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Broome County
Division of Solid Waste Management

Operational Year 6
Quarter Number 2
Monitoring Report

September 17, 2008

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Operational Year 6
Quarter Number 2
Monitoring Report

Colesville Landfill,
Broome County, New York
NYSDEC Site 704010

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1. Introduction

This Monitoring Report (Report) was prepared on behalf of the Broome County Division of Solid Waste Management for the Colesville Landfill, located in Broome County, New York (site) to evaluate and document long-term monitoring (LTM) activities at the site. Remediation and monitoring activities are being conducted pursuant to the Record of Decision (ROD) and Explanation of Significant Difference (ESD) that were issued in March 1991 and September 2000, respectively. LTM activities (which include environmental effectiveness and remediation system performance monitoring) were performed in accordance with the LTM Plan (ARCADIS G&M, Inc. 2002), LTM Plan Addendum for Spring Water Remediation Systems (ARCADIS 2003), and Interim Remedial Action Report (ARCADIS 2004), which were approved by the United States Environmental Protection Agency (USEPA) and New York State Department of Environmental Conservation (NYSDEC). These documents provide a detailed description of the LTM program, methodology, and rationale. Where applicable these elements are either summarized or incorporated by reference herein.

This report describes the results of the March 2008 groundwater quality monitoring event conducted during Operational Year 6, Quarter Number 2. A description of the operation, maintenance, and monitoring (OM&M) associated with the Groundwater Remediation System from December 2007 through March 2008 has also been provided. Following the detailed data analysis and discussion is a summary of findings, conclusions, and recommendations.

2. Methodology

The following section provides a summary of the environmental effectiveness and remedial system performance monitoring methodology for Operational Year 6, Quarter Number 2. A site plan, which shows the location of environmental effectiveness monitoring, is provided on Figure 1.

2.1 Environmental Effectiveness Monitoring

The environmental effectiveness monitoring performed during Operational Year 6, Quarter Number 2 included the following:

- Groundwater samples were collected from six monitoring wells (Year 6, Q1 list of wells plus alternate electron donor test well TW-1), during the week of March 24, 2008. The samples were selectively analyzed for volatile organic compounds

(VOCs), dissolved gases, and total organic carbon (TOC). Field parameters were also recorded at these monitoring locations.

- Samples (VOCs only) were collected at the SP-4 surface water locations on March 26, 2008.

- Water level measurements were collected from 23 monitoring wells on March 25, 2008.

In accordance with the Proposed Modifications to the Long-Term Monitoring Program (ARCADIS 2005), groundwater samples were collected from monitoring wells utilizing passive diffusive bag (PDB) samplers.

2.2 Groundwater Remediation System Performance Monitoring

Groundwater Remediation System performance monitoring activities during Operational Year 6, Quarter Number 2, were as follows:

- Pump-and-treat (PT) system recovery well influent and effluent samples were collected on March 26, 2008. The samples were selectively analyzed for VOCs and total iron.

- One vapor sample from the PT system air stripper effluent was collected on March 26, 2008. The sample was analyzed for VOCs.

- PT system operating parameters were recorded during the quarterly OM&M site visit.

- Total organic carbon (TOC) samples were collected from select injection wells during the week of March 24, 2008.

- A TOC sample was collected from alternate electron donor monitoring well TW-1 on March 25, 2008.

- Automated reagent injection (ARI) system operating parameters were recorded during each injection event.

PT system groundwater samples were collected as grab samples directly from the individual recovery pipelines connected to recovery wells GMPW-3, GMPW-4, GMPW-

5, the combined influent water to the low profile air stripper, and the combined effluent after the cartridge filters. The effluent air sample was collected as a grab sample directly from the designated point located on the low profile air stripper stack.

2.3 Spring Water Remediation System Performance Monitoring

Standard SP-5 Spring Water Remediation System performance monitoring could not be conducted during the current reporting period due to the presence of tailwater at the discharge monitoring location (i.e., outfall) as described previously in the Operational Year 6, Quarter Number 1 Monitoring Report.

3. Groundwater Flow

Water-level measurements were made from existing wells on March 25, 2008. The measurements are provided in Table 1. The water level in the project area (i.e., adjacent to the landfill western perimeter) and site-wide in the Operational Year 6, Quarter Number 2 round was consistent with previous rounds. Seasonal fluctuations are observed during each operating quarter; however, the data generally indicate groundwater flow directions consistent with that observed during the Operational Year 5, Quarter Number 4 monitoring event.

4. Groundwater Quality

The following sections describe the analytical results for groundwater samples collected during the March 2008 monitoring round (Operational Year 6, Quarter Number 2). Groundwater analytical results are provided in Tables 2 and 3. Where applicable, the previous round of analytical results for the respective sampling location has been provided in the same table for comparative purposes.

4.1 Volatile Organic Compounds

As shown in Table 2, total VOC (TVOC) concentrations in all monitoring wells sampled during the reporting period remained generally consistent when compared to analytical results from the previous round. Specifically, the TVOC concentration in monitoring wells GMMW-2, GMMW-5, W-5, GMMW-6, and PW-4 were 330.9, 69.2, 195.4, 357.9, and 47.4 ug/L, respectively. TVOC concentrations in monitoring well TW-1 (139.0 ug/L) decreased by approximately 50 percent when compared to its previous round of monitoring data.

PT system TVOC analytical results are provided in Table 5. During the current reporting period, the TVOC concentration at recovery wells GMPW-3, GMPW-4, and GMPW-5 were consistent with prior rounds of data. Specifically, TVOC concentrations in recovery wells GMPW-3, GMPW-4, and GMPW-5 were 225.5 ug/L, 252.4 ug/L, and 0.0 ug/L, respectively. A complete evaluation of performance monitoring conducted on the PT system is provided in Section 8.1.2 of this report.

4.2 Indicators of Reducing Conditions

Groundwater analytical results for biogeochemical parameters and field parameters were collected in accordance with the LTM plan and are provided in Table 3. In summary, field and laboratory groundwater data for Wells TW-1, GMMW-5, and GMMW-6 indicate that reducing conditions are being maintained within the IRZ. This is evidenced by the presence of reduced forms of alternate electron acceptors (i.e., methane). Further details of the ARI system performance monitoring are provided in Section 8.2.2 of this report.

4.3 Evidence of Biodegradation

Table 3 provides the results of biodegradation end product concentrations in monitoring wells and indicates the continued occurrence of bioactivity and biodegradation of VOCs within the IRZ. Specifically, the concentrations of ethene at monitoring well GMMW-6 continue to be elevated when compared to baseline conditions. Similarly, the concentration of ethane remained elevated at monitoring wells GMMW-5 and GMMW-6 during the reporting period. Additional details on the results of biogeochemical monitoring as evidence of Groundwater Remediation System performance and effectiveness are discussed in Section 8.2.2 of this report.

5. Spring Water Quality

Spring water locations SP-2 and SP-3 were observed during the OM&M site visit on March 26, 2008. A spring was not observed at the SP-2 location. A few small areas of stagnant water were observed between SP-3 and SP-4, but no flowing springs were present that could be sampled.

6. Surface Water Quality

Surface water quality analytical results for the Operational Year 6, Quarter Number 2 monitoring round are summarized in Table 2. As shown in Table 2, surface water

quality at the SP-4 sampling location remained consistent with previous analytical data. Specifically, TVOC concentrations at the SP-4 sampling location were below the limits of detection. The data indicate that surface water quality is not being adversely impacted.

7. Groundwater Remediation System Performance

The following section describes the results of the Groundwater Remediation System performance monitoring conducted during Operational Year 6, Quarter Number 2.

7.1 PT System

The following section describes the results of the PT system performance monitoring conducted during Operational Year 6, Quarter Number 2.

7.1.1 Summary of Operation, Maintenance, and Monitoring

During Operational Year 6, Quarter Number 2, the PT system operated continuously with the exception of brief system shutdowns as a result of minor system alarms and routine OM&M activities.

PT system OM&M for Operational Year 6, Quarter Number 2 was conducted during the week of March 24, 2008 and included operation and maintenance of system equipment, the collection of system performance samples (water and vapor), and recording system operating parameters. Table 4 provides a summary of the recorded system operating parameters for the current operating period. As shown in Table 4, the total effluent groundwater recovery rate for Operational Year 6, Quarter Number 2 was approximately 0.69-gallons per minute (gpm), with individual recovery rates of 0.12-gpm, 0.29-gpm, and 0.11-gpm in GMPW-3, GMPW-4, and GMPW-5, respectively. The average individual recovery well pumping rate during Operational Year 6, Quarter Number 2 was consistent with previous performance at recovery well GMPW-4. The average individual recovery well pumping rate in recovery wells GMPW-3 and GMPW-5 were higher when compared to the previous quarter of data but lower when compared to system startup data.

A total of 69,417 gallons of groundwater was recovered during Operational Year 6, Quarter Number 2 and a total of 1,462,853 gallons of groundwater has been recovered since system startup. The low profile air stripper operated in accordance with the

design specifications and had a blower flow rate of 209 standard cubic feet per minute (scfm).

7.1.2 Results of Performance Sampling

PT system performance sampling for Operational Year 6, Quarter Number 2 was conducted on March 26, 2008. As discussed previously, five groundwater samples and one vapor sample were collected. Groundwater samples included collection of individual recovery well samples (GMPW-3, GMPW-4, and GMPW-5), total influent, and total effluent after the cartridge filters. The vapor sample was collected from the effluent stack of the low profile air stripper.

Table 5 provides a summary of the PT system performance groundwater sampling analytical results. As shown in Table 5, all groundwater VOCs were treated to below their respective Best Professional Judgment (BPJ) limits via the low profile air stripper. The total iron concentration after the cartridge filter is below the respective recommended daily maximum BPJ limit. Based on the total groundwater recovered during the reporting period and total influent groundwater concentration, an estimated 0.13 pounds (lbs) of VOC mass were removed from the subsurface during the quarterly reporting period, as shown in Table 6. A total of approximately 2.80 lbs of VOCs have been removed from the subsurface since system startup.

Table 7 provides a summary of the PT system performance vapor sampling analytical results. As shown in Table 7, VOCs were not detected above their respective detection limits. To be conservative, a NYSDEC DAR-1 air model was calculated using the actual analytical data for detected constituents and the detection limit of all constituents that were not detected but have historically been detected in the influent groundwater. All COCs were below their respective short-term guideline concentrations (SGCs) and annual guideline concentrations (AGCs). Appendix B contains the NYSDEC DAR-1 AGC screening simulation based on the hand calculations provided in the NYSDEC DAR-1 AGC/SGC tables dated December 22, 2003.

7.2 ARI System

The following section describes the results of the ARI system performance monitoring conducted during Operational Year 6, Quarter Number 2.

7.2.1 Summary of Operation, Maintenance, and Monitoring

ARI system OM&M was conducted during the Operational Year 6, Quarter Number 2 OM&M site visit during the week of March 24, 2008. The visit included operation and maintenance of system equipment and the collection of samples for analysis of TOC from injection wells IW-3 and IW-13. In addition, a TOC sample was collected from monitoring well TW-1 to evaluate the long- term performance of the alternate electron donor in providing TOC to the subsurface.

One reagent injection was conducted during Operational Year 6, Quarter Number 2. The injection was initiated on December 24, 2008 and was completed on January 28, 2008. As described in the Hydraulic Injection Test and Alternate Electron Donor Pilot Test Letter Work Plan (ARCADIS 2006), an alternate electron donor (e.g., emulsified edible oil [EOS]) was injected into existing injection well IW-8 during the week of December 18, 2006. Accordingly, IW-8 was not included in the current reagent injection to allow for long-term groundwater monitoring of the alternate electron donor.

Based on the number of injection events, quantity of molasses solution delivered to each injection well, and molasses solution percentage, approximately 13,705-gallons of molasses solution were delivered to the subsurface during Operational Year 6, Quarter Number 2. A total of 158,342-gallons of molasses solution have been injected since system startup. Appendix C provides a summary of the recorded system operating parameters for each of the injection events for Operational Year 6, Quarter Number 2.

7.2.2 Results of Performance Sampling

ARI system performance sampling was conducted on March 26, 2008. As discussed previously, this event consisted of collecting TOC samples at two injection wells. In addition, analytical results from select monitoring wells under the environmental effectiveness monitoring program were used to determine the effectiveness of the ARI system. A summary of key observations is as follows:

- The TOC concentrations at injection wells IW-3 and IW-13 are 260 and 100 mg/L, which indicated that sufficient organic carbon is being delivered to the subsurface to maintain the IRZ.

- The TOC in monitoring well TW-1 was 200 mg/L. The data indicate that the alternate electron donor (EOS) continues to provide sufficient organic carbon to the subsurface following the one time injection in injection well IW-8.

- The methane concentration in monitoring wells GMMW-5 and TW-1 remained elevated at 6,100 ug/L and 17,000 ug/L, respectively. These data provide evidence that strongly reducing conditions (methanogenic) are being maintained within the IRZ.

- The ethene concentration in monitoring well GMMW-6 remained elevated at 57,000 ng/L.

- The ethane concentration remained elevated in monitoring wells GMMW-5 and GMMW-6 at 26,000 and 9,800 ng/L, respectively.

8. Spring Water Remediation System Performance

SP-5 Spring Water Remediation System OM&M could not be conducted during Operational Year 6, Quarter Number 2 due to the presence of tailwater (e.g. backed up water) at the discharge sampling location. The source of the tailwater and proposed corrective measures are currently being evaluated.

9. Conclusions

Based on the data obtained from the Operational Year 6, Quarter Number 2 monitoring, ARCADIS concludes the following:

- The anaerobic IRZ established downgradient of the injection transect is successfully reducing the concentration of site-related VOCs through enhanced reductive dechlorination.

- The PT system is operating as designed and is treating recovered groundwater VOCs to below BPJ limits prior to discharge.

- Sufficient organic carbon was delivered to the subsurface to maintain the IRZ.

- The groundwater flow direction in the project area (i.e., adjacent to the landfill western perimeter) and site-wide in the March 2008 round was consistent with previous rounds. The groundwater flow direction in the project area is toward the

southwest from the western perimeter of the landfill. The groundwater flow direction in areas further to the east of the project area is toward the south/southwest.

- Surface water quality continues to be consistent with historical data indicating that impacted groundwater is not causing an adverse impact to surface water along the North Stream.

- Ongoing TOC data from the alternate electron donor pilot test indicate the EOS is an effective product to provide sufficient organic carbon to the subsurface over long periods of time.

10. Recommendations

The following recommendations are made for Operational Year 6, Quarter Number 2 activities:

- Continue to inspect the former spring locations and the side slopes of the North Stream.

- Continue to operate the ARI system without injection well IW-8. Continue to obtain and evaluate data related to the ongoing alternate electron donor pilot program.

- Evaluate the instantaneous and long-term performance of recovery well pump GMPW-3 and GMPW-5 to determine if the filter sock replacement period needs to be adjusted.

- Continue to evaluate and determine the source of water emerging at the SP-5 spring water remediation system outfall location.

11. Project Schedule

Groundwater environmental effectiveness monitoring is scheduled to be conducted for Operational Year 6 on the quarterly schedule set forth in the Proposed Modifications to Long-Term Monitoring Program (ARCADIS 2005). System OM&M of the Groundwater Remediation System will continue to be performed on a quarterly basis consistent with the LTM Plan. Evaluation of the SP-5 spring water remediation system will be

completed and the proposed corrective maintenance will be finalized by the end of the summer 2008.

12. References

ARCADIS G&M, Inc. 2002. Long-Term Monitoring Plan, Colesville Landfill, Broome County, New York, NYSDEC Site 704010. June 28, 2002.

ARCADIS G&M, Inc. 2003. Long-Term Monitoring Plan Addendum for Spring Water Remediation Systems, Colesville Landfill, Broome County, New York, NYSDEC Site 704010. November 3, 2003.

ARCADIS G&M, Inc. 2004. Interim Remedial Action Report, Colesville Landfill, Broome County, New York, NYSDEC Site 704010. September 22, 2004.

ARCADIS G&M, Inc. 2005 Proposed Modifications to Long-Term Monitoring Program, Broome County, New York, NYSDEC Site 704010. June 28, 2005.

ARCADIS G&M, Inc. 2006. Hydraulic Injection Test and Alternate Electron Donor Pilot Test, Colesville Landfill, Broome County, New York (Site No. 704010). November 30, 2006.

ARCADIS of New York, Inc. 2008. Operational Year 6, Quarter Number 1 Monitoring Report, Colesville Landfill, Broome County, New York (Site No. 704010).

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Table 1. Water-Level Measurements Collected During Opertational Year 6, Quarter Number 2, Colesville Landfill, Broome County, New York.

Well Identification	MP Elevation (feet above msl)	3/25/2008 Depth to Water (feet below MP)	3/25/2008 Water-Table Elevation (feet above msl)	MP Description
GMMW-2	1030.95	35.52	995.43	Inner casing
GMMW-3	1028.02	33.14	994.88	Inner casing
GMMW-4	1042.9	45.17	997.73	Inner casing
GMMW-5	1043.66	48.78	994.88	Inner casing
GMMW-6	1033.56	37.64	995.92	Inner casing
GMMW-7	1045.43	46.81	998.62	Inner casing
PW-1	976.23	14.18	962.05	Inner casing
PW-3	988.92	9.81	979.11	Inner casing
PW-4	1001.75	14.95	986.80	Inner casing
PW-5	986.12	0.00	986.12	Inner casing
W-5	1051.41	51.23	1000.18	Inner casing
W-6	1050.38	48.25	1002.13	Inner casing
PW-7	1042.47	39.13	1003.34	Inner casing
W-7	1049.12	40.62	1008.50	Inner casing
PW-10	1049.29	36.90	1012.39	Inner casing
PW-11	1052.37	51.07	1001.30	Inner casing
PW-13	1072.41	61.05	1011.36	Inner casing
W-13	1053.43	45.35	1008.08	Inner casing
W-14S	957.68	5.19	952.49	Inner casing
W-16S	990.33	8.27	982.06	Outer casing
W-17S	959.13	7.72	951.41	Inner casing
W-18	973.56	9.50	964.06	Inner casing
W-20S	952.88	7.71	945.17	Inner casing

msl Mean sea level.
MP Measuring point.
NM Not measured.
-- Water Level not Recorded

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Table 2. Concentrations of Volatile Organic Compounds Detected in Groundwater and Surface Water, Operational Year 6, Quarter Number 2, Colesville Landfill, Broome County, New York.

(units in ug/L)	Sample ID: GMMW-02 Date: 12/19/2007	GMMW-02 3/25/2008	GMMW-05 12/18/2007	GMMW-05 3/25/2008	GMMW-05 * 3/25/2008	GMMW-06 12/18/2007	GMMW-06 3/25/2008	PW-04 12/18/2007	PW-04 3/25/2008
1,1,1-Trichloroethane	**9.5**	**9.0**	<1.0	<1.0	<1.0	**3.1**	**1.8**	**9**	**8.9**
1,1,2-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	**92**	**110**	**16**	**21**	**20**	**120**	**130**	**4.6**	**8.3**
1,1-Dichloroethene	**1.3**	**1.2**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0	<1.0	**1.1**	**1.0**	<1.0	<1.0
Benzene	**3**	**2.5**	<1.0	<1.0	<1.0	**9.5**	**8.1**	<1.0	<1.0
Carbon Tetrachloride	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	**34**	**30**	**16**	**11**	**11**	**37**	**35**	<1.0	<1.0
Chloroethane	**32**	**24**	**34**	**33**	**31**	**180**	**140**	**1.8**	**3.6**
Chloroform	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.2**	**1.4**
cis-1,2-Dichloroethene	**100**	**110**	**2.3**	**1.8**	**2.1**	**14**	**7.8**	**5.6**	**5.8**
Dichlorodifluoromethane	**1.6**	**1.2**	<1.0	<1.0	<1.0	**5.8**	**4.6**	**2.3**	**1.4**
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	**2.9**	**2.9**	<1.0	<1.0
Methylene chloride	<1.0	<1.0	<1.0	<1.0	<1.0	**5.5**	**5.8**	<1.0	<1.0
Methyl tert-butyl ether	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Naphthalene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o-Xylene	<1.0	<1.0	**2.0**	**1.1**	**1.1**	**2.7**	**2.2**	<1.0	<1.0
m,p-Xylene	<2.0	<2.0	<2.0	<2.0	<2.0	**7.0**	**6.0**	<2.0	<2.0
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	**2.5**	<1.0	<1.0	**3.0**	**2.8**	<1.0	<1.0
trans-1,2-Dichloroethene	**1.1**	<1.0	<1.0	<1.0	<1.0	**1.6**	**1.6**	<1.0	<1.0
Trichloroethene	**40**	**28**	**1.3**	**1.1**	**1.0**	**3.4**	**3.2**	**22**	**18**
Vinyl chloride	**20**	**15**	<1.0	<1.0	<1.0	**10**	**5.1**	<1.0	<1.0
Total VOCs	**334.5**	**330.9**	**74.1**	**69.0**	**66.2**	**406.6**	**357.9**	**46.5**	**47.4**

Bold Constituent detected above MDL.
VOCs Volatile Organic Compounds.
ug/L Micrograms per liter.
* Field replicate.
J Estimated value.
MDL Method detection limit.
NA Not analyzed.

Table 2. Concentrations of Volatile Organic Compounds Detected in Groundwater and Surface Water, Operational Year 6, Quarter Number 2, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID: / Date:	W-05 12/18/2007	W-05 3/25/2008	TW-01 12/18/2008	TW-01 3/25/2008	SP-04 12/19/2007	SP-04 3/26/2008	FBV032608 3/26/2008
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		**57**	**67**	**34**	**18**	**1.1**	<1.0	<1.0
1,1-Dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		**1.2**	**1.0**	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene		**8.0**	**5.8**	**3.2**	**3.3**	<1.0	<1.0	<1.0
Carbon Tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene		**11**	**9.9**	**16**	**15**	<1.0	<1.0	<1.0
Chloroethane		**150**	**100**	**110**	**67**	<1.0	<1.0	<1.0
Chloroform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene		**3.0**	**3.5**	**14**	**12**	<1.0	<1.0	<1.0
Dichlorodifluoromethane		**2.4**	**1.2**	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride		**3.6**	**2.6**	**1.6**	<1.0	<1.0	<1.0	<1.0
Methyl tert-butyl ether		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Naphthalene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o-Xylene		**3.3**	**3.0**	**1.6**	**1.5**	<1.0	<1.0	<1.0
m,p-Xylene		**1.8**	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Tetrachloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene		<1.0	<1.0	**29**	**20**	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene		<1.0	**1.4**	**2.2**	**2.2**	<1.0	<1.0	<1.0
Vinyl chloride		<1.0	<1.0	**7.5**	<1.0	<1.0	<1.0	<1.0
Total VOCs		**241.3**	**195.4**	**219.1**	**139.0**	**1.1**	**0.0**	0.0

Bold Constituent detected above MDL.
VOCs Volatile Organic Compounds.
ug/L Micrograms per liter.
* Field replicate.
J Estimated value.
MDL Method detection limit.
NA Not analyzed.

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Table 3. Concentrations of General Chemistry, Field Parameters, and Dissolved Gases Detected in Groundwater, Operational Year 6, Quarter Number 2, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	GMMW-02 12/19/07	GMMW-02 3/25/08	GMMW-05 12/18/07	GMMW-05 3/25/08	GMMW-06 12/18/07	GMMW-06 3/25/08
	UNITS						
GENERAL CHEMISTRY							
Total Organic Carbon	mg/L	**2.1**	**1.9**	**20**	**16**	**3.9**	**3.4**
FIELD PARAMETERS							
pH	Standard units	**6.67**	**6.95**	**6.65**	**6.72**	**6.71**	**6.89**
Specific Conductance	mmhos/cm	**0.621**	**0.615**	**0.36**	**0.281**	**0.869**	**0.863**
Turbidity	NTU	--	--	--	--	--	--
Dissolved Oxygen	mg/L	**1.8**	**2.91**	**1.17**	**1.05**	**2.05**	**2.79**
Temperature	deg C	**8.1**	**9.04**	**8.4**	**12.07**	**8.35**	**10.03**
ORP	mV	**5**	**-22**	**-105**	**-111**	**-89**	**-55**
DISSOLVED GASES							
Carbon dioxide	mg/L	--	<5.00	--	<5.00	--	<5.00
Carbon monoxide	mg/L	--	<1.00	--	<1.00	--	<1.00
Ethane	ng/L	**790**	**630**	**18,000**	**26,000**	**12,000**	**9,800**
Ethene	ng/L	**12,000**	**13,000**	**470**	**780**	**67,000**	**57,000**
Methane	ug/L	**3,900**	**3,300**	**16,000**	**6,100**	**1,600**	**1,300**
Nitrogen	mg/L	--	**18.00**	--	**19.00**	--	**19.00**
Oxygen	mg/L	--	**2.10**	--	**2.50**	--	**3.20**

Bold Constituent detected above MDL.

mg/L	Milligrams per liter.
mmhos/cm	Millimhos per centimeter.
NTU	Nephelometric Turbidity Units.
deg C	Degrees Celsius.
mV	Millivolts.
ng/L	Nanograms per liter.
--	Not analyzed or collected.
ug/L	Micrograms per liter.
IW	Injection well.
ORP	Oxidation-reduction potential.
J	Qualifier assigned to analytical data indicating result is estimated.

Table 3. Concentrations of General Chemistry, Field Parameters, and Dissolved Gases Detected in Groundwater, Operational Year 6, Quarter Number 2, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	PW-04 12/19/07	PW-04 3/25/08	W-05 12/18/07	W-05 3/25/08	IW-03 3/25/08
	UNITS					
GENERAL CHEMISTRY						
Total Organic Carbon	mg/L	**8**	**0.8**	**7.7**	**6.9**	**260**
FIELD PARAMETERS						
pH	Standard units	**5.85**	**6.15**	**6.46**	**6.72**	**6.00**
Specific Conductance	mmhos/cm	**0.473**	**0.818**	**1.006**	**0.955**	**0.653**
Turbidity	NTU	--	--	--	--	--
Dissolved Oxygen	mg/L	**2.24**	**5.26**	**1.49**	**1.3**	**1.21**
Temperature	deg C	**9.35**	**8.34**	**8.12**	**9.26**	**9.28**
ORP	mV	**130**	**41**	**-111**	**-87**	**-54**
DISSOLVED GASES						
Carbon dioxide	mg/L	--	<5.00	--	<5.00	--
Carbon monoxide	mg/L	--	<1.00	--	<1.00	--
Ethane	ng/L	**<25**	**40**	**17,000**	**17,000**	--
Ethene	ng/L	**<25**	**52**	**1,500**	**2,000**	--
Methane	ug/L	**0.33**	**3.1**	**3,100**	**4,900**	--
Nitrogen	mg/L	--	**21.00**	--	**20.00**	--
Oxygen	mg/L	--	**6.00**	--	**2.70**	--

Bold Constituent detected above MDL.

mg/L	Milligrams per liter.
mmhos/cm	Millimhos per centimeter.
NTU	Nephelometric Turbidity Units.
deg C	Degrees Celsius.
mV	Millivolts.
ng/L	Nanograms per liter.
--	Not analyzed or collected.
ug/L	Micrograms per liter.
IW	Injection well.
ORP	Oxidation-reduction potential.
J	Qualifier assigned to analytical data indicating result is estimated.

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Table 7. Concentrations of Volatile Organic Compounds Detected in Air Stripper Effluent, Operational Year 6, Quarter Number 2, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Compounds	CAS Numbers	Sample ID: Date Sampled:	Effluent 3/26/2008 ppbv
Vinyl Chloride	75-01-4		<7.4
Chloroethane(Ethyl Chloride)	75-00-3		<7.4
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4		<7.4
Methylene Chloride(Dichloromethane)	75-09-2		<7.4
1,1-Dichloroethane	75-34-3		<7.4
cis-1,2-Dichloroethylene	156-59-2		<7.4
Chloroform	67-66-3		<7.4
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6		<7.4
Benzene	71-43-2		<7.4
Trichloroethene	79-01-6		<7.1
Toluene	108-88-3		<7.4
Ethyl benzene	100-41-4		<7.4
m,p-Xylene	108-38-3/106-42-3		<7.4
o-Xylene	95-47-6		<7.4
1,2,4-Trimethylbenzene	95-63-6		<7.4
2-Propanol (Isopropyl alcohol)	67-63-0		<7.4
Dichlorodifluoromethane(Freon 12)	75-71-8		<7.4

Bold Constituent detected above MDL.
ppbv: parts per billion by volume

Notes/Assumptions:

1. Samples collected by ARCADIS personnel on the dates shown and submitted to Air Toxics Laboratories LTD. for volatile organic compound (VOC) analyses using a modified USEPA Method TO-14A.

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Appendix A

Groundwater Sampling Logs

Table 3. Field Measurements of Depth to Water in Select Wells, Colesville Landfill, Broome County, New York.

Date: 3/25/08

Well Identification		Depth to Water (feet below MP)	Comments All New Locks
GMMW-2		35.52	
GMMW-3		33.14	
GMMW-4		45.17	
GMMW-5		48.78	
GMMW-6		37.64	
GMMW-7		46.81	
PW-3		9.81	
PW-4		14.95	
PW-5		Top of Pvc 0.0	
W-5		51.23	
W-6		48.25	
PW-7		39.13	Rusted Lock
W-7		40.62	
PW-10		36.90	Rusted Lock
PW-11		51.07	
PW-13		61.05	no Lock
W-13		45.35	Rusted Lock
W-14S		5.19	Rusted Lock
W-16S		8.27	Took Reading from Top of Casing/no Lock
W-17S		7.72	Rusted Lock
W-18		9.5	New Lock
W-20S		7.71	
TW-1		50.64	
PW1		14.18	

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0020	Page	1 of 1
Site Location	Harpursville, NY			Date	3/25/08
Site/Well No.	GMW-5	Replicate No.	Rep#TB2508	Code No.	—
Weather	Sun → 40	Sampling Time: Begin	1510	End	1310

Evacuation Data

Measuring Point	Top of PVC
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	48.78
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	yellow tint
Odor	Mod
Appearance	clear / sm. flocks
pH (s.u.)	6.72
Conductivity (mS/cm)	0.281
(µmhos/cm)	
Turbidity (NTU)	
Temperature (°C)	12.07
Dissolved Oxygen (mg/L)	1.05
ORP	-111
Sampling Method	Bailer / PDB
Remarks	Redeployed a PDB

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML ~~VOA~~ Vials	2	Na3PO4
TOC	Amber ~~250 ML Plastic~~ 40mL vials	2	Drops. H2SO4
Total Iron	250 ML Plastic	0	HNO3

Sampling Personnel: KA / JaSon

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	mililiter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0020	Page	1 of 1
Site Location	Harpursville, NY			Date	3/25/08
Site/Well No.	TW-1	Replicate No.	—	Code No.	—
Weather	Sun 40°	Sampling Time:	Begin 1320	End	1331

Evacuation Data

Measuring Point	Top of PVC
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	50.64
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	—
Purge Time	begin ____ end ____
Pumping Rate (gpm)	—
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	yellow
Odor	Mild
Appearance	Murky Cloudy
pH (s.u.)	6.11
Conductivity (mS/cm)	1.490
(µmhos/cm)	
Turbidity (NTU)	
Temperature (°C)	11.47
Dissolved Oxygen (mg/L)	1.02
ORP	-121
Sampling Method	Bailer / PDB
Remarks	Redeployed PDB

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML ~~VOA~~ Vials	2	Na3 PO4
TOC	~~Amb. 250 ML~~ Plastic 40 mL Vial	2	~~Unpres.~~ H2SO4
Total Iron	250 ML Plastic	0	HNO3

Sampling Personnel: KA / Jason

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0020	Page	1 of 1
Site Location	Harpursville, NY			Date	3/25/08
Site/Well No.	W-5	Replicate No.	—	Code No.	
Weather	Sun 40	Sampling Time: Begin	1340	End	1345

Evacuation Data

Measuring Point	
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	51.23
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Clear
Odor	Slight
Appearance	Cloudy (tiny micro organism units)
pH (s.u.)	6.72
Conductivity (mS/cm)	0.955
(µmhos/cm)	
Turbidity (NTU)	
Temperature (°C)	9.26
Dissolved Oxygen (mg/L)	1.30
ORP	-87
Sampling Method	Bailer / PDB
Remarks	Redeployed a PDB

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML ~~VOA~~ Vials	2	Na_3PO_4
TOC	AMBER ~~250 ML Plastic~~ 40 mL Vial	2	~~Unpres.~~ H_2SO_4
Total Iron	250 ML Plastic	0	HNO3

Sampling Personnel: KA / JASON

Well Casing Volumes

Gal./Ft.			
1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Water Sampling Log

Project: Colesville Landfill | Project No.: NY000949.0021 | Page 1 of 1

Site Location: Harpursville, NY | Date: 3/25/08

Site/Well No.: GMMW-6 | Replicate No.: MS/MSD | Code No.: —

Weather: Sun 40 | Sampling Time: Begin 1407 End 1418

Evacuation Data

Measuring Point	Top of PVC
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	37.64
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Clear / cloudy
Odor	Slight
Appearance	Clear
pH (s.u.)	6.89
Conductivity (mS/cm)	0.863
(µmhos/cm)	
Turbidity (NTU)	
Temperature (°C)	10.03
Dissolved Oxygen (mg/L)	2.79
ORP	-55
Sampling Method	Bailer / PDB
Remarks	Redeployed as PDB

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML ~~VOA~~ Vials	2	Na_3PO_4
TOC	Amber ~~250 ML Plastic~~ 40mL Vial	2	~~Unpres~~ H_2SO_4
Total Iron	250 ML Plastic	0	HNO3

Sampling Personnel: KA / Jason

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	3/25/08
Site/Well No.	GMW-2	Replicate No.	—	Code No.	
Weather	Sun 40°	Sampling Time: Begin	1426	End	1432

Evacuation Data

Measuring Point	Top of PVC
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	35.52
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Clear
Odor	Slight
Appearance	Clear
pH (s.u.)	6.95
Conductivity (mS/cm)	0.615
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	9.04
Dissolved Oxygen (mg/L)	2.91
ORP	-22
Sampling Method	Bailer / PDB
Remarks	Redeployed a PDB

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML ~~VOA~~ Vials	2	Na3PO4
TOC	Amber ~~250 ML Plastic~~ 40 ML VIAL	2	~~Unpres.~~ H2SO4
Total Iron	250 ML Plastic	0	HNO3

Sampling Personnel: KA / Jason

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Water Sampling Log

Project: Colesville Landfill | Project No.: NY000949.0021 | Page 1 of 1

Site Location: Harpursville, NY | Date: 3/25/08

Site/Well No.: PW-4 | Replicate No.: — | Code No.: ____

Weather: Sun 40° | Sampling Time: Begin 1435 End 1446

Evacuation Data

Measuring Point	Top of PVC
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	14.95
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Cloudy
Odor	None
Appearance	Cloudy
pH (s.u.)	6.15
Conductivity (mS/cm)	0.518
(µmhos/cm)	
Turbidity (NTU)	
Temperature (°C)	8.34
Dissolved Oxygen (mg/L)	5.26
ORP	41
Sampling Method	Bailer / PDB
Remarks	Redeployed a PDB (used a bag from the Building)

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML VOA Vials	2	Na3PO4
TOC	Amber ~~250 ML Plastic~~ 40 ML Vial	2	~~Unpres.~~ H2SO4
Total Iron	250 ML Plastic	0	HNO3

Sampling Personnel: KA / Jason

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Water Sampling Log

Project: Colesville Landfill | Project No.: NY000949.0021 | Page 1 of 1

Site Location: Harpursville, NY | Date: 3/25/08

Site/Well No.: IW-13 IW-13 | Replicate No.: | Code No.: 25

Weather: Sun 40° | Sampling Time: Begin 1554 End 1557

Evacuation Data

Measuring Point	—
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Yellow
Odor	Strong
Appearance	Cloudy a Lot of Small Particles
pH (s.u.)	6.32
Conductivity (mS/cm)	0.589
(µmhos/cm)	—
Turbidity (NTU)	—
Temperature (°C)	9.59
Dissolved Oxygen (mg/L)	1.33
ORP	-65
Sampling Method	Bailer
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	—	HCL
Ethene, Ethane, Methane	40 ML VOA Vials	—	
TOC	Amber ~~250 ML Plastic~~ 40 ML Vial	2	~~Unpres.~~ H_2SO_4
Total Iron	250 ML Plastic	—	HNO3

Sampling Personnel: KA

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	mililiter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	3/29/05
Site/Well No.	IW-3	Replicate No.	—	Code No.	
Weather	SW 40	Sampling Time:	Begin 1530	End	1332

Evacuation Data

Measuring Point	
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Yellow
Odor	Strong
Appearance	Cloudy
pH (s.u.)	6.00
Conductivity (mS/cm)	0.653
(µmhos/cm)	-
Turbidity (NTU)	—
Temperature (°C)	9.28
Dissolved Oxygen (mg/L)	1.21
ORP	-54
Sampling Method	Bailer
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	—	HCL
Ethene, Ethane, Methane	40 ML VOA Vials	—	
TOC	Amber 250 ML Plastic 40 ML Vial	2	~~Unpres.~~ H2SO4
Total Iron	250 ML Plastic	—	HNO3

Sampling Personnel: KA

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	3/26/08
Site/Well No.	TW - MW 8	Replicate No.	—	Code No.	
Weather	Cloudy 35	Sampling Time:	Begin 0940	End	0842

Evacuation Data

Measuring Point	
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Cloudy Slight yellow
Odor	Strong
Appearance	Cloudy Floating material
pH (s.u.)	5.35
Conductivity (mS/cm)	0.179
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	12.64
Dissolved Oxygen (mg/L)	0.32
ORP	60.0
Sampling Method	Bailer
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	—	HCL
Ethene, Ethane, Methane	40 ML ~~VOA~~ Vials	—	
TOC AM60C	~~250 ML Plastic~~ 240 mL Vial	2	~~Unpres.~~ H_2SO_4
Total Iron	250 ML Plastic	—	HNO3

Sampling Personnel: KA JDM

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Surface Water Sampling Form

Project: Colesville Landfill Project No.: NY000949.0021 Page 1 of 1

Site Location: Harpursville NY Date: 3/26/08

Site/Well No.: SP-4 Replicate No.: —

Weather: Cloudy 35° Sampling Time: Begin 10:24 End

Site Conditions

Water Quality Meter: Quanta

Location Condition: Cobbles + Stones Good

Vegetation: none

Depth of Water: 4"

Estimated Flow Rate: 5 sec 1.5'

Collection Method: direct Collection

Field Parameters

Color	Clear
Odor	none
Appearance	Clear
pH (s.u.)	7.71
Conductivity (mS/cm)	0.096
Temperature (°C)	5.28
DO (mg/L)	7.52
Turbidity (NTU)	—
ORP	24
Time	

Remarks:

Constituents Sampled: See COC Sampling Personnel: KA / DM

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Water Sampling Log

Project: Colesville Landfill | Project No.: NY000949.0020 | Page 1 of 1

Site Location: Harpursville, NY | Date: 3/26/08

Site/Well No.: Combined effluent | Replicate No.: — | Code No.: _____

Weather: — | Sampling Time: Begin 1201 | End _____

Evacuation Data

Measuring Point	
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin _____ end _____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	
Odor	
Appearance	
pH (s.u.)	
Conductivity (mS/cm)	
(µmhos/cm)	
Turbidity (NTU)	
Temperature (°C)	
Dissolved Oxygen (mg/L)	
ORP	
Sampling Method	~~Bailer~~ direct
Remarks	System Sampling

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML VOA Vials	—	—
TOC	250 ML Plastic	—	Unpres.
Total Iron	250 ML Plastic	1	HNO3

Sampling Personnel: KA / DM / Jason

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Water Sampling Log

Project: Colesville Landfill | Project No.: NY000949.0020 | Page 1 of 1

Site Location: Harpursville, NY | Date: 3/26/08

Site/Well No.: Combined Influent | Replicate No.: — | Code No.: ____

Weather: — | Sampling Time: Begin 1158 End 1200

Evacuation Data

Measuring Point	
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	
Odor	
Appearance	
pH (s.u.)	
Conductivity (mS/cm)	
(µmhos/cm)	
Turbidity (NTU)	
Temperature (°C)	
Dissolved Oxygen (mg/L)	
ORP	
Sampling Method	~~Bailer~~ direct
Remarks	System Sampling

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML VOA Vials	—	
TOC	250 ML Plastic	—	Unpres.
Total Iron	250 ML Plastic	1	HNO3

Sampling Personnel: KA / DM

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Appendix B

New York State Department of Environmental Conservation DAR-1 Air Modeling Data

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Appendix C

Automated Reagent Injection System
Operating Parameters

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Table C-1. Automated Reagent Injection System Summary of Operational Year 6, Quarter Number 2 Injection Quantities, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Summary of Automated Reagant Injections

Date 1/28/2008	Total Quantity of Molasses Solution Injected (gal.)	Total Quantity of Molasses Injected (gal.)	Total Quantity of Rinse Water Injected (gal.)
1/28/2008	13,705	137	320
Quarter Totals (gal.) =	**13,705**	**137**	**320**
Totals Since Startup (gal.) =	**158,342**	**8,876**	**8,423**

Notes:

gal. Gallons

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Table C-2. Automated Reagent Injection System, Operational Year 6, Quarter Number 2 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Injection Number 57

Injection Start Date = 12/24/2008
Injection Completion Date = 1/28/2008

Molasses to Water Ratio (%) = 1.0 Programmed Mixing Time (min.)[1] = 60

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[2] Quantity (gal.)	Raw Molasses Per Well (gal.)	Min. Injection[3] Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	530	20	5.3	NM	28
IW-3	530	20	5.3	NM	29
IW-1	210	20	2.1	NM	28
IW-2	210	20	2.1	NM	29
GMMW-1	140	20	1.4	NM	7
IW-4	989	20	9.9	NM	29
IW-5	989	20	9.9	NM	29
IW-6	989	20	9.9	NM	28
IW-7	989	20	9.9	NM	29
IW-8[4]	0	0	0.0	NM	0
IW-9	1,230	20	12.3	NM	0
IW-10	1,230	20	12.3	NM	28
IW-11	1,230	20	12.3	NM	28
IW-12	1,230	20	12.3	NM	28
IW-13	1,230	20	12.3	NM	35
IW-14	989	20	9.9	NM	28
IW-15	989	20	9.9	NM	28
Totals (gal.) =	13,705	320	137.1	NA	NA

Notes:

gal.	Gallons.
min.	Minutes.
i.w.c.	Inches of water column.
psi	Pounds per square inch.
gpm	Gallons per minute.
NA	Not applicable.
NM	Not measured.
1.	Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2.	Rinse quantity was injected manually at 20 gpm for 1 minute.
3.	Parameter not measured due to SCADA system malfunction.
4.	Injection not conducted into IW-8 for ongoing Alternate Electron Donor Pilot test evaluation.

Table 3. Concentrations of General Chemistry, Field Parameters, and Dissolved Gases Detected in Groundwater, Operational Year 6, Quarter Number 2, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	IW-13 3/26/08	IW-13 12/19/07	IW-13 3/25/08	TW-01 12/18/07	TW-01 3/25/08
	UNITS					
GENERAL CHEMISTRY						
Total Organic Carbon	mg/L	**130**	**300**	**100**	**150**	**200**
FIELD PARAMETERS						
pH	Standard units	**5.35**	**5.69**	**6.32**	**6.33**	**6.71**
Specific Conductance	mmhos/cm	**0.179**	**0.689**	**0.589**	**1.21**	**1.49**
Turbidity	NTU	--	--	--	**440**	--
Dissolved Oxygen	mg/L	**0.82**	**1.65**	**1.33**	**2.74**	**1.02**
Temperature	deg C	**12.64**	**6.82**	**9.59**	**11.1**	**11.47**
ORP	mV	**6**	**-62**	**-65**	**-98**	**-121**
DISSOLVED GASES						
Carbon dioxide	mg/L	--	--	--	--	<5.00
Carbon monoxide	mg/L	--	--	--	--	<1.00
Ethane	ng/L	--	--	--	**840**	**1,000**
Ethene	ng/L	--	--	--	**3,900**	**3,200**
Methane	ug/L	--	--	--	**21,000**	**17,000**
Nitrogen	mg/L	--	--	--	--	**7.80**
Oxygen	mg/L	--	--	--	--	**1.70**

Bold Constituent detected above MDL.

mg/L	Milligrams per liter.
mmhos/cm	Millimhos per centimeter.
NTU	Nephelometric Turbidity Units.
deg C	Degrees Celsius.
mV	Millivolts.
ng/L	Nanograms per liter.
--	Not analyzed or collected.
ug/L	Micrograms per liter.
IW	Injection well.
ORP	Oxidation-reduction potential.
J	Qualifier assigned to analytical data indicating result is estimated.

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Table 4. PT Groundwater Remediation System Operating Parameters, Operational Year 6, Quarter Number 2, Colesville Landfill, Broome County, New York.

Date	Time Recorded	Air Stripper Measurements: Blower Discharge Pressure PI-301 (i.w.c.)	Air Stripper Measurements: Blower Effluent Flowrate (scfm)	Flow Measurements: Total[1] Effluent Totalizer FQI-401 (gallons)	Flow Measurements: Water Bypass[2] Totalizer FQI-402 (gallons)	Flow Measurements: GMPW-3 Totalizer FQI-101 (gallons)	Flow Measurements: GMPW-4 Totalizer FQI-102 (gallons)	Flow Measurements: GMPW-5 Totalizer FQI-103 (gallons)
1/16/2008	4:00 PM	9.0	225	217,606.1	NM	522,529.9	211,185.1	423,152.9
3/26/2008	3:14 PM	8.5	209	287,023.3	NM	535,042.6	240,330.3	434,293.5
Average Daily Flowrate During Reporting Period (gpm) =				**0.69**	NA	**0.12**	**0.29**	**0.11**
Total Groundwater Recovered During Reporting Period (gallons) =				**69,417**	NA	**12,513**	**29,145**	**11,141**

NA	Not applicable
NM	Not measured.
gpm	Gallons per minute.
i.w.c.	Inches of water column.
scfm	Standard cubic feet per minute.

Notes:

1. Total effluent totalizer replaced on 12/23/2005
2. Water bypass totalizer was damaged as a result of freezing in February 2007.

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Table 5. Concentrations of Volatile Organic Compounds and Selected Metals Detected in Aqueous Samples Collected from the PT System, Operational Year 6, Quarter Number 2, Colesville Landfill, Broome County, New York[5,6].

Constituents	Model Technology BPJ Limits[1,2] (ug/L)	Sample ID:	GMPW-3 INF	GMPW-4 INF	GMPW-5 INF	COMBINED INF	COMBINED EFF
		Date:	3/26/2008	3/26/2008	3/26/2008	3/26/2008	3/26/2008
1,1,1-Trichloroethane	39741		**19**	**13**	<1.0	**16**	<1.0
1,1,2-Trichloroethane	10		<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	10		**51**	**69**	<1.0	**53**	<1.0
1,1-Dichloroethene	10		**1.4**	**1.2**	<1.0	**1.2**	<1.0
1,2-Dichloroethane	10-30		<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	NA		<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	5		**2.8**	**3.3**	<1.0	**2.6**	<1.0
Carbon Tetrachloride	NA		<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	NA		**2.8**	**7.3**	<1.0	**3.9**	<1.0
Chloroethane	NA		**16**	**29**	<1.0	**19**	<1.0
Chloroform	NA		<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	10		**74**	**53**	<1.0	**57**	<1.0
Dichlorodifluoromethane	NA		**1.0**	**1.6**	<1.0	**1.5**	<1.0
Ethylbenzene	5		<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	10-50		**1.8**	**2.0**	<1.0	**1.6**	<1.0
Methyl tert-butyl ether	50		<1.0	<1.0	<1.0	<1.0	<1.0
Naphthalene	10		<1.0	<1.0	<1.0	<1.0	<1.0
o-Xylene	5		<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	10		**1.7**	<1.0	<1.0	**1.0**	<1.0
Toluene	5		<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	10-50		<1.0	<1.0	<1.0	**1.3**	<1.0
Trichloroethene	10		**54**	**59**	<1.0	**50**	<1.0
Vinyl Chloride	10-50		<1.0	**14**	<1.0	**9.1**	<1.0
Total VOCs			**225.5**	**252.4**	**0.0**	**217.2**	**0.0**

Metals (units in mg/L)	Model Technology BPJ Limits[3,4] (mg/L)					
Total Iron	1.2 / 0.61	**2.67**	**0.164**	**0.421**	**7.17**	**0.172**

See Notes on Last Page.

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Table 6. PT Groundwater Remediation System Mass Removal Rate of Volatile Organic Compounds, Operational Year 6, Quarter Number 2, Colesville Landfill, Broome County, New York.

Date Sampled	Total VOC Influent Concentration (ug/L)	Total Effluent Totalizer[4] FQI-401 (gallons)	Total Groundwater Recovered[1] Between Sampling Intervals (gal)	Influent Concentration[2] Geometric Mean (ug/L)	Total Estimated Mass[3] Removed (lbs)
1/17/2008	220.1	217,606	NA	NA	NA
3/26/2008	217.2	287,023	69,417	219	0.13
			Total Estimated Mass Removed During Operational Year 6, Quarter Number 2 (lbs) =		**0.13**
			Total Estimated Mass Removed Since System Startup (lbs) =		**2.80**

Notes:

NA	Not applicable.
ug/L	Micrograms per liter.
gal	Gallons.
lbs	Pounds.
VOC	Volatile organic compound.

1. Total Groundwater Recovered Between Sampling Intervals = Well Totalizer Reading for current sampling event - Well Totalizer Reading for prior sampling event.
2. Influent Concentration Geometric Mean = (Influent Concentration for prior sampling event x Influent Concentration for current sampling event) ^ (1/2).
3. Total Mass Removed = (Total Groundwater Recovered Between Intervals) x Influent Concentration Geometric Mean x 3.7854 L/gallon x (1 lb / 453,592,370 ug).
4. Total effluent totalizer was replaced on March 13, 2007.