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Infrastructure, environment, facilities

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ENVIRONMENT

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

Subject:
Soil Vapor Screening Evaluation Work Plan
Colesville Landfill Site (Site No. 704010)
Broome County, New York

Date:
October 2, 2008

Contact:
Steven M. Feldman

Phone:
(631) 391-5244

Email:
Steven.Feldman@arcadis-us.com

Our ref:
NY000949.0021.00005

Dear Mr. Jacob:

On behalf of the Broome County Division of Solid Waste Management, ARCADIS is submitting to the U. S. Environmental Protection Agency (EPA) the revised Soil Vapor Screening Evaluation Work Plan (Work Plan) to evaluate the potential for indoor air vapor intrusion at residences in the vicinity of the Colesville Landfill (Site) located in Broome County, New York. This Work Plan addresses the agency comments that were provided on the August 16, 2006 Work Plan for the Site; specifically, the comments that were provided in the EPA e-mail dated January 16, 2007, the New York State Department of Environmental Conservation (NYSDEC) letter dated March 8, 2007, and the New York State Department of Health (NYSDOH) letter dated February 7, 2007.

ARCADIS intends to conduct the field work on October 27 and 28, 2008 and will provide the EPA with advance notification prior to commencing the work. If there are any questions, please do not hesitate to contact me at 631-391-5244.

Sincerely,

ARCADIS

Steven Feldman

Steven M. Feldman
Project Manager

Copies:
Chloe Metz, EPA
Joseph Yavonditte, NYSDEC
Payson Long, NYSDEC
Julia Kenney, NYSDOH
David Donoghue, Broome County
File

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Broome County Division of
Solid Waste Management

Soil Vapor Screening Evaluation Work Plan

Colesville Landfill
Broome County, New York
NYSDEC Site 704010

October 3, 2008

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Project Manager/Associate Vice President

Broome County Division of Solid Waste Management

Soil Vapor Screening Evaluation Work Plan

Colesville Landfill
Broome County, New York
NYSDEC Site 704010

Prepared for:
Broome County Division of Solid Waste Management

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Our Ref.:
NY000949.0021.00005

Date:
October 3, 2008

1. Introduction

On behalf of the Broome County Division of Solid Waste Management, ARCADIS has prepared this Soil Vapor Screening Evaluation Work Plan (Work Plan) to evaluate the potential for indoor air vapor intrusion at residences in the vicinity of the Colesville Landfill (Site). The Site is located in Broome County, New York. The scope of work presented in this Work Plan has been developed in response to a suggestion that was provided in the U.S. Environmental Protection Agency (EPA) Second Five-Year Review Report for the Site dated April 2005. The EPA suggested that sub-slab soil vapor samples be collected beneath homes located hydraulically downgradient of the Site to evaluate the potential for vapor intrusion. Based on follow up discussions with EPA, it was mutually agreed that soil vapor samples would be collected from the interval immediately above the water table to evaluate the potential for vapor intrusion. Consequently, the scope of work presented in this Work Plan has been developed to evaluate volatile organic compounds (VOCs) in soil vapor in the vicinity of the residences.

Consistent with Section 2.2.2 of the October 2006 New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, sub-slab soil vapor samples can be collected after soil vapor characterization and/or other environmental sampling (e.g., soil and groundwater characterization) indicate they are warranted. Therefore, the soil vapor samples will be used as an initial step to determine if VOCs are present in soil vapor on parcels with occupied structures. Sub-slab soil vapor samples may be collected if the soil vapor data indicate they are warranted.

Based on a number of discussions and correspondences with the EPA, the New York State Department of Environmental Conservation (NYSDEC), and the NYSDOH between 2006 and 2008, the key aspects of the work scope are as follows:

- Soil borings will be advanced in the vicinity of the residences and along East Windsor Road.
- It is believed that the North Stream intercepts VOC-impacted groundwater. However, at the request of the EPA, one of the soil borings (SV-1) will be advanced on the west of the North Stream to evaluate the potential for vapor intrusion at the residences on this side of the stream.

- Soil vapor samples will be collected at the interval just above the water table.

- The soil vapor sample results will be evaluated in accordance with the Office of Solid Waste and Emergency Response (OSWER) document entitled, "Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)".

  - The soil vapor sample data will be compared to Target Shallow and Deep Soil Gas Concentrations and evaluated using attenuation factors.

- A summary report will be prepared that describes the sampling methodology and data evaluation, and provides conclusions and recommendations.

2. Environmental Setting

The following subsections of this Work Plan describe the soil type in the vicinity of the proposed soil borings and recent environmental conditions as they relate to groundwater flow conditions and groundwater quality.

2.1 Soil Type

The soil type in the vicinity of the proposed soil borings is glacial till. The surficial till is generally brown in color, consisting of sand and gravel, with some clay and silt. The density of the material, as determined during drilling during remedial investigation activities, was quite low with blow counts generally less than 20 per six inches.

2.2 Groundwater Flow Conditions

Water-level measurements collected in existing wells in June 2005 and September 2005 are provided in Table 1. The depth to water in the vicinity of the residences ranges from 7 to 10 feet below the ground surface. Water-level elevations and the groundwater flow direction for the September 2005 monitoring event are shown on Figure 1. As shown on Figure 1, the groundwater flow direction in the project area (i.e., adjacent to the landfill western perimeter) and site-wide for the September 2005 round 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. The groundwater flow direction in the project area was consistent with previous rounds.

2.3 Groundwater Quality

As shown in Table 2, total VOC (TVOC) concentrations detected in groundwater in monitoring wells ranged from not detected above laboratory reporting limits to 1,378 micrograms per liter (ug/L) (GMMW-6). TVOC concentrations in monitoring wells located in the vicinity and south of East Windsor Road were less than 150 ug/L. The primary constituent of potential concern (COPC) detected downgradient of the Site relative to the soil vapor intrusion pathway is trichloroethene (TCE).

3. Soil Vapor Screening Evaluation

Consistent with the scope of work objectives described in Section 1, this Work Plan focuses on determining if there is a potential for the vapor intrusion pathway to be complete in the vicinity of the residences located hydraulically downgradient of the Site. To meet this objective, a screening evaluation will be conducted through the collection of soil vapor samples in the vicinity of the residences and on the west side of the North Stream.

3.1 EPA Second Five-Year Review Evaluation

During its Second Five-Year Review, EPA evaluated the potential for vapor intrusion into downgradient residences using a conservative screening level analysis. This analysis was conducted by using the worst-case assumption that concentrations in the groundwater under the residences are the same as the maximum chemical concentration that was detected in downgradient off-site monitoring wells. Only the off-site wells were used by the EPA in this screening level evaluation because the on-site wells exhibit concentrations that are not representative of groundwater quality beneath the residences downgradient of the Site.

EPA compared the maximum concentrations of VOCs measured between 2002 and 2004 in the downgradient off-site monitoring wells with the health-based screening criteria provided in the "Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils" (EPA, 2002). This guidance provides chemical-specific groundwater concentrations protective of indoor air quality based on a cancer

risk ranging from one in one million to one in ten thousand ($1x10^{-6}$ to $1x10^{-4}$) and/or a noncancer hazard quotient (HQ) of 1.0.

As described previously, TCE is the primary COPC in groundwater. For TCE, EPA compared the maximum groundwater concentration of TCE detected in a downgradient off-site monitoring well (19 ug/l at well W-18) to the EPA Target Groundwater Concentration (5.3 ug/L), which is based on a cancer risk of one in ten thousand (10^{-4}). The comparison showed that the measured concentration in well W-18 exceeded the Target Groundwater Concentration. While monitoring well W-18 is located on a property where there is currently an abandoned house and, therefore, no current potential for exposure, these results did suggest that vapor intrusion could potentially be a route of future exposure if a residential dwelling were to be constructed there.

It is unlikely that groundwater VOC concentrations in well W-18 are representative of the groundwater VOC concentrations near occupied residences. This is due to the fact that the residences are located either sidegradient of the locations where the highest VOC concentrations have been measured in groundwater, or are located on the other side of the North Stream.

3.2 Sampling Approach and Methodology

To evaluate VOCs in soil vapor, six (6) soil borings (SV-1 through SV-6) will be advanced for the collection of soil cores and soil vapor samples along East Windsor Road. The proposed soil boring locations are shown on Figure 1. The proposed soil boring locations are positioned to meet the objective of the screening evaluation. Specifically, the proposed soil borings are located to provide areal coverage and are situated along a transect that is generally transverse to the direction of groundwater flow. SV-1 is located on the west side of the North Stream. Three of the proposed soil borings (SV-2, SV-4, and SV-6) are located in the vicinity of the Riley residence (abandoned house), the Scott residence, and the Smith residence. SV-2 is located in the vicinity of the Riley residence and upgradient of well W-18, SV-3 is located between SV-2 and the Scott residence, SV-4 is located near the Scott residence and downgradient of well W-16, SV-5 is located between the Scott and Smith residences, and SV-6 is located near the Smith residence. Soil borings SV-2, SV-4, and SV-6 will be advanced at least 10 feet away from the residential structures.

A soil boring will be advanced at each location to a depth of approximately 10 to 12 feet below land surface (ft bls) for the collection of continuous soil cores. The soil

cores will be used to characterize the soil lithology and to determine the depth of the water table in the vicinity of the soil vapor sample locations. After the soil cores have been collected, a separate boring will be advanced approximately five feet from the soil boring for the collection of the soil vapor sample.

3.2.1 Soil Core Collection Methodology

The soil cores will be collected using a Geoprobe® direct push drill rig and a Geoprobe® Macro-Core Soil Sampler. The Geoprobe® Macro-Core Soil Sampler will be fitted with acetate liners dedicated to each soil core. The soil cores will be logged and the soil lithology and moisture content will recorded. The soil borings will be backfilled with the soil core material and clean sand.

Soil from the two-foot interval above the soil vapor sample depth (e.g., 5 to 7 foot soil core if the soil vapor sample is collected at 7 ft bls and the depth to water is 8 ft bls) will be submitted to a laboratory for grain size analysis by ASTM D422 Standard Test Method for Particle-Size Analysis of Soils.

3.2.2 Soil Vapor Sampling Methodology

Soil vapor samples will be collected using the following methodology. At each location, ARCADIS will install a temporary soil vapor sampling point using a Geoprobe® direct push drill rig and the Geoprobe® Post Run Tubing (PRT) System. The PRT System allows for the collection of soil vapor samples at the desired sampling depth while significantly reducing the chances of rod leakage and ambient air contamination. O-ring connections enable the PRT System to deliver a vacuum-tight seal that prevents sample contamination from ambient air and assures that the sample is taken from the desired depth at the bottom of the boring. A tracer gas (i.e., helium) test will be conducted at all of the soil boring locations to check the seal established around the temporary soil vapor sampling point.

A temporary soil vapor sampling point consisting of 1.25-inch diameter steel drive rods will be advanced to a depth approximately one foot above the water table. The depth to water in the vicinity of the residences ranges from 7 to 10 feet below the ground surface. Therefore, it is anticipated that the soil vapor samples will be collected from depths approximately 6 to 9 feet below the ground surface depending on field conditions during sampling. An expendable PRT System point holder and expendable PRT System point will be affixed at the downhole end of the rods. Once the desired sample depth is reached, the sampling assembly will be retracted approximately 6

inches, allowing the expendable point to disengage from the rods, and creating a void in the subsurface for soil vapor sample collection. A bentonite seal will be placed around the outside of the rods at the ground surface. Teflon®-lined tubing and a PRT adapter will then be inserted down the center of the rods. The system is airtight and the potential for rod leakage is significantly reduced using O-ring connections. New Teflon®-lined tubing will be used at each sample location.

The soil vapor samples will be collected in batch certified, pre-cleaned 6-liter SUMMA® canisters provided by Air Toxics, Ltd. (ATL), a NYSDOH approved laboratory, located in Folsom, California. All samples will be analyzed for the TO-15 compound list by U.S. Environmental Protection Agency (USEPA) Method TO-15. The TO-15 compound list and associated laboratory reporting limits are provided in Appendix A. The whole-air sample will be analyzed using a gas chromatograph/mass spectrometer (GC/MS) system to provide the low-level target compound detection limits provided in Appendix A.

Prior to sampling, a portable vacuum pump will be used to purge at least 1.5 volumes of air from the temporary soil vapor sampling point and tubing at a rate of approximately 100 to 200 mL/min. A laboratory pre-calibrated 0.5-hour flow controller (i.e., calibrated to collect the soil vapor sample at a rate of less than 200 mL/min) with an in-line particulate filter will be attached to the SUMMA® canister. Following purging, the tubing will be connected to the flow controller and the SUMMA® canister. The SUMMA® canister valve will be opened, the sample start time and initial vacuum will be recorded, and the soil vapor sample will be collected. The SUMMA® canister vacuum and sample time duration will be monitored during sampling and the SUMMA® canister valve will be closed when the vacuum is between 2 and 5 inches of Hg. The sample end time and final vacuum will be recorded. Weather-related data such as barometric pressure and wind speed will also be recorded. The SUMMA® canisters will then be submitted to ATL for analysis.

A duplicate soil vapor sample will be collected at the SV-2 location. The duplicate sample will be collected at the same time as the SV-2 sample using a stainless steel "T" fitting, a second SUMMA® canister, and the procedures described above.

4. Data Evaluation and Reporting

The soil vapor sample analytical results will be evaluated in accordance with the OSWER document entitled, *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion*

Guidance) (EPA, 2002). The soil vapor analytical results will be compared to target concentrations presented in Tables 2a and 2c of that guidance, which represent target soil vapor concentrations based on cancer risks of $1x10^{-4}$ and $1x10^{-6}$, respectively, as a means to bracket the potential risk associated with the soil gas results. This information will aid in determining all available options ranging from no further action to additional sampling. Sampling results will be compared with the Target Shallow Soil Gas Concentrations presented in Tables 2a and 2c if the sample was collected at a depth of 5 feet or less below the foundation level of the adjacent structure. Sampling results will be compared with the Target Deep Soil Gas Concentrations if the sample was collected at a depth greater than approximately 5 feet below the foundation level of the adjacent structure, or if the sample was collected at a depth greater than 5 feet below land surface, if no structure exists near the sample location.

The target soil gas concentrations presented in Tables 2a and 2c of the guidance have been developed using generic attenuation factors that may not be representative of site-specific conditions. Thus, if the soil vapor sample concentration data exceed the relevant target concentrations provided in those tables, a revised site-specific Target Shallow or Deep Soil Gas Concentration(s) (whichever is relevant) will be calculated using the scenario-specific attenuation factors provided in Figure 3a, which are based on soil type and depth to groundwater. These revised, site-specific Target Soil Gas Concentrations will be calculated for the 1×10^{-4} to 1×10^{-6} risk range.

At the completion of these comparisons, a summary report will be prepared that describes the sampling methodology and data evaluation, and provides conclusions and recommendations.

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Table 1. Water-Level Measurements Collected During 2005, Colesville Landfill, Broome County, New York.

Well Identification	MP Elevation (feet above msl)	6/21/2005 Depth to Water (feet below MP)	6/21/2005 Water-Level Elevation (feet above msl)	9/13/2005 Depth to Water (feet below MP)	9/13/2005 Water-Level Elevation (feet above msl)	MP Description
GMMW-2	1030.95	AM	AM	36.38	994.57	Inner casing
GMMW-5	1043.66	47.78	995.88	47.16	996.50	Inner casing
GMMW-6	1033.56	37.77	995.79	38.84	994.72	Inner casing
GMMW-7	1045.43	NM	NM	46.89	998.54	Inner casing
PW-3	988.92	10.92	978.00	13.09	975.83	Inner casing
PW-4	1001.75	16.15	985.60	17.88	983.87	Inner casing
PW-5	986.12	AM	AM	AM	AM	Inner casing
W-5	1051.41	50.35	1001.06	50.90	1000.51	Inner casing
W-6	1050.38	47.35	1003.03	49.02	1001.36	Inner casing
PW-7	1042.47	39.46	1003.01	38.79	1003.68	Inner casing
W-7	1049.12	40.87	1008.25	42.24	1006.88	Inner casing
PW-10	1049.29	35.17	1014.12	AM	AM	Inner casing
PW-13	1072.41	58.73	1013.68	60.41	1012.00	Inner casing
W-13	1053.43	44.64	1008.79	46.43	1007.00	Inner casing
W-14S	957.68	9.41	948.27	11.34	946.34	Inner casing
W-16S	990.33	10.59	979.74	10.08	980.25	Outer casing
W-17S	959.13	10.43	948.70	12.26	946.87	Inner casing
W-18	973.56	11.46	962.10	10.67	962.89	Inner casing
W-20S	952.88	10.00	942.88	11.81	941.07	Inner casing

msl Mean sea level.
MP Measuring point.
NM Not measured.
AM Anomalous measurement.

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Table 2. Concentrations of Volatile Organic Compounds Detected in Groundwater Between December 2004 and September 2005, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID: / Date:	GMMW-02 12/8/2004	GMMW-02 3/24/2005	GMMW-02 6/22/2005	GMMW-2 9/15/2005	GMMW-05 12/7/2004	GMMW-05 3/24/2005	GMMW-05 6/21/2005	GMMW-5 9/15/2005	GMMW-06 12/9/2004	GMMW-06 3/24/2005	GMMW-06 6/21/2005
1,1,1-Trichloroethane		**62**	**57**	**57**	**38**	<10	<10	<10	<5	<10	<10	<10
1,1,2-Trichloroethane		<1.0	<1	<1.0	<1	<10	<10	<10	<5	<10	<10	<10
1,1-Dichloroethane		**120**	**120**	**130**	**110**	**110**	**150**	**88**	**47**	**520**	**390**	**370**
1,1-Dichloroethene		**2.3**	**2.8**	**2.7**	**2**	<10	<10	<10	<5	<10	<10	<10
1,2-Dichloroethane		<1.0	<1	<1.0	<1	<10	<10	<10	<5	<10	<10	<10
1,2-Dichloropropane		<1.0	<1	<1.0	<1	<10	<10	<10	<5	<10	<10	<10
Benzene		**3.6**	**3.6**	**4.0**	**3.4**	<10	<10	<10	<5	<10	<10	<10
Chlorobenzene		**44**	**38**	**42**	**40**	**17**	**25**	**28**	**45**	**38**	**31**	**32**
Chloroethane		**38**	**40**	**45**	**37**	**90**	**190**	**240**	**240**	**250**	**190**	**120**
Chloroform		<1.0	<1	<1.0	<1	<10	<10	<10	<5	<10	<10	<10
cis-1,2-Dichloroethene		**150**	**150**	**150**	**150**	**360**	**180**	**96**	**150**	**290**	**170**	**200**
Dichlorodifluoromethane		**1.5**	<1	**1.9**	<1	<10	<10	<10	<5	<10	<10	<10
Ethylbenzene		<1.0	<1	<1.0	<1	<10	<10	<10	<5	<10	<10	<10
Methylene chloride		<2.0	**1.9**	**2.0**	<1	<10	<10	<10	<5	**21**	**16**	<10
Methyl tert-butyl ether		<1.0	<1	<1.0	<1	<10	<10	<10	<5	<10	<10	<10
o-Xylene		<1.0	<1	<1.0	<1	<10	<10	<10	<5	<10	<10	<10
Tetrachloroethene		<1.0	<1	<1.0	<1	<10	<10	<10	<5	**13**	<10	<10
Toluene		<1.0	<1	<1.0	<1	<10	<10	<10	**6.2**	<10	<10	<10
trans-1,2-Dichloroethene		**2**	<1	<1.0	<1	<10	<10	<10	<5	<10	<10	<10
Trichloroethene		**110**	**90**	**100**	**84**	<10	<10	<10	<5	**16**	<10	**10**
Vinyl chloride		**21**	**20**	**22**	**18**	<10	**31**	**23**	**32**	**230**	**170**	**94**
Total VOCs		**554.4**	**523.3**	**556.6**	**482.4**	**577.0**	**576.0**	**475.0**	**520.2**	**1,378.0**	**967.0**	**826.0**

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 Volatile Organic Compounds Detected in Groundwater Between December 2004 and September 2005, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID:	GMMW-06	GMMW-06*	PW-03	PW-03	PW-04	PW-04	PW-04	PW-04	PW-05	PW-05	PW-07
	Date:	9/15/2005	9/15/2005	3/23/2005	9/15/2005	12/9/2004	3/24/2005	6/21/2005	9/14/2005	3/25/2005	9/15/2005	9/13/2005
1,1,1-Trichloroethane		**40J**	**3.8J**	**13**	**16**	**22**	**18**	**21**	**16**	<1	<1	<1
1,1,2-Trichloroethane		<5J	**2.6J**	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
1,1-Dichloroethane		**110J**	**390J**	**37**	**40**	**16**	**13**	**23**	**13**	**5.7**	<1	**4.4**
1,1-Dichloroethene		<5J	**1.4J**	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
1,2-Dichloroethane		<5	<1	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
1,2-Dichloropropane		<5J	**1.2J**	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Benzene		<5J	**6.0J**	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Chlorobenzene		**39**	**36**	<1	<1	<1	<1	<1.0	<1	<1	<1	**3.8**
Chloroethane		**34J**	**150J**	**9.6**	**6.5**	**4.6**	**4.6**	**9.7**	**4.9**	**1.4**	<1	**6.9**
Chloroform		<5	**1.3**	**1.7**	**1.6**	**1.7**	**1.6**	**1.3**	**1.2**	<1	<1	<1
cis-1,2-Dichloroethene		**150**	**190**	**42**	**39**	**15**	**15**	**25**	**15**	**60**	**3.6**	<1
Dichlorodifluoromethane		<5J	**3.9J**	<1	<1	**2.0**	<1	**1.7**	<1	<1	<1	<1
Ethylbenzene		<5	<1	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Methylene chloride		<5J	**11J**	**2**	**1.6**	<1	<1	<1.0	<1	<1	<1	<1
Methyl tert-butyl ether		<5	<1	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
o-Xylene		<5	<1	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Tetrachloroethene		<5	<1	**2.7**	**3.3**	<1	<1	<1.0	<1	<1	<1	<1
Toluene		<5J	**1.5J**	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
trans-1,2-Dichloroethene		<5	<1	<1	<1	**1.8**	<1	<1.0	<1	<1	<1	<1
Trichloroethene		**78J**	**9.2J**	**23**	**25**	**28**	**20**	**27**	**21**	**2.8**	<1	**1.3**
Vinyl chloride		**17J**	**110J**	<1	**1.9**	<1	<1	**1.7**	<1	**2.3**	<1	<1
Total VOCs		**468**	**917.9**	**131.0**	**134.9**	**91.1**	**72.2**	**110.4**	**71.1**	**72.2**	**3.6**	**16.4**

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 Between December 2004 and September 2005, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID: / Date:	PW-13 9/13/2005	W-05 12/8/2004	W-05 3/24/2005	W-05 6/22/2005	W-05 9/15/2005	W-06 3/22/2005	W-06 9/14/2005	W-07 3/23/2005	W-07 9/13/2005	W-13 9/13/2005	W-14S 9/13/2005
1,1,1-Trichloroethane		<1	**2**	**2.4**	**7.4**	<1	<1	<1	<1	**28**	<1	<1
1,1,2-Trichloroethane		<1	<1	<1	<1.0	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane		**5.6**	**97**	**91**	**120**	**77**	**31**	**30**	**3.6**	**170**	<1	<1
1,1-Dichloroethene		<1	<1	<1	<1.0	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethane		<1	<1	<1	<1.0	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloropropane		<1	<1	<1	<1.0	<1	<1	<1	<1	<1	<1	<1
Benzene		<1	**3.8**	**3.3**	**4.9**	**4.2**	**4.8**	**5**	<1	<1	<1	<1
Chlorobenzene		**14**	**23**	**23**	**25**	**18**	**13**	**18**	**3.8**	**27**	<1	<1
Chloroethane		**4.7**	**87**	**63**	**51**	**110**	**7.4**	**7.8**	**2.8**	**34**	<1	<1
Chloroform		<1	<1	<1	<1.0	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene		**2.1**	**7.8**	**14**	**36**	**1.5**	**8.5**	**6.1**	<1	**55**	<1	<1
Dichlorodifluoromethane		<1	**1.4**	<1	**2.3**	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene		<1	<1	<1	<1.0	<1	<1	<1	<1	**17**	<1	<1
Methylene chloride		<1	<2.8	**1.8**	<1.0	**1.9**	<1	<1	<1	**4.8**	<1	<1
Methyl tert-butyl ether		<1	<1	<1	<1.0	<1	<1	<1	<1	<1	<1	<1
o-Xylene		<1	<1	<1	<1.0	<1	<1	<1	<1	**12**	<1	<1
Tetrachloroethene		<1	<1	<1	<1.0	<1	<1	<1	<1	<1	<1	<1
Toluene		<1	**1.4**	**2.1**	<1.0	**1.2**	<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene		<1	<1	<1	<1.0	<1	<1	<1	<1	<1	<1	<1
Trichloroethene		**3**	**5.9**	**7.4**	**6.6**	**1.5**	**5.5**	**5.3**	**1.1**	**11**	<1	<1
Vinyl chloride		<1	**16**	**23**	**7.2**	**8.3**	<1	<1	<1	**13**	<1	<1
Total VOCs		**29.4**	**245.3**	**231.0**	**260.4**	**223.6**	**70.2**	**72.2**	**11.3**	**371.8**	**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 Volatile Organic Compounds Detected in Groundwater Between December 2004 and September 2005, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID: / Date:	W-16S 3/23/2005	W-16S 9/13/2005	W-17S 9/13/2005	W-18 3/22/2005	W-18 9/15/2005	W-20S 9/13/2005	TB 09-13-05 9/13/2005	FB9-15-05 9/15/2005
1,1,1-Trichloroethane		<1	<1	<1	**7.1**	**18**	<1	<1	NA
1,1,2-Trichloroethane		<1	<1	<1	<1	<1	<1	<1	NA
1,1-Dichloroethane		**23**	**24**	<1	**6**	**17**	<1	<1	NA
1,1-Dichloroethene		<1	<1	<1	<1	<1	<1	<1	NA
1,2-Dichloroethane		<1	<1	<1	<1	<1	<1	<1	NA
1,2-Dichloropropane		<1	<1	<1	<1	<1	<1	<1	NA
Benzene		**3.1**	**2.6**	<1	<1	<1	<1	<1	NA
Chlorobenzene		**24**	**26**	<1	<1	<1	<1	<1	NA
Chloroethane		**11**	**9.8**	<1	<1	<1	<1	<1	NA
Chloroform		<1	<1	<1	<1	<1	<1	<1	NA
cis-1,2-Dichloroethene		<1	**1.7**	<1	**4.2**	**14**	<1	<1	NA
Dichlorodifluoromethane		<1	<1	<1	<1	<1	<1	<1	NA
Ethylbenzene		<1	<1	<1	<1	<1	<1	<1	NA
Methylene chloride		<1	<1	<1	<1	<1	<1	<1	NA
Methyl tert-butyl ether		<1	<1	<1	<1	<1	<1	<1	NA
o-Xylene		<1	<1	<1	<1	<1	<1	<1	NA
Tetrachloroethene		<1	<1	<1	<1	<1	<1	<1	NA
Toluene		<1	<1	<1	<1	<1	<1	<1	NA
trans-1,2-Dichloroethene		<1	<1	<1	<1	<1	<1	<1	NA
Trichloroethene		**2.1**	**2.6**	<1	**8.7**	**20**	<1	<1	NA
Vinyl chloride		<1	<1	<1	<1	<1	<1	<1	NA
Total VOCs		**63.2**	**66.7**	**0.0**	**26.0**	**69.0**	**0.0**	**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.

Appendix A

TO-15 Compound List and
Laboratory Reporting Limits

Air Toxics LTD.

Method : Modified TO-15-LL

Compound	Rpt. Limit (uG/m3)
Freon 12	0.49
Freon 114	0.70
Chloromethane	0.21
Vinyl Chloride	0.26
1,3-Butadiene	0.22
Bromomethane	0.39
Chloroethane	0.26
Freon 11	0.56
Ethanol	0.94
Freon 113	0.77
1,1-Dichloroethene	0.40
Acetone	1.2
2-Propanol	1.2
Carbon Disulfide	1.6
Methylene Chloride	0.69
Methyl tert-butyl ether	0.36
trans-1,2-Dichloroethene	0.40
Hexane	0.35
1,1-Dichloroethane	0.40
2-Butanone (Methyl Ethyl Ketone)	0.29
cis-1,2-Dichloroethene	0.40
Tetrahydrofuran	1.5
Chloroform	0.49
1,1,1-Trichloroethane	0.54
Cyclohexane	0.34
Carbon Tetrachloride	0.63
Benzene	0.32
1,2-Dichloroethane	0.40
Heptane	0.41
Trichloroethene	0.54
1,2-Dichloropropane	0.46
1,4-Dioxane	0.36
Bromodichloromethane	0.67
cis-1,3-Dichloropropene	0.45
4-Methyl-2-pentanone	0.41
Toluene	0.38
trans-1,3-Dichloropropene	0.45
1,1,2-Trichloroethane	0.54
Tetrachloroethene	0.68
2-Hexanone	2.0
Dibromochloromethane	0.85
1,2-Dibromoethane (EDB)	0.77
Chlorobenzene	0.46

Reporting Limits cited do not take into account sample dilution due to canister pressurization.

Air Toxics LTD.

Method : Modified TO-15-LL

Compound	Rpt. Limit (uG/m3)
Ethyl Benzene	0.43
m,p-Xylene	0.43
o-Xylene	0.43
Styrene	0.42
Bromoform	1.0
Cumene	0.49
1,1,2,2-Tetrachloroethane	0.69
Propylbenzene	0.49
4-Ethyltoluene	0.49
1,3,5-Trimethylbenzene	0.49
1,2,4-Trimethylbenzene	0.49
1,3-Dichlorobenzene	0.60
1,4-Dichlorobenzene	0.60
alpha-Chlorotoluene	0.52
1,2-Dichlorobenzene	0.60
1,2,4-Trichlorobenzene	3.7
Hexachlorobutadiene	5.3

Surrogate	Method Limits
1,2-Dichloroethane-d4	70-130
Toluene-d8	70-130
4-Bromofluorobenzene	70-130

Reporting Limits cited do not take into account sample dilution due to canister pressurization.