING No. MW-12D
PROJECT SIDNEY LANDFILL	LOCATION SIDNEY, NEW YORK	SHEET 3 OF 4
LIENT U.S. Environmental Protection Agency		PROJECT No. 8001-05-1



MALCOLM PIRNIE	TEST BORING LOG	BORING No. MW-12D
PROJECT SIDNEY LANDFILL	LOCATION SIDNEY, NEW YORK	SHEET 4 OF 4
IENT U.S. Environmental Protection Agency		PROJECT No. 8001-05-1

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. / DEPTH	WELL Constr.	REMARKS
74	RUN 2				SANDSTONE - light gray, medium grained, massive			
					(SHALE)	1691.0 75.4		
					SANDSTONE - light gray, medium grained, massive, one horizontal iron stained fracture at 75.8'	1690.6 75.8		
					(SANDSTONE) SHALE - dark gray, massive, one high angle iron stained fracture at 76.5			78.5

4 diameter Riser
Cement
Bentonite Seal
Cement/ Bentonite Grout

MALCOLM PIRNIE	TEST BORING LOG	BORING No. MW-12DD

PROJECT	SIDNEY LANDFILL	LOCATION	SIDNEY, NEW YORK			SHEET	1 OF 6
CLIENT	U.S. Environmental Protection Agency					PROJECT No.	8001-05-1
DRILLING CONTRACTOR	ADI					MEAS. PT. ELEV.	1764.29
PURPOSE	MONITORING WELL					GROUND ELEV.	1763.1 (1762)
WELL MATERIAL	STAINLESS STEEL					DATUM	U.S.G.S.
DRILLING METHOD(S)	HSA, ROLLER BIT		SAMPLE	CORE	CASING	DATE STARTED	10/15/93
DRILL RIG TYPE	CME 750	TYPE		HQ	STEEL	DATE FINISHED	11/15/93
GROUND WATER DEPTH		DIA.		3.875	4	DRILLER	ADI
MEASURING POINT	SS RISER	WEIGHT	#			PIRNIE STAFF	CG/LAD
DATE OF MEASUREMENT		FALL					

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. / DEPTH	WELL Constr.	REMARKS
2					Not Sampled	3.0		See Boring Log for MW-12D for bedrock description 0-80'.
4								
6								
8								
10								
12								
14								
16								
18								

4 diameter Riser | Cement | Bentonite Seal | Cement/ Bentonite Grout

MALCOLM PIRNIE	TEST BORING LOG	BORING No. MW-12DD
PROJECT SIDNEY LANDFILL	LOCATION SIDNEY, NEW YORK	SHEET 2 OF 6
CLIENT U.S. Environmental Protection Agency		PROJECT No. 8001-05-1

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. / DEPTH	WELL Constr.	REMARKS
					(TILL)	1741.6 / 21.5		See Boring Log MW-12D
22					SANDSTONE			
24								
26					Not Sampled			
28								
30								
32								
34								
36								
38								
40					(SANDSTONE)	1723.1 / 40.1		
42								
44								

4 diameter Riser | Cement | Bentonite Seal | Cement/ Bentonite Grout

MALCOLM PIRNIE	TEST BORING LOG	BORING No. MW-12DD
PROJECT SIDNEY LANDFILL	LOCATION SIDNEY, NEW YORK	SHEET 3 OF 6
CLIENT U.S. Environmental Protection Agency		PROJECT No. 8001-05-1

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. / DEPTH	WELL Constr.	REMARKS
48								See Boring Log MW-12D
50								
52								
54								
56								
58								
60								
62						1701.1 / 62.0		
64					(SANDSTONE) SHALE	1698.9 / 64.2		
66					(SHALE) SANDSTONE	1697.6 / 65.5		
68					Not Sampled			
70					(SANDSTONE) SHALE	1693.3 / 69.8		

4 diameter Riser | Cement | Bentonite Seal | Cement/ Bentonite Grout

MALCOLM PIRNIE	TEST BORING LOG	BORING No. MW-12DD
PROJECT SIDNEY LANDFILL	LOCATION SIDNEY, NEW YORK	SHEET 4 OF 6
CLIENT U.S. Environmental Protection Agency		PROJECT No. 8001-05-1

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. / DEPTH	WELL Constr.	REMARKS
74								
76					(SHALE) SANDSTONE	1687.7 75.4		
78						1684.3 78.8 1684.1 79.1		
80					SANDSTONE - gray, medium-grained, some cross-bedding, occasional coarse sandstone with pebbles (80.8 - 81.1').	1683.1 80.0		
82					SANDSTONE	1681.0 82.1		RQD = 89%
84	RUN 1		ND		SILTSTONE - gray 82.15 - 86.4' - transitional to fine-grained at 86.4'.			
86					SILTSTONE	1676.7 86.4		
88					SANDSTONE - gray, transitionsal to medium-grained at 88.0'. 88.0 - 90.0' gray, medium-grained sandstone with fine cross-bedding.			
90					90.0 - 91.5' - medium to coarse-grained gray sandstone.			
92					91.5 - 91.8' - coarse sandstone pebbles in gray sandstone. 91.8 - 97.1' - medium-grained gray sandstone			RQD = 95%
94	RUN 2		ND					
96					97.1 - 98.5' - frequent black carbon layers with pyrite			

4 diameter Riser | Cement | Bentonite Seal | Cement/ Bentonite Grout

MALCOLM PIRNIE	TEST BORING LOG	BORING No. MW-12DD
PROJECT SIDNEY LANDFILL	LOCATION SIDNEY, NEW YORK	SHEET 5 OF 6
CLIENT U.S. Environmental Protection Agency		PROJECT No. 8001-05-1

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. DEPTH	WELL Constr.	REMARKS
					pebbles present in gray sandstone.			
100								RQD = 100%
102	RUN 3		ND					
104					SANDSTONE - fine to medium-grained, gray			
106					medium to coarse pebbles in gray sandstone.			RQD = 94%
	RUN 4		ND		106.75 - 106.85' - black carbon bed with pyrite.	1655.4		
108					106.85 - 107.7' - medium sandstone with silt pebbles and partings	107.7 1654.7 108.4		
					SANDSTONE			
110					SILTSTONE - gray 108.35' - 45 degree contact between siltstone and underlying sandstone.			
					(SILTSTONE)	1651.0		
112					SANDSTONE - fine-grained, gray with silt partings and carbon partings containing pyrite.	112.1		RQD = 86%
114					SANDSTONE - fine-grained, gray, with carbon partings, pyrite, and frequent layers of pebbles (0.05' thick).			
	RUN 5		ND		(SANDSTONE)	1647.8 115.3		
116					SILTSTONE - gray	1646.9 116.2		
					SILTSTONE			
118					SANDSTONE - fine-grained, gray (SANDSTONE)			
					SILTSTONE - gray			
120								
122					121.9' - 45 degree fracture			RQD = 76%

4 diameter Riser | Cement | Bentonite Seal | Cement/ Bentonite Grout

MALCOLM PIRNIE	TEST BORING LOG	BORING No. MW-12DD
PROJECT SIDNEY LANDFILL	LOCATION SIDNEY, NEW YORK	SHEET 6 OF 6
CLIENT U.S. Environmental Protection Agency		PROJECT No. 8001-05-1

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. / DEPTH	WELL Constr.	REMARKS
126	RUN 6		ND					
128					SILTSTONE	1634.6 128.5		
					SANDSTONE - gray, fine-grained			
130					SANDSTONE - gray, medium-grained (SANDSTONE)	1632.7 130.4		
					SILTSTONE - gray (SILTSTONE)	1632.4 130.7		
132					SANDSTONE - medium-grained, gray (SANDSTONE)	1632.1 131.0		RQD = 61%
					SILTSTONE - gray (SILTSTONE)	1629.4 133.7		
134	RUN 7		ND		SILTSTONE / SANDSTONE - gray			Rock recovered in small pieces - siltstone and sandstone out of sequence.
136								
138								
140					(SILTSTONE / SANDSTONE)	1623.1 140.0		

WELL Constr.: 127.0; 130.0; 140.0

4 diameter Riser; Cement; Bentonite Seal; Cement/ Bentonite Grout

O'BRIEN & GERE ENGINEERS, INC.	Water Well Log	REPORT OF BORING New Dimatos Residential
Client: JTM Associates Proj. Loc: Richardson Hill Rd File No.:	Drilling Method: Air Rotary Rig Type: Dual Rotary	Page 1 of 1 Location: Dimatos Property Start Date: 6/30/08 End Date: 7/14/08
Boring Company: Layne Christensen Company Foreman: Bob OBG Geologist: J. Bone		6" Casing Grout Open Rock Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Well Description	Stratum Change General Descript	Equip. Installed	Well Construction
20									
40						Bedrock @ 29 ft bgs Temporary 12" Steel Casing Set +4.0-33 ft bgs			6" Steel Casing set from ~3' above grade to 200' bgs
60									
80									
100									Grouted from surface to 198' bgs
120						Boring generating ~20 gal/min of water @ ~121 ft bgs			
140									
160									
180						~100 gal/min flow rate down to 200 ft bgs			Bentonite 198'-200' bgs
200						6" Steel Casing set 0-200 ft bgs			
220									
240									
260						Well completely dry, no water generated while drilling 200' to 280' bgs			Open bedrock 200'-316' bgs
280						Well started to generate ~1.0 gal/min of water			
300									
320						Bottom of Boring @ 316 ft bgs			

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING RW-05
Client: RHRL Proj. Loc: Sidney, NY File No.:	Sampler: Sonic Rig 7" Overburden, 6" Bedrock Hammer: Fall: NA	Page 1 of 1 Location: RW-05 Start Date: 7/14/08 End Date:
Boring Company: Boart Longyear Foreman: Craig Marsh/Greg Halliday OBG Geologist: Nate Kranes		Screen / Riser; Grout / Sand Pack / Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	PHOTO
0		36				7" Casing-Samples. 8" to 9" to 10" overide casing will be used to set permanent 7"		
						Depths are estimated from samples		
0		1.5				Top-grass, miscellaneous fill, saturated	Fill	1
1.5		3				Miscellaneous Fill - coarse to fine GRAVEL and coarse to fine SAND, some silt	Fill	
							3.0	
3		6				Mottles, most, SILT, little coarse to fine Sand, trace clay	Silt	2
6		10				SAA		3
10		11				Most to wet SAA, increasing to some coarse to fine Sand	11.0	
11		14				Reddish brown, wet, coarse to Fine GRAVEL with some Silt and Clay matrix	Till	4, 5, 6
14		15				SAA	Till	
15		16				COBBLES and COBBLE fragments, dry (from drilling process)	Cobble	7
16		17				Reddish brown, moist, coarse to fine SAND and COBBLES with Clay and Silt matrix	Till	8, 9, 10
17		18				SAA	Till	
18		19				SAA		
							16.0	
19		21				Weathered SANDSTONE, dry from drilling	weathered rock	11
21		23				SAA - Weathed SANDSTONE	weathered rock	12
23		26				SAA with 6" clay seam. Gray saturated CLAY, little Silt	weathered rock	13, 14
26		31				Med gray SILTSTONE, thinly bedded to laminated with cross bedding and hummocky bedding, some iron staining and fracture with staining at ~28'	weathered rock	15, 16
31		33				Med gray SANDSTONE, massive, fine grained. Fracture at ~32'	weathered rock	16 through
33		33.5				Med gray SILTSTONE, thinly bedded to laminated with cross bedding and hummocky bedding		20
33.5		36				Massive SANSTONE		
36		37				SAA		21

Note: 7" casing set at 37' bgs and grouted to grade.

O'BRIEN & GERE ENGINEERS, INC. 5000 Brittonfield Parkway East Svracuse. New York 13057 File: Corelog.xls	**CORE LOG**	Hole No.: RW-05 Sheet 1 of 1	Job No.: 42138 Date Started: 7/14/2008
Project: Richardson Hill Road Landfill	Drilling Contractor: Boart Longyear		Date Finished:
Client: Amphenol	Driller: Craig Marsh		Total Depth: 67 ft
Purpose: Monitoring well	Geologist: Nate Kranes		Ground Elev.:
Location: Sidney, NY	Length of Casing: 37		S.W.L.:
Hole Location: RW-05	Casing Size: NA	Core Size: Sonic Rig - 6" Core	Inclination/Bearing:

Formation Member Unit	Run No. Depth	Pen. Rate (min. per foot)	Depth Scale	Lithologic Description (include in order: ROCK TYPE, color, grain size, texture, bedding, fracture & minerals.)	Core Recovery Length	Core Recovery Percent	RQD
	1		37 37.5	0-6" Grout Med gray SANDSTONE, massive, fine grained. Natural fractures at 38.0' (diagonal), 38.6(diagonal), 39.5, 40.8(diagonal), 41.2-42.5, 43.5 (with rust colored staining), 44, 46.3 (diaganol).	10'		N/A
	2		47	Med gray SANDSTONE, massive, fine grained. Natural fractures at 47.2, 47.6, 48.6, 50.3. Pyritized wood fragmments at 52.5.			
	3		57 67	Med gray SANDSTONE, massive, fine grained. Natural fractures at 57, 57.3, 57.5 (diaganol), 60.1, 60.5, 61.9-62.1 (highly fractured zone), 62.5. Pyritized wood fragmments at 62.5.			
				Bottom of boring: 67.0 ft. Permanent 7 inch Casing grouted 0-37 ft bgs. Nominal 6 inch rock core with open interval from 37-67 ft bgs.			

Modified Sections of the Sampling, Analysis, and Monitoring Plan for Post Construction Activities – Richardson Hill Road Landfill Site, Sidney, New York

SECTION 1

SAMPLING, ANALYSIS, AND MONITORING PLAN

1.1 INTRODUCTION

This Sampling, Analysis, and Monitoring Plan (SAMP) describes the sampling and data gathering methods and procedures to be used during post-remedial activities at the Richardson Hill Road Landfill (RHRL) site. This SAMP should be used in conjunction with the Operation and Maintenance (O&M) Manual and the Quality Assurance Project Plan (QAPP). The objective of the field sampling is to generate data to evaluate the long-term effectiveness of the remedy. Long-term monitoring locations and monitoring schedules for groundwater, surface water, sediment, leachate, and landfill gas are presented in detail in the Operation and Maintenance Manual, as follows:

- Groundwater (O&M Manual, Section 4.2)
- Surface Water and Sediment (O&M Manual, Section 4.3)
- Leachate (O&M Manual, Section 4.4)
- Landfill Gas (O&M Manual, Section 4.5)

SECTION 2

GENERAL GUIDELINES FOR FIELD WORK

2.1 SURFACE HAZARDS

Potential on-site surface hazards, such as sharp objects, overhead power lines, and building hazards, will be identified prior to initiation of fieldwork. Generally, such hazards will be identified during a site reconnaissance visit that precedes the fieldwork.

2.2 UNDERGROUND UTILITIES

Underground utilities, including electric lines, gas lines, and communication lines will be identified prior to initiation of drilling and other subsurface work. This will include contacting Dig Safely New York at 800.962.7962. A representative will mark utility lines on public property in the work area. New York State law requires that Dig Safely New York be notified at least two working days, and not more than ten working days, before subsurface work is conducted.

2.3 FIELD LOG BOOKS

Field activities will be documented in field logbooks. Entries will be of sufficient detail that a complete daily record of significant events, observations, and measurements is obtained.

- Field books will be assigned a unique identification number.
- Field books will be bound with consecutively numbered pages.
- Field books will be controlled by the Field Team Leader while fieldwork is in progress.
- Entries will be written with waterproof ink.
- Entries will be signed and dated at the conclusion of each day of fieldwork.
- Erroneous entries made while fieldwork is in progress will be corrected by the person that made the entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing the correction.
- Corrections made after departing the field will be made by the person who made the original entries. The correction will be made by drawing a line through the error, entering the correct information, and initialing and dating the time of the correction.
- The O&M Manager will control field books when fieldwork is not in progress.

At a minimum, daily field book entries will include the following information:

- Location of field activity;

- Date and time of entry;
- Names and titles of field team members;
- Names and titles of any site visitors and site contacts;
- Weather information: temperature, cloud coverage, wind speed and direction;
- Purpose of field activity; and
- A detailed description of the fieldwork conducted.

SECTION 3

PROCEDURES FOR FIELD EQUIPMENT DECONTAMINATION, WASTE MANAGEMENT, AND EQUIPMENT CALIBRATION

3.1 FIELD EQUIPMENT CHECKLIST

General list of equipment for field measurement and sample collection includes:

- Security lock keys
- Field log book
- Site maps indicating the locations of samples, sample analysis request forms
- Health and Safety Plan and health and safety equipment specified in the Health and Safety Plan
- Contact list

Specific lists of equipment for groundwater, surface water, leachate, and landfill gas monitoring are presented in the following sections.

3.1.1 Field Equipment Checklist for Groundwater Sampling~~Monitoring~~

A list of equipment for groundwater field measurement and sample collection includes:

- Well construction data, location map, field data from last sampling event, sample analysis request forms
- Stakes to identify sampling locations
- Field instrumentation for on-site measurements (e.g., PID, flow through cell with pH, temperature, conductivity, dissolved oxygen, oxidation reduction potential, turbidity meters, and electronic water level indicator)
- Tools (e.g., screw drivers, hammers, chisels, pipe wrenches with chain, tape measure, knife, pocket calculator, and wristwatch)
- Sample collection equipment (pumps, controller, safety cable, sample tubing, generator, gas, polypropylene rope, graduated level etc.)
- Appropriate sample containers (see QAPP)
- Groundwater sampling record forms, Chain-of-Custody forms, sample bottle labels, and COC seals
- Indelible ink marker

- Sample cooler, ice or ice packs, bubble wrap or other packing/shipping material for sample bottles
- Appropriate field and trip blanks
- Strapping tape, clear plastic tape, duct tape; and re-sealable plastic bags
- Clean plastic drop cloths, two 10-gallon basins/buckets, and several big beakers
- Paper towels and trash bags
- Decontamination supplies and reagents: phosphate-free decontamination soaps (such as Alconox), gloves (latex, nitrile, or scrub brushes equivalent), reagent-grade isopropanol, reagent-grade HNO_3, potable water, deionized water, and scrub brushes
- Shipping labels and forms.

3.1.2 Field Equipment Checklist for Surface Water and Sediment ~~Monitoring~~Sampling

A list of equipment for surface water and sediment field measurement and sample collection includes:

- Site maps indicating the locations of samples, sample analysis request forms
- Marker flags or stakes
- Field instrumentation for on-site measurements (e.g., pH, conductivity, dissolved oxygen, oxidation reduction potential, turbidity meters, volatile organic compound monitor, folding ruler)
- Surface water sampling record form
- Sediment sampling record form
- Dedicated Lexan tubes, stainless steel bowls and spoons for sediment sample collection
- Indelible ink markers, pens
- Pocket calculator, wristwatch/time
- Reagents for sample preservation, if sample containers not pre-preserved by the laboratory
- Appropriate sample bottles (see QAPP) and sample labels
- FID or PID (e.g., OVM), if warranted
- Trip blanks and extra sample sets for collection of field blanks, duplicates
- Coolers packed with enough ice and/or cold packs to maintain sample preservation
- Sample Record forms and Chain-of-Custody forms
- Paper towels and trash bags

- Clean plastic sheeting and 5-gallon buckets
- PPE: vinyl, neoprene, and/or nitrile gloves, Tyvek, hip waders and/or waterproof boots
- Deionized/Distilled water
- Decontamination supplies and reagents: Alconox (or equivalent), gloves (latex, nitrile, or scrub brushes equivalent), brushes

3.1.3 Field Equipment Checklist for Leachate Level Monitoring

- Electronic water level indicator
- Decontamination supplies and reagents: Alconox (or equivalent), gloves (latex, nitrile, or scrub brushes equivalent), brushes

3.1.4 Field Equipment Checklist for Landfill Gas Monitoring

- MSA Model 62S gas scope or similar instrument, with 5-ft and 10-ft long sampling lines.

3.2 EQUIPMENT DECONTAMINATION

Sample collection devices will be decontaminated prior to each use. Equipment decontamination will be conducted in a clean area free of dust. Precautions will be taken to minimize any impact to the surrounding area that might result from decontamination operations, and deviations from these procedures will be documented in the field notebook and on the appropriate sampling record.

Laboratory-supplied sample containers will be cleaned and sealed by the laboratory. The type of container provided and the method of container decontamination will be documented in the laboratory's permanent record of the sampling event.

Decontamination procedures for sample collection equipment, submersible pump and water level indicator, and above-ground pump are provided below. As phosphorus or phosphorus containing compounds are not required for analysis, both Liquinox and Alconox (or equivalent) can be used as a cleaning detergent. Unless otherwise specified, ambient temperature water will be used. Unless otherwise specified, pesticide grade solvent (isopropanol) should be used for decontamination. This grade of alcohol must be purchased from a laboratory supply vendor. Rubbing alcohol or other commonly available sources of isopropanol are not acceptable.

3.2.1 Decontamination Pad

If decontamination of large equipment or vehicles is necessary, a temporary decontamination pad will be constructed of high-density polyethylene sheeting on a prepared surface sloped to a sump. The sump will also be lined and provide sufficient quantity to contain at least 20 gallons of decontamination water. Sides of the pad will be bermed so that all

decontamination water is contained. The decontamination water will be pumped from the sump into 55-gallon drums. The location of the decontamination pad will be determined in the field.

3.2.2 Decontamination of Sample Collection Equipment

Non-dedicated sample collection equipment (e.g., bailers) used to collect groundwater, or surface water will be decontaminated by the following process:

- Wash equipment with potable water.
- Soak equipment in a hot detergent (Alconox or Liquinox) solution. A scrub brush will be used to remove dirt and surface film.
- Rinse thoroughly with tap water.
- Rinse (wet all surfaces) with 10% reagent grade nitric acid (for analytes other than nitrogen components) or reagent grade 10% hydrochloric acid (for nitrogen component samples). If samples for organics will be collected, rinse with pesticide grade isopropanol. Check manufacturer's instruction for cleaning restrictions and/or recommendations.
- Rinse thoroughly with deionized, organic-free, reagent grade water from laboratory.
- Remove excess water and allow equipment to air dry.
- Wrap equipment in aluminum foil, shiny side out.
- Rinse water and detergent water will be replaced with new solutions daily, when visibly impacted by residuals, or between sampling areas or changes in operations.

3.2.3 Decontamination of Submersible Water Level Indicator

Submersible water level indicators will be decontaminated with the following procedure:

- Wash outside of water level indicator and hoses/lines with laboratory-grade detergent (Alconox or Liquinox) and water.
- Rinse outside of water level indicator and hoses/lines with potable water.
- Rinse outside of water level indicator and hoses/lines with deionized, organic-free, reagent grade water.
- Remove excess water.
- Wrap water level indicator in plastic.

3.2.4 Sample Tubing Decontamination

Sample tubing will be single use tubing (e.g., polypropylene, Teflon-lined polyethylene) that will not require decontamination. Tubing will remain in its shipping package prior to use to avoid potential contamination.

3.2.5 Decontamination of Submersible Pumps

Submersible pump (including support cable and electrical wires which are in contact with the sample) must be decontaminated thoroughly each day before use ("daily decon") and after each well is sampled ("between-well decon"). The following procedures described in the USEPA Region 2 Low Stress (Low Flow) procedure (provided in Section VII) should be followed.

Daily Decon

- Pre-rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.
- Wash: Operate pump in a deep basin containing 8 to 10 gallons of a non-phosphate detergent solution, such as Alconox, for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes. Use the detergent sparingly.
- Rinse: Operate pump in a deep basin of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.
- Disassemble pump.
- Wash pump parts: Place the disassembled parts of the pump into a deep basin containing 8 to 10 gallons of non-phosphate detergent solution. Scrub all pump parts with a test tube brush.
- Rinse pump parts with potable water.
- Rinse the following pump parts with distilled/ deionized water: inlet screen, the shaft, the suction interconnector, the motor lead assembly, and the stator housing.
- Place impeller assembly in a large glass beaker and rinse with 10% nitric acid (HNO_3).
- Rinse impeller assembly with potable water.
- Place impeller assembly in a large glass bleaker and rinse with isopropanol.
- Rinse impeller assembly with distilled/deionized water.

Between-Well Decon

- Pre-rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.
- Wash: Operate pump in a deep basin containing 8 to 10 gallons of a non-phosphate detergent solution, such as Alconox, for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes. Use the detergent sparingly.
- Rinse: Operate pump in a deep basin of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.
- Final Rinse: Operate pump in a deep basin of distilled/deionized water to pump out 1 to 2 gallons of this final rinse water.

Please note that when decontaminating centrifugal pumps manufactured by GRUNDFOS, the motor coolant chamber contains water and potential contaminants from prior usage. Therefore, to avoid cross contamination, the coolant fluid must be removed and replaced. The manufacturer's installation and operating instructions will be reviewed by field crew before any sampling.

3.2.6 Decontamination of Above-Ground Pumps

Above-ground pump will be decontaminated by the procedures listed below prior to use and following sampling of each well.

- For pumps used only for purging, the exterior of the pump must be free of oil and grease, followed by the steps 3 described as below.
- For pumps used for sampling, clean the exterior of the pump with a detergent solution followed by a tap water rinse. Use clean cloths or unbleached paper towels that have been moistened with the appropriate solution to wipe down the pump.
- Clean the tubing that contacts the formation water according to the appropriate protocol specified in Section 3.2.4.

* Please note that when decontaminating centrifugal pumps manufactured by GRUNDFOS, the motor coolant chamber contains water and potential contaminants from prior usage. Therefore, to avoid cross contamination, the coolant fluid must be removed and replaced. See manufacturer's installation and operating instructions for further details.

3.3 MANAGEMENT OF WASTE

This section provides general procedures for containing, sampling, and disposing of investigation derived waste (IDW). IDW may include, but is not limited to sediment, purge water, decontamination water, sampling and decontamination equipment, and personal protective equipment (PPE). The objective is to dispose of waste generated as a result of field activities in accordance with applicable local, state, and federal laws and regulations.

3.3.1 Decontamination Fluids, Calibration Fluids, and Development and Purge Water

All steam cleaning and decontamination fluids, calibration fluids, and development and purge water will be collected in Department of Transportation (DOT) -approved 55-gallon drums or a plastic temporary holding tank. The drums will be labeled as investigation derived wastewater and temporarily stored in a secured area to be determined prior to commencement of field activities. The drums will be stored on wooden pallets in a plastic-lined containment area or in other approved secondary containment structures. At the end of field activities, the water will be sent to the onsite treatment facility.

3.3.2 Personal Protective Equipment and Disposable Sampling Equipment

All personal protective equipment (PPE) and used disposable sampling equipment and consumables will be placed in 55-gallon drums and sent to an offsite disposal facility to be disposed of as uncontaminated refuse.

3.4 FIELD INSTRUMENT CALIBRATION

All field screening and sampling instruments (e.g., temperature-conductivity-pH probes, explosimeter, etc.) that require calibration prior to operation will be calibrated in accordance with the manufacturer's instructions. All instrument calibrations will be documented in the project field book and in an instrument calibration log. Instrument operating manuals will be maintained on-site by the field team.

3.5 MAINTENANCE PROCEDURES

3.5.1 Non-Routine Maintenance Procedures

Field equipment will be inspected prior to initiation of fieldwork to determine whether or not it is operational. If it is not operational, it will be serviced or replaced. Batteries will be fully charged or fresh, as applicable.

3.5.2 Routine Maintenance Procedures and Schedules

Field equipment requiring preventive maintenance will be serviced in accordance with written procedures based on the manufacturer's instructions or recommendations. Maintenance will be performed in accordance with the schedule specified by the manufacturer, in order to minimize the downtime of the measurement system. Maintenance work will be performed by qualified personnel.

3.5.3 Spare Parts

A list of critical spare parts will be developed prior to the initiation of fieldwork. Field personnel will have ready access to critical spare parts in order to minimize downtime while fieldwork is in progress. In lieu of maintaining an inventory of spare parts, access to critical spare parts may be provided by firms capable of rapid repair or replacement. These firms must be identified prior to initiation of fieldwork.

3.5.4 Maintenance Records

Equipment maintenance logs will be maintained to document maintenance activities and schedules. All maintenance logs will be traceable to a specific piece of equipment. These records may be audited by the Quality Assurance Officer (QAO) to verify compliance.

SECTION 4

SAMPLING EQUIPMENT AND PROCEDURES FOR FIELD MEASUREMENTS AND MONITORING

4.1 WATER LEVEL MEASUREMENT

The following procedures will be used to measure static groundwater levels in monitoring wells, observation wells and piezometers:

- The cap on the monitoring well will be opened and the breathing zone above the opening of the casing will be screened for organic vapors with a PID;
- The total depth of the well will be measured with a decontaminated tape measure or a decontaminated electronic water level indicator;
- The static water level in each monitoring well, observation well or piezometer will then be measured with a decontaminated electronic water level indicator. The groundwater depth should be measure to a reference point of the top casing (usually a V-cut or a permanent black mark). If the well does not have a reference point, make one;
- The water level will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the casing; and
- The well depth and water level measurement will be recorded in the field book.

4.2 AIR MONITORING

Air monitoring will be conducted in accordance with the site-specific Health and Safety Plan (HASP) during field activities with a Photovac MicroTip HL-2000 (or equivalent) PID equipped with a 10.6 eV lamp. The Photovac MicroTip is capable of ionizing and detecting compounds with an ionization potential of less than 10.6 eV. This accounts for roughly 54 percent to 73 percent of the VOCs on the NYSDEC ASP Target Compound List and for most of the VOCs detected onsite. The compounds with ionization potentials above 10.6 eV have correspondingly high allowable limits, 100 ppm for 1,1-DCA and 350 ppm for 1,1,1-TCA. The PID will be used to monitor for VOCs in the breathing zone.

Method

- The PID will be calibrated at the beginning and end of each day of use with a standard calibration gas of a concentration within the expected range of use. The calibration gas that is most often used has an approximate concentration of 100 ppm of isobutylene.
- If abnormal or erratic readings are observed, additional calibration will be required.

- All calibration data will be recorded in field notebooks and on calibration log sheets to be maintained on-site.
- The PID will be used to monitor the breathing zone. Action levels are specified in the HASP.
- The PID will also be used to screen samples and sample headspace.
- PID readings will be recorded in the field book.
- A battery check will be completed at the beginning and end of each working day, and the battery will be checked for proper voltage.
- Procedures for operation of the PID are included in the HASP.

4.3 LANDFILL GAS

Landfill gas monitoring will be conducted with an MSA Model 62S gas scope or similar instrument, with 5-ft and 10-ft long sampling lines. The meter is capable of measuring both lower explosive limit (LEL) and percentage of methane gas. The measurements taken at each location will be recorded in a log book. The following activities will be conducted during routine gas monitoring at the site.

- The meter shall be calibrated monthly, at a minimum. Calibration will be accomplished using a bottled calibration gas. Dual scale meters need to be calibrated on 2% or 2.5% methane for the LEL scale and 40% or 50% methane for the percentage of gas scale. Calibration data will be recorded on an instrument calibration report. If the meter does not correct the probe, return the meter to the factory for service.
- Prior to use, the meter will be cleared and each scale zeroed. This will be accomplished by pumping the bulb with the probe in fresh air. After clearing the meter, the scale will be readjusted to zero, as necessary. Each measurement will be started with the instrument set to percentage of gas to avoid over-ranging the meter and damaging the elements.
- To measure gas levels in the gas vents, the 5-ft long sampling line will be inserted into the gas vent approximately three to four feet. The meter bulb will be pumped to obtain a sample. A minimum of eight to ten pumps will be necessary to obtain a sample, or as indicated in the instrument O&M manual. For the groundwater collection trench sumps, the 10-ft long sampling line should be inserted into each sump to obtain a reading at three locations within each sump (low, mid-level, high).

4.4 TSCA CELL ELEVATION MEASUREMENT

TSCA cell depths to water will be collected with and electronic water level indicator. The water level indicator will be decontaminated following each use, or a dedicated water level indicator will be used.

SECTION 5

SAMPLING EQUIPMENT AND PROCEDURES FOR FIELD SAMPLE COLLECTION

5.1 INTRODUCTION

Procedures for obtaining samples of various environmental media are described in this section. Sample handling procedures are described in Section 6.

5.2 GROUNDWATER

Ground water samples will be collected from six collection trench monitoring wells, 21 ground water monitoring wells, and three residential wells. Groundwater sampling from the collection trench wells will be performed according to the Ground Water Sampling Procedure Low Stress (Low Flow) Purging and Sampling (USEPA Region 2, 1998). The sampling of monitoring wells other than the collection trench wells will conform to the Region 2 low flow protocol subsequent to the initial removal of one well volume from each of these monitoring wells. The residential well samples will be collected directly from faucets within each residence. Table 1 of the Post Closure Environmental Sampling and Monitoring Plan presents depth of well from grade, well diameter, depth of screened interval from grade, and depth to mid-point of the screened or open interval for site wells.

5.2.1 Collection Trench Monitoring Wells

~~Groundwater sampling for monitoring wells, with the exception of the MW-12 group (see Section 5.2.2), will be performed according to the Ground Water Sampling Procedure Low Stress (Low Flow) Purging and Sampling (USEPA Region 2, 1998).~~ Low flow methods will be used to collect samples that are representative of groundwater conditions at the site. The USEPA Region 2 recommended procedures are presented in Appendix A and are summarized below. Groundwater samples should be collected in sequence from least to most contaminated well, whenever feasible, to minimize the possibility of introducing contaminants into cleaner aquifers or areas.

- Planning documentation and equipment. A list of documentation and equipment is listed in the USEPA Region 2 (1998) SOP.
- Decontaminate the sampling equipment. SOPs for sample tubing and submersible pump decontamination are presented in Sections 3.2.4 and 3.2.5, respectively.
- Check the well, the lock, and the locking cap for damage or evidence of tampering. Record observations. Data regarding groundwater sample collection will be recorded on the Groundwater Sampling Record.
- Place sheet of polyethylene around wellhead for placement of monitoring and sampling equipment.

- Measure VOCs at the rim of the unopened well with a PID and record the reading.
- Unlock protective casing and remove well cap.
- Immediately after well cap removal, take an organic vapor reading at the rim of the opened well using a PID and record reading in the field logbook.
- Measure water level distance from top of casing and sound the total depth as detailed below. Record in logbook. Check tip of water level indicator for silt or product residue (if either are observed note in logbook).
  - Lower decontaminated water level indicator into monitoring well until indicator sounds and light is illuminated.
  - Confirm that the water surface has been contacted by repeatedly raising and lowering the indicator at least three times.
  - Measure and record depth (nearest 0.01 feet) to the water surface from the top of casing in field logbook. The groundwater depth should be measure to a reference point of the top casing (usually a V-cut or a permanent black mark). If the well does not have a reference point, make one.
  - Lower the indicator to the well bottom and record the total depth.
  - Retrieve and decontaminate water level indicator.
- Lower decontaminated low-flow purging device (pump, safety cable, tubing and electrical lines) ~~in~~to the approximate mid-point of the screened or open-interval of the well as specified on Table 1 of the Environmental Sampling and Monitoring Plan (ESMP). ~~within the screened area of the well producing the highest flow rate. The pump intake should correspond to the mid-point of the most permeable zone in the screened interval. The pump intake must be kept at least two feet above the bottom of the well to prevent disturbance and resuspension of any sediment or NAPL present in the bottom of the well. Table 5.1 presents pump to be used, depth of well, screened interval, and depth to mid-point of most permeable screed interval for site wells.~~
- The water level will be measured again, with the pump in the well, before starting the pump.
- Connect the discharge end of the tubing to the flow through cell. The discharge tubing should have a tee-fitting between the well head and the flow through cell from which turbidity measurements can be obtained. Sediment can accumulate in the flow through cell and turbidity readings measured within the flow through cell are typically not representative of water coming from the well.
- Begin pumping at 200 to 500 milliliters per minute (ml/min) and measure the groundwater elevation approximately every five minutes. Ideally, the pump rate should cause little or no water level drawdown (drawdown of 0.3 ft or less) in the well; and, if necessary, pumping rates will be reduced to the minimum capabilities of the pump to avoid pumping the well dry and/or to stabilize the indicator parameters. If significant draw down occurs, reduce the pumping rate. All development and purge

water will be contained in 55-gallon drums and managed in accordance with Section 3.3.

- Observe and record: odor, color, clarity, turbidity and general water condition. A form for recording this information is included as Figure 5.1. Also record changes in the physical condition of the monitoring wells that could affect the well integrity. Monitor indicator parameters (temperature, pH, turbidity, oxidation-reduction potential, dissolved oxygen, and specific conductivity of the groundwater quality) approximately every five minutes during purging of the well using calibrated instruments. The well is considered stabilized and ready for sample collection when at least one well volume has been removed and the indicator parameters have stabilized for three consecutive readings as follows:
  - ± 0.1 for pH;
  - ± 3% for conductivity;
  - ± 10 mv for redox potential;
  - ± 10% for DO; and
  - ± 10% NTUs for turbidity with the turbidity below 50 NTU (10 NTU or below is preferred).

If the above stabilization parameters can not be met, and all attempts have been made to minimize the drawdown, check the instrument condition and calibration, purging flow rate and all tubing connections to determine if they might be affecting the ability to achieve stable measurements. All measurements that were made during the attempt must be documented. The sampling team leader may decide whether or not to collect a sample or to continue purging after five well volumes or five volumes of the screened interval. After the monitoring well is purged, do not turn off the pump or remove it from the well. Groundwater sample collection using the low-flow method is as follows:

- Purge the monitoring well as described previously. After purging the well, the sampling team will change to new outer gloves for sample collection.
- Prior to sample collection, the discharge tubing from the pump will be removed from the flow through cell.
- The groundwater sampling order is as follows (sample only for analytes identified in the O&M Plan): 1) volatile organic compounds, 2) semivolatile organic compounds, 3) herbicides, 4) pesticides and PCBs, 5) explosives, 6) phenols, 7) total metals (preserved) 8) cyanide, 9) sulfate and chloride, 10) nitrate and ammonia, and 11) radionuclides. Collect groundwater samples for volatile analyses first, before any of the other parameters of interest. The actual sampling flow rate for volatiles must be accomplished with a gradual reduction in the flow rate down to 100 milliliters per minute and such that the drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 ft and that hydraulic head pressure is sustained within the sampling tube to reduce aeration, bubble formation, turbulent

filling of sample bottles, and loss of volatiles due to extended residence time in the tubing.

A gradual reduction in association with sustained hydraulic head pressure will minimize aeration, bubble formation, turbulent filling of sample bottles, and loss of volatiles due to extended residence time in the tubing. Hence, this coincides with the USEPA Region 2 (1998) Low-Flow Purging and Sampling Procedure and the RCRA Groundwater Monitoring Technical Enforcement Guidance Document (OSWER Directive #9950.1, September 1986), which states that when collecting samples where volatile constituents are of concern using a bladder pump, pumping rates should not exceed 100 mLs/min. If problems are encountered trying to maintain a uniform 100 mLs/min flow rate during sampling, the inside diameter (I.D.) of the sampling tube will be reduced as it reaches the well head so that hydraulic head pressure is maintained. A reducer coupling (0.5 inch to 0.25 inch) will be installed approximately six feet from the actual sample port. Proper fitting installation, including the use of Teflon® tape, will eliminate connection problems. VOC samples will be collected in a manner that will minimize the loss of volatile compounds and will be collected directly into pre-preserved sample containers.

In some very low-yielding formations it may not be possible to sample with minimal drawdown even using low pumping rates. It should be noted that if the water level will not stabilize at minimum pumping rates and the water level is drawn down below the top of the pump, then stabilization of the indicator parameters may not be possible. In the past, these wells have been pumped to dryness and sampled as soon as they recovered sufficiently. Approval to sample in this manner will be required from the O&M Manager, task manager, or site manager.

- The sample discharge for all other analytical parameters can be a continuous flow of up to 250 milliliters per minute. All sample containers should be filled with minimal turbulence by allowing the groundwater to flow from the tubing gently down the inside of the container. To decrease the sampling collection time for other parameters, a 0.5-inch coupling and tubing should replace the reducer coupling and 0.25-inch tubing. Therefore, a stoppage in flow could occur after the collection of volatile organic samples in order to change the coupling/tubing. If field filtering is required, an in-line 45-micron filter will be inserted into the sample intake line.
- After the sample bottle is filled, the cap will be placed on the bottle and the bottle will be packaged for shipment.
- Collect QA/QC samples.
- Measure conductivity, pH, turbidity, DO, redox potential, and temperature after sample collection and record in the field logbook.
- Remove pump and tubing. Pump will be decontaminated for use for the next well and tubing will be discarded.
- Measure and record well depth.

- Close and lock the well.

Field crews should take caution while collecting groundwater samples to avoid the spread of contamination. A polyethylene ground cloth and 5-gallon bucket will be placed beneath all sampling equipment during well purging and sampling to prevent the spread of contaminated groundwater, and if a gas-powered generator is used to drive the pump motor or controller, the generator must be placed a minimum of 25 feet downwind of the well to limit the incidence of cross-contamination during sampling. Low flow centrifugal or bladder pumps constructed of stainless steel or Teflon® and Teflon® tubing will be used for groundwater sampling at the site. Each well will have its own dedicated tubing.

5.2.2 ~~MW-12 Group~~Other Monitoring Wells ~~Sampling Protocol~~

The protocol agreed upon for the ~~MW-12 group~~monitoring wells is a combination of the low flow criteria outlined above, and purging techniques employed on the Sidney Landfill. The above procedure requires a removal of one well volume followed by chemical stabilization prior to sampling. ~~Due to the large storage capacity of the MW-12 group wells~~Prior to low flow purging, one well volume will be removed with the pump placed in the casing above the open interval. This purging will be achieved at a flow rate of one half to one gallon per minute. The water level ~~will be drawn down in 12D and 12DD, however it~~ will not be drawn below the top of the screened or open interval. Once one volume has been removed, the pump ~~is~~ will be lowered such that the intake is at the ~~to the~~ center of the screened or open interval as specified on Table 1 of the ESMP, and low flow procedures will be initiated as described above. Drawdown will be controlled with low flow rates and strict compliance to low flow criteria. Once chemical parameters are stable over three five minute intervals, samples may be collected. This procedure allows for compliance with Region 2 Low Flow Sampling procedures, and will maintain consistency with previous sampling procedures.~~also complies with the site specific one volume removal criteria.~~

5.2.3 Residential Wells

Three residential wells will be sampled as part of the Post-Closure Monitoring Program. The new Dimatos residential well will be sampled for VOCs on a quarterly basis. The Haynes and Demitriadou residential wells will be sampled for VOCs on an annual basis.

The residential samples will be collected from faucets within each residence. Avoid leaking or spraying faucets and single level faucets that mix cold and warm water together, if possible. Remove any attachments from the faucet such as aerators, screens, washers, hoses, and water filters. Turn on the cold water only and let it run for at least 10 minutes. Prior to collecting the sample, reduce the flow from the faucet to a thin stream. Don a pair of disposable nitrile gloves and prepare the sample bottles for filling.

5.3 SURFACE WATER AND SEDIMENT

Three surface water and three sediment samples will be collected within South Pond on an annual basis. The proposed surface water and sediment sampling locations are shown on Figure

2 of this ESMP. These locations are considered to be areas where PCB-impacted ground water has the greatest potential to discharge to sediment and surface water, potentially re-contaminating these media. The rationale for selection of the sediment and surface water sampling locations is as follows:

- Review of historic ground water sampling data for PCBs indicates that the area where PCB-impacted ground water has the greatest potential to discharge to sediment and surface water is along the western portion of South Pond downgradient of the ground water collection trench. The highest concentrations of PCBs in ground water were detected in monitoring wells within and immediately downgradient of the collection trench. PCBs have not been detected in monitoring wells located further downgradient of the collection trench (specifically RH-1, RH-2, RH-9D, RH-10D, and RH-11D). Monitoring wells RH-2 and RH-10D are located adjacent to Herrick Hollow Creek south of South Pond. PCBs have not been detected in these wells suggesting that the potential for PCB impacts to Herrick Hollow Creek from ground water discharge is low.

Each surface water and sediment sampling location will be located using a hand-held global positioning system (GPS) device such that the sampling locations can be replicated for subsequent sampling events. The surface water and sediment samples will be analyzed for PCBs in accordance with the QAPP. In addition, the sediment samples will also be analyzed for TOC in accordance with the QAPP.

The surface water sample collection location should be deep enough so the sample bottles can be completely submerged, in an area with minimal flow or surface disturbance to minimize the loss of volatiles, and be free of suspended material. Downstream samples will be collected first and wading should be avoided. At locations where both surface water and sediments will be collected, the surface water sample should be collected before sediment samples.

Surface Water Sampling Method

- Prior to sampling at any surface water~~/sediment~~ location, the direction of actual surface water flow directions shall be noted and recorded on a site map. The flow direction shall also be compared to the flow directions expected at the site so that the samples planned for the downstream direction are truly at a downstream location.
- A new pair of clean disposable latex or nitrile gloves will be donned at each sampling location.
- Facing up-stream, submerge pre-labeled sample bottles in the up right position to prevent the loss of preservative into the water. Sediment should not be disturbed during the collection of surface water samples.
- Allow sample bottle to fill and use cap if necessary to fill the bottle completely. If samples cannot be collected directly into the sample bottle, a decontaminated sample collection device may be used.

- After the sample bottle is filled, the cap will be placed on the bottle and COC procedures will be followed.
- Measurements of temperature, pH, specific conductance, turbidity, and oxidation-reduction potential (ORP) shall be taken by direct immersion of instrument probes into the water body. If direct measurement is not possible, these measurements shall be taken from water collected and placed in a field container. The results shall be recorded in the field logbook.
- QA/QC samples will be collected as specified in Section 4.4 of the QAPP.
- If filtered samples are required, a pump will be used to pull the sample through an in-line 45-micron filter. The sample will be drawn directly from the surface water body, or from a sample aliquot collected into a laboratory-supplied, preservative-free sample bottle. The sample will be discharged from the filter line outlet directly into laboratory-supplied pre-preserved sample bottles.
- Sample description and location will be recorded in the field book.

Sediment Sampling Method

- Sediment samples will be collected from the most downstream location proceeding to the most upstream location.
- A new pair of clean disposable latex or nitrile gloves will be donned at each sampling location.
- Prepare a new 2-inch diameter Lexan tube, the length of which will be determined based on the depth to sediment below the surface water.
- Place a tight fitting cap or expandable plug on top of the tube prior to lowering the tube through the surface water column to minimize the amount of water within the tube.
- Once at the sediment surface, remove the cap or plug and push the tube into the sediment to an approximate depth of 6-inches.
- Once the sediment has been penetrated, place the cap or plug over the top of the tube to create a vacuum as the tube is retrieved.
- Extrude the sediment into a pre-cleaned stainless steel mixing bowl and homogenize the sediment sample by mixing thoroughly with a stainless steel spoon.
- Subsequent to homogenization, transfer the sediment to the appropriate sample jars.
- After the sample jar is filled, cap the jar and follow the COC procedures.
- Observations related to the color, grain-size, and any visual and/or olfactory signs of contamination shall be recorded in the field logbook. In addition, the length of the surface water column at each sampling location shall be recorded.

- QA/QC samples will be collected as specified in Section 4.4 of the QAPP.

FIGURE 5.1
SAMPLING RECORD - GROUNDWATER

				CLIENT:					WELL # :		
PROJECT (STUDY_ID):							DATE:				
SWMU # (AREA):							LABORATORY :				
SCREENED INTERVAL (toc):							SAMPLING PERSONEL				
MONITORING DATE							NAME:				
INSTRUMENT							NAME:				
DETECTOR											
BOREHOLE DIAMETER FACTORS											
DIAMETER (INCHES):	1	1.5	2	3	4	5	6	7	8	9	10
GALLONS/FOOT:	0.041	0.092	0.163	0.367	0.654	1.02	1.47	2.00	2.61	3.30	5.87
PURGE INFORMATION:						WELL HEAD VOC CONCENTRATION (ppm):					
STATIC DEPTH TO WATER (TOC):						STANDING WATER VOLUME IN WELL (gallons):					
WELL DEPTH (TOC):						THREE WELL VOLUMES (gallons):					
FEET OF WATER IN WELL:						ONE:		TWO:		THREE:	
PURGING WITH A LOW FLOW PUMP (measure indicator parameters at 3 to 5 minute intervals)											
TIME BEGIN PURGING:								TIME END PURGING:			
Time:											
Depth to Water (ft)											
Depth to bottom opening of Pump or Tubing (TOC)											
Flow Rate (ml/min.)											
Volume of Water Removed (gals)											
Temperature (deg. C)											
Spec.Cond.(umhos)											
pH											
DO (g/L)											
ORP (eV)											
Turbidity (NTU)											
TDS											
SALINITY											

DEPTH TO WATER MEASUREMENTS AFTER PURGING						
Date						
Time						
Depth to Water (ft) "After Purge"						
Water Column (ft) "Static"						
Water Column (ft)						
% RECOVERY						
Notes:						
(1) Determine water column in the borehole(for both "after purge" and "static" conditions)						
by subtracting the measured water level from the well point.						
(2) Divide the "after purge" water column by "static" water column,multiply by 100 to determine the percent of recovery for the well.						

FIGURE 5.1 (CONTINUED)
SAMPLING RECORD - GROUNDWATER

SAMPLING INFORMATION **WELL # :**

SAMPLING DEVICE:
SAMPLE NUMBER:

SAMPLE PARAMETER	*TIME*	*CONTAINER*	*PRESERVATIVE*	*SAMPLE COLOR/ TURBIDITY*

QA\QC:

QA/QC DUPLICATE SAMPLE COLLECTED: **YES** or NO
Duplicate Sample Name:

QA\QC RINSATE SAMPLE NAME:

MATRIX SPIKE SAMPLE COLLECTED: YES or NO

INVESTIGATION DERIVED WASTE (IDW):

Date:				
Volume Transfered to Drum:				
Drum Number:				

COMMENTS:

SECTION 6

SAMPLE HANDLING AND ANALYSIS

6.1 SAMPLE DESIGNATION

Each sample will be given a unique alphanumeric identifier in accordance with the classification system shown in Table 6.1. Duplicate samples will be assigned identifiers that do not allow the laboratory to distinguish them as duplicates. Each sample container will be labeled prior to packing for shipment. The sample identifier, site name, date and time of sampling, and analytical parameters will be written on the label in waterproof ink and recorded in the field book.

6.2 SAMPLE CONTAINERIZATION, PRESERVATION, AND ANALYSIS

Sample containerization, holding time requirements, and preservation requirements are listed in Section 4 of the QAPP. Sample tracking and custody is described in Section 5 of the QAPP. Analytical methods for sample analyses are listed in Section 7 of the QAPP.

6.3 CHAIN OF CUSTODY

A COC record (Figure 6.1) will accompany the sample containers at the field where the sample is collected, preserved, and then returned to the laboratory. The COC will identify each sample container and the analytical parameters for each, and will list the field personnel that collected the samples, the project name and number, the name of the analytical laboratory that will receive the samples, and the method of sample shipment. If samples are split and sent to different laboratories, a copy of the COC record will be sent with each sample shipment.

Method

- The COC will be completed by field personnel as samples are collected and packed for shipment.
- Erroneous markings will be crossed-out with a single line and initialed by the author.
- The REMARKS space will be used to indicate if the sample is a matrix spike, matrix spike duplicate, or matrix duplicate.
- Trip and field blanks will be listed on separate rows.
- After the samples have been collected and sample information has been listed on the COC form, the method of shipment, the shipping cooler identification number(s), and the shipper airbill number will be entered on the COC.
- Finally, a member of the sampling team will write his/her signature, the date, and time on the first RELINQUISHED BY space. Duplicate copies of each COC must be completed.

- One copy of the COC will be retained by sampling personnel. The other copy and the original will be sealed in a plastic bag and taped inside the lid of the shipping cooler.
- Sample shipments will be refrigerated at 4°C, typically by packing with ice (the ice should be placed in two sealed zip-lock plastic bags), to preserve the samples during shipment.
- After the shipping cooler is closed, custody seals provided by the laboratory will be affixed to the latch and across the front and back of the cooler lid, and signed by the person relinquishing the samples to the shipper.
- The seal will be covered with clear tape, and the cooler lid will be secured by wrapping with packing tape.
- Then the cooler will be relinquished to the shipper, typically an overnight carrier.
- The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the O&M Manager, and the samples will not be analyzed.
- The samples must be delivered to the laboratory within 48 hours of collection.

6.4 SAMPLE DOCUMENTATION

The field team leader will retain a copy of the COC, and, in addition, the field team leader will ensure that the following information about each sample is recorded in the field book:

- Sample identifier;
- Identification of sampled media (e.g., groundwater);
- Sample location with respect to known reference point;
- Physical description of sample location;
- Field measurements, (e.g., pH, temperature, conductivity, and water levels);
- Date and time of collection;
- Sample collection method;
- Volume of groundwater purged before sampling;
- Number of sample containers;
- Analytical parameters;
- Preservatives used; and
- Shipping information:
  - Dates and method of sample shipments,
  - COC Record numbers,
  - FedEx Air Bill numbers, and
  - Sample recipient (e.g., laboratory name).

6.5 SAMPLE TRACKING

A tracking system will be used to monitor sampling schedules, and the progress of laboratory analytical work and reporting, and to assist in performing contract compliance screening and data validation. The system tracks the following information for each sample: sample identifier, sample medium, sampling date, analytical parameters, sample delivery group (SDG) designations for samples, and laboratory report due date.

The sample tracking system consists of the following procedures:

- A Data Tracker (DT) will be assigned to each sampling event. The DT will provide sequentially numbered COC forms to the field sampling team (FT), and maintain a COC log. The FT will sign-out the COC forms prior to sampling.
- The FT will ship the white (original) and yellow copy of the completed COCs to the laboratory with the field samples. The serial numbers of all the COCs that were either sent to the laboratory or voided will be recorded in the field book.
- The FT will return: (1) pink copies of the COC forms that were sent to the lab; (2) voided COCs; and (3) any unused COCs to the DT. The DT will maintain a file of the completed COCs for each project, and will keep an inventory of all the numbered COCs.
- The DT will enter the following information into the COC log: (1) all COC numbers (including voided or unused numbers); (2) names of FT members; (3) site name; (4) project number; (5) sampling date; (6) shipping date; (7) number of samples per matrix; (8) analytical parameters requested; and (9) the laboratory name, address, and phone number.
- The DT will call the laboratory on the work day following receipt of the COCs to confirm the time, date, and condition of the samples shipped; to determine laboratory SDG identifiers; and to confirm the contract-required due-date for receipt of analytical results.
- The DT will use an electronic spreadsheet and database program to generate a Sample Tracking Report every two weeks, or more frequently if necessary. The database allows sampling data to be sorted by site name, project number, sampling dates, project number, laboratory, and laboratory name.
- The O&M Manager or a designated representative will maintain day-to-day contact with the laboratory to monitor the progress of analytical work.
- The DT will contact the O&M Manager every Friday to determine the status of analytical work, and to confirm the dates for contract compliance screening and data validation.
- The O&M Manager will deliver sample analytical results received from the laboratory to the DT for contract compliance screening, and to the data validator for validation. The O&M Manager will retain the shipping receipt to document the date of receipt, and forward the shipping receipt to the data validator with the analytical package.

TABLE 6.1
SAMPLE DESIGNATIONS

RICHARDSON HILL ROAD LANDFILL

SAMPLE IDENTIFIER:

Sample Type	Sample Number	QC Identifier
LL or LLL	NNN	LL

L = Letter
N = Number

SAMPLE TYPES:

Water

MW – Groundwater from Monitoring Wells

EW – Effluent Water from GWTP

SW - Surface Water

DW – Decon Water

SAMPLE NUMBER: Samples are numbered consecutively beginning with the next number following any previous samples.

QC IDENTIFIER:
FB - Field Blank
TB - Trip Blank
RB – Rinsate Blank
MS - Matrix Spike
MD - Matrix Spike Duplicate

FIGURE 6.1 EXAMPLE CHAIN-OF-CUSTODY

Chain Of Custody / Analysis Request

	Privileged & Confidential	**Site Name:**
	EDD To:	**Location of Site:**
Client Contact: (name, co., address)	**Sampler:**	**Grab/Composite** / **Preservative**
	P O #	
	Analysis Turnaround Time:	
	Standard -	
	Rush Charges Authorized for -	
	2 weeks -	
Hardcopy Report To:	1 week -	
Invoice To:	Next Day -	

Sample Identification

	Location ID	Start Depth (ft)	End Depth (ft)	Field Sample ID	Sample Date	Sample Time	Sample Type	Sample Matrix	Sample Purpose	# of Cont.	Grab/Composite	Units												
1																								
2																								
3																								
4																								
5																								
6																								
7																								
8																								
9																								
10																								
11																								
12																								

Special Instructions:

Relinquished by	Company		Received by	Company		Condition	
	Date/Time			Date/Time		Cooler Temp.	
Relinquished by	Company		Received by	Company		Condition	
	Date/Time			Date/Time		Cooler Temp.	

Preservatives: 0 = None; [1 = HCL]; [2 = HNO3]; [3 = H2SO4]; [4 = NaOH]; [5 = Zn. Acetate]; [6 = MeOH]; [7 = NaHSO4]; 8 = Other (specify):

SECTION 7

SAMPLING QA AUDITS

7.1 SAMPLING QA AUDITS

Sampling quality assurance (QA) audits may be conducted to evaluate whether fieldwork is conducted in accordance with the procedures specified in this document. The QA audits will be performed by the approved quality assurance officer (QAO) or a qualified designee under the direction of the QAO. The designee will not have responsibility for the project work associated with the audit.

Sampling QA audits will include, but will not be limited by, review of the following items:

- Decontamination procedures;
- Sampling procedures;
- Sampling container cleanliness, size, and material;
- Sample identification (labels and COC);
- Sample handling, preservation, and shipping;
- Sample tracking;
- Maintenance and calibration of sampling equipment; and
- Corrective action.

An audit report must be submitted to the O&M Manager within 15 days of completion of the audit. Serious deficiencies will be reported to the O&M Manager within 24 hours. This may be accomplished by issuing a Corrective Action Request (CAR) (Figure 7.1). The CAR identifies the out-of-compliance condition, reference documents, and recommended corrective action. The CAR will be issued to the individual(s) responsible for the noncompliance and to the O&M Manager. The individual to whom the CAR is addressed will respond by writing a brief description of the cause and corrective action required in the appropriate area on the CAR, sign and date the response, and return the CAR to the QAO.

The O&M Manager will be responsible for implementing all required corrective actions identified during an audit are acted upon promptly and satisfactorily. The QAO or a qualified designee will verify and document that satisfactory corrective action has been taken. All audit checklists, audit reports, audit findings, and acceptable resolutions will be approved by the QAO. Then the QAO will close the audit. The QAO will maintain a status log for CARs, and the CARs will be retained in the project file.

7.2 RECORD MAINTENANCE

A project file will be established to retain the documents and records generated during the project. Field records will be stored in the project file when not in use. At the conclusion of the

work assignment the project file will be archived. A list of the files that will be archived after the project is complete is provided in the QAPP (Section 15). Field records that must be retained in the project files include:

- Field books,
- COC forms,
- Site photographs, and
- QA audit reports.

Equipment calibration and maintenance records will be retained by a designated equipment manager for at least as long as the project files are retained.

All project files will be maintained for the duration of the project or a minimum of five years, whichever is longer, or as dictated by project requirements (if longer than five years). Electronic project files are maintained on a no-fault server and back-ups of project files on to magnetic tapes on the no-fault server are performed on a weekly basis and updated daily, Monday through Thursday.

FIGURE 7.1

CORRECTIVE ACTION REQUEST FORM

CORRECTIVE ACTION REQUEST

Number _____ Date:_____

TO: _____

You are hereby requested to take corrective actions indicated below and as otherwise determined by you (a) to resolve the noted conditions and (b) to prevent it from recurring. Your written response is to be returned to the Project quality assurance manager by _____.

Condition:

Reference Documents:

_____	_____	_____	_____	_____	___
Originator	Date	Approval	Date	Approval	Date

Response

Cause of Condition:

Corrective Action

Resolution:

(B) Prevention

(B2) Affected Documents

Signature_____ Date_____

CA Follow-up

Corrective Action verified by:_____ Date _____

SECTION 8

REFERENCES

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APPENDIX A

USEPA REGION 2 LOW-FLOW PURGING AND SAMPLING PROCEDURE

Appendix C

Monitored Natural Attenuation Study Plan

Monitored Natural Attenuation (MNA) Study Plan

The objective of the MNA Study is develop a database from which site hydrogeologic, chemical, and geochemical conditions, and temporal changes in these conditions as they relate to natural attenuation mechanisms, can be documented.

This MNA Study Plan provides discussion of the following:

- Technical guidance to be used to evaluate MNA
- Description of the MNA monitoring network
- MNA data uses

Technical guidance to be used to evaluate MNA
The USEPA has issued a technical protocol for implementing and evaluating natural attenuation processes associated with chlorinated solvents in ground water. This protocol is presented in the USEPA document titled Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water (Wiedemeier, et. al., 1998). This document will be utilized as the primary guidance for the evaluation of natural attenuation processes.

Natural attenuation refers to the physical, chemical, and/or biological processes that act to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil and ground water. These processes may include dispersion, advection, sorption, and volatilization, and chemical and/or biological stabilization, transformation, or destruction of contaminants.

The USEPA protocol referenced above identifies three lines of evidence that can be used to evaluate natural attenuation of chlorinated aliphatic hydrocarbons (CAHs) such as those detected in ground water at the Site. These lines of evidence are identified as follows:

- The first line of evidence utilizes historic ground water and/or soil analytical data to demonstrate decreasing trends in contaminant mass and/or concentration over time at appropriate monitoring points.
- The second line of evidence utilizes hydrogeologic and geochemical data to indirectly demonstrate the types of natural attenuation processes occurring at a site, and the rate at which natural attenuation processes will reduce contaminant concentrations to regulatory criteria.
- The third line of evidence utilizes field or microcosm data to directly demonstrate the degradation of particular contaminants of concern via biological processes.

As part of the MNA Study as applied to the RHRL site, the first two lines of evidence will be utilized to evaluate the potential occurrence of natural attenuation. The historic ground water analytical data will be evaluated in conjunction with newly collected data to assess trends in contaminant concentrations to evaluate whether the shallow bedrock ground water plume is stable or decreasing in size. The second line of evidence will be evaluated through the collection and analysis of geochemical parameters, and examining those, as well as previous site data, for trends and a relationship between parent and daughter products. The third line of evidence, a microcosm study, will not be completed as part of this MNA Study.

MNA monitoring well network

The monitoring wells identified for MNA monitoring were selected to allow evaluation of VOC concentration and MNA parameter changes along the central portion, and eastern and western extents of the shallow bedrock ground water plume, as well as the downgradient extent of the shallow bedrock ground water plume. The monitoring wells from which MNA data will be collected and their relationship to the shallow bedrock plume geometry are summarized on the following table.

Location Relative to Shallow Bedrock Plume	Associated Monitoring Wells
Central Portion	RH-02, RH-03, RH-08S, RH-08D, RH-10I, RH-10D
Eastern/Downgradient Extent	MW-12S, MW-12D, RH-01, RH-09D
Western/Downgradient Extent	MW-11D
Downgradient Extent	MW-12D

MNA data uses

The newly generated ground water analytical data will be evaluated in conjunction with historic ground water analytical data to provide further evaluation of the natural attenuation mechanisms that are occurring at the RHRL site. The evaluation of MNA will be consistent with guidance presented in the Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water (Wiedemeier et. al., 1998). Components of this evaluation will include the following:

- Review of the ground water elevation data to evaluate seasonal variations in shallow bedrock ground water seepage velocities and ground water flow directions.

- Review of the site-related chlorinated ground water data to evaluate potential changes in the magnitude and geometry of the ground water plume, and the distribution of source area contaminants and their daughter products

- Review of the geochemical data to evaluate seasonal variability in the concentrations of electron donors and acceptors, such as dissolved organic carbon, chlorinated compounds, dissolved oxygen, nitrate, ferric iron, manganese, and sulfate as they relate the occurrence of intrinsic bioremediation at the Site

- Review of the geochemical data to evaluate seasonal variability in the concentrations of metabolic by-products, such as ferrous iron, methane, ethane, ethene, alkalinity, oxidation-reduction potential, and chloride, resulting from the transformation of organic compounds

- Review of the geochemical data to evaluate the likely terminal electron-accepting processes (TEAP(s)) which may be occurring at the Site, and how these TEAPs relate to intrinsic bioremediation given the site conditions.