UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

August 26, 2015

Ms. Peggy Williams
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, Maryland 21230

Re: Generals Highway Sanitary Landfill, Site Inspection Report
SEMS I.D. No. MDN000306755
State I.D. No. MD-599; SSID: A3SR

Dear Ms. Williams:

The United States Environmental Protection Agency ("EPA") Region III Office has reviewed the Site Inspection Report ("SI") that was prepared for Generals Highway Sanitary Landfill, located in Crownsville, Anne Arundel County, Maryland. The document was received on or about January 22, 2015. The findings of this report have the potential to support the conclusion that no further federal action is needed, based on the current land use and the soil and surface water pathways that were evaluated. However, EPA finds that without groundwater sampling data, the pathway is incomplete and must be evaluated (given the presence of two known private drinking water wells in close proximity north of the landfill) before making a Remedial Site Assessment Decision (RSAD).

Based on the presumed depth to groundwater at the two residential wells (marked PW-1 and PW-2 on Figure 15 of the site inspection report) north of the site and the types of contaminants detected in other media samples, the likelihood of a release of hazardous substances to groundwater may be low. However, sample data is needed to support this assumption. In order to complete an evaluation of the groundwater pathway, EPA feels that it is appropriate to collect water samples from the two private drinking water wells located north of the landfill to determine if any contaminants attributable to the landfill may have impacted those wells.

The report indicates there are 404 domestic wells located within .50 miles of the site and at least two public wells within that same radius, downgradient of the site. Locating several of the nearest downgradient domestic wells in that .50 mile radius, determining the potential for those wells to receive contaminants that may be migrating from the site, and obtaining water samples from those locations would also be appropriate. EPA can assist in obtaining access to these properties and collecting the samples, if needed.

Upon receipt of a revised SI report that includes a narrative discussion of the potential impact on the migration of contaminants to the groundwater pathway and the supporting sampling data, EPA will proceed with making a formal RSAD for Generals Highway Sanitary Landfill. If you have any questions or concerns about this matter, you may reach me at 215-814-3354 or by email at vitello.joseph@epa.gov.

Sincerely,

Joseph Vitello, Site Assessment Manager
Site Assessment/Non-NPL Federal Facilities Branch

SITE INSPECTION
of the
Generals Highway Sanitary Landfill (MD-599)

Crownsville, Anne Arundel County, Maryland

January 2015

Volume I

Prepared by: Maryland Department of the Environment
Land Management Administration
1800 Washington Boulevard
Baltimore, MD 21230

Prepared for: U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103-2029

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1.0 INTRODUCTION

1.1 Authorization

This Site Inspection (SI) was performed by the Maryland Department of the Environment, Land Management Administration, Land Restoration Program (MDE) under a Cooperative Agreement with the U.S. Environmental Protection Agency (EPA).

1.2 Scope of Work

The MDE's Federal Assessment and Remediation Division performed an SI of the Generals Highway Sanitary Landfill Site (GH), EPA identification number MDN000306755. The purpose of this SI is to determine if former use of the site as an unregulated landfill has contaminated soil, groundwater, surface water or sediment to the level where it is a threat to human health or the environment. The scope of this SI included reviewing the available file information, a target survey, site reconnaissance and sampling under the EPA Contract Laboratory Program (CLP).

1.3 Executive Summary and Conclusions

On June 3-5, 2014, MDE's Federal Assessment and Remediation Division performed exploratory test pitting and sampled soil, surface water, and sediment at the GH site.

Surface and subsurface soil samples were analyzed for VOCs (in subsurface only), SVOCs, metals, pesticides, and PCBs. A subset of those samples was analyzed for chromium VI.

Surface water and sediment samples were analyzed for VOCs, SVOCs, total metals, dissolved metals (for water samples), pesticides and PCBs.

Sampling results confirm some impact from historical disposal activity, as indicated by the presence of low levels of organic solvents in the soil and surface water, and low levels of PCBs and hexavalent chromium in the soil. Metals levels were consistently elevated in both the surface and subsurface soil, including for arsenic, chromium, chromium VI, iron, and vanadium.

A toxicological evaluation was performed on the analytical results. The evaluation determined that the incidental ingestion of contaminated soils and sediments at the site exceeded MDE and EPA risk levels for child resident populations. Two surface water contaminants exceeded the Ambient Water Quality Standards (AWQS) or Ambient Water Quality Criteria (AWQC) for the protection of aquatic life (acute or chronic) and one contaminant exceeded the recommended AWQC for the protection of human health via fish consumption (Appendix B).

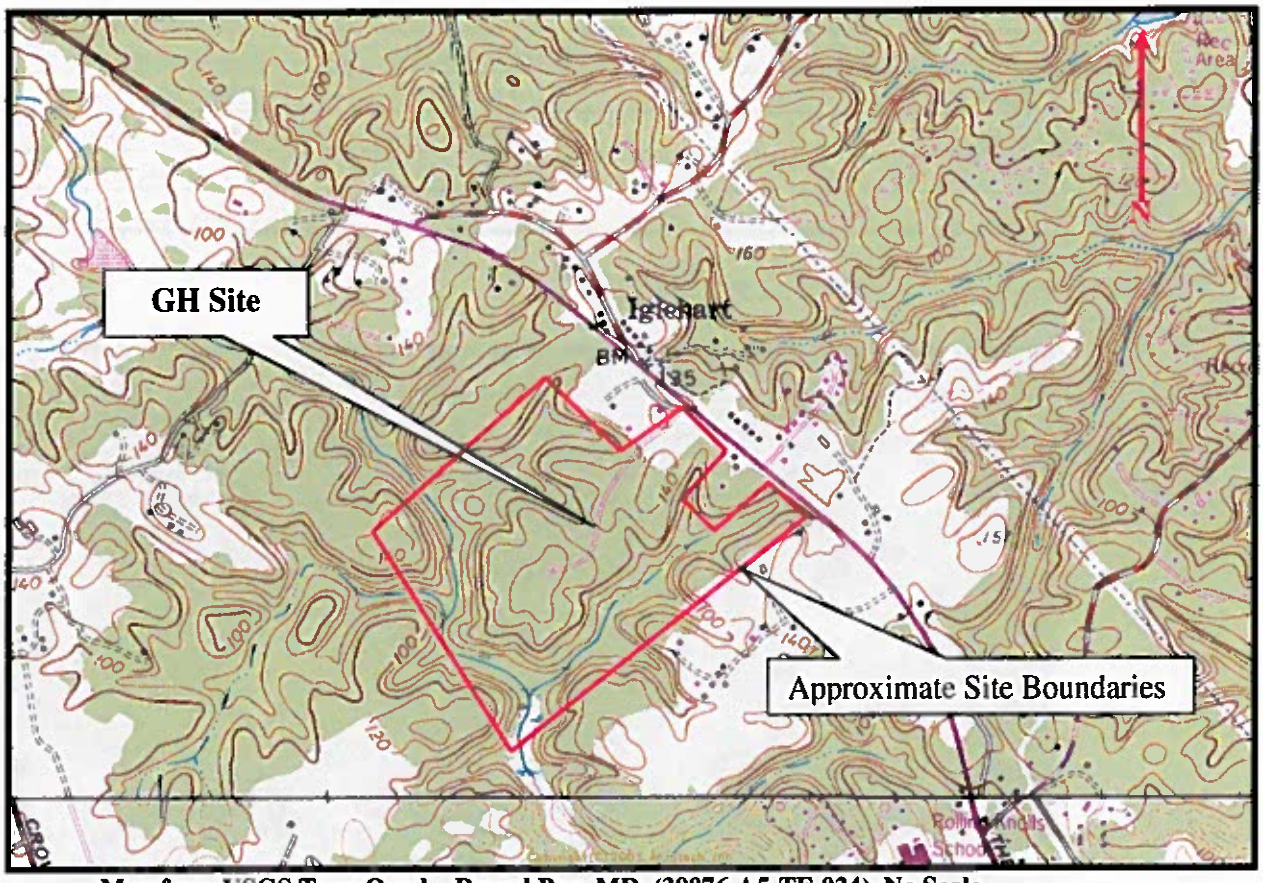
Areas adjacent and partially on the site are currently being proposed as part of a residential development, with the landfill portion being proposed as an open space/natural area.

Based on the relatively low levels of contaminants found during this sampling investigation, MDE recommends that the site does not warrant further federal action at this time and that the site be designated No Further Remedial Action Planned by EPA. However, MDE will recommend to the property owner to place an Environmental Covenant on the deed to restrict future use of the property and its groundwater.

2.0 SITE DESCRIPTION

The site consists of approximately 95-acres of undeveloped property located south of and adjacent to Generals Highway in Crownsville, Anne Arundel County, MD. The site is listed on the Anne Arundel County tax map 44 parcel 48 and is situated at 39.007456 degrees north latitude and -76.569105 degrees west longitude (center of site). The site sits on a topographic high that slopes down to the west, south and east to streams that are tributaries of the North Basin, a reservoir formerly used by the City of Annapolis as a public water supply and from there to Broad Creek, a tributary of South River (Figure 1). The topographical elevation difference between the top of the hill to the stream valleys is approximately 100 feet. The property is wooded except for the central portion which is vegetated in grasses and shrubs (Photos 2, 5, 6, and 7). This grassy area is on the topographic high of the site and contains some random piles of rubbish along with some abandoned vehicles and motor homes (Photos 12 and 14). It is also the area where trash was buried. There is a gate at the entrance of the site which limits vehicle access but does not prevent someone from walking onto the site (Photo 1).

Figure 1: Site Topography



Map from USGS Topo Quad – Round Bay, MD (39076-A5-TF-024) No Scale

2.1 Site Ownership and Use

Property records for the site have been searched back to 1903. In 1903 John Reid bought the property from Harry Elliot. In 1933 the property was sold to Henry and Lilian Wilking through Benjamin Wilkinson an executor of John Reid's estate. In 1944 the property was sold to Rudolphus and Rosa Johnson. In 1992 the property was inherited in its entirety by Rosa Johnson.

It is not known what the property was used for before the Johnson ownership. The photograph from 1959 shows the site with some cleared areas with vehicles stored in the eastern edge of the central cleared area (Figure 2). In the 1970 photograph the vehicles are gone but there are roads/trails added to the southern section of the site (Figure 3). The 1977 photograph shows a major increase in the cleared area along with a sediment pond (Figure 4). There were vehicles stored in the southern woods of the site and behind the house at 1789 Generals Hwy. The 1984 and 1990 photographs show hundreds of vehicles stored on the surface of the site (Figures 5 and 6).

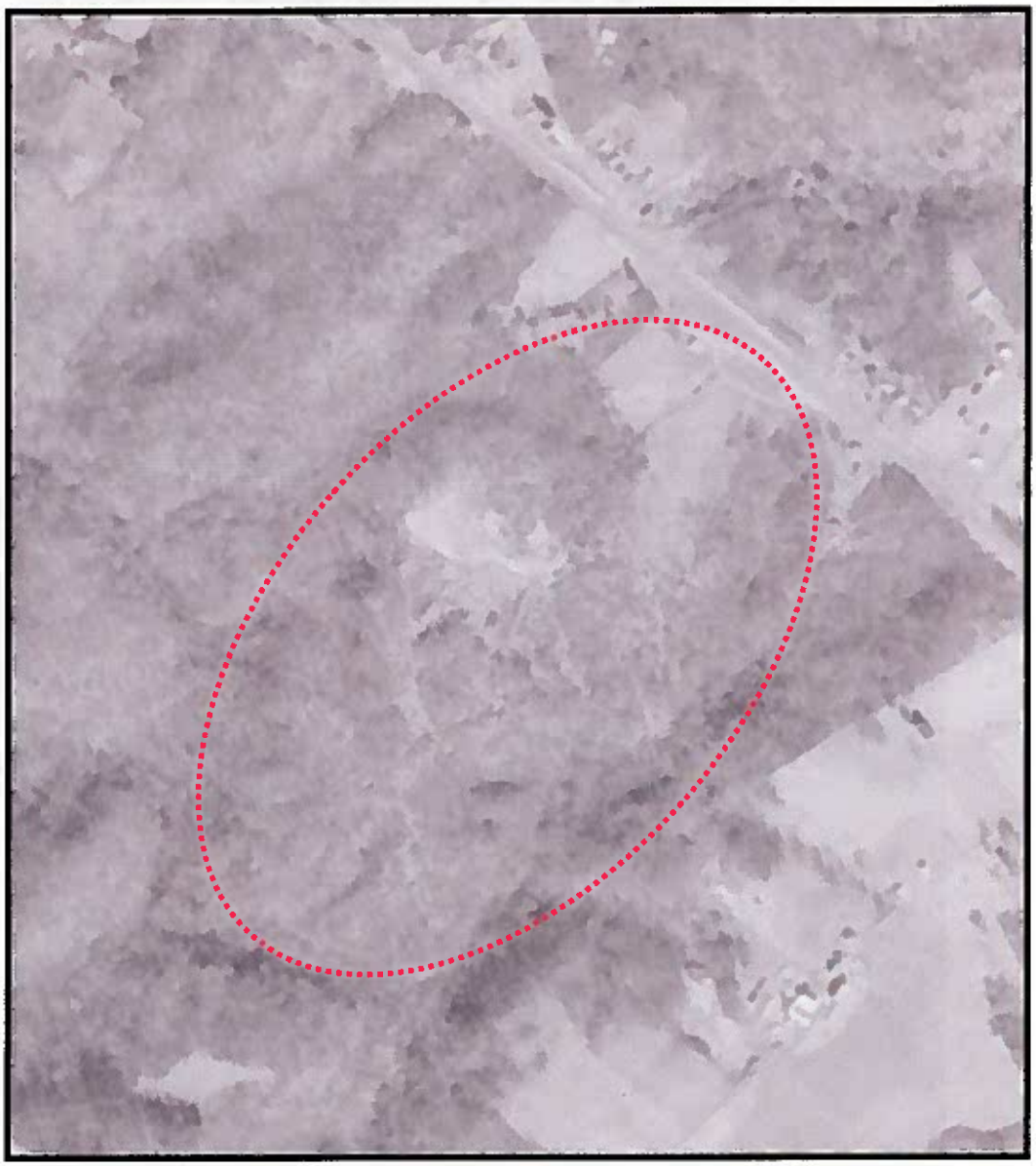
Table 1: Property Ownership History

Owner	Date Aquired	Documentation
Rosa V. Johnson	12/9/1992	Liber 5904, f. 4
Rudolphus & Rosa V. Johnson	6/24/1944	Liber 308, f. 300
Henry & Lilian Wilking	12/9/1933	Liber 119, f. 9
John Reid	7/28/1903	Liber 33, f. 92

Figure 2: 1959 Aerial Photograph

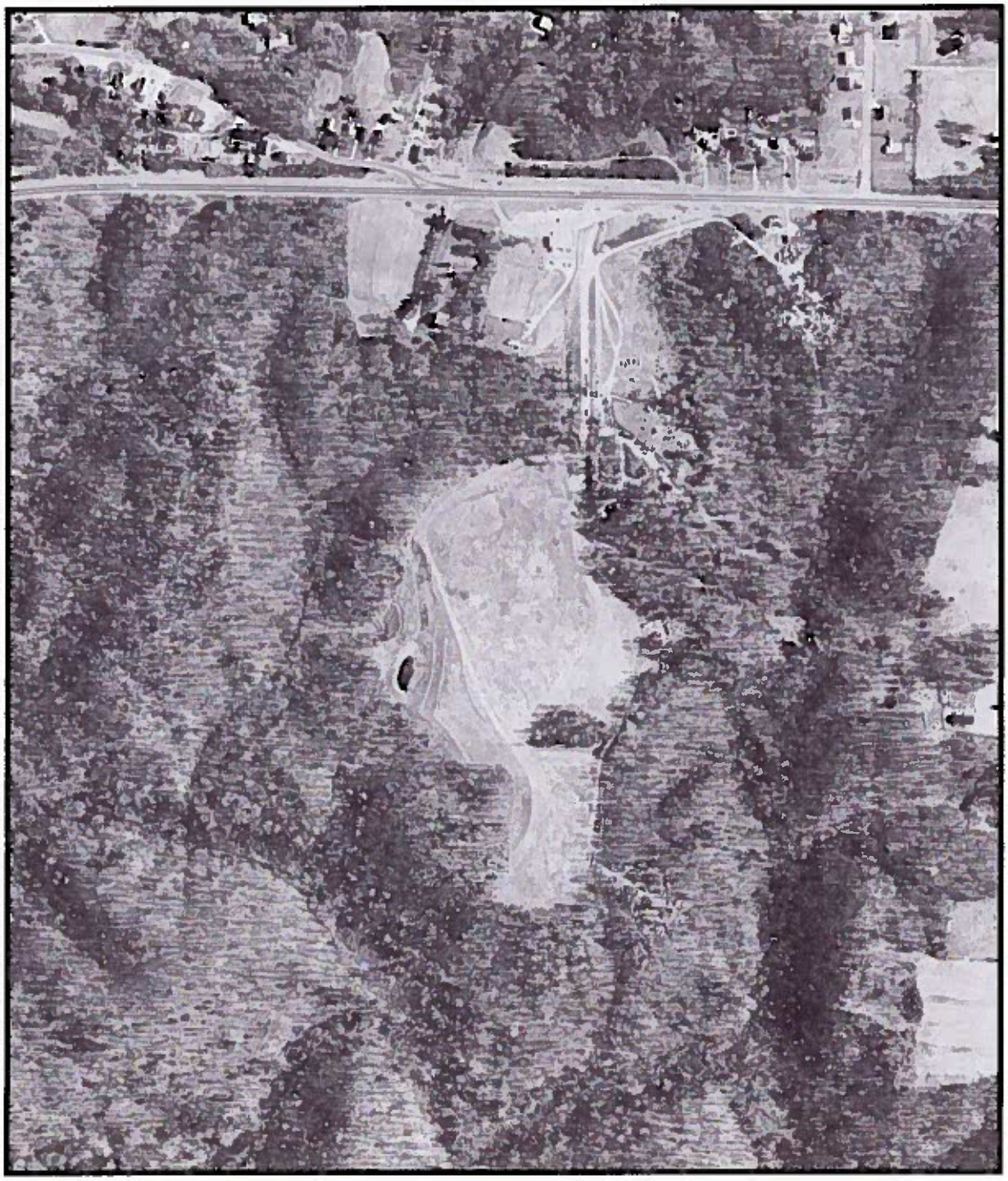
Photographic analysis of the areal photograph indicated that there are vehicles lined up around the central cleared area and some dumping has occurred along the entrance road.

Figure 3: 1970 Aerial Photograph



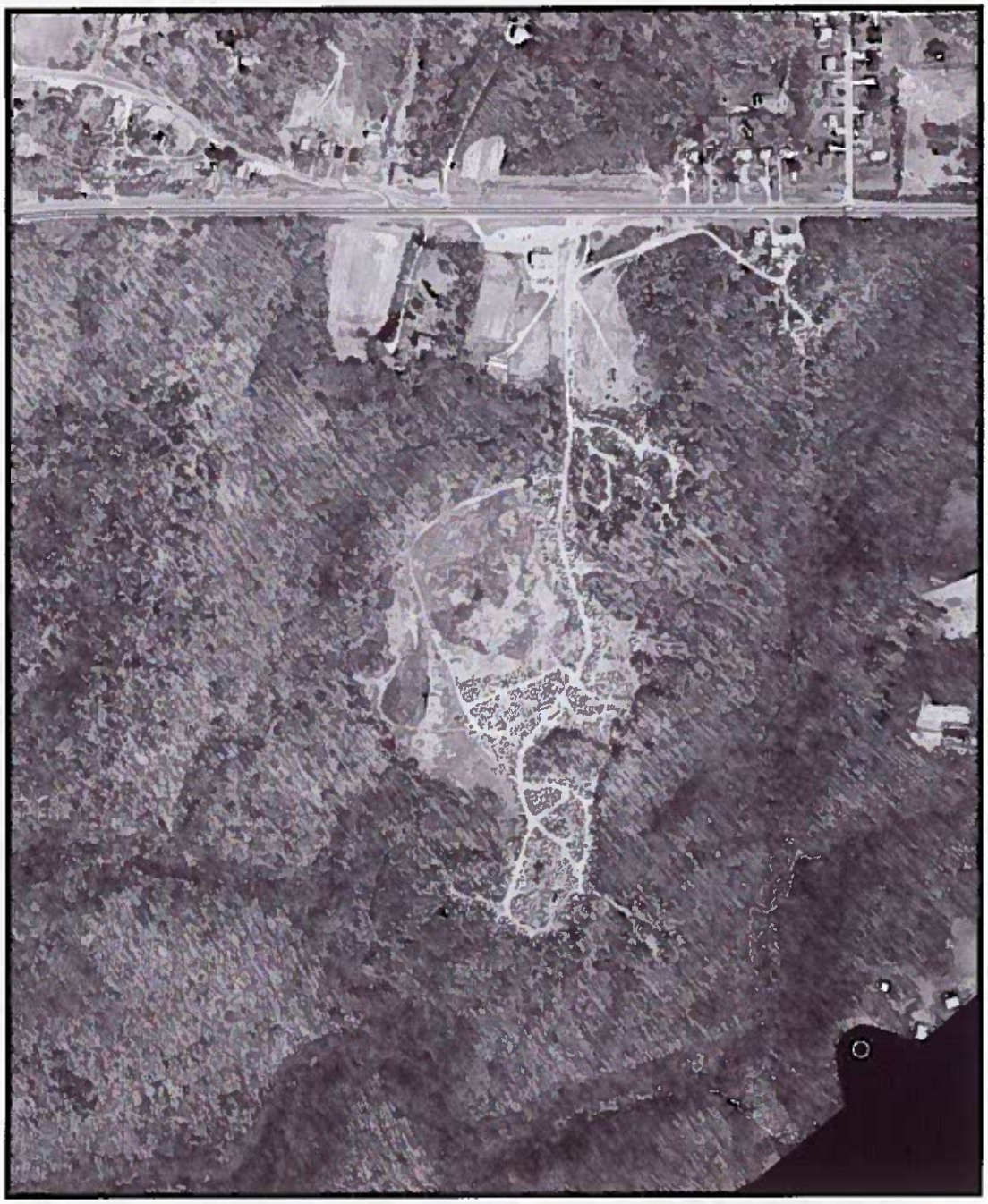
No more vehicles observed on the site. There are trails in the southern portion of the site.

Figure 4: 1977 Aerial Photograph



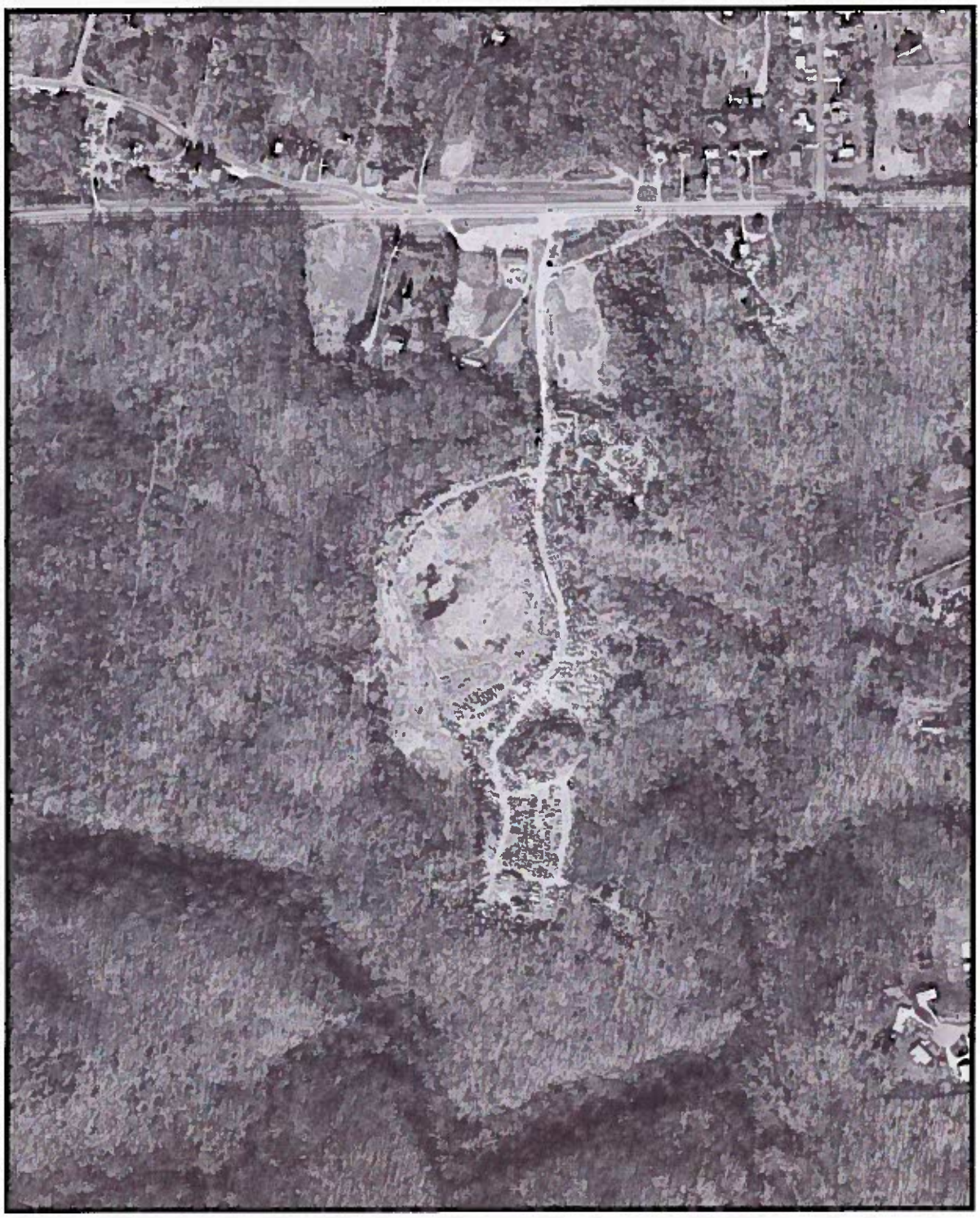
Note the sediment pond on western edge of site and vehicles in the woods in the SE section of the site and behind the house at 1789 Generals Hwy.

Figure 5: 1984 Aerial Photograph



Vehicles stored along entrance road and southern section of site

Figure 6: 1990 Aerial Photograph



More vehicles stored along roads, woods and open areas of site.

2.2 Permitting and Regulatory Actions

There are no known permits or regulatory actions pertaining to this site.

2.3 Remedial Actions

There are no records in the MDE archives of remedial actions taken at the GH site.

3.0 ENVIRONMENTAL SETTING

3.1 Water Supply

The groundwater pathway assessment addresses hazardous substance migration to and within aquifers and potential threats to targets such as drinking water supplies. The target population is the human population associated with the site and/or its targets. The target distance limit for groundwater is a four-mile radius around the site.

The majority of the population within a four-mile radius of the GH site relies on domestic wells for their water supply. The property is adjacent to land owned by the City of Annapolis that was used as a buffer along a tributary of North Basin which is located just southeast of the site. The North Basin was a part of the water supply system for the City before the City installed several large capacity wells on the property which now supplies public water to city residents. The wells are protected by a Wellhead Protection Area that is one-half a mile southeast of the site (Figure 9).

There are 5 industrial, 1 farm, 1 geothermal and 404 domestic drinking water wells within ½ mile of the site. The closest domestic wells are located at the Ram's Head Roadhouse and the residence at 1789 Generals Highway, both approximately 1500 feet away from the center of the dump. There are 2,051 domestic wells within four miles of the site (Table 2).

Table 2: Well Summary

	Well Use							
Distance from Site	**Domestic**	**Farm**	**Industrial**	**Test**	**Monitoring**	**Geothermal**	**Public**	**Total**
0 to 1/2 Mile	404	1	5	4	0	1	0	415
1/2 to 1 Mile	133	1	13	6	0	1	2	156
1 to 2 Miles	371	2	16	198	0	5	3	595
2 to 3 Miles	546	4	19	72	0	1	0	642
3 to 4 Miles	597	8	17	30	0	2	2	656
Total	2051	16	70	310	0	10	7	2464

3.2 Surface Waters

The surface water pathway addresses hazardous substance migration to surface water bodies, drinking water supplies, the human food chain and sensitive environments. The target population consists of those people who use surface water for drinking water or consume food chain species from target fisheries. The target distance limit (TDL) for the surface water pathway is 15 miles downstream from the probable point of entry (PPE).

The site is located adjacent to a tributary of the North Basin and Broad Creek which is a tributary of South River. At less than a mile downstream from the site (0.87 miles) the tributary enters the North Basin. The North Basin is a reservoir that was formerly used as the water supply for the City of Annapolis. There are no longer any active water intakes in the reservoir as the City now gets its water from two large capacity wells located on the reservoir property. After water leaves the reservoir it flows southward through Broad Creek (1.89 miles) to the South River (3.36 miles) which is a tidal tributary of the Chesapeake Bay. The 15 mile target distance extends all of the way out of South River and into the Chesapeake Bay to a location south of West River off shore of the Shady Side community. There are no water intakes along the 15 mile TDL.

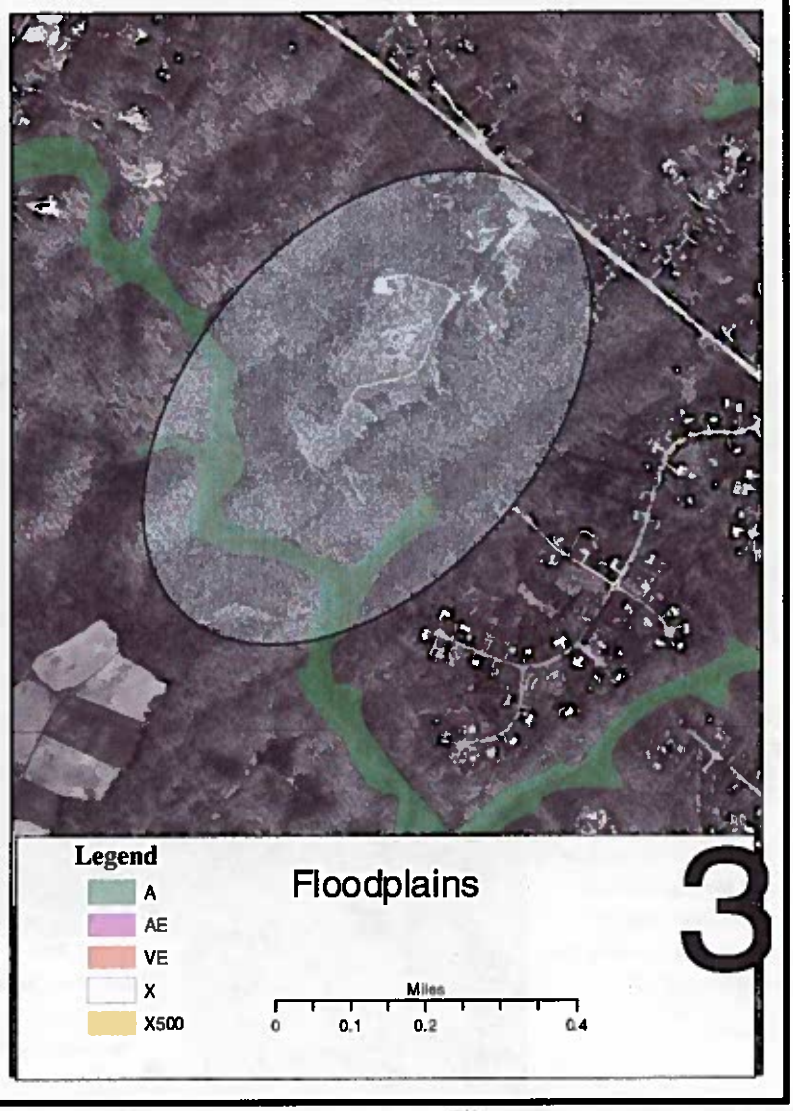
3.3 Wetlands and Floodplains

There are wetlands and floodplains located in the northwestern/western edge of the site in the valley that carries the stream that feeds the North Basin reservoir (Photos 32, 33 and 34). Wetlands in the stream valley are classified as "Freshwater Emergent Wetlands" and extend down to the basin (Figure 8). The 100-year floodplain is located within the same stream valley and extends beyond the wetland boundaries but not beyond the bottom of the stream valley (Figure 7). The stream valley runs along just south of the property line and then south/southeastward toward the basin with a tributary that is located southeast of the property. There is an approximate 100 foot elevation differential between the top of the hill and the stream valleys.

3.4 Well Head Protection Areas

The GH site is approximately ½ mile from Well Head Protection Areas located west and south of the property (Figure 9).

Figure 7: Floodplain Map of the Vicinity



From MDE GIS Files

A = 100 Year Flood, no base flood elevation determined
AE = 100 Year Flood, base elevation determined
VE = Coastal Flood with velocity hazard; base flood elevations determined
X = 500 Year Flood
X500 = Areas outside of the 500 Year Flood Plain

Figure 8: Wetlands in the Vicinity

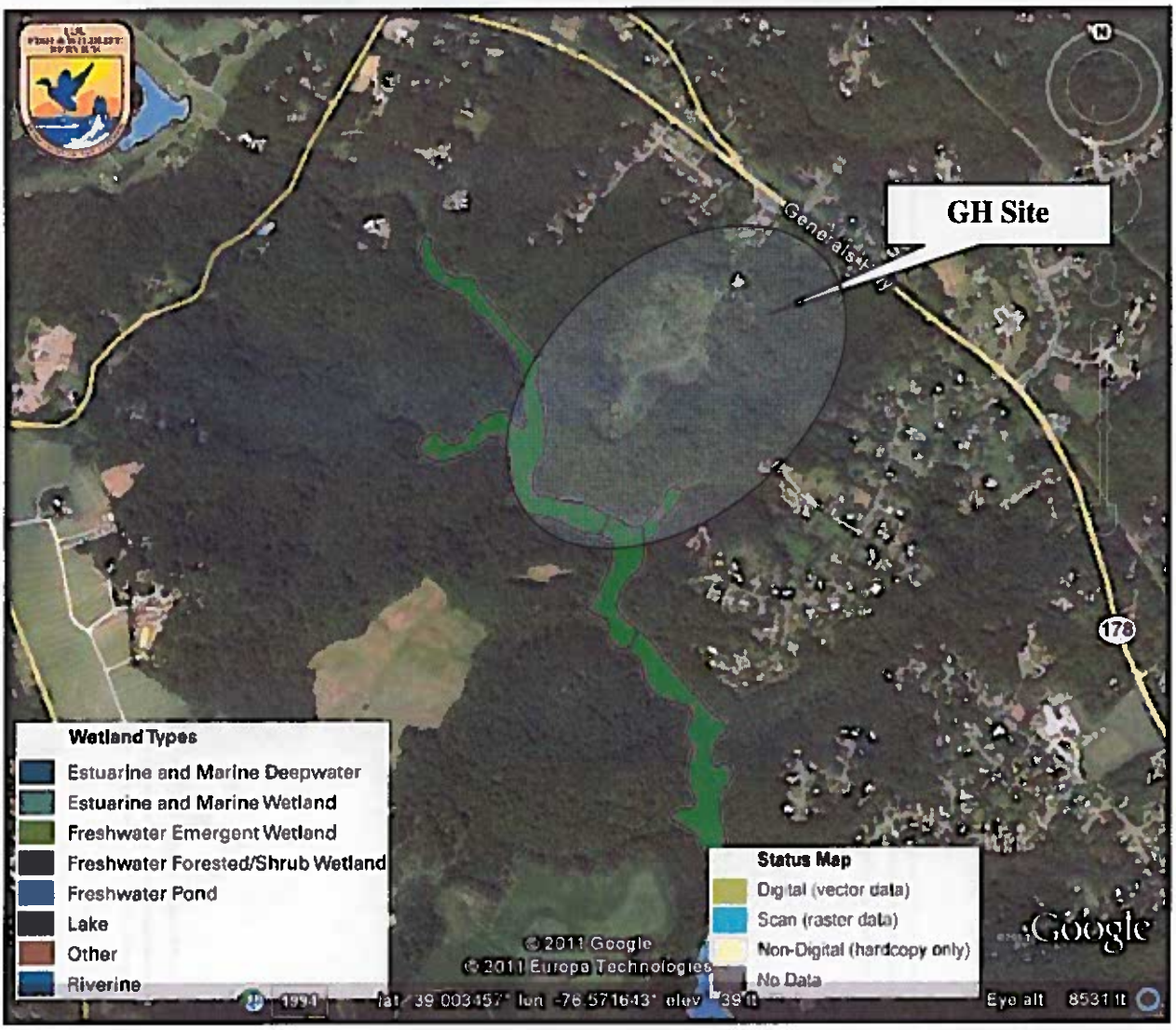
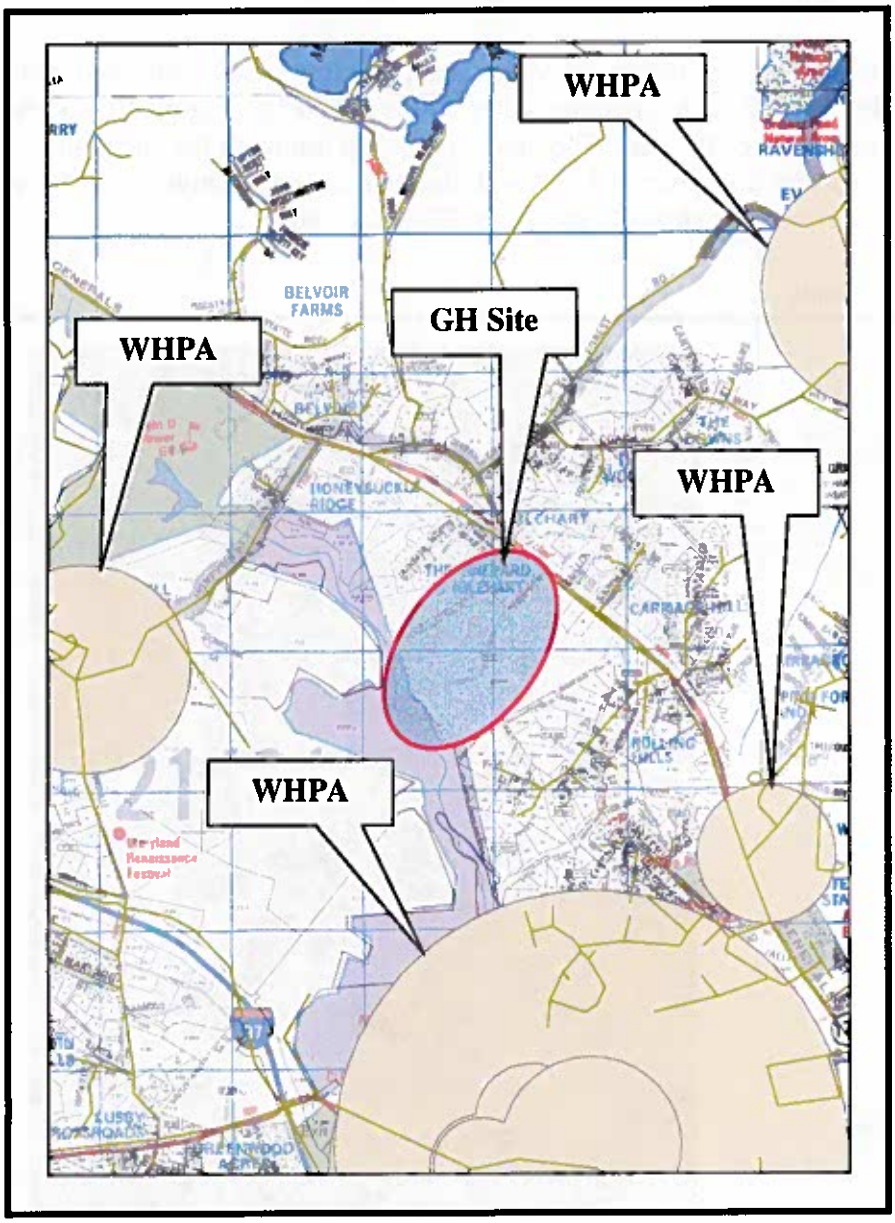


Figure 9: Well Head Protection Areas



From MDE GIS Files – No Scale

3.5 Soils

Soils on the site are primarily the Annapolis fine sandy loam (As) which is described as a well drained soil with moderate water holding capacity (Figure 10). These soils cover approximately 80% of the site. The other soil group found on the site is the Collington-Wist complex (Co) which is described as a well drained soil with a high available water capacity. These soils cover approximately the other 20% of the site.

Figure 10: Soils

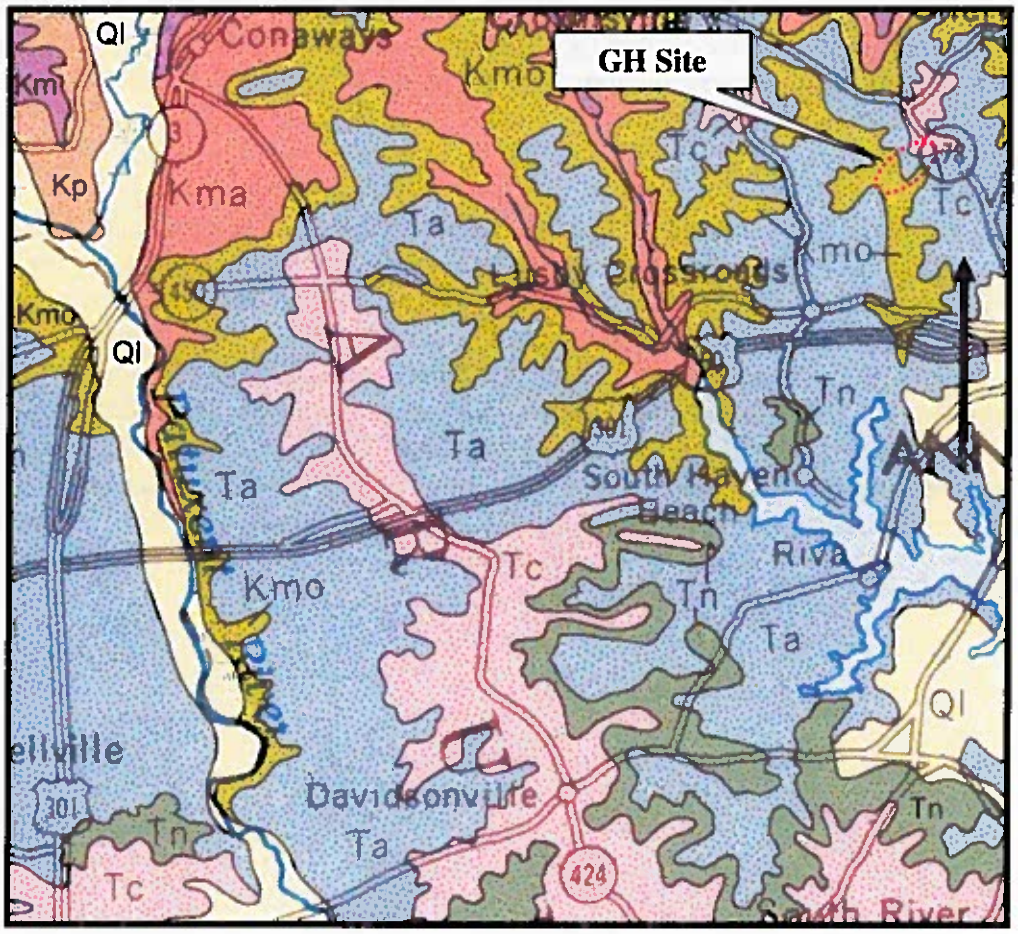
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AsC	Annapolis fine sandy loam, 5 to 10 percent slopes	23.7	12.2%
AsE	Annapolis fine sandy loam, 15 to 25 percent slopes	7.7	4.0%
AsF	Annapolis fine sandy loam, 25 to 40 percent slopes	103.1	53.1%

3.6 Geology and Groundwater

The site is located in the Atlantic Coastal Plain physiographic province. The Coastal Plain consists of a series of unconsolidated formations that dip and thicken to the southeast. The site lies over portions of three formations including the Calvert formation, the Aquia formation and the Monmouth formation which are described in the legend accompanying the Geologic Map (Figure 11).

Due to the topography of the site, the water table is located very deep beneath the surface of the hilltop area and is likely located within the Aquia formation just above the elevation of the stream valleys. The Aquia formation contains an aquifer that is extensively used for water supplies in Anne Arundel County where it is confined. Nearby wells are drilled to the 250 to 300 foot depth range and are screened in the Magothy formation. The formations between the Magothy and the Aquia formations contain significant amounts of clayey material and may act as aquitards. The streams located west, south and east of the site likely receive inflow from the unconfined aquifer in the Aquia formation and act as groundwater divides limiting the horizontal extent of potentially contaminated groundwater.

Figure 11: Geologic Map of Central Anne Arundel County, MD



MGS 1968 No Scale

Geologic Map Legend

Calvert Formation Tc

Plum Point Marls Member: Interbedded dark green to dark bluish-gray, fine-grained argillaceous sand and sandy clay; contains prominent shell beds and locally silica-cemented sandstones. Fairhaven Member: Greenish-blue diatomaceous clay, weathers to pale gray; pale brown to white, fine-grained argillaceous sand and greenish-blue sandy clay; total thickness 0 to 150 feet.

Aquia Formation Ta

Dark green to gray-green, argillaceous, highly glauconitic, well sorted fine- to medium-grained sand; locally indurated shell beds; thickness 0 to 100 feet.

Monmouth Formation Kmo

Dark gray to reddish-brown, micaceous, glauconitic, argillaceous, fine- to coarse-grained sand; basal gravel in Prince Georges County; thickness 0 to 100 feet.

3.7 Meteorology

Summers are warm and sometimes humid and the winters are mild. Especially pleasant weather prevails in the spring and autumn. The coldest weather occurs in late January and early February, with an average daily maximum temperature of 7 °C (45 °F) and an average daily minimum of –2 °C (28 °F). The warmest weather occurs in late July, when daily high temperatures commonly exceed 30 °C (86 °F). There are no well-defined wet and dry seasons. Snowfall is not common, and averages only about 43cm (17 inches) per winter season. During the summer, showers are frequent. Thunderstorms occur on about one of every five days.

Prevailing winds in the Baltimore/Washington area are from a west-northwest direction at 7 miles per hour with a slight seasonal variation. Winds are more from the northwest in the winter and from the southwest in the summer. Coastal storms may produce heavy rain in the warmer months and heavy snow in the colder months in addition to high winds and coastal flooding. Thunderstorms may become severe and produce heavy rains, high winds, and hail. Precipitation is evenly distributed throughout the year (Figure 13). Normal yearly precipitation is 42 to 44 inches with an annual snowfall of 21.6 inches. July is the wettest month with 4.18 inches of precipitation, and April is the driest month with a normal precipitation of 3.06 inches. The 2-year 24- hour rainfall is 3.5 inches (Figure 12).

Figure 12: 2-Year 24-Hour Rainfall

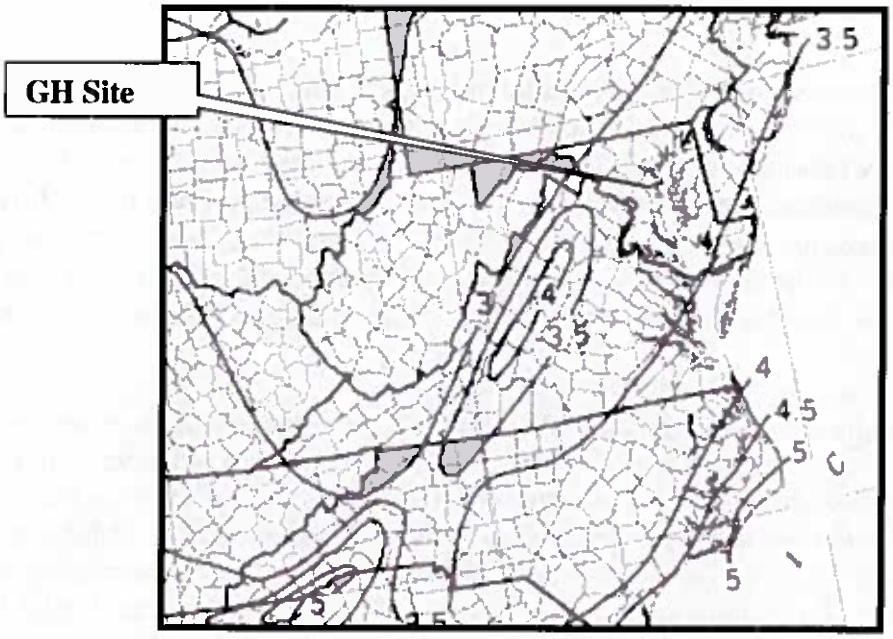
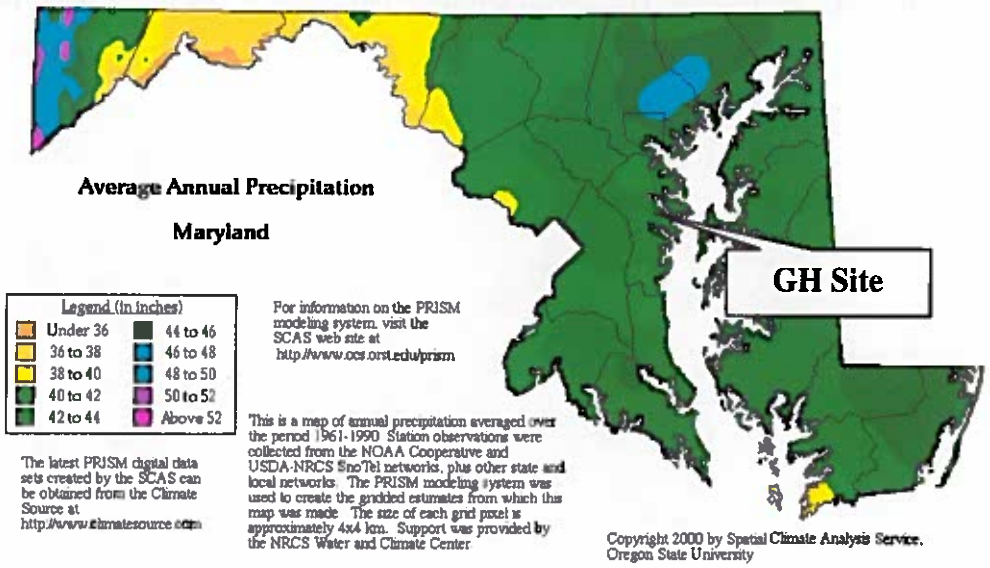


Figure 13: Average Annual Precipitation



3.8 Nearby Population Distribution and Land Use

The target distance limit for the soil exposure pathway is 200 feet for resident population and one mile for the nearby population (Figure 14). Approximately 1,674 people live within a mile of the site (See Table 3). The pathway for soil exposure accounts for the potential threat to people on or near the site who may come into contact with exposed materials and areas of suspect contamination. This includes both ingestion and dermal exposure.

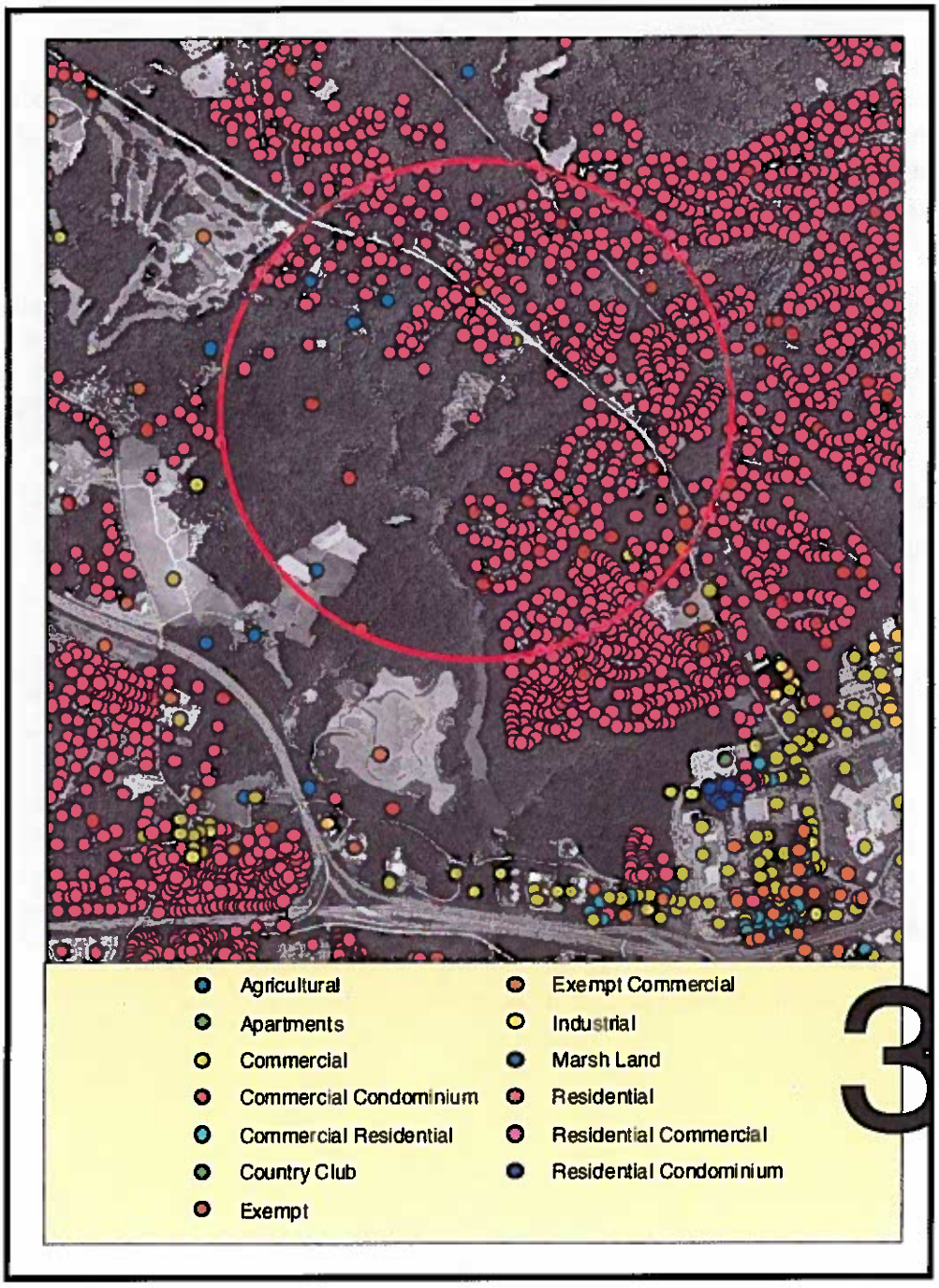
The site is located adjacent to housing developments on the east and west sides and a golf course further to the west. The City of Annapolis owns the property to the south and it is part of the water supply watershed for the stream feeding North Basin. There is a gate blocking vehicular traffic onto the site but the site is not fenced and can be easily accessed by foot.

Table 3: Population within four miles of the site

Ring Distance from the Site (Miles)	Estimated Population
0 – 0.25	343
0.25 – 0.50	511
0.50 – 1	1674
1 – 2	6562
2 – 3	13,626
3 - 4	22,532
TOTAL	**45,248**

The land use within ¼ -mile of the site is shown in Figure 14.

Figure 14: Land Use Within ¼-Mile Radius of the Site



4.0 WASTE DESCRIPTION

The site was the location of an unpermitted landfill which accepted unregulated waste. Test pits have revealed general household and commercial waste products (Photos 9, 10 and 11). The site was also used as a storage area for hundreds of junked vehicles with the potential to have leaked oils, fuels and other liquid wastes associated with motor vehicles. There were also complaints from local citizens that drums of potentially hazardous wastes were dumped and buried on the site.

5.0 PREVIOUS STUDIES

In September of 2011 a Preliminary Assessment (PA) of the site was conducted by MDE. The PA concluded that since the site was located within the Aquia aquifer, which is an extensively used aquifer for wells in the area and located near recreational and residential properties, the site should be further investigated. The site is also under consideration for residential development and a private entity has performed Phase I and Phase II Environmental Site Assessments on the property. Those assessments have not been made available to the MDE.

6.0 MDE CONTRACT LABORATORY PROGRAM (CLP) SAMPLING

EPA Region III approved the SI Sampling and Analysis Plan on December 12, 2013. Sampling was conducted on June 4 and 5, 2014 in accordance with the plan and the procedures outlined in EPA's CLP Routine Analytical Services Case Number 44339 and MDE's Standard Operating Procedures document.

The scope of this SI is to investigate the GH site to determine whether contamination from waste disposal activities is present at the site. Samples were collected and submitted for analysis in accordance with the CLP Routine Analytical Services. Samples collected for this SI were analyzed for Target Analyte List (TAL) inorganics, and hexavalent chromium (in selected samples), Target Compound List (TCL) VOCs, PCBs/Pesticides and SVOCs. The samples were collected in several sample matrices: (1) organic aqueous, (2) inorganic aqueous (3) dissolved aqueous (4) organic solid and (5) inorganic solid. CLP protocol was followed throughout the sample collection and submittal process (U.S. EPA, "CLP Guidance for Field Samplers" January 2011). The quality control used by MDE includes the submittal of a field duplicate for each matrix, as defined above. In addition, an aqueous matrix spike sample was collected at specified additional volumes for CLP matrix spike quality control procedures.

Table 4 summarizes the sampling rationale used in this study. Groundwater samples are designated as GW-#, soil samples are designated as S-# (surface sample), SS-# (subsurface sample), SW-# (surface water sample), and Sed-# (sediment sample). Figure 15 shows the approximate sampling locations.

Table 4: Sampling Summary

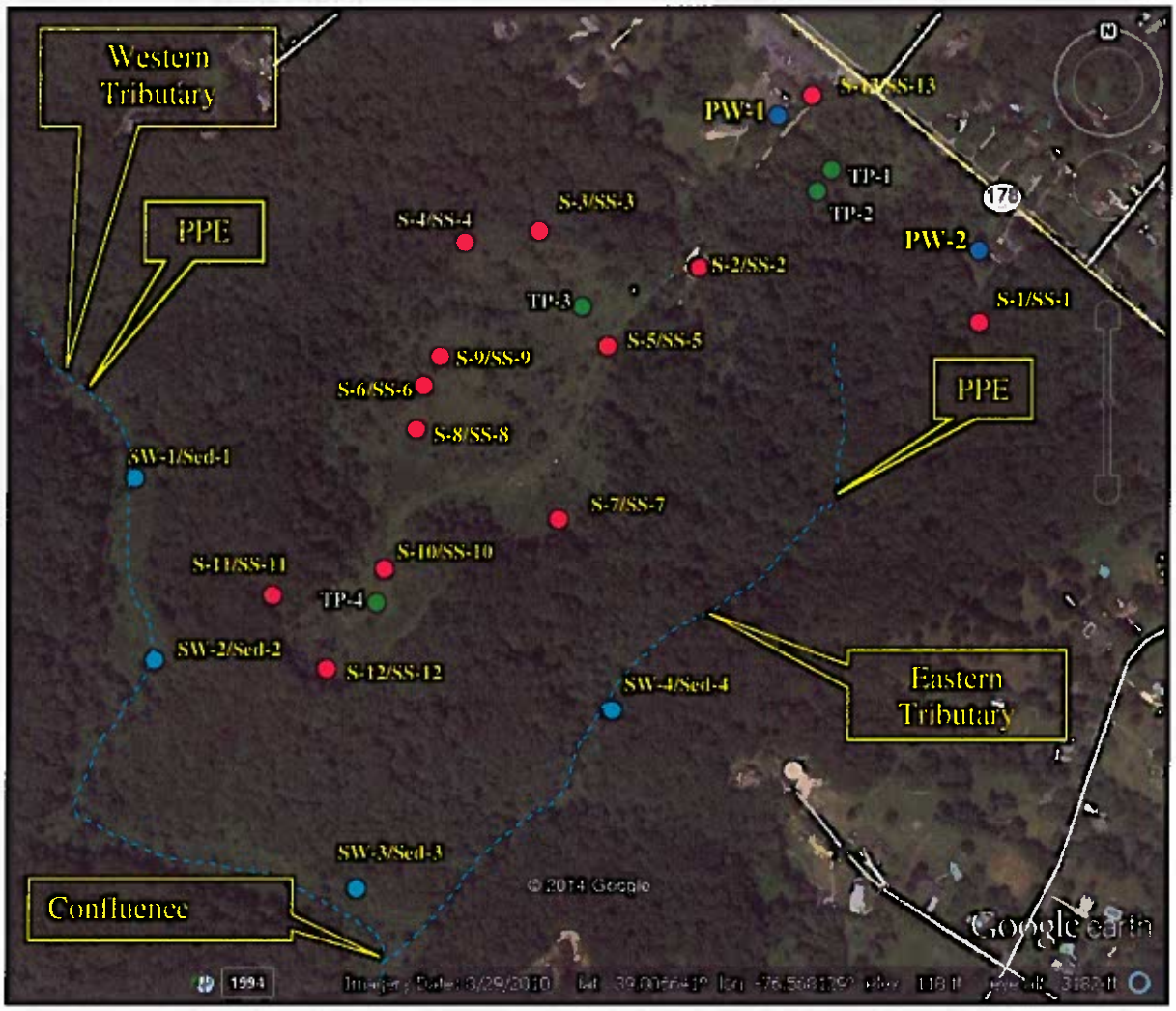
Sample Identification	Sample Type	Sample Location	Rationale	Parameters
S-1	Solid	Back yard at 1789 Generals Highway 39.008370° N -76.563990° W	Determine if soil is contaminated	TAL Metals, SVOCs, Pesticides/PCBs, Chromium VI
SS-1				TAL Metals, VOCs, SVOCs, Pesticides/PCBs,
S-2	Solid	Bare soil open area near entrance to site 39.008550° N -76.567010° W	Determine if soil is contaminated.	TAL Metals, SVOCs, Pesticides/PCBs
SS-2				TAL Metals, VOCs, SVOCs, Pesticides/PCBs, Chromium VI
S-3	Solid	Northwest corner of northern open area 39.008863° N -76.568611° W	Determine if soil is contaminated **MS/MSD**	TAL Metals, SVOCs, Pesticides/PCBs **Inorganic Spike**
SS-3				TAL Metals, VOCs, SVOCs, Pesticides/PCBs **Organic Spike**
S-4	Solid	Center of northern open area 39.008767° N -76.569483° W	Determine if soil is contaminated	TAL Metals, SVOCs, Pesticides/PCBs, Chromium VI
SS-4				TAL Metals, VOCs, SVOCs, Pesticides/PCBs
S-5	Solid	Eastern edge of northern open area 39.007530° N -76.568180° W	Determine if soil is contaminated	TAL Metals, SVOCs, Pesticides/PCBs
SS-5				TAL Metals, VOCs, SVOCs, Pesticides/PCBs, Chromium VI
S-6	Solid	Southwestern corner of northern open area 39.007561° N -76.569946° W	Determine if soil is contaminated **MS/MSD**	TAL Metals, SVOCs, Pesticides/PCBs, Chromium VI **Inorganic Spike**
SS-6			Determine if soil is contaminated	TAL Metals, VOCs, SVOCs, Pesticides/PCBs
S-7	Solid	Eastern edge of northern open area 39.006480° N -76.568550° W	Determine if soil is contaminated	TAL Metals, SVOCs, Pesticides/PCBs
SS-7				TAL Metals, VOCs, SVOCs, Pesticides/PCBs, Chromium VI
S-8	Solid	Middle of northern open area 39.007098° N -76.570014° W	Define contaminant	TAL Metals, SVOCs, Pesticides/PCBs
SS-8			Define contaminant	TAL Metals, VOCs, SVOCs, Pesticides/PCBs
S-9	Solid	Southern section of northern open area 39.007731° N -76.569807° W	Determine if soil is contaminated	TAL Metals, SVOCs, Pesticides/PCBs, Chromium VI
SS-9				TAL Metals, VOCs, SVOCs, Pesticides/PCBs
S-10	Solid	Middle of southern open area 39.006010° N -76.570310° W	Determine if soil is contaminated	TAL Metals, SVOCs, Pesticides/PCBs
SS-10				TAL Metals, VOCs, SVOCs, Pesticides/PCBs
S-11	Solid	Western woods where autos were stored 39.006000° N -76.571530° W	Determine if soil is contaminated	TAL Metals, SVOCs, Pesticides/PCBs
SS-11				TAL Metals, VOCs, SVOCs, Pesticides/PCBs
S-12	Solid	Southern section of open area 39.005417° N -76.571217° W	Determine if soil is contaminated **MS/MSD**	TAL Metals, SVOCs, Pesticides/PCBs **Inorganic Spike**
SS-12				TAL Metals, VOCs, SVOCs, Pesticides/PCBs **Organic Spike**

Sample Identification	Sample Type	Sample Location	Rationale	Parameters
S-13	Solid	Near site entrance 39.010030° N -76.565880° W	Background	TAL Metals, SVOCs, Pesticides/PCBs
SS-13				TAL Metals, VOCs, SVOCs, Pesticides/PCBs
S-14	Solid	**Duplicate of S-5**	**QA/QC**	TAL Metals, SVOCs, Pesticides/PCBs
SS-14		**Duplicate of SS-5**	**QA/QC**	TAL Metals, VOCs, SVOCs, Pesticides/PCBs, Chromium VI

Sample Identification	Sample Type	Sample Location	Rationale	Parameters
SW-1	Aqueous	Northernmost location in western tributary. 39.006850° N -76.573167° W	Determine if surface water is contaminated **MS/MSD**	TAL Metals, VOCs, SVOCs, Pesticides/PCBs **Organic Spike**
SW-2	Aqueous	Downstream of SW-1 39.005450° N -76.573100° W	Determine if surface water is contaminated **MS/MSD**	TAL Metals, VOCs, SVOCs, Pesticides/PCBs **Inorganic Spike**
SW-3	Aqueous	Downstream of site in western tributary. 39.003482° N -76.571304° W	Determine if surface water is contaminated **MS/MSD**	TAL Metals, VOCs, SVOCs, Pesticides/PCBs **Inorganic Spike**
SW-4	Aqueous	Eastern tributary 39.004800° N -76.568050° W	Determine if surface water is contaminated	TAL Metals, VOCs, SVOCs, Pesticides/PCBs
SW-5	Aqueous	Duplicate of SW-3	**QA/QC**	TAL Metals, VOCs, SVOCs, Pesticides/PCBs
DM-SW-1	Aqueous	Northernmost location in western tributary. 39.006850° N -76.573167° W.	Determine if surface water is contaminated	Dissolved TAL Metals
DM-SW-2	Aqueous	Downstream of SW-1 39.005450° N -76.573100° W	Determine if surface water is contaminated	Dissolved TAL Metals
DM-SW-3	Aqueous	Downstream of site in western tributary. 39.003482° N -76.571304° W	Determine if surface water is contaminated	Dissolved TAL Metals
DM-SW-4	Aqueous	Eastern tributary 39.004800° N -76.568050° W	Determine if surface water is contaminated	Dissolved TAL Metals
DM-SW-5	Aqueous	Duplicate of SW-3	**QA/QC**	Dissolved TAL Metals
Sed-1	Solid	At SW-1	Determine if stream sediments are contaminated **MS/MSD**	TAL Metals, VOCs, SVOCs, Pesticides/PCBs **Inorganic Spike**
Sed-2	Solid	At SW-2	Determine if stream sediments are contaminated **MS/MSD**	TAL Metals, VOCs, SVOCs, Pesticides/PCBs **Organic Spike**
Sed-3	Solid	At SW-3	Determine if stream sediments are contaminated	TAL Metals, VOCs, SVOCs, Pesticides/PCBs
Sed-4	Solid	At SW-4	Determine if stream sediments	TAL Metals, VOCs, SVOCs, Pesticides/PCBs

Sample Identification	Sample Type	Sample Location	Rationale	Parameters
			are contaminated	
Sed-5	Solid	Duplicate of Sed-3	QA/QC	TAL Metals, VOCs, SVOCs, Pesticides/PCBs
FB-1	Aqueous	N/A	QA/QC	TAL Metals, VOCs, SVOCs, Pesticides/PCBs
FB-2	Aqueous	N/A	QA/QC	TAL Metals, VOCs, SVOCs, Pesticides/PCBs
TB-1	Aqueous	N/A	QA/QC	VOCs
TB-2	Aqueous	N/A	QA/QC	VOCs

Figure 15: Sampling and Test Pit Locations



Soil Sample Location Test Pit Location Surface Water/Sediment Sample Location

Closest potable wells to site

6.1 Groundwater and Surface Water Results

Attempts to sample groundwater from boreholes S-1/SS-1, S-6/SS-6, S-7/SS-7, S-11/SS-11 and S-12/SS-12 were not successful due to the groundwater not being within the depth range of the sampling equipment.

SW/Sed-1 was intended to be collected as a surface water and sediment background sample. However, upon closer inspection of this location and near-vicinity, it was apparent that it was downstream from a PPE to the stream, and therefore, unsuitable as a background sample for comparative purposes.

Surface water samples were collected and designated SW-1 through SW-5. For purposes of this report, the stream tributaries are designated "western tributary" and "eastern tributary." The western tributary originates at a point west and runs along the southwestern portion of the site. The eastern tributary runs along the eastern side of the site, and drains an area where drums of hazardous waste were allegedly buried. The confluence of the two tributaries is directly south of the site. Sample SW-1 was collected upstream and west of the site in the western tributary (Photo 32). Samples SW-2 and SW-3 were collected downstream from SW-1 in the western tributary (Photo 33), SW-3 located just upstream from the confluence. Sample SW-4 was collected from the eastern tributary southeast of the landfill (Figure 15, Photo 34). Sample SW-5 is a duplicate of SW-3. Samples were analyzed for dissolved (DM-SW-#) and total inorganics, VOCs, SVOCS, pesticides and PCBs.

Dissolved inorganic samples consistently contained high concentrations of iron and manganese that exceeded EPA Freshwater standards. Sample DM-SW-4 contained levels of barium, iron and manganese that exceeded EPA standards (Table 5). Sample SW-3 had concentrations of 16 total inorganic analytes that exceeded EPA standards while the duplicate sample SW-5 had 13 analytes that exceeded the standards (Table 6). Samples SW-3 and SW-4 contained low concentrations of VOCs and SW-3 had a low concentration of one SVOC analyte, 4-methylphenol (Tables 7 and 8). No pesticides or PCBs were detected in the surface water samples.

Table 5: Surface Water Results – Dissolved Inorganics

Dissolved Metals ug/L	EPA Freshwater BTAG ug/L	DM-SW-1	DM-SW-2	DM-SW-3	DM-SW-4	DM-SW-5 Dup of DM-SW-3
Arsenic	5	*ND*	**4.2J**	**4.3J**	**4.2J**	*ND*
Barium	4	*ND*	*ND*	*ND*	**28J**	*ND*
Beryllium	0.66	*ND*	*ND*	**0.056J**	*ND*	**0.074J**
Calcium	116,000	**8580**	**8520**	*ND*	**7560**	*ND*
Chromium, Total	85	*ND*	*ND*	**0.81J**	*ND*	**0.77J**
Cobalt	23	*ND*	*ND*	*ND*	*ND*	**1.2J**
Iron	300	**2860**	**1750**	**7790**	**4380**	**8020**
Magnesium	82,000	**3940J**	**3870J**	**1210J**	**3920J**	**1170J**
Manganese	120	**183**	**161**	**70.5**	**319**	**71**
Nickel	52	**0.62J**	*ND*	*ND*	**0.83J**	*ND*
Potassium	53,000	**2880J**	**3000J**	**1920J**	**3740J**	**1860J**
Sodium	680,000	**14,100J**	**14,500J**	**3320J**	**3890J**	**3330J**
Vanadium	20	*ND*	*ND*	**0.61J**	*ND*	**0.99J**
Zinc	120	**4.7J**	*ND*	*ND*	*ND*	*ND*

ND-Not detected J-Analyte present. Reported value may not be accurate or precise. Shaded results exceed MDE or EPA standards. EPA Region III Freshwater Screening Benchmarks, July 2006

Table 6: Surface Water Results – Total Inorganics

Dissolved Metals ug/L	EPA Freshwater BTAG ug/L	SW-1	SW-2	SW-3	SW-4	SW-5 Dup of SW-3
Aluminum	87	*ND*	*ND*	37,300	*ND*	21,800
Arsenic	5	*ND*	4.9J	59.8	*ND*	37.3
Barium	4	*ND*	*ND*	554	32.4J	332
Beryllium	0.66	*ND*	*ND*	10.5	*ND*	6.1
Cadmium	0.25	*ND*	*ND*	7.1	*ND*	3.7J
Calcium	116,000	8820J	9000J	5280J	7060J	*ND*
Chromium, Total	85	*ND*	0.68J	197	*ND*	118
Cobalt	23	*ND*	*ND*	27.2J	*ND*	15.6J
Copper	9	*ND*	*ND*	59.1	*ND*	38.1
Iron	300	5250	6970	165,000	14,600	115,000
Lead	2.5	*ND*	*ND*	162	*ND*	95.8
Magnesium	82,000	4000J	4090J	7310J	3620J	4800J
Manganese	120	189	190	354	308	260
Mercury	0.026	*ND*	*ND*	0.34	*ND*	0.22
Nickel	52	0.74J	0.85J	72.8	0.99J	42.3
Potassium	53,000	3060J	3050J	6680	3580J	4410J
Silver	3.2	*ND*	*ND*	2J	*ND*	1.2J
Sodium	680,000	14,900J	15,000J	3620J	3720J	3250J
Thallium	0.8	*ND*	*ND*	7.6J	*ND*	*ND*
Vanadium	20	0.43J	1.8J	248	2.2J	143
Zinc	120	2.6J	3.9J	489	*ND*	271

ND-Not detected J-Analyte present. Reported value may not be accurate or precise. Shaded results exceed MDE or EPA standards. EPA Region III Freshwater Screening Benchmarks, July 2006.

Table 7: Surface Water Results – VOCs

VOCs ug/L	EPA Freshwater BTAG ug/L	SW-1	SW-2	SW-3	SW-4	SW-5 Dup of SW-3
cis-1,2-Dichloroethene	590	*ND*	*ND*	**4.4J**	**0.92J**	**0.86J**
Benzene	370	*ND*	*ND*	**0.24J**	*ND*	*ND*
Trichloroethene	21	*ND*	*ND*	**0.21J**	*ND*	*ND*
Toluene	2	*ND*	*ND*	*ND*	**1.2J**	**1.2J**

ND-Not detected **J**-Analyte present. Reported value may not be accurate or precise. EPA Region III Freshwater Screening Benchmarks, July 2006.

Table 8: Surface Water Results – SVOCs

SVOCs ug/L	EPA Freshwater BTAG ug/L	SW-1	SW-2	SW-3	SW-4	SW-5 Dup of SW-3
4-Methylphenol	543	*ND*	*ND*	**0.66J**	*ND*	*ND*

ND-Not detected **J**-Analyte present. Reported value may not be accurate or precise. EPA Region III Freshwater Screening Benchmarks, July 2006.

6.2 Sediment Results

Sediment samples coincided with corresponding surface water locations, i.e., Sed-1 was taken at the same location as SW-1. Sed-5 is a duplicate of Sed-3.

Levels of arsenic, chromium, iron, lead and selenium that exceeded EPA freshwater sediment standards were identified in all sediment samples collected at the site, except for Sed-4 (Table 9). The VOCs analytes 2-butanone, chloroform, toluene and 2-hexanone were identified in sediment samples Sed-2, Sed-3, Sed-4 and Sed-5 with toluene identified in all of those samples. The pesticide 4,4'-DDT was identified in sediment samples Sed-1 and Sed-2 at levels below EPA standards (Table 11).

Table 9: Sediment Results – Inorganics

Metals mg/kg	EPA BTAG Freshwater Sediment	Sed-1	Sed-2	Sed-3	Sed-4	Sed-5 Dup of Sed-3
Aluminum	---	12000	7560	16,000	2050	13,000
Arsenic	9.8	19.1J	15.2J	7.7J	5.8J	6.6J
Barium	---	81.5	53.1	110	9.9J	82.2
Beryllium	---	1.5	0.89	1.7	*ND*	1.2
Cadmium	0.99	1.5J	0.97J	1J	0.037J	0.75J
Calcium	---	1640J	1210J	1040J	ND	756J
Chromium,Total	43.4	91.7	53.6	85.6	26.9	70.5
Cobalt	50	7.2J	6.5J	6.2J	1.1J	4.8J
Copper	31.6	6.2	3.6	11.6	*ND*	8.5
Iron	20,000	57,800	39,800	24400	19,200	20,600
Lead	35.8	16.8	11.3	38.2	2.6	30.5
Magnesium	---	3200	1890	3170	636	2480
Manganese	460	197	235	96.6	32.3	65.3
Mercury	0.18	*ND*	*ND*	0.068J	*ND*	0.078J
Nickel	22.7	15.5J	10.8J	15.1J	1.9J	12.2J
Potassium	---	6110	3490	4470	1660	3620
Selenium	2	2.7J	*ND*	2.4J	*ND*	1.4J
Silver	1	0.67J	0.38J	ND	0.23J	*ND*
Sodium	---	*ND*	*ND*	38.2J	*ND*	*ND*
Thallium	---	*ND*	*ND*	*ND*	*ND*	*ND*
Vanadium	---	*71*	46.4	67.6	25.9	55.6
Zinc	121	92.6	55.9	83.2	10.8	65.7

ND-Not detected **J**-Analyte present. Reported value may not be accurate or precise. Shaded results exceed MDE or EPA standards. EPA Region III Freshwater Sediments Screening Benchmarks, August 2006.

Table 10: Sediment Results – VOCs

VOCs ug/kg	EPA BTAG Freshwater Sediment	Sed-1	Sed-2	Sed-3	Sed-4	Sed-5 Dup of Sed-3
2-Butanone	---	*ND*	*ND*	*ND*	*ND*	90J
Chloroform	---	*ND*	19	*ND*	*ND*	*ND*
Toluene	---	*ND*	2.6J	3.6J	0.5J	8.2J
2-Hexanone	---	*ND*	*ND*	*ND*	*ND*	130J

ND-Not detected **J**-Analyte present. Reported value may not be accurate or precise. EPA Region III Freshwater Sediments Screening Benchmarks, August 2006.

Table 11: Sediment Results – Pesticides

Pesticides ug/kg	EPA BTAG Freshwater Sediment	Sed-1	Sed-2	Sed-3	Sed-4	Sed-5 Dup of Sed-3
4,4'-DDT	4.16	3.4J	2J	*ND*	*ND*	*ND*

ND-Not detected J-Analyte present. Reported value may not be accurate or precise. EPA Region III Freshwater Sediments Screening Benchmarks, August 2006.

6.3 Soil Results

Soil samples were collected from geoprobe borings at the surface (S-#) 0.5' to 1.5'bgs and subsurface samples (SS-#) at 4' to 5.5' bgs at thirteen locations across the site. Sample S-13/SS-13 was collected near the front gate of the site and is considered a background sample.

Surface and subsurface soil samples across the site contained levels of aluminum, arsenic, total and hexavalent chromium, iron, manganese and vanadium that exceeded EPA and MDE residential soil standards (Tables 12 and 13). Low levels of VOCs were identified in most of the subsurface soil samples. Low levels of toluene were identified in every subsurface sample and was the only VOC found in SS-13, the background sample (Table 14). Analyses of shallow soil samples from S-4 and S-10 identified low concentrations of some SVOCs and levels of benzo(a)pyrene that exceeded both EPA RBC and MDE residential cleanup standards (Table 15). Seven subsurface soil samples contained low levels of SVOC analytes with sample SS-3 having five different SVOC's identified (Table 16). Four shallow soil samples contained low levels of pesticides and PCBs. Four pesticides and one PCB was found in sample S-3 and three other shallow samples contained pesticides and or PCBs (Table 17). Two pesticides and one PCB were identified in subsurface sample SS-6. No pesticides or PCBs were identified in any other subsurface samples (Table 18).

Table 12: Surface Soil Results – Inorganics

Metals mg/kg	MDE Residential Cleanup Stds.	EPA Residential Soil RBC	S-1	S-2	S-3	S-4	S-5	S-6
Aluminum	7800	77,000	11,700	17,200	10,200	10,900	12,200	12,500
Antimony	3.1	31	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Arsenic	0.43	0.67	15.8J	6.9J	12.5	15J	24.1J	9.7J
Barium	1600	15,000	42.8	78.1	45.8J	30.7	52	58.1
Beryllium	16	160	1.3	0.35J	1.2	0.99	0.7	0.37J
Cadmium	3.9	70	4.5	*ND*	2.9J	0.3J	0.24J	0.12J
Calcium	---	---	4170J	858J	3810J	2600J	1750J	1190J
Chromium, Total	23	---	182J	35J	153	124J	49.2J	49.7J
Chromium VI	23	0.3	2.73	*NA*	*NA*	5.61	*NA*	3
Cobalt	---	23	4.2J	6.3	4.5	3.7J	2.3J	2.3J

Metals mg/kg	MDE Residential Cleanup Stds.	EPA Residential Soil RBC	S-1	S-2	S-3	S-4	S-5	S-6
Copper	310	3100	5.3	5.7	7J	3.3	5	4.7
Iron	5500	55,000	79,700J	29,400J	55,200	63,900J	45,500J	28,200J
Lead	400	400	18J	10.5J	20.2J	27.1J	13.8J	16.8J
Magnesium	---	---	4800J	2100J	4200	3780J	1170J	1490J
Manganese	160	1800	92.3J	185J	60.8	122J	37.4J	54.9J
Mercury	2.3	9.4	0.049J	0.028J	0.035J	*ND*	0.042J	0.034J
Nickel	160	1500	9.8J	10J	9.3	9.5J	4.4J	5.8J
Potassium	---	---	13,700J	1780J	12,100	8780J	1430J	2330J
Selenium	39	390	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Silver	39	390	0.52J	0.14J	0.53J	0.39J	0.3J	0.17J
Sodium	---	---	*ND*	*ND*	24.5J	*ND*	*ND*	*ND*
Thallium	0.55	0.78	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Vanadium	7.8	390	135J	43.6J	113	102J	58.5J	41.4J
Zinc	2300	23,000	271J	36.7J	286J	57.6J	17.9J	28.3J

Table 12: Surface Soil Results – Inorganics (con't)

Metals mg/kg	MDE Residential Cleanup Stds.	EPA Residential Soil RBC	S-7	S-8	S-9	S-10	S-11	S-12
Aluminum	7800	77,000	10,900	13,000	11,100	11,100	8510	17,900
Antimony	3.1	31	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Arsenic	0.43	0.67	17.3J	7.3J	7.9J	7.8J	2.2J	8.1J
Barium	1600	15,000	67	47.4	73.1	73.2	44.6	60.5
Beryllium	16	160	0.58J	0.2J	0.34J	0.51J	0.28J	0.43J
Cadmium	3.9	70	0.16J	0.081J	0.14J	0.27J	*ND*	0.034J
Calcium	---	---	1510J	550J	1320J	16,300J	*ND*	*ND*
Chromium, Total	23	---	87.2J	38.8J	47J	43.1J	16.7J	54.9J
Chromium VI	23	0.3	*NA*	*NA*	5.69	*NA*	*NA*	*NA*
Cobalt	---	23	3.1J	1.1J	1.5J	2.3J	1.6J	2J
Copper	310	3100	5.8	6.4	5.4	6.6	*ND*	6.8
Iron	5500	55,000	40,100J	18,600J	26,600J	38,800J	8650J	29,100J
Lead	400	400	15.1J	10.8J	26J	18.7J	5.9J	11.8J
Magnesium	---	---	1410J	744J	1160J	2940J	775J	1750J
Manganese	160	1800	162J	14.7J	30.4J	174J	33.6J	35.7J
Mercury	2.3	9.4	0.025J	0.059J	0.061J	0.042J	*ND*	0.088J
Nickel	160	1500	5.7J	3.9J	4.1J	4.1J	4.5J	4.7J
Potassium	---	---	1540J	693J	1060J	1140J	573J	1170J
Selenium	39	390	*ND*	*ND*	*ND*	*ND*	*ND*	1.4J
Silver	39	390	0.38J	0.12J	0.15J	0.39J	ND	0.12J
Sodium	---	---	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*

Metals mg/kg	MDE Residential Cleanup Stds.	EPA Residential Soil RBC	S-7	S-8	S-9	S-10	S-11	S-12
Thallium	0.55	0.78	*ND*	*ND*	*ND*	*ND*	*ND*	0.97J
Vanadium	7.8	390	72.6J	33.6J	30.8J	27.6J	16.4J	34.6J
Zinc	2300	23,000	45.4J	15J	142J	64.7J	22.8J	21.5J

Table 12: Surface Soil Results – Inorganics (con't)

Metals mg/kg	MDE Residential Cleanup Stds.	EPA Residential Soil RBC	S-13 BG	S-14 Dup of S-5
Aluminum	7800	77,000	6990	13,900
Antimony	3.1	31	*ND*	*ND*
Arsenic	0.43	0.67	4.2J	17.9J
Barium	1600	15,000	52.3	68.7
Beryllium	16	160	0.37J	0.52
Cadmium	3.9	70	*ND*	0.089J
Calcium	---	---	889J	1500J
Chromium, Total	23	---	19.8J	74.3J
Chromium VI	23	0.3	*NA*	*NA*
Cobalt	---	23	2.4J	2.8J
Copper	310	3100	5.7	18.8
Iron	5500	55,000	10,500J	43,600J
Lead	400	400	21.2J	12.1J
Magnesium	---	---	904J	1480J
Manganese	160	1800	174J	32.3J
Mercury	2.3	9.4	*ND*	0.042J
Nickel	160	1500	4.3J	5.3J
Potassium	---	---	625J	2110J
Selenium	39	390	*ND*	*ND*
Silver	39	390	*ND*	0.27J
Sodium	---	---	*ND*	24.7J
Thallium	0.55	0.78	*ND*	*ND*
Vanadium	7.8	390	16.7J	47.5J
Zinc	2300	23,000	21.4J	18J

BG – Background *ND*-Not detected *NT* – Not tested. **J**-Analyte present. Reported value may not be accurate or precise. Shaded results exceed MDE or EPA standards. Red font indicates a value at least three times the background level. RBC benchmarks as of May 2014 and MDE standards as of June 2008. R-Unusable result. *NA*- Not analyzed

Table 13: Subsurface Soil Results – Inorganics

Metals mg/kg	MDE Residential Cleanup Stds.	EPA Residential Soil RBC	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Aluminum	7800	77,000	8860	10,400	9400	9080	12,300	7350
Antimony	3.1	31	ND	ND	ND	ND	ND	ND
Arsenic	0.43	0.67	7.3J	8.9	21.5	16	26.8	12.1J
Barium	1600	15,000	299	92.3J	15.8J	31.8J	28.7J	28.5
Beryllium	16	160	0.17J	ND	1.1	1.2	1.3	0.79
Cadmium	3.9	70	ND	ND	0.4J	0.69J	0.36J	0.5J
Calcium	---	---	ND	ND	861J	ND	4310J	3100J
Chromium, Total	23	---	32.7J	50.3	155	185	162	218J
Chromium VI	23	0.3	NA	3.53	NA	NA	7.07	NA
Cobalt	---	23	0.26J	0.86J	2.4J	3J	2.4J	5
Copper	310	3100	7.1	5.1J	ND	ND	ND	2.2
Iron	5500	55,000	9200J	15,900	59,700	82,700	67,500	53,200J
Lead	400	400	9.7J	10.2J	7.8J	6.6J	8.8J	51J
Magnesium	---	---	1210J	1960	3330	3860	5480	2040J
Manganese	160	1800	12.5J	25.3	52.5	118	41.4	213J
Mercury	2.3	9.4	0.03J	0.049J	ND	ND	ND	0.074J
Nickel	160	1500	1J	1.7J	4.6	6.7	4.4J	9.4J
Potassium	---	---	1050J	1590	10,300	11,700	15,100	4830J
Selenium	39	390	ND	ND	ND	ND	ND	ND
Silver	39	390	ND	ND	0.36J	0.67J	0.52J	0.33J
Sodium	---	---	ND	ND	ND	ND	ND	ND
Thallium	0.55	0.78	ND	ND	ND	ND	ND	ND
Vanadium	7.8	390	16.3J	28	109	128	79.8	84.6J
Zinc	2300	23,000	12.5J	15.3J	42.7J	54.6J	40.2J	238J

Table 13: Subsurface Soil Results – Inorganics (con't)

Metals mg/kg	MDE Residential Cleanup Stds.	EPA Residential Soil RBC	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Aluminum	7800	77,000	11,800	10,600	10,500	10,600	12,200	11,300
Antimony	3.1	31	ND	ND	ND	ND	ND	ND
Arsenic	0.43	0.67	13.1J	7.3	18.7	4.3J	10.8J	6.9J
Barium	1600	15,000	54.3	67.1J	24.6J	118	119	57.7
Beryllium	16	160	0.31J	ND	1.7	0.26J	0.25J	0.25J
Cadmium	3.9	70	ND	1.9J	1.3J	ND	ND	ND
Calcium	---	---	ND	2440J	2940J	ND	ND	ND
Chromium, Total	23	---	65.2J	230	171	36.1J	40.2J	37.6J

Metals mg/kg	MDE Residential Cleanup Stds.	EPA Residential Soil RBC	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Chromium VI	23	0.3	3.33	*NA*	*NA*	*NA*	*NA*	*NA*
Cobalt	---	23	1.1J	2.5J	7.5	0.47J	1J	0.75J
Copper	310	3100	6	9.6J	*ND*	10.7	6.1	5
Iron	5500	55,000	24,600J	35,900	77,700	13,300J	19,400J	18,600J
Lead	400	400	10.8J	345J	22.7J	12.2J	11.4J	9.7J
Magnesium	---	---	1700J	1660	3900	1340J	1420J	1190J
Manganese	160	1800	33J	181	186	13.2J	20.6J	16.8J
Mercury	2.3	9.4	0.037J	*ND*	*ND*	0.053J	0.042J	0.046J
Nickel	160	1500	2.4J	6.3	19.2	1.4J	2.1J	1.9J
Potassium	---	---	1530J	1510	10,400	1110J	1220J	881J
Selenium	39	390	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Silver	39	390	0.17J	0.39J	0.51J	*ND*	*ND*	*ND*
Sodium	---	---	*ND*	58.1J	*ND*	*ND*	*ND*	*ND*
Thallium	0.55	0.78	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Vanadium	7.8	390	37.8J	33	171	19.5J	28.1J	21.8J
Zinc	2300	23,000	16.3J	1000J	121J	45.5J	14.9J	13.2J

Table 13: Subsurface Soil Results – Inorganics (con't)

Metals mg/kg	MDE Residential Cleanup Stds.	EPA Residential Soil RBC	SS-13 BG	SS-14 Dup of SS-5
Aluminum	7800	77,000	12,500	13,200
Antimony	3.1	31	*ND*	*ND*
Arsenic	0.43	0.67	9.5J	22.4
Barium	1600	15,000	45.7	18.4J
Beryllium	16	160	0.3J	1.4
Cadmium	3.9	70	ND	0.31J
Calcium	---	---	1030J	1590J
Chromium, Total	23	---	38.6J	185
Chromium VI	23	0.3	*NA*	*ND*
Cobalt	---	23	2.3J	2.3J
Copper	310	3100	6	*ND*
Iron	5500	55,000	20,600J	73,100
Lead	400	400	7.9J	6.3J
Magnesium	---	---	1540J	5990
Manganese	160	1800	41.7J	19.6
Mercury	2.3	9.4	0.021J	*ND*
Nickel	160	1500	5J	3.9J
Potassium	---	---	1270J	17,300
Selenium	39	390	*ND*	*ND*

Metals mg/kg	MDE Residential Cleanup Stds.	EPA Residential Soil RBC	SS-13 BG	SS-14 Dup of SS-5
Silver	39	390	*ND*	**0.6J**
Sodium	---	---	*ND*	*ND*
Thallium	0.55	0.78	*ND*	*ND*
Vanadium	7.8	390	**36J**	**78.4**
Zinc	2300	23,000	**21.3J**	**34.8J**

BG – Background *ND*-Not detected **J**-Analyte present. Reported value may not be accurate or precise. Shaded results exceed MDE or EPA standards. Red font indicates a value at least three times the background level. RBC benchmarks as of May 2014 and MDE standards as of June 2008. R-Unusable result. *NA*- Not analyzed

Table 14: Subsurface Soil Results – VOCs

VOCs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Acetone	7,000,000	61,000,000	*ND*	*ND*	41	36	68	*ND*
Carbon Disulfide	780,000	770,000	*ND*	*ND*	**0.98J**	**0.62J**	**0.82J**	*ND*
Methyl Acetate	---	78,000,000	*ND*	*ND*	5	*ND*	*ND*	*ND*
Methylene Chloride	85,000	57,000	*ND*	**3J**	16	17	18	*ND*
MTBE	160,000	47,000	*ND*	*ND*	*ND*	**3.7J**	*ND*	*ND*
cis-1,2-Dichloroethene	78,000	160,000	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Benzene	12,000	1200	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Toluene	630,000	4,900,000	**0.94J**	**0.98J**	**0.45J**	**0.68J**	**0.66J**	**0.93J**
Tetrachloroethene	1200	24,000	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Chlorobenzene	160,000	280,000	*ND*	*ND*	12	*ND*	*ND*	*ND*
Ethylbenzene	780,000	5800	*ND*	*ND*	*ND*	*ND*	**0.79J**	*ND*
o-Xylene	1,600,000	650,000	*ND*	*ND*	*ND*	*ND*	**0.37J**	**0.52J**
m,p-Xylene	1,600,000	580,000	**0.53J**	*ND*	**0.38J**	**0.69J**	**1.1J**	**2J**
Isospropylbenzene	780,000	1,900,000	*ND*	*ND*	**0.89J**	*ND*	*ND*	*ND*
1,4-Dichlorobenzene	---	2600	*ND*	*ND*	**2.4J**	*ND*	**4J**	**4.1J**
1,2-Dichlorobenzene	---	1,800,000	*ND*	*ND*	**2.4J**	*ND*	33	**0.45J**

Table 14: Subsurface Soil Results – VOCs (con't)

VOCs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Acetone	7,000,000	61,000,000	**21**	*ND*	**29**	48	*ND*	*ND*
Carbon Disulfide	780,000	770,000	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Methyl Acetate	---	78,000,000	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Methylene chloride	85,000	57,000	*ND*	**1.5J**	**18**	24	*ND*	14

VOCs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
MTBE	160,000	47,000	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
cis-1,2-Dichloroethene	78,000	160,000	*ND*	*ND*	*ND*	**4.2J**	*ND*	*ND*
Benzene	12,000	1200	*ND*	**0.63J**	*ND*	*ND*	*ND*	*ND*
Toluene	630,000	4,900,000	**0.95J**	9.2	**0.6J**	**0.76J**	**0.93J**	**1J**
Tetrachloroethene	1200	24,000	*ND*	*ND*	*ND*	**1.8J**	*ND*	*ND*
Chlorobenzene	160,000	280,000	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Ethylbenzene	780,000	5800	*ND*	10	*ND*	*ND*	*ND*	*ND*
o-Xylene	1,600,000	650,000	*ND*	6.3	*ND*	*ND*	*ND*	*ND*
m,p-Xylene	1,600,000	580,000	**0.57J**	49	*ND*	*ND*	**0.54J**	**0.55J**
Isospropylbenzene	780,000	1,900,000	*ND*	**0.97J**	*ND*	*ND*	*ND*	*ND*
1,4-Dichlorobenzene	---	2600	*ND*	*ND*	**2.5J**	*ND*	*ND*	*ND*
1,2-Dichlorobenzene	---	1,800,000	*ND*	*ND*	**1.8J**	*ND*	*ND*	*ND*

Table 14: Subsurface Soil Results – VOCs (con't)

VOCs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	SS-13 BG	SS-14 Dup of SS-5
Acetone	7,000,000	61,000,000	*ND*	75
Carbon Disulfide	780,000	770,000	*ND*	*ND*
Methyl Acetate	---	78,000,000	*ND*	*ND*
Methylene chloride	85,000	57,000	*ND*	16
MTBE	160,000	47,000	*ND*	*ND*
cis-1,2-Dichloroethene	78,000	160,000	*ND*	*ND*
Benzene	12,000	1200	*ND*	*ND*
Toluene	630,000	4,900,000	**0.68J**	**0.56J**
Tetrachloroethene	1200	24,000	*ND*	*ND*
Chlorobenzene	160,000	280,000	*ND*	*ND*
Ethylbenzene	780,000	5800	*ND*	*ND*
o-Xylene	1,600,000	650,000	*ND*	*ND*
m,p-Xylene	1,600,000	580,000	*ND*	*ND*
Isospropylbenzene	780,000	1,900,000	*ND*	*ND*
1,4-Dichlorobenzene	---	2600	*ND*	**0.69J**
1,2-Dichlorobenzene	---	1,800,000	*ND*	5.9J

BG – Background *ND*-Not detected **J**-Analyte present. Reported value may not be accurate or precise. Red font indicates a value at least three times the background level. RBC benchmarks as of November 2013 and MDE standards as of June 2008.

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Table 15: Surface Soil Results – SVOCs

SVOCs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	S-1	S-2	S-3	S-4	S-5	S-6
Chrysene	22,000	15,000	*ND*	*ND*	*ND*	**160J**	*ND*	*ND*
Bis(2-ethylhexyl)phthalate	46,000	---	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Pyrene	230	1,700,000	*ND*	*ND*	*ND*	**230**	*ND*	*ND*
Benzo(a)anthracene	220	150	*ND*	*ND*	*ND*	**110J**	*ND*	*ND*
Benzo(b)fluoranthene	220	150	*ND*	*ND*	*ND*	**130J**	*ND*	*ND*
Benzo(a)pyrene	22	15	*ND*	*ND*	*ND*	**130J**	*ND*	*ND*
Benzo(g,h,i)perylene	230,000	---	*ND*	*ND*	*ND*	**140J**	*ND*	*ND*

Table 15: Surface Soil Results – SVOCs (con't)

SVOCs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	S-7	S-8	S-9	S-10	S-11	S-12
Chrysene	22,000	15,000	*ND*	*ND*	*ND*	**160J**	*ND*	*ND*
Bis(2-ethylhexyl)phthalate	46,000	---	*ND*	*ND*	*ND*	**100J**	*ND*	*ND*
Benzo(a)anthracene	220	150	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Benzo(b)fluoranthene	220	150	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Benzo(a)pyrene	22	15	*ND*	*ND*	*ND*	**220**	*ND*	*ND*
Benzo(g,h,i)perylene	230,000	---	*ND*	*ND*	*ND*	**350**	*ND*	*ND*

Table 15: Surface Soil Results – SVOCs (con't)

SVOCs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	S-13 BG	S-14 Dup of S-5
Chrysene	22,000	15,000	*ND*	*ND*
Bis(2-ethylhexyl)phthalate	46,000	---	*ND*	*ND*
Benzo(a)anthracene	220	150	*ND*	*ND*
Benzo(b)fluoranthene	220	150	*ND*	*ND*
Benzo(a)pyrene	22	15	*ND*	*ND*
Benzo(g,h,i)perylene	230,000	---	*ND*	*ND*

BG – Background *ND*-Not detected **J**-Analyte present. Reported value may not be accurate or precise. Shaded results exceed MDE or EPA standards. Red font indicates a value at least three times the background level. RBC benchmarks as of May 2014 and MDE standards as of June 2008.

Table 16: Subsurface Soil Results – SVOCs

SVOCs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
4-Methylphenol	39,000	6,200,000	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
2-Methylnaphthalene	31,000	---	*ND*	*ND*	**120J**	*ND*	*ND*	*ND*
Phenanthrene	2,300,000	---	*ND*	*ND*	**130J**	*ND*	*ND*	*ND*
Di-n-butylphthalate	780,000	---	*ND*	**260**	**370**	**160J**	**190J**	*ND*
Butylbenzylphthalate	---	280,000	*ND*	*ND*	**140J**	*ND*	*ND*	*ND*
Bis(2-ethylhexyl)phthalate	46,000	---	*ND*	*ND*	**1200**	*ND*	*ND*	**2200**

Table 16: Subsurface Soil Results – SVOCs (con't)

SVOCs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
4-Methylphenol	39,000	6,200,000	*ND*	**130J**	*ND*	*ND*	*ND*	*ND*
2-Methylnaphthalene	31,000	---	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Phenanthrene	2,300,000	---	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Di-n-butylphthalate	780,000	---	*ND*	**210J**	**310**	*ND*	*ND*	*ND*
Butylbenzylphthalate	---	280,000	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Bis(2-ethylhexyl)phthalate	46,000	---	*ND*	**440**	*ND*	*ND*	*ND*	*ND*

Table 16: Subsurface Soil Results – SVOCs (con't)

SVOCs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	SS-13 BG	SS-14 Dup of SS-5
4-Methylphenol	39,000	6,200,000	*ND*	*ND*
2-Methylnaphthalene	31,000	---	*ND*	*ND*
Phenanthrene	2,300,000	---	*ND*	*ND*
Di-n-butylphthalate	780,000	---	*ND*	**380**
Butylbenzylphthalate	---	280,000	*ND*	*ND*
Bis(2-ethylhexyl)phthalate	46,000	---	*ND*	*ND*

BG – Background *ND*-Not detected **J**-Analyte present. Reported value may not be accurate or precise. Red font indicates a value at least three times the background level. RBC benchmarks as of May 2014 and MDE standards as of June 2008.

Table 17: Surface Soil Results – Pesticides/PCBs

Pesticides/PCBs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	S-1	S-2	S-3	S-4	S-5	S-6
gamma-Chlordane	1800	1800	*ND*	*ND*	**1.3J**	*ND*	*ND*	*ND*
alpha-Chlordane	1800	1800	*ND*	*ND*	**1.5J**	*ND*	*ND*	*ND*
Heptachlor Epoxide	70	59	*ND*	*ND*	**0.99J**	*ND*	*ND*	*ND*
4,4'-DDT	1900	1900	*ND*	*ND*	**8.5**	*ND*	*ND*	*ND*
Arochlor - 1016	550	4000	*ND*	*ND*	*ND*	*ND*	**47**	*ND*
Arochlor - 1260	320	240	*ND*	*ND*	**55**	*ND*	**12J**	**18J**

Table 17: Surface Soil Results – Pesticides/PCBs (con't)

Pesticides/PCBs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	S-7	S-8	S-9	S-10	S-11	S-12
gamma-Chlordane	1800	1800	*ND*	*ND*	*ND*	**0.92J**	*ND*	*ND*
alpha-Chlordane	1800	1800	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Heptachlor Epoxide	70	59	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
4,4'-DDT	1900	1900	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Arochlor - 1016	550	4000	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Arochlor - 1260	320	240	**3.4J**	*ND*	*ND*	*ND*	*ND*	*ND*

Table 17: Surface Soil Results – Pesticides/PCBs (con't)

Pesticides/PCBs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	S-13 BG	S-14 Dup of S-5
gamma-Chlordane	1800	1800	*ND*	*ND*
alpha-Chlordane	1800	1800	*ND*	*ND*
Heptachlor Epoxide	70	59	*ND*	*ND*
4,4'-DDT	1900	1900	*ND*	*ND*
Arochlor - 1016	550	4000	*ND*	*ND*
Arochlor - 1260	320	240	*ND*	*ND*

BG – Background *ND*-Not detected **J**-Analyte present. Reported value may not be accurate or precise. Red font indicates a value at least three times the background level. RBC benchmarks as of May 2014 and MDE standards as of June 2008.

Table 18: Subsurface Soil Results – Pesticides/PCBs

Pesticides/PCBs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
4,4'-DDE	1900	1600	*ND*	*ND*	*ND*	*ND*	*ND*	**1.6J**
4,4'-DDD	2700	2200	*ND*	*ND*	*ND*	*ND*	*ND*	**2.8J**
Arochlor - 1260	320	240	*ND*	*ND*	*ND*	*ND*	*ND*	**14J**

Table 18: Subsurface Soil Results – Pesticides/PCBs (con't)

Pesticides/PCBs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
4,4'-DDE	1900	1600	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
4,4'-DDD	2700	2200	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Arochlor - 1260	320	240	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*

Table 18: Subsurface Soil Results – Pesticides/PCBs (con't)

Pesticides/PCBs ug/kg	MDE Residential Cleanup Std.	EPA RESIDENTIAL SOIL RBC	SS-13 BG	SS-14 Dup of SS-5
4,4'-DDE	1900	1600	*ND*	*ND*
4,4'-DDD	2700	2200	*ND*	*ND*
Arochlor - 1260	320	240	*ND*	*ND*

BG – Background *ND*-Not detected **J**-Analyte present. Reported value may not be accurate or precise.
RBC benchmarks as of May 2014 and MDE standards as of June 2008.

7.0 SUMMARY

Samples of soil, surface water, and sediments were collected at the Generals Highway site on June 3rd, 4th and 5th, 2014 and analyzed for inorganics, VOCs, SVOCs, pesticides, PCBs, and hexavalent chrome. It is evident that previous uses of the property for disposal of general waste and its use as an automotive junk yard have impacted the site. Analysis of soil samples across the site identified significant levels of inorganics, especially aluminum, arsenic, total and hexavalent chromium, iron and vanadium which exceeded EPA and MDE benchmarks. Analyses also identified low concentrations of VOCs, SVOCs, pesticides and PCBs in some soil samples collected at the site.

Surface waters were sampled from the streams running along the southern and eastern borders of the site. Surface waters along the perimeter of the site are likely fed by inflow from the unconfined groundwater within the Aquia formation beneath the site. Inorganic analyses of surface waters identified concentrations of iron and manganese that consistently exceeded EPA benchmarks consistently in nearly all total and dissolved samples. In surface water sample SW-3, located downstream from sample locations SW-1 and SW-2 and prior to the confluence, 16 inorganic analytes (unfiltered) exceeded EPA Freshwater BTAG standards, including arsenic up to 59.8 µg/L and vanadium up to 248 µg/L. Other, similarly elevated inorganics identified at that location included, but were not limited to, copper (59.1 µg/L), nickel (72.8 µg/L), and lead (162 µg/L). Analysis of SW-3 and its duplicate SW-5 also identified low levels of organic contaminants, including cis-1,2-DCE, benzene, and TCE, none of which exceeded EPA BTAG standards. Test results for SW-4, in the eastern tributary, also showed low levels of organic contaminants.

Sediment samples were co-located with the surface water samples. Analysis of sediment samples identified levels of arsenic, cadmium, chromium, iron, lead and selenium that exceeded EPA freshwater sediment standards in samples Sed-1, Sed-2 and Sed-3 which were collected from the southeasterly flowing stream above the confluence. The VOCs analytes 2-butanone, chloroform, toluene and 2-hexanone were identified in sediment samples, but at levels below EPA standards. The pesticide, 4,4'-DDT was identified in sediment samples Sed-1 and Sed-2, also at levels below EPA standards. No PCBs were identified in any of the sediment samples.

A toxicological evaluation was performed on the analytical results. The evaluation determined that the incidental ingestion of contaminated soils and sediments at the site exceeded MDE and EPA risk levels for child resident populations. Two surface water contaminants exceeded the Ambient Water Quality Standards (AWQS) or Ambient Water Quality Criteria (AWQC) for the protection of aquatic life (acute or chronic) and one contaminant exceeded the recommended AWQC for the protection of human health via fish consumption.

8.0 REFERENCES

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9.0 PHOTOGRAPHS

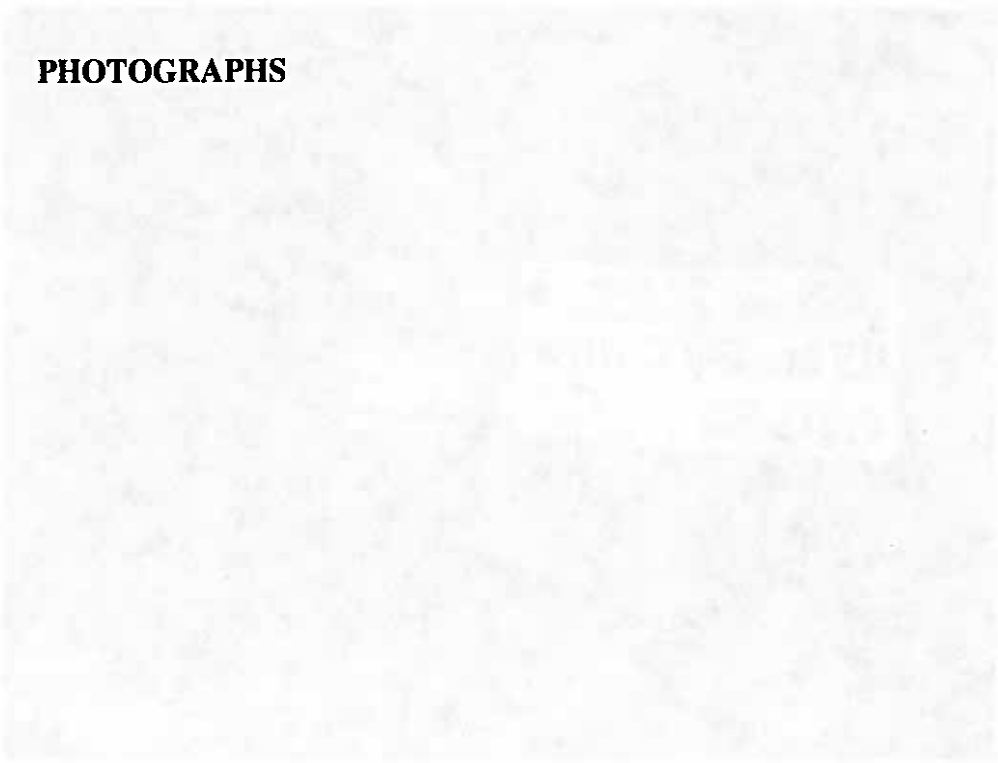

Photo 1 - Entrance Gate

Photo 2- Open area on top of hill

Photos 3 & 4 - Overgrown area between house at 1789 Generals Hwy and Entrance Gate

Photos 5 & 6- Wooded areas where vehicles were stored

Photo 7 - Abandoned camper

Photo 8 – Access road near site entrance

Photo 9 - Former Test Pit Location

Photo 10 - Former Test Pit Location

Photo 11 - Former Test Pit Location

Photo 12 – Abandoned campers

Photo 13 – Discarded propane tanks

Photo 14 – Abandoned vehicles

Photo 15 - TP-1

Photo 16 - TP-2

Photo 17 - TP-3

Photo 18 - TP-4

Photo 19 - S-1/SS-1 Behind 1789 Generals Hwy

Photo 20 - S-13/SS-13 Near Site Entrance

Photo 21 - S-6/SS-6

Photo 22 - S-7/SS-7

Photo 23 - S-11/SS-11 Area where vehicles were stored

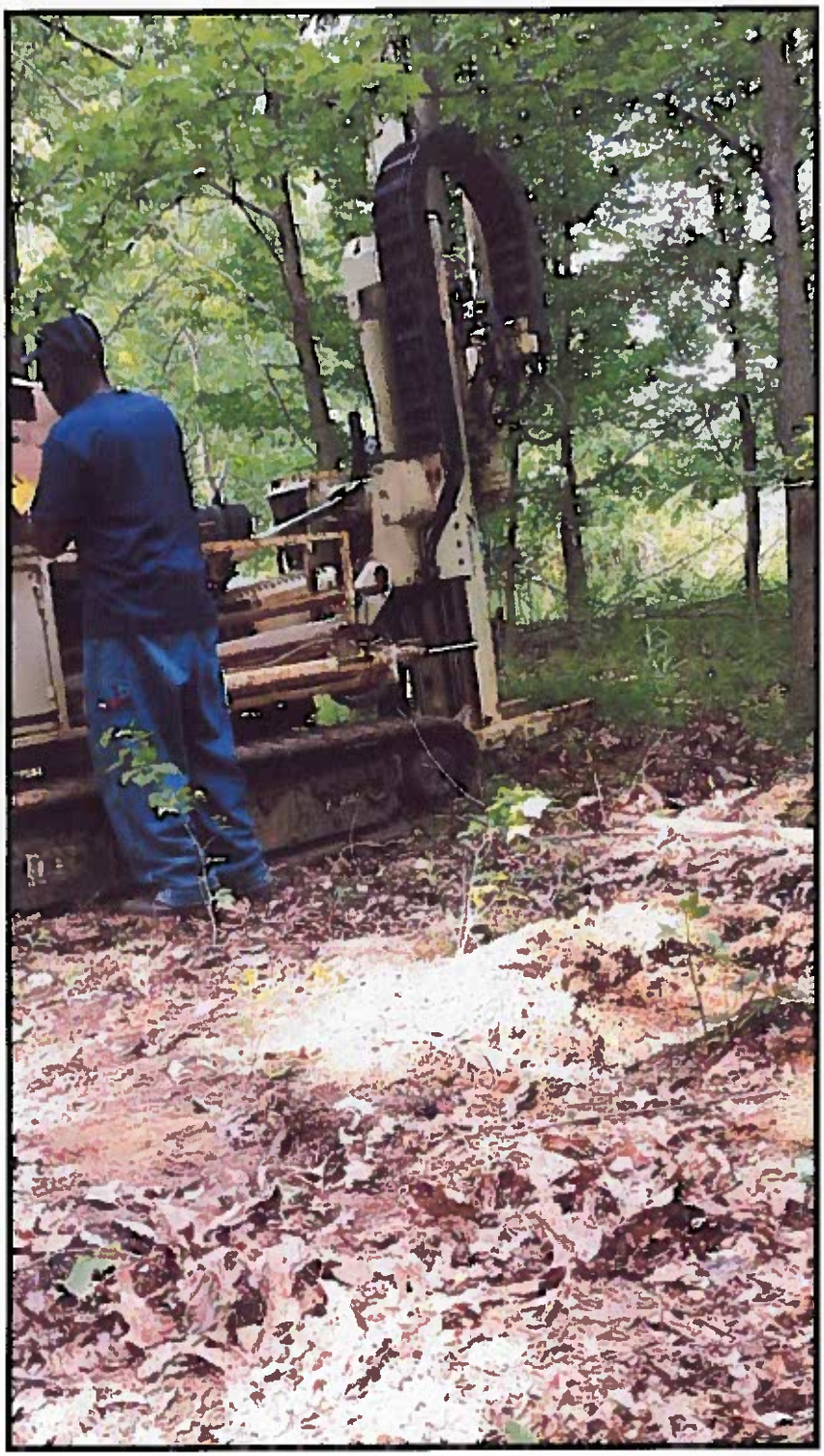

Photo 24 - S-12/SS-12

Photo 25 - S-2/SS-2

Photo 26 - S-5/SS-5

Photo 27 - S-10/SS-10

Photo 28 - S-9/SS-9

Photo 29 - S-8/SS-8

Photo 30 - S-4/SS-4

Photo 31 - S-3/SS-3

Photo 32 - SW-1/Sed-1

Photo 33 - SW-2/Sed-2

Photo 34 - SW-4/Sed-4