# FINAL
# Phase II Environmental Site Assessment Report
# Portion of Chase Land, LLC Properties
# Jessup, Maryland 21044

*Prepared for*

Bureau of Environmental Services
Howard County Department of Public Works
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Columbia, Maryland 21046

*Prepared by*

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May 2017

EA Project No. 1483546

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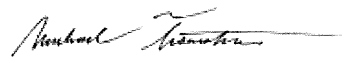

15 May 2017

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Date

15 May 2017

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Date

May 2017

EA Project No. 1483546

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## LIST OF ACRONYMS

| | |
|---|---|
| ABS | Dermal Absorption Factor |
| ADAF | Age-Dependent Adjustment Factor |
| ADI | Average Daily Intake |
| AF | Adherence Factor |
| ASTM | American Society for Testing and Materials |
| AT | Average Time |
| ATC | Anticipated Typical Concentration |
| BW | Body Weight |
| CF | Conversion Factor |
| COC | Chain of Custody |
| COPC | Constituent of Potential Concern |
| CSM | Conceptual Site Map |
| DBCP | 1,2-Dibromo-3-Chloropropane |
| dL | Deciliter |
| DPW | Department of Public Works |
| DRO | Diesel Range Organics |
| EA | EA Engineering, Science, and Technology, Inc., PBC |
| EC | Exposure Concentration |
| ED | Exposure Duration |
| EDB | 1,2-Dibromoethane |
| EF | Exposure Frequency |
| EFH | EPA Exposure Factors Handbook |
| EPC | Exposure Point Concentration |
| ESA | Environmental Site Assessment |
| ET | Exposure Time |
| GIABS | Gastrointestinal Dermal Absorption Factor |
| GPS | Global Positioning System |
| GRO | Gasoline Range Organics |
| HASP | Health and Safety Plan |
| HHRA | Human Health Risk Assessment |
| HQ | Hazard Quotient |
| IDW | Investigation Derived Waste |
| IR | Ingestion Rate |
| ISM | Intermittent Soil Mounds Area |

## LIST OF ACRONYMS (continued)

| | |
|---|---|
| IUR | Inhalation Unit Risk |
| LADI | Lifetime Average Daily Intake |
| MB | Method Blank |
| MDE | Maryland Department of the Environment |
| µg/kg | Micrograms per kilogram |
| µg/L | Micrograms per liter |
| mg/kg | Milligrams per kilogram |
| mg/L | Milligrams per liter |
| MS/MSD | Matrix Spike/Matrix Spike Duplicate |
| NOAEL | No Observed Adverse Effect Level |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PCB | Polychlorinated Biphenyls |
| PEF | Particulate Emissions Factor |
| PID | Photo-ionization Detector |
| PPE | Personal Protective Equipment |
| ppm | Parts per million |
| QC | Quality Control |
| RBA | Relative Bioavailability Factor |
| RfC | Reference Concentration |
| RfD | Reference Dose |
| RL | Reporting Limit |
| RME | Reasonable Maximum Exposure |
| RSL | U.S. EPA Regional Screening Level |
| SA | Surface Area for Contact |
| SAW | Sprawling Area of Waste |
| SDG | Sample Delivery Group |
| SF | Slope Factor |
| SOP | Standard Operating Procedure |
| SVOC | Semi-volatile Organic Compounds |
| SW | Surface Water |
| TAT | Turn Around Time |
| TB | Trip Blank |
| TPH | Total Petroleum Hydrocarbons |

## LIST OF ACRONYMS (continued)

| | |
|---|---|
| UCLM | Upper Confidence Limit on the Mean |
| UF | Uncertainty Factor |
| USCS | Unified Soil Classification System |
| U.S. EPA | United States Environmental Protection Agency |
| VOC | Volatile Organic Compound |

## EXECUTIVE SUMMARY

EA Engineering, Science, and Technology, Inc., PBC (EA) completed a Phase II Environmental Site Assessment (ESA) at the Chase Lands Properties. The subject site consists of, either in whole or in part, the lands of five individual parcels, totaling 79.06 +/- acres of land located in Jessup, Howard County, Maryland. The subject site primarily currently consists of unimproved wooded land. Parcel 349, which is owned by Chase Land, LLC, is part of the subject site that was to be evaluated, but it was omitted from the Phase II ESA because it was occupied at the time of assessment. "Site", when used in this report, is defined as the subject site except for Parcel 349. Howard County has expressed interest in purchasing the subject site for future school development. As part of the process, EA completed a Phase I ESA in November 2016. Based on the findings identified in the Phase I ESA Report, Howard County requested a Phase II ESA to assist the County with making informed decisions regarding the future use of the property.

The Phase II ESA included test pit excavation of mounded soil, as well as soil and surface water sampling across the Site. It is anticipated that the mounded soil will be removed during site development. Assessment of groundwater was not included in this investigation, because the Phase I ESA did not identify potential concerns associated with groundwater. Further, it is not anticipated that groundwater will be used as a drinking water source in the future at this site. Figures depicting the Chase Lands Properties and areas of investigation are included as Appendix A. Tabulated laboratory analytical data and summarized field observations are included as Appendix B.

An eight-day field investigation was performed that included surveying and sample location selection activities, utility avoidance activities, test pit excavation, and the collection of soil and surface water samples for laboratory analysis. Reported concentrations of arsenic, lead, chromium, polycyclic aromatic hydrocarbons (PAHs), and petroleum were detected in soil samples collected during the Phase II ESA.

As part of the Phase II ESA, chemicals with reported concentrations exceeding the U.S. Environmental Protection Agency (EPA) residential soil risk-based screening levels (RSLs) were evaluated to assess potential concerns for human exposures at the Site. The RSLs are periodically reviewed and updated by EPA to incorporate revised toxicity values and other information for Human Health Risk Assessments (HHRA). The 2008 Maryland Cleanup Standards for Soil and Groundwater were based on EPA Risk-Based Concentrations that were current at the time, and Maryland's Standards can be used as an initial screen for contamination at a site. Because a risk assessment was completed for the Site, EA deferred to the updated (May

2016) EPA RSLs for screening as the basis of the risk-based analysis. EPA does not have an RSL for Total Petroleum Hydrocarbons (TPH), because TPH encompasses the entire group of hydrocarbons, rather than an individual chemical; therefore, the 2008 Maryland Cleanup Standards were used for screening TPH results.

An HHRA was performed to determine potential carcinogenic risks and non-carcinogenic hazards based upon EPA and MDE risk assessment methodology and for the expected future use. The carcinogenic risk results for the evaluated receptors (elementary, middle, high school, and adult recreational users) are less than the Maryland Department of the Environment (MDE) remedial action level of $10^{-5}$. Non-carcinogenic hazards for all receptors are below the MDE target threshold of 1. Additionally, the risk results are consistent throughout the exposure areas evaluated. This indicates that overall exposures across the Site are consistent and not a concern for human health.

The EPA has not published toxicity values for lead, so potential human health concerns cannot be determined in a manner like other chemicals evaluated in the HHRA. Instead, blood lead levels are the indicator of excess lead exposure in humans. The maximum detected concentration of lead exceeded the EPA residential soil RSL of 400 mg/kg at three sample locations: GS-S-03 (543 milligram per kilogram [mg/kg]), SE-S-08 (563 mg/kg), and SE-S-09 (432 mg/kg). Sample location GS-S-03 is located within the northern area grab samples exposure area. The arithmetic mean concentration of lead for this area is 135.5 mg/kg. Sample locations SE-S-8 and SE-S-09 are located within the sewer easement exposure area. The arithmetic mean concentration of lead for this area is 140 mg/kg. For both areas, the mean lead concentration is less than the EPA residential soil RSL. This indicates that overall exposures to lead at the Site are not a concern for human health, since effective exposures are to average concentrations, not those at one point.

It was noted that arsenic concentrations across the Site were within an order of magnitude of the United States Geological Survey (USGS) anticipated typical concentration (ATC) for Central Maryland and are considered a naturally occurring product of site geology.

Detections of total petroleum hydrocarbons – diesel range organics (TPH-DRO) at reported concentrations greater than the screening criteria could not be included in the risk assessment because TPH includes a range of organic compounds, rather than individual compound results that are required for the HHRA analysis. TPH-DRO was reported at concentrations exceeding screening levels in one sample collected from the Intermittent Soil Mounds (ISM) area and one sample collected from the Sprawling Area of Waste (SAW). The exceedances in these areas do not appear to be correlated with the presence of either soil mounds or surficial waste. In

addition, the exceedances were 2.6 and 3.2 times the screening level, with no individual VOCs or PAHs exceeding MDE generic numeric screening criteria at those locations. MDE guidance (2008) provides for attainment of a soil cleanup standard when at least 10 soil samples are collected from a soil horizon and 75 percent of all samples collected are equal or less than the standard and no individual sample exceeds 10 times the standard. Therefore, in conformance with MDE guidance, no further action is required or recommended for the TPH-DRO detections within the ISM area and the SAW area.

TPH-DRO was reported at concentrations exceeding screening levels in two samples collected within the sewer easement. The exceedances in this area appear to be associated with observed surficial waste. In addition, the exceedances were 3.0 and 5.4 times the screening level, with several PAHs exceeding MDE generic numeric screening criteria at those locations. It is recommended that soil be removed from the locations within the sewer easement where TPH-DRO concentrations exceeded screening levels. Confirmatory sampling is recommended following soil excavation activities.

# 1. INTRODUCTION

## 1.1 PURPOSE AND SCOPE

The purpose of the Phase II ESA was to provide Howard County with additional information to evaluate the previously-identified areas of soil and debris mounding noted in the Phase I ESA Report, and to assist Howard County with making informed decisions regarding the planned future use of the property (i.e., construction of schools and recreational fields). EA Engineering, Science, and Technology, Inc., PBC (EA) conducted this Phase II Environmental Site Assessment (ESA) in accordance with EA Proposal No. 0751510, dated 27 January 2017 under the November 2010 Consulting Services Agreement CA#11-10, between Howard County, Maryland and EA. This Phase II ESA was performed in accordance with Standard Practice for ESAs: Phase II ESA Process – American Society for Testing and Materials (ASTM) E-1903-11 requirements. This report reflects the observations, information, and data collected by EA from 01 to 17 February 2017.

The scope of the investigation was based on the findings of the Phase I ESA; the proposed investigation was focused on the visual assessment of mounded soil, characterization of native soil, and the identification of potential impacts to soil and surface water across the Site. To meet these objectives, an eight-day field investigation was performed that included surveying and sample location selection activities, utility avoidance activities, test pit excavation, and the collection of soil and surface water samples for laboratory analysis. It is anticipated that removal of the mounded soil will be completed prior to site development. Assessment of groundwater was not included in this investigation because the Phase I ESA did not identify potential concerns associated with groundwater and groundwater is not anticipated to be used as a drinking source in the future at this site.

# 2. BACKGROUND

## 2.1 SITE LOCATION AND DESCRIPTION

The subject site is hereby referred to as the Chase Lands Properties, and is comprised, either in whole or in part, of the lands of five individual parcels, totaling 79.06 +/- acres of land as detailed in Table 1-1. Parcel 349, which is owned by Chase Land, LLC, is part of the subject site but was omitted from the Phase II ESA because it was occupied at the time of assessment. Site, when used in this report, is defined as all tax parcels identified in Table 1-1 except for Parcel 349. The Site primarily consists of unimproved, currently wooded land.

**Table 1-1. Subject Site Details**

| Tax Map | Tax Parcel | Total Size of Parcel | Area of Phase II ESA | Owner | Tax Address |
|---|---|---|---|---|---|
| 42 | 102 | 4 acres | 4 acres | Chase Land, LLC | Mission Road |
| 42 | 349 | 8.2 acres | 8.2 acres | Chase Land, LLC | 8717 Mission Road |
| 43 | 235 | 228 acres | +/- 65 acres | Chase Land, LLC | 8601 Washington Boulevard |
| 47 | 384 | 39.4 acres | 0.87 acres | Konterra | SE Pine Road |
| 48 | 548/ Parcel B | 0.99 acres | 0.99 acres | Chase Land, LLC | 8552 Washington Boulevard |

The boundaries of the subject site and areas of investigation are depicted on Figure 1 (Appendix A).

## 2.2 PREVIOUS INVESTIGATIONS

At the request of the Department of Public Works (DPW), EA performed a Phase I ESA during November 2016 for the subject site. The subject site history was included in the Phase I ESA report. Based on the Phase I findings, the Phase II ESA was recommended. EA understands that the DPW is in the process of purchasing the subject site and is therefore interested in addressing the findings identified during the Phase I ESA.

During the Phase I ESA, the following RECs were identified:

- Parcel 235: Wastes were observed within a large pile northwest of the sewer easement and additionally were strewn in a northerly and easterly direction along this easement and into the northern wetland.
- Parcel 235: Soil mounds with evidence of non-household waste observed along the sewer easement and strewn along the northern side of the mining access road.
- Parcel 349: A partially filled plastic 55-gallon drum of used oil and approximately 10 less than five-gallon portable gasoline cans were observed; a lead-acid battery was observed on the ground surface along the exterior wall of the shop beneath a plastic tarp.

During the Phase I ESA, various small piles of discarded household wastes were noted throughout the study area, most noticeably along the sewer easement within Parcel 235 (i.e., small quantities of automotive waste/metal, children's toys and stuffed animals, isolated automobile tires, clothing, unspecified metal debris). The presence of these materials is not indicative of a release of petroleum products or hazardous substances and therefore is considered a *de minimis* condition. Mounded soil was observed within the interior of the study area without signs of waste. No surficial evidence was observed to indicate that materials are indicative of a release of hazardous substances or petroleum products.

# 3. METHODOLOGY

## 3.1 TASK 1: SURVEYING AND SAMPLE LOCATION SELECTION

On 1 February 2017, representatives from the Howard County Bureau of Environmental Services, the Howard County Bureau of Engineering Survey Division and EA mobilized to the Site in advance of the site investigation (Task 2) to record and verify the areal extent of potential waste disposal and the individual soil mounds and groupings of mounds (mound areas). A total of 16 pin-flags were placed along the outer perimeter of the area of Intermittent Soil Mounds (ISM) previously identified in the Phase I ESA. A total of 8 pin-flags were placed along the outer perimeter of the Sprawling Area of Waste (SAW) previously identified in the Phase I ESA. The locations of pin flags in each area were recorded by representatives from Howard County's Survey Division and were reported to EA. Prior to the start of fieldwork, a tentative grid layout was planned for each area based on observations made during the Phase I ESA. Subsequent to the delineation of the ISM and SAW, EA revised the grid layout in each area so that the grid bounds extended just outside the most exterior mounds or locations of waste. As a result of the delineation of the ISM and SAW, the planned 30-point sampling grid in the ISM was updated to a 20-point sampling grid, and the planned 10-point sampling grid in the SAW was updated to a 13-point sampling grid. The 20-point sampling grid in the ISM was set up so that each grid has an area of 0.5 acres and dimension of 145 feet by 145 feet. The 13-point sampling grid in the SAW was set up so that each grid has an area of 0.25 acres and dimensions of 95 feet by 115 feet. The ISM and SAW areas along with the associated grids are shown in Figure 1.

A 20-foot buffer was marked with wooden stakes on either side of the domestic/industrial waste sewer easement located on Parcel 235. The total width of the easement and buffer is 80 linear feet, and the total area is 4.4 acres. A 10-point sampling grid was established along the entire length of the easement and buffer. The 10-point sampling grid was set up so that each grid has an area of 0.4 acres and dimensions of 80 feet by 239 feet. The sewer easement and associated grid are shown in Figure 1.

## 3.2 TASK 2: SITE INVESTIGATION

Field activities followed requirements contained in EA's General Health and Safety Plan (HASP) for Hazardous Waste & Environmental Services (EA 2014), as well as the site-specific health and safety plan addendum that was prepared prior to fieldwork. Level D personal protective equipment (PPE) was used for the duration of the investigative activities.

### 3.2.1 Utility Avoidance

Prior to the start of fieldwork, EA contacted Miss Utility to request utility clearance and received four separate tickets (Ticket Nos. 17073598, 17083580, 17085046, and 17083603) for the duration of the project. On 15 February 2017, the subsurface sewer line was marked with green pin flags in areas where excavation was anticipated to occur within the previously surveyed and marked sewer easement.

### 3.2.2 Sampling Methodology

Based on the findings identified in the Phase I ESA and the known site limitations and intended use, the investigation focused on identifying potential impacts to native surface soil and surface water from historical dumping and/or potential waste disposal. Soil, consisting of the upper six inches of native soil, was selected as a target medium because dumping practices might have impacted the native land surface and non-native soils associated with the mounds are anticipated to be removed during site development. Surface water was also selected as a target medium because water was observed emanating from areas (i.e., seeps) with observed waste.

In accordance with Maryland Department of the Environment (MDE) Cleanup Standards for Soil and Groundwater, Interim Final Guidance (MDE 2008), the sampling methodology included two approaches to ensure adequate sample coverage. Soil sampling locations were based on grids within areas identified as containing scattered waste or soil mounds, and were grab samples at locations based on where evidence of waste was observed outside of grid areas. If evidence of waste was not observed within a grid, the sample location was moved to the center of that grid. Details on the sampling approach are included in each subsection below.

The positions of soil and surface water sampling locations were collected in the field using a Trimble® global positioning system (GPS) unit and a follow-up survey of sampling locations was conducted by the Howard County Survey Division.

#### 3.2.2.1 Surface Soil Sampling

Surface soil sampling involved the use of manual sampling tools and heavy equipment capable of test pitting soil mounds and debris areas. At each test pit location where a soil sample was collected, the observed soil stratum was logged and described for grain size, composition percentages, relative sorting, color, and classified in accordance with the Unified Soil Classification System (USCS) by field personnel. Test pit logs were not completed for the additional test pit locations described in Section 4.1 or for grab sample locations; however,

information such as soil characteristics, observed waste, and depth to native soil was included in the field logbook for each of these locations. A representative photograph log is included as Appendix C. Test pit logs are included in Appendix D of this report. Soil was field screened for volatile organic compounds (VOCs) with a photoionization detector (PID) in accordance with EA Standard Operating Procedure (SOP) No. 011 for PID. In addition, any visual/olfactory observations of potential impacts were recorded on the test pit logs. Field personnel collected photographs at each sampling location to document the observations and sampling activities. EA SOPs are included in Appendix E. Specific details on the methodologies are provided below.

Parcel 235 - Intermittent Soil Mounds without Surficial Evidence of Waste (ISM)

An extensive area of intermittent soil mounds without surficial evidence of debris/waste (approximately 6.4 acres) was observed west of the railroad tracks and north/northwest of the sediment trap/pond. Mounds ranged from low relief (one to two feet above native ground surface) to moderate relief (3 to 4 feet above native ground surface). Many mounds were observed to have mature trees growing on them, indicating that the ground disturbance or deposition was not recent.

EA laid out a 20-point sampling grid within the ISM. Each grid has an area of 0.5 acres and dimensions of 145 feet by 145 feet. One grab soil sample was collected from within each grid, with sampling locations biased towards areas of mounded soil, areas where evidence of waste was observed, or where field observations (e.g., elevated PID reading, visual staining, olfactory evidence) indicated that native soil may be impacted. In grids where no evidence of waste was observed, the grab soil sample was collected from the center of the grid. EA utilized the compact excavator to test pit down to native soil in grids containing soil piles. Each grab soil sample was obtained from the upper six inches of the native soil. Subsequent to soil sample collection, the excavated soil was backfilled to eliminate hazards associated with open excavations.

Parcel 235 - Sprawling Area of Waste (SAW)

A sprawling area of waste (approximately 2 acres) strewn along the northern side of the mining access road amongst mounds of soil on Parcel 235 contained unspecified metal debris, a 10-gallon drum, rusty 1-gallon paint cans, 40-50 automotive tires and other unspecified wastes. This area extends west from the sediment trap/pond and continues west toward the southwestern side of Parcel 235. The origin and current disposition of these materials is unknown and appears to either be a remnant of sediment trap/pond construction, or deposited over time (e.g., dumping) via pathways observed on historical aerial photographs.

EA laid out a 13-point sampling grid within the SAW. Each grid (except for D4 and E3) has an area of 0.25 acres and dimensions of 95 feet by 115 feet. Grids D4 and E3 were truncated due to their proximity to the property boundary which resulted in smaller grids (area of 0.125 acres). One grab soil sample was collected from within each grid, with sampling locations biased towards areas of mounded soil, areas where evidence of waste was observed, or where field observations (e.g., elevated PID reading, visual staining, olfactory evidence) indicated that native soil may be impacted. In grids where no evidence of waste was observed, the grab soil sample was collected from the center of the grid. EA utilized the compact excavator to test pit down to native soil in grids containing soil piles. Each grab soil sample was obtained from the upper six inches of the native soil. Subsequent to soil sample collection, the excavated soil was backfilled to eliminate hazards associated with open excavations.

Parcel 235 - Domestic/Industrial Waste Sewer Easement

Evidence of waste was observed along the sewer easement. Waste was primarily categorized as residentially-originated and was observed to include discarded automotive tires, a vehicle hood, empty small quantity petroleum containers, children's toys, clothing, shoes, broken small appliances, and other household goods and metallic debris. In addition, a large pile containing unspecified metal debris, several large filament light bulbs, a portion of a former wooden light or electrical pole, sections of transite pipe, and numerous discarded "telephone/telegraph tiles" were observed in the northern portion of the easement.

A 20-foot buffer was marked out on either side of the sewer easement. The total width of the easement and buffer is 80 linear feet, and the total area is 4.4 acres. The Howard County Bureau of Engineering Survey Division laid out a 10-point sampling grid along the entire length of the easement and buffer. Each grid has an area of 0.4 acres and dimensions of 80 feet by 239 feet. One grab soil sample was collected from within each grid, with sampling locations biased towards areas where evidence of waste was observed, or where field observations (e.g., elevated PID reading, visual staining, olfactory evidence) indicated that native soil may be impacted. In grids where no evidence of waste was observed, the grab soil sample was collected from the center of the grid. EA utilized the compact excavator to test pit down to native soil in grids containing soil piles. Each grab soil sample was obtained from the upper six inches of the native soil unless noted otherwise.

Parcel 235/384 – Grab Sampling Locations Outside of Grid Areas

Grab soil sampling was conducted at eight locations of isolated waste disposal outside areas where grids were established. EA utilized the compact excavator to test pit down to native soil at locations where soil mounds were present. Hand tools were used to collect grab soil samples

from the upper six inches of native soil at the locations where surficial waste was observed. When possible, surficial waste was removed during sampling to allow for the collection of the immediately underlying native soil. At sampling locations where surficial waste could not be removed manually, a sample was collected from the upper six inches of native soil at a point along the perimeter of the waste. Subsequent to soil sample collection at locations requiring test pit excavation, excavated soil was backfilled to eliminate hazards associated with open excavations.

#### 3.2.2.2 Surface Water Sampling

Parcel 235 - Drainage Channels

Two drainage channels were observed near the northern portion of the sewer easement. The northern-most drainage channel was observed to pass through a small pile of discarded tires, and the southern-most drainage channel was observed to pass over a concrete culvert. A surface-water sample was collected from each of the two drainage channels immediately downgradient of the sewer easement in accordance with EA SOP No. 007 for Surface Water Sampling.

### 3.2.3 Laboratory Analysis

Upon completion of sampling, the necessary entries on the chain-of-custody (COC) form were completed. The labeled and filled sample containers were placed into an iced cooler immediately after sampling. At the end of the sampling day, the COC was placed in a waterproof plastic bag and taped to the inside lid of the cooler. Turn-around time (TAT) [standard] was noted on the COC and coordinated with the analytical laboratory as requested by DPW. Samples were submitted to Howard County's contract laboratory (ALS Environmental) for the following laboratory analyses:

Soil Samples (51 Grab Samples and 6 Duplicate Samples)

- VOCs and Oxygenates by U.S. Environmental Protection Agency (EPA) Method 8260/5035
- Semi-volatile Organic Compounds (SVOCs) by U.S. EPA Method 8270
- Total Petroleum Hydrocarbon (TPH) Gasoline Range Organics (GRO) by U.S. EPA Method 8015
- TPH Diesel Range Organics (DRO) by U.S. EPA Method 8015
- Polychlorinated biphenyls (PCB) by U.S. EPA Method 8082A

- Priority Pollutant Metals by U.S. EPA Method 6020/3051
- Organochlorine Pesticides by U.S. EPA Method 8081

Surface-water Samples (2 Grab Samples and 1 Duplicate Sample)

- VOCs by U.S. EPA Method 8260
- 1,2-Dibromo-3-Chloropropane (DBCP) and 1,2-Dibromoethane (EDB) by U.S. EPA Method 8011
- SVOCs by U.S. EPA Method 8270/8270 SIM
- TPH-GRO by U.S. EPA Method 8015
- TPH-DRO by U.S. EPA Method 8015
- Priority Pollutant Metals by U.S. EPA Method 6020/3015
- Polychlorinated biphenyls by U.S. EPA Method 8082A
- Organochlorine Pesticides by U.S. EPA Method 8081

A summary of the quantity and type of collected samples is included in Table 3-1.

**Table 3-1: Sample Locations and Quantities**

| Parcel | Area Name | Matrix | Qty. Grab Samples |
|---|---|---|---|
| 235 | Intermittent Soil Mounds (ISM) | Soil | 20 |
| 235 | Sprawling Area of Waste (SAW) | Soil | 13 |
| 235 | Sewer Easement (SE) | Soil | 10 |
| 235/384 | Grab Sampling (GS) Locations Outside of Gridded Areas | Soil | 8 |
| 235 | Drainage Channels (SW) | Surface Water | 2 |

### 3.2.3.1 Sample Nomenclature

Prior to sampling, soil containers were labeled to coincide with the Site (Chase Lands [CL]), and to identify the sample location (ISM), the matrix (S), and the grid/sample number (A1). For example, the surface soil sample collected in grid A1 of the Intermittent Soil Mound area (ISM) was labeled:

CL-ISM-S-A1

The first field duplicate sample was labeled as follows:

DUP-01

Prior to sampling, surface water containers were labeled to coincide with the Site (Chase Lands [CL]), grab sample (GS), the matrix (SW), and the sample number (01). For example, the first surface water sample collected was labeled:

CL-GS-SW-01

The field duplicate sample was labeled as follows:

DUP-01

### 3.2.3.2 Quality Control Samples

A total of 51 soil samples and 2 surface water samples were collected. In addition to the environmental samples, a summary of quality control (QC) samples is indicated below (Table 3-2). Trip blanks (for VOCs only) and field duplicate samples were collected to monitor sampling and laboratory quality control.

**Table 3-2: Quality Control Samples**

| QC Method | Purpose | Frequency | Sample Names |
|---|---|---|---|
| Field Duplicate Samples | Measures precision | 10 percent | DUP-01 – DUP-07 |
| Trip Blanks | Measures cross-contamination | 1 per cooler (VOC samples only) | TB-01 – TB-07 |

A complete record of QC samples was maintained as a part of the field sampling documentation. A brief description of the quality control samples and collection procedures is listed below.

Field Duplicates

Field duplicates are co-located samples (collected at the same time from the same location using the same sampling procedures) that are analyzed to evaluate the precision of the sampling and analysis system. Field duplicate samples submitted for laboratory analyses are submitted without indication of which investigative sample the duplicate represents.

Trip Blanks

Trip blanks are sample bottles containing analyte-free, deionized water prepared at the laboratory, and stored and shipped with samples being submitted for VOC analysis. The trip blanks are not opened in the field. Care is taken to ensure that the trip blank and sample bottles

originate from the same shipment of bottles from the laboratory. Information obtained from the trip blank analyses is used to determine whether, and to what extent, sample handling and analysis has introduced positive bias to the sample results.

### 3.2.4 Investigation-Derived Waste

Investigation Derived Waste (IDW) consisted of soil and unearthed household and non-household waste because of test pit excavation. IDW was left in place following test pit excavation. Decontamination water resulting from soil sampling activities was not containerized.

### 3.2.5 Decontamination

Decontamination procedures followed EA SOP No. 005 for Field Decontamination. Decontamination of the compact excavator between test pits was not performed because the bucket was used only to excavate to native soil and did not contact the soil to be sampled. Decontaminated soil sampling equipment was used to collect samples from native soil (i.e., below the extent to which the bucket of the compact excavator was advanced). Non-dedicated soil sampling equipment was decontaminated between each sampling location using a Liquinox solution followed by a deionized water rinse.

# 4. RESULTS

## 4.1 SURFACE SOIL AND SURFACE WATER PHYSICAL CHARACTERISTICS

In accordance with MDE Cleanup Standards for Soil and Groundwater, Interim Final Guidance (MDE 2008), the sampling methodology included two approaches to ensure adequate sample coverage. Soil sampling locations were based on three areas that were subdivided into regularly spaced grids identified as containing scattered waste or soil mounds, and were grab samples at areas where evidence of waste was observed outside of areas where grids were defined. If evidence of waste was not observed within a particular grid, the sample location was moved to the center of that grid. Surface water was also selected as a target medium for sampling because water was observed emanating from areas (i.e., seeps) with observed waste. Sample locations are shown in Figure 2 in Appendix A and a detailed summary of observations made during sampling activities is included in Table 4-1 in Appendix B. Photographs of field investigation activities are provided in Appendix C. Test pit logs are included in Appendix D of this report.

### 4.1.1 Parcel 235 - Intermittent Soil Mounds without Surficial Evidence of Waste (ISM)

Soil mounds were observed in 17 out of 20 grids in the ISM area. Test pit excavation was conducted in each grid where soil mounds were observed. These test pits were excavated to the depth that native soil was encountered and ranged in depth from approximately 2.5 feet to 5.5 feet depending on the thickness of the soil mound. A grab soil sample was collected from the upper six inches of native soil at each test pit location.

Mounded soil in the ISM area was observed to be generally composed of the following materials:

**USCS Classification: OL**
*Slightly Sandy Organic Silt and Clay Mixture with Occasional Gravel* – Approximately 50 - 90 percent fines, 10 - 40 percent sand, 0 - 10 percent gravel, fine to coarse grain size, moderately sorted, dark brown color, rich in organic material.

Native soil in the ISM area was observed to be generally composed of the following materials:

**USCS Classification: SC/SM to CL/CH**
*Sand and Clay/Silt Mixture of Varying Proportions with Occasional Gravel* – Approximately 40 – 90 percent fines, 10 – 60 percent sand, 0 – 20 percent gravel, very fine to coarse grain size, very poorly to moderately sorted, light brown to occasionally light tan color.

No test pit excavations in the ISM area were observed to exhibit evidence indicating impacts to the native soil. No elevated PID readings, visual staining, olfactory evidence, or significant waste deposits were observed throughout the vertical profile of either the mounded soil or native soil in the ISM area.

Three grids in the ISM area were observed to contain no soil mounds or evidence of surficial waste (A1, B5, and D2). Hand tools were used to collect a grab sample from the upper six inches of native soil from the center of each of these grids.

Groups of soil mounds in the ISM area were frequently observed to exhibit a bowl/horseshoe shape with soil mounds partially or fully encircling a slight depression relative to the mounds. EA conducted an additional test pit excavation in one grid in the ISM area where this configuration was observed (B3). The test pit was excavated to a depth of approximately 3 feet in a central depression encircled by a group of mounds. Native soil was encountered at a depth of two inches and no waste or evidence of impacts to the native soil was observed. No soil sample was collected from this location.

### 4.1.2 Parcel 235 - Sprawling Area of Waste (SAW)

Soil mounds were observed in 6 out of 13 grids in the SAW. Test pit excavation was conducted in each grid where soil mounds were observed. Test pits were located to coincide with soil mounds and evidence of surficial waste where possible. These test pits were excavated to the depth that native soil was encountered and ranged in depth from approximately 2.5 feet to 4.75 feet depending on the thickness of the soil mound. A grab soil sample was collected from the upper six inches of native soil at each test pit location.

Mounded soil in the SAW was observed to be generally composed of the following materials:

**USCS Classification: OL**
*Slightly Sandy Organic Silt and Clay Mixture* – Approximately 50 - 90 percent fines, 10 - 40 percent sand, fine to coarse grain size, moderately sorted, dark brown color, rich in organic material.

Native soil in the ISM was observed to be generally composed of the following materials:

**USCS Classification: SC to CL/CH**

*Sand and Clay Mixture of Varying Proportions* – Approximately 40 – 90 percent fines, 10 – 60 percent sand, very fine to coarse grain size, poorly to moderately sorted, light brown color.

No test pit excavations in the SAW were observed to exhibit evidence indicating impacts to the native soil. No elevated PID readings, visual staining, or olfactory evidence was observed throughout the vertical profile of either the mounded soil and native soil in the SAW.

Soil mounds and surficial waste (unspecified metal debris, empty 15-gallon [estimated] drum, tires, and household waste) were co-located in two grids in the SAW (B1 and E3). Observation of the vertical profile of test pit excavations in these grids indicated that waste deposition was limited to the surface.

Five grids in the SAW were observed to contain no soil mounds but did contain evidence of surficial waste (A1, A2, C1, C2, and D3). Surface waste was observed to include tires, metal debris, and an empty 10-gallon (estimated) drum. Hand tools were used to collect a grab sample from the upper six inches of native soil from beneath the observed surficial waste in each grid.

Two grids in the SAW were observed to contain no soil mounds or evidence of surficial waste (B2 and C3). Hand tools were used to collect a grab sample from the upper six inches of native soil from the center of each of these grids.

Additional test pit excavation was conducted in one grid (B1) in the SAW which exhibited co-located soil mounds, surficial waste, and the bowl/horseshoe configuration of mounds observed frequently in the ISM area. The compact excavator was used to test pit approximately 75 percent of the area exhibiting surficial waste to a depth of two feet. Native soil was encountered at a depth of six inches and observation of the vertical profile of the test pit excavation indicated that waste deposition was limited to the surface. Test pit excavation was also conducted to a depth of approximately 3 feet in the central depression encircled by the group of mounds. Native soil was encountered at a depth of 12 inches and no waste or evidence of impacts to the native soil was observed. No soil samples were collected from the additional test pit excavations in this grid.

### 4.1.3 Parcel 235 - Domestic/Industrial Waste Sewer Easement

Evidence of waste was observed along the sewer easement. Waste was primarily categorized as residentially-originated and was observed to include discarded automotive tires, a vehicle hood, empty small quantity petroleum containers, children's toys, clothing, shoes, broken small

appliances, and other household goods and metallic debris. In addition, a large pile containing unspecified metal debris, several large filament light bulbs, a portion of a former wooden light or electrical pole, sections of transite pipe, and numerous discarded "telephone/telegraph tiles" were observed in the northern portion of the easement.

Waste was observed in all ten grids in the sewer easement area. Except for sample CL-SE-S-09, hand tools were used to collect a grab soil sample from the upper six inches of native soil at locations where surficial waste was observed in each of the ten grids.

Hand tools were used to collect sample CL-SE-S-09 from the upper six inches of the large soil and waste pile located in-part within the sewer easement. Mounded soil instead of native soil was chosen as the target media for this sample to determine whether the telephone/telegraph tiles, automotive parts, and unspecified metal debris had impacted the directly underlying soil. In addition, a soil sample was collected from the native soil in this area subsequent to test pit excavation as one of the eight grab sample locations outside of grid area (CL-GS-S-08).

Native soil in the sewer easement area was observed to be generally composed of the following materials:

**USCS Classification: SC to CL/CH**
*Sand and Clay Mixture of Varying Proportions* – Approximately 40 – 90 percent fines, 10 – 60 percent sand, very fine to coarse grain size, poorly to moderately sorted, light brown color.

No sample locations in the sewer easement area were observed to exhibit evidence indicating impacts to the native soil except for sample CL-SE-S-04. PID screening of the soil at this sampling location beneath an empty, rusted paint can resulted in a reading of 2.8 parts per million (ppm) indicating a slight impact to the native soil. No elevated PID readings, visual staining, or olfactory evidence was observed at any other sampling location within the sewer easement area.

### 4.1.4 Parcel 235/384 – Grab Sampling Locations Outside of Gridded Areas

A small asphalt pile was observed on the northern portion of Parcel 235, east of Parcel 349 and west of the sewer easement. Hand tools were used to reach the native soil at a point along the perimeter of the asphalt pile and one grab soil sample (CL-GS-S-01) was collected from the upper six inches of the native soil.

The foundation of a historical farmhouse was observed equidistant between the eastern boundary of Parcel 349 and the sewer easement to the east. Household waste was removed from the surface of the native soil to a point where approximately 50 percent of the area within the foundation was excavated down to native soil. Due to site limitations, excavation was focused on two areas within the foundation; along the eastern retaining wall to a depth of approximately 4 feet and in the southwestern corner to a depth of approximately 6 feet.

Mounded soil along the eastern retaining wall of the foundation was observed to be composed of the following materials:

**USCS Classification: OL**
*Sandy Organic Clay with Gravel* – Approximately 50 percent fines, 40 percent sand, very fine to coarse grained sand, fine gravel, poorly sorted, dark brown color.

Native soil along the eastern retaining wall of the foundation was observed to be composed of the following materials:

**USCS Classification: CH**
*Sandy Clay of High Plasticity with Gravel* – Approximately 60 percent fines, 30 percent sand, 10 percent gravel, very fine to medium grained sand, fine gravel, poorly sorted, light brown color.

Mounded soil in the southwestern corner of the foundation was observed to be composed of the following materials:

**USCS Classification: PT/Debris**
*Primarily Organic Material* – Mixture of mulch/wood and concrete, stone, and brick debris.

Native soil in the southwestern corner of the foundation was observed to be composed of the following materials:

**USCS Classification: SP**
*Clean Poorly Graded Sand with Gravel* – Approximately 50 percent sand, 50 percent gravel, coarse grained sand, fine to coarse gravel, very poorly sorted, light brown color.

One composite soil sample (CL-GS-S-02) was collected from the same vertical interval but from each of the two excavation areas within the areal extent of the foundation.

A transite pipe and unspecified metal debris was observed between the eastern boundary of Parcel 349 and the sewer easement near the western boundary of the easement. Hand tools were used to reach the native soil at a point along the edge of the transite pipe and one grab soil sample (CL-GS-S-03) was collected from the upper six inches of the native soil.

An empty, rusted 15-gallon (estimated) drum was observed equidistant between the southern boundary of Parcel 349 and the sewer easement to the south. Hand tools were used to reach the native soil at a point beneath the drum and one grab soil sample (CL-GS-S-04) was collected from the upper six inches of the native soil.

A transite pipe was observed near the western boundary of the third sewer easement grid from the south. Hand tools were used to reach the native soil at a point along the edge of the transite pipe and one grab soil sample (CL-GS-S-05) was collected from the upper six inches of the native soil.

A small pile with evidence of burned waste/debris of unknown origin and use was observed between the western boundary of the Site and the western boundary of the Intermittent Soil Mound area. Hand tools were used to reach the native soil at a point within the center of the pile and one grab soil sample (CL-GS-S-06) was collected from the upper six inches of the native soil.

A soil pile and associated excavation was observed in Parcel 384 with no surficial evidence of waste disposal. Due to the small size of the parcel and focused area of dumping, a total of one grab soil sample (CL-GS-S-07) was collected from the upper six inches of the native soil. To reach native soil, a compact excavator was used to test pit approximately 50 percent of the soil pile to a depth of approximately 3.5 feet, with the vertical extents limited to where native soil was encountered. An additional test pit was excavated in the existing depression adjacent to the soil pile to a depth of approximately one foot at which no soil sample was collected.

Native soil and mounded soil at this sampling location was observed to be composed of the following materials:

**USCS Classification: SC**
*Sandy Clay with Gravel* – Approximately 40 percent sand, 30 percent fines, 30 percent gravel, coarse grained sand to fine gravel, very poorly sorted, light brown to light orange color.

No evidence was observed within either test pit excavation to indicate impacts to the native soil. No elevated PID readings, visual staining, olfactory evidence, or significant waste deposits were observed throughout the vertical profile of either the mounded soil and native soil at this location.

A large pile of mounded soil, telephone/telegraph tiles, automotive parts and unspecified metal debris was observed between the eastern boundary of Parcel 349 and the sewer easement near the western boundary of the easement. To reach native soil, a compact excavator was used to test pit approximately 75 percent of the soil pile to a depth of approximately 2.5 feet, with the vertical extents limited to where native soil was encountered.

Mounded soil at this location was observed to be composed of the following materials:

**USCS Classification: OL**
*Sandy Organic Clay* – Approximately 60 percent fines, 40 percent sand, fine to medium grain size, moderately sorted, dark brown to very dark brown color, rich in organic material, automotive waste and metal debris.

Native soil at this location was observed to be composed of the following materials:

**USCS Classification: CH**
*Sandy Clay of High Plasticity* – Approximately 50 percent fines, 50 percent sand, medium grained sand, moderately sorted, light brown color.

Waste disposal consisting primarily of automotive parts and unspecified metal debris was observed within the mounded soil at this location to the depth that native soil was encountered at approximately two feet. No waste was observed within the vertical profile of the native soil. One soil sample (CL-GS-S-08) was collected from the upper six inches of native soil at this location.

None of the sample locations outside of grid areas were observed to exhibit evidence indicating impacts to the native soil. No elevated PID readings, visual staining, or olfactory evidence was observed throughout the vertical profile of both mounded soil and native soil at any of the sample locations outside of gridded areas.

### 4.1.5 Parcel 235 - Drainage Channels

Two drainage channels were observed near the northern portion of the sewer easement. The northern-most drainage channel (CL-GS-SW-02) was observed to pass through a small pile of discarded tires, and the southern-most drainage channel (CL-GS-SW-01) was observed to pass over a concrete culvert. A surface-water sample was collected from each of the two drainage channels immediately downgradient of the sewer easement. No oil sheen, discoloration, or olfactory evidence was observed to indicate impacts to the surface water.

## 4.2 LABORATORY ANALYTICAL RESULTS

Analytical results from the sampling event (provided in Appendix F) were summarized for comparison with the residential EPA RSLs for soil and the EPA tapwater RSLs multiplied by a factor of ten for surface water. Chemicals with reported concentrations exceeding the RSLs were evaluated to assess potential concerns for human exposures at the Site. The RSLs are periodically reviewed and updated by EPA to incorporate revised toxicity values and other information for Human Health Risk Assessments (HHRA). The 2008 Maryland Cleanup Standards for Soil and Groundwater were based on EPA Risk-Based Concentrations that were current at the time, and Maryland's Standards can be used as an initial screen for contamination at a site. Because a risk assessment was completed for the Site, EA deferred to the updated (May 2016) EPA RSLs for screening as the basis of the risk-based analysis. EPA does not have an RSL for Total Petroleum Hydrocarbons (TPH), because TPH encompasses the entire group of hydrocarbons, rather than an individual chemical; therefore, the 2008 Maryland Cleanup Standards were used for screening TPH results.

EPA RSLs for water are based upon the expected human contact with surface water in the area and account for ingestion of surface water as a water supply. Because surface water will not be used as a water supply at the Site, the assumption for screening is that any surface water exposure would be at least ten times less than the EPA RSL exposure scenario that includes the ingestion of surface water. A comparison of screening levels and analytical results is provided in Tables 4-2 and 4-3 in Appendix B.

The United States Geological Survey (USGS) published the professional paper titled "Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States" (USGS 1984) that summarizes the anticipated typical concentrations (ATC) that were observed in soil across Maryland. This data was included as an appendix to the MDE Cleanup Standards for Soil and Groundwater (MDE 2008) and provides reference levels of metals (i.e., background

concentrations) that can be used to determine if observed concentrations are consistent with the concentrations observed in other investigations throughout Maryland.

### 4.2.1 Surface Soil Sampling

Fifty-one surface soil samples and six duplicate samples were collected for analysis.

Figure 2 includes surface soil and surface water screening level exceedances. No metals were reported at concentrations that exceeded the EPA residential soil RSLs or the USGS ATC for Central Maryland except for the following:

- Arsenic was reported at concentrations that exceeded the EPA residential soil RSL of 0.68 mg/kg in all surface soil samples except for CL-SAW-S-A1 and CL-SE-S-03. Samples in which arsenic was reported at concentrations exceeding the USGS ATC for Central Maryland of 4.9 mg/kg are as follows:

  CL-GS-S-01 [7.7 mg/kg], CL-GS-S-03 [5.5 mg/kg], CL-GS-S-07 [5.4 mg/kg], CL-ISM-S-A4 [22.1 mg/kg], DUP-04 (parent CL-ISM-S-A4) [12.5 mg/kg], CL-ISM-S-B3 [5.9 mg/kg], CL-ISM-S-B4 [7.2 mg/kg], CL-ISM-S-B5 [6.7 mg/kg], CL-ISM-S-C1 [12.3 mg/kg], CL-ISM-S-C2 [10 mg/kg], CL-ISM-S-C4 [5.9 mg/kg], CL-ISM-S-C5 [5.0 mg/kg], CL-ISM-S-D2 [6.2 mg/kg], CL-ISM-S-D4 [7.5 mg/kg], CL-ISM-S-D5 [13.8 mg/kg], DUP-03 (parent CL-ISM-S-D5) [6.3 mg/kg], CL-ISM-S-E4 [6.2 mg/kg], CL-SAW-S-E2 [6.7 mg/kg], CL-SAW-S-E3 [8.5 mg/kg], and CL-SE-S-04 [5.2 mg/kg].
- Chromium was reported at a concentration exceeding the USGS ATC for Central Maryland of 30 mg/kg in a total of nine surface soil samples; however, reported concentrations did not exceed the EPA residential soil RSL of 120,000 mg/kg for any of these samples.
- Hexavalent chromium was reported at concentrations exceeding the EPA residential soil RSL of 0.3 mg/kg in samples CL-ISM-S-A4 [1.6 J mg/kg], DUP-04 (parent CL-ISM-S-A4) [2.9 mg/kg], CL-ISM-S-D5 [0.74 J mg/kg], CL-SAW-S-E3 [3.6 mg/kg], CL-SE-S-04 [0.52 J mg/kg], and CL-SE-S-09 [2.2 J mg/kg].
- Lead was reported at concentrations exceeding the EPA residential soil RSL of 400 mg/kg in samples CL-GS-S-03 [543 mg/kg], CL-SE-S-08 [563 mg/kg], and CL-SE-S-09 [432 mg/kg].

No TPH-GRO was reported at concentrations that exceeded the MDE residential soil cleanup standard.

No TPH-DRO was reported at concentrations that exceeded the MDE residential soil cleanup standard except for the following:

- TPH-DRO was reported at concentrations exceeding the MDE residential soil cleanup standard of 230 mg/kg in samples CL-ISM-S-B3 [742 mg/kg], CL-SAW-S-B2 [595 mg/kg], CL-SE-S-03 [707 mg/kg], and CL-SE-S-09 [1240 mg/kg].

No pesticides were reported at concentrations that exceeded the EPA residential soil RSLs.

No PCBs were reported at concentrations that exceeded the EPA residential soil RSLs.

No VOCs were reported at concentrations that exceeded the EPA residential soil RSLs.

No SVOCs were reported at concentrations that exceeded the EPA residential soil RSLs except for the following:

- Benzo[a]pyrene was reported at a concentration exceeding the EPA residential soil RSL of 16 µg/kg in samples CL-GS-S-01 [37.0 J µg/kg], CL-GS-S-02 [20.3 J µg/kg], CL-GS-S-03 [32.8 J µg/kg], CL-GS-S-04 [22.7 J µg/kg], CL-GS-S-05 [33.0 J µg/kg], CL-GS-S-06 [17.6 J µg/kg], CL-SE-S-03 [38.5 J µg/kg], CL-SE-S-08 [64.3 J µg/kg], CL-SE-S-09 [224 µg/kg], and CL-SE-S-10 [32.0 J µg/kg].
- Benzo[b]fluoranthene was reported at a concentration exceeding the EPA residential soil RSL of 160 µg/kg in sample CL-SE-S-09 [492 µg/kg].
- Dibenz[a,h]anthracene was reported at a concentration exceeding the EPA residential soil RSL of 16 µg/kg in samples CL-SE-S-08 [75.2 J µg/kg] and CL-SE-S-09 [47.4 J µg/kg].

### 4.2.2 Surface Water Sampling

Two surface water samples and one duplicate sample were collected for analysis.

No metals were reported at concentrations that exceeded the EPA tapwater RSLs multiplied by a factor of ten for surface water except for the following:

- Arsenic was reported at a concentration that exceeded the screening level of 0.00052 mg/L in the duplicate sample (DUP-01 [0.0011 J mg/L]) collected from sampling location CL-GS-SW-02. Arsenic was not reported at a concentration greater than the laboratory reporting limit in the parent sample CL-GS-SW-02.

No TPH-GRO was reported at concentrations that exceeded the EPA tapwater RSLs multiplied by a factor of ten for surface water.

No TPH-DRO was reported at concentrations that exceeded the EPA tapwater RSLs multiplied by a factor of ten for surface water.

No pesticides were reported at concentrations that exceeded the EPA tapwater RSLs multiplied by a factor of ten for surface water.

No PCBs were reported at concentrations that exceeded the EPA tapwater RSLs multiplied by a factor of ten for surface water.

No VOCs were reported at concentrations that exceeded the EPA tapwater RSLs multiplied by a factor of ten for surface water.

No SVOCs were reported at concentrations that exceeded the EPA tapwater RSLs multiplied by a factor of ten for surface water.

### 4.2.3 Data Validation

EA did not perform a formal data validation process on the data analyzed by ALS Laboratories. The data was however reviewed for completeness and usability. EA received seven sample delivery groups (SDGs) from ALS for the Phase II ESA at a Portion of the Chase Lands, LLC Properties. The data packages were complete and all samples were analyzed for the requested methods. There were no major issues identified for any of the data during review. There were minor laboratory quality control (QC) issues listed in the laboratory reports that resulted in qualification of the data. The common issues included matrix spike and matrix spike duplicate (MS/MSD) samples with recoveries outside QC limits, relative percent differences for MS/MSD pairs outside QC limits, and method blank (MB) detections. The MB detections were used to assess contamination resulting from the analytical process. The analytes that were detected in the MB samples that resulted in qualification are: acetone, benzo[a]anthracene, bromomethane, butylbenzylphthalate, carbon disulfide, chloromethane, di-n-butylphthalate, diesel range

organics, gasoline range organics, and methylene chloride. The ten times rule was applied to common laboratory contaminates and the five time rule was applied to the remaining analytes, meaning if the result was less than ten or five times the result of the MB, the result was considered non-detect. Analytical results that were found to be non-detect due to the contamination from the MB samples have been qualified "UB".

A laboratory supplied Trip Blank (TB) sample was submitted with each sample cooler containing samples for VOC analysis. TB results include shipping and laboratory sources of contamination for VOCs only. The TB samples were also assessed for contamination and it was found that acetone was detected in 4 TB samples that resulted in qualified "UB" data.

All of the data contained in the seven SDGs from ALS Laboratories were sufficiently precise and accurate for use. However, there were some minor issues that resulted in qualification of the data. The usability of the qualified data for risk assessment and decision-making was not impaired.

# 5. RISK ASSESSMENT

As part of the Phase II ESA investigation, chemicals detected above the EPA residential soil RSLs were evaluated to determine if there are potential concerns for human exposures at the Site under the anticipated future use scenario. The comparison to the EPA RSLs is included in Tables 4-2 and 4-3 in Appendix B. A HHRA characterizes the nature and magnitude of potential health risks to humans from chemical contaminants that may be present. The HHRA only evaluates potential concerns with chemicals detected in analytical results from the Phase II ESA investigation. The risk assessment follows the risk assessment methodology and guidance as recommended by the EPA (1989 and 2009) and MDE (2008). Risks determined in the HHRA are considered baseline risks associated with exposure to media at the Site. The baseline risk assumes no means of exposure reduction and evaluates the reasonable maximum exposure (RME) that has the potential to occur at the Site based upon EPA guidance (1989). Therefore, HHRA results are considered potential and should be used as a guideline in making risk management decisions.

## 5.1 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) was developed to identify all complete, potentially complete, or incomplete exposure pathways for the Site, for anticipated future land uses. An exposure pathway is the course a chemical or physical agent takes from a source to a receptor. The CSM evaluates the potential sources of contamination, routes of migration, and potential receptors under the anticipated future use of the Site (i.e., schools and recreational fields), and removal of the mounded soil prior to site development. Exposure pathways begin from potential source areas and progress through the environment via various fate and transport processes to potential human receptors. A completed exposure pathway requires the following four components:

- A source and mechanism of chemical release to the environment
- An environmental transport medium for the released chemical
- A point of potential human contact with the contaminated medium
- A human exposure route at the point of exposure

All four components must exist for an exposure pathway to be complete and for exposure to occur. Incomplete exposure pathways do not result in actual human exposure and are not a concern for human health. All four components must exist for an exposure pathway to be complete and for exposure to occur. Incomplete exposure pathways do not result in actual human exposure and are not a concern for human health.

Currently, the Site is not used but some parcels have been used in the past as a residence. Definitive plans for future use of the Site have not been determined by Howard County at this time. However, it is anticipated that the Site and any associated future uses will fall under the category identified by MDE in the Cleanup Standards as Level 1: Public Recreational Areas (High Frequency Use) (MDE 2008). This level of public recreational area includes playgrounds, schools, golf courses, and picnic areas. These areas are available to a range of age groups at a high exposure frequency. The exposure frequency assumed for this type of receptor is 250 days per year (MDE 2008).

Due to the potential for various age groups to visit the Site, age ranges were broken down to mimic typical age ranges that correspond to specific school types (e.g., elementary, middle, and high). These age ranges would account for use of the Site as a potential school, as wells as, provide an indication of the typical age groups that may use the Site for athletic fields or other recreational activities. The elementary school receptor was assumed from kindergarten to 5$^{th}$ grade with an age range of 5 to 11 years. The middle school receptor was assumed from 6$^{th}$ through 8$^{th}$ grade with an age range of 11 to 14 years. The high school receptor was assumed from 9$^{th}$ through 12$^{th}$ grade with an age range of 14 to 18 years. It is reiterated that the future use of the Site has not been determined, and the age ranges identified in the HHRA are assumed to account for all potential recreational uses that may occur. Additionally, an adult was also assumed to account for workers or adult who may also frequent the Site for recreational uses. An adult is assumed at an age >18 years. Future use of the Site is not expected to include residences.

Because the Site will be used for recreational uses, as defined by MDE, trespassers may also access the area. However, a recreational user is expected to have higher contact at a longer duration than a trespasser. The assessment of a recreational user adequately accounts for any trespasser exposure that may occur.

## 5.2 EXPOSURE ASSESSMENT

To determine potential concerns for human health, an estimate of chemical intake or exposure is calculated. Two different measures of intake are calculated, depending on the nature of the effect being evaluated. When evaluating longer-term (i.e., chronic) exposures to chemicals that produce adverse non-carcinogenic effects, intakes are averaged over the period of exposure (i.e., the averaging time [AT]) (USEPA 1989). This measure of intake is referred to as the average daily intake (ADI) and is a less than lifetime exposure. For chemicals that produce carcinogenic

effects, intakes are averaged over an entire lifetime and are referred to as the lifetime average daily intake (LADI) (USEPA 1989).

Due to the size of the Site, the overall area was evaluated by exposure areas that are more representative of potential exposures. The exposure areas were delineated based upon potential sources, sample locations, and sample collection methods (e.g., grab or composite samples). Three exposure areas were identified for the Site. The first exposure area includes the mounded areas in the southern portion of the Site and includes samples identified as ISM and SAW. The second exposure area is along the sewer easement and includes samples identified as SE. The third exposure area includes the samples collected within the northern portion of the Site and identified as GS.

### 5.2.1 Exposure Intake Equations

Intake for the incidental ingestion of soil was estimated using the following equation:

$$(L)ADI = \frac{EPC \times IR \times EF \times ED \times CF \times RBA}{BW \times AT}$$

where:

| | | |
|---|---|---|
| *(L)ADI* | = | (Lifetime) Average daily intake [milligram per kilogram (mg/kg)-day] |
| *EPC* | = | Concentration in soil (mg/kg) |
| *IR* | = | Ingestion Rate (mg/day) |
| *EF* | = | Exposure frequency (days/year) |
| *ED* | = | Exposure duration (years) |
| *CF* | = | Conversion Factor ($10^{-6}$ kg/mg) |
| *RBA* | = | Relative Bioavailability Factor (unitless) (0.6 for arsenic) |
| *BW* | = | Body weight (kg) |
| *AT* | = | Averaging time (days)<br>For non-carcinogens, AT = ED x 365 days/year<br>For carcinogens, AT = 70 years x 365 days/year |

It is noted that the intake for incidental ingestion of arsenic in soil was adjusted by a RBA of 0.6. For chemicals where the medium of exposure differs from the medium of exposure associated with the toxicity value, an adjustment to the exposure intake or toxicity value can be made (EPA 2012). The toxicity values for arsenic are based upon exposure to arsenic in water; however, exposures at the Site are for exposure to arsenic in soil only. To assume that the bioavailability of arsenic in soil is equal to that in water would result in an overestimate of potential risks. In accordance with EPA guidance, the RBA was applied to only the ingestion exposure route to account for lower bioavailability of arsenic in soil (EPA2012).

Exposure associated with dermal contact with soil was estimated based upon the following equation:

$$(L)ADI = \frac{EPC \times SA \times AF \times ABS \times EF \times ED \times CF}{BW \times AT}$$

Where:

| | | |
|---|---|---|
| *(L)ADI* | = | (Lifetime) Average daily intake (mg/kg-day) |
| *EPC* | = | Concentration of a COPC in a soil (mg/kg) |
| *SA* | = | Surface Area for Contact (square centimeters [$cm^2$]) |
| *AF* | = | Skin adherence factor (mg/$cm^2$-event) |
| *ABS* | = | Absorption factor (dimensionless) |
| *EF* | = | Exposure frequency (days/year) |
| *ED* | = | Exposure duration (years) |
| *CF* | = | Conversion Factor ($10^{-6}$ kg/mg) |
| *BW* | = | Body weight (kg) |
| *AT* | = | Averaging time (days)<br>For non-carcinogens, AT = ED x 365 days/year<br>For carcinogens, AT = 70 years x 365 days/year |

For inhalation, exposure concentrations (ECs) are calculated. ECs are time weighted average concentrations from contaminant concentrations in air, adjusted based on the characteristics of the exposure scenario being evaluated. The equation to calculate inhalation exposure concentration from soil is given below (USEPA 2009):

$$EC = \frac{EPC \times ET \times EF \times ED \times CF_1}{AT \times CF_2}$$

Where:

| | | |
|---|---|---|
| *EC* | = | Exposure Concentration (mg/$m^3$) |
| *EPC* | = | Concentration of a chemical in air (mg/$m^3$) |
| | = | Concentration of chemical in soil / particulate emission factor (PEF) |
| *ET* | = | Exposure Time (hours/day) |
| *EF* | = | Exposure frequency (days/year) |
| *ED* | = | Exposure duration (years) |
| *AT* | = | Averaging time (days)<br>For non-carcinogens AT = ED x 365 days/year<br>For carcinogens AT = 70 years (lifetime) x 365 days/year = 25,550 days |
| $CF_1$ | = | Conversion Factor (1,000 µg/mg) (applied to carcinogenic intakes only) |
| $CF_2$ | = | Conversion Factor (24 hours/day) |

The particulate emissions factor (PEF) relates the concentration of a chemical in soil with the concentration of dust particles in air and is used in determining the intake for inhalation of soil particulate exposures. A PEF value of $1.35x10^9$ was used (EPA 2002b).

### 5.2.2 Exposure Point Concentration

The final step in the estimation of intake is the determination of the exposure point concentration (EPC). For the HHRA, the EPC represents the concentration of COPC in media of concern that a potential receptor is expected to contact over a designated exposure period. Site receptors are assumed to move randomly across areas of the Site over an exposure time, so COPC concentrations are represented by a conservative estimate of the average concentration of the area of exposure. The COPC concentrations are represented by the 95th percentile upper confidence limit on the mean (95%UCLM), which represents a conservative estimate of the average concentration (EPA 1989). The 95%UCLM represents the concentration of COPCs in soil that a potential receptor is expected to contact over a designated exposure period. When determining the 95%UCLM, all soil sample results from the designated exposure areas were evaluated. The 95%UCLM was determined through the EPA ProUCL program version 5.1.02 (USEPA 2016). The EPA ProUCL program determines the distribution, sample size, variance, and recommended 95%UCLM of each COPC (EPA 2016). Table 5-1 in Appendix B presents the EPCs for each chemical evaluated in each exposure area. Outputs from the ProUCL program are provided in Appendix G.

For the statistical determination of the 95%UCL, the following data evaluation procedures were followed:

- Analytical results bearing the U qualifier (indicating that the analyte was not detected at the given reporting limit [RL]) were retained in the data set and considered non-detects (i.e., were assessed at the given RL).
- Analytical results bearing the J qualifier (indicating that the analyte was detected between the RL and the method detection limit [MDL]) were retained in the data set and considered a detect (i.e., were assessed at the given reported result value).
- For duplicate samples, if both samples showed that the analyte was present, the average concentration of the two detected concentrations was retained; and if only one sample indicated that the analyte was present, the detected concentration was retained for analysis and the non-detect value was discarded.

For chemicals that had 4 or less detections, the EPC is represented by the maximum detected concentration. Hexavalent chromium and dibenz(a,h)anthracene were the two chemicals that

were evaluated using the maximum detected concentration. Additionally, lead is evaluated using the arithmetic mean concentration (EPA 1994). The EPA residential soil RSL for lead is determined through the use of blood-lead modeling that takes into account the arithmetic mean concentration of lead (EPA 1994).

### 5.2.3 Selection of Exposure Parameters

The second step in quantifying intake requires the identification of exposure parameters. Exposure parameters include rates of contact (e.g., ingestion rates, skin surface areas, etc.), exposure frequency (EF) and duration, body weight (BW), and averaging time. The contact rate reflects the amount of contaminated media contacted per unit time or event. EF and duration are used to estimate the total time of exposure to COPC in media of concern. The BW represents the average BW over an exposure period (EPA 1989). Specific exposure parameters for each receptor are chosen based on EPA guidance (EPA 1989, 1991a, 1991b, 2004, 2011, 2014, and 2016) and MDE guidance (2008). Exposure parameters for each receptor are presented in Tables 5-2 through 5-5 in Appendix B.

The exposure frequency of 250 days per year is based upon MDE guidance (2008) for the potential Site use. The exposure duration is based upon the age range evaluated. For the adult recreational user, an exposure duration of 20 years was assumed based upon typical exposure durations for adult residents (EPA 2011; 2016). The ingestion rate for recreational users exposure to soil is based upon ingestion rates presented in multiple EPA guidance documents and is assumed at 100 mg/kg based upon the age ranges evaluated in the HHRA (EPA 1991a, 1991b, 2011, 2014, and 2016).

Dermal exposure to soil is assumed for exposed body surface areas only. The surface area (SA) available for contact is presented in the EPA RAGS E guidance and generally assumes hands, forearms, head, lower legs, and feet. The recommended SA for each age range was taken from Table 7-2 of EPA *Exposure Factors Handbook (EFH)* (EPA 2011). For the determination of the SA of the lower leg, the lower leg was assumed as 40% of the total surface area of the leg. The SA for the forearms was determined based upon the mean proportion of the total skin SA by body part presented on Table 7-8 of EPA's *EFH* and the total body surface area presented on Table 7-1 of EPA's *EFH* (EPA 2011). For the adult recreational user, the SA set forth for an adult resident of 6,032 $cm^2$ was assumed (EPA 2016). The inhalation of soil particulates assumes an 8-hour day. The adult recreational user was assumed to weigh 80 kg, and the BW for other recreational users was taken from Table 8-1 of EPA's *EFH* based upon the age range evaluated (EPA 2011).

## 5.3 TOXICITY ASSESSMENT

The toxicity assessment considers the types of potential adverse health effects associated with exposures to chemicals, the relationship between the magnitude of exposure and potential adverse effects, and related uncertainties, such as the weight of evidence of a particular chemicals carcinogenicity in humans. USEPA guidance (USEPA 1989) specifies that the assessment be accomplished in two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining whether studies demonstrate that exposure to a COPC may cause the incidence of an adverse effect. USEPA specifies the dose-response assessment, which involves: (1) USEPA's quantitative evaluation of the existing toxicity information, and (2) USEPA's characterization of the relationship between the dose of the chemical administered or received, and the incidence of potentially adverse health effects in the exposed population. From this quantitative dose-response relationship, specific toxicity values are derived by USEPA that can be used to estimate the incidence of potentially adverse effects occurring in humans at different exposure levels (USEPA 1989).

For all chemicals evaluated in the HHRA, the non-carcinogenic effects are typically judged to have a threshold daily dose below which deleterious or harmful effects are unlikely to occur. This concentration is called the no-observed-adverse-effect-level (NOAEL), and may be derived from either animal laboratory experiments or human epidemiology investigations (usually workplace studies). Uncertainty factors (UFs) are applied to the NOAELs to account for specific types of uncertainty inherent in extrapolation from the available data. The UFs are default factors used in operationally deriving the reference dose (RfD) and reference concentration (RfC) from experimental data. The UFs are intended to account for (1) variation in susceptibility among the members of the human population (i.e., inter-individual or intraspecies variability); (2) uncertainty in extrapolating animal data to humans (i.e., interspecies uncertainty); (3) uncertainty in extrapolating from data obtained in a study with less-than-lifetime exposure (i.e., extrapolating from subchronic to chronic exposure); (4) uncertainty in extrapolating from a LOAEL rather than from a NOAEL; and (5) uncertainty associated with extrapolation when the database is incomplete. Tables 5-6 and 5-7 present the non-carcinogenic toxicity values for all chemicals evaluated in this HHRA.

Unlike non-carcinogens, carcinogens are generally assumed to have no threshold. All chemicals evaluated in the HHRA are identified as either "Probable Human Carcinogens" or "A Known Human Carcinogen". For a carcinogen, there is presumed to be no level of exposure below which carcinogenic effects will not manifest themselves. This "non-threshold" concept supports the idea that there are small, finite probabilities of inducing a carcinogenic response associated

with every level of exposure to a potential carcinogen. The EPA uses a two-part evaluation for carcinogenic effects. This evaluation includes the assignment of a weight-of-evidence classification and the quantification of a cancer toxic potency concentration. Quantification is expressed as a slope factor (SF) for oral and dermal exposures and Inhalation Unit Risk (IUR) for inhalation exposures, which reflects the dose-response data for the carcinogenic endpoint(s) (USEPA 1989 and 2009). Tables 5-8 and 5-9 present the carcinogenic toxicity values for all chemicals evaluated in this HHRA.

Hexavalent chromium, benzo(b)fluoranthene, benzo(a)pyrene, and dibenz(a,h)anthracene have been identified with a mutagenic mode of action. Chemicals identified as mutagenic have sensitivity pertaining to cancer risks associated with early-life exposures. To account for the early-life exposure and the mutagenic mode of action, the cancer potency estimates are adjusted by an age-dependent adjustment factor (ADAF). EPA recommends, for mutagenic chemicals, when no chemical-specific data exist, a default approach using estimates from chronic studies (i.e., cancer slope factors) with appropriate modifications to address the potential for differential risk of early life stage exposure (EPA 2005a,b). An ADAF modification for early life stage exposure to mutagenic chemicals is required because available studies indicate higher cancer risks resulting from a given exposure occurring early in life when compared with the same amount of exposure during adulthood (EPA 2005b). For this HHRA, the intakes for chemicals identified with a mutagenic mode of action are modified by an ADAF for the following (EPA 2005b, 2015):

- For exposures between 2 and <16 years of age (i.e., spanning a 14-year time interval from a child's second birthday up until their sixteenth birthday), a 3-fold adjustment.
- For exposures after turning 16 years of age, no adjustment.

### 5.3.1 Dermal Exposures

Toxicity values specific to dermal exposures are not available and require adjustment of the oral toxicity values (oral RfDs or SFs). This adjustment accounts for the difference between the daily intake dose through dermal contact as opposed to ingestion. Most toxicity values are based on the actual administered dose and must be corrected for the percent of chemical-specific absorption that occurs across the gastrointestinal tract prior to use in dermal contact risk assessment (EPA 1989, 2004). EPA recommends utilizing oral absorption efficiency factors in converting oral toxicity values to dermal toxicity values (EPA 2004). This adjustment accounts for the absorption efficiency in the "critical study," which is utilized in determining the RfD and SF. Where oral absorption in the critical study is essentially complete (i.e., 100 percent), the absorbed dose is equivalent to the administered dose, and no adjustment of oral toxicity values is

necessary when evaluating dermal exposures. When gastrointestinal absorption of a chemical in the critical study is poor (e.g., 1 percent), the absorbed dose is much smaller than the administered dose, and toxicity values for dermal exposure are adjusted to account for the difference in the absorbed dose relative to the administered dose. To account for the differences between the administered (oral) and the absorbed (dermal) dose, RfDs and SFs are modified by the gastrointestinal dermal absorption factor (GIABS). Table 5-10 in Appendix B presents the chemical-specific parameters for dermal contact.

In addition to the GIABS modification of the toxicity values for dermal contact, dermal contact rates are also evaluated based upon a chemical's ability to be absorbed through the skin surface. For soil, EPA has identified a dermal absorption factor (ABS) that is chemical-specific. The ABS value reflects the desorption of a chemical from soil and the absorption of the chemical across the skin and into the blood stream. Recommended values are presented that take into account ranges of values that result from different soil types, loading rates, chemical concentrations, and other conditions.

### 5.3.2 Lead

Lead is classified as a B2-probable human carcinogen by EPA. However, EPA has not published an SF or IUR for quantifying carcinogenic risks so potential human health concerns cannot be determined similar to other chemicals evaluated in the HHRA. Instead, blood lead levels are the indicator of excess lead exposure in humans. The EPA residential soil RSL of 400 mg/kg is based upon modeled blood-lead level results compared to the EPA-established threshold of no more than 5 percent of the population having a blood-lead of 10 micrograms (µg) lead per deciliter (dL) or greater (EPA 2010; 2016). The EPA residential soil RSL for lead is considered protective of human health for children. Arithmetic means for lead are compared to the EPA residential soil RSL of 400 mg/kg to determine potential concerns for a child's exposure to lead in soil.

## 5.4 RISK CHARACTERIZATION

In risk characterization, the calculated chemical intakes (Section 5.2) and toxicity values (Section 5.3) are used to quantitatively estimate both carcinogenic and non-carcinogenic risks. Risks are calculated for each potential receptor.

### 5.4.1 Hazard Quotient for Non-Carcinogenic Effects

The potential human health risks associated with exposures to non-carcinogenic COPCs are calculated by comparing the ADI with the chemical-specific RfD, as per EPA Guidance (EPA 1989). A hazard quotient (HQ) is derived for each COPC, as shown in the equation below:

$$HQ = \frac{EC}{(RfC \times 1000\ \mu g/mg)} \quad \text{or}$$

$$HQ = \frac{ADI}{RfD}$$

where:

| | | |
|---|---|---|
| *HQ* | = | Hazard Quotient; ratio of average daily intake level to acceptable daily intake level (unitless) |
| *EC* | = | Exposure Concentration ($\mu g/m^3$) |
| *ADI* | = | Calculated non-carcinogenic average daily intake (mg/kg-day) |
| *RfD* | = | Reference dose (mg/kg-day) |
| *RfC* | = | Reference concentration ($mg/m^3$) |

If the average daily dose exceeds the RfD or RfC, the HQ will exceed a ratio of one (1.0) and there may be concern that potential adverse systemic health effects will be observed in the exposed populations. If the ADI does not exceed the RfD or the RfC, the HQ will not exceed 1.0 and there will be no concern that potential adverse systemic health effects will be observed in the exposed populations. In general, the greater the value of the HQ above 1.0, the greater the level of concern. However, the HQ does not represent a statistical probability that an adverse health effect will occur.

### 5.4.2 Carcinogenic Risks

Carcinogenic risk is calculated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen. The numerical estimate of excess lifetime cancer risk is calculated by multiplying the LADI by the risk per unit dose (the SF).

This is shown in the following equation:

$$Risk = LADI \times SF \quad \text{or}$$
$$Risk = EC \times IUR$$

where:

| | | |
|---|---|---|
| *Risk* | = | Unitless estimate for the probability of an exposed individual developing cancer |
| *LADI* | = | Lifetime cancer average daily intake (mg/kg-day) |
| *SF* | = | Cancer slope factor $(mg/kg\text{-}day)^{-1}$ |
| *EC* | = | Exposure Concentration ($\mu g/m^3$) |
| *IUR* | = | Inhalation Unit Risk $(\mu g/m^3)^{-1}$ |

Because the SF and the IUR are considered to be upper-bound estimates of risk per increment of dose or concentration respectively, this method provides a conservative estimate of risk. It should be noted that the interpretation of the significance of the cancer risk estimate is based on the appropriate public policy. MDE has identified a cancer risk level of $10^{-5}$ as the level where remedial actions should be considered.

### 5.4.3 Risk Characterization Results

Risk calculations are presented by receptor by exposure area in Tables 5-11 through 5-14 (Northern Area Grab Samples), Tables 5-20 to 5-23 (Mounded Area), and Tables 5-29 to 5-32 (Sewer Easement). Tables 5-15, 5-24, and 5-33 present the estimation of COPC air concentrations of particulate from soil. Estimates of cumulative risks across all pathways for non-carcinogenic and carcinogenic effects are presented in Tables 5-16 through 5-19 (Northern Area Grab Samples), Tables 5-25 to 5-28 (Mounded Area), and Tables 5-34 to 5-37 (Sewer Easement). Tables 5-1 through 5-37 are located in Appendix B, while Table 5-38, below presents a summary of the HHRA results by exposure area.

**Table 5-38: HHRA Results by Exposure Area**

| Receptor | Carcinogenic Risk | Non-carcinogenic Hazard | Table Number |
|---|---|---|---|
| ***Northern Area Grab Samples Exposure Area*** | | | |
| Elementary School Age Recreational User | $1 \times 10^{-6}$ | 0.04 | Table 5-16 |
| Middle School Age Recreational User | $4 \times 10^{-7}$ | 0.02 | Table 5-17 |
| High School Age Recreational User | $5 \times 10^{-7}$ | 0.02 | Table 5-18 |
| Adult Recreational User | $2 \times 10^{-6}$ | 0.01 | Table 5-19 |

| Receptor | Carcinogenic Risk | Non-carcinogenic Hazard | Table Number |
|---|---|---|---|
| ***Mounded Area Exposure Area*** | | | |
| Elementary School Age Recreational User | $2 \times 10^{-6}$ | 0.04 | Table 5-25 |
| Middle School Age Recreational User | $7 \times 10^{-7}$ | 0.02 | Table 5-26 |
| High School Age Recreational User | $8 \times 10^{-7}$ | 0.02 | Table 5-27 |
| Adult Recreational User | $2 \times 10^{-6}$ | 0.01 | Table 5-28 |
| ***Sewer Easement Exposure Area*** | | | |
| Elementary School Age Recreational User | $2 \times 10^{-6}$ | 0.03 | Table 5-34 |
| Middle School Age Recreational User | $5 \times 10^{-7}$ | 0.02 | Table 5-35 |
| High School Age Recreational User | $5 \times 10^{-7}$ | 0.01 | Table 5-36 |
| Adult Recreational User | $1 \times 10^{-6}$ | 0.01 | Table 5-37 |

The carcinogenic risk results for all receptors are below the MDE remedial action level of $10^{-5}$. Non-carcinogenic hazards for all receptors are below the target threshold of 1. Additionally, all risk results are consistent throughout the exposure areas evaluated. This reveals that overall exposures across the Site are consistent and not a concern for human health.

Toxicity values are not available for lead. As a result, lead is evaluated based upon a comparison to the EPA residential soil RSL. The maximum detected concentration of lead exceeded the EPA residential soil RSL at three sample locations: CL-GS-S-03 (543 mg/kg), CL-SE-S-08 (563 mg/kg), and CL-SE-S-09 (432 mg/kg). Sample location CL-GS-S-03 is located within the northern area grab samples exposure area. The arithmetic mean concentration of lead for this area is 135.5 mg/kg (Table 5-1, Appendix B). For sample locations CL-SE-S-8 and CL-SE-S-09, these locations are located within the sewer easement exposure area. The arithmetic mean concentration of lead for this area is 140 mg/kg (Table 5-1, Appendix B). For both areas, the mean lead concentration is less than the EPA residential soil RSL of 400 mg/kg. This indicates that overall exposures to lead at the Site are not a concern for human health.

## 6. DISCUSSION AND RECOMMENDATIONS

As part of the Phase II ESA investigation, chemicals detected above the EPA residential soil RSLs were evaluated to determine if there are potential concerns for human exposures at the Site under the expected future use. The carcinogenic risk results for all receptors are below the MDE remedial action level of $10^{-5}$. Non-carcinogenic hazards for all receptors are below the target threshold of 1. Additionally, all risk results are consistent throughout the exposure areas evaluated. This reveals that overall exposures across the Site are consistent and not a concern for human health.

The EPA has not published toxicity values for lead, so potential human health concerns cannot be determined similar to other chemicals evaluated in the HHRA. Instead, blood lead levels are the indicator of excess lead exposure in humans. As a result, lead is evaluated through a comparison with the EPA residential soil RSL, which is based upon acceptable blood-lead level concentrations. The maximum reported concentration of lead exceeded the EPA residential soil RSL at three sample locations: GS-S-03 (543 mg/kg), SE-S-08 (563 mg/kg), and SE-S-09 (432 mg/kg). Sample location GS-S-03 is located within the northern area grab samples exposure area. The arithmetic mean concentration of lead for this area is 135.5 mg/kg (Table 5-1). For sample locations SE-S-8 and SE-S-09, these locations are located within the sewer easement exposure area. The arithmetic mean concentration of lead for this area is 140 mg/kg (Table 5-1). For both areas, the mean lead concentration is below the EPA residential soil RSL of 400 mg/kg. This reveals that overall exposures to lead at the Site are not a concern for human health.

Arsenic concentrations across the Site were within an order of magnitude of the USGS ATC for Central Maryland and are considered to be a naturally occurring product of site geology.

EPA does not have an RSL for Total Petroleum Hydrocarbons (TPH), because TPH encompasses the entire group of hydrocarbons, rather than an individual chemical; therefore, the 2008 Maryland Cleanup Standards were used for screening TPH results. The discussion related to TPH-DRO results are included in the following paragraphs separate from the risk assessment.

TPH-DRO was detected at reported concentrations exceeding screening levels in a total of two samples collected from the ISM area and the SAW. The exceedances in these areas do not appear to be correlated with the presence of either soil mounds or surficial waste. In addition, the exceedances were 2.6 and 3.2 times the screening level, with no individual VOCs or PAHs exceeding MDE generic number screening criteria at those locations. MDE guidance (2008)

provides for attainment of a soil cleanup standard when at least 10 soil samples are collected from a soil horizon and 75 percent of all samples collected are equal or less than the standard and no individual sample exceeds 10 times the standard. Therefore, no further action is recommended for the TPH-DRO detections within the ISM area and the SAW.

TPH-DRO was reported at concentrations exceeding screening levels in two samples collected within the sewer easement. The exceedances in this area appear to be associated with observed surficial waste. In addition, the exceedances were 3.0 and 5.4 times the screening level, with several PAHs exceeding MDE generic numeric screening criteria at those locations. While these two sample results meet the attainment criteria detailed in the previous paragraph, the surficial waste at the exceedance locations make these unique. Therefore, it is recommended that soil be removed from the locations within the sewer easement where TPH-DRO concentrations exceeded screening levels. Confirmatory sampling is recommended following soil excavation activities.

## 7. FUTURE PLANNING CONSIDERATIONS

A conceptual site model was developed to identify complete, potentially complete, or incomplete exposure pathways for the Site, for anticipated future land uses with removal of the mounded soil. Currently, the Site is not used but some parts have been used in the past as a residence. Definitive plans for future use of the Site have not been determined by Howard County at this time. However, it is anticipated that the Site and any associated future uses will fall under the category identified by MDE in the Cleanup Standards as Level 1: Public Recreational Areas (High Frequency Use) (MDE 2008). This type of use includes playgrounds, schools, golf courses, and picnic areas. Findings of the HHRA indicate that the risk characterization for the Site is consistent with the EPA School Siting Guidelines (EPA, 2011). During the test pit excavation of the soil and debris within the mounded soil areas, the soil and debris within the piles appeared consistent with the surface conditions noted during the Phase I ESA; therefore, the mounds themselves were not characterized separately. Further, it is anticipated that all the mounded soil will be removed from the Site as part of the site development process. The observations from the Phase II ESA are included herein for future consideration during site preparation, filling/grading, and construction. Also, as part of future planning considerations, it should be noted that Parcel 349 was omitted from the Phase II ESA because it was occupied at the time of assessment.

## 8. REFERENCES

The following sources of information were consulted as a part of this ESA.


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