Waite
Environmental Management, LLC.

January 26, 2011

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

RE: 2010 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 *2010 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 2010 (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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2010 ANNUAL MONITORING REPORT

for the

WHEATLEY SITE
BROOKFIELD, VERMONT

VT DEC Site #77-0087

January 26, 2011

Prepared for:

STATE OF VERMONT
Vermont Department of Environmental Conservation
Waste Management Division
103 South Main Street, West Building
Waterbury, Vermont 05671-0404

Prepared by:

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1.0 INTRODUCTION

The following *2010 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 2010. 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 four (4) groundwater monitoring wells during October 2010.
- Collection of two (2) indoor air samples from the Moorcroft residence during October 2010.

Monitoring is 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 22, 2010. The following four (4) monitoring wells were monitored: MW-S1, MW-S2, MW-PL1 and 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.

WEM was unable to sample well MW-S3, which is typically sampled as part of the annual monitoring program, as it has been destroyed. WEM was prepared to repair the well during October 2010 as it had previously been noted to be damaged but repairable. However, the stickup well guard that formerly protected the well was gone, and the PVC casing appears to have been buried and is no longer repairable. The horses which occupy the field here are to blame for the damage, as they like to use the well guard as a scratching post. The VT DEC must decide whether there is a continued need for this well, and if so, then how to best replace the well.

2.1 Groundwater Level Measurement

Prior to sampling on October 22, 2010, 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 3.68 to 17.94 ft below top-of-casing (ft btoc).

Using top-of-casing elevation data, the measurements were converted into groundwater elevations. Elevation data from October 2010 are shown with historical measurements in Table 1.1 in Appendix B. Compared to the previous round of measurements in October 2009, there was an average increase in groundwater elevation of 1.1 ft. The largest increase was noted in well MW-PL1 (1.81 ft). The overall increase appears to be seasonal and not part of a long-term trend.

Groundwater elevations were also plotted to develop a groundwater elevation map (see Groundwater Elevation Map – October 2010 in Appendix A). As this map shows, the general direction of overburden groundwater flow was toward the west, or toward the Second Branch of the White River. The lateral hydraulic gradient between well MW-PL2 and MW-S2 was 0.013 ft/ft, or 1.3%. In the lower meadow in the vicinity of wells MW-S1 and MW-S2, the groundwater flow direction is southerly, also toward the River. The 2010 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. The purge rate, as specified by site protocols, was 100 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 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 with the exception of the measurement of turbidity. While the turbidity readings could be used in the field to evaluate stabilization, the values were all atypically high and are not presented in Appendix B. It was later determined that the problem was due to a faulty sensor in the water quality meter. The probe was fixed after the sampling event was complete.

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. Based on a comparison to historical water quality parameters (2002-2009), the following observations can me made from the October 2010 data:

- **Dissolved oxygen** readings were within the range of historical measurements for MW-PL1 and MW-PL-2, but were slightly higher than typical for MW-S1 and MW-S2. No clear increasing trends are noted.
- **Specific conductance** readings were all within the range of historical measurements with no anomalies or clear trends.
- **pH** readings were generally lower than historical measurements for all wells. No clear decreasing trends are noted.
- **Turbidity** readings are deemed inaccurate are not evaluated; this was later determined to be from a faulty sensor on the meter.
- **Redox (ORP)** readings were all within the range of historical measurements with no anomalies or clear trends.

2.3.2 Analytical Results

The analytical results from October 2010 indicate the following:

- **MW-PL1**: the target compound PCE was reported at a concentration of 2.2 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.

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 2005-2010 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.

It should be mentioned that the non-target petroleum compound toluene that was reported in sample MW-S2 during 2005-06 was not present in the 2010 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 2010 sampling event. A duplicate "MW-PLX" was collected in conjunction with MW-PL2. These samples were analyzed by TA using the same method (EPA Method 8260B). Because no target compounds greater than 2 times the quantitation limit were detected in either sample, precision could not be evaluated in this field duplicate pair.

WEM also collected a trip blank (TB-3) and a field blank (FB-4) during the October 2010 sampling event. No target compounds were reported in either of these samples, indicating that there were no spurious influences on sample quality.

2.4 Discussion of Data Validation

The laboratory data from the October 2010 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 22, 2010 (sample delivery group SDG No. WHEA16).

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 2011. Due to the irreparable damage to well MW-S3, the VT DEC must decide whether this well needs to be replaced for future groundwater monitoring.

3.0 INDOOR AIR SAMPLING

Indoor air sampling was conducted from inside the Moorcroft residence by WEM on October 22, 2010. Sampling was conducted in accordance with WEM's Work Plan. Details and results of the air sampling event 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 and flow controllers were procured by WEM from TestAmerica Laboratory (TA) of South Burlington, Vermont prior to sampling. The flow controllers were all calibrated by TA to provide a flow rate that allowed a final canister pressure between -7.0 and -2.0 inches of Mercury (in Hg) below ambient pressure after a run time of approximately 4 hours. The cleanliness of each canister was individually certified by TA. Prior to use of the canisters, WEM reviewed the "Air Canister Cleaning Logs and Clean Canister Certification Report" and the "Mass Flow Controller Set Flow Rate & Leak Check Record" and did not find any problems.

The sampling procedure at each site involved setting up the canister at the designated sampling location, attaching a digital pressure gauge to measure initial pressure and comparing it to the pressure recorded by laboratory, attaching the flow controller, recording initial canister pressure from the analog pressure gauge, 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 or the thermostat in the sampling location. Samples were allowed to run for approximately 4 hours. Upon completion, a second digital pressure gauge measurement is made and recorded along with the analog pressure gauge measurement. Exact times of each sample collection and other recorded field data are shown on the Canister Samples Chain of Custody Record & Field Test Data Sheet in Appendix C.

No significant problems were encountered during the sampling event, and all sampling procedures were in accordance with the *Work Plan*. However, the final pressure reading for sample WHTLYBSMT was recorded in the field at 0.0 in Hg, or ambient. The laboratory confirmed the pressure readings upon receipt of the canister, and determined that a faulty flow controller that allowed an excessively high flow rate was to blame. After discussion with the Data Validator and VT DEC, it was agreed that the duplicate sample FD-1, which was collected in conjunction with WHTLYBSMT, could be used to evaluate basement airspace conditions and avoid the need for re-sampling, which accommodated the needs of the homeowner without compromising the project quality objectives.

All samples were delivered by WEM to TA under chain-of-custody procedures for analysis of the four target volatile organic compounds: tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), and trans-1,2-dichloroethene (trans-1,2-DCE). Analysis was by Method TO-15 (Low Level). Results, in parts per billion (ppbv), are discussed below.

3.2 Discussion of Results

Air sampling results from October 2010 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 compounds PCE, TCE, and trans-1,2-DCE were detected above quantitation limits in the first floor sample, and only the compound trans-1,2-DCE was detected in the basement sample. All concentrations are very low and below applicable guidance levels. The PCE concentration in the first floor (0.10 parts per billon (ppbv)) is an order of magnitude below the guidance level of 1.0 ppbv.

In October 2009 there was an unexpected detection of TCE at a concentration above the guidance level in the first floor. Prior to this, TCE had been detected only one other occasion, during sampling in October 2007. Previous to 2007, TCE had not previously been detected in the airspace inside this house <u>or</u> in the groundwater under the property. The October 2010 concentration (0.12 ppbv) is well below the guidance level (1.0 ppbv), indicating that the concentration, and associated concern, may be diminishing with time. The lack of TCE in the basement airspace in October 2010 suggests that this chemical is not migrating into the house via a soil/groundwater flowpath, but rather from a different source. Given that maintenance of vehicles is conducted on the property, WEM suspects that the source of TCE in the air is engine and brake cleaning solvents that are used by Mr. Moorcroft and may be brought into the house on clothing or tools.

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 2010 indoor air sampling event. This sample was collected in conjunction with the sample from the basement (WHTLYBSMT). Because one of the pairs (WHTLYBSMT) was not analyzed due to the fact that it went to ambient pressure, precision could not be evaluated.

WEM also submitted a trip blank (TB-1) on October 22, 2010. 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 19, 2010 (SDG No. 200-2136). 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 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 2011.

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,* December 31, 2007.

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,* December 22, 2007.

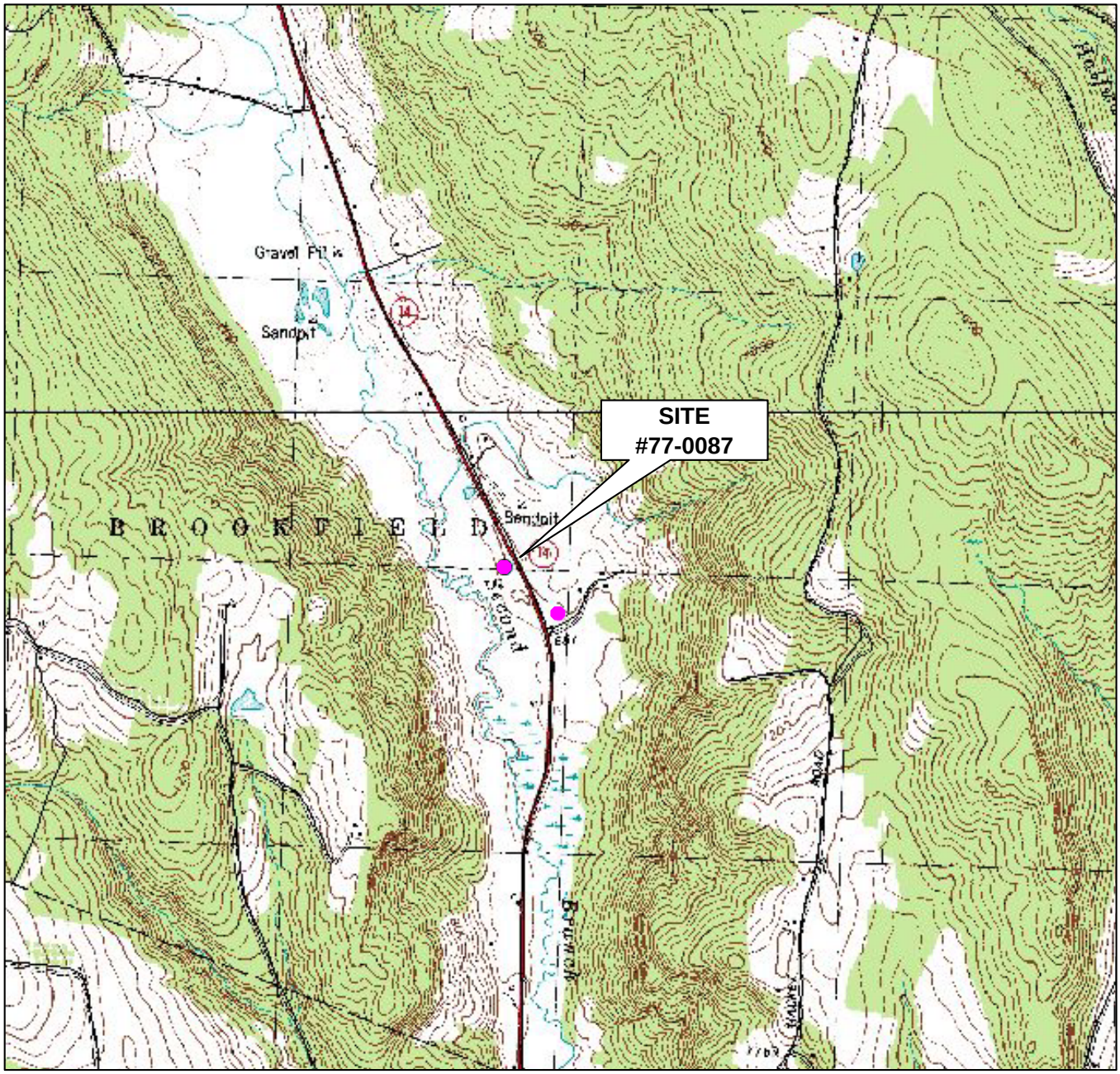
4. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Bressett, Wheatley and UniFirst Sites, Randolph, Brookfield and Williamstown, VT, Organic Analyses Data, Volatile Organics in Water Samples, Sample Delivery Group Nos. BRES48, UNIF38 , and WHEA16,* December 10, 2010.

5. Phoenix Chemistry Services, *Data Validation for the UniFirst Project, Wheatley Site, Brookfield, VT, Organic Analyses Data, Selected Volatiles in Air Samples, Sample Delivery Group No.200-2136,* December 14, 2010.

6. State of Vermont, Agency of Natural Resources, Department of Environmental Conservation, *Chapter 12, Groundwater Protection Rule and Strategy,* 2005.

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 2006.*

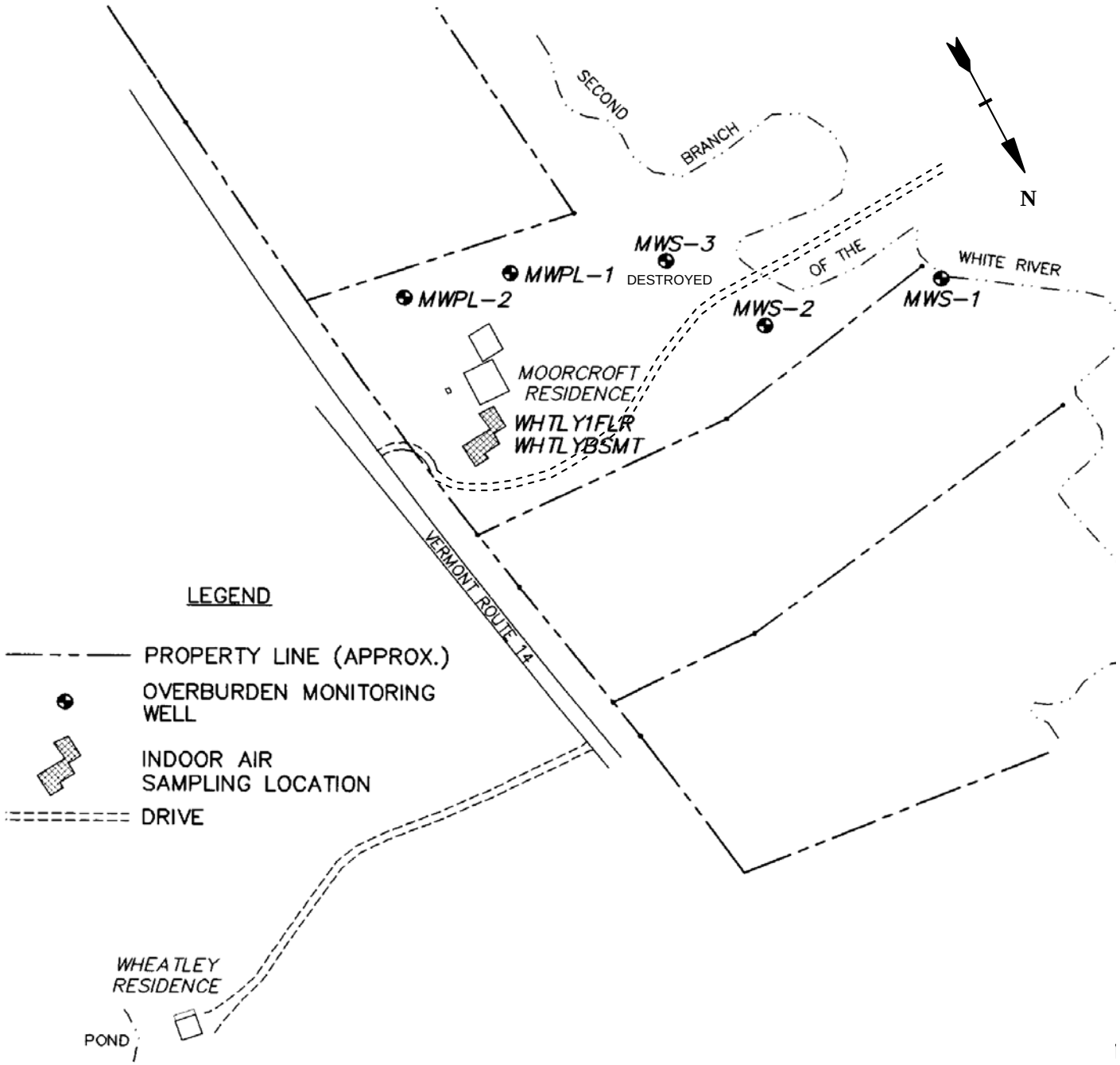
Waite Environmental Management, LLC

SITE LOCATION MAP

Wheatley Site / Moorcroft Residence

Brookfield, Vermont

Date: 03/31/09	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.
Map has been annotated by WEM.
All locations approximate

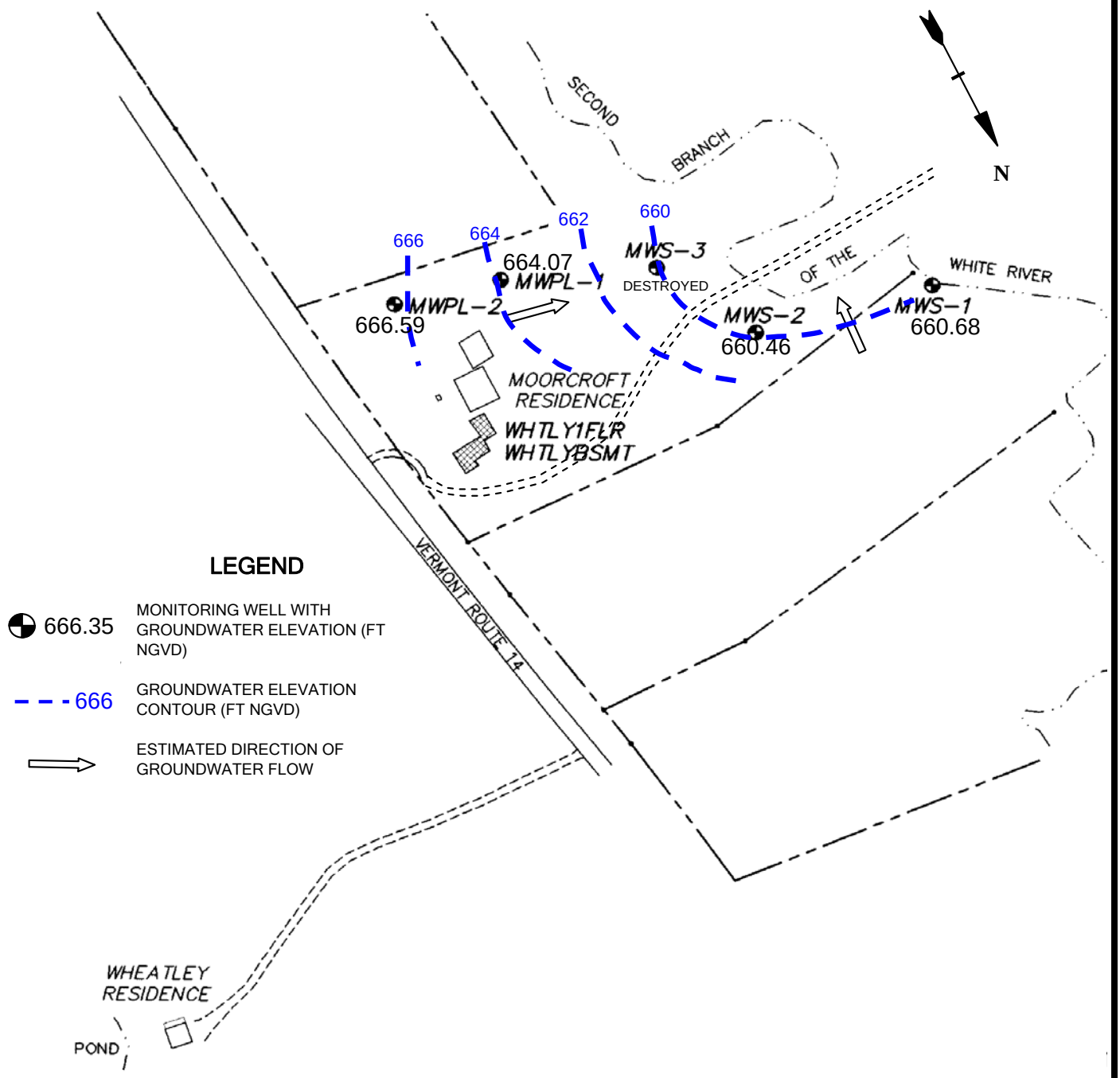
Waite Environmental Management, LLC

SITE PLAN

Wheatley Farm Site

Brookfield, Vermont

Date: 01/17/11	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-10

Wheatley Farm Site

Brookfield, Vermont

Date: 01/17/11	Drawing No.	Scale: 1" = 200'	By: MEW

APPENDIX B:

TABLES AND GRAPHS

WEM

TABLE 1.1
Groundwater Elevation Measurements: 2003 - 2010
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Apr-03	Oct-03	Oct-04	Oct-05	Apr-06	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10
MW-S1	Monitoring Well	FT	NS	NS	659.95	660.74	660.77	661.89	662.07	660.35	659.62	660.68
MW-S2	Monitoring Well	FT	NS	NS	658.93	660.62	659.42	660.79	661.23	660.32	659.30	660.46
MW-S3	Monitoring Well	FT	NS	662.58	661.41	662.41	659.61	662.08	662.00	661.83	NS	NS
MW-PL1	Monitoring Well	FT	NS	663.70	663.06	663.87	663.99	663.56	663.88	663.81	662.26	664.07
MW-PL2	Monitoring Well	FT	NS	666.37	666.08	665.58	666.10	666.35	665.91	666.91	666.24	666.59

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.

WEM

TABLE 1.2
Dissolved Oxygen Field Measurements: 2003 - 2010
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Apr-03	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10
MW-S1	Monitoring Well	mg/L	NS	NA	3.33	0.48	0.29	0.00	0.00	0.00	3.42
MW-S2	Monitoring Well	mg/L	NS	1.63	0.34	0.00	0.42	0.00	1.51	0.00	3.89
MW-S3	Monitoring Well	mg/L	NS	1.38	0.36	0.04	0.19	0.00	0.00	NS	NS
MW-PL1	Monitoring Well	mg/L	NS	4.06	3.33	1.97	4.71	2.79	1.75	2.45	4.79
MW-PL2	Monitoring Well	mg/L	NS	2.96	7.47	12.76	13.41	10.67	8.17	9.55	7.28

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: 2003 - 2010
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Apr-03	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10
MW-S1	Monitoring Well	us/cm	NS	NA	369	296	229	385	319	518	401
MW-S2	Monitoring Well	us/cm	NS	210	268	257	138	273	222	346	255
MW-S3	Monitoring Well	us/cm	NS	257	368	283	203	345	273	NS	NS
MW-PL1	Monitoring Well	us/cm	NS	349	498	391	292	509	448	744	574
MW-PL2	Monitoring Well	us/cm	NS	287	401	400	215	399	376	661	528

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: 2003 - 20010
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Apr-03	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10
MW-S1	Monitoring Well	deg C	NS	NA	16.1	13.6	15.1	11.8	15.3	14.3	9.8
MW-S2	Monitoring Well	deg C	NS	12.0	16.5	14.5	15.1	12.2	15.6	14.2	10.6
MW-S3	Monitoring Well	deg C	NS	8.7	10.9	11.2	11.8	10.2	11.3	NS	NS
MW-PL1	Monitoring Well	deg C	NS	8.9	11.1	10.7	10.9	9.8	10.1	10.0	8.5
MW-PL2	Monitoring Well	deg C	NS	8.8	10.7	11.0	10.8	10.0	10.7	9.8	9.2

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.

WEM

TABLE 1.5
pH Field Measurements: 2003 - 2010
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Apr-03	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10
MW-S1	Monitoring Well	unitless	NS	NA	7.25	8.09	8.22	7.65	NA	7.96	6.92
MW-S2	Monitoring Well	unitless	NS	6.25	6.80	7.63	8.09	6.33	NA	6.71	6.00
MW-S3	Monitoring Well	unitless	NS	8.24	8.67	9.44	8.41	8.26	NA	NS	NS
MW-PL1	Monitoring Well	unitless	NS	7.54	8.06	8.69	7.72	7.56	NA	6.31	6.10
MW-PL2	Monitoring Well	unitless	NS	7.09	7.89	8.16	7.32	7.41	NA	6.43	6.20

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: 2003 - 2010
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Apr-03	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10
MW-S1	Monitoring Well	NTU	NS	NA	183	89	21.2	18.1	71.2	11.4	NA
MW-S2	Monitoring Well	NTU	NS	2.0	81	47	17.0	4.9	0.0	0.0	NA
MW-S3	Monitoring Well	NTU	NS	1.0	53	21	0.0	1.5	2.9	NS	NA
MW-PL1	Monitoring Well	NTU	NS	2.5	108	95	0.0	0.0	0.0	1.2	NA
MW-PL2	Monitoring Well	NTU	NS	0.8	126	178	0.0	0.0	0.0	3.2	NA

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: 2003 - 2010
Wheatley Site, Brookfield, Vermont

Location	Type	Units	Apr-03	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10
MW-S1	Monitoring Well	mV	NS	NA	-72	-99	-159	-216	-182	-173	-187
MW-S2	Monitoring Well	mV	NS	-31	-43	-134	-123	-103	-50	-68	-62
MW-S3	Monitoring Well	mV	NS	-177	-220	-214	-168	-183	-205	NS	NS
MW-PL1	Monitoring Well	mV	NS	137	43	169	150	139	101	155	158
MW-PL2	Monitoring Well	mV	NS	174	128	190	162	150	112	153	170

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: 2003-2010
Wheatley Farm Site, Brookfield

Location	Parameter Method 8260	Groundwater Enforcement Standard	Units	Oct-03	Oct-04	Oct-05	Apr-06	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10
MW-S1	**PCE**	**5.0**	ug/L	NA	1.0 U	1.0 U	1.0 U	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	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	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	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	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	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	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	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	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	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	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	1.0 U		
MW-PL1	**PCE**	**5.0**	ug/L	**1.2**	**1.6**	**1.1**	**2.8**	**2.5**	**2.1**	**3.1**	**2.9**	**2.2**
	TCE	**5.0**	ug/L	1.0 U	1.0 U	1.0 U	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	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	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	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	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	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	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.

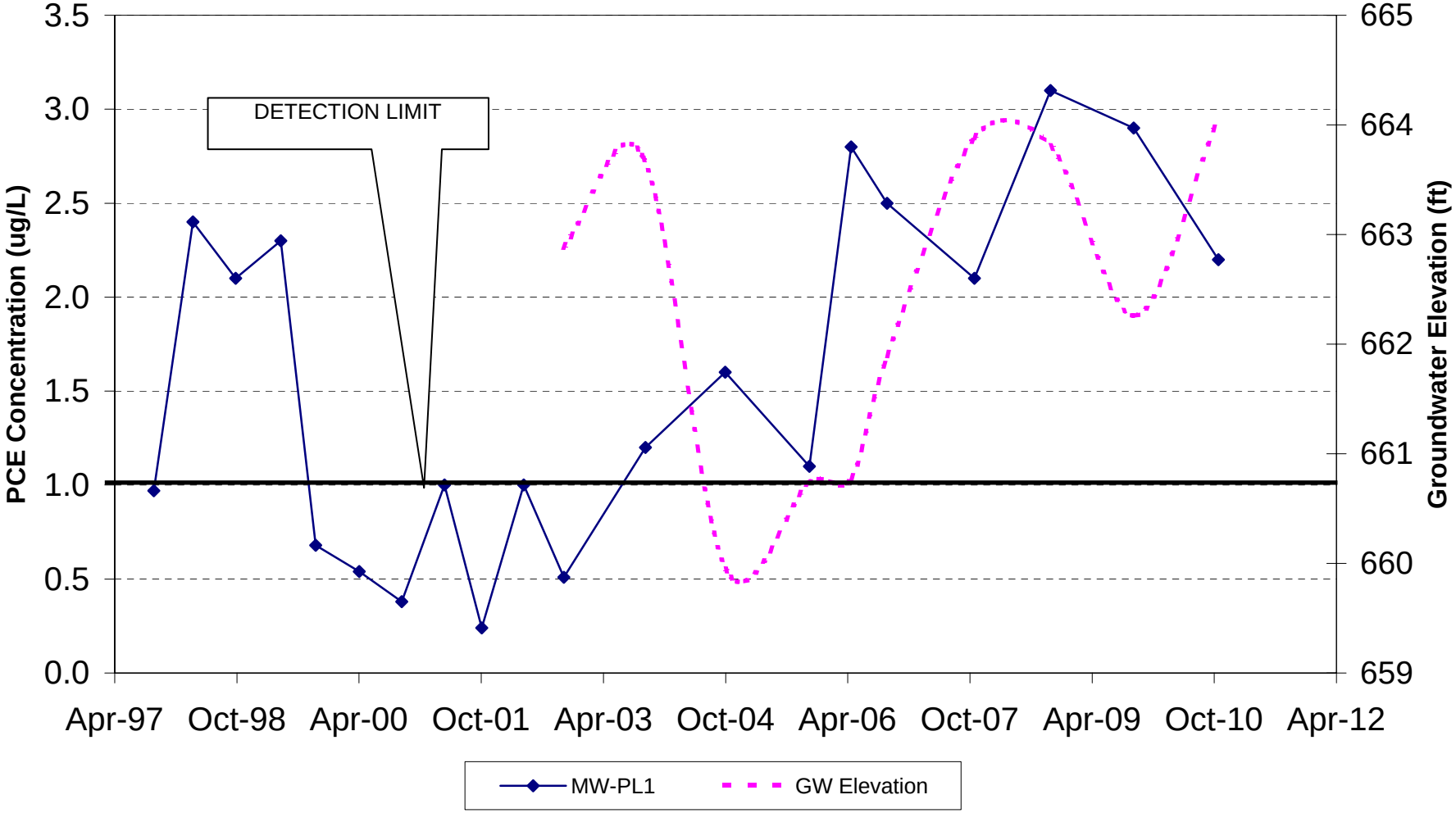
WEM Waite Environmental Management, LLC.

TABLE 3.0
INDOOR AIR QUALITY RESULTS: 2002-2010
Wheatley Farm Site, Brookfield, Vermont

Owner	Location	Parameter Method T-014A	Guidance Level	Units	Jul-02	Oct-03	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08	Oct-09	Oct-10
Moorcroft	WHTLY1FLR	Tetrachloroethene	1.0	ppbv	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	**0.022**	**0.100**
		Trichloroethene	1.0	ppbv	0.5 U	NS	0.5 U	0.2 U	0.2 U	**0.96**	NS	**2.0**	**0.012**
		cis-1,2-Dichloroethene	9.3	ppbv	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	0.010 U	0.010 U
		trans-1,2-Dichloroethene	18.4	ppbv	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	**0.014**	**0.043**
	WHTLYBSMT	Tetrachloroethene	1.0	ppbv	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	**0.020**	0.010 U
		Trichloroethene	1.0	ppbv	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	**0.017**	0.010 U
		cis-1,2-Dichloroethene	9.3	ppbv	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	0.010 U	0.010 U
		trans-1,2-Dichloroethene	18.4	ppbv	0.5 U	NS	0.5 U	0.2 U	0.2 U	0.010 U	NS	**0.028**	**0.017**

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).

PCE in Groundwater: MW-PL1
Wheatley Site, Brookfield, Vermont



Note:
1) Concentrations shown below the detection limit are estimated (J).

APPENDIX C:

FIELD DATA SHEETS

WEM Waite Environmental Management, LLC.

UNIFIRST - WHEATLEY
FIELD WATER COLLECTION SHEET

(1)

SAMPLING LOCATION	MW-PL1	Pump Intake Depth	16.1
Date	10/22/10	Pump Type	peri
Sampler	MW	Well Diameter	3/4"
Weather	pc & cold. 40°	Well Depth	17.32
Water Type	gw sw supply	Initial Depth to Water	12.44
Sampling Method	bailer low flow grab	Traditional Purge Vol. (bailer)	100-200 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. µ(s/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)*		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1103	12.44	100								began
1107	12.44	100	9.0	0.606	5.82	163	9.49	—		clear
1111	12.44	100	8.8	0.599	5.87	162	6.48	162		
1115	12.44	100	8.5	0.594	5.91	162	5.80	82.0		
1120	12.44	100	8.3	0.578	5.98	161	5.43	84.7		
1124	12.44	100	8.5	0.575	6.04	159	5.04	80.8		
1128	12.44	100	8.6	0.574	6.09	159	4.80	80.0		
1132	12.44	100	8.5	0.574	6.10	158	4.79	79.3		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	2.1 L	8.5	0.574	6.10	158	4.79	79.3		

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

General Notes:

added trip blank TB-3 to cooler

* not reliable turb readings

WEM Project #110220010

VT DEC Site #

WEM Waite Environmental Management, LLC.

UNIFIRST - WHEATLEY
FIELD WATER COLLECTION SHEET

 (2)

SAMPLING LOCATION	MW-PL2	Pump Intake Depth	19.4
Date	10/22/10	Pump Type	peri
Sampler	ML	Well Diameter	3/4"
Weather	pc & cold	Well Depth	20.4
Water Type	(gw) sw supply	Initial Depth to Water	17.94
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	100-200 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. (s/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU) *		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1149	17.94	100								begin
1153	18.01	100	8.7	0.529	6.19	165	8.20	121		clear
1157	18.01	100	8.9	0.530	6.19	168	7.45	96.8		
1201	18.01	100	9.2	0.529	6.20	170	7.31	86.9		
1206	18.01	100	9.3	0.528	6.20	170	7.31	86.2		
1209	18.01	100	9.2	0.528	6.20	170	7.28	86.3		complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	2.0L	9.2	0.528	6.20	170	7.28	86.3		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-PL2	VOA	3	HCl	8260B	1215	UF-3	
As Required:								
Field Duplicate	MW-PLX	"	"	"	"	"1100"		blind
Field Blank								
MS/MSD								

General Notes:

* Turbidity calibration failure - not accurate

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

UNIFIRST - WHEATLY
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-S1	Pump Intake Depth	9.8
Date	10/22/10	Pump Type	peri
Sampler	MW	Well Diameter	3/4"
Weather	cold & pc 40°	Well Depth	10.8
Water Type	(gw) sw supply	Initial Depth to Water	4.51
Sampling Method	bailer (low flow) grab	Traditional Purge Vol. (bailer)	100-200 ml/a.c

LOW FLOW PURGING DATA

Time	*DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. µs/cm	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)*		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1259	4.51	100								began
1303	5.15	100	8.5	0.402	6.40	-155	6.84	90.8		clear
1308	5.34	100	9.1	0.399	6.72	-168	4.26	86.8		
1313	5.15	100	9.5	0.400	6.80	-172	3.66	84.5		
1317	5.15	100	9.6	0.400	6.84	-176	3.46	82.4		
1319	5.15	100	9.7	0.400	6.87	-179	3.29	82.0		
1323	5.15	100	9.8	0.397	6.91	-184	3.03	78.1		
1327	5.15	100	9.8	0.401	6.92	-187	3.42	75.7		complete

SAMPLE COLLECTION

	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	2.1 L	9.8	0.401	6.92	-187	3.42	75.7		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #	
Sample	MW-S1	VA	3	HCl	8260B	1330	UF-3	
As Required:								
Field Duplicate								
Field Blank								
MS/MSD								

General Notes:

* not accurate

WEM Project #110320012

VT DEC Site #

WEM Waite Environmental Management, LLC.

UNIFIRST - WHEATLEY
FIELD WATER COLLECTION SHEET

SAMPLING LOCATION	MW-52			Pump Intake Depth	16.8'
Date	10/22/10			Pump Type	peri
Sampler	ML			Well Diameter	3/4"
Weather	Ac & cold			Well Depth	11.1
Water Type	(gw)	sw	supply	Initial Depth to Water	3.68
Sampling Method	bailer	(low flow)	grab	Traditional Purge Vol. (bailer)	100-200 ml/min

LOW FLOW PURGING DATA

Time	DTW (ft btp)	Purge Rate (ml/min)	Temp. (deg C)	Specific Cond. µ (s/cm)	pH	ORP (mv)	DO (mg/L)	Turbidity (NTU)*		Notes
			within 3%	within 3%	1 pH unit	10 mv	within 10%	within 10%		
1342	3.68	100								begin
1348	3.85	100	9.4	0.255	6.35	-72	5.78	86.8		clear
1354	3.85	100	10.3	0.255	6.17	-68	4.73	76.7		
1401	3.85	100	10.7	0.248	6.04	-44	4.09	71.9		
1404	3.85	100	10.6	0.250	6.00	-64	3.98	72.0		
1408	3.85	100	10.6	0.255	6.00	-62	3.89	74.2		complete

SAMPLE COLLECTION	Purge Volume	Temp.	Specific Cond.	pH	ORP	DO	Turbidity		
Final Measurements:	3 L	10.6	0.255	6.00	-62	3.89	74.2		

Sample Description	Label	Type Container	# Container	Preservative	Analysis Method	Collection Time	COC #
Sample	MW-52	VOA	3	HCl	8260B	1410	VE-3
As Required:							
Field Duplicate							
Field Blank	FB-4	"	2	"	"	1420	"
MS/MSD	MW-52	VOA	4	"	"	1410	"

General Notes:

* not accurate

WEM Project #110320012

VT DEC Site #

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
Company: Waite Environmental Mangement	Phone: (802) 860-9400
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 (whentley)	Standard (Specify) ✓
PO # 1103200/2	Rush (Specify)

Carrier: Waite Env. Mgt

Sampled By: MW

1 of 1 COCs

Sample identification	Sample Date(s)	Time Start (24 hr clock)	Time Stop (24 hr clock)	Controller Gauge Pressure in Field ("Hg) (Start)	Digital Gauge Pressure in Field ("Hg) (Start)	Controller Gauge Pressure in Field ("Hg) (Stop)	Digital Gauge 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 (ft)	TO-15 L	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)
FD-1	10/22/10	1030	~~1424~~ 1425	-30	-28.7	-5	-4.3	64	64	-29.0		3445	3505	6L		EEHAA	21"	✓										
Trip Blank TB-1	↓	—							—	↓		—	2595	↓		↓	—	✓										
WHTLYBSMT		1029	1426	-28	-28.5	0.0	0.0	64	64			3118	4487				21"	✓										
WHTLY/FLR	↓	1028	1424	-29	-29.6	-9	-7.0	74	74	↓		4726	3519	↓		↓	40"	✓										

Ambient Pressure and Temperature

	Ambient Temp (F)	Ambient Pressure (in Hg)	Data Source
Start	20 C	29.86	Knapp @ 1015
Stop	4°C	29.89	" " 1430

GC/MS Analyst Signature (TO-15)

Air Canisters Shipped By: (Lab Release) Chris Kolb	Date 10/21/10	Time 1400	Air Canisters Received By: (Courier/Sampler/Client) [signature] Date: 10/22/10 Time: 0855
Samples Relinquished By: [signature]	Date 10/22/10	Time 1700	Samples Received By: [signature] Date: 10/22/10 Time: 1700
Samples Relinquished By:	Date:	Time:	Samples Received By: Date: Time:

Lab Use Only Shipping Boxes Opened by: Condition:

WEM Waite Environmental

SITE: Whatley DATE: 10/22/10

AIR SAMPLING CHECKLIST

SAMPLE: WHTLY 1 FLR LOCATION: kitchen table

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: Floor near bottom of stairs

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:
Kel oil tank
* duplicate FD-1 collected next to canister

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:

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:

APPENDIX D:

DATA VALIDATION REPORT

DATA VALIDATION

FOR

UniFirst Project
Bressett, Wheatley, and UniFirst Sites
Randolph, Brookfield, and Williamstown, VT

ORGANIC ANALYSIS DATA
Volatile Organics in Water Samples

Sample Delivery Group Nos. BRES48, UNIF38, UNIF39, and WHEA16

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

December 10, 2010

Reference #s 2010-1028-001, -1029-001, -1103-001, &1109-001
VOA Validation Report/BRES48_UNIF38_39_WHEA16/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 40 groundwater samples, 11 potable water samples, 1 performance evaluation (PE) sample, 6 field blanks (FB), and 4 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. BRES48, UNIF38, UNIF39, and WHEA16, which were submitted as four data packages received by Phoenix on October 28 and 29, November 3, and December 9, 2010. These SDGs include the following samples:

Sample Identifier	Laboratory ID
Method 8260B	
SDG No. BRES48	
BRW-3	200-1967-7
BRW-2	200-1967-8
BRW-1	200-1967-9
TRIP BLANK TB-2	200-2050-1
MW-3S	200-2050-10
MW-3D	200-2050-11
FB-3	200-2050-12
MW-Z	200-2050-13
MW-104S	200-2050-2
MW-104D	200-2050-3
MW-102D	200-2050-4
MW-102S	200-2050-5
MW-101S	200-2050-6
MW-101D	200-2050-7
MW-4S	200-2050-8
MW-4D	200-2050-9
SDG No. UNIF38	
MW-25884	200-1975-1
FB-2	200-1975-2
BRW-Z	200-1975-3
SDG No. UNIF39	
TRIP BLANK TB-4	200-2167-1
PZ-101	200-2167-2
PZ-102	200-2167-3
W-20	200-2167-4
W-19	200-2167-5
MW-50	200-2167-6
MW-C	200-2167-7
W-1	200-2167-8
MW-D	200-2167-9
MW-E	200-2167-10

Sample Identifier	Laboratory ID
W-25	200-2167-11
SEEP-1A	200-2167-12
SS-2	200-2167-13
W-SEEP	200-2167-14
SS-5	200-2167-15
SS-3	200-2167-16
SP-4	200-2167-17
SP-3	200-2167-18
W-Z	200-2167-19
SS-Z	200-2167-20
FB-5	200-2167-21
SDG No. WHEA16	
Trip Blank TB-3	200-2132-1
MW-PL1	200-2132-2
MW-PL2	200-2132-3
MW-PLX	200-2132-4
MW-S1	200-2132-5
MW-S2	200-2132-6
FB-4	200-2132-7
Method 524.2	
SDG No. BRES48	
TB-1 TRIP BLANK	200-1967-1
BRESSETT TAP	200-1967-2
FB-1	200-1967-3
BRESSETT PRE-FILTER	200-1967-4
SHIELDS	200-1967-5
WELL Z	200-1967-6
SDG No. UNIF39	
WP-3	200-2167-22
WP-5	200-2167-23
WP-7	200-2167-24
WP-Z	200-2167-25
WP-8	200-2167-26
WP-13	200-2167-27
WP-23	200-2167-28
FB-6	200-2167-29

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

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

- Results for bromomethane in samples WELL Z, FB-6, WP-13, WP-3, WP-5, WP-7, WP-8, and WP-Z were qualified as estimated (UJ).

- Results for 1,1,2-trichloroethane and 1,2-dichloropropane in BRESSETT PRE-FILTER, BRESSETT TAP, FB-1, SHIELDS, and TB-1 TRIP BLANK were qualified as estimated

(UJ).

- 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 part of the data packages 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 TestAmerica SOP BR-MV-005r8, and SDWA Method 524.2 Rev. 4.1, as documented in TestAmerica SOP BR-MV-005r11, 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. BRES48, UNIF38, UNIF39, and WHEA16 were collected on October 13, 14, 19, and 20, 2009. 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 three 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, with the exception of a single sample (W-SEEP) for which the collection data was not recorded completely.

The cooler temperatures on receipt at the laboratory were checked and documented in the data packages, and were 3.5, 2.1, 3.5, 3.9, and 3.0 ^{o}C, which are within the acceptance range of 4 ^{o}C ±2 ^{o}C.

II. GC/MS Instrument Performance Check (Tuning)

The samples were analyzed on a single GC/MS system identified as instrument L. The tuning of this instrument 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 twelve (12) 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)

One IC (10/4/10) was performed on instrument L in support of the Method 8260B sample analyses, and two ICs (10/12/10 and 10/26/10) 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.

No target compounds were manually integrated in the ICs and CCs performed for this data set.

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

Instrument	IC	Average RRF	
		acetone	2-butanone
L (8260B)	10/4/10	0.0402	0.0215
L (524.2)	10/12/10	0.0449	0.0229
L (524.2)	10/26/10	0.0397	0.0221

Pursuant to the Region I validation document, results for acetone and 2-butanone in all samples 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, laboratory control samples, and laboratory control sample duplicates for both methods analyzed with this data set, and

acceptable 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. All percent differences (%D) in the submitted ICVs were within laboratory established control limits (±25 %D for Method 8260B and ±30 %D for Method 524.2), and Region 1 limits for continuing calibrations (±25 D) with the following exceptions:

ICV	Analyte	RRF	%D
Method 8260B			
10/5/10 10:11	acetone	0.0376	acceptable
	2-butanone	0.0219	acceptable
Method 524.2			
10/12/10 13:13	acetone	0.0421	acceptable
	2-butanone	0.0218	acceptable
10/26/10 10:48	bromomethane	acceptable	+27.1
	acetone	0.0412	acceptable
	2-butanone	0.0228	acceptable

The percent difference for bromomethane in the Method 524.2 ICV on instrument L on 10/26/10 at 10:48 is within the laboratory limits of ±30 %D, but outside Region 1 criteria for continuing calibrations. On the basis of %D in the ICV outside Region 1 continuing calibration criteria, results for bromomethane in samples WELL Z, FB-6, WP-13, WP-3, WP-5, WP-7, WP-8, and WP-Z were qualified as estimated (UJ).

For the reasons discussed above, no results for acetone or 2-butanone were qualified on the basis of the low RRFs in the associated ICVs

IV. Continuing Calibration (CC)

Seven continuing calibration (CC) standards were run in support of the Method 8260B sample analyses, and two CC standards were run 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.

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 for both methods. All RRFs were above the 0.05 minimum criterion, with the exceptions of acetone and 2-butanone, in all CC standards for both methods (range: acetone, 0.0350 - 0.0421; 2-butanone, 0.0208 - 0.0220)

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, ICVs, and CCs.

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 nine (9) water-matrix laboratory method blanks (MBs) were reported in association with this set of samples. No target compounds were detected in any MB for either method.

Four trip blanks (TBs) were reported in these SDGs. The analyte carbon disulfide (0.23 ug/L; action limit = 1.15 ug/L) was detected at a concentration below the quantitation limit in TRIP BLANK TB-3, which accompanied the samples in SDG No. WHEA16. It should be noted that a trip blank for analysis by Method 524.2, which has lower detection limits, was not submitted with the water supply samples collected on 10/25/10 from the UniFirst sites. However, the laboratory reports down to the method detection limit (MDL) for all analytes, and for the Method 8260B analysis of the associated trip blank, this concentration is below the quantitation limit for all Method 524.2 analytes.

Six field blanks (FBs) were reported in these SDGs; four were analyzed by Method 8260B and two by Method 524.2. 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 for either method.

VI. Surrogate Compounds

Percent recoveries (%R) for all surrogate compounds in Method 8260B were correctly calculated, accurately reported on the Form II summaries within the data packages, and were within acceptance limits for all sample analyses.

No surrogate recoveries were reported for any Method 524.2 analysis. The laboratory SOP includes four surrogate compounds, and these were present in all sample analyses; however, they were reported in the same manner as internal standard compounds (on the Form VIII), and some were labeled as internal standards in the quantitation reports within the raw data sections of the data packages. An explanation has been requested from the laboratory.

The surrogate compounds in the Method 524.2 sample analyses were evaluated from the Form VIII area responses, and were within the acceptance criteria established by the laboratory SOP (±30 % of the area response in the associated continuing calibration standard). The laboratory SOP also defines recovery criteria relative to the associated initial calibration (±50 % of the IC), but does not specify which standard from the IC to use. An explanation of how sample performance is evaluated for this criterion has also been requested.

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 W-1, SS-5, MW-4S, and MW-S2 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). 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 – 135 %R; overall laboratory-derived control limits: 55 – 150 %R; Region 1 limits 60 – 140 %R) and reproducible (RPD range 0-20%; limit 30% RPD), with the following exceptions:

Parent Sample	Analyte	Native Conc. (ug/L)	% R (MS)	% R (MSD)	Laboratory Limits (%R)	% RPD
W-1	tetrachloroethene	21	142	138	85 - 120	a
SS-5	1,1,2,2-tetrachloroethane	nd	a	125	85 - 120	a
MW-4S	1,1,2,2-tetrachloroethane	nd	122	a	85 - 120	a
MW-S2	1,1,2,2-tetrachloroethane	nd	130	121	85 - 120	a

a = acceptable nd = not detected

On the basis of recoveries within Region 1 criteria, no qualifications were deemed necessary for recoveries of the analytes shown slightly above laboratory-established limits in the MS or MSD analyses of samples SS-5, MW-4S, and MW-S2. 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 high recoveries in the associated MS and MSD analyses.

Samples BRESSETT TAP 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 and relative percent differences between paired recoveries were correctly calculated and accurately reported on the Form III summaries for the spiked analytes.

All recoveries were acceptable (range 81 – 116 %R; limits: 70 – 130 %R) and reproducible (RPD range 0-28.5%; limit 30% RPD), with the exception of bromomethane in BRESSETT TAPMSD, which was recovered at 153 %R. Since bromomethane was not detected in sample BRESSET TAP, the result for bromomethane in BRESSETT TAP did not warrant qualification on the basis of its recovery above both laboratory and Region 1 upper acceptance limits.

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. BRES48, UNIF38, UNIF39, and WHEA16 contained five groundwater and two potable water field duplicate pairs, which were identified by the field sampler as follows:

Field Sample	Field Duplicate
Groundwater	
MW-3D	MW-Z
MW-D	W-Z

Field Sample	Field Duplicate
SS-3	SS-Z
MW-PL2	MW-PLX
MW-25884	BRW-Z
Water Supply	
SHIELDS	WELL Z
WP-7	WP-Z

Precision in the field duplicate pairs MW-3D and MW-Z, MW-D and W-Z, and SS-3 and SS-Z was acceptable (less than 30 % RPD) for all target analytes greater than 2 times the quantitation limit. Tetrachloroethene was detected at greater than twice the quantitation limit in MW-3D, W-Z, MW-D, MW-Z, SS-3, and SS-Z; trichloroethene was detected at greater than twice the quantitation limit in MW-3D, W-Z, MW-D, and MW-Z, and cis-1,2-dichloroethene and total 1,2-dichloroethene were detected at twice the quantitation limit in MW-3D and MW-Z. 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 4/21/09 and the MDL verification studies were completed on 5/7/09, which is slightly more than one year of the sample analyses in this data set. All analytes had calculated and verified MDLs below the method quantitation limits in the studies. More recent verification studies have not been requested.

The aqueous MDL and the MDL verification studies for Method 524.2 submitted for this project were completed on 11/30/09 and 12/1/09, which is within one year of the sample analyses in this data set. All analytes had calculated and 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 (ketones at 5 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 (except as noted). 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

Six zero blind PE samples (commonly known as laboratory control sample, LCS) and duplicate (LCSD) pairs, and three LCS and LCSD pairs were prepared and analyzed by the laboratory at 1 µg/L (ketones at 5 ug/L) in support of the Method 8260B and Method 524.2, respectively, sample analyses in this data set. Laboratory established control limits are 55 – 150 %R overall for Method 8260B, and 60 - 130 % for each analyte for Method 524.2; the Region 1 control limits are 60 – 140 %R. A 30 %RPD limit is shown on the Form III for Method 8260B analyses; no limit is shown on the Form III summaries for the Method 524.2 paired analyses, but the spreadsheet files show a limit of 20 %RPD for this method, and this is consistent with exceedances noted on the Form III summaries.

Percent recoveries were correctly calculated and accurately reported on Form III summaries in the data packages, and were acceptable (81 – 140 %R) and reproducible (0 - 17 %RPD) with the following

exceptions:

Batch ID (date)	Analyte	LCS %R	LCSD %R	Laboratory Limits (%R)	% RPD
Method 8260B					
200-8095 10/19/10)	bromomethane	**149**	a	55 - 150	a
200-8252 (10/21/10)	1,1,2,2-tetrachloroethane	123	a	85 - 120	a
200-8297 (10/22/10)	bromomethane	**142**	a	55 - 150	a
	1,1,2,2-tetrachloroethane	121	a	85 - 120	
200-8748 (10/28/10)	1,1,2,2-tetrachloroethane	124	127	85 - 120	a
200-8960 (11/2/10)	bromomethane	**144**	a	55 - 150	a
Method 524.2					
200-8389 (10/25/10)	1,1,2-trichloroethane	a	a	70 - 130	24
	1,2-dichloropropane	a	a	70 - 130	22

a = acceptable

No reanalysis was performed for the unacceptably high recoveries in the LCS/LCSD pairs analyzed for Method 8260B. Since recoveries for 1,1,2,2-tetrachloroethane were within Region 1 limits, no results were qualified for the slightly high recoveries of 1,1,2,2-tetrachloroethane in the LCS or LCSD analyses on 10/21/10, 10/22/10, and 10/28/10 for Method 8260B.

Since bromomethane was not detected in associated samples, no results warranted qualification on the basis of recoveries within laboratory but above Region 1 limits for bromomethane in the associated LCS samples analyzed on 10/19/10, 10/22/10, and 11/2/10.

No analytes were found outside both laboratory and Region I control limits in any LCS or LCSD analyses. Reproducibility between all Method 8260B LCS and LCSD pairs was acceptable (0 – 26 % RPD).

On the basis of the unacceptable precision demonstrated for 1,1,2-trichloroethane and 1,2-dichloropropane in the LCS/LCSD pair analyzed on 10/25/10, results for 1,1,2-trichloroethane and 1,2-dichloropropane in BRESSETT PRE-FILTER, BRESSETT TAP, FB-1, SHIELDS, and TB-1 TRIP BLANK were qualified as estimated (UJ).

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). Acceptance ranges for the combined m- & p-xylene isomers and the o-xylene isomer were not established by the vendor.

XII. Target Compound Identification

Reported target compounds were correctly identified with supporting spectra present for all samples in these data packages. All analytes in both methods are reported on the calibration summary forms and in the raw data for calibration samples, spiked analyses, and field samples; however, the spiked analysis summary forms and the sample Form 1s present only the requested target compound list.

It was noted that the spectra for cis-1,2-dichloroethene and trans-1,2-dichloroethene are duplicated in the sample raw data each time both isomers are present in a sample. The software which generates these reports should be corrected for this unnecessary duplication of spectra.

The sample quantitation report for sample WP-3 is missing compound trichloroethene, which is included in the Form I and in the spectra submitted for this sample. A replacement quantitation report containing all target compounds has been requested from the laboratory. When this report is received, it should be archived with the data package.

XIII. Compound Quantitation and Reported Quantitation Limits

Target compound quantitation and practical quantitation limits (PQLs) were accurately reported on the Form I summaries. Based on screen results, dilution analyses were initially performed for samples MW-101D, MW-3D, and MW-Z to bring results for tetrachloroethene within the upper half of the calibration range for Method 8260B. All dilutions were less than 4-fold, so a full-strength analysis was not required. Also on the basis of screen results, sample WP-23 was initially analyzed at a dilution to bring the result for chlorobenzene within the upper half of the calibration range for Method 524.2. A full-strength analysis was not performed or submitted for any of these samples.

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.

One or more manual integrations were performed on field samples and spiked analyses. 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, with the exception that one sample quantitation report was missing the compound trichloroethene, which was manually integrated. The laboratory was asked to submit the final quantitation report for this sample.

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. BRES48, UNIF38, UNIF39, and WHEA16, with the following exceptions:

- On the basis of %D in the ICV outside Region 1 continuing calibration criteria, results for bromomethane in samples WELL Z, FB-6, WP-13, WP-3, WP-5, WP-7, WP-8, and WP-Z were qualified as estimated (UJ).

- On the basis of the unacceptable precision demonstrated for 1,1,2-trichloroethane and 1,2-dichloropropane in the LCS/LCSD pair analyzed on 10/25/10, results for 1,1,2-trichloroethane and 1,2-dichloropropane in BRESSETT PRE-FILTER, BRESSETT TAP, FB-1, SHIELDS, and TB-1 TRIP BLANK were qualified as estimated (UJ).

- 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, with the following exceptions:

- The field notes for samples collected on 10/18/10 were incomplete for sample W-SEEP, and the field sheet for sample MW-D contains an incorrect reference to a non-existent sample "MW-2" on the lower half of the sheet..

- The ICOC for samples received on 10/19/10 was present for Method 8260B samples, but was not included in the data package for Method 524.2 samples.

Data presentation was acceptable, with the following observations:

- No surrogate recoveries were reported for any Method 524.2 analysis. The laboratory SOP includes four surrogate compounds, and these were present in all sample analyses; however, they were reported in the same manner as internal standard compounds (on the Form VIII), and some were labeled as internal standards in the quantitation reports within the raw data sections of the data packages. An explanation has been requested from the laboratory.

- The spectra for cis-1,2-dichloroethene and trans-1,2-dichloroethene are duplicated in the sample raw data each time both isomers are present in a sample. The software which

generates these reports should be corrected for this unnecessary duplication of spectra.

- The sample quantitation report for sample WP-3 is missing compound trichloroethene, which is included in the Form I and in the spectra submitted for this sample. A replacement quantitation report containing all target compounds has been requested from the laboratory. When this report is received, it should be archived with the data package.

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

DATA VALIDATION

FOR

UniFirst Project
Wheatley Site
Brookfield, VT

ORGANIC ANALYSIS DATA
Selected Volatiles in Air Samples

Sample Delivery Group (SDG) No.
200-2136

Chemical Analyses Performed by:

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South Burlington, VT 05403

FOR

Mr. Gerold Noyes
Waste Management Division
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Data Validation Report by:

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Dec. 14, 2010

Reference #2010-1102-001
VOA Air Validation Report/200-2136/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 2 air samples and one trip blank (TB) from the Wheatley project site in Brookfield, VT. The laboratory reported the data under Sample Delivery Group (SDG) No. 200-2136, which was submitted as a single data package received by Phoenix on November 2, 2010, and which includes the following samples:

Sample ID	Laboratory ID
FD-1	200-2136-1
TB-1	200-2136-3
WHTLY1FLR	200-2136-4

A cross-reference table of sample IDs was provided in the data packages. A sample was collected at site WHTYLBSMT, but the canister went to ambient pressure during sampling. After consultation, and determining that the field duplicate was collected at the same location, the original WHTLYBSMT sample analysis was cancelled by the data validator.

The samples in this data set represent the sample collection from October 22, 2010 inside the private residence site in Brookfield, VT. All samples were 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 part of the data package 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, as modified for low concentration analyses in the laboratory standard operating procedure (SOP) No. BR-AT-003, and in accordance with requirements in the Field/Laboratory Coordination Memorandum for Air Monitoring (FLCM), December 22, 2007. 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 22, 2010 for the October sampling round at one private residence in Brookfield, VT. All analyses were performed within five (5) 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) show that the sample canisters were collected and transported according to method specifications. The canisters were picked up from the laboratory the morning of sample collection, and the canisters were hand-delivered to the laboratory on the same day as collected.

The canister used for sample collection at location WHTLYBSMT went to ambient pressure during the sample collection period (less than 3.5 hours). It was rechecked at the laboratory on 10/25/2010, and confirmed to be at ambient pressure, and the flow controller rate was checked and found to be higher (28.0 mL/min) than it had been set for (20.4 mL/min) when checked and adjusted following cleaning on Oct. 18, 2010. Because the canister went to ambient pressure within a short time after deployment, and the sample location was used for collection of the field duplicate sample, the analysis for WHTLYBSMT was canceled.

II. GC/MS Instrument Performance Check (Tuning)

The samples for volatiles in air analysis from SDG No. 200-2136 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 (7/7/2010) 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, 0.1, 0.2, 0.5, and 1.0 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 0.20 ppbv for the IC was included in the data package, and all target analytes were recovered within 98 – 103 % recovery of expected values; all target analytes were 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)

One continuing calibration (CC) standard was run in support of the sample analyses reported in this data package. Documentation of the CC standard was present 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.

One trip blank (TB) was reported in this data package. No target compounds were found in the TB.

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 WHTLYBSMT; however, the original sample analysis was cancelled due to an excessively high flow rate during sampling and consequent loss of vacuum in the sample canister before sampling was completed..

X. Sensitivity Check

An MDL study for this TO-15 method was analyzed on 4/4/09 – 4/7/09 and verified at four concentrations on 4/8/09 – 4/17/09, which is slightly more than one year prior to these sample analyses. All target analytes in this study had calculated MDLs below the method quantitation limits, and demonstrated

acceptable ratios (at least 3:1) of the quantitation limit (QL) to the verified MDL (MDLV), except for cis-1,2-dichloroethene, which exhibited a QL/MDLV ratio of 2.3. This compound was detected with acceptable recovery (121 %R) when spiked at the limit of detection (LOD, 0.010 ppbv) in the verification study. 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 limit of quantitation (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 at 0.20 ppbv. 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 sets of 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. The laboratory uses additional qualifiers on these forms, which are defined within the data package. However, as part of the validation effort, the validator has struck out the additional qualifiers. The other set presents the results in both units, but uses separate pages for these; these forms also include more analysis-related information. Both sets of forms are examined during the data validation process.

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

The chain of custody (COC) records were present for all reported samples, and accurately completed.

Data presentation was acceptable, with the following observations:

The laboratory has implemented a new Laboratory Information Management System (LIMS), which includes new summary forms. These summary forms are accurate, with the exception that the precision on the Form 7 (daily calibrations) is not as high as in the previous summary forms. The values presented on the Form 7s appear to be based on rounded values, and were only reproducible from the raw data within the first two significant figures.

The required records for canister cleanliness were included with the data package, and, as required by the FLCM, calibration check and pre-sampling leak check records for the mass flow controllers supplied by the laboratory were properly included with this data set. The presentation was well-organized and complete.

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.

ATTACHMENT A

DATA SUMMARY FORMS
SDG No. 200-2136
Selected Volatiles in Air Samples

DATA SUMMARY FORM: VOA COMPOUNDS
AIR SAMPLES
(ppbv and ug/m^3)

Site Name: Wheatley
Brookfield, VT
SDG No. 200-2136

Phoenix Chemistry Services Project No: 2010-1102-001

Sampling Date: Oct. 22, 2010

Units	PQL	Client ID	FD-1		TRIP BLANK TB-1		WHTLY1FLR											
		Lab ID	200-2136-1		200-2136-3		200-2136-4											
		Dilution Factor*	1.0		1.0		1.0											
ppbv	0.010	trans-1,2-Dichloroethene	0.017		0.010	U	0.043											
ppbv	0.010	cis-1,2-Dichloroethene	0.010	U	0.010	U	0.010	U										
ppbv	0.010	Trichloroethene	0.010	U	0.010	U	0.012											
ppbv	0.010	Tetrachloroethene	0.010	U	0.010	U	0.100											
ug/m^3	0.040	trans-1,2-Dichloroethene	0.069		0.040	U	0.170											
ug/m^3	0.040	cis-1,2-Dichloroethene	0.040	U	0.040	U	0.040	U										
ug/m^3	0.054	Trichloroethene	0.054	U	0.054	U	0.063											
ug/m^3	0.068	Tetrachloroethene	0.068	U	0.068	U	0.690											

*includes adjustments for larger
or smaller sample volume

ATTACHMENT B

ORGANIC ANALYSIS DATA SUMMARY SHEETS (Form I)
SDG No. 200-2136
Selected Volatiles in Air Samples

Client: VT Dept of Envir Conservation

Job Number: 200-2136-1
Sdg Number: 200-2136

Client Sample ID: **FD-1**

Lab Sample ID: 200-2136-1
Client Matrix: Air

Date Sampled: 10/22/2010 1425
Date Received: 10/22/2010 1700

TO15 LL Volatile Organic Compounds in Ambient Air, Low Concentration (GC/MS)

Method:	TO15 LL	Analysis Batch: 200-8623	Instrument ID:	E.i
Preparation:	Summa Canister		Lab File ID:	eehac006.d
Dilution:	1.0		Initial Weight/Volume:	500 mL
Date Analyzed:	10/27/2010 2001		Final Weight/Volume:	500 mL
Date Prepared:	10/27/2010 2001		Injection Volume:	500 mL

Analyte	Result (ppb v/v)	Qualifier	RL
trans-1,2-Dichloroethene	0.017		0.010
cis-1,2-Dichloroethene	0.010	U	0.010
Trichloroethene	0.010	U	0.010
Tetrachloroethene	0.010	U	0.010

Analyte	Result (ug/m3)	Qualifier	RL
trans-1,2-Dichloroethene	0.069		0.040
cis-1,2-Dichloroethene	0.040	U	0.040
Trichloroethene	0.054	U	0.054
Tetrachloroethene	0.068	U	0.068

Client: VT Dept of Envir Conservation

Job Number: 200-2136-1
Sdg Number: 200-2136

Client Sample ID: **TRIP BLANK TB-1**

Lab Sample ID: 200-2136-2
Client Matrix: Air

Date Sampled: 10/22/2010 0000
Date Received: 10/22/2010 1700

TO15 LL Volatile Organic Compounds in Ambient Air, Low Concentration (GC/MS)

Method:	TO15 LL	Analysis Batch: 200-8623	Instrument ID:	E.i
Preparation:	Summa Canister		Lab File ID:	eehac007.d
Dilution:	1.0		Initial Weight/Volume:	500 mL
Date Analyzed:	10/27/2010 2056		Final Weight/Volume:	500 mL
Date Prepared:	10/27/2010 2056		Injection Volume:	500 mL

Analyte	Result (ppb v/v)	Qualifier	RL
trans-1,2-Dichloroethene	0.010	U	0.010
cis-1,2-Dichloroethene	0.010	U	0.010
Trichloroethene	0.010	U	0.010
Tetrachloroethene	0.010	U	0.010

Analyte	Result (ug/m3)	Qualifier	RL
trans-1,2-Dichloroethene	0.040	U	0.040
cis-1,2-Dichloroethene	0.040	U	0.040
Trichloroethene	0.054	U	0.054
Tetrachloroethene	0.068	U	0.068

Client: VT Dept of Envir Conservation

Job Number: 200-2136-1
Sdg Number: 200-2136

Client Sample ID: **WHTLY 1 FLR**

Lab Sample ID: 200-2136-4
Client Matrix: Air

Date Sampled: 10/22/2010 1424
Date Received: 10/22/2010 1700

TO15 LL Volatile Organic Compounds in Ambient Air, Low Concentration (GC/MS)

Method:	TO15 LL	Analysis Batch: 200-8623	Instrument ID:	E.i
Preparation:	Summa Canister		Lab File ID:	eehac009.d
Dilution:	1.0		Initial Weight/Volume:	500 mL
Date Analyzed:	10/27/2010 2247		Final Weight/Volume:	500 mL
Date Prepared:	10/27/2010 2247		Injection Volume:	500 mL

Analyte	Result (ppb v/v)	Qualifier	RL
trans-1,2-Dichloroethene	0.043		0.010
cis-1,2-Dichloroethene	0.010	U	0.010
Trichloroethene	0.012		0.010
Tetrachloroethene	0.10		0.010

Analyte	Result (ug/m3)	Qualifier	RL
trans-1,2-Dichloroethene	0.17		0.040
cis-1,2-Dichloroethene	0.040	U	0.040
Trichloroethene	0.063		0.054
Tetrachloroethene	0.69		0.068