Waite - Heindel
Environmental Management

May 27, 2016

Mr. Gerold Noyes, P.E.
Vermont Department of Environmental Conservation
Waste Management & Prevention Division
Nation Life Drive – Davis 1
Montpelier, Vermont 05620-3704

Sent via email: gerold.noyes@state.vt.us

RE: 1st Quarter 2016 Monitoring Report
Bressett Site, Randolph, Vermont (Site #77-0019)

Dear Gerold:

Waite-Heindel Environmental Management (WHEM) is pleased to present the *1st Quarter 2016 Monitoring Report* for the Bressett Site in Randolph, Vermont. This report is being submitted per WHEM's contract with the State of Vermont (contract EC13-04). A PDF version has been uploaded to the ANR ftp site.

The only scheduled task at this Site for the 1st Quarter 2016 is indoor air sampling. Results of the air sampling event, conducted by WHEM on March 4, 2016, are described herein.

Sincerely,

Miles E. Waite, Ph.D.
Principal Hydrogeologist

Enclosure

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1st QUARTER 2016 MONITORING REPORT

for the

BRESSETT SITE
RANDOLPH, VERMONT

VT DEC Site #77-0019

May 27, 2016

Prepared for:

STATE OF VERMONT
Vermont Department of Environmental Conservation
Waste Management & Prevention Division
National Life Drive – Davis 1
Montpelier, Vermont 05620-3704

Prepared by:

Waite - Heindel
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EXECUTIVE SUMMARY

On March 4, 2016, Waite-Heindel Environmental Management (WHEM) conducted indoor air sampling at the former Bressett residence (VT DEC Site #77-0087) in Randolph, Vermont. This residence was recently purchased after having been vacant for several years, during which time the vapor mitigation system in the basement was inactive. The sampling on March 4 was conducted with the mitigation system remaining inactive, in order to reassess vapor intrusion potential. The last indoor sampling event to occur at this Site took place in August 2013. The mitigation system utilizes an airtight membrane over the fieldstone foundation walls combined with active depressurization of the basement space via a perforated pipe and fan system behind the membrane.

Air samples were collected from the 1st floor, basement, and from outside using 6-liter Silco steel air canisters procured by WHEM from TestAmerica (TA) Laboratory of South Burlington, Vermont. Each sample was drawn through a calibrated flow regulator over an approximately 4-hour period. No significant problems were encountered during the sampling event and sampling procedures were in accordance with site protocols.

The air samples were analyzed by TA using Method TO-15 (Low Level) for the following 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).

Based on the analytical results, both the 1st floor and basement samples had reported concentrations of target compounds PCE, TCE, and cis-1,2-DCE; the additional compound trans-1,2-DCE was detected in the basement only. The Outdoor sample was non-detect for all target compounds. Compared to the previous sampling event in August 2013, levels increased significantly in the first floor sample and in the basement sample. The increase in contaminant concentrations is due to the residence being vacant for several years and the vapor mitigation system being inactive. PCE and TCE concentrations exceeded VT DEC guidance levels for indoor air (0.08 ppbv and 0.09 ppbv, respectively) in both basement and first floor samples. There were no additional exceedances.

All analytical results were validated by an independent validator in accordance with Tier III guidelines as described by the USEPA Region I. While the results for PCE in both the first floor and basement sample were reported above the calibration range of the instrument and had to be reanalyzed at dilution, there were no qualification of results.

Since it is clear that vapor intrusion continues when the mitigation system is inactive, WHEM recommends that the mitigation system be activated as soon as possible, if it has not already been done. The new owner, Bob Simpson, should be provided with a copy of the O&M Manual for the mitigation system and instructed on who to report to if there is a problem with the system. Air sampling should continue for an adequate period after re-start of the mitigation system to confirm that it is successful in reducing target VOC concentrations to below VT DEC guidelines. WHEM recommends continuing with the indoor air monitoring program as specified in the *Work Plan* and *FLCM-Air*. The next air sampling event is scheduled to occur in July 2016.

1.0 INTRODUCTION

The following *1st Quarter 2016 Monitoring Report* for the Bressett Site in Randolph, Vermont (refer to Site Location Map in Appendix A) was prepared by Waite-Heindel Environmental Management (WHEM) for the Vermont Department of Environmental Conservation (VT DEC). This report has been completed in accordance WHEM's contract with State of Vermont (contract EC13-04) for Environmental Monitoring at the UniFirst sites.

The scheduled task for this Site during the 1st Quarter 2016 is indoor air quality sampling at the former Bressett residence.

2.0 INDOOR AIR SAMPLING

Indoor air sampling was conducted at the former Bressett residence by WHEM on March 4, 2016. This residence was recently purchased by Robert Simpson who is renovating the home into several rental units. Sampling was generally conducted in accordance with WHEM's *Work Plan for Environmental Monitoring* ("Work Plan") dated July 11, 2013, and with the *Field/Lab Coordination Memorandum for Air Monitoring* ("FLCM-Air") developed by Phoenix Chemistry Services dated December 22, 2007.

As this home has been vacant since the fall of 2013, it had not been sampled since August 2013. During the time, the vapor mitigation system, which utilizes an airtight membrane over the fieldstone foundation walls combined with active depressurization of the basement space via a perforated pipe and fan system behind the membrane, was turned off. It was decided to conduct the March 2016 air sampling with the mitigation system off in order to reassess vapor intrusion potential and the continued need for mitigation. As an additional parameter, it was also decided to collect an outdoor air sample at the same time, which is not required by the Work Plan or FLCM-Air.

2.1 Air Sample Collection

A total of three (3) air samples were collected from the residence on March 4, 2016. The 1st floor sample ("BRST1FLR") was collected from the office off the kitchen on the east side of the house[1], and the basement ("BRSTBSMT") sample was collected from the northeastern portion of the basement, halfway between the stair and the north wall. An outdoor air sample ("OUTDOOR") was collected for the first time at this site at the request of the state; this sample was collected approximately 30 feet east of the building near the foot of the hill. A duplicate sample ("FD-1") was collected in conjunction with the basement sample.

Samples were collected by WHEM using 6-liter stainless steel Silco air canisters. The canisters and flow controllers were procured by WHEM from TestAmerica Laboratory (TA) of South Burlington, Vermont prior to sampling. The flow controllers were all calibrated by TA to

[1] This room has previously been a bedroom and a "craft room" during previous sampling events.

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, WHEM 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* and acceptable final canister pressures were attained.

All samples were delivered by WHEM 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.

2.2 Discussion of Results

Air sampling results from March 2016 are summarized in Table 1.0 in Appendix B. These results have been validated by an independent validator (see Section 2.3). Full copies of the laboratory report are presented in the data validation report on file in Montpelier.

The results indicate that target compounds were detected in both of the indoor air samples. Both the 1st floor and basement samples reported detections of PCE, TCE, and cis-1,2-DCE. In addition to this, target compound trans-1,2-DCE was also detected in the basement sample. No compound were detected in the outdoor sample, which confirms that the indoor detections of target compounds are from vapor intrusion via subsurface and not from an outside source.

The Vermont Department of Environmental Conservation (VT DEC) has developed target indoor air guidance levels of 0.08 ppbv for PCE and 0.09 ppbv for TCE, as presented on table C7 of the VT DEC Investigation and Remediation of Contaminated Properties Procedure (IROCPP, April 2012[2]). The US EPA has developed risk-based guidelines (Regional Screening Levels for residential air, May 2013) that is used for trans-1,2-DCE (there is no RSL for cis-1,2-DCE).

[2] Target Indoor Air levels have been converted from ug/m^3 to ppbv.

Based on the March 2016 results, PCE concentrations in the basement (3.2 ppbv) and 1st floor (1.0 ppbv) significantly exceeded the VT DEC target indoor air guidance level (0.08 ppbv). TCE concentrations in the basement (0.58 ppbv) and 1st floor (0.15 ppbv) also exceeded their respective guideline. Target compounds cis-1,2-DCE was detected in the basement (0.25 ppbv) for the first time since January 2012, and in the 1st floor (0.15 ppbv) for the first time since January 2011. In the basement, trans-1,2-DCE was also detected (0.023 ppbv) at a concentration in the middle of the range of previously detected values; it remains well below its respective guideline (15.9 ppbv). All compounds detected in both samples are the highest they have been detected since January 2011. These values are approaching the high exceedances that were regularly detected before the mitigation system at this site was installed, but are not at the maximum levels detected during 2006-07.

Based on historical results dating back to 1997 (see graphs in Appendix B), the presence of target compounds inside the house, particularly PCE, is not unusual. After the vapor mitigation system was installed during the fall of 2009, there was a notable decrease in indoor air concentrations during 2010. However, the January 2011 concentrations spiked upward to levels detected before the vapor mitigation system was installed, but appeared to be an anomaly, as all subsequent sampling rounds since January 2011 show concentrations comparable to or below 2010 levels. Concentrations during this round of sampling indicates that the target compounds increased significantly since the house has been unoccupied [since 2013] and the mitigation system has been turned off. Contaminant concentrations could likely be reduced substantially if the mitigation system is turned back on.

2.2.1 QA/QC Samples

As part of the quality assurance/quality control (QA/QC) program, WHEM collected one (1) field duplicate sample (FD-1). This sample was collected in conjunction with the sample from the basement (BRSTBSMT) and analyzed by TA using the same method. Relative percent difference (RPD) values for all detected analytes were acceptable (<25% RPD) in the field duplicate pair FD-1 and BRSTBSMT.

WHEM did not submit a trip blank for the March 2016 sampling event, due to the lack of a sufficient number of certified clean canisters at the time sampling was requested.

2.3 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 report: *Data Validation for the UniFirst Project, Williamstown and Bressett Sites, Williamstown and Randolph, VT (Sample Delivery Group No. 200-15084 and 200-15275), May 15, 2013* by Phoenix Chemistry Service, on file at the VT DEC offices in Waterbury. The text of the data validation report is included as Appendix D.

Findings of the validation effort resulted in the following qualifications:

- Results for PCE in BRST-1FLR, BRST-BSMT, and FD-1 were rejected (R) as they were above the calibration range of the instrument, and replaced with the acceptable PCE concentrations from the more diluted analyses of these samples (BRST-1FLRDL, BRST-BSMTDL, and FD-1DL)

- Results for all other analytes in BRST-1FLRDL, BRST-BSMTDL, and FD-1-DL were rejected (R) because acceptable results for these compounds were taken from the original analyses (BRST-1FLR, BRST-BSMT, and FD-1).

The chain-of-custody was not signed by the laboratory when the canisters were picked up, which is not compliant with the FLCM. However, since the field sampler was the one to pick up the canisters, no qualifications were deemed necessary for sample results.

3.0 CONCLUSIONS AND RECOMMENDATIONS

Based on results of air sampling conducted by WHEM at the former Bressett residence on March 4, 2016, the following conclusions are presented:

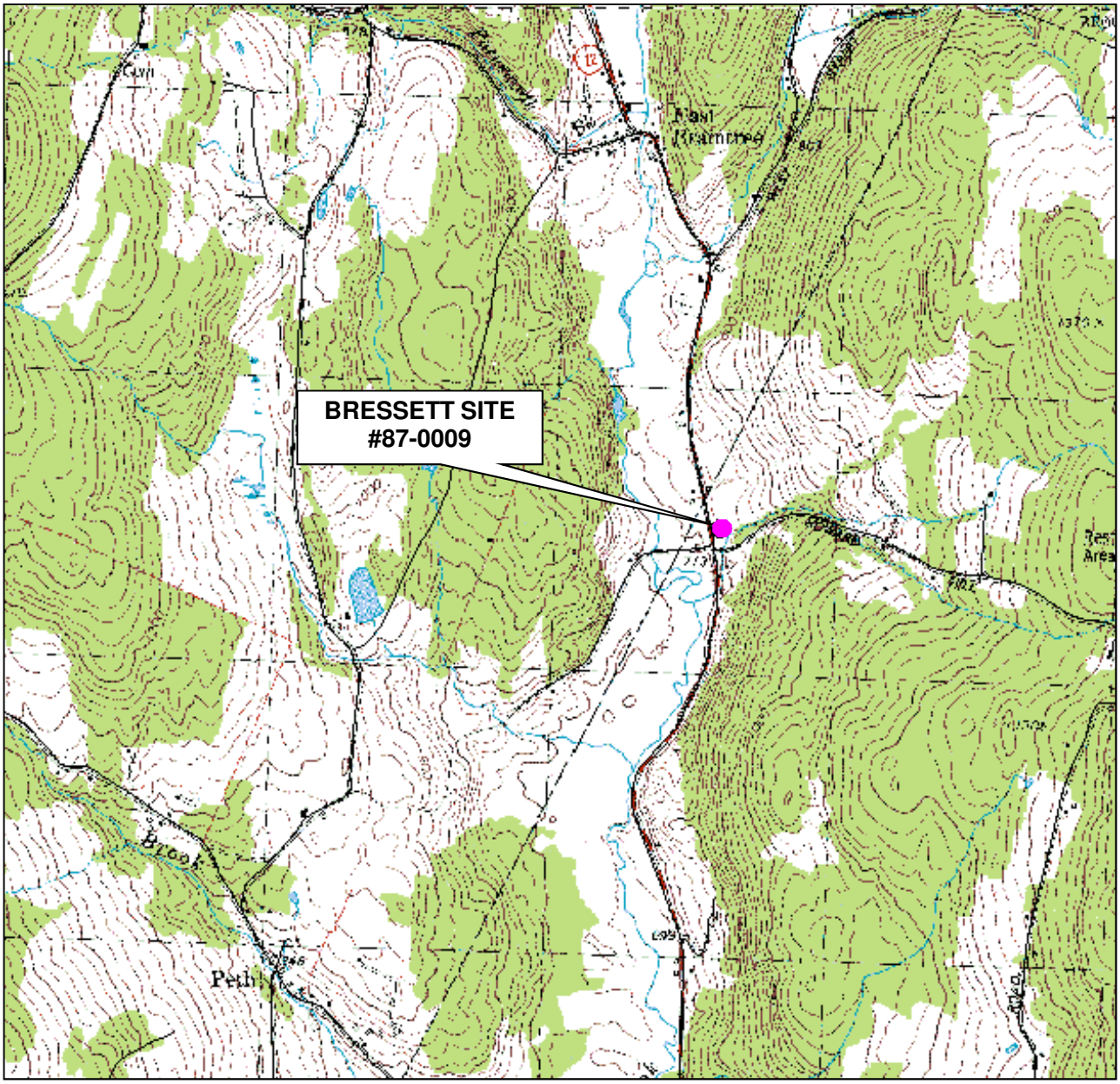
- Target compounds were reported in the indoor air collected from the both the 1st floor and basement samples:
  - Target compound PCE and TCE were detected in exceedance of VTDEC guidelines in both the first floor and basement samples. In addition to this, cis-1,2-DCE was detected in both the basement and 1st floor samples, and trans-1,2-DCE was also detected in the basement. No target compounds were detected in the outdoor air sample.
  - A significant increase in target compound concentrations to pre-mitigation levels was not unforeseen as the building has been unoccupied and the mitigation system turned off. If the mitigation system is reactivated, it is likely to reduce the concentrations of target compounds.
- Other than the qualification of PCE results above the calibration range of the instrument and replacement with diluted results, there were no qualifications and all air analytical data was reported to be valid.

Since it is clear that vapor intrusion through the subsurface and into the basement continues when the mitigation system is inactive, WHEM recommends that the mitigation system be activated as soon as possible, if it has not already been done. The new owner, Bob Simpson, should be provided with a copy of the O&M Manual for the mitigation system and instructed on who to report to if there is a problem with the system. Air sampling should continue for an adequate period after re-start of the mitigation system to confirm that it is successful in reducing target VOC concentrations to below VT DEC guidelines. WHEM recommends continuing with the indoor air monitoring program as specified in the *Work Plan* and *FLCM-Air*. The next air sampling event is scheduled to occur in July 2016.

APPENDIX A:

FIGURES

USGS Site Location Map
Site Map



LEGEND

State-Listed Hazardous Waste Site

N

Map Source: *USGS Mapping 7.5 Minute Quadrangle: Randolph (1981)*

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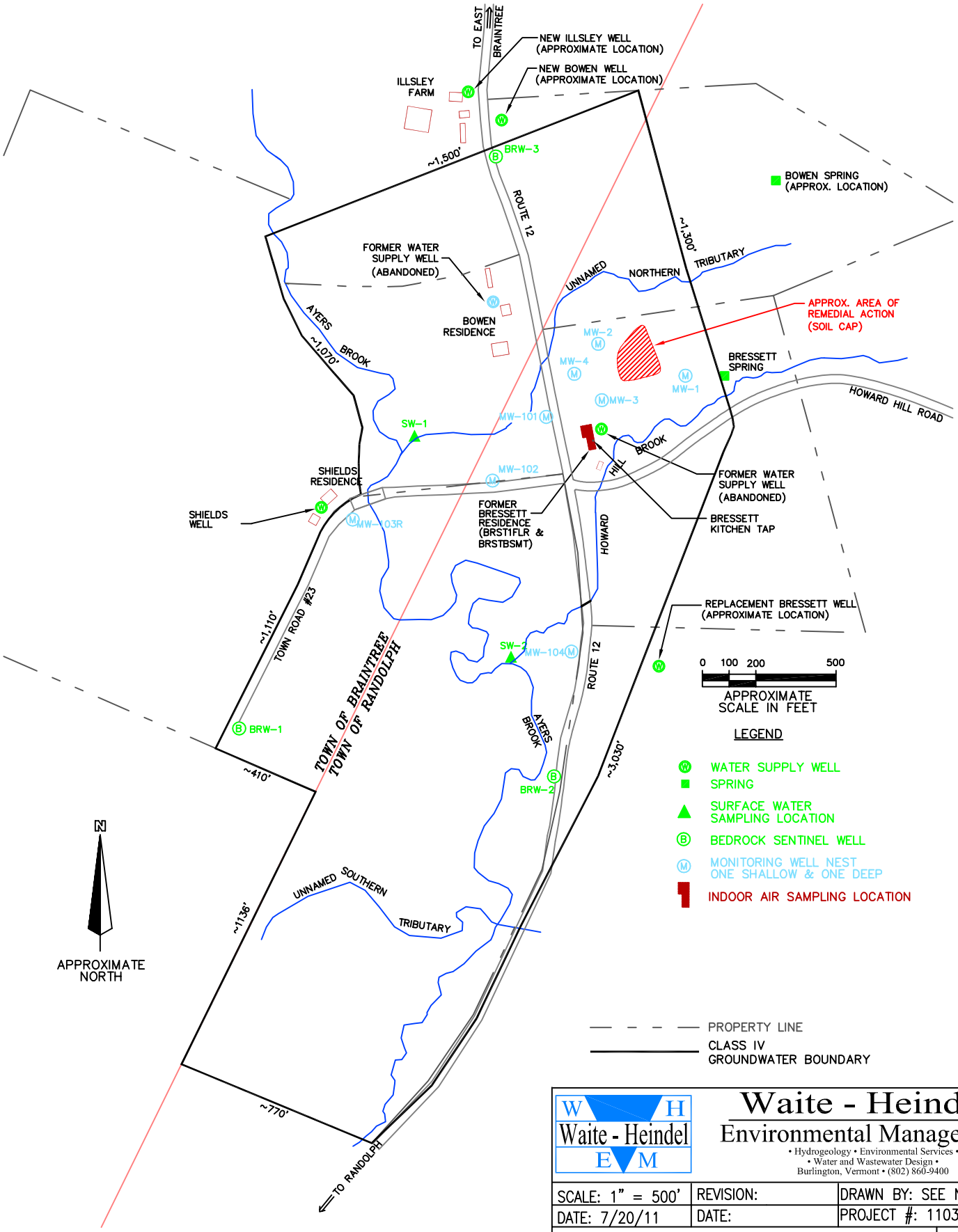
SITE LOCATION MAP

Bressett Site
Randolph, Vermont

Date: 12/15/12	Drawing No. 1	Scale: 1:24,000	By: MEW



NOTES:
1. MAP SOURCE IS "PLATE 1: SITE MAP, BRESSETT SITE, RANDOLPH, VERMONT" PREPARED BY THE JOHNSON COMPANY, INC. MAP HAS BEEN ANNOTATED BY WAITE-HEINDEL ENVIRONMENTAL MGT.

W H
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E M

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• Hydrogeology • Environmental Services •
• Water and Wastewater Design •
Burlington, Vermont • (802) 860-9400

SCALE: 1" = 500'	REVISION:	DRAWN BY: SEE NOTE
DATE: 7/20/11	DATE:	PROJECT #: 110320012

SITE PLAN

BRESSETT SITE
RANDOLPH, VERMONT

1 OF 1

APPENDIX B:

TABLES AND GRAPHS

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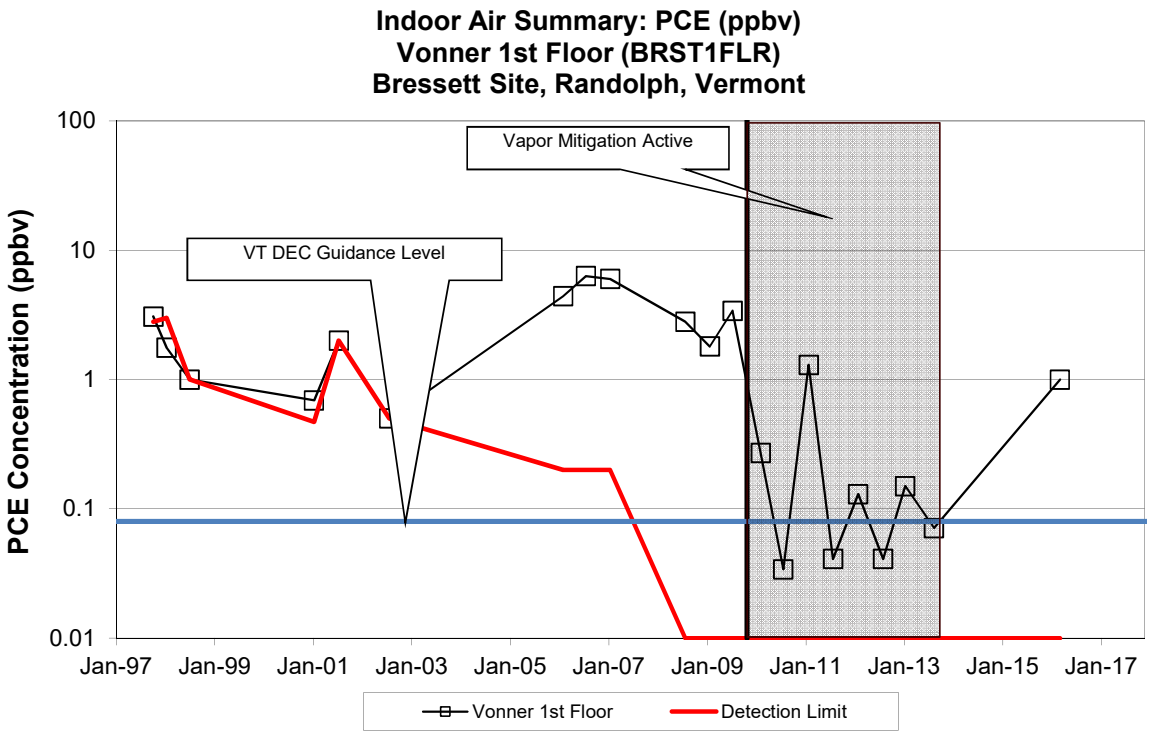
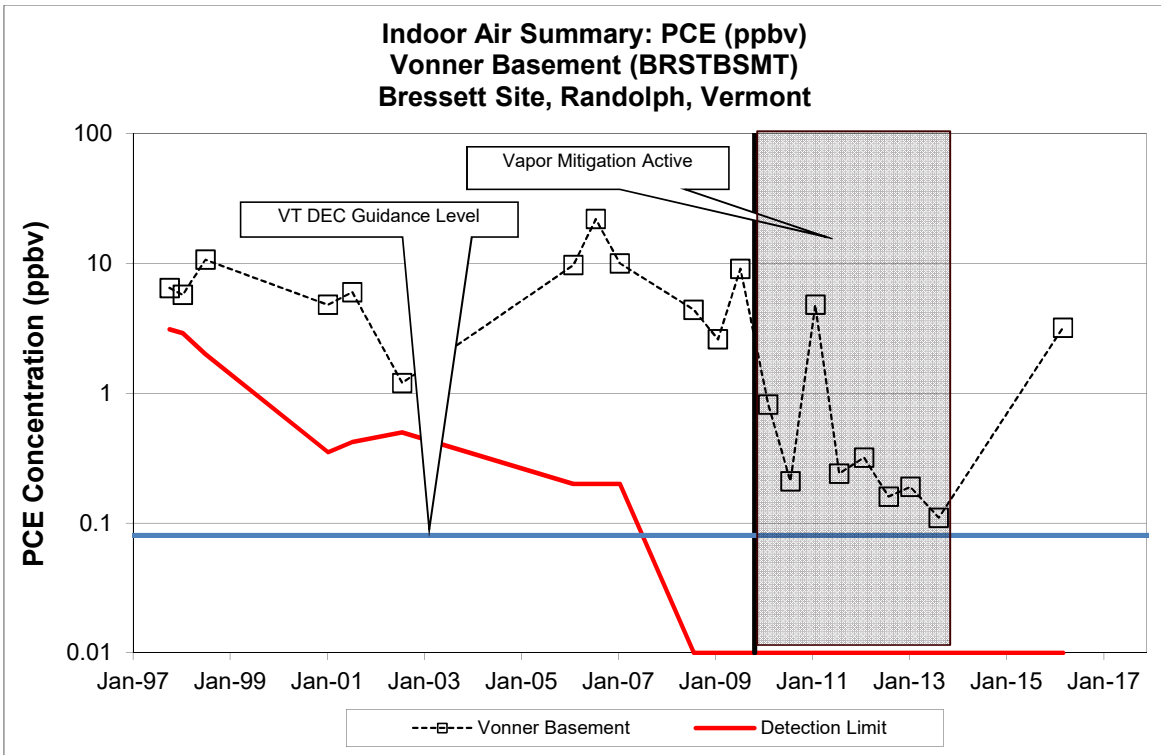
TABLE 1.0
INDOOR AIR QUALITY RESULTS: 2009-2016
Bressett Site, Randolph, Vermont

Current Owner	Location	Parameter Method T-014A	Guidance Level	Units	Jul-09	Feb-10	Jul-10	Jan-11	Jul-11	Jan-12	Aug-12	Feb-13	Aug-13	Mar-16
Simpson	BRST1FLR	Tetrachloroethene	0.08	ppbv	**3.4**	**0.27**	**0.034** J	**1.3**	**0.041**	**0.13**	**0.041**	**0.15**	**0.071**	**1.0**
		Trichloroethene	0.09	ppbv	**0.20**	**0.034**	0.010 UJ	**0.19**	0.010 U	**0.018**	0.010 U	**0.019**	0.010 U	**0.15**
		cis-1,2-Dichloroethene		ppbv	**0.055**	**0.025**	0.010 UJ	**0.16**	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	**0.063**
		trans-1,2-Dichloroethene	15.9	ppbv	0.010 U	0.010 U	0.010 U	**0.015**	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
	BRSTBSMT	Tetrachloroethene	0.08	ppbv	**9.1**	**0.82** J	**0.21** J	**4.8**	**0.24**	**0.32**	**0.16**	**0.19**	**0.11**	**3.2**
		Trichloroethene	0.09	ppbv	**0.55**	**0.084**	**0.029** J	**0.65**	**0.035**	**0.037**	**0.027**	**0.025**	**0.015**	**0.58**
		cis-1,2-Dichloroethene		ppbv	**0.14** J	**0.067**	0.010 UJ	**0.53**	**0.015**	**0.020**	0.010 U	**0.017**	0.010 U	**0.25**
		trans-1,2-Dichloroethene	15.9	ppbv	**0.016** J	0.010 U	0.010 U	**0.047**	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	**0.023**
	OUTDOOR	Tetrachloroethene	100,000	ppbv										0.010 U
		Trichloroethene	100,000	ppbv										0.010 U
		cis-1,2-Dichloroethene	200,000	ppbv										0.010 U
		trans-1,2-Dichloroethene	200,000	ppbv										0.010 U

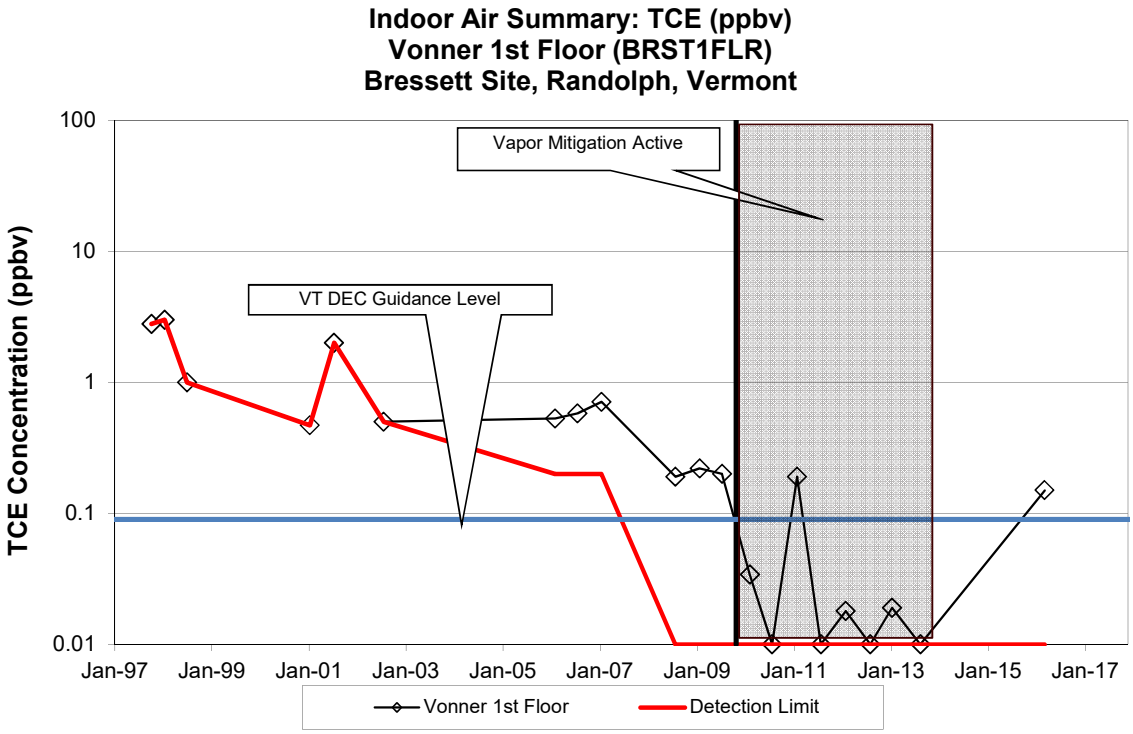
Notes:
-"U" = not detected above listed quantitation limit; "J" = reported concentration is an estimated value; "UJ" = reported quantitation limit is an estimated value; "R" = the data are unusable (analyte may or may not be present).
-"NS" = Not Sampled (house unoccupied or access not obtained).
-Bold values are reported above quantitation limit; shaded cells are in excess of the guidance level.
-Guidance levels for tetrachloroethene and trichloroethene are Target Indoor Air concentrations from Table C.7 of VT ANR Investigation and Remediation of Contaminated Properties Procedure, April 2012. These values have been converted from ug/m3 to ppbv using the formula: concentration (ppbv) = concentration (ug/m3) * 24.46/MW @ 25 dec C.
-Guidance level for trans-1,2,-dichloroethene is based on the EPA Regional Screening Level (RLS) for residential indoor air (May 2013). There is no EPA RSL for cis-1,2-



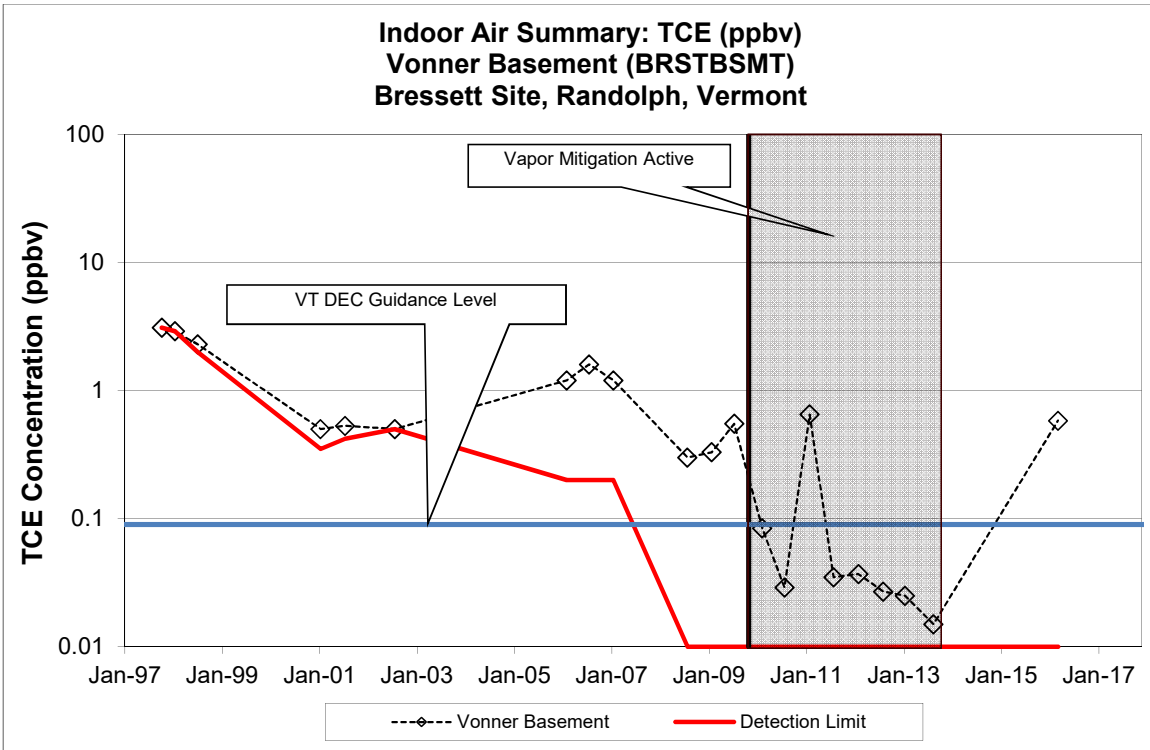
Notes:
1) Only values above detection limit line are considered positive detections; values below line are estimated only.



Notes:
1) Only values above detection limit line are considered positive detections; values below line are estimated only.



Notes:
1) Only values above detection limit line are considered positive detections; values below line are estimated only.



Notes:
1) Only values above detection limit line are considered positive detections; values below line are estimated only.

APPENDIX C:

FIELD DATA SHEETS

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SITE: Bressett DATE: 3/4/16

AIR SAMPLING CHECKLIST

SAMPLE: BRST-1FLR **LOCATION:** On window sill in central 1st floor Apt. See sketch.

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

List activities or materials present in vicinity of sampling location that could result in volatile emissions:
Recently painted. Newly-installed bathroom recently caulked. Beams exposed so some demo had occurred in the last few months. New drywall and insulation.

SAMPLE: BRST-BSMT **LOCATION:** Placed on work bench against North wall
↳ usual sampling location

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

List activities or materials present in vicinity of sampling location that could result in volatile emissions:
Cans of spray foam. Recent demolition/construction activities, particularly the installation of a new

SAMPLE: Outdoor **LOCATION:** Set canister in the back yard near the berm by the stream

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

List activities or materials present in vicinity of sampling location that could result in volatile emissions:
No activities or matls noted.

SAMPLE: **LOCATION:**

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

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

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

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

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

Client Contact Information	Project Manager: Miles Waite	Carrier: Chris Page WHEM	1 of 1 COCs
Company: Waite Environmental Mangement	Phone: (802) 860-9400	Sampled By: Chris Page, WHEM	
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	Standard (Specify) TO-15		
PO #	Rush (Specify)		

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	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)
BRST-BSMT	3/4/16	0947	1327	-30	-29.1	-8.0	-7.0	54	54	-29.3		4745	2634	6L	~~4745~~	18269	4.5	X										
FD-1	3/4/16	"0942"	"1342"	-30	-28.9	-10	-7.7	54	54	-29.3		3470	3160	↓	~~3470~~	↓	4.5	X										
BRST-1FLR	3/4/16	0940	1314	-30	-29.0	-9.0	-8.0	66	66	-29.4		3125	2533	↓	~~3125~~	↓	3.5	X										
Outdoor	3/4/16	1010	1340	-30	-29.0	-7.5	-7.7	~~54~~		-29.3		2995	3310	↓	~~2995~~	↓	2.0	X										

Ambient Pressure and Temperature			
	Ambient Temp (F)	Ambient Pressure (in Hg)	Data Source
Start	7	30.24	Knapp State Airport
Stop	21	30.17	Knapp state Airport

GC/MS Analyst Signature (TO-15)

Air Canisters Shipped By: (Lab Release)	Date	Time	Air Canisters Received By: (Courier/Sampler/Client)	Date:	Time:
[signature]	3/4/16	1500	[signature]	3/4/16	1500
Samples Relinquished By:	Date	Time	Samples Received By:	Date:	Time:
Samples Relinquished By:	Date:	Time:	Samples Receivd By:	Date:	Time:

Lab Use Only **Shipping Boxes Opened by:** **Condition:**

APPENDIX D:

DATA VALIDATION REPORT

DATA VALIDATION

FOR

UniFirst Project
Williamstown Sites
Williamstown, VT

ORGANIC ANALYSIS DATA
Selected Volatiles in Air Samples

Sample Delivery Group (SDG) Nos. 200-31867 and 200-32329

Chemical Analyses Performed by:

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

FOR

Mr. Gerold Noyes
VT Department of Environmental Conservation
Waste Management and Prevention Division
1 National Life Dr – Davis 1
Montpelier, VT 05620-3704

Data Validation Report by:

Phoenix Chemistry Services
126 Covered Bridge Rd.
N. Ferrisburg, VT 05473
(802) 233-2473
April 13, 2016

Reference #2016-0317-001 & -0331-001
VOA Air Validation Report/200-31867_32329/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 Laboratories, Inc. of South Burlington, VT, for 16 air samples and one (1) trip blank (TB) from the UniFirst project site in Williamstown, VT and for 4 air samples from the Bressett site in Randolph, VT. The laboratory reported the data under Sample Delivery Group (SDG) Nos. 200-31867 and 200-32329, which were submitted as two data packages received by Phoenix on March 17 and 31, 2016, and which include the following samples:

Sample ID	Laboratory ID
SDG No. 200-31867	
AQ5-1FLR	200-31867-1
AQ1-BSMT	200-31867-2
AQ5-BSMT	200-31867-3
AQ6-BSMT	200-31867-4
AQ2B-1FLR	200-31867-5
AQ6-1FLR	200-31867-6
AQ7-1FLR	200-31867-7
AQ7-BSMT	200-31867-8
AQ1-1FLR	200-31867-9
TRIP BLANK	200-31867-10
NORTHSIDE	200-31867-11
GYM	200-31867-12
FD-1 (FD-1-20160203)	200-31867-13
AS-3	200-31867-14
AS-4	200-31867-15
AVRM	200-31867-16
NECRNR	200-31867-17
SDG No. 200-32329	
BRST-BSMT	200-32329-1
FD-1 (FD-1-20160304)	200-32329-2
BRST-1FLR	200-32329-3
OUTDOOR	200-32329-4

A cross-reference table of sample IDs was provided in the data package. During the post sampling pressure check in the laboratory it was noted that one sample canister (AQ7-1FLR) was received with slightly less sample volume than the minimum specified by the laboratory to ensure adequate sample for testing needs; the vacuum on receipt.

The samples in this data set represent the sample collections from February 6, 2015 inside and outside the Williamstown Elementary School site and various public and private buildings in Williamstown, VT, and one private building in Randolph, VT. For clarity in this report, the two field duplicate samples have been given suffixes corresponding to the date of collection (as shown in parentheses in table above). The actual Sample Identifiers have not been changed in the spreadsheet files or the laboratory data packages.

Findings of the validation effort resulted in the following qualifications:

- Results for tetrachloroethene in BRST-1FLR, BRST-BSMT, and FD-1-20160304 were rejected (R) and replaced with the acceptable concentrations from the more diluted analyses of these samples (BRST-1FLRDL, BRST-BSMTDL, and FD-1-20160304DL)

- Results for all other analytes in BRST-1FLRDL, BRST-BSMTDL, and FD-1-20160304DL were rejected (R) because acceptable results for these compounds were taken from the original analyses (BRST-1FLR, BRST-BSMT, and FD-1-20160304).

- The validator removed all laboratory-applied "E" and "D" 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 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, and to maintain consistency with previous site work, 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, 10/99) 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 packages is presented in accordance with the CLP requirements. It is also assumed that the data packages 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 in the Data Summary Table contained in Attachment A and the spreadsheet summary files (Attachment B, submitted electronically) 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 February 3, 2016 for the winter sampling round at the Williamstown Elementary School site in Williamstown, VT, and various public and buildings in Williamstown, VT, and on March 4, 2016 for a private building in Randolph, VT. One canister (AQ7-1FLR) was returned to the laboratory with slightly less than the required minimum sample volume to ensure adequate sample for testing, necessitating raised reporting limits for this sample.

All analyses were performed within twenty-five (25) days after sample collection, which is within the 30 day holding time defined in Method TO-15.

The Canister Samples Chain of Custody Record & TO-15 Field Test Data Sheet (COC) shows that the sample canisters were collected and transported according to method specifications, and were checked and found to be within specifications of the FLCM, with the exceptions noted above. The canisters for the Williamstown sample collections were picked up from the laboratory by the field engineer one day before sample collection, and were hand-delivered to the laboratory on the same day as collected. The COC for the canisters for the Bressett sample collections was not signed by the laboratory when the canisters were picked up, which is not compliant with the Field-Laboratory Coordination Memorandum (FLCM). Since the field sampler picked the canisters up, no qualifications were deemed necessary for sample results; however, this could be problematic in a litigation situation.

II. GC/MS Instrument Performance Check (Tuning)

The samples for volatiles in air analysis from SDG Nos. 200-31867 and 200-32329 were analyzed on a single GC/MS system identified as instrument CHE. 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. All five (5) BFB tunes were correctly calculated, within acceptance limits, and are reported accurately on the Form 5 summaries in the data packages.

III. Initial Calibration (IC)

One IC (1/11/16-1/12/16) was performed on instrument CHE in support of the TO-15 sample analyses. The IC was performed at seven concentration levels (0.01, 0.0201, 0.0402, 0.1, 0.2, 0.5, and 0.999 parts per billion by volume [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 6 summaries. Three additional calibration levels (0.75, 1.5, and 2.0 ppbv) were analyzed, are listed on the Form 5 summaries, and are present in the data packages, but were not used in the calculation of the calibration curves for the target analytes, and appropriately do not appear on the Form 6 summaries.

Manual integrations for some target analytes were performed on standards and samples in this data set. The before and after ion chromatograms, the reason for the manual integration, and the analyst's initials and date were printed for each manual integration. Where a signal was detected, a manual integration was

attempted and included in the data package for the analytes with screening levels below reporting limits, demonstrating that the calculated concentrations were below achievable laboratory detection limits for those analytes.

An Independent Calibration Verification (ICV) sample at 0.20 ppbv was analyzed immediately after the IC and was included in the data package. All target analytes were present in the ICV analysis and were recovered within 86.6 - 108.4 % recovery of expected values.

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)

Four continuing calibration (CC) standards were run in support of the sample analyses reported in these data packages. Documentation of the CC standards was present and RRF as well as percent difference (%D) values were reported on the Form 7 summaries 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 three air-matrix laboratory method blanks (MBs) were reported in association with these samples. No target compounds were found in any MB.

One trip blank (TB) which was used as a field blank, was reported in the first data package. No target compounds were found in the TB.

Neither a trip blank nor a field blank is required for Method TO-15, although a trip blank is specified in the FLCM. With the concurrence of the Project Manager and the data validator, a trip blank was not used in the second sample collection effort due to the unavailability of a sufficient number of certified clean canisters at the time sampling was requested.

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 these data packages, with the single exception that IS 1,4-difluorobenzene was recovered above (147 %R) the upper acceptance limit (140 %R) in the dilution analysis FD-1-20160304DL. Since IS 1,4-difluorobenzene is not used for quantitation of the analyte tetrachloroethene, for which the dilution was performed, no qualifications were needed on the basis of the unacceptably high IS recovery.

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-1-20160203 was identified by the field sampler as a field duplicate of sample AQ6-BSMT, and sample FD-1-20160304 was identified as a field duplicate of sample BRST-BSMT. In the field duplicate pair AQ6-BSMT and FD-1-20160203, tetrachloroethene was the only analyte detected, at less than twice the quantitation limit in both members of the field duplicate pair, so precision could not be evaluated. In the field duplicate pair BRST-BSMT and FD-1-20160304, all four target analytes were reported at greater than twice the quantitation limit, and exhibited acceptable precision (3.4 – 12.8 percent relative percent difference, %RPD; limit 25 %RPD).

X. Sensitivity Check

An MDL study for this TO-15 method was analyzed on 4/24/10 and most recently verified at 0.04 ppbv on 12/12/14, which is more than one year prior to these analyses. All target analytes in the statistical study had calculated MDLs below the method quantitation limits, and demonstrated slightly low ratios (just below 3:1) of the quantitation limit (QL) to the verified MDL (MDLV) for all four target analytes. Since the QL is also supported by the low concentration standard (at 0.010 ppbv) in the initial calibration, no qualification was deemed necessary on the basis of the slightly low test ratios. The Laboratory has been reminded that the FLCM requires an annual MDL study, but the validator agreed to accept annual verification studies instead, in accordance with the Laboratory's SOP and accreditation requirements.

On the basis of acceptable sensitivity and accuracy, as demonstrated by the full MDL study, including the MDLV and the current 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

Two sets 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 3 summaries in the data packages, and were within (86 - 120 %R) 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 1 summaries. Results below the PQL are not reported by the laboratory for the low level TO-15 method.

As presented in the Case Narrative, a 100% analysis of sample AQ7-1FLR was attempted but unacceptable due to internal standard failures that were determined to be instrumental in origin. However, due to the insufficient air volume collected for AQ7-1FLR, the reanalysis of this sample had to be accomplished at a 2-fold dilution. While this brought the results for tetrachloroethene and trichloroethene into the mid-range of the instrument's established linear range, cis-1,2-dichloroethene and trans-1,2-dichloroethene were not detected at an elevated quantitation limit (0.020 ppbv). No qualifications are necessary on the basis of the raised quantitation limit; however, the data may not be used to support the absence of the non-detected analytes at the project-required reporting limits. The field sampler should ensure that adequate sample volume has been collected prior to ending sample collection.

Results for tetrachloroethene were reported above the calibration range in the initial analysis of samples BRST-1FLR, BRST-BSMT, and FD-1-20160304. The samples were appropriately reanalyzed at a dilution, with the resulting concentrations of tetrachloroethene within the upper half of the calibration range. Both sets of these analyses were reported in the data package.

Results for tetrachloroethene in BRST-1FLR, BRST-BSMT, and FD-1-20160304 were rejected (R) due to detection of these compounds outside the linear range of the instrument. Results for tetrachloroethene were replaced with the acceptable concentrations from the more diluted analyses of these samples (BRST-1FLRDL, BRST-BSMTDL, and FD-1-20160304DL).

Results for all other analytes in BRST-1FLRDL, BRST-BSMTDL, and FD-1-20160304DL were rejected (R) because acceptable results for these compounds were taken from the original analyses (BRST-1FLR, BRST-BSMT, and FD-1-20160304). It should be noted (as detailed in Section VII) that although the internal standard 1,4-difluorobenene was above the upper acceptance limit in the diluted analysis FD-1-20160304DL, this internal standard is not used for quantitation of tetrachloroethene, so no qualifications were necessary on this basis.

"E" qualifiers were appropriately applied by the laboratory to sample Form 1 results when concentrations of target analytes were greater than the instrument calibration range. "D" qualifiers were properly applied by the laboratory to positive results from diluted sample analyses. The validator removed all laboratory-applied "E" and "D" qualifiers.

The values and associated qualifiers that the validator has judged to be acceptable are presented in the "Validated_Value" and "Validator_Qualifier" columns, respectively, in both the Data Summary Table in Attachment A and the spreadsheet summary files submitted electronically as Attachment B. The Data Summary Table presents only non-detect results for which the result or qualifier was changed during validation, and all positive results, whether or not the value or qualifier was changed as a result of the validation. All results, positive and non-detect, are listed in the spreadsheet summaries. If a value or qualifier was changed, this is indicated by the "Y" (for yes) notation in the "Validator_Change" column in the Data Summary Table and spreadsheet summaries; if the value or qualifier was not changed during the validation

effort, this field is marked with an "N" to indicate "no change". Sample-specific quantitation limits are also given in both summaries ("PQL" in the Data Summary Table, or "High Limit" in Attachment B).

All laboratory-specific qualifiers, such as the asterisk (*), have been removed by the validator. This is not noted as a validation change.

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 acceptably for all samples analyzed on 2/19/15 through 2/21/15, based on instrument printouts and spectral quality.

XVI. Overall Evaluation of Data

Findings of the validation effort resulted in the following qualifications:

- Results for tetrachloroethene in BRST-1FLR, BRST-BSMT, and FD-1-20160304 were rejected (R) due to detection of these compounds outside the linear range of the instrument. Results for tetrachloroethene were replaced with the acceptable concentrations from the more diluted analyses of these samples (BRST-1FLRDL, BRST-BSMTDL, and FD-1-20160304DL)

- Results for all other analytes in BRST-1FLRDL, BRST-BSMTDL, and FD-1-20160304DL were rejected (R) because acceptable results for these compounds were taken from the original analyses (BRST-1FLR, BRST-BSMT, and FD-1-20160304).

- The validator removed all laboratory-applied "E" and "D" qualifiers.

XVII. Documentation

The chain of custody (COC) records were present and accurately completed for all reported samples, and samples were correctly logged in, with the following exceptions:

- The COC for the canisters for the Bressett sample collections was not signed by the laboratory when the canisters were picked up, which is not compliant with the Field-Laboratory Coordination Memorandum (FLCM). Since the field sampler picked the canisters up, no qualifications were deemed necessary for sample results.

While this issue does not directly affect the validity of the data, it could be problematic in a litigation situation.

The required records for canister cleanliness were included with the data packages, 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, and data presentation was acceptable, with the following observations:

- One canister (sampled at location AQ7-1FLR) exhibited an elevated vacuum upon receipt (insufficient air was collected). Due to an instrumental failure for the first analysis of this sample, reanalysis was necessary; however, an excess dilution (two-fold) had to be performed on the basis of the inadequate sample volume. The field sampler should ensure that adequate sample volume has been collected prior to ending sample collection.

- Some unnecessary data was included in the clean canister certification records.

- The Laboratory has been reminded that the FLCM requires an annual MDL study, but the validator agreed to accept annual verification studies instead, in accordance with the Laboratory's SOP and accreditation requirements. This study (last performed 12/12/14) is more than one year out of date.

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