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Submitted via Fed Ex

November 26, 2013

Ms. Susan Bull
Maryland Department of the Environment
Oil Control Program
1800 Washington Boulevard, Suite 620
Baltimore, Maryland 21230-1719

Subject: Subsurface Investigation Work Plan
MDE Case No. 2011-0112-HA and 2013-0007-HA
Bel Air Xtra Fuels Station
2476 East Churchville Road, Bel Air, Harford County, Maryland

Dear Ms. Bull:

Brown and Caldwell (BC), on behalf of Drake Petroleum Company, Inc. (Drake), is submitting this Subsurface Investigation Work Plan for the above referenced Site in response to the Maryland Department of the Environment's (MDE) directive sent via email on November 12, 2013. The MDE's directive included a request for the proposed location and schedule for the installation of the second bedrock and overburden monitoring well pair proposed in the Well Installation Work Plan – Additional Activities prepared and submitted by BC on March 6, 2013.

Based upon the results of the installation of the previous monitoring well cluster (MW-16S, MW-I and MW16D), BC has determined that impacted groundwater is present in the overburden and shallow bedrock aquifers with predominant flow to the southwest. The laboratory analytical results indicates that the dissolved phase concentrations of benzene, toluene, ethyl benzene, and xylenes (BTEX) and methyl tert-butyl ether (MTBE) decrease significantly with depth. MTBE and benzene are the best constituents for tracking the extent of impacted groundwater and the highest dissolved phase concentrations of benzene and MTBE were observed in the highly weathered shallow bedrock. Hydraulic head measurements indicate that groundwater flow from the overburden aquifer is predominantly lateral with a downward component to the shallow bedrock. Similarly, the hydraulic heads are greater in the deep bedrock indicating upward flow also to the shallow bedrock. The nearest discharge location of this groundwater is likely springs and surface water several hundred feet to the southwest. Based upon these results, BC recommends that the proposed monitoring well cluster be installed southwest of monitoring well MW-16 near 2303 Churchville Road (Grace Assembly of God Church) and that the nested well cluster focus on groundwater impacts in the shallow overburden and bedrock aquifer where the plume is concentrated to better delimit horizontal extent.

Well Installation

Based upon the success of installing monitoring well cluster MW-16 (e.g. without collapse) and the hydraulic and geochemical data obtained, BC is proposing to install two (2) groundwater monitoring wells (tentatively MW-17S and MW-17I) located due west of the building on the property at 2303 Churchville Road (Grace Assembly of God Church). The proposed location is depicted on Figure 1. Please note that the exact location will be confirmed once public mark outs indicate that the proposed location is ten (10) feet from all utilities and access agreements have been signed granting permission to conduct the drilling activities. The nested monitoring well pair will consist of one (1) overburden monitoring well and one (1) shallow bedrock monitoring well.

The overburden monitoring well (MW-17S) will be installed to a depth of approximately 30 feet below ground surface (ft. bgs), corresponding to the depth of overburden observed while installing monitoring well MW-16S. Monitoring well MW-17S will be installed using a hollow stem auger rig. During the installation of monitoring well MW-17S, BC will supervise continuous soil sampling utilizing a two (2) foot split spoon method. Each recovered spoon will be examined by an on-site BC geologist and described to note percent recovery, lithology, color and moisture and will be field screened for volatile organic compounds (VOCs) with a properly calibrated photoionization detector (PID).

The bedrock monitoring well (MW-17I) will be drilled to a depth of approximately 60 ft. bgs to target the more highly fractured and conductive bedrock zone which corresponds to monitoring well MW-16I. The proposed depth of the bedrock monitoring well was determined based on both groundwater elevation data and laboratory analytical results from the monitoring well MW-16 cluster.

On November 15, 2013 BC gauged each monitoring well for water level, surveyed the elevations, and collected groundwater samples from monitoring wells MW-16S, MW-16I, and MW-16D. The laboratory analytical results indicated the following:

- Monitoring well MW-16I had the highest dissolved-phase concentration of MTBE at 4,180 micrograms per liter [µg/L], while monitoring well MW-16D had the lowest dissolved-phase concentration of MTBE at 284 µg/L.
- All three (3) groundwater samples contained dissolved-phase concentrations of MTBE above the MDE Generic Numeric Cleanup Standards for Groundwater and Soil (MDE Groundwater Standards) of 20 µg/L.
- Benzene exceeded the MDE Generic Numeric Cleanup Standards for Groundwater (5 ug/L) in only the overburden and shallow bedrock wells.
- Groundwater flow in the overburden was largely horizontal with a down-ward vertical component to the shallow bedrock weathered zone.
- Groundwater flow in the deep bedrock section is vertically up-ward also to the shallow weathered bedrock.
- Flow in the shallow bedrock aquifer is largely horizontal migrating south westerly.

The groundwater elevations are shown on Figure 2 and the laboratory analytical results are shown on Table 1.

Targeting the monitoring well MW-16I fractured bedrock interval will allow the investigation to be focused on the highest dissolved-phase concentrations of MTBE and benzene. Although MTBE is observed at the deeper monitoring well, the concentrations are more than an order of magnitude less than the shallow bedrock zone, and groundwater elevation data is indicating that the groundwater flow will be upward toward the shallow bedrock.

Bedrock monitoring well MW-17I will first be cored using wireline core drilling method. During drilling, rock cores will be collected to provide a visual observation of the lithology. These descriptions will provide data about fractured zones that may indicate higher hydraulic conductivity and groundwater flow. These data will be used to determine appropriate monitoring well screening intervals. Casing will be set in the upper weathered bedrock and the bedrock monitoring well will be over drilled via air rotary method. The exact screen interval for the discrete bedrock zone will be determined by packer testing and confirmed with the MDE prior to well completion. The packer testing will occur every ten (10) ft. as the drilling progresses.

The bedrock monitoring well, MW-17I, will consist of a six (6) inch steel casing seated approximately ten (10) feet into competent rock. From the bottom of the steel casing to the terminal depth, tentatively 60 ft. bgs, the bedrock well will exist as an open borehole. One (1) 2-inch monitoring well will be installed within the borehole and will be completed with an approximately ten (10) foot screen interval across an identified fracture or flow zone.

If drilling conditions indicate that the borehole is collapsing during drilling as a result of a highly fractured rock, BC may use the following approach:

- Employ mud rotary drilling techniques with a mud mixture designed to stabilize the borehole and advance a temporary casing as drilling is progressed. Once borehole is stabilized we will set an intermediate casing to isolate a collapsing interval. Packer testing may be conducted prior to setting the intermediate casing (if feasible/practicable). Drilling to the target depth would then be conducted from the base of the intermediate casing.
- Once the hole is stabilized, the drilling will be advanced in increments (e.g., ten [10] to fifteen [15] feet) and conducting packer testing in each increment, to obtain groundwater samples for laboratory analysis. With this approach, if the borehole collapse occurs at depth, there may be sufficient characterization of the intervals above that well screen intervals can be selected in the interval above the collapse. Alternatively, if the data from the packer testing indicate that deeper exploration is still required, this may provide data to help plan and justify the additional investigation efforts.

These contingencies would be planned prior to mobilizing so that appropriate equipment and casing diameters are selected.

Based on the geologic conditions encountered at the monitoring well MW-16 cluster, BC does not recommend performing a borehole geophysical evaluation. Rather, by packer testing (and collecting a groundwater sample for rapid turn-around laboratory analysis) every ten (10) feet as drilling proceeds into the bedrock, we will be able to identify impacted groundwater directly and select the interval for setting the well screen.

The monitoring wells will be finished with a flush-mount protective steel road box cover. Well development will be performed by the driller under the supervision of a BC geologist. The procedure includes pumping until the groundwater runs clear, surging by agitating the pump, followed by a second round of pumping until the groundwater runs clear. The groundwater monitoring well will be surveyed and mapped once the monitoring well is completed.

Groundwater Sampling

Two (2) weeks after the installation of the new monitoring wells, BC will collect groundwater samples to be analyzed for the full suite of VOCs plus fuel oxygenates in accordance with United States Environmental Protection Agency (USEPA) Method 8260, and total petroleum hydrocarbons – diesel range organics (TPH-DRO) and TPH gasoline range organics (TPH-GRO) in accordance with USEPA Method 8015B. The groundwater wells will be purged three (3) well volumes, then groundwater samples will be collected with a disposable bailer. Groundwater samples will be shipped to Accutest of Dayton, New Jersey for laboratory analysis.

Waste Handling and Disposal

All soil and groundwater generated during drilling, and development will be containerized and transported off-site for proper disposal.

Project Schedule

An addendum to the current access agreement between Drake and Grace Assembly of God Church must be secured before a schedule can be determined. Once the monitoring well installation work plan is approved by the MDE, Drake will pursue access for drilling on the Grace Assembly of God property. Drilling will commence within 45 days of access being granted, weather permitting.

If you have any questions regarding the contents of this submittal please do not hesitate to contact me.

Very truly yours,

Brown and Caldwell

Charles F. Myette
Vice President

cc: Scott Nelson, Brown and Caldwell, via email
Eric Harvey, Drake Petroleum Company, Inc. via electronic submittal
Michele Alabiso, Drake Petroleum Company, Inc. via electronic submittal
Jeff Walker, Warren Equities, Inc., via electronic submittal
Jeannette DeBartolomeo – Maryland Department of Environment
Andrew Miller – Maryland Department of Environment

Attachments (3)

1. Table 1: MW-16D, MW-16I and MW-16S Groundwater Laboratory Analytical Results
2. Figure 1 – Proposed Sampling Plan
3. Figure 2 – October 9 and November 15, 2013 Groundwater Elevations

Attachments

TABLE 1
MW-16D, MW-16I, AND MW-16S GROUNDWATER LABORATORY ANALYTICAL RESULTS
BEL AIR XTRA FUELS
BEL AIR, MARYLAND

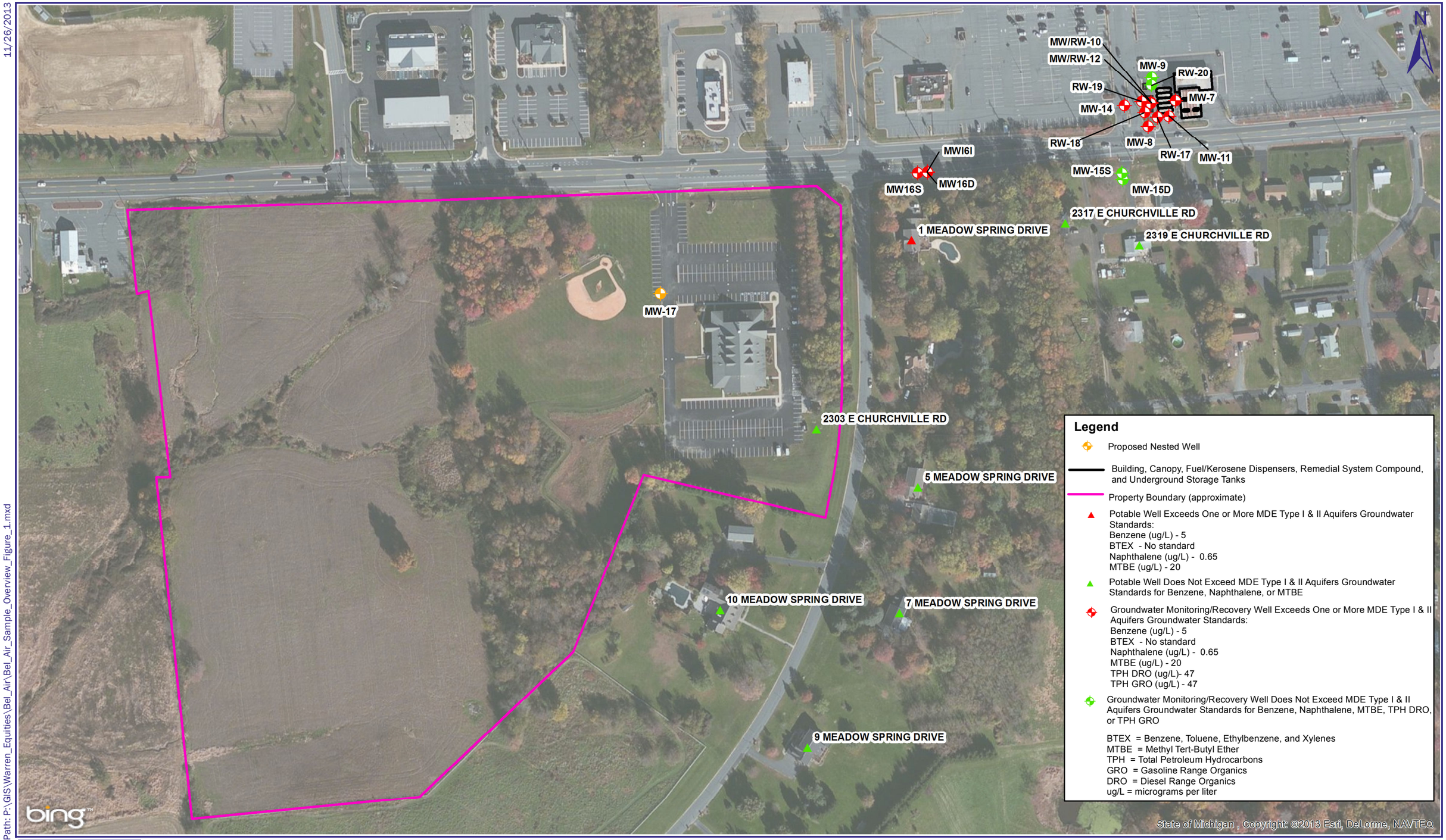
Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	GW Elevation (ft)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	Total BTEX (µg/L)	MTBE (µg/L)	TPH-DRO (µg/L)	TPH-GRO (µg/L)
GW Clean-up Standards for Type I and II Aquifers					5	1,000	700	10,000	NA	20	47	47
MW-16D	11/15/13	398.2177	17.64	380.58	<1.0	<1.0	<1.0	<1.0	ND	**284**	<0.10	**424**
MW-16I	11/15/13	398.1332	17.05	381.08	**164**	<10	<10	<10	164	**4,180**	**413**	**4,220**
MW-16S	11/15/13	398.6401	17.23	381.41	**157**	<5.0	<5.0	<5.0	157	**2,330**	NA	**2,770**

All samples were placed on ice in a cooler and transported under a Chain of Custody to Accutest Laboratories of Dayton, NJ. All samples were analyzed within the applicable holding time with a dilution of 10% Hydrochloric Acid (HCL) as a preservative. All samples were sampled using a disposable bailer & were purged three volumes, prior to sampling. Regulatory Standards are based on the Maryland Department of the Environment Maryland Environmental Assessment Technology Generic Number Standards (February 2003).

Bolded values indicate concentrations above MDE standards.

<#	= Less than the reporting limit of #
µg/L	= Micrograms/liter
BTEX	= Benzene, toluene, ethylbenzene, xylenes
MTBE	= Methyl-tertiary Butyl-ether
NA	= Not Available or not analyzed for that specific compound
TPH-DRO	= Total Petroleum Hydrocarbons - Diesel Range Organics
TPH-GRO	= Total Petroleum Hydrocarbons - Gasoline Range Organics
"-"	= Not Sampled

11/26/2013



Legend

- Proposed Nested Well
- Building, Canopy, Fuel/Kerosene Dispensers, Remedial System Compound, and Underground Storage Tanks
- Property Boundary (approximate)
- Potable Well Exceeds One or More MDE Type I & II Aquifers Groundwater Standards:
  Benzene (ug/L) - 5
  BTEX - No standard
  Naphthalene (ug/L) - 0.65
  MTBE (ug/L) - 20
- Potable Well Does Not Exceed MDE Type I & II Aquifers Groundwater Standards for Benzene, Naphthalene, or MTBE
- Groundwater Monitoring/Recovery Well Exceeds One or More MDE Type I & II Aquifers Groundwater Standards:
  Benzene (ug/L) - 5
  BTEX - No standard
  Naphthalene (ug/L) - 0.65
  MTBE (ug/L) - 20
  TPH DRO (ug/L)- 47
  TPH GRO (ug/L) - 47
- Groundwater Monitoring/Recovery Well Does Not Exceed MDE Type I & II Aquifers Groundwater Standards for Benzene, Naphthalene, MTBE, TPH DRO, or TPH GRO

BTEX = Benzene, Toluene, Ethylbenzene, and Xylenes
MTBE = Methyl Tert-Butyl Ether
TPH = Total Petroleum Hydrocarbons
GRO = Gasoline Range Organics
DRO = Diesel Range Organics
ug/L = micrograms per liter

Author: ACastro Path: P:\GIS\Warren_Equities\Bel_Air\Bel_Air_Sample_Overview_Figure_1.mxd

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Figure 1. Sample Overview
Bel Air Xtra Fuels
2476 Churchville Road, Bel Air, Maryland

0 90 180
Feet

11/22/2013

Author: ACastro Path: P:\GIS\Warren_Equities\Bel_Air\Bel_Air_GWE_MW16_OctNov_2013.mxd

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Figure 2. October 9 and November 15, 2013 Groundwater Elevations Figure
Bel Air Xtra Fuels
2476 Churchville Road, Bel Air, Maryland

0 10 20
Feet