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Infrastructure, environment, facilities

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Mr. George Jacob
United Stated Environmental Protection Agency – Region 2
290 Broadway, 20th Floor
New York, New York 10007-1866

ENVIRONMENT

Subject:
Operational Year 4 Quarter Number 1 Monitoring Report,
Colesville Landfill, Broome County, New York. (Site No. 704010).

Date:
16 June 2006

Dear Mr. Jacob:

On behalf of Broome County, ARCADIS is providing the Operational Year 4 Quarter Number 1 Monitoring Report for the Colesville Landfill, Broome County, New York.

Please feel free to contact me if you have any questions or comments.

Sincerely,

ARCADIS G&M, Inc.

Steven M. Feldman
Project Manager

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Imagine the result

Operational Year 4
Quarter Number 1
Monitoring Report

Colesville Landfill,
Broome County, New York
NYSDEC Site 704010

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Operational Year 4
Quarter Number 1
Monitoring Report

Colesville Landfill,
Broome County, New York
NYSDEC Site 704010

Prepared for:
Broome County Division of Solid Waste Management

Prepared by:
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Our Ref.:
NY000949.00019.00004

Date:
June 16, 2006

Tables

Figures

Appendices

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 December 2005 groundwater quality monitoring event conducted during Operational Year 4, Quarter Number 1. A description of the operation, maintenance, and monitoring (OM&M) associated with the Groundwater Remediation System from October 2005 through December 2005 has also been included. In addition, this report describes SP-5 Spring Water Remediation System OM&M activities conducted during this quarter. 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 4, Quarter Number 1. 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 4, Quarter Number 1 included the following:

- Groundwater samples were collected from six monitoring wells (Year 4, Q1 list of wells and the newly installed well GMMW-7) during the week of December 19,

2005 and were selectively analyzed for volatile organic compounds (VOCs) and select inorganic parameters. Field parameters were also recorded at these monitoring locations.

- Samples (VOCs only) were collected at the SP-2 and SP-3 spring water locations on December 23, 2005.

- Samples (VOCs only) were collected at the SP-4 and F-6 surface water locations on December 23, 2005.

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 4, Quarter Number 1 were as follows:

- Pump-and-treat (PT) system production well influent and effluent samples were collected during the OM&M quarterly site visit completed during the week of December 19, 2005. The samples were selectively analyzed for VOCs and total iron.

- One vapor sample from the PT system air stripper effluent was collected during the OM&M quarterly site visit completed during the week of December 19, 2005. 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 on December 22, 2005.

- 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 production wells GMPW-3, GMPW-4 and 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

SP-5 Spring Water Remediation System OM&M was conducted on November 17 and December 23, 2005. Liquid phase granular activated carbon (LPGAC) media was replaced on November 17, 2005. System OM&M was conducted on December 23, 2005 in accordance with the LTM Plan Addendum for Spring Water Remediation Systems (ARCADIS 2003) and consisted of the collection of influent and effluent spring water samples for analysis of VOCs. Discharge flow rate and depth to water in the treatment unit were also recorded. The influent sample was collected after removing three well volumes from the influent monitoring well, which is located within the SP-5 treatment unit and screened below the liquid phase granular activated carbon (LPGAC) zone. The treatment system effluent sample was collected as a grab sample from the discharge pipe prior to entering the riprap-lined outlet. All spring water samples were analyzed for VOCs using USEPA Method 8260.

3. Groundwater Flow

A synoptic round of water level measurements will be completed during Quarters 2 and 4 for evaluation of groundwater flow conditions.

4. Groundwater Quality

The following sections describe the analytical results for groundwater samples collected during the December 2005 monitoring round (Operational Year 4, Quarter Number 1). Groundwater analytical results are provided in Tables 1 and 2. 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 1, total VOC (TVOC) concentrations in monitoring well GMMW-5, which is located closest to the IRZ, decreased significantly to 227.9 micrograms per liter (ug/L) during the current reporting period.

TVOC concentrations in mid-plume monitoring wells located down-gradient of the IRZ were stable to decreasing during this reporting period. Specifically, TVOC

concentrations in monitoring wells PW-4, GMMW-6, W-5 and GMMW-2 decreased to 51.4 ug/L, 899.6 ug/L, 196.9 ug/L and 435.2 ug/L, respectively. TVOC concentrations in landfill perimeter well GMMW-7 (located up-gradient of the IRZ) increased to 1,051.9 ug/L.

PT system analytical VOC results are provided in Table 6. During the current reporting period, groundwater TVOC concentration at PT system production well GMPW-5 decreased significantly, while TVOC concentration at production wells GMPW-3 and GMPW-4 were consistent with prior rounds of data. Specifically, TVOC concentrations in production wells GMPW-3, GMPW-4, and GMPW-5 were 363.3 ug/L, 390.2 ug/L, and 39.3 ug/L, respectively. A complete evaluation of performance monitoring conducted on the PT system is provided in Section 7.1.2 of this report.

4.2 Indicators of Reducing Conditions

In accordance with the Proposed Modifications to Long-Term Monitoring Program (ARCADIS 2005), laboratory analytical parameters which typically demonstrate reducing conditions (i.e., dissolved oxygen [DO] and methane) were not collected during the reporting period. ARI system performance monitoring details are provided in Section 7.2.2 of this report.

4.3 Evidence of Biodegradation

In accordance with the LTM plan, the monitoring wells were not sampled for light hydrocarbons (i.e. ethane and ethane) during this reporting period and will be sampled during the next reporting period. Additional details on the results of biogeochemical monitoring as evidence of Groundwater Remediation System performance and effectiveness are discussed in Section 7.2.2 of this report.

5. Spring Water Quality

Spring water analytical results for VOCs are summarized in Table 3. As shown in Table 3, TVOC concentrations at the SP-2 spring water sampling location increased to 65.2 ug/L, while TVOC concentrations at the SP-3 spring water sampling location remained consistent with previous data at 8.7 ug/L. In order to confirm spring water quality, the SP-2 sampling location will resampled during the next quarterly sampling event.

Analytical results for the former SP-4 spring location are provided in Section 6 below. Analytical results for the SP-5 Spring Water Remediation System are discussed in Section 8 of this report.

6. Surface Water Quality

Surface water quality analytical results for the Operational Year 4, Quarter Number 1 monitoring round are summarized in Table 4. As shown in Table 4, surface water quality at the F-6 and SP-4 sampling locations remains consistent with prior rounds of analytical data. Specifically, TVOC concentrations at the F-6 and SP-4 sampling locations were 1.7 ug/L and 2.6 ug/L, respectively. The data continue to indicate that the SP-4 spring location remedial construction was successful in preventing surface water impacts caused by the former SP-4 spring.

7. Groundwater Remediation System Performance

The following section describes the results of the Groundwater Remediation System performance monitoring conducted during Operational Year 4, Quarter Number 1.

7.1 PT System

The following section describes the results of the PT system performance monitoring conducted during Operational Year 4, Quarter Number 1.

7.1.1 Summary of Operation, Maintenance, and Monitoring

The PT system operated continuously during Operational Year 4, Quarter Number 1. PT system OM&M was conducted on December 23, 2005 and included operation and maintenance of system equipment, collection of system performance samples (water and vapor), and recording system operating parameters. Table 5 provides a summary of the recorded system operating parameters. As shown in Table 5, the total influent groundwater recovery rate was approximately 0.54-gallons per minute (gpm), with individual recovery rates of 0.02-gpm, 0.26-gpm, and 0.26-gpm for production wells GMPW-3, GMPW-4, and GMPW-5, respectively. The average recovery rate at GMPW-3 continued to remain well below system startup conditions during Operational Year 4, Quarter Number 1. Since the recovery wells were redeveloped in August 2005 and instantaneous water recovery rates in GMPW-3 indicate that GMPW-3 is operating as designed, ARCADIS will evaluate whether the observed water recovery rate decline in GMPW-3 may be a result of an equipment malfunction rather than a well screen problem. The average recovery rate of production wells GMPW-4

and GMPW-5 were consistent when compared to previous operation. A total of 78,390 gallons of groundwater were recovered during the reporting period and a total of 1,017,540 gallons of groundwater have been recovered since system startup. The low profile air stripper operated at design specifications with the blower discharge pressure of 8.9-inches of water column (i.w.c.) and a low profile air stripper blower flowrate of 292 standard cubic feet per minute (scfm).

7.1.2 Results of Performance Sampling

PT system performance sampling for Operational Year 4, Quarter Number 1 was conducted on December 22, 2005. As discussed previously, five groundwater samples and one vapor sample were collected. Groundwater samples included collection of individual production 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 6 provides a summary of the PT system performance groundwater sampling analytical results. As shown in Table 6, 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 was below the respective recommended daily average BPJ limit. Based on the total groundwater recovered during the reporting period and total influent groundwater concentration, an estimated 0.14 pounds (lbs) of VOC mass were removed from the subsurface during the quarterly reporting period, as shown in Table 7. A total of approximately 1.76 lbs of VOCs have been removed from the subsurface since system startup.

Table 8 provides a summary of the PT system performance vapor sampling analytical results. As shown in Table 8, 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 or the detection limit of all constituents, which were not detected but have historically been detected in the influent groundwater. All COCs were below their respective short-term guidance concentrations (SGCs) and annual guidance 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 4, Quarter Number 1.

7.2.1 Summary of Operation, Maintenance, and Monitoring

As recommended in the Operational Year 3 Annual Monitoring Report (ARCADIS 2006), injection parameters were re-evaluated to optimize performance of the IRZ during the current reporting period. Specifically, the injected electron donor solution volume was increased from 2,720 gal to 13,500 gal per injection, the electron donor solution concentration was reduced from 10-percent to 1-percent by volume, and the injection frequency was decreased from monthly to quarterly. The benefits of the modified methodology are as follows:

- Injection of a larger volume ensures more complete coverage of the target zone and enhances contact with adsorbed phase contaminant mass.
- Injection of a more dilute solution reduces the risk of pH fluctuations caused by fermentation of excess organic carbon.
- The modified methodology requires less frequent injections and optimizes the use of electron donor solution.

ARI system OM&M was conducted during the Operational Year 4, Quarter Number 1 OM&M site visit on December 23, 2005 and included operation and maintenance of system equipment. In addition, ARI system operating parameters were recorded during the automated injection event. One quarterly automated injection was conducted during Operational Year 4, Quarter Number 1. The injection began on November 17, 2005 and was completed on December 21, 2005. Based on the number of injection events, quantity of molasses solution delivered to each injection well, and molasses solution percentage, approximately 13,500-gallons of molasses solution were delivered to the subsurface during Operational Year 4, Quarter Number 1. A total of 80,214 gallons of molasses solution have been delivered since system startup. Appendix C provides a summary of the recorded system operating parameters for each of the injection events for this period.

7.2.2 Results of Performance Sampling

ARI system performance sampling was conducted on December 22, 2005. As discussed previously, this event consisted of obtaining TOC samples at three injection wells. Analytical results from select monitoring wells under the environmental effectiveness monitoring program were also utilized to determine the effectiveness of the ARI system. Summary of key observations is as follows:

- TOC analytical data indicate that sufficient organic carbon was delivered to the subsurface during the operating period. Specifically, TOC at injection wells IW-2, IW-8, and IW-13 were 4,010 mg/L, 2,100 mg/L, and 577 mg/L, respectively. Similarly, TOC at monitoring well GMMW-5 was 84.3 mg/L.

- As referenced previously, TVOC concentrations within well GMMW-5 decreased significantly from 520.2 ug/L to 227.9 ug/L when comparing Operational Year 4, Quarter Number 1 data to Operational Year 3, Quarter Number 4 data.

- As a result of reduced injection donor concentration, measured pH at injection wells IW-2, IW-8, and IW-13 increased to 4.24, 4.14, and 5.43. These data indicate that reduction in injection donor concentration successfully reduced pH fluctuations in the injection wells, which are an evidence of fermentation of excess organic carbon.

8. Spring Water Remediation System Performance

SP-5 Spring Water Remediation System OM&M was conducted on December 23, 2005 in accordance with the LTM Plan Addendum for Spring Water Remediation Systems (ARCADIS 2003). SP-5 remediation system analytical results are provided in Table 9. As shown in Table 9, all effluent COCs were treated to below their respective BPJ limits via the LPGAC. Influent TVOC analytical data (73.4 ug/L) remained consistent with historical analytical data. Table 10 contains the SP-5 Spring Water Remediation System field parameters recorded during Operational Year 4, Quarter Number 1. As shown in Table 10, the SP-5 remedial system treated approximately 34,888 gallons of spring water during the operating period. An estimated 0.03 lbs of VOCs was removed by the SP-5 remedial system during the same period. An estimated 823,086 gallons of spring water have been treated and an estimated 0.62 lbs of VOC mass have been recovered since system startup.

9. Conclusions

Based on the data obtained from the Operational Year 4, Quarter Number 1 monitoring, ARCADIS concludes the following:

- The revised injection methodology appears to have produced an immediate benefit to the anaerobic IRZ. Specifically, as discussed in section 7.2.2, reduction in injection donor concentration successfully reduced pH fluctuations in the injection wells. Furthermore, TVOC concentrations at monitoring well GMMW-5 (located closest to the IRZ injection wells) decreased significantly. Finally, sufficient TOC was delivered to the subsurface to maintain the reducing conditions.

- The Groundwater Remediation System operated continuously during the current reporting period. Similarly to the Operational Year 3, Quarter Number 4 operating period, the recovery rate in production well GMPW-3 remained below historical levels.

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

- The ARI system is operating as designed and has established an anaerobic IRZ in the vicinity of and downgradient of the injection wells.

- The SP-5 Spring Water Remediation System is operating as designed and is treating recovered spring water VOCs to below BPJ limits prior to discharge.

10. Recommendations

The following recommendations are made for Operational Year 4, Quarter Number 2 activities:

- Collect a confirmatory sample of the SP-2 spring water during the Operational Year 4, Quarter Number 2 monitoring event as a result of the anomalous increase in TVOC concentrations.

- Continue to operate the ARI system following the modified injection methodology utilized during the current reporting period.

- Continue to evaluate and troubleshoot performance of the recovery well GMPW-3 to determine the cause of decreased performance.

11. Project Schedule

Groundwater environmental effectiveness monitoring is scheduled to be conducted for Operational Year 4 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.

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 Operational Year 3 Annual Monitoring Report, Broome County, New York, NYSDEC Site 704010. March 2, 2006.

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Table 1. Concentrations of Volatile Organic Compounds Detected in Groundwater, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID:	GMMW-02	GMMW-02	GMMW-05	GMMW-05	GMMW-06	GMMW-06	GMMW-06*	GMMW-07	GMMW-07
	Date:	9/15/2005	12/21/2005	9/15/2005	12/21/2005	9/15/2005	12/21/2005	12/21/2005	9/14/2005	12/21/2005
1,1,1-Trichloroethane		**38**	**30**	<5.0	<1.0	**4.2J**	**4.9**	**4.7**	**16**	**22**
1,1,2-Trichloroethane		<1.0	<1.0	<5.0	<1.0	**2.4J**	**2.6**	**2.6**	**2.2**	<5.0
1,1-Dichloroethane		**110**	**95**	**47**	**22**	**380J**	**370**	**360**	**240**	**350**
1,1-Dichloroethene		**2.0**	**2.1**	<5.0	<1.0	**1.2J**	**1.5**	**1.8**	**2.6**	**5.1**
1,2-Dichloroethane		<1.0	<1.0	<5.0	**2.0**	<1.0J	**3.0**	**3.1**	**2.4**	<5.0
1,2-Dichloropropane		<1.0	<1.0	<5.0	<1.0	<1.0J	**1.3**	**1.1**	<1.0	<5.0
Benzene		**3.4**	**3.0**	<5.0	**1.3**	**7.7J**	**6.1**	**6.1**	**1.8**	<5.0
Chlorobenzene		**40**	**38**	**45**	**19**	**43J**	**39**	**35**	**19**	**23**
Chloroethane		**37**	**27**	**240**	**120**	**200J**	**150**	**160**	**79**	**93**
Chloroform		<1.0	<1.0	<5	<1.0	**1.3J**	**1.5**	**1.5**	**1.2**	<5.0
cis-1,2-Dichloroethene		**150**	**140**	**150**	**43**	**180J**	**200**	**200**	**200**	**390**
Dichlorodifluoromethane		<1.0	**1.1**	<5.0	<1.0	**4.6J**	**3.6**	**3.7**	<1.0	<5.0
Ethylbenzene		<1.0	<1.0	<5.0	<1.0	<1.0J	<1.0	<1.0	<1.0	<5.0
Methylene chloride		<1.0	**2.0**	<5.0	**2.5**	<1.0J	**11**	**12**	<1.0	**6.8**
Methyl tert-butyl ether		<1.0	<1.0	<5.0	<1.0	**13J**	<1.0	<1.0	**4.3**	<5.0
Naphthalene		<1.0	<1.0	<5.0	<1.0	<1.0J	<1.0	<1.0	<1.0	<5.0
o-Xylene		<1.0	<1.0	<5.0	**3.5**	**1.4J**	**1.2**	**1.1**	<1.0	<5.0
Tetrachloroethene		<1.0	<1.0	<5.0	<1.0	<1.0J	<1.0	<1.0	<1.0	<5.0
Toluene		<1.0	<1.0	**6.2**	**3.2**	**2.1J**	**1.4**	**1.3**	<1.0	<5.0
trans-1,2-Dichloroethene		<1.0	<1.0	<5.0	<1.0	**2.1J**	**1.9 J**	**2.4 J**	<1.0	<5.0
Trichloroethene		**84**	**82**	<5.0	**1.6**	**6.7J**	**5.6**	**6.5**	**59**	**72**
Vinyl chloride		**18**	**15**	**32**	**9.8**	**120J**	**95**	**100**	**88**	**90**
Total VOCs		**482.4**	**435.2**	**520.2**	**227.9**	**969.7**	**899.6**	**902.9**	**715.5**	**1051.9**

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 1. Concentrations of Volatile Organic Compounds Detected in Groundwater, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID: / Date:	PW-04 9/14/2005	PW-04 12/21/2005	W-05 9/15/2005	W-05 12/21/2005	TBV122105 12/21/2005	FBV122105 12/21/2005
1,1,1-Trichloroethane		**16**	**13**	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		**13**	**8.8**	**77**	**72**	<1.0	<1.0
1,1-Dichloroethene		<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
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene		<1.0	<1.0	**4.2**	**5.2**	<1.0	<1.0
Chlorobenzene		<1.0	<1.0	**18**	**19**	<1.0	<1.0
Chloroethane		**4.9**	**2.4**	**110**	**84**	<1.0	<1.0
Chloroform		**1.2**	**1.4**	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene		**15**	**7.5**	**1.5**	**3.2**	<1.0	<1.0
Dichlorodifluoromethane		<1	**1.3**	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride		<1.0	<1.0	**1.9**	**2.5**	<1.0	<1.0
Methyl tert-butyl ether		<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
o-Xylene		<1.0	<1.0	<1.0	**1.3**	<1.0	<1.0
Tetrachloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene		<1.0	<1.0	**1.2**	**1.3**	<1.0	<1.0
trans-1,2-Dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene		**21**	**17**	**1.5**	**3.3**	<1.0	<1.0
Vinyl chloride		<1.0	<1.0	**8.3**	**5.1**	<1.0	<1.0
Total VOCs		**71.1**	**51.4**	**223.6**	**196.9**	**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.

Table 2. Concentrations of Selected Metals, General Chemistry, Field Parameters, and Dissolved Gases Detected in Groundwater, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	GMMW-02 9/15/05	GMMW-02 12/22/05	GMMW-05 9/15/05	GMMW-05 12/22/05
	UNITS				
METALS					
Iron, Dissolved	mg/L	--	--	--	--
Manganese, Dissolved	mg/L	--	--	--	--
GENERAL CHEMISTRY					
Bromide	mg/L	--	--	--	--
Chloride	mg/L	--	--	--	--
Nitrogen, Nitrate (As N)	mg/L	--	--	--	--
Nitrogen, Nitrite	mg/L	--	--	--	--
Total Organic Carbon	mg/L	<2.0	**5.07**	--	**84.3**
Sulfate	mg/L	--	--	--	--
Sulfide (field)	mg/L	**0.203**	--	--	--
Iron (field)	mg/L	--	--	--	--
FIELD PARAMETERS					
pH	Standard units	**6.05**	**6.4**	**6.17**	**6.47**
Specific Conductance	mmhos/cm	**0.543**	**0.472**	**1.963**	**0.603**
Turbidity	NTU	--	--	--	--
Dissolved Oxygen	mg/L	**2.26**	--	--	--
Temperature	deg C	**14.54**	**7.7**	**13.04**	**6**
ORP	mV	**212.7**	--	**-75**	--
DISSOLVED GASES					
Carbon dioxide	mg/L	--	--	--	--
Carbon monoxide	mg/L	--	--	--	--
Ethane	ng/L	**490**	--	**68**	--
Ethene	ng/L	**2,100**	--	**9,000**	--
Methane	ug/L	**1,100**	--	**24,000**	--
Nitrogen	mg/L	--	--	--	--
Oxygen	mg/L	--	--	--	--

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 2. Concentrations of Selected Metals, General Chemistry, Field Parameters, and Dissolved Gases Detected in Groundwater, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	GMMW-06 9/15/05	GMMW-06 12/22/05	GMMW-07 9/14/05	GMMW-07 12/22/05
	UNITS				
METALS					
Iron, Dissolved	mg/L	--	--	--	--
Manganese, Dissolved	mg/L	--	--	--	--
GENERAL CHEMISTRY					
Bromide	mg/L	--	--	--	--
Chloride	mg/L	--	--	--	--
Nitrogen, Nitrate (As N)	mg/L	--	--	--	--
Nitrogen, Nitrite	mg/L	--	--	--	--
Total Organic Carbon	mg/L	**5.44**	**5.00**	**2.05**	**3.24**
Sulfate	mg/L	--	--	--	--
Sulfide (field)	mg/L	**0.052**	--	**0.153**	--
Iron (field)	mg/L	--	--	--	--
FIELD PARAMETERS					
pH	Standard units	**6.67**	**6.78**	**6.18**	**6.66**
Specific Conductance	mmhos/cm	**0.816**	**0.869**	**0.321**	**0.28**
Turbidity	NTU	--	--	--	--
Dissolved Oxygen	mg/L	--	--	**0.66**	--
Temperature	deg C	**16.31**	**6.7**	**14.5**	**6.8**
ORP	mV	**-55.6**	--	**224.7**	--
DISSOLVED GASES					
Carbon dioxide	mg/L	--	--	--	--
Carbon monoxide	mg/L	--	--	--	--
Ethane	ng/L	**930**	--	**580**	--
Ethene	ng/L	**73,000**	--	**5,100**	--
Methane	ug/L	**870**	--	**710**	--
Nitrogen	mg/L	--	--	--	--
Oxygen	mg/L	--	--	--	--

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 2. Concentrations of Selected Metals, General Chemistry, Field Parameters, and Dissolved Gases Detected in Groundwater, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	PW-04 9/13/05	PW-4 12/22/05	W-05 9/15/05	W-05 12/22/05
	UNITS				
METALS					
Iron, Dissolved	mg/L	--	--	--	--
Manganese, Dissolved	mg/L	--	--	--	--
GENERAL CHEMISTRY					
Bromide	mg/L	--	--	--	--
Chloride	mg/L	--	--	--	--
Nitrogen, Nitrate (As N)	mg/L	--	--	--	--
Nitrogen, Nitrite	mg/L	--	--	--	--
Total Organic Carbon	mg/L	<2.0	**2.47**	**3.83**	**7.86**
Sulfate	mg/L	--	--	--	--
Sulfide (field)	mg/L	--	--	--	--
Iron (field)	mg/L	--	--	--	--
FIELD PARAMETERS					
pH	Standard units	--	**6.86**	**7.72**	**5.02**
Specific Conductance	mmhos/cm	--	**0.362**	**0.837**	**0.839**
Turbidity	NTU	--	--	--	--
Dissolved Oxygen	mg/L	--	--	--	--
Temperature	deg C	--	**7.2**	**13.91**	**8.6**
ORP	mV	--	--	--	--
DISSOLVED GASES					
Carbon dioxide	mg/L	--	--	--	--
Carbon monoxide	mg/L	--	--	--	--
Ethane	ng/L	**40**	--	**25,000**	--
Ethene	ng/L	**76**	--	**8,900**	--
Methane	ug/L	**5.3**	--	**2,200**	--
Nitrogen	mg/L	--	--	--	--
Oxygen	mg/L	--	--	--	--

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 2. Concentrations of Selected Metals, General Chemistry, Field Parameters, and Dissolved Gases Detected in Groundwater, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	IW-02 9/13/05	IW-02 12/22/05	IW-08 9/13/05	IW-08 12/22/05
	UNITS				
METALS					
Iron, Dissolved	mg/L	--	--	--	--
Manganese, Dissolved	mg/L	--	--	--	--
GENERAL CHEMISTRY					
Bromide	mg/L	--	--	--	--
Chloride	mg/L	--	--	--	--
Nitrogen, Nitrate (As N)	mg/L	--	--	--	--
Nitrogen, Nitrite	mg/L	--	--	--	--
Total Organic Carbon	mg/L	**20,900**	**4,010**	**42,700**	**2,100**
Sulfate	mg/L	--	--	--	--
Sulfide (field)	mg/L	--	--	--	--
Iron (field)	mg/L	--	--	--	--
FIELD PARAMETERS					
pH	Standard units	**3.9**	**4.24**	**1.91**	**4.14**
Specific Conductance	mmhos/cm	--	--	**3.675**	--
Turbidity	NTU	--	--	--	--
Dissolved Oxygen	mg/L	--	--	--	--
Temperature	deg C	--	--	**16.64**	--
ORP	mV	--	--	--	--
DISSOLVED GASES					
Carbon dioxide	mg/L	--	--	--	--
Carbon monoxide	mg/L	--	--	--	--
Ethane	ng/L	--	--	--	--
Ethene	ng/L	--	--	--	--
Methane	ug/L	--	--	--	--
Nitrogen	mg/L	--	--	--	--
Oxygen	mg/L	--	--	--	--

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 2. Concentrations of Selected Metals, General Chemistry, Field Parameters, and Dissolved Gases Detected in Groundwater, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	UNITS	IW-13 9/13/05	IW-13 12/22/05
METALS				
Iron, Dissolved		mg/L	--	--
Manganese, Dissolved		mg/L	--	--
GENERAL CHEMISTRY				
Bromide		mg/L	--	--
Chloride		mg/L	--	--
Nitrogen, Nitrate (As N)		mg/L	--	--
Nitrogen, Nitrite		mg/L	--	--
Total Organic Carbon		mg/L	**507**	**577**
Sulfate		mg/L	--	--
Sulfide (field)		mg/L	--	--
Iron (field)		mg/L	--	--
FIELD PARAMETERS				
pH		Standard units	**4.96**	**5.43**
Specific Conductance		mmhos/cm	**0.906**	--
Turbidity		NTU	--	--
Dissolved Oxygen		mg/L	--	--
Temperature		deg C	--	--
ORP		mV	--	--
DISSOLVED GASES				
Carbon dioxide		mg/L	--	--
Carbon monoxide		mg/L	--	--
Ethane		ng/L	--	--
Ethene		ng/L	--	--
Methane		ug/L	--	--
Nitrogen		mg/L	--	--
Oxygen		mg/L	--	--

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 Volatile Organic Compounds Detected in Spring Water, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID: / Date:	SP-2 6/22/2005	SP-2 12/23/2005	SP-3 6/22/2005	SP-3 12/23/2005
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		<1.0	**46**	**1.3**	**6.0**
1,1-Dichloroethene		<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane		<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0
Benzene		<1.0	<1.0	<1.0	<1.0
Chlorobenzene		<1.0	**2.9**	<1.0	**1.1**
Chloroethane		<1.0	**7.0**	<1.0	<1.0
Chloroform		<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene		<1.0	**3.7**	**5.5**	**1.6**
Dichlorodifluoromethane		<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0
Methylene chloride		<1.0	<1.0	<1.0	<1.0
Methyl tert-butyl ether		<1.0	<1.0	<1.0	<1.0
Naphthalene		<1.0	<1.0	<1.0	<1.0
o-Xylene		<1.0	<1.0	<1.0	<1.0
Tetrachloroethene		<1.0	<1.0	<1.0	<1.0
Toluene		<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene		<1.0	<1.0	<1.0	<1.0
Trichloroethene		<1.0	**3.5**	<1.0	<1.0
Vinyl chloride		<1.0	**2.1**	<1.0	<1.0
Total VOCs		**0.0**	**65.2**	**6.8**	**8.7**

Bold Constituent detected above MDL.

VOCs Volatile Organic Compounds.

ug/L Micrograms per liter.

Table 4. Concentrations of Volatile Organic Compounds Detected in Surface Water, Operational Year 4, Quarter number 1, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID: / Date:	F-6 6/22/2005	F-6 12/23/2005	SP-4 6/22/05	SP-4 12/23/05
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		**2.0**	**1.7**	<1.0	**2.6**
1,1-Dichloroethene		<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane		<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0
Benzene		<1.0	<1.0	<1.0	<1.0
Chlorobenzene		<1.0	<1.0	<1.0	<1.0
Chloroethane		<1.0	<1.0	<1.0	<1.0
Chloroform		<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene		<1.0	<1.0	<1.0	<1.0
Dichlorodifluoromethane		<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0
Methylene chloride		<1.0	<1.0	<1.0	<1.0
Methyl tert-butyl ether		<1.0	<1.0	<1.0	<1.0
Naphthalene		<1.0	<1.0	<1.0	<1.0
o-Xylene		<1.0	<1.0	<1.0	<1.0
Tetrachloroethene		<1.0	<1.0	<1.0	<1.0
Toluene		<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene		<1.0	<1.0	<1.0	<1.0
Trichloroethene		<1.0	<1.0	<1.0	<1.0
Vinyl chloride		<1.0	<1.0	<1.0	<1.0
Total VOCs		**2.0**	**1.7**	**0.0**	**2.6**

Bold Constituent detected above MDL.
VOCs Volatile Organic Compounds.
ug/L Micrograms per liter.

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Table 5. PT System Operating Parameters, Operational Year 4, Quarter Number 1, Groundwater Remediation System, 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 Effluent Totalizer FQI-401 (gallons)	Flow Measurements: Water Bypass 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)
9/13/2005	4:40 PM	8.5	336 [1]	939,149.4	837,354.5	362,874.4 [2]	287,300.0	312,707.8
12/23/2005	4:00 PM	8.9	292	1,017,539.5	898,562.4	365,695.4	401.0 [3]	351,187.3
		Average Daily Flowrate (gpm) =		**0.54**	**0.42**	**0.02**	**0.26** [3]	**0.26**
		Total Groundwater Recovered During Reporting Period (gallons) =		**78,390**	**61,208**	**2,821**	**37,090** [3]	**38,480**

gpm Gallons per minute.
i.w.c. Inches of water column.
scfm Standard cubic feet per minute.

Notes:

1. Exit velocity was not recorded on 9/13/2005 due to equipment malfunction. Exit velocity measured during an interim site visit on 8/1/2005 is provided above.
2. GMPW-3 totalized flow recorded on 9/13/2005 was erroneously reported as 366,874.4 gallons in the Operational Year 3 Annual Monitoring Report. The corrected value is included in this table.
3. GMPW-4 totalizing flow meter malfuctioned and was replaced on 12/23/2005. Average daily flow rate and total groundwater recovered during this reporting period was based on total groundwater recovered calculated by subtracting volume of groundwater recovered from GMPW-3 and GMPW-5 well from the total effluent groundwater flow recovered during this reporting period.

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Table 6. Concentrations of Volatile Organic Compounds and Selected Metals Detected in Aqueous Samples Collected from the PT System, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York[5,6].

Constituents	Model Technology BPJ Limits[1,2] (ug/L)	Sample ID: Date:	GMPW-3 INF 12/22/2005	GMPW-4 INF 12/22/2005	GMPW-5 INF 12/22/2005	COMBINED INF 12/22/2005	EFFLUENT AC II 12/22/2005
1,1,1-Trichloroethane	10-20		**42**	**43**	**6**	**43**	<1.0
1,1,2-Trichloroethane	10		<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	10		**81**	**84**	**10**	**52**	<1.0
1,1-Dichloroethene	10		**3.6**	**3.4**	<1.0	**3.5**	<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		**5.2**	**5.5**	<1.0	**4.6**	<1.0
Chlorobenzene	NA		**2.7**	**4.5**	<1.0	<1.0	<1.0
Chloroethane	NA		**27**	**29**	**2.9**	**15**	<1.0
Chloroform	NA		<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	10		**88**	**91**	**13**	**88**	<1.0
Dichlorodifluoromethane	NA		**1.8**	**1.8**	<1.0	**1.1**	<1.0
Ethylbenzene	5		<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	10-50		**4.0**	**4.0**	<1.0	**3.1**	<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		<1.0	<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	<1.0	<1.0
Trichloroethene	10		**68**	**81**	**5.4**	**45**	<1.0
Vinyl Chloride	10-50		**40**	**43**	**2.0**	**12**	<1.0
Total VOCs			**363.3**	**390.2**	**39.3**	**267.3**	**0**

Metals (units in mg/L)	Model Technology BPJ Limits[3,4] (mg/L)					
Total Iron	1.2 / 0.61	**4.92**	**0.891**	**0.285**	**0.533**	**0.206**

See Notes on Last Page.

Table 6. Concentrations of Volatile Organic Compounds and Selected Metals Detected in Aqueous Samples Collected from the PT System, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York[5,6].

Notes:

1. Model Technology Best Professional Judgment (BPJ) Limits recommended for Air Stripping with appropriate pretreatment from Attachment C of TOGS 1.2.1.
2. When a range is listed for the BPJ limit, a variation in available references was found. Recommended daily maximum limits should be in this range.
3. Model Technology BPJ Limits recommended for Lime, Settle and Filter treatment.
4. The recommended daily maximum permit limit is 1.2 mg/L and the recommended daily average permit limit is 0.61 mg/L.
5. Production wells were sampled in accordance with the schedule set forth in Table 3 of the Long-Term Monitoring Plan (ARCADIS 2002).
6. Bold values indicate compound detected above method detection limit.

NA	No BPJ limit listed.
J	Estimated Value.
ug/L	Micrograms Per Liter.
mg/L	Milligrams Per Liter.
VOCs	Volatile Organic Compounds.
AC	After Cartridge Filter.
BC	Before Cartridge Filter.
PT	Pump and Treat.
--	Not Analyzed or Collected.
<	Analyte Below Detection Limit.

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Table 7. PT System Mass Removal Rate of Volatile Organic Compounds, Operational Year 4, Quarter Number 1, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Date Sampled	Total VOC Influent Concentration (ug/L)	Total Effluent Totalizer FQI-401 (gallons)	Total Groundwater Recovered[1] Between Sampling Intervals (gal)	Influent Concentration[2] Geometric Mean (ug/L)	Total Estimated Mass[3] Removed (lbs)
9/13/2005	160.8	939,149.4	NA	NA	NA
12/23/2005	267.3	1,017,539.5	78,390.1	207	0.14
			Total Estimated Mass Removed During Operational Year 4, Quarter Number 1 (lbs) =		**0.14**
			Total Estimated Mass Removed Since System Startup (lbs) =		**1.76**

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 Sampling Intervals) x Influent Concentration Geometric Mean x 3.7854 L/gallon x (1 lb / 453,592,370 ug).

Table 8. Concentrations of Volatile Organic Compounds Detected in Air Stripper Effluent, Operational Year 4, Quarter Number 1, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Compounds	CAS Numbers	Sample ID: Date Sampled:	Effluent 12/23/2005 ppbv
Vinyl Chloride	75-01-4		<7.2
Chloroethane(Ethyl Chloride)	75-00-3		<7.2
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4		<7.2
Methylene Chloride(Dichloromethane)	75-09-2		<7.2
1,1-Dichloroethane	75-34-3		<7.2
cis-1,2-Dichloroethylene	156-59-2		<7.2
Chloroform	67-66-3		<7.2
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6		<7.2
Benzene	71-43-2		<7.2
Trichloroethene	79-01-6		<7.2
Toluene	108-88-3		<7.2
Ethyl benzene	100-41-4		<7.2
m,p-Xylene	108-38-3/106-42-3		<7.2
o-Xylene	95-47-6		<7.2
1,2,4-Trimethylbenzene	95-63-6		<7.2
2-Propanol (Isopropyl alcohol)	67-63-0		<7.2
Dichlorodifluoromethane(Freon 12)	75-71-8		<7.2

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.

Table 9. Concentrations of Volatile Organic Compounds Detected in Aqueous Samples Collected from the SP-5 Spring Water Remediation System, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Constituents	Model Technology BPJ Limits[1,2] (ug/L)	Sample ID:	SP-5 INF.	SP-5 EFF.
		Date:	12/23/2005	12/23/2005
VOCs (units in ug/L)				
1,1,1-Trichloroethane	10		<1.0	<1.0
1,1-Dichloroethane	10		**33**	<1.0
1,2-Dichloroethane	10-100		<1.0	<1.0
Benzene	5		**2.8**	<1.0
Chlorobenzene	10-25		**24**	<1.0
Chloroethane	10		**9.3**	**1.4**
cis-1,2-Dichloroethene	10		**1.6**	<1.0
Dichlorodifluoromethane	NA		<1.0	<1.0
Ethylbenzene	5		<1.0	<1.0
Toluene	5		<1.0	<1.0
trans-1,2-Dichloroethene	10-100		<1.0	<1.0
Trichloroethene	10		**2.7**	<1.0
Vinyl Chloride	10		<1.0	<1.0
Total VOCs			**73.4**	**1.4**

Bold Constituent detected above MDL.

ug/L	Micrograms per liter.
VOCs	Volatile organic compounds.
<	Analyte below detection limit.
INF.	Influent.
EFF.	Effluent.
NA	No BPJ limit listed.

Notes:

1. Model Technology Best Professional Judgment (BPJ) Limits recommended for carbon adsorption with appropriate pretreatment from Attachment C of TOGS 1.2.1.
2. When a range is listed for the BPJ limit, a variation in available references was found. Recommended daily maximum limits should be in this range.

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Table 10. Spring Water Remediation System Mass Removal Rate of Volatile Organic Compounds, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Date Sampled	Total VOC Influent Concentration (ug/L)	Effluent Flowrate (gpm)	Depth to Water (feet btc)	Total Groundwater Treated[1] Between Sampling Intervals (gal)	Influent Concentration[2] Geometric Mean (ug/L)	Total Estimated Mass[3] Removed (lbs)
9/15/2005	102.0	1.13	0	NA	NA	NA
12/23/2005	73.4	0.053	0	34,858	86.5	0.03
					Total Estimated Mass Removed During Current Quarter (lbs) =	**0.03**
					Total Estimated Mass Removed Since System Startup (lbs) =	**0.62**
					Total Effluent Treated Since System Startup (gallons) =	**823,056**

Notes:

NA	Not applicable.
NR	Not recorded.
ug/L	Micrograms per liter.
gpm	Gallons per minute.
btc	Below top of casing.
gal	Gallons.
lbs	Pounds.
VOC	Volatile organic compound.

1. Total Spring Water Treated Between Sampling Intervals = Effluent Flowrate x 1440 min/day x days between sampling events.
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 Treated Between Sampling Intervals) x Influent Concentration Geometric Mean x 3.7854 L/gallon x (1 lb / 453,592,370 ug).

Appendix A

Groundwater Sampling Logs

x14 0500849 0018. 000374.
PARAMATER READINGS.

	PH	COND.	TEMP.
IW 2	4.24		
IW 8	4.14		
IW 13	5.43		
MMW 2	6.40	472	7.7 c
MMW 5	6.47	603	6.0 c
GMMW 6	6.78	869	6.7 c
MMW-7	6.66	280	6.8 c
IN-5	8.07	839	8.6 c
W-4	6.16	362	7.2 c
MPW-3	6.29	506	6.9 c
MPW-4	6.10	478	8.1 c
MPW-5	7.60	295	6.7 c PARAMETER WITH A BAICER
COMB. INF	7.22	463	9.3 c
TOTAL EFF	7.70	486	10.4 c
SP-1	7.40	260	8.1 c
SP-3	7.97	111.8	6.7 c. STANDING WATER NEAR SPRING
SP-4	7.30	119.7	6.7 c
SP-5 INF	6.63	553	7.8 c
SP-5 EFF.	6.57	560	6.7 c
F-6	7.30	127.5	3.7 c

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Appendix B

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

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Table B-1. NYSDEC DAR-1 Air Modeling Data, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters for 12/23/2005 Sampling Event			
Discharge Temperature	T	514	°R
Ambient Temperature	Ta	483	°R
Stack Diameter	D	6	in
Stack Radius	R	0.25	ft
Stack Area	A	0.20	ft^2
Exit Velocity	V	24.2	fps
Exit Flow	Q	285	acfm
Exit Flow	Q	292	scfm
Stack Height	h_s	17	ft
Building Height	h_b	13.25	ft
Ratio of Heights	h_s/h_b	1.28	
Plume rise credit? $h_s/h_b > 1.5$?	(If no, $h_e=h_s$)	(If Yes, $h_e = h_s + 1.1 (F_m)^{1/3}$)	
Momentum Flux	Fm = Ta/T * V2 * R2	n/a	ft^4/s^2
Effective Stack Height	h_e	17.0	ft
Reduction Factor? $2.5 > h_s/h_b > 1.5$?		No, do not reduce impact	
Actual Annual Impact	C_a	$RF*6*Q_a/h_e^{2.25}$	
Mass Flow	Q_a	S lbs emitted for last 12 months	

fps: feet per second
acfm: actual cubic feet per minute
ug/m^3: micrograms per cubic meter
lb/yr: pounds per year
lb/hr: pounds per hour
ppb: parts per billion

Notes/Assumptions:

1. The stack discharge temperature is 54°F based on recorded parameters.
2. The ambient temperature is approximately 23°F, the average temperature recorded in Binghamton, NY on December 23, 2005.
3. Calculations assume that the system will run with the maximum allowable concentrations between quarterly readings.
4. AGC refers to the Annual Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated December 22, 2003.
5. To be conservative the lower detection limit was used for compounds that were below the limit of detection, but are found in the influent groundwater of the Groundwater Remediation System.

Table B-2. NYSDEC DAR-1 Air Modeling Data, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Calculation of the Short-Term Guideline Concentration (SGC) for Sampling Event on 12/23/2005

Compounds	CAS Numbers	Maximum Limit (SGC) (ug/m^3)	Analytical Concentration (ppb)	Detection Limit Used	Actual Emissions C_a (ug/m^3)	Mass/hour (lb/hr)	Maximum Potential Impact (Step III.A.3 in DAR-1) (ug/m^3)	Short Term Impact (Step III.A.5 in DAR-1) (ug/m^3)	Percent of the SGC (%)
Vinyl Chloride	75-01-4	180,000	7.2	*	18.71	2.63E-05	0.0045	0.29191	1.6E-04
Chloroethane(Ethyl Chloride)	75-00-3	--	7.2	*	19.31	2.71E-05	0.0046	0.30134	NA
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4	--	7.2	*	29.02	4.08E-05	0.0070	0.45280	NA
Methylene Chloride(Dichloromethane)	75-09-2	14,000	7.2	*	25.42	3.57E-05	0.0061	0.39671	2.8E-03
1,1-Dichloroethane	75-34-3	--	7.2	*	29.62	4.16E-05	0.0071	0.46224	NA
cis-1,2 - Dichloroethylene	156-59-2	--	7.2	*	29.02	4.08E-05	0.0070	0.45280	NA
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6	68,000	7.2	*	39.93	5.61E-05	0.0096	0.62314	9.2E-04
Trichloroethene	79-01-6	54,000	7.2	*	39.33	5.52E-05	0.0094	0.61370	1.1E-03
Dichlorofluoromethane(Freon 12)	75-71-8	--	7.2	*	36.19	5.08E-05	0.0087	0.56466	NA

ug/m^3: Micrograms per cubic meter
ppb: parts per billion
*: Analyte concentration below detection limit, detection limit was used in calculations
lb/hr: pounds per hour
--: No SGC listed for compound
NA: Not applicable

Notes:

1. DAR-1 refers to DAR-1 AGC/SGC Tables dated December 22, 2003.
2. SGC refers to the Short-Term Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated December 22, 2003.
3. To be conservative the lower detection limit was used for compounds that were below the limit of detection, but are found in the influent groundwater of the Groundwater Remediation System.

Table B-3. NYSDEC DAR-1 Air Modeling Data, Operational Year 4, Quarter Number 1, Colesville Landfill, Broome County, New York.

Calculation of AGC based on 12/23/2005 Sampling Event

Compounds	CAS Numbers	Maximum Limit on C_a (AGC[4]) ug/m^3	Maximum Mass Flow Q_a lb/yr	Lab Data ppb	Detection Limit Used[5]	Actual Emissions C_a ug/m^3	Actual Mass Flow per Hour lb/hr	Actual Mass Flow per Year lb/yr	**Percent of Annual %**
Vinyl Chloride	75-01-4	0.11	10.76	7.2	*	18.71	2.05E-05	0.17476	**1.62**
Chloroethane(Ethyl Chloride)	75-00-3	10,000	978,044.97	7.2	*	19.31	2.12E-05	0.18041	**0.00**
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4	70	6,846.31	7.2	*	29.02	3.18E-05	0.27109	**0.00**
Methylene Chloride(Dichloromethane)	75-09-2	2.1	205.39	7.2	*	25.42	2.79E-05	0.23750	**0.12**
1,1-Dichloroethane	75-34-3	0.63	61.62	7.2	*	29.62	3.25E-05	0.27673	**0.45**
cis-1,2-Dichloroethylene	156-59-2	1,900	185,828.54	7.2	*	29.02	3.18E-05	0.27109	**0.00**
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6	1,000	97,804.50	7.2	*	39.93	4.37E-05	0.37306	**0.00**
Trichloroethene	79-01-6	0.5	48.90	7.2	*	39.33	4.31E-05	0.36741	**0.75**
Dichlorodifluoromethane(Freon 12)	75-71-8	12,000	1,173,653.96	7.2	*	17.99	1.97E-05	0.16805	**0.00**

fps: feet per second
acfm: actual cubic feet per minute
ug/m^3: micrograms per cubic meter
lb/yr: pounds per year
lb/hr: pounds per hour
ppb: parts per billion

Notes/Assumptions:

1. The stack discharge temperature is 54°F based on recorded parameters.
2. The ambient temperature is approximately 23°F, the average temperature recorded in Binghamton, NY on December 23, 2005.
3. Calculations assume that the system will run with the maximum allowable concentrations between quarterly readings.
4. AGC refers to the Annual Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated December 22, 2003.
5. To be conservative the lower detection limit was used for compounds that were below the limit of detection, but are found in the influent groundwater of the Groundwater Remediation System.

Appendix C

Automated Reagent Injection System
Operating Parameters

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Table C-1. Automated Reagent Injection System Summary of Operational Year 4, Quarter Number 1 Injection Quantities, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Summary of Automated Reagant Injections

Date	Total Quantity of Molasses Solution Injected (gal.)	Total Quantity of Molasses Injected (gal.)	Total Quantity of Rinse Water Injected (gal.)
11/17/2005	13,500	135	157
Quarter Totals (gal.) =	**13,500**	**135**	**157**
Totals Since Startup (gal.) =	**80,214**	**8,048**	**7,524**

Notes:

gal. Gallons

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Table C-2. Automated Reagent Injection System, Operational Year 4, Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Injection Number 51

Injection Start Date = 11/17/2005
Injection Completion Date = 12/21/2005

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	0	5	0.0	NM	0
IW-3	500	5	5.0	NM	0
IW-1	500	4	5.0	NM	13
IW-2	500	3	5.0	NM	12
GMMW-1	500	3	5.0	NM	0
IW-4	500	4	5.0	NM	13
IW-5	1,000	5	10.0	NM	14
IW-6	1,000	7	10.0	NM	15
IW-7	1,000	8	10.0	NM	16
IW-8	1,000	9	10.0	NM	12
IW-9	1,000	11	10.0	NM	16
IW-10	1,000	12	10.0	NM	18
IW-11	1,000	13	10.0	NM	18
IW-12	1,000	15	10.0	NM	19
IW-13	1,000	16	10.0	NM	20
IW-14	1,000	18	10.0	NM	21
IW-15	1,000	19	10.0	NM	28
Totals (gal.) =	13,500	157	135.0	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 is approximately 1-pipeline volume for each injection well.
3. Parameter not measured due to SCADA system malfunction.