

November 10, 2014

James Donaldson  
Waste Management and Prevention Division  
1 National Life Drive - Davis 1  
Montpelier, VT 05620-3704

Re: Fall 2014 Groundwater Monitoring Results at St. Michael's College – Joyce Hall, One  
Winooski Park, Colchester, Vermont. VTDEC Site# 2006-3473  
JCO #1-1950-2

Dear Mr. Donaldson:

The Johnson Company is pleased to present the results of the most recent groundwater monitoring event at the above referenced Site (Figure 1) conducted on October 9, 2014. The work scope and budget was approved Waste Management and Prevention Division via e-mail on September 22, 2014 and tracking number 13608 for facilitating reimbursement from the petroleum cleanup fund was issued.

## **1.0 INTRODUCTION AND BACKGROUND**

The Site has served in its present capacity as a college for approximately the last 100 years. The Site and host vicinity currently contain several dormitories and other related buildings (Figure 2). The Johnson Company conducted a soil and groundwater investigation in January and March 2006 which included the installation of eight soil borings and groundwater monitoring wells, and the collection of groundwater samples from each of the wells. The results of the investigation were detailed in the May 2006 Soil and Groundwater Investigation Report prepared by The Johnson Company. In June 2006 the UST adjacent to Joyce Hall was removed and replaced with a new 10,000 gallon UST. Several small holes were observed in the bottom of the old UST, and an observation/recovery well was installed adjacent to the new UST. Groundwater monitoring has been conducted previously at the Site in January and November 2006 and in November 2007, 2008, 2009 and 2012. Significant building and site development has occurred since the most recent monitoring in 2012 that apparently has resulted in several of the site monitoring wells being destroyed or otherwise missing. An extensive non-intrusive search with a metal detector yielded no indication of the former wells existence. The two most critical downgradient monitoring wells, MW-3 and MW-4, are still in-place and were sampled.

## 2.0 METHODOLOGY

Groundwater samples were collected from four monitoring wells (MW- 3, and - 4) on October 9, 2014 using a peristaltic pump and dedicated tubing after purging each well of at least three well volumes to ensure that representative formation water was sampled. Prior to sampling the depth to groundwater was measured to the nearest 0.01 foot. The remaining wells could not be located as discussed above. Groundwater samples were collected for analysis of VOCs by EPA Method 8021B in 40 mL VOA vials preserved with Hydrochloric acid (HCL). The vials were stored chilled in an ice chest for same day delivery to Endyne Laboratories in Williston, Vermont.

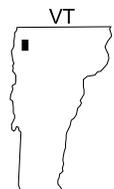
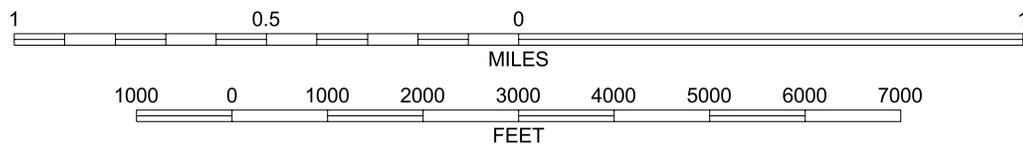
## 3.0 RESULTS AND DISCUSSION

### Groundwater Hydraulics

Depth to water in monitoring wells MW-3 and MW-4 was 9.91 to 9.87 feet below top of casing, respectively. Water level elevations were approximately 0.1 to 0.2 feet lower than those observed in these two well during the previous sampling event in November 2012. As noted in previous monitoring events the water level in MW-4 is slightly lower (~ 0.1 feet) than in MW-3. The difference is consistent with the prior documented groundwater flow direction toward the south.

### Groundwater Analytical Results

Groundwater analytical results were reported from Endyne Analytical on October 13, 2014 and are included in Appendix 1 along with the field notes from the monitoring event. The 8021B results are summarized on Figure 2 and Table 1 below. Only MW-3 contained detectable concentrations of petroleum related VOCs. MW-3 contained one VOC (naphthalene at 57.8 µg/L) in excess the 20 µg/L Vermont Groundwater Enforcement Standard (VGES). None of the other reported VOCs exceeded the VGES. Since 2008 the only exceedance of VGES at MW-3 has been for naphthalene and albeit slowly the naphthalene concentration has continually declined since 2007. The reported concentrations for Method 8021B analytes detected in MW-3 samples since monitoring began are plotted on Figure 3. As can be noted on Figure 3, since 2007 a general downward trend of concentrations in detected VOCs is occurring. No VOCs were reported present in the MW-4 groundwater sample consistent with past monitoring. Based on the groundwater flow direction and lack of contamination reported in MW-4 it appears the sewer line is intercepting the groundwater flow in the vicinity of MW-3 and 4. Prior to removal of the Joyce Hall UST in 2006, fuel oil was observed in the sewer manhole adjacent to MW-3 and MW-4. Presumably the sewer line up gradient of the manhole and located between MW-3 and MW-4 was intercepting the fuel oil flowing in the direction of the groundwater.

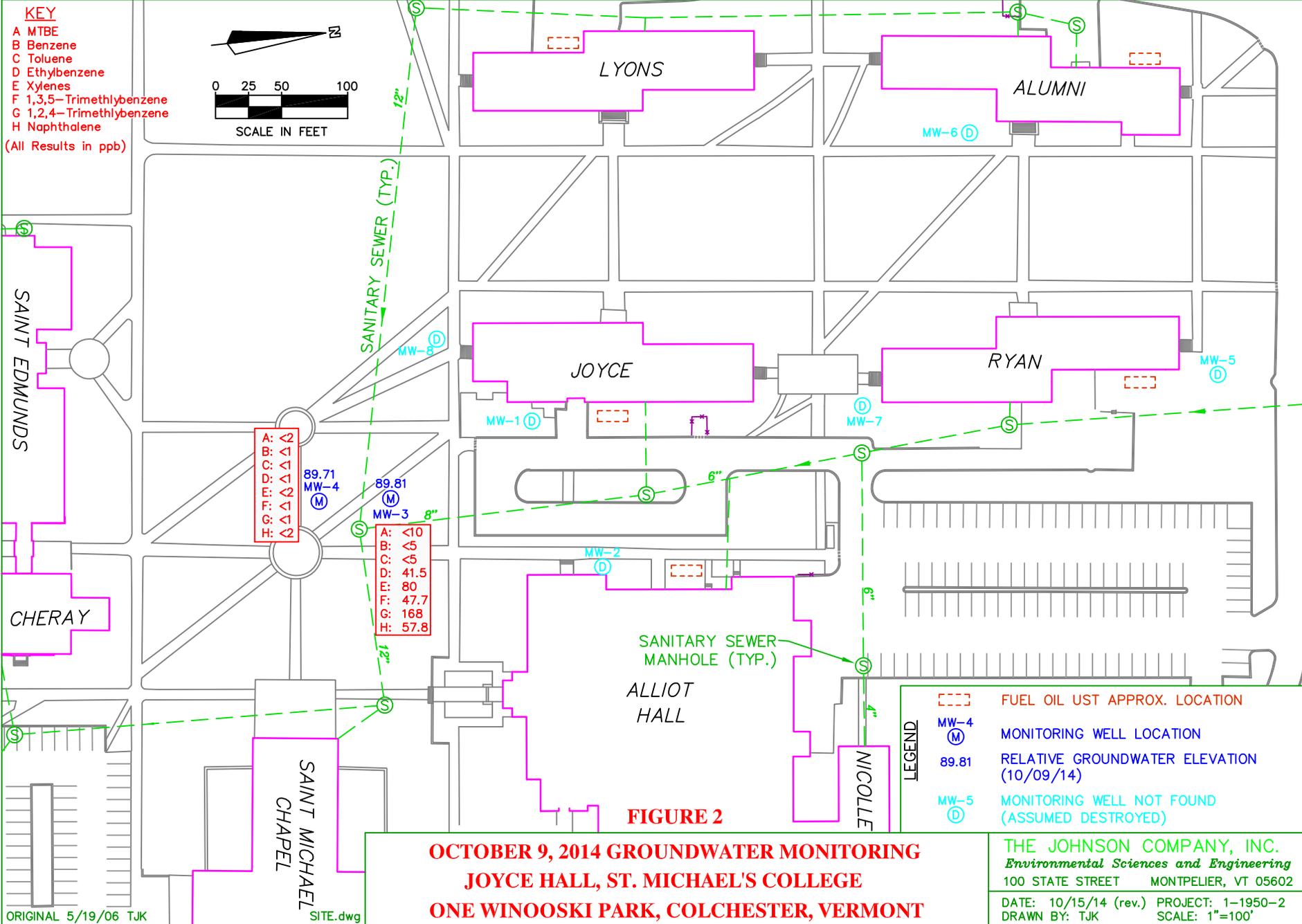


BASE MAP: USGS 7.5 Minute Topographic Quadrangle COLCHESTER, VT. 1987 & BURLINGTON, VT. 1987

MAP LOCATION

**FIGURE 1: SITE LOCATION MAP**  
**ST. MICHAEL'S COLLEGE**  
**ONE WINOOSKI PARK, COLCHESTER, VT.**

**THE JOHNSON COMPANY, INC.**  
 Environmental Sciences and Engineering  
 100 STATE STREET  
 MONTPELIER, VT 05602

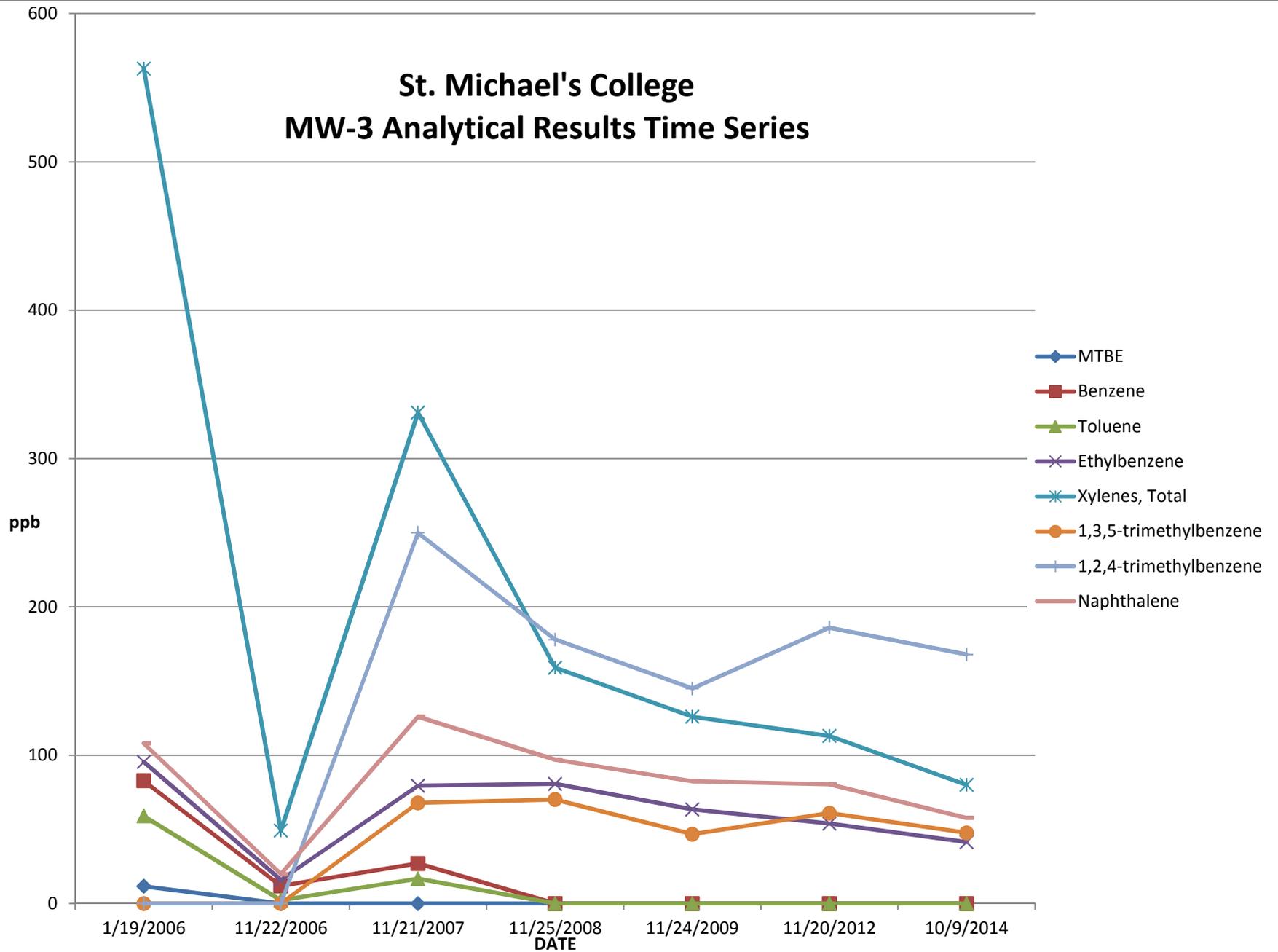


**Table 1  
Summary of Groundwater Analytical Results  
St. Michaels College, Colchester, Vermont**

Analyte	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes, Total	1,3,5-trimethylbenzene	1,2,4-trimethylbenzene	Naphthalene	
Vermont Groundwater Enforcement Standard	40	5	1000	700	10000	350 (sum of both compounds)		20	
Well	Sample Date								
MW-1	1/19/2006	20.6	<b>325</b>	208	177	675	<b>151*</b>	<b>482*</b>	<b>160</b>
	11/22/2006	11.7	<b>78.1</b>	9.8	49.1	151	<b>54.2*</b>	<b>161*</b>	<b>73.5</b>
	11/21/2007	<20	<b>62.4</b>	<10	60.5	110	68.8	243	<b>53.6</b>
	11/25/2008	<20	<b>12.7</b>	<10	30.2	58	46.9	105	<b>37.4</b>
	11/24/2009	<20	<b>6.7</b>	14.4	60.3	115	49.2	165	<b>65.2</b>
	11/20/2012	<10	<5	7.5	73.3	205	<b>89.6*</b>	<b>274*</b>	<b>143</b>
	10/9/2014	Unable to locate - possibly destroyed							
MW-2	1/19/2006	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0*	<1.0*	<2.0
	11/22/2006	<2.0	<1.0	<1.0	<2.0	<1.0	<1.0*	<1.0*	<2.0
	11/21/2007	Not Sampled							
	11/25/2008	Not Sampled							
	11/24/2009	Not Sampled							
	11/20/2012	Unable to locate - possibly destroyed							
MW-3	1/19/2006	11.7	<b>82.8</b>	59.1	95.6	563	<b>110*</b>	<b>340*</b>	<b>108</b>
	11/22/2006	<2.0	<b>11.9</b>	2.3	16.1	49.2	<b>15.2*</b>	<b>45.8*</b>	19.9
	11/21/2007	<20	<b>27.1</b>	16.8	79.5	331	67.9	250	<b>126</b>
	11/25/2008	<20	<10	<10	80.7	159	70.2	178	<b>97.1</b>
	11/24/2009	<20	<10	<10	63.5	126	46.8	145	<b>82.5</b>
	11/20/2012	<10	<5	<5	54	113	61	186	<b>80.5</b>
	10/9/2014	<10	<5	<5	41.5	80	47.7	168	<b>57.8</b>
MW-4	1/19/2006	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0*	<1.0*	<1.0
	11/22/2006	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0*	<1.0*	<2.0
	11/21/2007	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0
	11/25/2008	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0
	11/24/2009	Not Sampled							
	11/20/2012	<2	<1	<1	<1	<2	<1	<1	<2
	10/9/2014	<2	<1	<1	<1	<2	<1	<1	<2
MW-5	3/28/2006	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0*	<1.0*	<1.0
	11/22/2006	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0*	<1.0*	<2.0
	11/21/2007	Not Sampled							
	11/25/2008	Not Sampled							
	11/24/2009	<2	<1	<1	<1	<2	<1	<1	<2
	11/20/2012	Unable to locate-possibly destroyed							
MW-6	3/28/2006	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0*	<1.0*	<1.0
	11/22/2006	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0*	<1.0*	<2.0
	11/21/2007	Not Sampled							
	11/25/2008	Not Sampled							
	11/24/2009	Not Sampled							
	11/20/2012	Not Sampled No Access - Building Construction							
MW-7	3/28/2006	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0*	<1.0*	<1.0
	11/22/2006	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0*	<1.0*	<2.0
	11/21/2007	Not Sampled							
	11/25/2008	Not Sampled							
	11/24/2009	<2	<1	<1	<1	<2	<1	<1	<2
	11/20/2012	Not Sampled No Access - Building Construction - Possibly destroyed							
MW-8	3/28/2006	<10	<5.0	<5.0	19.2	82.3	<5.0*	<b>6.3*</b>	<b>60.5</b>
	11/22/2006	<2.0	<1.0	2.7	7.4	47.3	<b>5.6*</b>	<b>13.4*</b>	<b>39.2</b>
	11/21/2007	<2.0	<1.0	<1.0	2.7	8.5	4.1	4.3	11.1
	11/25/2008	<2.0	<1.0	<1.0	2.1	7.4	3.2	4	4.5
	11/24/2009	<2	<1	<1	<1	<2	<1	2.4	<2
	11/20/2012	<2	<1	<1	<1	<2	2.2	3	<2

Notes: all results in parts per billion (ppb)  
 \* On February 26, 2007 the Vermont Groundwater Enforcement Standard for 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene was changed from 4 ppb and 5 ppb respectively to 350 ppb for the sum of both compounds  
 bold values exceed the Vermont Groundwater Enforcement Standard for that compound

# St. Michael's College MW-3 Analytical Results Time Series



Mr. James Donaldson  
Waste Management and Prevention Division  
Montpelier, VT

November 10, 2014  
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Based on the latest round of groundwater monitoring at the Site the following conclusions can be made:

- Depth to water in the monitoring wells ranged from 9.87 to 9.91 feet below top of casing. Water level elevations were approximately 0.1 to 0.2 feet lower than those observed during the previous sampling event in November 2012.
- One of the two sampled wells (MW-3) contained one petroleum related VOC (naphthalene) in excess of their respective VGES. Based on the groundwater results and lack of contamination reported in MW-4 it appears the sewer line is intercepting groundwater flow in the vicinity of MW-3 and 4.
- Petroleum related VOCs, especially naphthalene and trimethylbenzenes continued to be present in MW-3, however the water quality has improved significantly since the initial water quality sampling event in January 2006.

The Johnson Company recommends that an additional groundwater monitoring round be conducted in the fall of 2016 to continue to track the decline of contaminant concentrations at the Site.

Please feel free to contact me with any questions or concerns,

Sincerely,  
THE JOHNSON COMPANY, INC.

By:

  
Joel Behrsing, P.E.  
Senior Engineer  
Email: [jbehrsing@jcomail.com](mailto:jbehrsing@jcomail.com)

cc: Rick Battistoni, St. Michael's College

KAI-1950-2\Fall 2014 GW monitoring report.doc

**APPENDIX A**

**ENDYNE, INC. LABORATORY  
ANALYTICAL LABORATORY REPORTS**



## Laboratory Report

Johnson Company (The)	078611
100 State Street, Suite 600	
Montpelier, VT 05602	

PROJECT: St Michaels College 1-1950-2

WORK ORDER: **1410-21242**

DATE RECEIVED: October 09, 2014

DATE REPORTED: October 13, 2014

SAMPLER: Jeremy Matt

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. All required method quality control elements including instrument calibration were performed in accordance with method requirements and determined to be acceptable unless otherwise noted.

The column labeled Lab/Tech in the accompanying report denotes the laboratory facility where the testing was performed and the technician who conducted the assay. A "W" designates the Williston, VT lab under NELAC certification ELAP 11263; "R" designates the Lebanon, NH facility under certification NH 2037 and "N" the Plattsburgh, NY lab under certification ELAP 11892. "Sub" indicates the testing was performed by a subcontracted laboratory. The accreditation status of the subcontracted lab is referenced in the corresponding NELAC and Qual fields.

The NELAC column also denotes the accreditation status of each laboratory for each reported parameter. "A" indicates the referenced laboratory is NELAC accredited for the parameter reported. "N" indicates the laboratory is not accredited. "U" indicates that NELAC does not offer accreditation for that parameter in that specific matrix. Test results denoted with an "A" meet all National Environmental Laboratory Accreditation Program requirements except where denoted by pertinent data qualifiers. Test results are representative of the samples as they were received at the laboratory

Endyne, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose.

Reviewed by:

Harry B. Locker, Ph.D.  
Laboratory Director

[www.endynelabs.com](http://www.endynelabs.com)



160 James Brown Dr., Williston, VT 05495  
Ph 802-879-4333 Fax 802-879-7103

56 Etna Road, Lebanon, NH 03766  
Ph 603-678-4891 Fax 603-678-4893



CLIENT: Johnson Company (The)  
 PROJECT: St Michaels College 1-1950-2  
 REPORT DATE: 10/13/2014

WORK ORDER: **1410-21242**  
 DATE RECEIVED: 10/09/2014

TEST METHOD: EPA 8021B

001	Site: MW-3	Date Sampled: 10/9/14 13:30	Analysis Date: 10/10/14	W EEP
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Parameter	Result	Unit	Nelac	Qual	Parameter	Result	Unit	Nelac	Qual
Methyl-t-butyl ether (MTBE)	< 10.0	ug/L	N		Benzene	< 5.0	ug/L	N	
Toluene	< 5.0	ug/L	N		Ethylbenzene	41.5	ug/L	N	
Xylenes, Total	80.0	ug/L	N		1,3,5-Trimethylbenzene	47.7	ug/L	N	
1,2,4-Trimethylbenzene	168	ug/L	N		Naphthalene	57.8	ug/L	N	
Surr. 1 (Bromobenzene)	96	%	N		Unidentified Peaks	> 10		N	

TEST METHOD: EPA 8021B

002	Site: MW-4	Date Sampled: 10/9/14 14:10	Analysis Date: 10/10/14	W EEP
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Parameter	Result	Unit	Nelac	Qual	Parameter	Result	Unit	Nelac	Qual
Methyl-t-butyl ether (MTBE)	< 2.0	ug/L	N		Benzene	< 1.0	ug/L	N	
Toluene	< 1.0	ug/L	N		Ethylbenzene	< 1.0	ug/L	N	
Xylenes, Total	< 2.0	ug/L	N		1,3,5-Trimethylbenzene	< 1.0	ug/L	N	
1,2,4-Trimethylbenzene	< 1.0	ug/L	N		Naphthalene	< 2.0	ug/L	N	
Surr. 1 (Bromobenzene)	101	%	N		Unidentified Peaks	0		N	

TEST METHOD: EPA 8021B

003	Site: Trip Blank	Date Sampled: 10/7/14 10:40	Analysis Date: 10/10/14	W EEP
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Parameter	Result	Unit	Nelac	Qual	Parameter	Result	Unit	Nelac	Qual
Methyl-t-butyl ether (MTBE)	< 2.0	ug/L	N		Benzene	< 1.0	ug/L	N	
Toluene	< 1.0	ug/L	N		Ethylbenzene	< 1.0	ug/L	N	
Xylenes, Total	< 2.0	ug/L	N		1,3,5-Trimethylbenzene	< 1.0	ug/L	N	
1,2,4-Trimethylbenzene	< 1.0	ug/L	N		Naphthalene	< 2.0	ug/L	N	
Surr. 1 (Bromobenzene)	100	%	N		Unidentified Peaks	0		N	



Location Colchester VT Date 10-9-14Project / Client St. Mike's Joyce HallSEM - Sereny Matt

MW-1 could not be located w/ M.D.

MW-2 could not be located w/ M.D.

MW-3 see next pg

MW-4 see next ps

MW-5 could not be located w/ M.D.

MW-6 could not be located w/ M.D.

MW-7 new bldg over well

MW-8 could not be located w/ M.D.

MW-9MW-10

MW-8 &amp; MW-1 located near areas

of disturbance (Jute matting near

MW-8 ? new flower beds according

to Dale (grounds) near MW-1).

R. Boxes of these wells also

Damaged according to prev. G.W. Rept

CONTACTED:

-1 Dickerson, grounds

659 62 phone, left msg,

343-2363 " Area around wells protz

much trampled by equipment

M.D. - METAL DETECTOR

Location Colchester, VT Date 10-7-14

Project / Client SH<sup>Q</sup> S.J. Michaels

JEM

new sidewalk & flower beds near  
mw-2 Locn.

Mw-3 (1") - faint Sheen, Petroleum odor

Samp Time: 1330

U : 9.91

T.D. : 14.31

Target. Purge Vol: 0.54L @ 5g/l

ACT. Purge Vol: 0.75

Mw-4 (1")

Samp Time: 1410

U : 9.87

T.D. : 14.59

Targ. Purge Vol: 0.58 5g/l

ACT. Purge Vol: 0.75

Location \_\_\_\_\_ Date \_\_\_\_\_

Project / Client \_\_\_\_\_

