

Motiva Enterprises, LLC

2nd Half 2018 Semi-Annual Groundwater Monitoring Report

Former Shell Station
9829 Georgetown Pike
Great Falls, Virginia
PC# 2003-3230

January 14, 2019

Version 1.0





**2nd Half 2018 Semi-Annual
Groundwater Monitoring Report**

Former Shell Station
9829 Georgetown Pike
Great Falls, Virginia
PC# 2003-3230

Prepared for:
Motiva Enterprises, LLC
7765 Lake Worth Road #319
Lake Worth, Florida 33467

Prepared by:
Groundwater & Environmental Services, Inc.
1350 Blair Drive, Suite A
Odenton, MD 21113
TEL: 800-220-3606
www.gesonline.com

GES Project:
0403114

Date:
January 14, 2019

A handwritten signature in blue ink, appearing to read 'TB', is positioned above a horizontal line.

Tim Boswell
Geologist/Case Manager

A handwritten signature in black ink, reading 'A. Ashley Bell', is positioned above a horizontal line.

A. Ashley Bell
Senior Project Manager



SITE NAME: Former Shell Station

SITE LOCATION: 9829 Georgetown Pike, Great Falls, Virginia

VADEQ PC# 2003-3230

DATE OF REPORT: January 14, 2019

LAND USE CLASSIFICATION: Industrial/Commercial

CURRENT PROPERTY OWNER: Motiva Enterprises, LLC
7765 Lake Worth Road #319
Lake Worth, FL 33467

CONSULTANT: Groundwater & Environmental Services, Inc.
1350 Blair Drive, Suite A
Odenton, Maryland 21113
(800) 220-3606

RELEASE INFORMATION: Release from former Underground Storage
Tank basin and dispenser area



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Acronyms

BGS	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
COC	Constituents of Concern
GES	Groundwater & Environmental Services, Inc.
EIP	Electronic Interface Probe
EPA	Environmental Protection Agency
ESA	Environmental Site Assessment
LNAPL	Light Non-Aqueous Phase Liquid
MDL	Method Detection Limit
MTBE	Methyl Tertiary Butyl Ether
MW	Monitoring Well
PC	Pollution Complaint
PVC	Polyvinyl Chloride
SCR	Site Characterization Report
TPH	Total Petroleum Hydrocarbons
TPH-GRO	Total Petroleum Hydrocarbons – Gasoline Range Organics
µg/L	Micrograms per Liter
UST	Underground Storage Tank
VOC	Volatile Organic Compound
VADEQ	Virginia Department of Environmental Quality



1 Introduction

Groundwater & Environmental Services, Inc. (GES) has prepared this 2nd Half 2018 Semi-Annual Groundwater Monitoring Report on behalf of Motiva Enterprises, LLC (Motiva), documenting environmental monitoring activities performed at the Former Shell Station located at 9829 Georgetown Pike, Great Falls, VA (Site) with associated Pollution Complaint (PC) #2003-3230. The semi-annual groundwater monitoring activities were performed as directed by the Virginia Department of Environmental Quality (VADEQ) in the *Site Characterization Report* (SCR) response directive dated September 19, 2018. The VADEQ directive requested the monitoring of select monitoring well locations performed semi-annually for a minimum of four events to evaluate dissolved phase methyl tert-butyl ether (MTBE) concentration trends and to measure concentrations of other petroleum constituents. The Site is the location of an active retail gasoline and auto repair service station. A Site Location Map showing the general area is included as **Figure 1** and a Site Map depicting pertinent features of the Site and adjacent areas is provided as **Figure 2**.

This summary report documents the following monitoring activities during the 2nd Half 2018 Semi-Annual period including:

- Gauging of 12 select Site monitoring wells (MWs) including: W-1, W-2, W-7, MW-20D(73-83), MW-20D(90-100), MW-20D(132-142), MW-21S/I, MW-22, MW-27S/I and MW-B3 to measure groundwater elevations; and
- Semi-annual sampling of groundwater from select MWs including: W-1, W-2, W-7, MW-20D(73-83), MW-20D(90-100), MW-20D(132-142), MW-21S/I, MW-22, MW-27S/I and MW-B3 to monitor MTBE concentration trends.

1.1 Site History

On July 5, 1990, the VADEQ assigned PC #90-1792 to the former Shell facility located at the Site due to the discovery of petroleum hydrocarbon constituents in soil and groundwater during a pre-underground storage tank (UST) removal assessment. Subsequent soil and groundwater sampling identified concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) in soil and groundwater. Upon further sampling and delineation, dissolved concentrations of MTBE and total petroleum hydrocarbons (TPH) were also identified in groundwater. Following 6 years of monitoring, PC#90-1972 was closed on July 9, 1996 by approval of the VADEQ.

After petroleum related constituents were identified at the Site as part of a site investigation performed by Equiva Services, LLC (Equiva) in April 2003, the VADEQ issued PC#2003-3230. Following the review of data documented in the Groundwater Assessment Report, it was determined that concentrations resembled historical concentrations for the Site and the VADEQ approved case closure in April 2003.

On January 12, 2009, Advanced Environmental, LLC submitted a Baseline Environmental Site Assessment Report to the VADEQ following the sampling of seven existing MWs on behalf of DAG Petroleum Suppliers, LLC. BTEX, MTBE, naphthalene and TPH – Gasoline Range Organics



(TPH-GRO) were detected in groundwater at concentrations consistent with historical reported levels.

On August 14, 2009 the VADEQ assigned PC #2010-3028 to the former Exxon station located upgradient and across Walker Road from the Site at 9901 Georgetown Pike, following a Phase II Site Assessment identifying dissolved phase hydrocarbons and fuel oxygenates. An SCR conducted at the former Exxon station identified MTBE concentrations of up to 226,000 micrograms per liter ($\mu\text{g/L}$) in groundwater upgradient of the former Shell station in September 2009. From 2009-2013, MTBE concentrations remained stable. Fairfax Petroleum Realty, LLC submitted a Corrective Action Plan for PC #2010-3028 on November 22, 2013. MTBE concentrations in W-1 and W-2 at the former Shell station rose to 26,000 $\mu\text{g/L}$ and 14,000 $\mu\text{g/L}$, respectively, indicating likely plume migration from the former Exxon station. During 2014, Fairfax Petroleum Realty, LLC began operating soil vapor and groundwater extraction systems. MTBE concentrations at the former Shell station began to decrease following system operation, with concentrations in W-1 falling to 16,000 $\mu\text{g/L}$ in 2015 and 7,600 $\mu\text{g/L}$ in 2017.

On May 18, 2017, the Virginia Department of Environmental Quality (VADEQ) reopened PC #2003-3230 for the former Shell station based on Fairfax Petroleum Realty, LLC findings and requested the completion of a SCR. Three additional soil borings were installed near the source area, including one monitoring well (MW-B3) and groundwater sampling activities were conducted as documented within the SCR submitted to the VADEQ on August 31, 2018. On September 19, 2018, the VADEQ sent a directive letter requiring semi-annual monitoring for a minimum of four events in select MWs to evaluate MTBE concentration trends and to document groundwater concentrations of other petroleum constituents. The initial VADEQ directive requested groundwater samples to be analyzed for full suite volatile organic compounds (VOCs), but through email correspondence and VADEQ approval, the analyte list was reduced to BTEX, MTBE and TPH-GRO.

1.2 Surrounding Properties & Potential Receptors

The area surrounding the site consists primarily of commercial and residential properties and public spaces. To the north of the Site are commercial buildings, Leo Santabella Park, and a public library across Georgetown Pike. To the northeast of the Site are Great Falls Grange Park and residential properties across Georgetown Pike. To the east and southeast of the Site are the Great Falls Shopping Center followed by undeveloped land and residential properties. To the south of the Site are the Great Falls Shopping Center followed by commercial and residential properties. To the west of the Site are commercial properties across Walker Road followed by a post office and residential properties.

The nearest surface water body is a pond and intermittent stream located approximately 1,100 feet southwest of the Site. The Site and immediate area surrounding the Site are supplied by public water; however, a number of residents in the area have private potable wells. The closest private potable well to the Site is located approximately 790 feet east of well W-1 at 706 Innsbruck Avenue. Additional private potable wells are located to the southwest and southeast. A Local Area

Map showing potable well locations in the area was completed by Kleinfelder in 2014 and is attached as **Appendix A**.

2 Semi-Annual Monitoring Activities

The 2nd Half 2018 Semi-Annual scope of work was directed by the VADEQ as defined in the September 19, 2018 directive letter and subsequent email correspondence. The following activities were conducted during this monitoring period:

- Gauging of 12 select Site MWs including: W-1, W-2, W-7, MW-20D(73-83), MW-20D(90-100), MW-20D(132-142), MW-21S/I, MW-22, MW-27S/I and MW-B3 to measure groundwater elevations; and
- Groundwater sample collection from select MWs including: W-1, W-2, W-7, MW-20D(73-83), MW-20D(90-100), MW-20D(132-142), MW-21S/I, MW-22, MW-27S/I and MW-B3 for analysis of BTEX and MTBE via Environmental Protection Agency (EPA) Method 8021 and TPH-GRO via EPA Method 8015.

Groundwater samples were collected in polyvinyl chloride (PVC) bailers following the purging of each location of three well volumes utilizing a decontaminated submersible pump and disposable polyethylene tubing. Groundwater samples were containerized in laboratory supplied bottleware, placed on ice within a cooler and couriered to Eurofins Lancaster Laboratories in Lancaster, Pennsylvania (Eurofins). The laboratory analytical report and chain-of-custody documentation are attached as **Appendix B**. As requested by the VADEQ, the monitoring event was coordinated with the consultant for Fairfax Petroleum Realty, LLC, but the consultant finished a day early, on December 3, 2018 and the samples were collected by GES on December 4, 2018.

2.1 Hydrogeology

An electronic interface probe (EIP) capable of measuring groundwater to the nearest 0.01 foot was used to gauge the selected MWs. The 2nd Half 2018 Semi-Annual gauging data is presented in **Table 1**. Light non-aqueous phase liquids (LNAPL) were not detected during the 2nd Half 2018 Semi-Annual activities.

Groundwater depths ranged from 24.65 feet below ground surface (bgs) in monitoring well MW-22 to 34.53 feet bgs in nested monitoring well MW-20D(132-142) during the 2nd Half 2018 Semi-Annual sampling event, which is shallower than recent historical measurements by approximately 4 – 5 feet across the site. Groundwater levels have not been recorded this shallow since June 2014, prior to the start-up in August 2014 of the groundwater extraction system at the former Exxon station located at 9901 Georgetown Pike. The groundwater extraction system was turned off in August 2018. A Groundwater Monitoring Map depicting groundwater elevation data and analytical data from the December 4, 2018 event is included as **Figure 3**. The Groundwater Monitoring Map indicates groundwater flow to the southeast, which is consistent with the historical flow direction. The hydraulic gradient at the Site was calculated to be 0.025 feet per foot between W-2 and MW-22.



3 Groundwater Analytical Results

On December 4, 2018, groundwater samples were collected from MWs: W-1, W-2, W-7, MW-20D(73-83), MW-20D(90-100), MW-20D(132-142), MW-21S/I, MW-22, MW-27S/I and MW-B3, which was dry during the previous sampling event. As detailed in sections above, groundwater samples were collected and submitted to Eurofins for analysis of BTEX and MTBE via EPA Method 8021 and TPH-GRO via EPA Method 8015. During the December 2018 sampling event, MTBE and TPH-GRO were the only constituents that exceeded their respective laboratory method detection limits (MDLs). Analytical results for groundwater samples identified the following method detection limit (MDL) exceedances for MTBE and TPH-GRO:

- MTBE was detected in MWs W-1 (240 µg/L), W-2 (51 µg/L), MW-20D(73-83) (220 µg/L), MW-20D(90-100) (0.2 J µg/L), MW-21S (0.2 J µg/L), MW-27S (0.7 J µg/L), MW-27I (0.8 J µg/L) and MW-B3 (41 µg/L) exceeding the laboratory MDL of 0.08 µg/L; and
- TPH-GRO was detected in MWs W-1 (240 µg/L), W-2 (50 J µg/L), W-7 (76 µg/L), MW-20D(73-83) (230 µg/L) and MW-B3 (33 J µg/L) exceeding the laboratory MDL of 11 µg/L.

As seen above and included within the laboratory analytical report, J qualifiers are used for estimated values where the detected concentration is greater than or equal to the MDL, but less than the reporting limit. The most recent MTBE analytical results were compared to historical concentrations within the attached Mann-Kendall Constituent Trend Analysis (**Appendix C**). The Mann-Kendall analysis exhibits continued decreasing concentration trends in all sampled monitoring locations with the exceptions of MW-20D(73-83) (stable) and MW-21S, which calculates no current trend. After further review of the Mann-Kendall Trend Analyses it is apparent that even MW-20D(73-83) and MW-21S have decreased since December 2015, with some fluctuations resulting in either stable or no trend calculations as a result of the Mann-Kendall equations. An MTBE Iso-concentration Map showing MTBE concentrations from the December 2018 sampling event is provided as **Figure 4**.

TPH-GRO has historically not been analyzed at the Site. Five monitoring well locations had detectable concentrations of TPH-GRO with a maximum concentration of 240 µg/L in monitoring well W-1. BTEX constituents were not detected in any of the wells that were sampled.

Groundwater analytical results are summarized in the Historical Groundwater Analytical Data Summary included as **Table 1**. The laboratory analytical reports and chain-of-custody documentation are provided in **Appendix B**.

4 CONCLUSION/RECOMMENDATIONS

GES has completed this 2nd Half 2018 Semi-Annual Groundwater Monitoring Report for the former Shell service station located at 9829 Georgetown Pike, Great Falls, VA. The following is a summary of pertinent findings from the 2nd Half 2018 monitoring conducted at the site:

- LNAPL was not observed during the reporting period;
- Groundwater flow and gradient is consistent with historical observations;



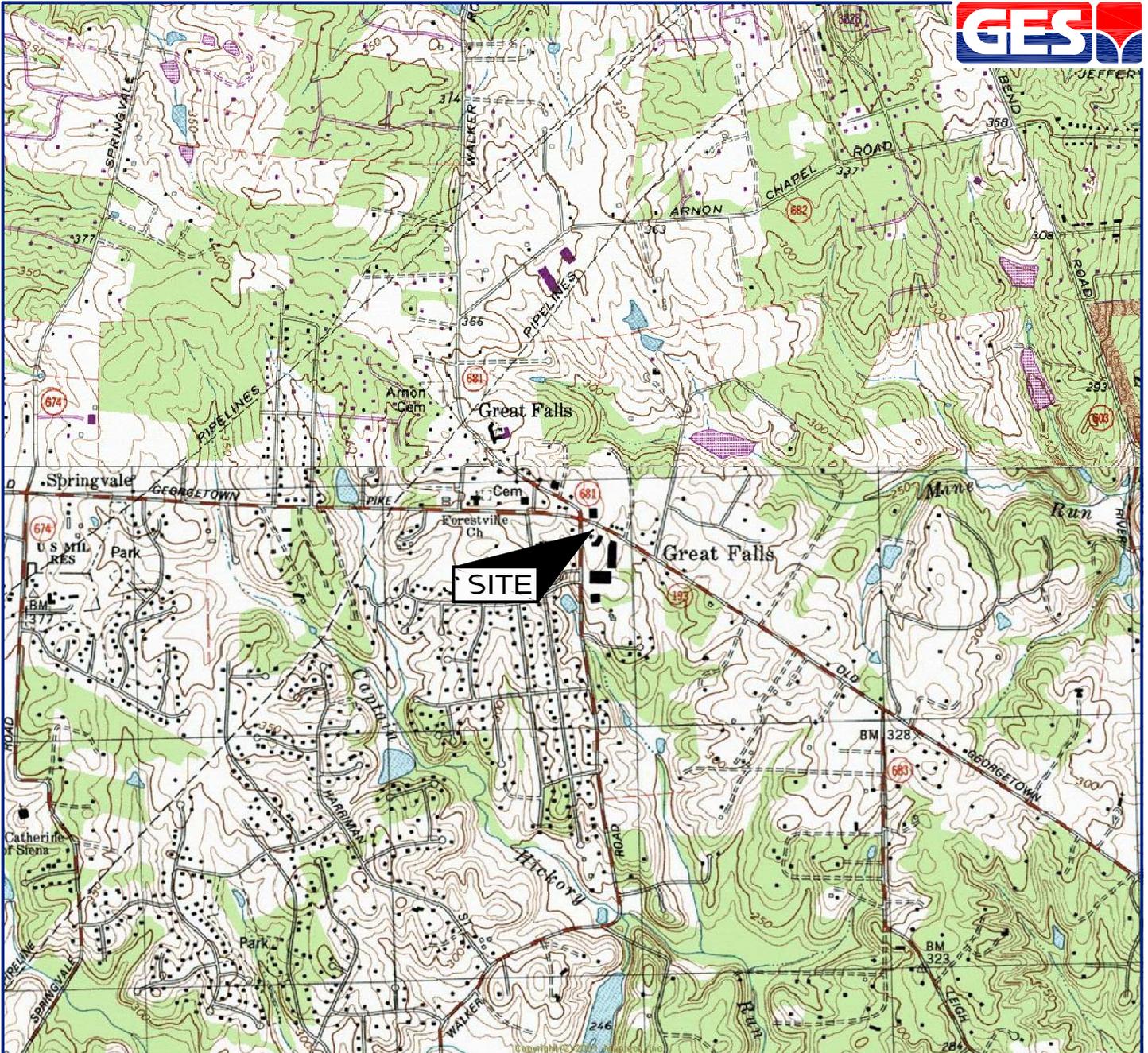
- MTBE concentrations in groundwater continue to decline, with a maximum concentration of 240 µg/L in monitoring well W-1;
- BTEX constituents were not detected in any of the groundwater samples collected; and
- TPH-GRO concentrations ranged from not detectable to a maximum concentration of 240 µg/L in monitoring well W-1.

Recommendations:

- Continue to monitor groundwater and concentrations in select onsite and offsite MWs; and
- Based on the lack of detectable concentrations of BTEX in any of the MWs sampled, GES, on behalf of Motiva, requests the elimination of BTEX analyses in future sampling events.



Figures



SOURCE: USGS 7.5 MINUTE SERIES
 TOPOGRAPHIC QUADRANGLE 1982
 VIENNA, VIRGINIA
 CONTOUR INTERVAL = 10'

Site Location Map

Former Shell Station
 9829 Georgetown Pike
 Great Falls, Virginia

Drawn
 A.A.B
 Designed

Approved
 A.A.B

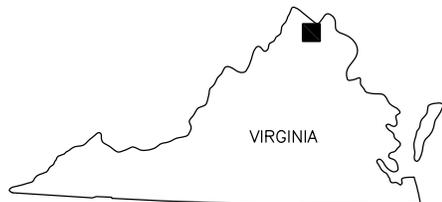
Date
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 Figure
 1



Scale In Feet



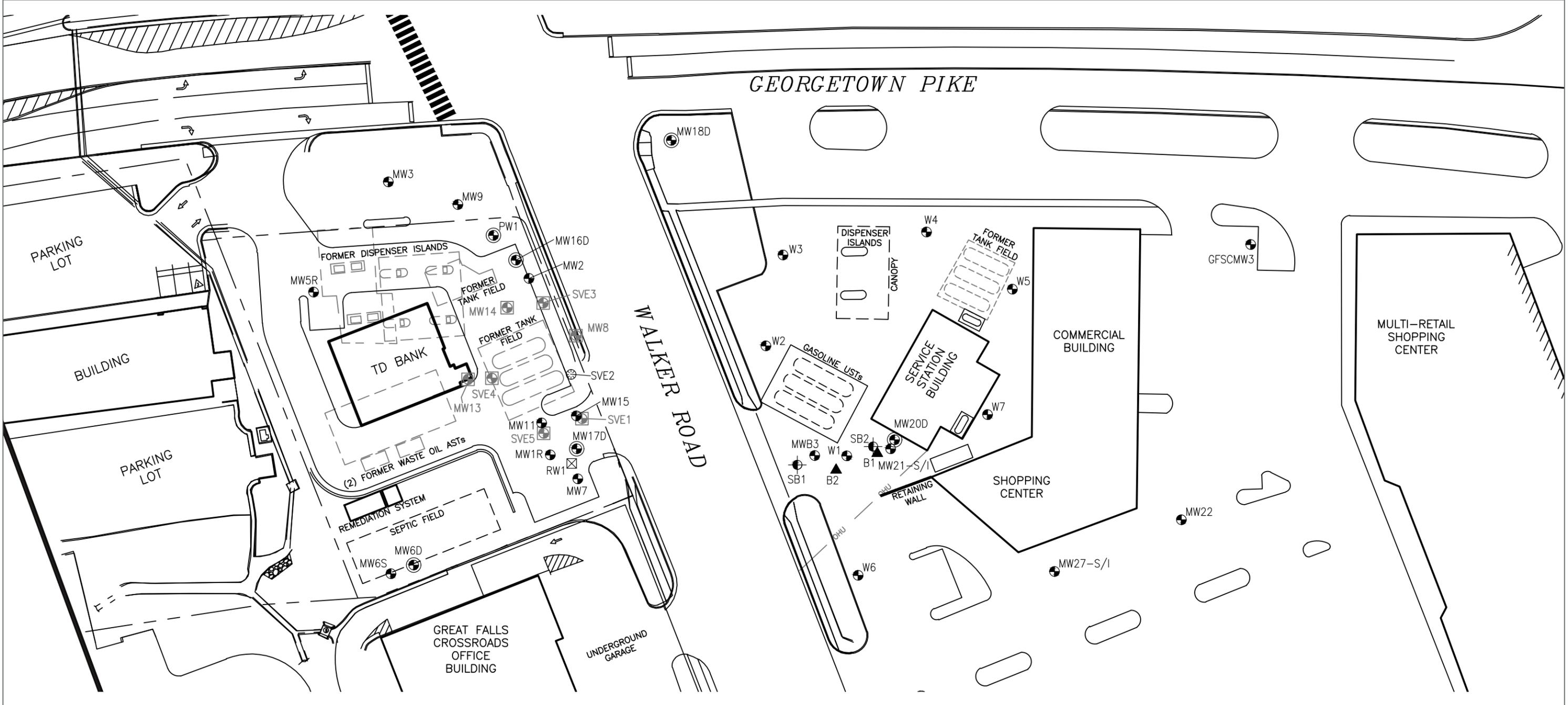
Groundwater & Environmental Services, Inc.



VIRGINIA

QUADRANGLE LOCATION

M:\Graphics\0400-Crofton\Shell-Motiva Enterprises, LLC\26140 Great Falls (9829 Georgetown Pike)\26140 great falls (9829 georgetown pk) SM.dwg, B-50, 7/11/2018 2:10:10 PM, wwesterlund



LEGEND

-  MONITORING WELL
-  DEEP MONITORING WELL
-  ABANDONED/DESTROYED MONITORING WELL
-  SOIL VAPOR EXTRACTION WELL
-  OHU OVERHEAD UTILITY LINE
-  SOIL BORING LOCATION
-  SOIL BORING LOCATION (07/2018)

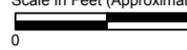
Site Map

Former Shell Station
9829 Georgetown Pike
Great Falls, Virginia

Drawn W.A.W. Designed Approved	Date 07/11/18 Figure 2
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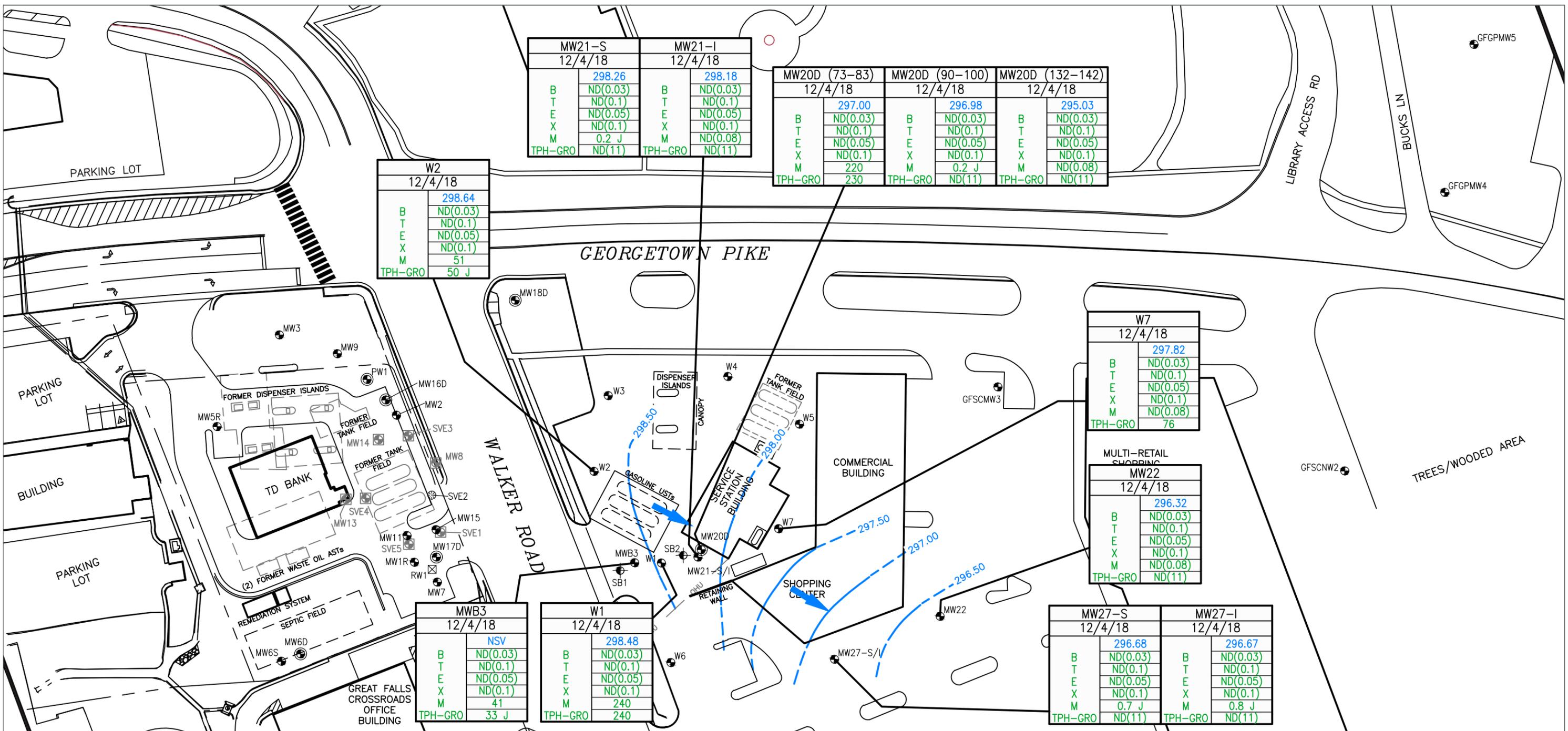


Scale In Feet (Approximate)




Groundwater & Environmental Services, Inc.

M:\Graphics\0400-Crofton\Shell-Motiva Enterprises, LLC\26140 Great Falls (9829 Georgetown Pk)\26140 great falls (9829 georgetown pk) SM.dwg, B-60, 1/8/2019 11:28:53 AM, V\Westerlund



MW21-S 12/4/18		MW21-I 12/4/18	
B	298.26	B	298.18
T	ND(0.03)	T	ND(0.03)
E	ND(0.1)	E	ND(0.1)
X	ND(0.05)	X	ND(0.05)
M	ND(0.1)	M	ND(0.1)
TPH-GRO	0.2 J	TPH-GRO	ND(0.08)
	ND(11)		ND(11)

MW20D (73-83) 12/4/18		MW20D (90-100) 12/4/18		MW20D (132-142) 12/4/18	
B	297.00	B	296.98	B	295.03
T	ND(0.03)	T	ND(0.03)	T	ND(0.03)
E	ND(0.1)	E	ND(0.1)	E	ND(0.1)
X	ND(0.05)	X	ND(0.05)	X	ND(0.05)
M	ND(0.1)	M	ND(0.1)	M	ND(0.1)
TPH-GRO	220	TPH-GRO	0.2 J	TPH-GRO	ND(0.08)
	230		ND(11)		ND(11)

W2 12/4/18	
B	298.64
T	ND(0.03)
E	ND(0.1)
X	ND(0.05)
M	ND(0.1)
TPH-GRO	51
	50 J

W7 12/4/18	
B	297.82
T	ND(0.03)
E	ND(0.1)
X	ND(0.05)
M	ND(0.1)
TPH-GRO	76

MW22 12/4/18	
B	296.32
T	ND(0.03)
E	ND(0.1)
X	ND(0.05)
M	ND(0.1)
TPH-GRO	ND(0.08)
	ND(11)

MWB3 12/4/18	
B	NSV
T	ND(0.03)
E	ND(0.1)
X	ND(0.05)
M	ND(0.1)
TPH-GRO	41
	33 J

W1 12/4/18	
B	298.48
T	ND(0.03)
E	ND(0.1)
X	ND(0.05)
M	ND(0.1)
TPH-GRO	240
	240

MW27-S 12/4/18		MW27-I 12/4/18	
B	296.68	B	296.67
T	ND(0.03)	T	ND(0.03)
E	ND(0.1)	E	ND(0.1)
X	ND(0.05)	X	ND(0.05)
M	ND(0.1)	M	ND(0.1)
TPH-GRO	0.7 J	TPH-GRO	0.8 J
	ND(11)		ND(11)

LEGEND

- MONITORING WELL
- DEEP MONITORING WELL
- ABANDONED/DESTROYED MONITORING WELL
- SOIL VAPOR EXTRACTION WELL
- OVERHEAD UTILITY LINE
- SOIL BORING LOCATION
- SOIL BORING LOCATION (06/27/18)
- 298.50 GROUNDWATER CONTOUR (feet)
DASHED WHERE INFERRED
- NSV NOT SURVEYED
- J ESTIMATED VALUE

W1 12/4/18	
B	298.48
T	ND(0.03)
E	ND(0.1)
X	ND(0.05)
M	ND(0.1)
TPH-GRO	240

- SAMPLE LOCATION
- SAMPLE DATE
- GROUNDWATER ELEVATION (feet)
- BENZENE CONCENTRATION (ug/L)
- TOLUENE CONCENTRATION (ug/L)
- ETHYLBENZENE CONCENTRATION (ug/L)
- TOTAL XYLENES CONCENTRATION (ug/L)
- MTBE CONCENTRATION (ug/L)
- NAPHTHALENE CONCENTRATION (ug/L)
- ug/L MICROGRAMS PER LITER
- MTBE METHYL *tert*-BUTYL ETHER
- TPH TOTAL PETROLEUM HYDROCARBONS
- GRO GASOLINE RANGE ORGANICS
- ND(##) NOT DETECTED AT OR ABOVE THE LABORATORY REPORTING LIMIT OR METHOD DETECTION LIMIT

NOTE:

MONITORING WELLS MW20D, MW21-I, AND MW27-I, WERE NOT INCLUDED IN GROUNDWATER CONTOURING.

Groundwater Contour Map
December 4, 2018

Former Shell Station
9829 Georgetown Pike
Great Falls, Virginia

Drawn
W.A.W.
Designed
T.B.
Approved
A.A.B.

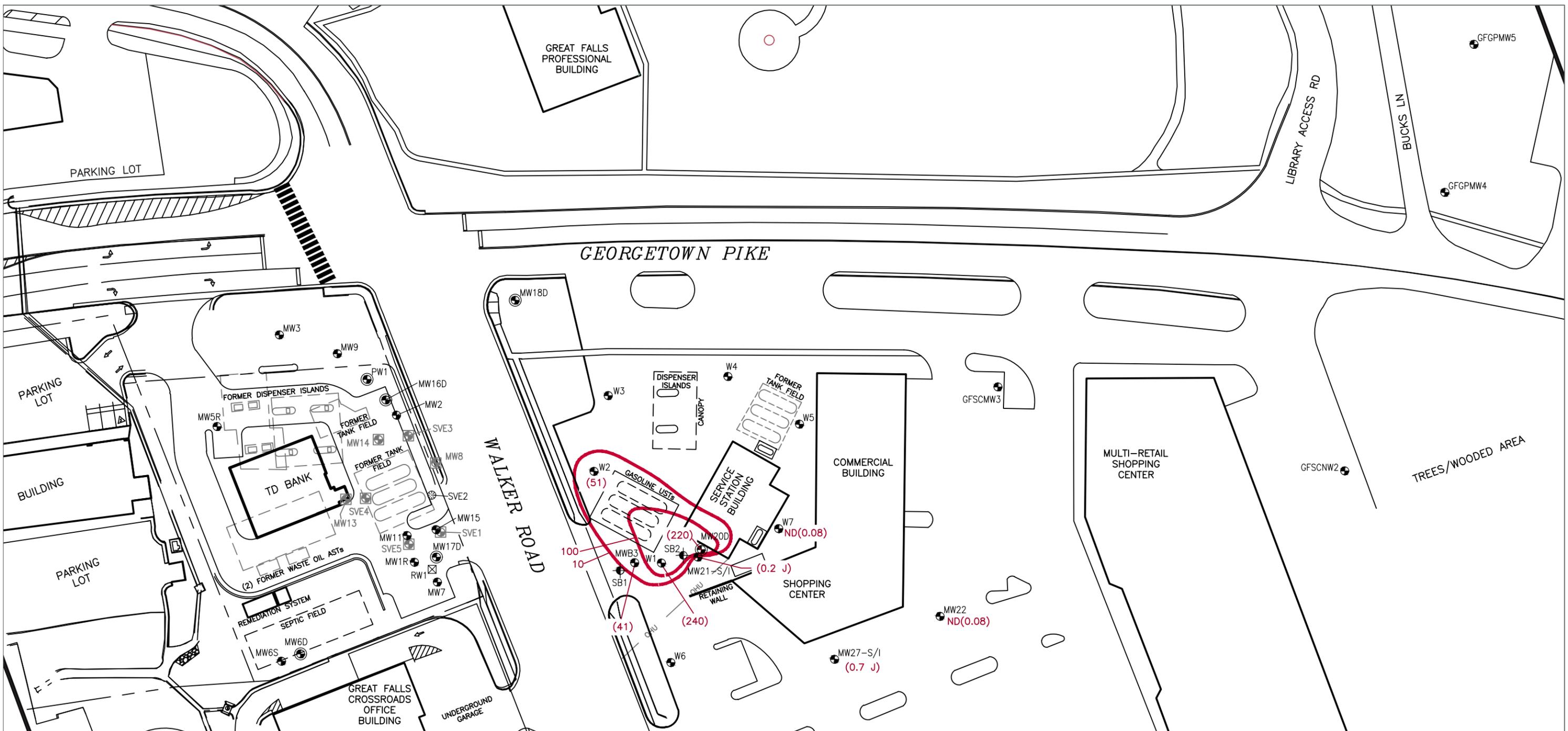


Date
12/24/18
Figure
3

Scale In Feet (Approximate)
0 60



M:\Graphics\0400-Crofton\Shell-Motiva Enterprises, LLC\26140 Great Falls (9829 Georgetown Pike)\26140 great falls (9829 georgetown pk) SM.dwg, B-60, 12/27/2018 9:22:32 AM, WWesterlund



LEGEND

- MONITORING WELL
- DEEP MONITORING WELL
- ABANDONED/DESTROYED MONITORING WELL
- SOIL VAPOR EXTRACTION WELL
- OHU — OVERHEAD UTILITY LINE
- SOIL BORING LOCATION
- SOIL BORING LOCATION (06/27/18)
- (2,000) MTBE ISOCONCENTRATION (ug/L)
- 10 (ug/L) MTBE ISOCONCENTRATION CONTOUR (ug/L)
- (41) MTBE ISOCONCENTRATION (ug/L)
- (220) MTBE ISOCONCENTRATION (ug/L)
- (240) MTBE ISOCONCENTRATION (ug/L)
- (0.2 J) MTBE ISOCONCENTRATION (ug/L)
- (0.7 J) MTBE ISOCONCENTRATION (ug/L)
- ND(0.08) WHERE AN ANALYTE IS NOT DETECTED, A METHOD DETECTION LIMIT IS GIVEN
- J ESTIMATED VALUE
- NS NOT SAMPLED

NOTE:

DATA FOR MONITORING WELLS MW20D (90-100'), MW20D (132-142'), MW21-I, & MW27-I WERE NOT INCLUDED IN ISOCONTOURING.

MTBE Isoconcentration Map
December 4, 2018

Former Shell Station
9829 Georgetown Pike
Great Falls, Virginia

Drawn: W.A.W. Designed: W.A.W. Approved: W.A.W. Date: 12/24/18 Figure: 4

Scale In Feet (Approximate)
0 60

Groundwater & Environmental Services, Inc.



Table

Table 1



HISTORICAL GROUNDWATER ANALYTICAL DATA SUMMARY

Former Shell Station
9892 Georgetown Pike
Great Falls, Virginia

Well ID	Date	Top of Casing Elevation (feet)	Depth to Water (feet)	Depth to Hydrocarbon (feet)	Hydrocarbon Thickness (feet)	Corrected GW Elevation (feet)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	TPH-GRO (µg/L)	Comments
MW-20D(73-83)	4/11/2014	329.57	NM	NM	NM	NM	ND(1)	ND(1)	ND(1)	ND(1)	72	NS	Screened from 73-83
	7/10/2014	329.57	NM	NM	NM	NM	ND(1)	ND(1)	ND(1)	ND(1)	100	NS	
	8/26/2014	329.57	31.26	ND	ND	298.31	ND(1)	ND(1)	ND(1)	ND(1)	100	NS	
	9/2/2014	329.57	33.62	ND	ND	295.95	ND(1)	ND(1)	ND(1)	ND(1)	120	NS	
	12/9/2014	329.57	36.52	ND	ND	293.05	NS	NS	NS	NS	NS	NS	
	3/12/2015	329.57	38.02	ND	ND	291.55	ND(2)	ND(2)	ND(2)	ND(2)	740	NS	
	3/27/2015	329.57	37.51	ND	ND	292.06	ND(1)	ND(1)	ND(1)	ND(1)	1400	NS	
	5/6/2015	329.57	36.48	ND	ND	293.09	ND(1)	ND(1)	ND(1)	ND(1)	980	NS	
	6/1/2015	329.57	36.52	ND	ND	293.05	ND(2)	ND(2)	ND(2)	ND(2)	940	NS	
	9/1/2015	329.57	38.69	ND	ND	290.88	ND(1)	ND(1)	ND(1)	ND(1)	990	NS	
	12/1/2015	329.57	38.97	ND	ND	290.60	ND(1)	ND(1)	ND(1)	ND(1)	900	NS	
	3/17/2016	329.57	NM	NM	NM	NM	ND(1)	ND(1)	ND(1)	ND(1)	680	NS	
	4/29/2016	329.57	35.41	ND	ND	294.16	ND(1)	ND(1)	ND(1)	ND(1)	670	NS	
	8/19/2016	329.57	36.56	ND	ND	293.01	2	ND(1)	ND(1)	ND(1)	740	NS	
	12/13/2016	329.57	37.70	ND	ND	291.87	ND(1)	ND(1)	ND(1)	ND(1)	570	NS	
	3/13/2017	329.57	38.41	ND	ND	291.16	ND(1)	ND(1)	ND(1)	ND(1)	400	NS	
	6/22/2017	329.57	38.31	ND	ND	291.26	NS	NS	NS	NS	NS	NS	
	8/28/2017	329.57	38.85	ND	ND	290.72	NS	NS	NS	NS	NS	NS	
	11/30/2017	329.57	39.46	ND	ND	290.11	NS	NS	NS	NS	NS	NS	
	3/08/2018	329.57	39.90	ND	ND	289.67	NS	NS	NS	NS	NS	NS	
6/04/2018	329.57	37.43	ND	ND	292.14	NS	NS	NS	NS	NS	NS		
7/26/2018	329.57	36.34	ND	ND	293.23	NS	NS	NS	NS	300	NS		
12/04/2018	329.57	32.57	ND	ND	297.00	ND(0.03)	ND(0.1)	ND(0.05)	ND(0.1)	220	230		
MW-20D(90-100)	4/11/2014	329.58	NM	NM	NM	NM	ND(1)	ND(1)	ND(1)	ND(1)	55	NS	Screened from 90-100
	7/10/2014	329.58	NM	NM	NM	NM	ND(1)	ND(1)	ND(1)	ND(1)	73	NS	
	8/26/2014	329.58	32.88	ND	ND	296.70	ND(1)	ND(1)	ND(1)	ND(1)	75	NS	
	9/2/2014	329.58	34.25	ND	ND	295.33	ND(1)	ND(1)	ND(1)	ND(1)	2N	S	
	12/9/2014	329.58	37.24	ND	ND	292.34	NS	NS	NS	NS	NS	NS	
	3/12/2015	329.58	38.22	ND	ND	291.36	ND(1)	ND(1)	ND(1)	ND(1)	1N	S	
	6/1/2015	329.58	36.72	ND	ND	292.86	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	9/1/2015	329.58	38.82	ND	ND	290.76	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	12/1/2015	329.58	39.42	ND	ND	290.16	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	3/17/2016	329.58	NM	NM	NM	NM	ND(1)	ND(1)	ND(1)	ND(1)	1N	S	
	4/29/2016	329.58	35.63	ND	ND	293.95	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	8/19/2016	329.58	37.30	ND	ND	292.28	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	12/13/2016	329.58	38.82	ND	ND	290.76	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	3/13/2017	329.58	39.03	ND	ND	290.55	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	6/22/2017	329.58	38.46	ND	ND	291.12	NS	NS	NS	NS	NS	NS	
	8/28/2017	329.58	39.40	ND	ND	290.18	NS	NS	NS	NS	NS	NS	
	11/30/2017	329.58	40.32	ND	ND	289.26	NS	NS	NS	NS	NS	NS	
	3/08/2018	329.58	10.00	ND	ND	289.58	NS	NS	NS	NS	NS	NS	
	6/04/2018	329.58	37.78	ND	ND	291.80	NS	NS	NS	NS	NS	NS	
	7/26/2018	329.58	36.64	ND	ND	292.94	NS	NS	NS	NS	ND(0.5)	NS	
12/04/2018	329.58	32.60	ND	ND	296.98	ND(0.03)	ND(0.1)	ND(0.05)	ND(0.1)	0.2 J	ND(11)		

Table 1



HISTORICAL GROUNDWATER ANALYTICAL DATA SUMMARY

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Well ID	Date	Top of Casing Elevation (feet)	Depth to Water (feet)	Depth to Hydrocarbon (feet)	Hydrocarbon Thickness (feet)	Corrected GW Elevation (feet)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	TPH-GRO (µg/L)	Comments
MW-20D(132-142)	4/11/2014	329.56	NM	NM	NM	NM	ND(1)	ND(1)	ND(1)	ND(1)	32	NS	Screened from 132-142'
	7/10/2014	329.56	NM	NM	NM	NM	ND(1)	ND(1)	ND(1)	ND(1)	55	NS	
	8/26/2014	329.56	33.85	ND	ND	295.71	ND(1)	ND(1)	ND(1)	ND(1)	130	NS	
	9/2/2014	329.56	34.36	ND	ND	295.20	ND(1)	ND(1)	ND(1)	ND(1)	100	NS	
	12/9/2014	329.56	38.19	ND	ND	291.37	NS	NS	NS	NS	NS	NS	
	3/12/2015	329.56	38.26	ND	ND	291.30	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	6/1/2015	329.56	36.73	ND	ND	292.83	ND(1)	ND(1)	ND(1)	ND(1)	8N	S	
	9/1/2015	329.56	38.80	ND	ND	290.76	ND(1)	ND(1)	ND(1)	ND(1)	7N	S	
	12/1/2015	329.56	39.79	ND	ND	289.77	ND(1)	ND(1)	ND(1)	ND(1)	2N	S	
	3/17/2016	329.56	NM	NM	NM	NM	ND(1)	ND(1)	ND(1)	ND(1)	1N	S	
	4/29/2016	329.56	35.64	ND	ND	293.92	ND(1)	ND(1)	ND(1)	ND(1)	1N	S	
	8/19/2016	329.56	37.36	ND	ND	292.20	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	12/13/2016	329.56	38.78	ND	ND	290.78	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	3/13/2017	329.56	38.94	ND	ND	290.62	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	6/22/2017	329.56	38.38	ND	ND	291.18	NS	NS	NS	NS	NS	NS	
	8/28/2017	329.56	39.44	ND	ND	290.12	NS	NS	NS	NS	NS	NS	
11/30/2017	329.56	40.30	ND	ND	289.26	NS	NS	NS	NS	NS	NS		
3/08/2018	329.56	40.03	ND	ND	289.53	NS	NS	NS	NS	NS	NS		
6/04/2018	329.56	37.77	ND	ND	291.79	NS	NS	NS	NS	NS	NS		
7/16/2018	329.56	37.18	ND	ND	292.38	NS	NS	NS	NS	ND(0.5)	NS		
12/04/2018	329.56	34.53	ND	ND	295.03	ND(0.03)	ND(0.1)	ND(0.05)	ND(0.1)	ND(0.08)	ND(11)		
MW-21S	4/11/2014	329.69	33.65	ND	ND	296.04	ND(10)	ND(10)	ND(10)	ND(10)	7500	NS	Screened from 26-46'
	6/18/2014	329.69	31.42	ND	ND	298.27	ND(1)	ND(1)	ND(1)	ND(1)	53	NS	
	9/16/2014	329.69	34.26	ND	ND	295.43	ND(1)	ND(1)	ND(1)	ND(1)	130	NS	
	12/10/2014	329.69	37.30	ND	ND	292.39	ND(1)	ND(1)	ND(1)	ND(1)	780	NS	
	3/11/2015	329.69	37.33	ND	ND	292.36	ND(2)	ND(2)	ND(2)	ND(2)	910	NS	
	6/3/2015	329.69	35.74	ND	ND	293.95	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	9/4/2015	329.69	37.78	ND	ND	291.91	ND(1)	ND(1)	ND(1)	ND(1)	32	NS	
	12/1/2015	329.69	38.98	ND	ND	290.71	ND(1)	ND(1)	ND(1)	ND(1)	1500	NS	
	3/17/2016	329.69	36.24	ND	ND	293.45	ND(1)	ND(1)	ND(1)	ND(1)	1400	NS	
	5/4/2016	329.69	34.54	ND	ND	295.15	ND(2)	ND(2)	ND(2)	ND(2)	2400	NS	
	8/19/2016	329.69	36.24	ND	ND	293.45	ND(1)	ND(1)	ND(1)	ND(1)	670	NS	
	12/15/2016	329.69	38.03	ND	ND	291.66	ND(2)	ND(2)	ND(2)	ND(2)	1400	NS	
	3/16/2017	329.69	38.24	ND	ND	291.45	ND(2)	ND(2)	ND(2)	ND(2)	1100	NS	
	6/22/2017	329.69	37.43	ND	ND	292.26	NS	NS	NS	NS	NS	NS	
	8/28/2017	329.69	38.52	ND	ND	291.17	NS	NS	NS	NS	NS	NS	
	11/30/2017	329.69	39.55	ND	ND	290.14	NS	NS	NS	NS	NS	NS	
3/08/2018	329.69	39.10	ND	ND	290.59	NS	NS	NS	NS	NS	NS		
6/04/2018	329.69	36.95	ND	ND	292.74	NS	NS	NS	NS	NS	NS		
7/16/2018	329.69	36.23	ND	ND	293.46	NS	NS	NS	NS	220	NS		
12/04/2018	329.69	31.43	ND	ND	298.26	ND(0.03)	ND(0.1)	ND(0.05)	ND(0.1)	0.2 J	ND(11)		

Table 1



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Well ID	Date	Top of Casing Elevation (feet)	Depth to Water (feet)	Depth to Hydrocarbon (feet)	Hydrocarbon Thickness (feet)	Corrected GW Elevation (feet)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	TPH-GRO (µg/L)	Comments
MW-211	4/11/2014	329.71	33.71	ND	ND	296.00	ND(2)	ND(2)	ND(2)	ND(2)	2500	NS	Screened from 56-66'
	6/18/2014	329.71	31.52	ND	ND	298.19	ND(1)	ND(1)	ND(1)	ND(1)	1700	NS	
	9/16/2014	329.71	34.35	ND	ND	295.36	ND(1)	ND(1)	ND(1)	ND(1)	2100	NS	
	12/10/2014	329.71	37.40	ND	ND	292.31	ND(1)	ND(1)	ND(1)	ND(1)	1900	NS	
	3/11/2015	329.71	37.40	ND	ND	292.31	ND(2)	ND(2)	ND(2)	ND(2)	1300	NS	
	5/6/2015	329.71	35.89	ND	ND	293.82	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	6/3/2015	329.71	35.81	ND	ND	293.90	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	9/4/2015	329.71	37.88	ND	ND	291.83	ND(2)	ND(2)	ND(2)	ND(2)	2300	NS	
	12/2/2015	329.71	39.04	ND	ND	290.67	ND(2)	ND(2)	ND(2)	ND(2)	2100	NS	
	3/17/2016	329.71	36.52	ND	ND	293.19	ND(1)	ND(1)	ND(1)	ND(1)	1300	NS	
	5/3/2016	329.71	34.75	ND	ND	294.96	ND(1)	ND(1)	ND(1)	ND(1)	630	NS	
	8/19/2016	329.71	36.37	ND	ND	293.34	ND(1)	ND(1)	ND(1)	ND(1)	1400	NS	
	12/15/2016	329.71	38.10	ND	ND	291.61	ND(1)	ND(1)	ND(1)	ND(1)	220	NS	
	3/16/2017	329.71	38.20	ND	ND	291.51	ND(1)	ND(1)	ND(1)	ND(1)	8N	S	
	6/22/2017	329.71	37.48	ND	ND	292.23	NS	NS	NS	NS	NS	NS	
	8/28/2017	329.71	38.60	ND	ND	291.11	NS	NS	NS	NS	NS	NS	
	11/30/2017	329.71	39.44	ND	ND	290.27	NS	NS	NS	NS	NS	NS	
	3/08/2018	329.71	39.25	ND	ND	290.46	NS	NS	NS	NS	NS	NS	
6/04/2018	329.71	36.97	ND	ND	292.74	NS	NS	NS	NS	NS	NS		
7/16/2018	329.71	36.32	ND	ND	293.39	NS	NS	NS	NS	1 J	NS		
12/04/2018	329.71	31.53	ND	ND	298.18	ND(0.03)	ND(0.1)	ND(0.05)	ND(0.1)	ND(0.08)	ND(11)		
MW-22	4/11/2014	320.97	28.55	ND	ND	292.42	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	Screened from 20-40'
	6/18/2014	320.97	25.75	ND	ND	295.22	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	9/2/2014	320.97	27.48	ND	ND	293.49	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	12/9/2014	320.97	30.54	ND	ND	290.43	NS	NS	NS	NS	NS	NS	
	3/12/2015	320.97	NM	NM	NM	NM	NS	NS	NS	NS	NS	NS	
	6/4/2015	320.97	28.49	ND	ND	292.48	NS	NS	NS	NS	NS	NS	
	9/2/2015	320.97	30.29	ND	ND	290.68	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	12/2/2015	320.97	31.76	ND	ND	289.21	NS	NS	NS	NS	NS	NS	
	3/16/2016	320.97	29.04	ND	ND	291.93	NS	NS	NS	NS	NS	NS	
	5/2/2016	320.97	28.32	ND	ND	292.65	NS	NS	NS	NS	NS	NS	
	8/18/2016	320.97	29.38	ND	ND	291.59	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	12/13/2016	320.97	32.49	ND	ND	288.48	NS	NS	NS	NS	NS	NS	
	3/13/2017	320.97	33.06	ND	ND	287.91	NS	NS	NS	NS	NS	NS	
	6/22/2017	320.97	31.59	ND	ND	289.38	NS	NS	NS	NS	NS	NS	
	8/29/2017	320.97	32.16	ND	ND	288.81	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	11/30/2017	320.97	33.47	ND	ND	287.50	NS	NS	NS	NS	NS	NS	
	3/08/2018	320.97	33.60	ND	ND	287.37	NS	NS	NS	NS	NS	NS	
	6/04/2018	320.97	30.85	ND	ND	290.12	NS	NS	NS	NS	NS	NS	
7/16/2018	320.97	29.37	ND	ND	291.60	NS	NS	NS	NS	ND(0.5)	NS		
12/04/2018	320.97	24.65	ND	ND	296.32	ND(0.03)	ND(0.1)	ND(0.05)	ND(0.1)	ND(0.08)	ND(11)		

Table 1



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Well ID	Date	Top of Casing Elevation (feet)	Depth to Water (feet)	Depth to Hydrocarbon (feet)	Hydrocarbon Thickness (feet)	Corrected GW Elevation (feet)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	TPH-GRO (µg/L)	Comments
MW-27S	8/26/2014	323.40	28.42	ND	ND	294.98	ND(1)	ND(1)	ND(1)	ND(1)	1	NS	Screened from 20-40'
	9/2/2014	323.40	28.88	ND	ND	294.52	ND(1)	ND(1)	ND(1)	ND(1)	1N	S	
	12/9/2014	323.40	32.28	ND	ND	291.12	ND(1)	ND(1)	ND(1)	ND(1)	2N	S	
	3/11/2015	323.40	32.35	ND	ND	291.05	ND(1)	ND(1)	ND(1)	ND(1)	1N	S	
	6/3/2015	323.40	30.72	ND	ND	292.68	ND(1)	ND(1)	ND(1)	ND(1)	2N	S	
	9/3/2015	323.40	32.46	ND	ND	290.94	ND(1)	ND(1)	ND(1)	7	ND(1)	NS	
	12/1/2015	323.40	33.80	ND	ND	289.60	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	3/16/2016	323.40	30.99	ND	ND	292.41	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	5/2/2016	323.40	29.95	ND	ND	293.45	ND(1)	ND(1)	ND(1)	1	1N	S	
	8/18/2016	323.40	31.33	ND	ND	292.07	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	12/14/2016	323.40	32.42	ND	ND	290.98	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	3/16/2017	323.40	33.77	ND	ND	289.63	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	6/22/2017	323.40	32.77	ND	ND	290.63	NS	NS	NS	NS	NS	NS	
	8/29/2017	323.40	33.62	ND	ND	289.78	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	11/30/2017	323.40	34.64	ND	ND	288.76	NS	NS	NS	NS	NS	NS	
	3/08/2018	323.40	34.50	ND	ND	288.90	NS	NS	NS	NS	NS	NS	
6/04/2018	323.40	32.13	ND	ND	291.17	NS	NS	NS	NS	NS	NS		
7/16/2018	323.40	31.30	ND	ND	292.10	NS	NS	NS	NS	0.7 J	NS		
12/04/2018	323.40	26.72	ND	ND	296.68	ND(0.03)	ND(0.1)	ND(0.05)	ND(0.1)	0.7 J	ND(11)		
MW-27I	8/26/2014	323.35	28.26	ND	ND	295.09	ND(1)	ND(1)	ND(1)	ND(1)	1	NS	Screened from 55-65'
	9/2/2014	323.35	27.69	ND	ND	295.66	ND(1)	ND(1)	ND(1)	ND(1)	1N	S	
	12/9/2014	323.35	32.31	ND	ND	291.04	ND(1)	ND(1)	ND(1)	ND(1)	1N	S	
	3/11/2015	323.35	32.39	ND	ND	290.96	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	6/3/2015	323.35	30.75	ND	ND	292.60	ND(1)	ND(1)	ND(1)	ND(1)	2N	S	
	9/3/2015	323.35	32.41	ND	ND	290.94	ND(1)	ND(1)	3	38	ND(1)	NS	
	12/1/2015	323.35	33.42	ND	ND	289.93	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	3/16/2016	323.35	31.01	ND	ND	292.34	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	5/2/2016	323.35	29.86	ND	ND	293.49	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	8/18/2016	323.35	31.29	ND	ND	292.06	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	12/14/2016	323.35	33.39	ND	ND	289.96	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	3/16/2017	323.35	33.73	ND	ND	289.62	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	6/22/2017	323.35	32.78	ND	ND	290.57	NS	NS	NS	NS	NS	NS	
	8/29/2017	323.35	33.71	ND	ND	289.64	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	11/30/2017	323.35	34.30	ND	ND	289.05	NS	NS	NS	NS	NS	NS	
	3/08/2018	323.35	34.60	ND	ND	288.75	NS	NS	NS	NS	NS	NS	
6/04/2018	323.35	32.23	ND	ND	291.12	NS	NS	NS	NS	NS	NS		
7/16/2018	323.35	31.28	ND	ND	292.07	NS	NS	NS	NS	ND(0.5)	NS		
12/04/2018	323.35	26.68	ND	ND	296.67	ND(0.03)	ND(0.1)	ND(0.05)	ND(0.1)	0.8 J	ND(11)		
W-1	1/18/2003	328.53	33.83	ND	ND	294.70	ND(5)	ND(5)	ND(5)	ND(10)	13000	NS	Screened from 10-40'
	8/5/2008	328.53	34.81	ND	ND	293.72	9.60	ND(5)	ND(5)	ND(5)	5200	NS	
	6/7/2013	328.53	34.52	ND	ND	294.01	ND(10)	ND(14)	ND(16)	ND(16)	26000	NS	
	12/19/2013	328.53	36.11	ND	ND	292.42	ND(100)	ND(100)	ND(100)	ND(100)	13000N	S	
	3/25/2014	328.53	33.50	ND	ND	295.03	ND(25)	ND(25)	ND(25)	ND(25)	16000	NS	
	6/19/2014	328.53	29.91	ND	ND	298.62	ND(50)	ND(50)	ND(50)	ND(50)	15000	NS	
	9/3/2014	328.53	31.77	ND	ND	296.76	ND(20)	ND(20)	ND(20)	ND(20)	13000	NS	
12/10/2014	328.53	36.07	ND	ND	292.46	ND(20)	ND(20)	ND(20)	ND(20)	18000	NS		

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Well ID	Date	Top of Casing Elevation (feet)	Depth to Water (feet)	Depth to Hydrocarbon (feet)	Hydrocarbon Thickness (feet)	Corrected GW Elevation (feet)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	TPH-GRO (µg/L)	Comments
W-1 (cont.)	3/12/2015	328.53	35.89	ND	ND	292.64	ND(20)	ND(20)	ND(20)	ND(20)	11000	NS	
	6/4/2015	328.53	34.34	ND	ND	294.19	ND(50)	ND(50)	ND(50)	ND(50)	8800	NS	
	9/4/2015	328.53	36.46	ND	ND	292.07	ND(10)	ND(10)	ND(10)	ND(10)	11000	NS	
	12/2/2015	328.53	37.57	ND	ND	290.96	ND(10)	ND(10)	ND(10)	ND(10)	16000	NS	
	2/12/2016	328.53	36.02	ND	ND	292.51	ND(10)	ND(10)	ND(10)	ND(10)	10000	NS	
	3/17/2016	328.53	34.72	ND	ND	293.81	ND(1)	ND(1)	ND(1)	ND(1)	9800	NS	
	5/4/2016	328.53	33.16	ND	ND	295.37	ND(10)	ND(10)	ND(10)	ND(10)	13000	NS	
	6/27/2016	328.53	34.09	ND	ND	294.44	ND(5)	ND(5)	ND(5)	ND(5)	6400	NS	
	8/19/2016	328.53	35.04	ND	ND	293.49	ND(10)	ND(10)	ND(10)	ND(10)	8400	NS	
	12/15/2016	328.53	36.54	ND	ND	291.99	ND(20)	ND(20)	ND(20)	ND(20)	9900	NS	
	3/16/2017	328.53	36.66	ND	ND	291.87	ND(5)	ND(5)	ND(5)	ND(5)	7600	NS	
	6/22/2017	328.53	35.97	ND	ND	292.56	NS	NS	NS	NS	NS	NS	
	8/28/2017	328.53	37.11	ND	ND	291.42	NS	NS	NS	NS	NS	NS	
	11/30/2017	328.53	37.99	ND	ND	290.54	NS	NS	NS	NS	NS	NS	
	3/08/2018	328.53	37.35	ND	ND	291.18	NS	NS	NS	NS	NS	NS	
	6/04/2018	328.53	35.50	ND	ND	293.03	NS	NS	NS	NS	NS	NS	
7/16/2018	328.53	34.83	ND	ND	293.70	NS	NS	NS	NS	2000	NS		
12/04/2018	328.53	30.05	ND	ND	298.48	ND(0.03)	ND(0.1)	ND(0.05)	ND(0.1)	240	240		
W-2	1/18/2003	329.47	34.56	ND	ND	294.91	ND(5)	ND(5)	ND(5)	ND(10)	100	NS	Screened from 10-40'
	8/5/2008	329.47	35.53	ND	ND	293.94	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	320	NS	
	6/7/2013	329.47	35.30	ND	ND	294.17	ND(5)	ND(7)	ND(8)	ND(8)	14000	NS	
	12/19/2013	329.47	36.82	ND	ND	292.65	ND(50)	ND(50)	ND(50)	ND(50)	7700	NS	
	3/25/2014	329.47	34.26	ND	ND	295.21	ND(100)	ND(100)	ND(100)	ND(100)	7000	NS	
	6/19/2014	329.47	30.74	ND	ND	298.73	ND(10)	ND(10)	ND(10)	ND(10)	5000	NS	
	9/3/2014	329.47	32.64	ND	ND	296.83	ND(10)	ND(10)	ND(10)	ND(10)	3900	NS	
	12/10/2014	329.47	36.75	ND	ND	292.72	ND(2)	ND(2)	ND(2)	ND(2)	2100	NS	
	3/11/2015	329.47	36.74	ND	ND	292.73	ND(2)	ND(2)	ND(2)	ND(2)	1000	NS	
	6/3/2015	329.47	35.19	ND	ND	294.28	ND(5)	ND(5)	ND(5)	ND(5)	1400	NS	
	9/4/2015	329.47	DRY	DRY	DRY	DRY	ND(1)	ND(1)	ND(1)	ND(1)	1100	NS	
	12/2/2015	329.47	38.42	ND	ND	291.05	ND(1)	ND(1)	ND(1)	ND(1)	440	NS	
	3/17/2016	329.47	35.81	ND	ND	293.66	ND(1)	ND(1)	ND(1)	ND(1)	970	NS	
	5/3/2016	329.47	34.06	ND	ND	295.41	ND(1)	ND(1)	ND(1)	ND(1)	580	NS	
	8/18/2016	329.47	35.86	ND	ND	293.61	ND(1)	ND(1)	ND(1)	ND(1)	190	NS	
	12/15/2016	329.47	37.30	ND	ND	292.17	ND(1)	ND(1)	ND(1)	ND(1)	170	NS	
	3/16/2017	329.47	37.35	ND	ND	292.12	ND(1)	ND(1)	ND(1)	ND(1)	240	NS	
	6/22/2017	329.47	36.74	ND	ND	292.73	NS	NS	NS	NS	NS	NS	
	8/28/2017	329.47	37.90	ND	ND	291.57	NS	NS	NS	NS	NS	NS	
	11/30/2017	329.47	38.74	ND	ND	290.73	NS	NS	NS	NS	NS	NS	
3/08/2018	329.47	38.21	ND	ND	291.26	NS	NS	NS	NS	NS	NS		
6/04/2018	329.47	36.31	ND	ND	293.16	NS	NS	NS	NS	NS	NS		
7/16/2018	329.47	35.69	ND	ND	293.78	NS	NS	NS	NS	160	NS		
12/04/2018	329.47	30.83	ND	ND	298.64	ND(0.03)	ND(0.1)	ND(0.05)	ND(0.1)	51	50 J		

Table 1



HISTORICAL GROUNDWATER ANALYTICAL DATA SUMMARY

Former Shell Station
9892 Georgetown Pike
Great Falls, Virginia

Well ID	Date	Top of Casing Elevation (feet)	Depth to Water (feet)	Depth to Hydrocarbon (feet)	Hydrocarbon Thickness (feet)	Corrected GW Elevation (feet)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	TPH-GRO (µg/L)	Comments
W-7	8/5/2008	329.77	37.35	ND	ND	292.42	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	16	NS	Screened interval not available, total depth ~ 50'
	6/6/2013	329.77	37.04	ND	ND	292.73	ND(0.5)	ND(0.7)	ND(0.8)	ND(0.5)	ND(0.5)N	S	
	12/18/2013	329.77	38.24	ND	ND	291.53	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	NS	
	3/24/2014	329.77	35.60	ND	ND	294.17	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	NS	
	6/18/2014	329.77	32.49	ND	ND	297.28	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	9/3/2014	329.77	34.24	ND	ND	295.53	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	12/9/2014	329.77	37.70	ND	ND	292.07	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	3/10/2015	329.77	37.74	ND	ND	292.03	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	6/2/2015	329.77	34.60	ND	ND	295.17	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	9/3/2015	329.77	37.95	ND	ND	291.82	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	12/1/2015	329.77	39.19	ND	ND	290.58	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	3/16/2016	329.77	36.46	ND	ND	293.31	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	5/2/2016	329.77	34.42	ND	ND	295.35	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	8/17/2016	329.77	36.72	ND	ND	293.05	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	12/14/2016	329.77	39.05	ND	ND	290.72	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	3/16/2017	329.77	39.39	ND	ND	290.38	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NS	
	6/22/2017	329.77	38.31	ND	ND	291.46	NS	NS	NS	NS	NS	NS	
	8/28/2017	329.77	39.14	ND	ND	290.63	NS	NS	NS	NS	NS	NS	
	11/30/2017	329.77	40.21	ND	ND	289.56	NS	NS	NS	NS	NS	NS	
	3/08/2018	329.77	40.09	ND	ND	289.68	NS	NS	NS	NS	NS	NS	
6/04/2018	329.77	37.67	ND	ND	292.10	NS	NS	NS	NS	NS	NS		
7/16/2018	329.77	36.77	ND	ND	293.00	NS	NS	NS	NS	ND(0.5)	NS		
12/04/2018	329.77	31.95	ND	ND	297.82	ND(0.03)	ND(0.1)	ND(0.05)	ND(0.1)	ND(0.08)	76		
MW-B3	7/16/2018	NSV	DRY	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	Screened from 13.5' - 33.5'
	12/4/2018	NSV	30.17	ND	ND	NSV	ND(0.03)	ND(0.1)	ND(0.05)	ND(0.1)	41	33 J	

Notes:

µg/L - micrograms per liter

NM - not monitored

NS - not sampled

MTBE - methyl tertiary butyl ether

GW - groundwater

ND (#) - not detected at or above the laboratory reporting limit or method detection limit

ND - not detected

J - estimated value

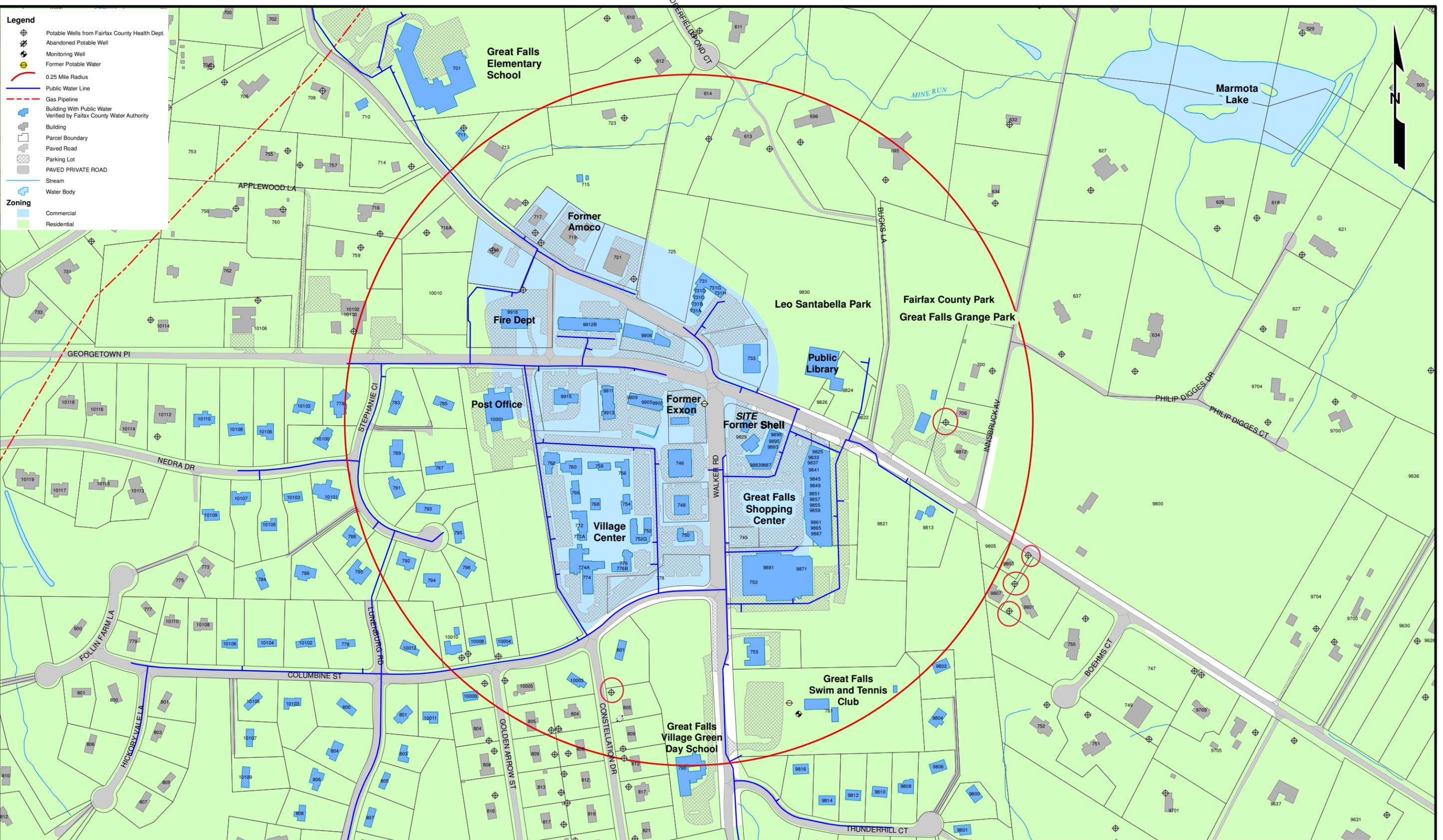
Sampling data prior to July 2018 was collected by Kleinfelder.

NSV - not surveyed



Appendix A – Local Area Map (Kleinfelder, 2014)

- Legend**
- Potable Wells from Fairfax County Health Dept.
 - Abandoned Potable Well
 - Monitoring Well
 - Former Potable Water
 - 0.25 Mile Radius
 - Public Water Line
 - Gas Pipeline
 - Building With Public Water Verified by Fairfax County Water Authority
 - Building
 - Parcel Boundary
 - Paved Road
 - Parking Lot
 - PAVED PRIVATE ROAD
 - Stream
 - Water Body
 - Zoning**
 - Commercial
 - Residential



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PROJECT NO.	20143589
DRAWN:	9/19/14
DRAWN BY:	PD/RA
CHECKED BY:	PW
FILE NAME:	26140_LAM_07_14.mxd

LOCAL AREA MAP
INACTIVE FAIRFAX FACILITY # 26140 9901 GEORGETOWN PIKE GREAT FALLS, VIRGINIA

FIGURE
3



Appendix B – Laboratory Data and Chain-of-Custody Documentation for Groundwater



ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
440 Creamery Way, Suite 500
Exton PA 19341

Report Date: December 14, 2018 10:52

Project: Motiva - 9829 Georgetown Pike, Great Falls, VA

Account #: 08390
Group Number: 2015462
PO Number: 0403114-101000-000001
Release Number: ORG # 0404
State of Sample Origin: VA

Electronic Copy To GES, Inc.-MD
Electronic Copy To GES, Inc.-MD

Attn: Data Distribution
Attn: Anne Ashley Bell

Respectfully Submitted,



Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

To view our laboratory's current scopes of accreditation please go to <http://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/resources/certifications/>. Historical copies may be requested through your project manager.



SAMPLE INFORMATION

<u>Client Sample Description</u>	<u>Sample Collection Date/Time</u>	<u>ELLE#</u>
W-1 Grab Groundwater	12/04/2018 14:00	9925738
W-2 Grab Groundwater	12/04/2018 11:30	9925739
W-7 Grab Groundwater	12/04/2018 14:35	9925740
MW-20D(73-83) Grab Groundwater	12/04/2018 12:30	9925741
MW-20D(90-100) Grab Groundwater	12/04/2018 13:30	9925742
MW-20D(132-142) Grab Groundwater	12/04/2018 15:00	9925743
MW-21S Grab Groundwater	12/04/2018 12:15	9925744
MW-21I Grab Groundwater 12/04/20	18 13:00	9925745
MW-22 Grab Groundwater	12/04/2018 09:45	9925746
MW-27S Grab Groundwater	12/04/2018 10:15	9925747
MW-27I Grab Groundwater 12/04/20	18 11:00	9925748
MW-B3 Grab Groundwater	12/04/2018 13:15	9925749

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

Sample Description: W-1 Grab Groundwater
Motiva - 9829 Georgetown Pike, Great Falls, VA

GES, Inc.
ELLE Sample #: GW 9925738
ELLE Group #: 2015462
Matrix: Groundwater

Project Name: Motiva - 9829 Georgetown Pike, Great Falls, VA

Submission Date/Time: 12/05/2018 16:30
Collection Date/Time: 12/04/2018 14:00

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Volatiles					
10598 T	PH-GRO water C6-C10	SW-846 8015C n.a.	ug/l 240	ug/l 11	1
GC Volatiles					
02102 B	enzene	SW-846 8021B 71-43-2	ug/l N.D.	ug/l 0.03	1
02102 E	thylbenzene	100-41-4	N.D.	0.05	1
02102	Methyl tert-Butyl Ether	1634-04-4	240	0.08	1
02102 T	oluene	108-88-3	N.D.	0.1	1
02102 T	otal Xylenes	1330-20-7	N.D.	0.1	1

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10598	TPH-GRO water C6-C10	SW-846 8015C	1	18342B94A	12/13/2018 14:23	Jeremy C Giffin	1
02102	BTEX/MTBE 8021	SW-846 8021B	1	18342B94A	12/13/2018 14:23	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	18342B94A	12/13/2018 14:22	Jeremy C Giffin	1

Sample Description: W-2 Grab Groundwater
Motiva - 9829 Georgetown Pike, Great Falls, VA

GES, Inc.
ELLE Sample #: GW 9925739
ELLE Group #: 2015462
Matrix: Groundwater

Project Name: Motiva - 9829 Georgetown Pike, Great Falls, VA

Submittal Date/Time: 12/05/2018 16:30
Collection Date/Time: 12/04/2018 11:30

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Volatiles					
		SW-846 8015C	ug/l	ug/l	
10598	TPH-GRO water C6-C10	n.a.	50 J	11	1
GC Volatiles					
		SW-846 8021B	ug/l	ug/l	
02102 B	enzene	71-43-2	N.D.	0.03	1
02102 E	thylbenzene	100-41-4	N.D.	0.05	1
02102	Methyl tert-Butyl Ether	1634-04-4	51	0.08	1
02102 T	oluene	108-88-3	N.D.	0.1	1
02102 T	otal Xylenes	1330-20-7	N.D.	0.1	1

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10598	TPH-GRO water C6-C10	SW-846 8015C	1	18342B94A	12/13/2018 15:38	Jeremy C Giffin	1
02102	BTEX/MTBE 8021	SW-846 8021B	1	18342B94A	12/13/2018 15:38	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	18342B94A	12/13/2018 15:37	Jeremy C Giffin	1

Sample Description: W-7 Grab Groundwater
Motiva - 9829 Georgetown Pike, Great Falls, VA

GES, Inc.
ELLE Sample #: GW 9925740
ELLE Group #: 2015462
Matrix: Groundwater

Project Name: Motiva - 9829 Georgetown Pike, Great Falls, VA

Submittal Date/Time: 12/05/2018 16:30
Collection Date/Time: 12/04/2018 14:35

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Volatiles					
10598 T	PH-GRO water C6-C10	SW-846 8015C n.a.	ug/l 76	ug/l 11	1
GC Volatiles					
02102 B	enzene	SW-846 8021B 71-43-2	ug/l N.D.	ug/l 0.03	1
02102 E	thylbenzene	100-41-4	N.D.	0.05	1
02102	Methyl tert-Butyl Ether	1634-04-4	N.D.	0.08	1
02102 T	oluene	108-88-3	N.D.	0.1	1
02102 T	otal Xylenes	1330-20-7	N.D.	0.1	1

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10598	TPH-GRO water C6-C10	SW-846 8015C	1	18342B94A	12/13/2018 16:03	Jeremy C Giffin	1
02102	BTEX/MTBE 8021	SW-846 8021B	1	18342B94A	12/13/2018 16:03	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	18342B94A	12/13/2018 16:02	Jeremy C Giffin	1

Sample Description: MW-20D(73-83) Grab Groundwater
Motiva - 9829 Georgetown Pike, Great Falls, VA

GES, Inc.
ELLE Sample #: GW 9925741
ELLE Group #: 2015462
Matrix: Groundwater

Project Name: Motiva - 9829 Georgetown Pike, Great Falls, VA

Submission Date/Time: 12/05/2018 16:30
Collection Date/Time: 12/04/2018 12:30

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Volatiles					
10598 T	PH-GRO water C6-C10	SW-846 8015C n.a.	ug/l 230	ug/l 11	1
GC Volatiles					
02102 B	enzene	SW-846 8021B 71-43-2	ug/l N.D.	ug/l 0.03	1
02102 E	thylbenzene	100-41-4	N.D.	0.05	1
02102	Methyl tert-Butyl Ether	1634-04-4	220	0.08	1
02102 T	oluene	108-88-3	N.D.	0.1	1
02102 T	otal Xylenes	1330-20-7	N.D.	0.1	1

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10598	TPH-GRO water C6-C10	SW-846 8015C	1	18342B94A	12/13/2018 16:29	Jeremy C Giffin	1
02102	BTEX/MTBE 8021	SW-846 8021B	1	18342B94A	12/13/2018 16:29	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	18342B94A	12/13/2018 16:28	Jeremy C Giffin	1

Sample Description: MW-20D(90-100) Grab Groundwater
Motiva - 9829 Georgetown Pike, Great Falls, VA

GES, Inc.
ELLE Sample #: GW 9925742
ELLE Group #: 2015462
Matrix: Groundwater

Project Name: Motiva - 9829 Georgetown Pike, Great Falls, VA

Submission Date/Time: 12/05/2018 16:30
Collection Date/Time: 12/04/2018 13:30

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Volatiles					
		SW-846 8015C	ug/l	ug/l	
10598	TPH-GRO water C6-C10	n.a.	N.D.	11	1
GC Volatiles					
		SW-846 8021B	ug/l	ug/l	
02102	Benzene	71-43-2	N.D.	0.03	1
02102	Ethylbenzene	100-41-4	N.D.	0.05	1
02102	Methyl tert-Butyl Ether	1634-04-4	0.2 J	0.08	1
02102	Toluene	108-88-3	N.D.	0.1	1
02102	Total Xylenes	1330-20-7	N.D.	0.1	1

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10598	TPH-GRO water C6-C10	SW-846 8015C	1	18342B94A	12/13/2018 16:54	Jeremy C Giffin	1
02102	BTEX/MTBE 8021	SW-846 8021B	1	18342B94A	12/13/2018 16:54	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	18342B94A	12/13/2018 16:53	Jeremy C Giffin	1

Sample Description: MW-20D(132-142) Grab Groundwater
Motiva - 9829 Georgetown Pike, Great Falls, VA

GES, Inc.
ELLE Sample #: GW 9925743
ELLE Group #: 2015462
Matrix: Groundwater

Project Name: Motiva - 9829 Georgetown Pike, Great Falls, VA

Submission Date/Time: 12/05/2018 16:30
Collection Date/Time: 12/04/2018 15:00

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Volatiles					
10598 T	PH-GRO water C6-C10	SW-846 8015C n.a.	ug/l N.D.	ug/l 11	1
GC Volatiles					
02102 B	enzene	SW-846 8021B 71-43-2	ug/l N.D.	ug/l 0.03	1
02102 E	thylbenzene	100-41-4	N.D.	0.05	1
02102	Methyl tert-Butyl Ether	1634-04-4	N.D.	0.08	1
02102 T	oluene	108-88-3	N.D.	0.1	1
02102 T	otal Xylenes	1330-20-7	N.D.	0.1	1

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10598	TPH-GRO water C6-C10	SW-846 8015C	1	18342B94A	12/13/2018 17:20	Jeremy C Giffin	1
02102	BTEX/MTBE 8021	SW-846 8021B	1	18342B94A	12/13/2018 17:20	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	18342B94A	12/13/2018 17:19	Jeremy C Giffin	1

Sample Description: MW-21S Grab Groundwater
Motiva - 9829 Georgetown Pike, Great Falls, VA

GES, Inc.
ELLE Sample #: GW 9925744
ELLE Group #: 2015462
Matrix: Groundwater

Project Name: Motiva - 9829 Georgetown Pike, Great Falls, VA

Submittal Date/Time: 12/05/2018 16:30
Collection Date/Time: 12/04/2018 12:15

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Volatiles					
		SW-846 8015C	ug/l	ug/l	
10598	TPH-GRO water C6-C10	n.a.	N.D.	11	1
GC Volatiles					
		SW-846 8021B	ug/l	ug/l	
02102	Benzene	71-43-2	N.D.	0.03	1
02102	Ethylbenzene	100-41-4	N.D.	0.05	1
02102	Methyl tert-Butyl Ether	1634-04-4	0.2 J	0.08	1
02102	Toluene	108-88-3	N.D.	0.1	1
02102	Total Xylenes	1330-20-7	N.D.	0.1	1

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10598	TPH-GRO water C6-C10	SW-846 8015C	1	18342B94A	12/13/2018 17:45	Jeremy C Giffin	1
02102	BTEX/MTBE 8021	SW-846 8021B	1	18342B94A	12/13/2018 17:45	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	18342B94A	12/13/2018 17:44	Jeremy C Giffin	1

Sample Description: MW-21I Grab Groundwater
Motiva - 9829 Georgetown Pike, Great Falls, VA

GES, Inc.
ELLE Sample #: GW 9925745
ELLE Group #: 2015462
Matrix: Groundwater

Project Name: Motiva - 9829 Georgetown Pike, Great Falls, VA

Submission Date/Time: 12/05/2018 16:30
Collection Date/Time: 12/04/2018 13:00

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Volatiles					
10598 T	PH-GRO water C6-C10	SW-846 8015C n.a.	ug/l N.D.	ug/l 11	1
GC Volatiles					
02102 B	enzene	SW-846 8021B 71-43-2	ug/l N.D.	ug/l 0.03	1
02102 E	thylbenzene	100-41-4	N.D.	0.05	1
02102	Methyl tert-Butyl Ether	1634-04-4	N.D.	0.08	1
02102 T	oluene	108-88-3	N.D.	0.1	1
02102 T	otal Xylenes	1330-20-7	N.D.	0.1	1

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10598	TPH-GRO water C6-C10	SW-846 8015C	1	18342B94A	12/13/2018 18:11	Jeremy C Giffin	1
02102	BTEX/MTBE 8021	SW-846 8021B	1	18342B94A	12/13/2018 18:11	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	18342B94A	12/13/2018 18:10	Jeremy C Giffin	1

Sample Description: MW-22 Grab Groundwater
Motiva - 9829 Georgetown Pike, Great Falls, VA

GES, Inc.
ELLE Sample #: GW 9925746
ELLE Group #: 2015462
Matrix: Groundwater

Project Name: Motiva - 9829 Georgetown Pike, Great Falls, VA

Submission Date/Time: 12/05/2018 16:30
Collection Date/Time: 12/04/2018 09:45

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Volatiles					
10598 T	PH-GRO water C6-C10	SW-846 8015C n.a.	ug/l N.D.	ug/l 11	1
GC Volatiles					
02102 B	enzene	SW-846 8021B 71-43-2	ug/l N.D.	ug/l 0.03	1
02102 E	thylbenzene	100-41-4	N.D.	0.05	1
02102	Methyl tert-Butyl Ether	1634-04-4	N.D.	0.08	1
02102 T	oluene	108-88-3	N.D.	0.1	1
02102 T	otal Xylenes	1330-20-7	N.D.	0.1	1

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10598	TPH-GRO water C6-C10	SW-846 8015C	1	18342B94A	12/13/2018 21:44	Jeremy C Giffin	1
02102	BTEX/MTBE 8021	SW-846 8021B	1	18342B94A	12/13/2018 18:37	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	18342B94A	12/13/2018 18:36	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	2	18342B94A	12/13/2018 21:43	Jeremy C Giffin	1

Sample Description: MW-27S Grab Groundwater
Motiva - 9829 Georgetown Pike, Great Falls, VA

GES, Inc.
ELLE Sample #: GW 9925747
ELLE Group #: 2015462
Matrix: Groundwater

Project Name: Motiva - 9829 Georgetown Pike, Great Falls, VA

Submittal Date/Time: 12/05/2018 16:30
Collection Date/Time: 12/04/2018 10:15

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Volatiles					
10598	TPH-GRO water C6-C10	SW-846 8015C n.a.	ug/l N.D.	ug/l 11	1
GC Volatiles					
02102	Benzene	SW-846 8021B 71-43-2	ug/l N.D.	ug/l 0.03	1
02102	Ethylbenzene	100-41-4	N.D.	0.05	1
02102	Methyl tert-Butyl Ether	1634-04-4	0.7 J	0.08	1
02102	Toluene	108-88-3	N.D.	0.1	1
02102	Total Xylenes	1330-20-7	N.D.	0.1	1

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10598	TPH-GRO water C6-C10	SW-846 8015C	1	18342B94A	12/13/2018 19:03	Jeremy C Giffin	1
02102	BTEX/MTBE 8021	SW-846 8021B	1	18342B94A	12/13/2018 19:03	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	18342B94A	12/13/2018 19:02	Jeremy C Giffin	1

Sample Description: MW-27I Grab Groundwater
Motiva - 9829 Georgetown Pike, Great Falls, VA

GES, Inc.
ELLE Sample #: GW 9925748
ELLE Group #: 2015462
Matrix: Groundwater

Project Name: Motiva - 9829 Georgetown Pike, Great Falls, VA

Submission Date/Time: 12/05/2018 16:30
Collection Date/Time: 12/04/2018 11:00

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Volatiles					
		SW-846 8015C	ug/l	ug/l	
10598	TPH-GRO water C6-C10	n.a.	N.D.	11	1
GC Volatiles					
		SW-846 8021B	ug/l	ug/l	
02102	Benzene	71-43-2	N.D.	0.03	1
02102	Ethylbenzene	100-41-4	N.D.	0.05	1
02102	Methyl tert-Butyl Ether	1634-04-4	0.8 J	0.08	1
02102	Toluene	108-88-3	N.D.	0.1	1
02102	Total Xylenes	1330-20-7	N.D.	0.1	1

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10598	TPH-GRO water C6-C10	SW-846 8015C	1	18342B94A	12/13/2018 19:28	Jeremy C Giffin	1
02102	BTEX/MTBE 8021	SW-846 8021B	1	18342B94A	12/13/2018 19:28	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	18342B94A	12/13/2018 19:27	Jeremy C Giffin	1

Sample Description: MW-B3 Grab Groundwater
Motiva - 9829 Georgetown Pike, Great Falls, VA

GES, Inc.
ELLE Sample #: GW 9925749
ELLE Group #: 2015462
Matrix: Groundwater

Project Name: Motiva - 9829 Georgetown Pike, Great Falls, VA

Submittal Date/Time: 12/05/2018 16:30
Collection Date/Time: 12/04/2018 13:15

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Volatiles					
		SW-846 8015C	ug/l	ug/l	
10598	TPH-GRO water C6-C10	n.a.	33 J	11	1
GC Volatiles					
		SW-846 8021B	ug/l	ug/l	
02102 B	enzene	71-43-2	N.D.	0.03	1
02102 E	thylbenzene	100-41-4	N.D.	0.05	1
02102	Methyl tert-Butyl Ether	1634-04-4	41	0.08	1
02102 T	oluene	108-88-3	N.D.	0.1	1
02102 T	otal Xylenes	1330-20-7	N.D.	0.1	1

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10598	TPH-GRO water C6-C10	SW-846 8015C	1	18342B94A	12/13/2018 20:44	Jeremy C Giffin	1
02102	BTEX/MTBE 8021	SW-846 8021B	1	18342B94A	12/13/2018 20:44	Jeremy C Giffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	18342B94A	12/13/2018 20:43	Jeremy C Giffin	1

Quality Control Summary

Client Name: GES, Inc.
Reported: 12/14/2018 10:52

Group Number: 2015462

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result ug/l	MDL ug/l
Batch number: 18342B94A	Sample number(s): 9925738-9925749	
Benzene	N.D.	0.03
Ethylbenzene	N.D.	0.05
Methyl tert-Butyl Ether	N.D.	0.08
Toluene	N.D.	0.1
TPH-GRO water C6-C10	N.D.	11
Total Xylenes	N.D.	0.1

LCS/LCSD

Analysis Name	LCS Spike Added ug/l	LCS Conc ug/l	LCSD Spike Added ug/l	LCSD Conc ug/l	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 18342B94A	Sample number(s): 9925738-9925749								
Benzene	20	20.37			102		80-120		
Ethylbenzene	20.12	21.53			107		80-120		
Methyl tert-Butyl Ether	20.09	21.94			109		80-120		
Toluene	20.06	21.26			106		80-120		
TPH-GRO water C6-C10	1100	957.59	1100	935.25	87	85	70-123	2	30
Total Xylenes	60.17	65.5			109		80-120		

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: BTEX/MTBE 8021
Batch number: 18342B94A

	Trifluorotoluene-P	Trifluorotoluene-F
9925738	81	74
9925739	81	67
9925740	81	69
9925741	81	78
9925742	81	68

*- Outside of specification

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc.
Reported: 12/14/2018 10:52

Group Number: 2015462

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: BTEX/MTBE 8021

Batch number: 18342B94A

	Trifluorotoluene-P	Trifluorotoluene-F
9925743	80	71
9925744	80	70
9925745	80	70
9925746	81	68
9925747	81	67
9925748	80	67
9925749	81	69
Blank	82	85
LCS	80	80

Limits: 51-120 63-135

	Trifluorotoluene-F
LCSD	79

Limits: 63-135

*- Outside of specification

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody



Lancaster Laboratories Environmental

Acct. # 0390 Group # 2015402 Sample # 9925730-50

Client: Motiva		Bill: 0403114-101000-000001		Matrix		Analyses Requested						For Lab Use Only			
Project Name/#: Great Falls		Site ID #:				Preservation and Filtration Codes						SF #: _____			
Project Manager: Ashley Bell		P.O. #: 0403114		Soil <input type="checkbox"/> Sediment <input type="checkbox"/> Tissue <input type="checkbox"/>	Potable <input type="checkbox"/> Ground <input type="checkbox"/> Surface <input type="checkbox"/>	Water <input type="checkbox"/> NPDES <input type="checkbox"/>	Other: _____	Total # of Containers	BTEX + MTBE (8021)	TPH-GRO (8015)				Preservation Codes	
Sampler: Jeff Plummer		PWSID #:												H = HCl	
Phone #: 800-220-3606 x. 3704		Quote #:		N = HNO ₃		B = NaOH		S = H ₂ SO ₄		P = H ₃ PO ₄		F = Field Filtered		O = Other	
State where samples were collected: VA_		For Compliance: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>												Remarks	
Sample Identification		Collection		Grab	Composite										
		Date	Time												
W-1		12-4-18	1400	X		X		3	X	X					
W-2			1130												
W-7			1435												
MW-20D(73-83)			1230												
MW-20D(90-100)			1330												
MW-20D(132-142)			1500												
MW-21S			1215												
MW-21I			1300												
MW-22		V	0945	V		V		V	V	V					
MW-27S		12-4-18	1015	X		X		3	X	X					
Turnaround Time Requested (TAT) (please check): Standard <input checked="" type="checkbox"/> Rush <input type="checkbox"/>				Relinquished by: <u>Jeff Plummer</u>		Date	Time	Received by: <u>Dennis Woodruff</u>		Date	Time				
(Rush TAT is subject to laboratory approval and surcharges.)						12-5-18	0730			12-5-18	0755				
Date results are needed:				Relinquished by: <u>Dennis Woodruff</u>		Date	Time	Received by: <u>[Signature]</u>		Date	Time				
Rush results requested by (please check): E- <input type="checkbox"/> N- <input type="checkbox"/> I- <input type="checkbox"/> P- <input type="checkbox"/>						12-5-18	1055			12/5/18	1055				
E-mail: SEPRRegion@gesonline.com; abell@gesonline.com; GES@EquisOnline.com				Relinquished by: <u>[Signature]</u>		Date	Time	Received by:		Date	Time				
Phone:						12/5/18	1630								
Data Package Options (please check if required)				Relinquished by:		Date	Time	Received by:		Date	Time				
Type I (Validation/non-CLP) <input type="checkbox"/>		MA MCP <input type="checkbox"/>													
Type III (Reduced non-CLP) <input type="checkbox"/>		CT RCP <input type="checkbox"/>													
Type VI (Raw Data Only) <input type="checkbox"/>		TX TRRP-13 <input type="checkbox"/>													
NJ DKQP <input type="checkbox"/>		NYSDEC Category <input type="checkbox"/> A or <input type="checkbox"/> B													
EDD Required? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				Relinquished by Commercial Carrier:				Received by: <u>[Signature]</u>		Date	Time				
If yes, format: EQEDD										12/5/18	1630				
UPS _____ FedEx _____ Other _____										Temperature upon receipt <u>6.4</u> °C					



2015402

Client: Motiva

Delivery and Receipt Information

Delivery Method: ELLE Courier Arrival Timestamp: 12/05/2018 16:30
 Number of Packages: 1 Number of Projects: 2
 State/Province of Origin: VA

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	No	Sample Date/Times match COC:	Yes
Samples Chilled:	Yes	VOA Vial Headspace \geq 6mm:	No
Paperwork Enclosed:	Yes	Total Trip Blank Qty:	2
Samples Intact:	Yes	Trip Blank Type:	HCl
Missing Samples:	No	Air Quality Samples Present:	No
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Ariel Garcia (15332) at 20:41 on 12/05/2018

Samples Chilled Details

Thermometer Types: *DT = Digital (Temp. Bottle)* *IR = Infrared (Surface Temp)* *All Temperatures in °C.*

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT42-01	0.4	DT	Wet	Y	Loose	N

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	mL	milliliter(s)
C	degrees Celsius	MPN	Most Probable Number
cfu	colony forming units	N.D.	non-detect
CP Units	cobalt-chloroplatinate units	ng	nanogram(s)
F	degrees Fahrenheit	NTU	nephelometric turbidity units
g	gram(s)	pg/L	picogram/liter
IU	International Units	RL	Reporting Limit
kg	kilogram(s)	TNTC	Too Numerous To Count
L	liter(s)	µg	microgram(s)
lb.	pound(s)	µL	microliter(s)
m3	cubic meter(s)	umhos/cm	micromhos/cm
meq	milliequivalents	MCL	Maximum Contamination Limit
mg	milligram(s)		
<	less than		
>	greater than		
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.		
ppb	parts per billion		
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.		

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" are not performed within 15 minutes.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value \geq the Method Detection Limit (MDL or DL) and $<$ the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column $>40\%$. The lower result is reported.
P^	Concentration difference between the primary and confirmation column $> 40\%$. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column $>100\%$. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods. Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.



Appendix C – MTBE Mann-Kendall Constituent Trend Analysis

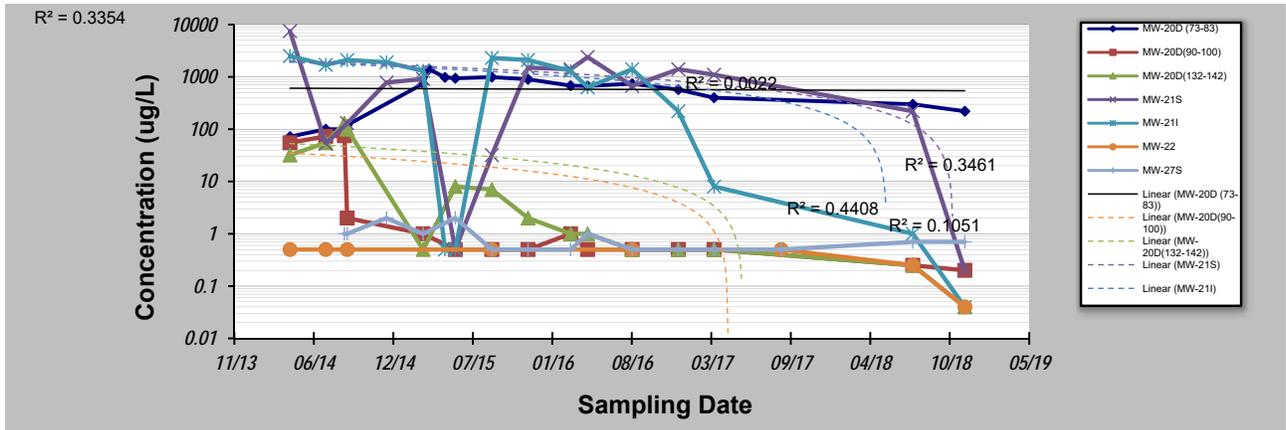
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **4-Jan-19**
 Facility Name: **Former Shell Station - Great Falls, VA**
 Conducted By: **T. Boswell**

Job ID: _____
 Constituent: **MTBE**
 Concentration Units: **ug/L**

Sampling Point ID: **MW-20D (73-83) MW-20D(90-100) MW-20D(132-142) MW-21S MW-21I MW-22 MW-27S**

Sampling Event	Sampling Date	MTBE CONCENTRATION (ug/L)						
		MW-20D (73-83)	MW-20D(90-100)	MW-20D(132-142)	MW-21S	MW-21I	MW-22	MW-27S
1	11-Apr-14	72	55.0	32.0	7500.0	2500.0	0.5	
2	10-Jul-14	100	73.0	55.0	53.0	1700.0	0.5	
3	26-Aug-14	100	75.0	130.0				1.0
4	2-Sep-14	120	2.0	100.0	130.0	2100.0	0.5	1.0
5	10-Dec-14				780.0	1900.0		2.0
6	12-Mar-15	740	1.0	0.5	910.0	1300.0		1.0
7	27-Mar-15	1400						
8	6-May-15	980				0.5		
9	1-Jun-15	940	0.5	8	0.5	0.5		2
10	1-Sep-15	990	0.5	7	32	2300	0.5	0.5
11	1-Dec-15	900	0.5	2	1500	2100		0.5
12	17-Mar-16	680	1	1	1400	1300		0.5
13	29-Apr-16	670	0.5	1	2400	630		1
14	19-Aug-16	740	0.5	0.5	670	1400	0.5	0.5
15	13-Dec-16	570	0.5	0.5	1400	220		0.5
16	13-Mar-17	400	0.5	0.5	1100	8		0.5
17	29-Aug-17						0.5	0.5
18	26-Jul-18	300	0.25	0.25	220	1	0.25	0.7
19	4-Dec-18	220	0.2	0.04	0.2	0.04	0.04	0.7
20								
Coefficient of Variation:		0.67	1.99	1.81	1.56	0.87	0.42	0.59
Mann-Kendall Statistic (S):		-2	-71	-78	-6	-61	-13	-32
Confidence Factor:		51.6%	>99.9%	>99.9%	59.6%	99.8%	92.9%	93.7%
Concentration Trend:		Stable	Decreasing	Decreasing	No Trend	Decreasing	Prob. Decreasing	Prob. Decreasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.
- Concentrations reported as not detected above laboratory reporting limits are included as half of the reporting limit.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.

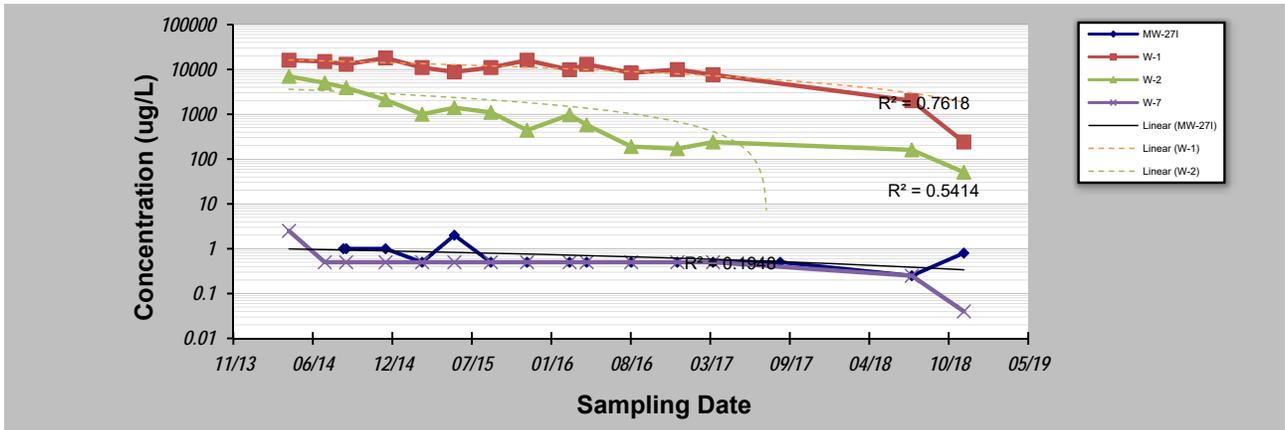
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **4-Jan-19** Job ID:
 Facility Name: **Former Shell Station - Great Falls, VA** Constituent: **MTBE**
 Conducted By: **T. Boswell** Concentration Units: **ug/L**

Sampling Point ID: **MW-27I** **W-1** **W-2** **W-7**

Sampling Event	Sampling Date	MTBE CONCENTRATION (ug/L)					
		MW-27I	W-1	W-2	W-7		
1	11-Apr-14		16000.0	7000.0	2.5		
2	10-Jul-14		15000.0	5000.0	0.5		
3	26-Aug-14	1					
4	2-Sep-14	1	13000.0	3900.0	0.5		
5	10-Dec-14	1	18000.0	2100.0	0.5		
6	12-Mar-15	0.5	11000.0	1000.0	0.5		
7	27-Mar-15						
8	6-May-15						
9	1-Jun-15	2	8800	1400	0.5		
10	1-Sep-15	0.5	11000	1100	0.5		
11	1-Dec-15	0.5	16000	440	0.5		
12	17-Mar-16	0.5	9800	970	0.5		
13	29-Apr-16	0.5	13000.0	580	0.5		
14	19-Aug-16	0.5	8400	190	0.5		
15	13-Dec-16	0.5	9900	170	0.5		
16	13-Mar-17	0.5	7600	240	0.5		
17	29-Aug-17	0.5					
18	26-Jul-18	0.25	2000	160	0.25		
19	4-Dec-18	0.8	240	51	0.04		
20							

Coefficient of Variation:	0.60	0.47	1.28	0.93		
Mann-Kendall Statistic (S):	-38	-68	-93	-39		
Confidence Factor:	96.7%	>99.9%	>99.9%	97.1%		
Concentration Trend:	Decreasing	Decreasing	Decreasing	Decreasing		



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.
 - Concentrations reported as not detected above laboratory method detection limits are included as half of the method detection limit.

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