Waite
Environmental Management, LLC.

February 11, 2008

Mr. Gerold Noyes, P.E.
Vermont Department of Environmental Conservation
Waste Management Division
103 S. Main Street, West Building
Waterbury, Vermont 05671-0404

RE: 2007 Annual Monitoring Report
Wheatley Site, Brookfield, Vermont (Site #94-1693)

Dear Gerold:

Waite Environmental Management, LLC (WEM) is pleased to present two copies of the *2007 Annual Monitoring Report* for the Wheatley Site in Brookfield, Vermont. A digital copy (*.PDF) has been placed on the VT DEC ftp site. The report provides details and results of the October 2007 (4th Quarter) sampling event. This report has been prepared in accordance with the requirements and conditions described in the *State of Vermont Contract for Personal Services* EC13-04.

Do not hesitate to call me if you have any questions about the report or the work conducted. I can be reached at (802) 860-9400 or by email at mwaite@waiteenv.com.

Sincerely,

Miles E. Waite, Ph.D.
Principal Hydrogeologist

Enclosure

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2007 ANNUAL MONITORING REPORT

for the

WHEATLEY SITE
BROOKFIELD, VERMONT

VT DEC Site #77-0087

February 11, 2008

Prepared for:

STATE OF VERMONT
Vermont Department of Environmental Conservation
Waste Management Division
103 South Main Street, West Building
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Prepared by:

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1.0 INTRODUCTION

The following *2007 Annual Monitoring Report* for the Wheatley Site in Brookfield, Vermont (see attached Site Location Map in Appendix A) was prepared by Waite Environmental Management, LLC (WEM) for the Vermont Department of Environmental Conservation (VT DEC). This report has been completed in accordance WEM's contract with State of Vermont (contract EC13-04) for environmental monitoring.

This report includes discussion of the results of groundwater and indoor air monitoring conducted by WEM during 2007. Monitoring locations were at the Wheatley Farm Site, currently a residential property occupied by Mr. James Moorcroft. Work conducted during this year under contract EC13-04 and covered in this report include:

- Monitoring of five (5) groundwater monitoring wells during October 2007.
- Monitoring of two (2) indoor air locations in October-November 2007.

Monitoring at these locations was conducted in accordance with WEM's *Work Plan for Environmental Monitoring* ("Work Plan") [1], with the *Field/Lab Coordination Memorandum for Water Monitoring* ("FLCM-Water") [2], and the *Field/Lab Coordination Memorandum for Air Monitoring* ("FLCM-Air") [3].

2.0 GROUNDWATER SAMPLING

Groundwater monitoring was conducted by WEM on October 29, 2007. The following five (5) monitoring wells were monitored: MW-S1, MW-S2, MW-S3, MW-PL1, MW-PL2. All monitoring well locations are shown in the Site Plan in Appendix A. Details and results of the sampling event are described below.

2.1 Groundwater Level Measurement

Prior to sampling on October 29, 2007, the water level in each monitoring well was measured with a water level probe. None of the wells were observed to be dry. Depth to groundwater ranged from 2.91 to 18.62 ft below top-of-casing (ft btoc).

Using top-of-casing elevation data, the measurements were converted into groundwater elevations. Elevation data from October 2007 are shown with historical measurements in Table 1.1 in Appendix B. Compared to the previous round of measurements in October 2006, there were slight increases in groundwater elevations in three wells, and slight decreases in two wells. The 2007 groundwater elevations had increased by an average of 0.08 ft compared to the 2006 results. While the groundwater elevations are generally stable with time, elevations in both wells MW-S1 and MW-S2 have been in a general rising trend since 2004.

Groundwater elevations were also plotted to develop a groundwater elevation map (see Groundwater Elevation Map – October 2007 in Appendix A). As this map shows, the general direction of overburden groundwater flow was toward the north/northeast, or toward the Second Branch of the White River. The lateral hydraulic gradient between well MW-PL2 and MW-S3,

was 0.012 ft/ft, or 1.2%. In the lower meadow in the vicinity of wells MW-S1 and MW-S2, the groundwater flow direction is easterly, also toward the River. The 2007 groundwater flow direction and gradient is typical for this site.

2.2 Groundwater Sample Collection

Monitoring wells were purged and sampled using a low-flow methodology. This involved using a peristaltic pump (Geotech Geopump II) connected to dedicated high density polyethylene (HDPE) tubing within each well that extended to a pre-specified intake depth. The dedicated HDPE tubing was connected to disposable silicon tubing that ran through the head of the peristaltic pump; new silicon tubing was used for each well purged. Purge rates, as specified by site protocols, ranged between 100-250 milliliters/minute (ml/min). Purge rates, purge volumes, and pump intake depths are shown in the field water collection sheets provided in Appendix C. During the purging process, the water level was monitored using a water level probe (Solinst) with a 0.25-inch probe, and geochemical parameters were measured using a water quality meter (Horiba U-22 Model U-22XD) with a flow cell connected to the outlet of the peristaltic pump. The following field geochemical parameters were monitored: dissolved oxygen, specific conductance, temperature, pH, turbidity, and redox potential. The water quality meter was calibrated in the morning prior to sampling.

Wells were allowed to purge until geochemical parameters stabilized, as specified by site protocols. Upon stabilization, the silicon tubing was disconnected from the water meter. Samples were then collected directly from the outlet of the peristaltic pump. Parameter measurements and sample times are shown in the field sheets in Appendix C. Stabilized parameter measurements are shown with historical data in Tables 1.2 through 1.7.

All samples were delivered by WEM to TestAmerica Laboratory (TA) of South Burlington, Vermont (formerly Severn-Trent Laboratories, Inc) for analysis of volatile organic compounds via EPA Method 8260B. Results for PCE, TCE, cis-1,2-DCE and trans-1,2-DCE are discussed below.

Sampling proceeded as per protocol, and there were no deviations from the Work Plan or the FLCM-Water.

2.3 Discussion of Results

Validated laboratory analytical results are summarized in Table 2.0 in Appendix B. Full copies of the laboratory report and the data validation package are presented in the Data Validation Report [4]. Following is a detailed discussion of field and laboratory results.

2.3.1 Field Geochemical Parameters

Field geochemical parameter measurements are summarized in Tables 1.2 through 1.7 in Appendix B. While there are not enough historical data to evaluate clear trends in water quality parameters, the following observation can me made from the October 2007 data:

- Dissolved oxygen levels in MW-S1, MW-S2, and MW-S3 were slightly depressed compared to values measured during 2002-2006.
- Specific conductance measurements were all of a similar magnitude and range as measurements from 2002-2006.
- pH measurements were all of a similar magnitude and range as measurements from 2002-2006. However, there was a significant decrease in pH between 2006 and 2007 in well MW-S2.
- Turbidity measurements were all of a similar magnitude and range as measurements from 2006, but significantly lower than the 2004-2005 values.
- Redox (ORP) measurements were of a similar magnitude and range as measurements from 2002-2006.

2.3.2 Analytical Results

The analytical results from October 2007 indicate the following:

- **MW-PL1**: the target compound PCE was reported at a concentration of 2.1 micrograms per liter (ug/L). No other target compounds were reported above detection limits.
- **MW-PL2**: no target compounds were reported above detection limits.
- **MW-S1**: no target compounds were reported above detection limits.
- **MW-S2**: no target compounds were reported above detection limits.
- **MW-S3**: no target compounds were reported above detection limits.

The PCE concentration in MW-PL1 is below the Vermont groundwater enforcement standard ("VGES") [6] of 5.0 ug/L. While this compound has been reported in MW-PL1 before, it has never been reported above the VGES. PCE concentrations in MW-PL1 reported between 1997 and the present are shown in the graph presented in Appendix B. The concentration has risen slightly in 2005-2007 as compared to data from 1999-2004. It should be noted that PCE has <u>never</u> been reported in any of the four other monitoring wells at this Site. Also, the other target compounds (TCE, cis-1,2-DCE, trans-1,2-DCE) have <u>never</u> been reported in any monitoring well on this Site based on records dating back to 1997.

It should be mentioned that neither of the two non-target compounds that were reported in sample MW-S2 during October 2005 (toluene and acetone) were present in the 2007 sample.

2.3.3 QA/QC Samples

As part of the quality assurance/quality control (QA/QC) program, WEM collected a field duplicate sample during the October 2007 sampling event. A duplicate "MW-PLX" was collected in conjunction with MW-PL1. These samples were analyzed by TA using the same

method (EPA Method 8260B). According to the Data Validation Report [4], precision in the field duplicate pair was acceptable (less than 30 % RPD) for all target analytes greater than 2 times the quantitation limit.

WEM also collected a trip blank (TB-5) and a field blank (FB-6) during the October 2007 sampling event. No target compounds were reported in either of these samples, indicating that were no spurious influences on sample quality.

2.4 Discussion of Data Validation

The laboratory data from the October 2007 groundwater sampling event were validated by Phoenix Chemistry Services, an independent data validator. The validation was performed in accordance with Tier III guidelines as described by the USEPA Region I. Details are presented in the Data Validation Report [4], the text of which is provided in Appendix D.

Results for the target VOCs were determined to be valid as reported for all groundwater samples collected from the Site on October 29, 2007 (sample delivery group SDG No. WHEA13). There were some documentation and compliance issues noted for the sample group, but none that directly affected the validity of the data.

2.5 Recommendations

Based on the above information, overburden groundwater within a portion of the Site continues to show evidence of low levels of dissolved PCE. Given this condition, WEM recommends continuing the groundwater monitoring program as specified in the Work Plan and FLCM-Water. The next sampling event is scheduled for October 2008.

3.0 INDOOR AIR SAMPLING

Indoor air sampling was conducted from inside the Moorcroft residence by WEM on October 29, 2007 and again on November 6, 2007. Sampling was conducted in accordance with WEM's Work Plan. However, there was one deviation from the FLCM-Air: the air canister for one sample on October 29 reached atmospheric pressure, likely due to the flow controller, and necessitated re-sampling on November 6.

Details and results of the air sampling events are described below.

3.1 Air Sample Collection

The indoor air sampling program involves sample collection from two (2) locations inside the Moorcroft residence at the Site. This building was the former Wheatley Farm farmhouse; refer to the Site Plan in Appendix A. Samples are collected from the kitchen of the first floor ("WHTLY1FLR") and from the basement ("WHTLYBSMT").

Samples were collected by WEM using 6-liter stainless steel Silco air canisters. The canisters were procured by WEM from TA several days prior to sampling. With each canister, a flow regulator was utilized that had a pressure gauge. The flow regulators were all calibrated by TA to provide a flow rate that allowed each canister will to have a final pressure between -7.0 and -2.0 inches of mercury (in Hg) below ambient pressure after a run time of approximately 4 hours.

The sampling procedure at each site involved setting up the canister at the designated sampling location, attaching the flow regulator, recording initial canister pressure, recording ambient pressure and temperature, and then opening the valve to initiate the sample collection. Ambient pressure values were obtained in the morning and afternoon from the Knapp State Airport, and ambient temperature was recorded using a digital thermometer. Samples were allowed to run for approximately 4 hours.

The final pressure in both WHTLYBSMT and WHTLY1FLR had gauge readings <-4.0 in Hg (minimum gauge reading) on October 29. Upon receipt by the lab, the incoming canister pressure for WHTLYBSMT was recorded at 0.0 in Hg, indicating that it had gone to ambient pressure. After discussion with the VT DEC, it was decided that re-sampling of the basement location was necessary. WEM returned to the Site on November 6, 2007 and successfully collected a WHTLYBSMT sample. Both sets of field test data sheets are provided in Appendix C.

All samples were delivered by WEM to TA for analysis of the four target volatile organic compounds: PCE, TCE, cis-1,2-DCE and trans-1,2-DCE. Analysis was by Method TO-15 low level. This is the first round of analyses using the low level method, which reduces the reporting limit from 0.2 to 0.010 parts per billion (ppbv). Results are discussed below.

3.2 Discussion of Results

Air sampling results from October-November 2007 are summarized in Table 3.0 in Appendix B. These results have been validated by an independent validator (see Section 3.3). Full copies of the laboratory report are presented in the data validation report [5].

The target compound TCE was detected in the fist floor sample collected on October 29 at a concentration of 0.96 ppbv. This concentration is just below the TCE guidance level of 1.0 ppbv. No other target compounds were detected. No target compounds were reported in basement sample collected on November 6.

Based on records dating back to July 2001, the compound TCE has not previously been detected in the airspace inside this house or in the groundwater under the property. The compound PCE has been detected on separate occasions in the basement (4.8 ppbv in July 2001) and in the first floor (estimated at 0.09 ppbv in January 2002), as well as in the groundwater. The sudden appearance of TCE during October 2007 is unexpected, and possibly unrelated to the original source of contamination. The lack of TCE in the basement suggests that this chemical is not migrating into the house via a soil/groundwater flowpath, but rather from a different source (solvent, cleaner, etc.). It should be noted that maintenance of vehicles is conducted on the property, and that engine and brake cleaning solvents often have TCE.

3.2.1 QA/QC Samples

As part of the QA/QC program, WEM collected one (1) field duplicate sample (FD-1) during the October 29 indoor air sampling event. This sample was collected in conjunction with the sample from the first floor (WHTLY1FLR). The field duplicate pair was analyzed by TA using the same method. TCE was reported in both samples and showed acceptable precision (4.3% RPD).

WEM also submitted a trip blank (TB-1) on October 29, 2007. No target compounds were detected in the trip blank.

3.3 Discussion of Data Validation

The laboratory data were validated by Phoenix Chemistry Services, an independent data validator. The validation was performed in accordance with Tier III guidelines as described by the USEPA Region I. Details are presented in the data validation report [5], the text of which is included in Appendix D. The full report is on file at the VT DEC offices in Waterbury.

Analytical Results for the target VOCs were determined to be valid as reported for all indoor air collected at the Site on October 29 and November 6, 2007 (SDG No. 122733). While there were some laboratory documentation deficiencies, there were no issues that directly affected the validity of the analytical data.

3.4 Recommendations

Due to the occasional presence of chlorinated VOCs in the indoor air as described in Section 3.2, WEM recommends continuing the air sampling program as specified in the Work Plan and FLCM-Air. The next sampling event is scheduled for October 2008.

4.0 REFERENCES

1. Waite Environmental Management, LLC, *Work Plan for Environmental Monitoring at the UniFirst Plant Site, Williamstown, Vermont, Wheatley Farm Site, Brookfield, Vermont, Bressett Site, Randolph, Vermont*, February 6, 2004.

2. Phoenix Chemistry Services, *Field/Lab Coordination Memorandum for Water Monitoring, UniFirst Plant Site, Williamstown, Vermont, Wheatley Farm Site, Brookfield, Vermont, Bressett Site, Randolph, Vermont*, April 2, 2004.

3. Phoenix Chemistry Services, *Field/Lab Coordination Memorandum for Air Monitoring, UniFirst Plant Site, Williamstown, Vermont, Wheatley Farm Site, Brookfield, Vermont, Bressett Site, Randolph, Vermont*, April 2, 2004.

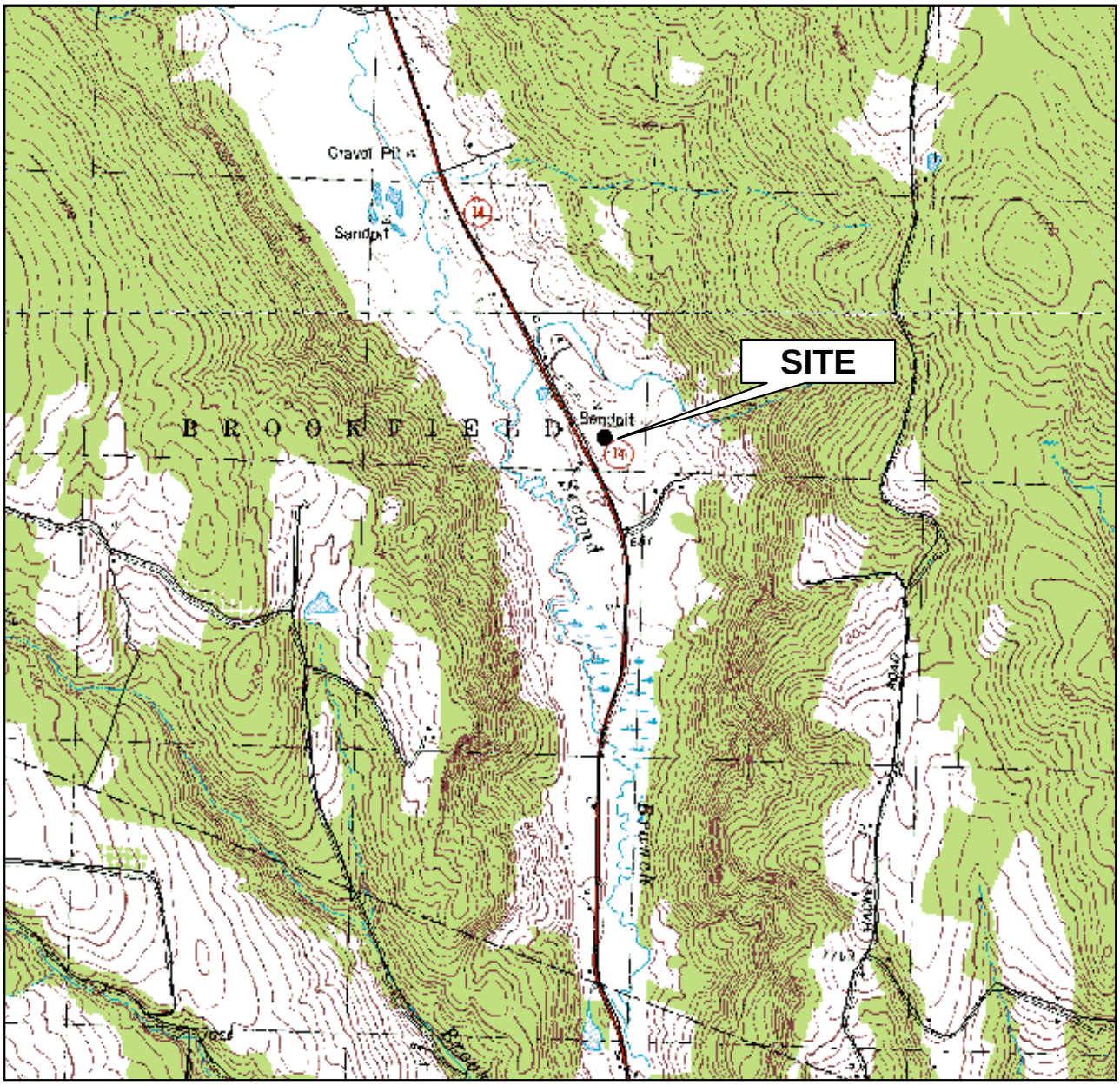
4. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Bressett, Wheatley, and UniFirst Sites, Randolph, Brookfield, and Williamstown, VT, Organic Analyses Data, Volatile Organics in Water Samples, Sample Delivery Group Sample Delivery Group Nos. BRES39, UNIF30, UNIF31, and WHEA13*, January 18, 2008.

5. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Williamstown Sites, Williamstown, VT (Sample Delivery Group No. 122733)*, December 29, 2007, revised February 8, 2008.

6. State of Vermont, Agency of Natural Resources, Department of Environmental Conservation, *Chapter 12, Groundwater Protection Rule and Strategy*, January 20, 2000.

APPENDIX A:

FIGURES



LEGEND

- ● Site
- ● State-Listed Hazardous Waste Site
- —— Roadway

N

Map Source: *USGS Mapping 7.5 Minute Quadrangles: Brookfield (1983), Randolph Ctr (1983)*

Data Source *Vermont DEC databases, updated August 2003.*

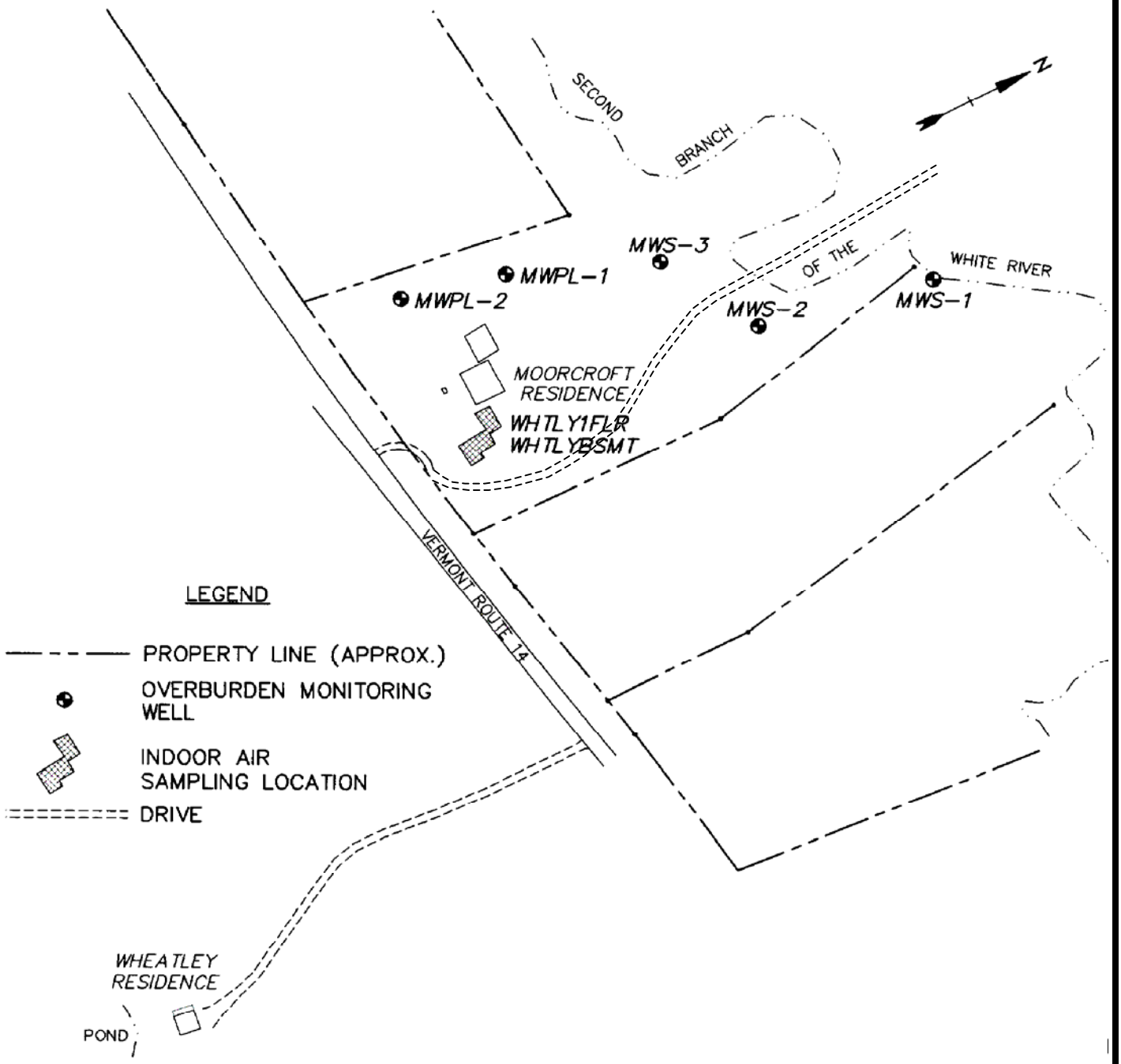
Waite Environmental Management, LLC

SITE LOCATION MAP

Wheatley Farm Site

Brookfield, Vermont

Date: 01/08/04	Drawing No. 1	Scale: 1:24,000	By: MEW



Notes:
This map is a copy of the Site Plan (April 1999) prepared Tighe & Bond, Inc., and has information provided by The Johnson Co.
All locations approximate

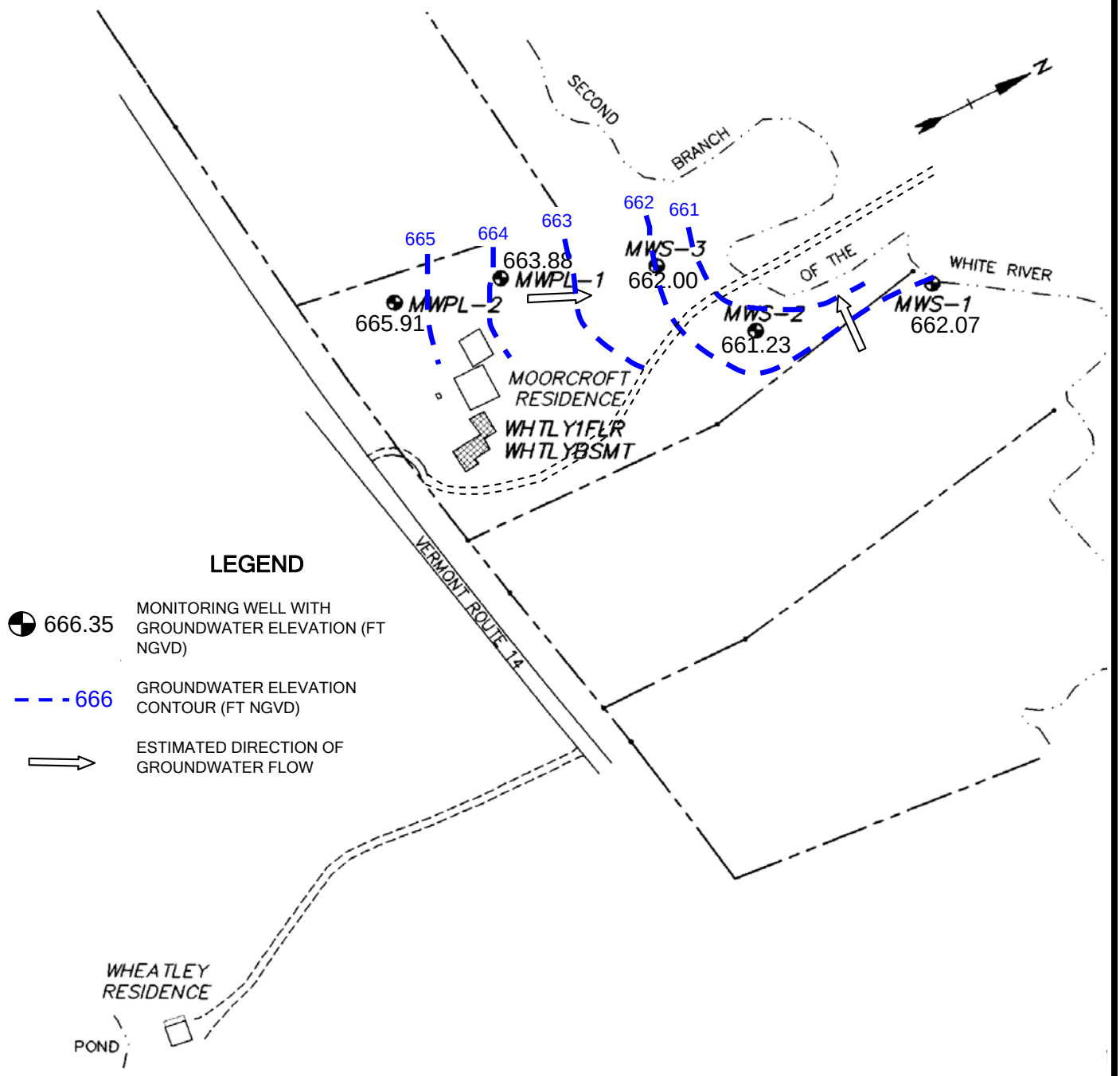
Waite Environmental Management, LLC

SITE PLAN

Wheatley Farm Site

Brookfield, Vermont

Date: 02/16/06	Drawing No.	Scale: 1" = 200'	By: MEW



LEGEND

666.35 — MONITORING WELL WITH GROUNDWATER ELEVATION (FT NGVD)

666 — GROUNDWATER ELEVATION CONTOUR (FT NGVD)

ESTIMATED DIRECTION OF GROUNDWATER FLOW

Notes:
This map is a copy of the Site Plan (April 1999) prepared Tighe & Bond, Inc., and has information provided by The Johnson Co.
Map has been modified by WEM.
All locations approximate

Waite Environmental Management, LLC

GROUNDWATER ELEVATION CONTOUR MAP

Oct-07

Wheatley Farm Site

Brookfield, Vermont

Date: 02/11/08	Drawing No.	Scale: 1" = 200'	By: MEW

APPENDIX B:

TABLES AND GRAPHS

WEM

TABLE 1.1
Groundwater Elevation Measurements: 2003 - 2007
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Oct-03	Oct-04	Oct-05	Apr-06	Oct-06	Oct-07
MW-S1	Monitoring Well	FT	NA	659.95	660.74	660.77	661.89	662.07
MW-S2	Monitoring Well	FT	NA	658.93	660.62	659.42	660.79	661.23
MW-S3	Monitoring Well	FT	662.58	661.41	662.41	659.61	662.08	662.00
MW-PL1	Monitoring Well	FT	663.70	663.06	663.87	663.99	663.56	663.88
MW-PL2	Monitoring Well	FT	666.37	666.08	665.58	666.10	666.35	665.91

Notes:
-All elevations in feet above NGVD; "NGVD" = National Geodetic Vertical Datum (1988).
-"Dry" = well dry during monitoring event; "NA" =not available; "NS" = not sampled.
-Data from 2003 collected by Tighe & Bond and reported in "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004).
-Data from 2004-2006 collected by Waite Environmental Management.

WEM

TABLE 1.2
Dissolved Oxygen Field Measurements: 2002 - 2007
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Oct-02	Apr-03	Oct-03	Apr-04	Oct-04	Oct-05	Oct-06	Oct-07
MW-S1	Monitoring Well	mg/L	0.61	NS	NA	NS	3.33	0.48	0.29	0.00
MW-S2	Monitoring Well	mg/L	9.00	NS	1.63	NS	0.34	0.00	0.42	0.00
MW-S3	Monitoring Well	mg/L	0.40	NS	1.38	NS	0.36	0.04	0.19	0.00
MW-PL1	Monitoring Well	mg/L	4.39	NS	4.06	NS	3.33	1.97	4.71	2.79
MW-PL2	Monitoring Well	mg/L	10.61	NS	2.96	NS	7.47	12.76	13.41	10.67

Notes:
-"Dry" = well dry during monitoring event; "NA" = not available; "NS = not sampled.
-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2003) and "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004).
-Data starting in 2004 collected by Waite Environmental Management.

WEM

TABLE 1.3
Specific Conductance Field Measurements: 2002 - 2007
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Oct-02	Apr-03	Oct-03	Apr-04	Oct-04	Oct-05	Oct-06	Oct-07
MW-S1	Monitoring Well	us/cm	248	NS	NA	NS	369	296	229	385
MW-S2	Monitoring Well	us/cm	191	NS	210	NS	268	257	138	273
MW-S3	Monitoring Well	us/cm	261	NS	257	NS	368	283	203	345
MW-PL1	Monitoring Well	us/cm	348	NS	349	NS	498	391	292	509
MW-PL2	Monitoring Well	us/cm	318	NS	287	NS	401	400	215	399

Notes:
- All conductivity meaurements in microsiemens per centimeter (us/cm).
-"Dry" = well dry during monitoring event; "NA" = not available; "NS = not sampled..
-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2003) and "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004).
-Data starting in 2004 collected by Waite Environmental Management.

WEM

TABLE 1.4
Temperature Field Measurements: 2002 - 2007
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Oct-02	Apr-03	Oct-03	Apr-04	Oct-04	Oct-05	Oct-06	Oct-07
MW-S1	Monitoring Well	deg C	12.9	NS	NA	NS	16.1	13.6	15.1	11.8
MW-S2	Monitoring Well	deg C	13.4	NS	12.0	NS	16.5	14.5	15.1	12.2
MW-S3	Monitoring Well	deg C	8.8	NS	8.7	NS	10.9	11.2	11.8	10.2
MW-PL1	Monitoring Well	deg C	9.9	NS	8.9	NS	11.1	10.7	10.9	9.8
MW-PL2	Monitoring Well	deg C	9.9	NS	8.8	NS	10.7	11.0	10.8	10.0

Notes:
- All temperature measurements in degrees Celsius (deg C).
-"Dry" = well dry during monitoring event; "NA" = not available; "NS = not sampled.
-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2003) and "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004).
-Data starting in 2004 collected by Waite Environmental Management.

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TABLE 1.5
pH Field Measurements: 2002 - 2007
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Oct-02	Apr-03	Oct-03	Apr-04	Oct-04	Oct-05	Oct-06	Oct-07
MW-S1	Monitoring Well	unitless	6.60	NS	NA	NS	7.25	8.09	8.22	7.65
MW-S2	Monitoring Well	unitless	6.30	NS	6.25	NS	6.80	7.63	8.09	6.33
MW-S3	Monitoring Well	unitless	8.36	NS	8.24	NS	8.67	9.44	8.41	8.26
MW-PL1	Monitoring Well	unitless	7.66	NS	7.54	NS	8.06	8.69	7.72	7.56
MW-PL2	Monitoring Well	unitless	7.44	NS	7.09	NS	7.89	8.16	7.32	7.41

Notes:
-"Dry" = well dry during monitoring event; "NA" = not available; "NS = not sampled.
-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2003) and "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004).
-Data starting in 2004 collected by Waite Environmental Management.

WEM

TABLE 1.6
Turbidity Field Measurements: 2002 - 2007
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Oct-02	Apr-03	Oct-03	Apr-04	Oct-04	Oct-05	Oct-06	Oct-07
MW-S1	Monitoring Well	NTU	0.6	NS	NA	NS	183	89	21.2	18.1
MW-S2	Monitoring Well	NTU	2.0	NS	2.0	NS	81	47	17.0	4.9
MW-S3	Monitoring Well	NTU	0.5	NS	1.0	NS	53	21	0.0	1.5
MW-PL1	Monitoring Well	NTU	2.3	NS	2.5	NS	108	95	0.0	0.0
MW-PL2	Monitoring Well	NTU	4.5	NS	0.8	NS	126	178	0.0	0.0

Notes:
-All turbidity measurements in nephelometric turbidity units (NTU).
-"Dry" = well dry during monitoring event; "NA" = not available; "NS = not sampled.
-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2003) and "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004).
-Data starting in 2004 collected by Waite Environmental Management.

WEM

TABLE 1.7
Redox Potential Field Measurements: 2002 - 2007
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Oct-02	Apr-03	Oct-03	Apr-04	Oct-04	Oct-05	Oct-06	Oct-07
MW-S1	Monitoring Well	mV	-69	NS	NA	NS	-72	-99	-159	-216
MW-S2	Monitoring Well	mV	12	NS	-31	NS	-43	-134	-123	-103
MW-S3	Monitoring Well	mV	-179	NS	-177	NS	-220	-214	-168	-183
MW-PL1	Monitoring Well	mV	150	NS	137	NS	43	169	150	139
MW-PL2	Monitoring Well	mV	176	NS	174	NS	128	190	162	150

Notes:
-All redox potential measurements in millivolts (mV).
-"Dry" = well dry during monitoring event; "NA" = not available; "NS = not sampled.
-Data from 2002-2003 collected by Tighe & Bond and reported in "2002 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2003) and "2003 Monitoring Report Summary, Wheatley Farm Site" (March 12, 2004)..
-Data starting in 2004 collected by Waite Environmental Management.

WEM

TABLE 2.0
MONITORING WELL RESULTS: 2003-2007
Wheatley Farm Site, Brookfield

Location	Parameter Method 8260	Groundwater Enforcement Standard	Units	Oct-03	Oct-04	Oct-05	Apr-06	Oct-06	Oct-07
MW-S1	**PCE**	**5.0**	ug/L	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**5.0**	ug/L	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-S2	**PCE**	**5.0**	ug/L	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-S3	**PCE**	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-PL1	**PCE**	**5.0**	ug/L	**1.2**	**1.6**	**1.1**	**2.8**	**2.5**	**2.1**
	TCE	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-PL2	**PCE**	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	TCE	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-DCE	**70.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-DCE	**100.0**	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:
- "PCE" = tetrachlorethene; "TCE" = tricholorethene; "DCE" = dichloroethene.
-"U" = not detected above listed quantitation limit; "J/J1" = reported concentration is an estimated value; "UJ" = reported quantitation limit is an estimated value; "J4" = values are estimated due to poor initial calibration data.
-"Dry" = well dry during monitoring event; "NA" = not available.
- Data from 2003 collected by Tighe & Bond and provided to WEM in digital format by Severn-Trent laboratory.
- Data starting in 2004 collected by Waite Environmental Management.
- Groundwater Enforcement Standards referenced from Table 1, Chapter 12 - Groundwater Protection Rule and Strategey, December 2000.

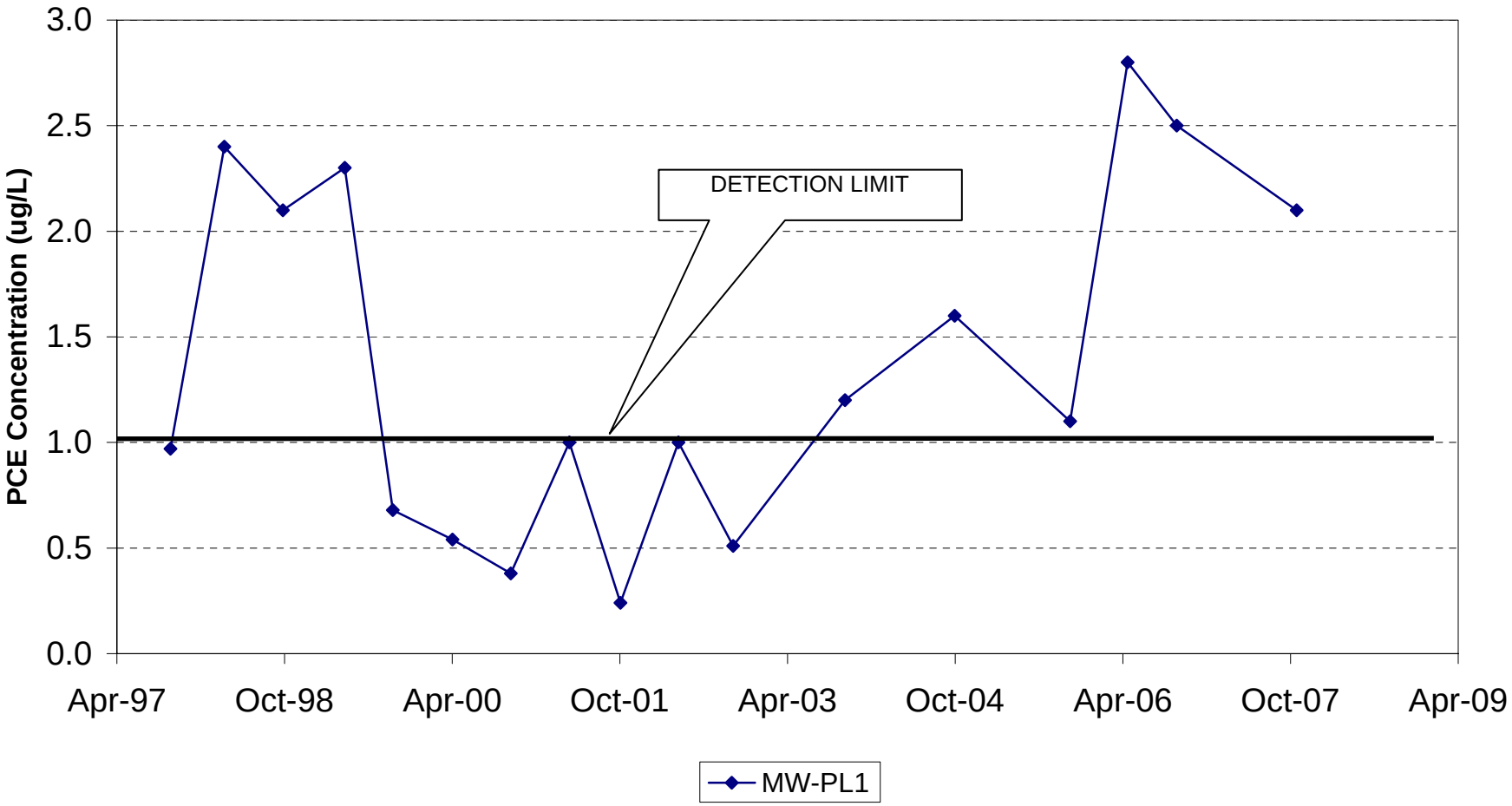
WEM Waite Environmental Management, LLC.

TABLE 3.0
INDOOR AIR QUALITY RESULTS: 2002 - 2007
Wheatley Farm Site, Brookfield, Vermont

Owner	Location	Parameter Method T-014A	Guidance Level	Units	Jan-02	Jul-02	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07
Moorcroft	WHTLY1FLR	Tetrachloroethene	1.0	ppbv	**0.09** J	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U
		Trichloroethene	1.0	ppbv	0.27 U	0.5 U	NS	0.5 U	0.2 U	0.2 U	**0.96**
		cis-1,2-Dichloroethene	9.3	ppbv	0.27 U	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U
		trans-1,2-Dichloroethene	18.4	ppbv	0.27 U	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U
	WHTLYBSMT	Tetrachloroethene	1.0	ppbv	0.32 U	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U
		Trichloroethene	1.0	ppbv	0.32 U	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U
		cis-1,2-Dichloroethene	9.3	ppbv	0.32 U	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U
		trans-1,2-Dichloroethene	18.4	ppbv	0.32 U	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U

Notes:
-"U" = not detected above listed quantitation limit; "J" = reported concentration is an estimated value; "UJ" = reported quantitation limit is an estimated value; "R" = the data are unusable (analyte may or may not be present).
-"NS" = Not Sampled (house unoccupied or access not obtained).
Bold values are reported above quantitation limit; shaded cells are in excess of the guidance level.
Data (qualified) from 2001-2003 was collected by Tighe & Bond and was entered from tabulated data from annual reports.
Data starting in 2004 collected by Waite Environmental Management.
Guidance level for tetrachloroethene and trichloroethene based on results of statewide indoor ambient air survey conducted by the Vermont Dept. Health in 1991-92.
Guidance level for cis- and trans-1,2,-dichloroethene is based on the EPA Region III risk-based concentration for ambient air (2002 RBC table).

Dissolved PCE: MW-PL1
Wheatley Site, Brookfield, Vermont



Note:
1) Non-detectable values (i.e. detection limits) are graphed as positive values. Values below detection limit are estimated (J).

APPENDIX C:

FIELD DATA SHEETS

WEM Waite Environmental Management, LLC.

SITE: wheatley
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-PL2	Pump Intake Depth	19.4 ~~(20.6 btop)~~ (mw)
Date	11/29/07	Pump Type	Geopump peri.
Sampler	MW	Well Diameter	3/4"
Weather	pdly cloudy, cool	Well Depth	20.4
Water Type	(gw) sw supply	Initial Depth to Water	18.62
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	200 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1030	18.62	200								Begin
1035	18.82	200	9.88	419	6.42	176	10.23	8.0		
1040	18.85	200	9.95	404	6.84	159	10.57	1.4		
1044	18.85	200	9.97	400	7.13	152	10.59	17.5		
1047	18.85	200	10.00	400	7.25	150	10.71	1.7		
1050	18.86	200	10.01	399	7.36	149	10.60	0.0		
1054	18.86	200	9.97	399	7.41	150	10.67	0.0		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	1.0 gal	9.97	399	7.41	150	10.67	0.0		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-PL2	VOA	3	HCl	8260	10:55		
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes: Added Trip blank TB-5 to cooler - 2 vials supplied by lab

WEM Waite Environmental Management, LLC.

SITE: Whoeffly

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-PL1			Pump Intake Depth	16.0
Date	10/29/07			Pump Type	Grepump peri.
Sampler	MW			Well Diameter	3/4"
Weather	p.c & cool			Well Depth	17.32
Water Type	(gw)	sw	supply	Initial Depth to Water	12.63
Sampling Method	bailer	(low flow)	grab	Traditional Purge Vol. (bailer)	250 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1113	12.63	250								began
1116	12.68	250	9.58	509	7.49	140	3.65	1.9		
1120	12.67	250	9.70	508	7.54	140	2.90	1.6		
1124	12.67	250	9.72	508	7.54	140	2.84	0.0		
1127	12.67	250	9.79	508	7.56	139	2.79	0.0		
1133	12.67	250	9.78	509	7.56	139	2.79	0.0		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	1.2 gal	9.78	509	7.56	139	2.79	0.0		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-PL1	VOA	3	HCl	8260	1135		
As Required:								
Field Duplicate	MW-PL1X	VOA	3	HCl	8260	"10:00"		blind
Field Blank								
MS/MSD								

General Notes:

WEM Waite Environmental Management, LLC.

SITE: Whately

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-53	Pump Intake Depth	19.4
Date	10/29/07	Pump Type	Geopump peri.
Sampler	MW	Well Diameter	3/4
Weather	p.c. 1 rain	Well Depth	19.8
Water Type	(gw) sw supply	Initial Depth to Water	5.09
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	200 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
11:57	5.09	200								begin
11:59	6.16	200	11.02	290	7.96	-66	3.25	6.2		
1203	6.90	200	10.29	348	8.15	-140	0.0	0.0		
1206	6.99	200	10.25	349	8.21	-165	0.0	1.4		
1210	7.03	200	10.26	347	8.24	-179	0.0	0.1		
1213	7.18	200	10.11	346	8.26	-188	0.0	1.4		
1216	7.28	200	10.15	345	8.26	-183	0.0	1.5		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	Filtered (y/n)	
Final Measurements:	0.9 gal	10.15	345	8.26	-183	0.0	1.5		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-53	VOA	3	HCl	8260	1220		
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

SITE: Wheatley
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-51	Pump Intake Depth	9.8
Date	10/29/07	Pump Type	Geopump peri.
Sampler	MW	Well Diameter	3/4
Weather	p.c. & cool	Well Depth	10.88
Water Type	(gw) sw supply	Initial Depth to Water	3.12
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	108 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
				within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%	
1250	3.12	100								begin
1252	4.12	100	12.49	381	7.96	-118	0.96	72.0		
1256	3.90	100	12.07	385	7.83	-164	0.18	18.7		
1300	3.90	100	12.06	387	7.77	-189	0.00	33.3		
1304	3.88	100	12.22	385	7.71	-205	0.00	29.5		
1309	3.88	100	11.77	387	7.68	-212	0.00	10.6		
1313	3.88	100	11.62	386	7.66	-216	0.00	10.1		
1317	3.88	100	11.76	385	7.65	-216	0.00	18.1		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity	Filtered (y/n)	
Final Measurements:	0.5-gal	11.76	385	7.65	-216	0.00	18.1		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-51	VOA	3	HCl	8260	1320		
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

SITE: Wheatly

FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-S2	Pump Intake Depth	10.8
Date	10/29/07	Pump Type	Geopump peri.
Sampler	MW	Well Diameter	3/4
Weather	PC & cool	Well Depth	11.1
Water Type	(gw) sw supply	Initial Depth to Water	2.91
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	250 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (us/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1403	2.91	200								begin
1406	3.12	200	12.09	275	6.76	-81	1.07	6.1		
1409	3.12	200	12.29	274	6.49	-79	0.13	4.8		
1414	3.16	200	12.20	273	6.36	-91	0.00	4.2		
1417	3.16	200	12.03	273	6.35	-96	0.00	5.1		
1420	3.15	200	12.27	273	6.33	-101	0.00	5.1		
1424	3.15	200	12.21	273	6.33	-103	0.00	4.9		complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	1.0 gal	12.21	273	6.33	-103	0.00	4.9		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-S2	VOA	3	HCl	8260	~~1425~~ 1430		1430
As Required:								
Field Duplicate								
Field Blank	FB-6	VOA	2	"	"	1435		STL water
MS/MSD	MW-S2	"	4	"	"	~~1425~~ 1430		

General Notes:

VT DEC Site #

30 Community Drive
Suite 11
South Burlington, VT 05403
phone 802-660-1990 fax 802-660-1919

Canister Samples Chain of Custody Record & TO-15 Field Test Data Sheet

TestAmerica Analytical Testing Corp. assumes no liability with respect to the collection and shipment of these samples.

Client Contact Information	Project Manager: Miles Waite	Carrier: IN EN
Company: Waite Environmental Mangement	Phone: (802) 860-9400	Sampled By: Miles Waite
Address: PO Box 4602	E-mail: mwaite@waiteenv.com	
City/State/Zip: Burlington, VT 05406	Site Contact:	
Phone: (802) 860-9400	STL Contact:	
FAX: (802) 860-9440		
Project Name: UniFirst	**Analysis Turnaround Time**	
Site: Williamstown / Bressett / Wh Rd / Log	Standard (Specify)	
PO #	Rush (Specify)	

1 of 1 COCs

Sample Identification	Sample Date(s)	Time Start (24 hr clock)	Time Stop (24 hr clock)	Canister Pressure in Field ("Hg) (Start)	Canister Pressure in Field ("Hg) (Stop)	Interior Temp. (F) (Start)	Interior Temp. (F) (Stop)	Outgoing Canister Pressure ("Hg) (Lab)	Incoming Canister Pressure ("Hg) (Lab)	Flow Reg. ID	Can ID	Can Size (L)	Flow Controller Readout (ml/min)	Can Cert ID	Can Intake Height	TO-15	TO-14A	EPA 3C	EPA 25C	ASTM D-1946	Other (Please specify in notes section)	Indoor /Ambient Air	Soil Gas	Landfill Gas	Helium Prefill for High Methane (LF Gas)	Other (Please specify in notes section)
AS-3	10/30/07	0905	1247	-28.0	0*	7°C	11°C	-30.7		2764	2962	6L		ECRD	32"	✓										
FD-1	10/29/07	0955	1352	-29.0	<4.0	68	68			2930	3434				42"	✓										
WHTLY 1 FLR	10/29/07	0955	1352	-29.5	<4.0	68	68			2913	4233				40"	✓										
AS-4	10/30/07	0907	1300	-29.2	-4.0	7°C	11°C			2939	2626				36"	✓										
TB-2 (Trip blank)	10/30/07										2631															
		NOT		USED							2708															
NORTHSIDE	10/30/07	0855	1245	-28.0	-4.0	7°C	11°C			3188	2522				19"	✓										
FD-2	10/30/07	0855	1245	-28.0	-5.0	7°C	11°C			3468	4261				19"	✓										
TB-1 (Trip blank)	10/29/07										3229															
WHTLY BSMT	10/29/07	0958	1355	-30.0	<4.0	55	55			3054	2553				20"	✓										

	Temperature (Fahrenheit)			
10/30		Ambient	Data Source	
	Start	7°C	Kingp Airport	
	Stop	11°C	↓	

	Pressure (inches of Hg)			
10/30: start 30.35" stop 30.37 10/29		Ambient	Data Source	
	Start	30.46	Kingp Airport	
	Stop	30.38	↓	

GC/MS Analyst Signature (TO-15)

Analyze for PCE, TCE, cis-1,2-DCE & TRANS-1,2-DCE only
& Need to check upon arrival at lab

Samples Relinquished by: Miles Waite	Date/Time: 10/30/07 15:50	Received by: [illegible]	Date/Time: 10/30/07 1550
Relinquished by:	Date/Time:	Received by:	Date/Time:

WEM Waite Environmental

SITE: Whitly DATE: 10/29/07

AIR SAMPLING CHECKLIST

SAMPLE: WHTLY 1 FLR

LOCATION: Kitchen near door on top of rail

Windows	☐ Open	☑ Closed
Doors	☐ Open	☑ Closed
Air System	☐ On	☑ Off
Carpets	☐ Yes	☑ No
Tobacco Use	☐ Yes	☑ No
Unusual Odors	☐ Yes	☑ No

List activities or materials present in vicinity of sampling location that could result in volatile emissions:

Kitchen materials only

SAMPLE: FD-1

LOCATION: (SE 1FLR)

Windows	☐ Open	☐ Closed
Doors	☐ Open	☐ Closed
Air System	☐ On	☐ Off
Carpets	☐ Yes	☐ No
Tobacco Use	☐ Yes	☐ No
Unusual Odors	☐ Yes	☐ No

List activities or materials present in vicinity of sampling location that could result in volatile emissions:

SAMPLE: WHTLY BSMT

LOCATION: basement near bottom of stairs (dirt floor, stone foundation, musty

Windows	☐ Open	☑ Closed
Doors	☐ Open	☑ Closed
Air System	☐ On	☑ Off
Carpets	☐ Yes	☑ No
Tobacco Use	☐ Yes	☑ No
Unusual Odors	☑ Yes	☐ No

Rail oil odor / musty odor

List activities or materials present in vicinity of sampling location that could result in volatile emissions:

SAMPLE:

LOCATION:

Windows	☐ Open	☐ Closed
Doors	☐ Open	☐ Closed
Air System	☐ On	☐ Off
Carpets	☐ Yes	☐ No
Tobacco Use	☐ Yes	☐ No
Unusual Odors	☐ Yes	☐ No

List activities or materials present in vicinity of sampling location that could result in volatile emissions:

SAMPLE:

LOCATION:

Windows	☐ Open	☐ Closed
Doors	☐ Open	☐ Closed
Air System	☐ On	☐ Off
Carpets	☐ Yes	☐ No
Tobacco Use	☐ Yes	☐ No
Unusual Odors	☐ Yes	☐ No

List activities or materials present in vicinity of sampling location that could result in volatile emissions:

TestAmerica Burlington
30 Community Drive
Suite 11
South Burlington, VT 05403
phone 802-660-1990 fax 802-660-1919

Canister Samples Chain of Custody Record & TO-15 Field Test Data Sheet

TestAmerica Analytical Testing Corp. assumes no liability with respect to the collection and shipment of these samples.

Client Contact Information	Project Manager: Miles Waite	Carrier: Waite Environmental Mgt	1 of 1 COCs
Company: Waite Environmental Mangement	Phone: (802) 860-9400	Sampled By: Miles Waite Miles Waite	
Address: PO Box 4602	E-mail: mwaite@waiteenv.com		
City/State/Zip: Burlington, VT 05406	Site Contact: Miles Waite		
Phone: (802) 860-9400	STL Contact: Ron P.		
FAX: (802) 860-9440			
Project Name: UniFirst	**Analysis Turnaround Time**		
Site: Williamstown Bressett Wheatley	Standard (Specify) ✓		
PO #	Rush (Specify)		

Sample Identification	Sample Date(s)	Time Start (24 hr clock)	Time Stop (24 hr clock)	Canister Pressure in Field ("Hg) (Start)	Canister Pressure in Field ("Hg) (Stop)	Interior Temp. (F) (Start)	Interior Temp. (F) (Stop)	Outgoing Canister Pressure ("Hg) (Lab)	Incoming Canister Pressure ("Hg) (Lab)	Flow Reg. ID	Can ID	Can Size (L)	Flow Controller Readout (ml/min)	Can Cert ID	Can Intake Height	TO-15 - Low Level	TO-14A	EPA 3C	EPA 25C	ASTM D-1946	Other (Please specify in notes section)	Indoor /Ambient Air	Soil Gas	Landfill Gas	Helium Prefill for High Methane (LF Gas)	Other (Please specify in notes section)
WHTLYBSMT	11/6/07	0959	1342	-29.0	-4.0	56	56	-30.1		2831	3597	6		ELRD	14"	✓										
AS-3	11/6/07	1114	1452	-29.0	-4.0	5°C	8°C	⊥		3054	3622	⊥		⊥	33"	✓										

	Temperature (Fahrenheit)			
	Ambient	Data Source		
Start				
Stop				

	Pressure (Inches of Hg)			
	Ambient	Data Source		
Start				
Stop				

GC/MS Analyst Signature (TO-15) _____

Samples Relinquished by: Miles Waite	Date/Time: 11/6/07 1555	Received by:	Date/Time: 11-6-07 1555
Relinquished by:	Date/Time:	Received by:	Date/Time:

APPENDIX D:

DATA VALIDATION REPORTS

DATA VALIDATION

FOR

UniFirst Project
Bressett and UniFirst Sites
Randolph and Williamstown, VT

ORGANIC ANALYSIS DATA
Volatile Organics in Water Samples

Sample Delivery Group Nos. BRES39, UNIF30, UNIF31, and WHEA13

Chemical Analyses Performed by:

TestAmerica Burlington
30 Community Drive Dr. Suite 11
South Burlington, VT 05403

FOR

Mr. Gerold Noyes
VT Department of Environmental Conservation
Waste Management Division
103 South Main Street, West Building
Waterbury, VT 05676-0404

Data Validation Report by:

Phoenix Chemistry Services
126 Covered Bridge Rd.
N. Ferrisburg, VT 05473
(802)-233-2473

January 18, 2008

Reference #s 2007-1109-001, -1115 -001, -1128-001, & -1129-001
VOA Validation Report/BRES39_UNIF30-31_WHEA13/dhg

EXECUTIVE SUMMARY

Phoenix Chemistry Services (Phoenix) has completed the validation of the volatile organics analysis data prepared by TestAmerica Burlington (formerly STL Burlington) for 36 groundwater samples, 11 potable water samples, 1 performance evaluation (PE) sample, 7 field blanks (FB), and 5 trip blanks (TB) from the Bressett Site in Randolph, VT, the UniFirst Site in Williamstown, VT, and the Wheatley Farm site in Brookfield, VT. The laboratory reported the data under Sample Delivery Group (SDG) Nos. BRES39, UNIF30, UNIF31, and WHEA13, which were submitted as four data packages received by Phoenix on November 9, 15, 28, and 29, 2007. These SDGs include the following samples:

Sample Identifier	Laboratory ID
Method 8260B	
SDG No. BRES39	
MW-103D	727783
MW-104S	727784
MW-104D	727785
MW-102D	727786
MW-101S	727787
MW-102S	727788
MW-101D	727789
MW-Z	727790
FB-1	727791
TB-1	727792
BRW-3	727793
BRW-2	727794
BRW-1	727795
MW-4S	727796
MW-4D	727797
MW-3S	727798
MW-3D	727799
MW-Y	727800
FB-3	727801
SDG No. UNIF30	
MW-103D	727783
MW-104S	727784
MW-104D	727785
MW-102D	727786
MW-101S	727787
MW-102S	727788
MW-101D	727789
MW-Z	727790
FB-1	727791
SDG No. WHEA13	
MW-PLX	730406
MW-PL2	730407

Sample Identifier	Laboratory ID
MW-PL1	730408
MW-S3	730409
MW-S1	730410
MW-S2	730411
FB-6	730412
TB-5	730413
VHBLK01	730414
TB-1	727792
BRW-3	727793
BRW-2	727794
BRW-1	727795
MW-4S	727796
MW-4D	727797
MW-3S	727798
Method 524.2	
SDG No. BRES39	
SHIELDS	727803
WELL Z	727804
FB-2	727805
BOWEN NEW WELL	727806
VHBLK02	727807
SDG No. UNIF31	
WP-5	730395
WP-7	730396
WP-8	730397
WP-13	730398
WP-20	730399
WP-3	730400
WP-Z	730401
FB-7	730402
TB-6	730403

A cross-reference table of sample IDs was provided in the data packages. The laboratory noted that sample BOWEN NEW WELL was received, but not listed on the chain of custody (COC), and that sample TB-2 was listed on the COC but not received. No trip blank was analyzed with the Method 524.2 samples collected on 10/11/07 at the Bressett site; the laboratory Sample Receipt document indicates that no trip blank was received in the cooler with the Method 524.2 samples; however, this is not discussed in the Case Narrative. The trip blank identified as TB-1, received on the same day, was logged in and analyzed with the Method 8260B samples.

Findings of the validation effort resulted in the following qualifications of sample results:

- Results for tetrachloroethene in the original analyses of samples MW-101D, MW-102S, MW-3S, MW-D, and MW-Z, and results for cis-1,2-dichloroethene and total 1,2-dichloroethene in the original analyses of samples MW-101D and MW-Z, were rejected (R) and replaced with the acceptable concentrations from the corresponding diluted samples (MW-101DDL, MW-102SDL,

MW-3SDL, MW-DDL, and MW-ZDL).

- Results for all other analytes in samples MW-101DDL, MW-102SDL, MW-3SDL, MW-DDL, and MW-ZDL were rejected (R).

- The laboratory applied "E" and "D" qualifiers to the sample Form I's as appropriate. The validator removed all laboratory-applied "E" and "D" qualifiers.

- The laboratory appropriately applied "J" qualifiers to the sample Form I's when the concentration of an analyte was less than the sample-specific PQL. The validator did not remove these qualifiers.

The Overall Evaluation of Data (Section XVI) summarizes the validation results. The validation findings and conclusions for each analytical parameter are detailed in the remaining sections of this report.

Documentation problems observed in the data packages are described in Section XVII.

This validation report shall be considered <u>part of the data packages</u> for all future distributions of the volatiles (8260B and 524.2) analysis data.

INTRODUCTION

Analyses were performed according to SW-846 Method 8260B Low Level, as documented in STL SOP 8260B, and SDWA Method 524.2 Rev. 4.1, as documented in STL SOP 524.2, and in accordance with requirements in the Field/Laboratory Coordination Memorandum for Water Monitoring (FLCM), April 2, 2004. The target compound list for the Method 8260B analyses was limited to the OLM03.1 CLP target compound list, and the target compound list for Method 52.4.2 was limited to the OLM03.1 CLP target compound list plus methyl-*tert*-butyl ether (MTBE).

Tentative identification of non-target analyte peaks (i.e., tentatively identified compounds, or TICs) was not requested for these analyses.

Phoenix Chemistry Services' validation was performed in conformance with Tier III guidelines as defined by USEPA Region in the "Region I EPA-NE Data Validation Manual: The Data Quality System", (12/96 Revision). The data were evaluated in accordance with the "Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses", December 1996. EPA's National Functional Guidelines for Organic Data Review (EPA 540/R-99/008, October, 1999) were also considered during the evaluation, and professional judgment was applied as necessary and appropriate.

The data validation process evaluates data on a technical basis for chemical analyses conducted under the CLP or other well-defined methods. Contract compliance is evaluated only in specific situations. Issues pertaining to contractual compliance are noted where applicable. It is assumed that the data package is presented in accordance with the CLP (CLP-like or SW-846) requirements. It is also assumed that the data package represents the best efforts of the laboratory and has already been subjected to adequate and sufficient quality review prior to submission for validation. In instances where SW-846 or other specific methods have been used for the analyses, the validation effort is modified to acknowledge the differences in methodology while maintaining the goals and quality objectives of the CLP.

Results of sample analyses are reported by the laboratory as either qualified or unqualified; various qualifier codes are used by the laboratory to denote specific information regarding the analytical results. During the validation process, laboratory data are verified against all available supporting documentation. Based on this evaluation, qualifier codes may be added, deleted, or modified by the data validator. Raw data is examined in detail to check calculations, compound identification, and/or transcription errors. Validated results are either qualified or unqualified; if results are unqualified, this means that the reported values may be used without reservation. Final validated results are annotated with the following codes, as defined in the EPA Region I Functional Guidelines:

U - The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit. The sample quantitation limit accounts for sample specific dilution factors and percent solids corrections or sample sizes that deviate from those required by the method.

J - The associated numerical value is an estimated quantity.

UJ - The analyte was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

R - The data are unusable (analyte may or may not be present). Resampling and reanalysis is

necessary for verification. The R replaces the numerical value or sample quantitation limit. In some instances (e.g., a dilution) a result may be indicated as "rejected" to avoid confusion when a more quantitatively accurate result is available.

EB, TB, BB - An analyte that was identified in an aqueous equipment (field) blank, trip blank, or bottle blank that was used to assess field contamination associated with soil/sediment samples. These qualifiers are to be applied to soil/sediment sample results only.

These codes are assigned during the validation process and are based on the data review of the results. They are recorded on the Data Summary Forms contained in Attachment A and the Organic Analysis Data Sheets (Form I) in Attachment B of this validation report.

All data users should note two facts. First, **the "R" qualifier means that the laboratory-reported value is completely unusable.** The analysis is invalid due to significant quality control problems, and provides no information as to whether the compound is present or not. Rejected values should not appear on data tables because they have no useful purpose under any circumstances. Second, **no analyte concentration is guaranteed to be accurate even if all associated quality control is acceptable.** While strict quality control conformance provides well-defined confidence in the reported results, any analytical result will always contain some error.

The user is also cautioned that the validation effort is based on the materials provided by the laboratory. Software manipulation, resulting in misleading raw data printouts, cannot be routinely detected during validation; unless otherwise stated in the report, these kinds of issues are outside the scope of this review.

Detailed Findings of Measurement Error Associated with the Analytical Analysis

I. Preservation and Technical Holding Times (Sample Integrity)

The samples for volatiles analysis in SDG Nos. BRES39, UNIF30, UNIF31, and WHEA13 were collected on October 10-12, 15, 29, and 30, 2007. All volatiles analyses were performed within the acceptable holding times for preserved water samples (14 days from collection), as required by Region 1. Although not provided in the case narrative (as required by the CLP SOW), the pH of the samples was measured within two days after receipt at the laboratory, and is recorded in the Sample Preparation sections of the data packages. All recorded sample pH values were <2. The field sample collection sheets also note that the samples were appropriately preserved with HCl.

The cooler temperatures on receipt at the laboratory were checked and documented in the data packages, and were 4.9, 2.9, 3.9, 3.6, and 4.9^{o}C, which are within the acceptable range of 4 ^{o}C ±2°C, for the field samples.

II. GC/MS Instrument Performance Check (Tuning)

The samples were analyzed on two GC/MS systems identified as instruments L and M. The tuning of these instruments was demonstrated with analysis of 4-bromofluorobenzene (BFB); tunes were analyzed for each shift (12-hour period) during which the samples or associated standards were analyzed. All sixteen (16) BFB tunes were correctly calculated, within acceptance limits, and are reported accurately on the Form V summaries in the data packages.

III. Initial Calibration (IC)

Four ICs (10/11/07, 1017/07, 1018/07, and 1030/07) were performed on instrument L in support of the Method 8260B sample analyses and two ICs (10/1/07 and 11/4/07) were performed on instrument L in support of the method 524.2 sample analyses reported in these data packages. Documentation of all individual IC standards was present in the data packages and relative response factor (RRF) as well as percent relative standard deviation (%RSD) values were correctly calculated and accurately reported on the Form VI summaries.

Some target compounds were manually integrated in the ICs performed on instrument L. All of the manual integrations appear to be correctly performed, are initialed by the analyst, and are accurately reported with the final area listed on the tabular report and the before and after ion chromatograms included in the data packages.

All % RSDs for all ICs were below the maximum limit (30%) specified by Region I. All RRF's were above the 0.05 minimum technical criterion, with the following exceptions:

Instrument	IC	Average RRF	
		acetone	2-butanone
L (8260B)	10/11/07	0.035	0.019
	10/17/07	0.038	0.018
	10/19/07	0.032	0.016
Instrument	IC	Average RRF	

		acetone	2-butanone
L (8260B)	10/30/07	0.039	0.020
M (524.2)	10/1/07	>0.05	0.025
L (524.2)	11/4/07	0.041	0.019

Pursuant to the Region I validation document, results for 2-butanone in all samples and for acetone in all samples analyzed on instrument L in this data set warranted rejection (R) based on the low RRFs achieved. However, acetone and 2-butanone were spiked at a concentration of 5 µg/L in the matrix spikes, matrix spike duplicates (with the exception of sample SS-5, spiked at 50 ug/L), laboratory control samples, and laboratory control sample duplicates analyzed with this data set, and acceptable or high recoveries for both compounds were achieved in these analyses. Therefore, results for acetone and 2-butanone were not qualified on the basis of the low RRFs in the associated ICs on both instruments.

An ICV was analyzed immediately after each IC, as required, and recoveries were correctly calculated and accurately reported in the data packages, with the exceptions that the ICVs shown on the instrument run logs for the Method 524.2 analyses were not submitted with the data packages. All recoveries in the submitted ICVs were within (76 - 119 % recovery overall) laboratory established control limits (75 – 125 % recovery), with the exception that in the ICVs analyzed on instrument L on 10/19/07 and 10/30/07, acetone was recovered below (69 and 74 % recovery, respectively) the lower control limit. For the reasons discussed in the previous paragraph, no results for acetone were qualified on the basis of the slightly low recoveries in the ICVs analyzed on instrument L on 10/19/07 and 10/30/07.

IV. Continuing Calibration (CC)

Six continuing calibration (CC) standards were run on instrument L in support of the Method 8260B sample analyses, and two CC standards were run on instrument L in support of the Method 524.2 sample analyses reported in this data set. Two CC standards were run on instrument M in support of the Method 524.2 sample analyses reported in this data set. Documentation of the CC standards was present in the data packages and RRF as well as percent difference (%D) values were correctly calculated and accurately reported on the Form VII summaries within the data packages.

All RRFs were above the 0.05 minimum criterion, with the exceptions of acetone and 2-butanone, in the CC standards as shown:

Instrument	CC	RRF	
		acetone	2-butanone
L (8260B)	10/151/07 20:04	0.034	0.018
	10/16/07 09:07	0.031	0.018
	10/17/07 12:18	0.044	0.021
	10/19/07 10:17	0.030	0.017
	10/22/07 10:56	0.040	0.020
	11/6/0714:27	0.043	0.021
L (524.2)	11/5/07 12:50	0.044	0.020
	11/6/07 01:44	0.042	0.019
M (524.2)	10/22/07 09:08	>0.05	0.023
	10/24/07 08:40	>0.05	0.022

For the reasons discussed in Section III, no results for acetone or 2-butanone were qualified on the basis of the low RRFs in the associated ICs and CCs.

The maximum limit for %D in the CC standard allowed by Region 1 is ±25%. All %D results were below this limit for the CC standards on both instruments. The Form 7 for the CC analyzed on instrument L on 10/22/07 has flags to indicate that the %D for acetone and 2-butanone are outside of the upper control limit; however, the results for both compounds round to 25%D, and on that basis no results warrant qualification for the marginally high %D in this CC standard.

It should be noted that negative % difference values will result in a low bias for positive detects, and a positive % difference will result in a high bias for positive detects.

V. Blanks

Results for ten (10) water-matrix laboratory method blanks (MBs) were reported in association with this set of samples. No target analytes were detected in any MB.

Five trip blanks (TBs) were reported in these SDGs. No target analytes were detected in any TB.

Seven field blanks (FBs) were reported in these SDGs. No target analytes were detected in any FB.

Six holding (storage) blanks (HBs) were reported in these SDGs. No target analytes were detected in any HB. The HB stored with the samples received on 10/16/07 in SDG No. UNIF30 is not listed in the cross-reference table in the Case Narrative; however, it was logged in, analyzed, and reported with the associated samples.

VI. Surrogate Compounds

Percent recoveries (%R) for all four surrogate compounds in both analytical methods were correctly calculated, accurately reported on the Form II summaries within the data packages, and were within acceptance limits for all sample analyses, with the exception of the Method 524.2 HB identified as VHBLK01, associated with the samples in SDG No. UNIF31. Two surrogates (1,2-dichloroethane-d_4 and toluene-d_8), were recovered above (137 % and 131 %R, respectively) the upper control limit (130%R) in the reanalysis on 11/6/07, which was not included in the data package, but which followed, as required, the reanalyses of the matrix spike and duplicate samples. The surrogates were within acceptance limits in the original analysis on 11/5/07, which was submitted in the data package. The raw data for the reanalysis of VHBLK01 should be appended to the data package for UNIF31.

No results warrant qualification on the basis of the high surrogate recoveries in the HB identified as VHBLK01 associated with the Method 524.2 samples in SDG No. UNIF31.

VII. Internal Standards (IS)

All IS areas and retention times (RT) were within the established QC limits for all reported sample analyses in these data packages.

VIII. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Samples MW-4S, SS-5, and W-1 were used for the Method 8260B MS/MSD analyses in this data set. The spiking solutions contained all target compounds at 1 µg/L (except for the ketones at 5 µg/L) for all MS/MSD pairs, except sample SS-5, which was spiked at 10 ug/L (ketones at 50 ug/L). Percent recoveries (%R) and relative percent differences (%RPD) between paired recoveries were correctly calculated and accurately reported on the Form III summaries for the spiked analytes.

All recoveries were acceptable (range 80 – 140 %R; overall laboratory-derived control limits: 60 – 145 %R) and reproducible (RPD range 0-30%; limit 30% RPD), with the following exceptions:

Recoveries above (120 -140%R) the upper laboratory-derived control limits, but within Region 1 limits (60 – 140 %R) were reported in either or both the MS and MSD analyses of sample MW-4S for chloromethane, vinyl chloride, methylene chloride, 1,1-dichloroethane, 1,2-dichloroethane, and tetrachloroethene. Bromomethane was recovered above (150 %R) both the laboratory limit (145 %R) and the Region 1 limit in sample MW-4SMSD.

Recoveries above (120 – 130 %R) the upper laboratory-derived control limits, but within Region 1 limits (60 – 140 %R) were reported in either or both the MS and MSD analyses of sample W-1 for 1,1-dichloroethene, methylene chloride, trans-1,2-dichloroethene, 1,1-dichloroethane, cis-1,2-dichloroethene, chloroform, 1,1,1-trichloroethane, benzene, 1,2-dichloroethane, 1,2-dichloropropane, toluene, ethylbenzene, m,p-xylene, and o-xylene. Recovery of tetrachloroethene was reported as 0%R in sample W-1MS, and as -200%R in W-1MSD. However, the native concentration of tetrachloroethene in samples W-1 was 31 ug/L, which is more than four times greater than the spiking concentration of 1.0 ug/L.

Recoveries above (120 – 130 %R) the upper laboratory-derived control limits, but within Region 1 limits (60 – 140 %R) were reported in either or both the MS and MSD analyses of sample MW-S2 for chloromethane and 1,2-dichloroethane.

On the basis of recoveries within the Region 1 upper limit, no results warrant qualification on the basis of recoveries above the laboratory-derived upper control limits but below 140%R in samples MW-4S, W-1, and MW-S2. Since bromomethane was not detected in sample MW-4S, the result for bromomethane does not warrant qualification on the basis of its unacceptably high recovery in the associated MSD analysis. On the basis of the native concentration being more than four times the spiking level, the result for tetrachloroethene in sample W-1 does not warrant qualification on the basis of its unacceptably low recoveries in the associated MS and MSD analyses.

Samples SHIELDS and WP-8 were used for the Method 524.2 MS/MSD analyses in this data set. The spiking solution contained all target compounds at 1 µg/L (except for the ketones at 5 µg/L) for both MS/MSD pairs. Percent recoveries (%R) and relative percent differences (%RPD) between paired recoveries were correctly calculated and accurately reported on the Form III summaries for the spiked analytes.

All recoveries were acceptable (range 84 – 130 %R; overall limits: 70 – 130 %R) and reproducible (RPD range 0-15%; limit 40% RPD), with the following exceptions:

Recoveries above (150 and 160 %R, respectively) the laboratory and the Region 1 upper control limits were reported for bromomethane in the MS and MSD analyses of sample SHIELDS. Recovery above (140 %R) the laboratory upper limit, but marginally within the Region 1 upper control limit, was reported for chloroethane in sample SHIELDSMSD.

All analytes were spiked into the MS/MSD analyses; therefore non-spiked target compounds could not be evaluated against the parent samples to evaluate laboratory precision.

IX. Field Duplicates

SDG Nos. BRES39, UNIF30, UNIF31, and WHEA13 contained six groundwater and two potable water field duplicate pairs, which were identified in the field sampling notes as follows.

Field Sample	Field Duplicate
Groundwater	
MW-101D	MW-Z
MW-3D	MW-Y
MW-E	W-Z
W-SEEP	SS-Z
MW-PL1	MW-PLX
MW-25884	BRW-X
Potable Water	
SHIELDS	WELL-Z
WP-3	WP-Z

Precision in the field duplicate pairs MW-101D and MW-Z, MW-3D and MW-Y, and MW-E and W-Z was acceptable (less than 30 % RPD) for all target analytes greater than 2 times the quantitation limit. No target compounds greater than 2 times the quantitation limit were detected in any of the remaining samples, so precision could not be evaluated in these field duplicate pairs.

X. Sensitivity Check

The aqueous MDL for Method 8260B submitted for this project was begun on 11/7/07 and the MDL verification studies were completed on 11/21/07, which is just after the time period in which these samples were being analyzed. The previous MDL was completed on 6/13/06, which is slightly more than one year prior to the sample analyses in this data set. All analytes had calculated, verified MDLs below the method quantitation limits in both MDL studies.

The aqueous MDL for Method 524.2 submitted for this project was begun on 9/23/07 and the MDL verification studies were completed on 10/26/07, which is just prior to or during the time period in which these samples were being analyzed. All analytes had calculated, verified MDLs below the method quantitation limits in the MDL study.

All of the laboratory control samples and the MS and MSD analyses analyzed with the samples for both methods were spiked at 1 µg/L, as required by the FLCM. Recoveries within or above Region 1 acceptance criteria (60 – 140 %R) were obtained for all target analytes in all spiked analyses. In addition, the low standard of the initial calibrations for both methods supports the reporting limit for the sample analyses.

XI. Performance Evaluation (PE) Samples/Accuracy Check

Five zero blind PE sample (commonly known as laboratory control sample, LCS) and duplicate

(LCSD) pairs were prepared and analyzed by the laboratory at 1 µg/L (ketones at 5 ug/L) on instrument L in support of the Method 8260B sample analyses in this data set. Laboratory established control limits are 60 – 145%R overall, and the Region 1 control limits are 60 – 140 %R. Percent recoveries were correctly calculated and accurately reported on Form III summaries in the data packages, and were acceptable (82 – 120 %R overall) for the LCS and LCSD pairs analyzed on 10/15/07, 10/16/07, 10/17/07, and 10/19/07, with the following exceptions:

Bromomethane was recovered at 160 %R in the LCSD analysis identified as LA101607LCSD, and chloromethane, chloroethane, and acetone were recovered above laboratory and Region 1 upper control limits in LA101707LCS.

For the LCS/LCSD pair analyzed on 10/22/07, identified as LA102207LCS and LA102207LCSD, all analytes in the LCS analysis were within both laboratory and Region 1 control limits, with the single exception of 1,1-dichloroethene, which was marginally above (115.7 %R) the laboratory upper control limit (115 %R). More than one-half of the analytes were above the laboratory upper control limits in the LCSD analysis; however, only acetone was above (144 %R) the Region 1 upper control limit.

Reproducibility between all Method 8260B LCS and LCSD pairs was acceptable (0 – 21 % RPD).

Two zero blind PE sample (commonly known as laboratory control sample, LCS) and duplicate (LCSD) pairs were prepared and analyzed by the laboratory at 1 µg/L (ketones at 5 ug/L) on instrument L and two on instrument M in support of the Method 524.2 sample analyses in this data set. Percent recoveries were correctly calculated and accurately reported on Form III summaries in the data packages, and were acceptable (78 – 130 %R overall); laboratory established control limits are 60 – 145 %R overall.

Since bromomethane, chloromethane, chloroethane, and acetone were not detected in any associated sample analysis, no results warrant qualification on the basis of the unacceptably high recoveries in either the LA101607LCSD or the LA101707LCS analyses. For all other compounds, on the basis of professional judgment, no results warrant qualification on the basis of the recoveries above laboratory established control limits but within Region 1 control limits in the Method 8260B and Method 524.2 LCS and LCSD pairs.

One external single-blind PES sample for Method 524.2 was submitted with the samples in this sampling round. The results of the PES are summarized in Appendix C. All spiked compounds were within the vendor's published QC Performance Acceptance Limits (three standard deviations).

An acceptance range for the combined m- & p-xylene isomers was not established by the vendor; however, the total xylenes result was well within its acceptance range.

XII. Target Compound Identification

Reported target compounds were correctly identified with supporting spectra present for all samples in these data packages.

XIII. Compound Quantitation and Reported Quantitation Limits

Target compound quantitation and practical quantitation limits (PQLs) were accurately reported on the Form I summaries. Tetrachloroethene was detected above the calibration range in the original analyses of samples MW-101D, MW-102S, MW-3S, MW-D, and MW-Z; these samples were reanalyzed at an

appropriate dilution to bring tetrachloroethene within the upper half of the calibration range, and both sets of analyses were reported in the data package.

Results for tetrachloroethene initially outside the calibration range in the original analyses of samples MW-101D, MW-102S, MW-3S, MW-D, and MW-Z were rejected (R) and replaced with the acceptable concentrations from the corresponding diluted samples (MW-101DDL, MW-102SDL, MW-3SDL, MW-DDL, and MW-ZDL). Results for cis-1,2-dichloroethene initially outside the calibration range, and results for total 1,2-dichloroethene based on the cis- isomer, in the original analyses of samples MW-101D and MW-Z were rejected (R) and replaced with the acceptable concentrations from the corresponding diluted samples (MW-101DDL and MW-ZDL).

Results for all other analytes in samples MW-101DDL, MW-102SDL, MW-3SDL, MW-DDL, and MW-ZDL were rejected (R) because acceptable results for these compounds were taken from the original analyses (MW-101D, MW-102S, MW-3S, MW-D, and MW-Z).

"E" qualifiers were appropriately applied by the laboratory to sample Form I results when concentrations of target analytes were greater than the instrument calibration range. "D" qualifiers were properly applied by the laboratory to positive results from diluted sample analyses. The validator removed all laboratory-applied "E" and "D" qualifiers. An "X" has been drawn across the entire Form I for the diluted analyses noted above.

The laboratory appropriately applied "J" qualifiers to the sample Form I's when the concentration of an analyte was less than the sample-specific PQL. The validator did not remove these qualifiers.

The values that the validator has judged to be acceptable are presented on the Data Summary Forms in Attachment A and on the Form 1s in Attachment B.

The Data Summary Forms (DSFs) in Attachment A list all individual sample analytes affected by the applied qualifications. All positive results are listed on these forms, whether or not the value or qualifier was changed as a result of the validation. Where no result is listed, the compound was not detected and the PQL was not qualified. Sample-specific quantitation limits may be found on the laboratory-generated Form I for each sample (Attachment B) or may be calculated for waters from the information on the DSFs as follows: unadjusted PQL (far left column) multiplied by the concentration/dilution factor (DF).

XIV. Tentatively Identified Compounds (TICs)

Evaluation of unidentified, non-target analyte peaks was not requested or performed for these samples.

XV. System Performance

The analytical systems appear to have been operating well at the time of these analyses based on the evaluation of the available raw data.

XVI. Overall Evaluation of Data

Results for volatile organic compounds were determined to be valid as reported for all samples in SDG Nos. BRES39 and UNIF30, with the following exceptions:

- Results for tetrachloroethene initially outside the calibration range in the original analyses of samples MW-101D, MW-102S, MW-3S, MW-D, and MW-Z, and results for cis-1,2-dichloroethene initially outside the calibration range, and results for total 1,2-dichloroethene based on the cis- isomer, in the original analyses of samples MW-101D and MW-Z, were rejected (R) and replaced with the acceptable concentrations from the corresponding diluted samples (MW-101DDL, MW-102SDL, MW-3SDL, MW-DDL, and MW-ZDL).

- Results for all other analytes in samples MW-101DDL, MW-102SDL, MW-3SDL, MW-DDL, and MW-ZDL were rejected (R) because acceptable results for these compounds were taken from the original analyses (MW-101D, MW-102S, MW-3S, MW-D, and MW-Z).

- "E" qualifiers were appropriately applied by the laboratory to sample Form I results when concentrations of target analytes were greater than the instrument calibration range. "D" qualifiers were properly applied by the laboratory to positive results from diluted sample analyses. The validator removed all laboratory-applied "E" and "D" qualifiers.

- The laboratory appropriately applied "J" qualifiers to the sample Form I's when the concentration of an analyte was less than the sample-specific PQL. The validator did not remove these qualifiers.

Documentation problems observed in the data packages are described in Section XVII.

XVII. Documentation

Chain-of-custody (COC) and internal chain of custody (ICOC) records were present and completed accurately.

- Improper edits were noted on some of the instrument run logs. All corrections should be made by making a single line through the edit, adding the correct information, and recording the editor's initials and the date.

- Sample BOWEN NEW WELL was received by the laboratory but not listed on the COC.

- Sample TB-2 was listed on the COC but not received by the laboratory. The groundwater collection field notes indicate that TB-2 was discarded by the sampler because only a single cooler was used; however, two coolers were received on 10/12/07 from the Bressett site sample collection. No trip blank was received with the Method 524.2 samples collected on 10/11/07 at the Bressett site.

These issues do not directly affect the validity of the analytical data, but could be problematic if the results were to be used in a litigation situation.

Data presentation was acceptable, with the following observations:

- The laboratory noted that the containers received for sample FB-1 did not list a time of collection; however, the COC did list the collection time, and this was used for sample log-in. The time on the COC is the same as the time on the field sample collection sheet.

- The ICVs listed on the instrument run logs for the Method 524.2 initial calibrations were not included in the data package.

- The HB stored with the samples received on 10/16/07 in SDG No. UNIF30 is not listed in the cross-reference table in the Case Narrative; however, it was logged in, analyzed, and reported with the associated samples.

- The raw data for the reanalysis on 11/6/07 of the HB VHBLK01 for SDG No. UNIF31 was not included in the data package; the raw data for the original analysis was present. The raw data for the reanalysis should be appended to the data package; this report was requested from the laboratory and received on January 18, 2008.

- In the data package for SDG No. BRES39, several pages are out of order for the analysis of LA101707LCSD; all pages are present.

- In the data package for SDG No. UNIF30, the quantitation report for LA101907LCSD is not present; the quantitation report for LA101907LCS is present twice. Pages 416 – 417 should be discarded, and the correct quantitation report should be inserted in their place. This report was requested from the laboratory and received on January 18, 2008.

This validation report should be considered <u>part of the data packages</u> for all future distributions of the volatiles (8260B and 524.2) analysis data.

DATA VALIDATION

FOR

UniFirst Project
Williamstown Sites
Williamstown, VT

ORGANIC ANALYSIS DATA
Selected Volatiles in Air Samples

Sample Delivery Group (SDG) No.
122733

Chemical Analyses Performed by:

Test America Burlington
30 Community Drive, Suite 11
South Burlington, VT 05403

FOR

Mr. Gerold Noyes
Waste Management Division
VT Department of Environmental Conservation
103 South Main Street/ West Building
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Data Validation Report by:

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December 29, 2007
Revised February 8, 2008

Reference #2007-1127-001
VOA Air Validation Report/122733/dhg

EXECUTIVE SUMMARY

Phoenix Chemistry Services (Phoenix) has completed the validation of the method TO-15 Low Level (volatiles in air) analysis data prepared by TestAmerica Burlington (formerly STL Burlington) of South Burlington, VT, for seven (7) air samples and two (2) trip blanks (TBs) from the UniFirst project sites in Williamstown and , VT. The laboratory reported the data under Sample Delivery Group (SDG) No. 122733, which was submitted as a single data package received by Phoenix on November 27, 2007, and includes the following samples:

Sample ID	Laboratory ID
FD-1	730331
WHTLY1FLR	730332
AS-4	730333
TB-2	730334
NORTHSIDE	730335
FD-2	730336
TB-1	730337
WHTLYBSMT	731190
AS-3	731191

A cross-reference table of sample IDs was provided in the data package.

The samples in this data set represent the sample collection from October 29 and 30, 2007 inside and outside the Williamstown Elementary School site and inside a private residence in Brookfield, VT. These samples were hand-delivered to the laboratory on the same day they were collected. Two sample canisters were received at the laboratory with insufficient vacuum remaining (+0.2 inches Hg and -0.4”Hg), and were cancelled after consultation with the Project Coordinator. The two replacement samples (AS-3 and WHTLYBSMT) were collected on November 6, 2007, and were also hand-delivered to the laboratory on the same day as collection.

Findings of the validation effort resulted in no qualifications of sample results.

The Overall Evaluation of Data (Section XVI) summarizes the validation results. The validation findings and conclusions for each analytical parameter are detailed in the remaining sections of this report.

Documentation problems observed in the data package are described in Section XVII.

This validation report shall be considered <u>part of the data package</u> for all future distributions of TO - 15 (volatiles in air) analysis data.

INTRODUCTION

Analyses of selected volatiles in air samples were performed according to Method TO-15, the laboratory standard operating procedure (SOP) No. LM-AT-LLTO15, and in accordance with requirements in the Field/Laboratory Coordination Memorandum for Air Monitoring (FLCM), April 2, 2004. The target compound list was limited to the following compounds:

cis-1,2-Dichloroethene	Trichloroethene
trans-1,2-Dichloroethene	Tetrachloroethene

Tentative identification of non-target analyte peaks (i.e., tentatively identified compounds, or TICs) was not requested for these analyses.

Phoenix's validation was performed in conformance with Tier III guidelines as defined by USEPA Region I. Data qualifiers are applied as necessary and appropriate. To the extent possible, the data were evaluated in accordance with the "Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses", December, 1996. EPA's National Functional Guidelines for Organic Data Review (EPA 540/R-94/012, 2/94) were also considered during the evaluation, and professional judgment was applied as necessary and appropriate.

The data validation process evaluates data on a technical basis for chemical analyses conducted under the CLP or other well-defined methods. Contract compliance is evaluated only in specific situations. Issues pertaining to contractual compliance are noted where applicable. It is assumed that the data package is presented in accordance with the CLP requirements. It is also assumed that the data package represents the best efforts of the laboratory and has already been subjected to adequate and sufficient quality review prior to submission for validation.

Results of sample analyses are reported by the laboratory as either qualified or unqualified; various qualifier codes are used by the laboratory to denote specific information regarding the analytical results. During the validation process, laboratory data are verified against all available supporting documentation. Based on this evaluation, qualifier codes may be added, deleted or modified by the data validator. Raw data is examined in detail to check calculations, compound identification, and/or transcription errors. Validated results are either qualified or unqualified; if results are unqualified, this means that the reported values may be used without reservation. Final validated results are annotated with the following codes, as defined in the EPA Region I Functional Guidelines:

U - The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit. The sample quantitation limit accounts for sample specific dilution factors and percent solids corrections or sample sizes that deviate from those required by the method.

J - The associated numerical value is an estimated quantity.

UJ - The analyte was analyzed for, but was not detected. The sample quantitation limit is an

estimated quantity.

R - The data are unusable (analyte may or may not be present). Resampling and reanalysis is necessary for verification. The R replaces the numerical value or sample quantitation limit. In some instances (e.g., a dilution) a result may be indicated as "rejected" to avoid confusion when a more quantitatively accurate result is available.

EB, TB, BB - An analyte that was identified in an aqueous equipment (field) blank, trip blank, or bottle blank that was used to assess field contamination associated with soil/sediment samples. These qualifiers are to be applied to soil/sediment sample results only.

These codes are assigned during the validation process and are based on the data review of the results. They are recorded on the Data Summary Forms contained in Attachment A and the Organic Analysis Data Sheets (Form I) in Attachment B of this validation report.

All data users should note two facts. First, **the "R" qualifier means that the laboratory-reported value is completely unusable.** The analysis is invalid due to significant quality control problems, and provides no information as to whether the compound is present or not. Rejected values should not appear on data tables because they have no useful purpose under any circumstances. Second, **no analyte concentration is guaranteed to be accurate even if all associated quality control is acceptable.** While strict quality control conformance provides well-defined confidence in the reported results, any analytical result will always contain some error.

The user is also cautioned that the validation effort is based on the materials provided by the laboratory. Software manipulation, resulting in misleading raw data printouts, cannot be routinely detected during validation; unless otherwise stated in the report, these kinds of issues are outside the scope of this review.

Detailed Findings of Measurement Error Associated with the Analytical Analysis

I. Sample Integrity

The air samples for TO-15 analysis were collected on October 29 and 30, 2007 for the October sampling round at the Williamstown Elementary School site in Williamstown, VT, and one private residence in Brookfield, VT. Two sample analyses were cancelled following receipt due to insufficient residual vacuum in the sample canisters, and the samples were again collected on November 6, 2007. All analyses were performed within fifteen (15) days after sample collection, which is within the 30 day holding time defined in Method TO-15.

The Canister Samples Chain of Custody Record & TO-15 Field Test Data Sheet (COC) shows that the sample canisters were collected and transported according to method specifications. The canisters were picked up from the laboratory on the first day of sample collection, and following sample collection, the canisters were hand-delivered to the laboratory on the same day or the day following collection.

II. GC/MS Instrument Performance Check (Tuning)

The samples for volatiles in air analysis from SDG No. 122733 were analyzed on a single GC/MS system identified as instrument E. The tuning of this instrument was demonstrated with analysis of 4-bromofluorobenzene (BFB); tunes were analyzed for each 24-hour period during which the samples or associated standards were analyzed. Both (2) BFB tunes were correctly calculated, within acceptance limits, and are reported accurately on the Form V summaries in the data package.

III. Initial Calibration (IC)

One IC (10/25/07) was performed on instrument E in support of the TO-15 sample analyses. The IC was performed at seven concentration levels (0.01, 0.02, 0.05, 0.10, 0.2, 0.5, and 1 ppbv). Documentation of all individual IC standards was present in the data package and relative response factor (RRF) as well as percent relative standard deviation (%RSD) values were correctly calculated and accurately reported on the Form VI summary. Three additional calibration levels (0.75, 1.5, and 2.0 ppbv) were analyzed, are listed on the Form V summary, and are present in the data package, but were not used in the calculation of the calibration curve, and appropriately do not appear on the Form VI summary.

An Independent Calibration Verification (ICV) sample analysis at 0.10 ppbv for the IC was included in the data package, and all target analytes were recovered within 97 – 105 % recovery of expected values; trans-1,2-dichloroethene was present in the ICV analysis.

All average RRF values were above the 0.05 minimum criterion, and all %RSDs were below the maximum limit (30%) specified by Region I.

IV. Continuing Calibration (CC)

A single continuing calibration (CC) standard was run in support of the sample analyses reported in this data package. Documentation of the CC standard was present in the data package and RRF as well as percent difference (%D) values were reported on the Form VII summary within the data package. Sample results were reported using the average RRF of the calibration curve for quantitation. All RRF values were above the 0.05 minimum criterion, and all %D results were below the maximum limit of 25% specified by Region I.

V. Blanks

Results for one air-matrix laboratory method blank (MB) were reported in association with these samples. No target compounds were found in the MB.

Two trip blanks (TBs) were reported in this data package. No target compounds were found in the TBs.

VI. Surrogate Compounds

No surrogate compounds are used in this method.

VII. Internal Standards (IS)

All IS areas and retention times (RT) were within the established QC limits for all reported sample analyses in this data package.

VIII. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

A matrix spike/matrix spike duplicate (MS/MSD) analysis is not used in this method.

IX. Field Duplicates

Sample FD-1 was identified as a field duplicate of WHTLY1FLR, and sample FD-2 was identified as a field duplicate of Northside. No target compounds were detected in the field duplicate pair FD-2 and Northside.

Trichloroethene was reported at greater than twice the quantitation limit in both samples of the field duplicate pair FD-1 and WHTLY1FLR, and showed acceptable precision (4.3 %RPD).

X. Sensitivity Check

An MDL study for this TO-15 method was analyzed on 7/6/07, and submitted on 9/28/07. All target analytes in this study had calculated MDL's below the method quantitation limits, and demonstrated acceptable ratios (at least 3:1) of the quantitation limit (QL) to the verified MDL (MDLV), with the exception of cis-1,2-dichloroethene, which had a quantitation limit (QL) to MDLV ratio of 1.2:1. The MDL verification studies performed as part of the overall MDL study demonstrated acceptable sensitivity for this compound (it was detected at less than one-half the QL), and acceptable precision (range: 83 – 119 %R) for spikes just above or just below the QL. The limit of quantitation (LOQ) verification study performed on 8/1/07 demonstrated acceptable precision (111 %R) at a spiking concentration twice the QL (0.020 ppbv). The QL is also supported by the low concentration standard (at 0.010 ppbv) in the initial calibration.

On the basis of acceptable sensitivity and accuracy, as demonstrated by the full MDL study, including the MDLV and LOQ verification studies, all results for the low level TO-15 method (detects and non-detects) not qualified for other reasons, are deemed acceptable as reported.

XI. Performance Evaluation Samples (PES)/Accuracy Check

One set of zero blind PE samples (commonly known as a laboratory control sample, LCS, and duplicate, LCSD) were prepared and analyzed by the laboratory in support of these analyses. All target analytes were spiked into the QC samples. Percent recoveries (%R) were correctly calculated for the spiked compounds, accurately reported on the Form III summary in the data package, and were within the laboratory established QC limits (70 - 130 %R) for all target analytes. All RPD values were acceptable (<25 %RPD).

No external single-blind PES sample was required or submitted with the samples in this data set.

XII. Target Compound Identification

Reported target compounds were correctly identified for all samples in this data set.

XIII. Compound Quantitation and Reported Quantitation Limits

Target compound quantitation and practical quantitation limits (PQLs) were accurately reported on the Form I summaries. Results below the PQL are not reported by the laboratory for the low level TO-15 method.

The values that the validator has judged to be acceptable are presented on the Data Summary Forms in Attachment A and on the Form 1s in Attachment B. Both forms include results in units of ppbv (parts per billion by volume) and in ug/m^3 (micrograms per cubic meter). Two sets of Form 1s are presented by the laboratory in the data package. One set presents the results in both units, and is included in Attachment B. The other set presents the results in ppbv only, but includes more sample-related information.

All positive results are listed on the Data Summary Forms, whether or not the value or qualifier was changed as a result of the validation. Where no result is listed, the compound was not detected and the reporting limit was not qualified. Sample-specific quantitation limits may be found on the laboratory-generated Form I for each sample (Attachment B) or may be calculated from the information on the DSFs as follows: reported PQL multiplied by the dilution factor (DF).

XIV. Tentatively Identified Compounds (TICs)

Evaluation of unidentified, non-target analyte peaks was not requested or performed for these samples.

XV. System Performance

The analytical system appears to have been working well at the time of these analyses based on evaluation of the available raw data.

XVI. Overall Evaluation of Data

Findings of the validation effort resulted in no qualifications of sample results.

XVII. Documentation

Calibration check and pre-sampling leak check records for the mass flow controllers supplied by the laboratory were included with this data set, as required by the FLCM. The required records for canister cleanliness were included with the data package.

The chain of custody (COC) records were present and accurately completed for all reported samples in this data set with the following exception:

- Improper edits were noted on one the instrument run logs and the COC. All corrections should be made by making a single line through the edit, adding the correct information, and recording the editor's initials and the date.

This issue does not directly affect the validity of the analytical data, but could be problematic if the results were to be used in a litigation situation.

This validation report should be considered <u>part of the data package</u> for all future distributions of the TO-15 (volatiles in air) analysis data.