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March 12, 2019

Mr. Michael Kilmer
Project Manager
New York State Department of Environmental Conservation
21 South Putt Corners Road
New Paltz, NY 12561

153292

Subject: Groundwater Data Gap Investigation Work Plan
Ardsley, LLC (Former Akzo Nobel Pilot Plant Site), ID #C360146
Ardsley, New York

Dear Mr. Kilmer:

Brown and Caldwell Associates (BC) submits this Groundwater Data Gap Investigation Work Plan describing the scope of work and procedures for conducting additional investigation activities at the Former Akzo Nobel Pilot Plant Site (hereafter referred to as the "Site"). This plan was prepared for EnviroAnalytics Group LLC (EAG) on behalf of Ardsley, LLC. The scope of work for this investigation was outlined during a February 22, 2019, conference call with you and representatives of EAG and BC in order to advance Site remediation and obtain a Certificate of Completion (COC) within the 2019 calendar year.

The Site was assigned ID Number C360146 by the NYSDEC. The property was acquired by Ardsley, LLC on May 25, 2017. The Site is being remediated within the NYSDEC's Brownfield Cleanup Program (BCP) pursuant to the Brownfield Cleanup Agreement between the NYSDEC and Ardsley, LLC dated July 10, 2018 (BCA).

The specific objective of the Groundwater Data Gap Investigation is to further define the nature and extent of groundwater impacts at the downgradient Site perimeter, including the southern property line and the shoreline of the Saw Mill River, and to obtain analytical data to evaluate monitored natural attenuation (MNA) of tetrachloroethene, carbon disulfide, benzene, and other organic substances.

Section 2.0 provides a summary of the background, geology and history of the Site. Section 3.0 describes the scope of work, including the technical approach and the methods and materials to be used in performing the GW data gap investigation scope of work. Section 4.0 provides the anticipated schedule for completion of the investigation activities.

Background

The Site location and history described below was previously provided in the "Remedial Investigation Work Plan for the Former Akzo Nobel Pilot Plant, 1 Lawrence Street, Ardsley, New York" (First Environment, 2017). An abridged version is presented herein with slight modifications/additions. Also provided below is a brief summary of the investigation findings to-date associated with the Site.

Site Location and Description

The Site is location at 1 Lawrence Street in the Town of Greenburgh (adjacent to the Village of Ardsley), Westchester County, New York. Latitude and longitude coordinate for the property are approximately 41° 00' 11.91" north latitude and 73° 51' 15.08" west longitude.

The Site consists of approximately 9.62 acres and formerly contained seven freestanding structures, which were demolished circa 2008. Except for an area of undeveloped land to the north, the property is largely covered by impervious surfaces including asphalt parking areas, landscaped areas, and clean brick and concrete rubble, which was used to grade the Site following demolition activities.

The topography of much of the Site is generally flat. The Site is located in the Saw Mill River valley and situated between the Saw Mill River Parkway to the west and a bank of the Saw Mill River to the east. Lawrence Street borders the property to the south and undeveloped land borders the Site to the north. The Saw Mill River is a tributary of the Hudson River, and flows in a general easterly direction along the northern portion of the Site and then in a southerly direction along the Site's eastern boundary. A small water course between the Site and the Saw Mill River Parkway appears to connect with the Saw Mill River approximately 0.2 mile south of the Site. A Site Location Map is included as Figure 1. A Site Plan depicting Site features and existing/proposed monitoring wells is provided as Figure 2.

Site History

The property was initially developed by Stauffer Chemical Company (Stauffer) in the 1920s. Stauffer manufactured citric acid, potash, carbon disulfide and insoluble sulfur and a variety of biocides and pesticides at various times until chemical manufacturing at the facility ceased in 1984. Research and development (R&D) operations began in the 1950s and continued after cessation of the manufacturing activities.

Akzo Nobel acquired Stauffer in 1987 and initially continued Stauffer's R&D operations but eventually converted the R&D operations away from the Stauffer processes towards Akzo's products. R&D operations continued at the Site until January 2006, at which time all site operations ceased.

Summary of Previous Site Investigations

Sovereign Consulting, Inc. (Sovereign) of Cherry Hill, New Jersey conducted a site investigation at the Site from October 2006 through June 2009. The objective of the site investigation was to identify areas of concern (AOCs) and evaluate potential impacts to soil and groundwater quality at each AOC, as well as assess sediment and surface water quality in the adjacent Saw Mill Creek. The investigation identified and addressed 15 AOCs.

The Vertex Companies (Vertex), on behalf of the prior property owner TDI Real Estate, Inc., mobilized to the Site in April 2014 to conduct further remedial investigation (RI) activities. The initial RI was conducted to evaluate subsurface conditions with respect to the specific AOCs identified in the earlier site investigation.

Subsequent site investigation activities have been conducted by First Environment (FE) of Boonton, New Jersey pursuant to the Remedial Investigation (RI) Work Plan prepared by FE in 2017[1]. A report of the RI completed by FE will be submitted under separate cover by EAG.

Scope of Work

The proposed Groundwater Data Gap Investigation activities are described in the subsections below. Specific methods and procedures associated with these activities will be conducted in accordance with the following plans and guidance documents:

- Health and Safety Plan for Remedial Investigation Activities, Former Akzo Nobel Pilot Plant Site (Brown and Caldwell, March 2019) (referred to as "Health and Safety Plan").
- DER-10/Technical Guidance for Site Investigation and Remediation (NYSDEC, May 2010).

1. Field Activities

1.1 Utility Mark Outs and Clearance

Prior to conducting the intrusive activities described below, the planned locations for the monitoring wells will be marked in the field. Dig Safely New York will be contacted to clear subscribed underground utilities, and the Town of Greenburgh and/or the Village of Ardsley will be contacted to clear utilities that they maintain (e.g., sewer and water).

Some of the proposed drilling and sampling locations may be adjusted to provide for adequate clearance from underground and aboveground utilities. The final locations for the monitoring wells will be determined in the field following the mark-out of underground utilities.

Clearance of subsurface utilities will be confirmed at each drilling location by vacuum soil extraction or hand shoveling to remove the soil at each drilling location to a depth of approximately 5 feet below ground surface (bgs).

1.2 Overburden Monitoring Well Installation

Overburden monitoring wells will be installed at three (3) locations (MW-3-REP[2], MW-4, and MW-5) at the approximate positions shown on Figure 2. The actual locations of these borings may be modified based on the utility mark-outs and physical clearance activities. The monitoring well locations were selected to contribute to meeting the following objectives: 1) establishing critical groundwater analytical

[1] Remedial Investigation Work Plan for the Former Akzo Nobel Pilot Plant, 1 Lawrence Street Ardsley, New York, NYSDEC Project No. C360146; July 21, 2017; First Environment, Inc.
[2] It has been reported that former monitoring well MW-3 cannot be located; MW-3REP is a replacement for MW-3.

conditions (including MNA) at the presumptively downgradient Site perimeter; and 2) further evaluating groundwater flow and hydrogeologic conditions at the Site including potential discharge of groundwater to the Saw Mill River.

Consistent with the existing monitoring wells installed by Sovereign Consulting, the screened interval for each well will be 15 feet in length and straddle the water table. The wells will be constructed of two-inch diameter, Schedule 40 PVC well casing with 0.010-inch slot PVC screens and an appropriately-sized filter pack. The wells will be developed after a minimum period of 12 hours has passed following well installation to allow for the cement/bentonite grout to set.

A Community Air Monitoring Plan (CAMP) will be implemented that meets the requirements of the NYSDOH's Generic CAMP provided in DER-10 during the advancement of the soil borings for the monitoring wells. The soil borings will be drilled using hollow-stem augers and sampled with a two-foot long, two-inch outside diameter (O.D.) split-spoon sampler from ground surface to the top of rock surface. The soil samples will be described in the field to characterize soil type, including grain size, texture, and apparent moisture content. Soil samples will be logged in accordance with a system after Burmister[3] and classified using the Unified Soil Classification System (USCS). The samples will also be field screened for indications of impacts based on appearance, odors or organic vapor concentration measurements using a photoionization detector (PID). Head-space screening with the PID will be conducted by immediately transferring a representative subsample of the soil to a clean glass jar and sealing its lid with aluminum foil or to a sealable polyethylene plastic bag (e.g., Ziploc®). To allow the sample to equilibrate, it will remain sealed for a period of time (approximately 15 minutes) and then the tip of the PID will be inserted through the foil, or though the plastic bag, and the maximum instrument reading will be recorded.

These wells will be used for establishing critical groundwater analytical conditions (including MNA) at the site perimeter; therefore, it is important to identify any soil impacts adjacent to the well screens. Accordingly, one (1) soil sample from each soil boring will be collected and submitted for analysis of Target Compound List (TCL) Volatile Organic Compounds (VOCs), TCL Semi Volatile Organic Compounds (SVOCs), TCL pesticides, Polychlorinated Biphenyls (PCBs), and Target Analyte List (TAL) metals . The depth interval(s) selected for sampling will be based on location within the proposed well screen interval and visual observations/field screening of the soil samples.

Analysis of soil samples will be conducted by a laboratory certified under the NYSDOH Environmental Laboratory Approval Program (ELAP) to provide Analytical Services Protocol (ASP)/Contract Laboratory Program (CLP) deliverables. The analytical results will be provided to the NYSDEC as an Electronic Data Deliverable (EDD) formatted to the NYSDEC's data submission requirements that are detailed on the NYSDEC's website

[3] Burmister, D M; "Principles and Techniques of Soil Identification"; Proceedings of the Twenty-Ninth Annual Meeting of the Highway Research Board Held at Washington, D.C. December 13-16, 1949.

(http://www.dec.ny.gov/chemical/62440.html). This will include: 1) populating the NYSDEC EDD with the analytical data; 2) validating the EDD using the database software application EQuIS™ from EarthSoft®, Inc.; and 3) submitting the validated EDD to the NYSDEC.

1.3 Groundwater Monitoring and NAPL Gauging

One (1) round of groundwater sampling will be conducted as part of this investigation[4]. Groundwater samples will be collected from the three newly installed monitoring wells specified herein and the two existing monitoring wells. Groundwater sampling will be initiated after at least one week has passed since completion of well development and after water levels in the wells have stabilized.

The depth to water will be measured in each monitoring well and staff gauge prior to groundwater sampling. Additionally, non-aqueous phase liquid (NAPL) gauging will be conducted on each Site monitoring well. In the unlikely event that NAPL is detected in a monitoring well, a groundwater sample will not be collected from that well. Groundwater samples will be collected according to the USEPA low flow sampling protocol.

The groundwater samples will be submitted for analysis of TCL VOCs, TCL SVOCs, TCL pesticides, PCBs, and TAL metals. In addition, the samples will be submitted for analysis of MNA parameters to evaluate the potential for MNA to be a component of the Site remedy. The MNA parameters will consist of the following:

Sample Evaluation	Chemical Test/Analyte Parameter
Field Measurements:	Carbon dioxide (Hach Kit[b])
	Iron (II) (Hach Kit[b])
	Manganese (II) (Hach Kit[b])
	Sulfide (Hach Kit[b])
	Conductivity
	ORP
	pH
	DO
	Temperature
	Turbidity
	Hydrogen Sulfide (Hach Kit[b])
Laboratory Analyses:	Chloride
	Iron (total)
	Manganese (total)
	Aluminum (total)
	Nitrate/nitrite
	Sulfate
	Ethane, ethene, and methane[a]

[4] It is recognized that multiple sampling events are necessary to conclusively demonstrate that natural attenuation is active and effective in controlling off-site migration in groundwater; however, it is expected that this single round of sampling will suffice to demonstrate that natural attenuation is possible and that MNA can be a component of the Site remedy.

Sample Evaluation	Chemical Test/Analyte Parameter
	VOCs[a]
	Alkalinity (carbonate/bicarbonate)
	Dissolved total organic carbon (TOC)
	Volatile fatty acids[a]
	TPH-DRO

Notes:

[a]Samples to be collected in zero headspace containers to prevent exchange of gases between the samples and the atmosphere.

[b]Method will be per manufacturer's procedures.

Analysis of groundwater samples will be conducted by a laboratory certified under NYSDOH ELAP to provide ASP/CLP deliverables. As described above, the analytical results will be provided to the NYSDEC as an EDD formatted to the NYSDEC's data submission requirements.

1.4 Slug Tests

In-situ hydraulic conductivity tests (i.e., slug tests) will be performed on select monitoring wells to evaluate the horizontal hydraulic conductivity of the adjacent formation. Rising and/or falling head slug tests will be conducted and the data generated will be input into AQTESOLV® software for hydraulic conductivity calculations using analytical solutions appropriate for the hydrogeologic conditions.

1.5 Continuous Water Level Monitoring

Continuous monitoring of water levels will be conducted within select monitoring wells and a staff gauge installed in the adjacent Saw Mill River. The monitoring will be conducted with pressure transducers equipped with automatic data loggers (e.g., In-Situ Level TROLL®). The automatic data loggers will be set to record water levels from the pressure transduces every 15 minutes for approximately one week. A manual water level meter will also be used to measure water levels in the monitoring wells and the staff gauge at the beginning and end of continuous monitoring period. Hourly barometric pressure data and precipitation data for the monitoring period will be obtained from the National Oceanic and Atmospheric Administration (NOAA) meteorological measurement station located at Westchester County Airport. This station is located approximately nine miles from the Site and, thus, the data should be generally representative of Site conditions. Additionally, barometric pressure will be measured on-Site every 15 minutes using a pressure transducer and automatic data logger configured to measure and record barometric pressure (e.g., In-Situ BaroTROLL®). The continuous water level, barometric and precipitation data will be used to evaluate the degree to which changes in groundwater levels (and flow directions) are influenced by changes in the Saw Mill River.

1.6 Survey

Each of the five monitoring wells and the staff gauge installed as part of the GW data gap investigation activities will be surveyed. The survey will include location coordinates, ground surface elevation, and in the case of the wells, top of casing elevation data. The elevation of a reference point on the staff gauge will also be surveyed. Coordinates will be referenced to the State Plane coordinate system for New York using the North American Datum of 1983 (NAD 1983) in units of feet. Elevations will be referenced to the National Geodetic Vertical Datum (NGVD) of 1929 in units of feet. The survey will be performed by a New York licensed surveyor.

1.7 Investigation-Derived Waste

Investigation-derived waste (IDW) generated during the GW data gap investigation activities will include soil cuttings, development water, equipment decontamination water, purge water, disposable sampling equipment, and personal protective equipment (PPE). The waste will be containerized in DOT approved, 55-gallon drums, which will be labeled to identify their contents and temporarily staged on site. The appropriate treatment/disposal will be arranged based on the characterization of the waste streams.

2. Data Evaluation and Reporting

Laboratory results for the soil and groundwater samples will be forwarded to a qualified data validator for preparation of a Data Usability Summary Report (DUSR) in accordance with DER-10 Appendix 2B, Guidance for Data Deliverables and the Development of Data Usability Summary Reports. The DUSR will present a summary of data usability, including a discussion of qualified and rejected data and provide recommendations for resampling/reanalysis, as applicable.

A report of the Groundwater Data Gap Investigation will be provided to the NYSDEC. The report will include the following:

- Soil boring logs and well construction diagrams for the three newly-installed monitoring wells;
- Data generated during the Groundwater Data Gap Investigation in EQuIS™ compatible format;
- DUSR and tabular and graphic summaries of the analytical results;
- Updated site plan depicting sampling locations and previous investigation locations;
- Figures (hydrographs) presenting the continuous water level monitoring data;
- Maps of groundwater elevations and interpreted flow directions;
- Hydrogeologic cross-sections depicting subsurface conditions;
- Conclusions regarding groundwater conditions at the downgradient Site boundaries;

- Conclusions regarding natural attenuation and the potential for MNA to be a part of the Site remedy; and
- Recommendations for continued groundwater monitoring.

Schedule

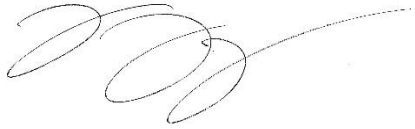
Following NYSDEC review and approval of this Groundwater Data Gap Investigation work plan, field activities will be initiated within approximately two weeks.

It is anticipated that approximately one month will be required to conduct the field activities described in this work plan through completion of: monitoring well installations; well development; slug testing; continuous water level monitoring and the round of groundwater sampling. The laboratory analyses and the DUSR are expected to be complete within approximately four weeks of completion of the round of groundwater sampling and submittal of the report of the Groundwater Data Gap Investigation will follow as soon as possible.

Please contact me to discuss any comments so that we can address them promptly.

Very truly yours,

Brown and Caldwell Associates



Brian F. Taylor, P.G.
Hydrogeologist/Project Manager

cc: D. Dunn, EAG
F. Williams, BC

Attachments (1)

1. Attachment A: Figures 1 and 2

Attachment A: Figures 1 and 2

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FIGURE 1
SITE LOCATION
ENVIROANALYTICS GROUP LLC
FORMER AKZO NOBEL PILOT PLANT

0 1,400 2,800
Feet

2/26/2019

Author: BFTaylor Path: P:\GIS\ELT\Ardsley\Site_Location.mxd

2/26/2019

Author: BFTaylor Path: P:\GIS\ELT\Ardsley\Site_Plan.mxd

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FIGURE 2
PROPOSED GROUNDWATER DATA GAP INVESTIGATION SAMPLE LOCATIONS
ENVIROANALYTICS GROUP LLC
FORMER AKZO NOBEL PILOT PLANT

0 60 120
Feet