

Health Consultation

ALTON PARK SITE #1

SOUTH SIDE HEALTH DEPARTMENT/ FORMER FRANKLIN
MIDDLE SCHOOL/ FORMER 36TH STREET LANDFILL PROPERTIES

TAX PARCEL 155M C 001 AND 155M C 003

CHATTANOOGA, HAMILTON COUNTY, TENNESSEE

**Prepared by the
Tennessee Department of Health**

MAY 3, 2010

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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FORMER 36TH STREET LANDFILL PROPERTIES

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Foreword

This document summarizes an environmental public health investigation performed by Environmental Epidemiology of the State of Tennessee Department of Health. Our work is conducted under a Cooperative Agreement with the federal Agency for Toxic Substances and Disease Registry. In order for the Health Department to answer an environmental public health question, several actions are performed:

Evaluate Exposure: Tennessee health assessors begin by reviewing available information about environmental conditions at a site. We interpret environmental data, review site reports, and talk with environmental officials. Usually, we do not collect our own environmental sampling data. We rely on information provided by the Tennessee Department of Environment and Conservation, U.S. Environmental Protection Agency, and other government agencies, businesses, or the general public. We work to understand how much contamination may be present, where it is located on a site, and how people might be exposed to it. We look for evidence that people may have been exposed to, are being exposed to, or in the future could be exposed to harmful substances.

Evaluate Health Effects: If people could be exposed to contamination, then health assessors take steps to determine if it could be harmful to human health. We base our health conclusions on exposure pathways, risk assessment, toxicology, cleanup actions, and the scientific literature.

Make Recommendations: Based on our conclusions, we will recommend that any potential health hazard posed by a site be reduced or eliminated. Reducing or eliminating the health hazard posed by a site will prevent possible harmful health effects. The role of Environmental Epidemiology in dealing with hazardous waste sites is to be an advisor. Often, our recommendations will be action items for other agencies. However, if there is an urgent public health hazard, the Tennessee Department of Health can issue a public health advisory warning people of the danger, and will work with other agencies to resolve the problem.

If you have questions or comments about this report, we encourage you to contact us.

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Or call us at: 615-741-7247 or toll-free 1-800-404-3006 during normal business hours

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SUMMARY

The Tennessee Department of Health's Environmental Epidemiology Program (EEP) wrote this health consultation based on the request of Ms. Yuen Lee with the Chattanooga-Hamilton County Regional Planning Agency (CHCRPA). The site being evaluated is the Brownfield site called the South Side Health Department/former Franklin Middle School/former 36th Street Landfill (Alton Park Site #1). The purpose of this health consultation is to provide guidance to the CHCRPA in understanding the scope of potential human health exposures by inhaling, ingesting, or touching polluted soil or groundwater. This health consultation will also discuss potential obstacles to safe redevelopment and reuse of the site.

This Alton Park Site #1 consists of 2 tax (property) parcels in Chattanooga, Hamilton County, Tennessee. The two parcels form a roughly square-shaped area approximately 53 acres in size. It is bordered on the north by an undeveloped wooded area, on the west by Central Avenue, on the south by a residential area and 38th Street and, on the east by Chattanooga Creek and undeveloped properties.

The CHCRPA received funding from the U.S. Environmental Protection Agency for investigation of this Brownfield site. A consultant retained by the CHCRPA performed the environmental investigation of the Alton Park Brownfield Site #1. Environmental data used by EEP as the basis for this health consultation were compared to residential comparison values provided by the Agency for Toxic Substance and Disease Registry (ATSDR) and the Environmental Protection Agency (EPA). Comparison values are chemical concentrations based on toxicology below which no adverse health effects are predicted to occur. When a comparison value is exceeded, it does not immediately indicate that people would be expected to develop adverse health effects. Instead, it means that the potential health risk needs further investigation.

Ensuring the future wellbeing of those living in, working in, or visiting the City of Chattanooga is a priority of the Tennessee Department of Health's (TDH), Environmental Epidemiology Program (EEP).

CONCLUSIONS

EEP reached five important conclusions in this health consultation:

Conclusion 1

EEP concludes that with the proper institutional controls and re-use plan, the site could be redeveloped and be protective of human health.

Basis for Conclusion

Once institutional controls are placed on the property preventing access to chemicals in soil and groundwater, the site could potentially be

redeveloped for recreational or commercial uses. EEP agrees with CHCRPA consultant's opinion that the site is not recommended to be redeveloped for residential use.

Next Steps

All stakeholders concerned with the redevelopment of the Alton Park Brownfield areas should express how they would like to see the Alton Park Site #1 reused. There are scheduled meetings to allow this exchange of ideas.

Conclusion 2

EEP concludes that contact with chemicals present in the surface soil of the site is not expected to harm the health of adults or children.

Basis for Conclusion

All identified chemicals in surface soil were below the levels expected to harm the health of adults and children or were low enough concentrations that the conservatively estimated theoretical risks for adults and children exposed to these chemicals are in an acceptable range.

Next Steps

No actions are planned with respect to these chemicals in surface soils at the site. The landfill portion of the site could be redeveloped into a green space area and the former Franklin Middle School could be redeveloped for recreational or community use.

Conclusion 3

EEP concludes that contact with chemicals in the subsurface soil of the site is not expected to harm the health of adults or children.

Basis for Conclusion

These soils are not accessible during normal use or during future recreational activities. In addition, all identified chemicals were below the levels expected to harm the health of adults and children, or were present in low enough concentrations given the worst case scenario. The conservatively estimated theoretical risk for adults and children exposed to chemicals in the soil at the site is in an acceptable range.

Next Steps

No actions are planned with respect to these chemicals in subsurface soils at the site. These soils will not be accessible.

Conclusion 4

EEP concludes that groundwater is not expected to harm the health of adults or children because it is not, and will not be, used as a source of drinking water.

Basis for Conclusion

Municipal water is provided to the area of the Alton Park Site #1. No water supply wells are currently installed and groundwater is not used as a drinking water source on either of the two property parcels making up the site.

Next Steps Site groundwater is not used as a potable water source. Institutional controls could be placed on the site to prevent the use of site groundwater and eliminating any future concerns.

Conclusion 5 EEP concludes that there are some minor physical hazards because of dumping of trash at the site that may cause physical harm to children or adults.

Basis for Conclusion Scattered trash including discarded furniture, wood, and tires were observed in and around the former Franklin Middle School and the fenced 36th Street landfill.

Next Steps The owner of the property, the City of Chattanooga, should remove the trash and debris. Access allowing the future dumping of trash and debris should be prevented. Access to the property should be restricted.

FOR MORE INFORMATION For more information on this Brownfield redevelopment site, call the Chattanooga and Hamilton County Regional Planning Agency at 423-757-5216 during normal business hours. If you have any questions or concerns about your personal health, you should contact your healthcare provider. Contact the Tennessee Department of Health's Environmental Epidemiology Program if you have concerns about waste sites and your health at 615-741-7247 or toll-free 1-800-404-3006 during normal business hours.

Introduction

Ms. Yuen Lee, Director of Information & Research with the Chattanooga-Hamilton County Regional Planning Agency (CHCRPA), contacted the Tennessee Department of Health's (TDH) Environmental Epidemiology Program (EEP) about the potential redevelopment of two parcels of property. These two property parcels will be referred to as Alton Park Site #1. Alton Park Site #1 is located immediately north of East 37th Street near its intersection with Central Avenue in the Alton Park neighborhood of South Chattanooga (Figures 1, 2, and 3). The property parcels were the subject of Phase 1 and Limited Phase 2 Environmental Site Assessments (ESAs) funded by U.S. Environmental Protection Agency (EPA) Brownfield grants.

The CHCRPA has been gathering information from the community on what redevelopment uses would be acceptable to their community. Initial suggestions were some type of recreational or public use. The location of the Alton Park Site #1 is shown in Figures 1, 2 and 3. With the redevelopment of these properties in mind, EEP has been involved with meetings, discussions, and planning with stakeholders. EEP was supplied environmental sampling data to review. Data was provided by CHCRPA's consultant, Aquaterra Engineering LLC (Aquaterra). EEP was asked to provide guidance in understanding the scope of potential human health exposures by inhaling, ingesting, or touching soil or groundwater having site-related chemicals. EEP was also asked to assist the CHCRPA in understanding the potential obstacles to safe redevelop and reuse of the site.

Background

Alton Park Site #1 was one of several potential Brownfield sites identified by CHCRPA. A Brownfield site is a property in which the expansion, redevelopment, or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant (EPA 2007). In 1995, the EPA developed their Brownfields Program to assist with the reuse of environmentally impacted properties. The Brownfields Program provides money to assist with the cleanup of the contaminated areas to make them safe for community members to reuse (EPA 2007).

The CHCRPA refers to two property parcels together as Alton Park Site #1. The Alton Park Site #1 is located near the intersection of Central Avenue and East 37th Street, specifically at Park Drive and 200 East 37th Street in Chattanooga, Hamilton County, Tennessee (Figure 1). The site was identified as Tax Parcels 155M C 001 and 155M C 003 and totals approximately 53 acres. Both of these two parcels have been previously developed as a landfill and junior high /middle school, respectively (Figure 2).

A meeting regarding potential Brownfield sites in the City of Chattanooga was held on September 25, 2007. At this community meeting, 10 potential Brownfield sites were identified and discussed. Participants were then asked to rank these sites in order of priority. The Alton Park Site #1 was ranked first and was since selected to undergo a Phase 1 and 2 Limited Environmental Site Assessments.

Tax parcel 155M C 001 is owned by the City of Chattanooga and is the former 36th Street Landfill (Figure 2). The landfill was built in 1980 and operated as a demolition debris landfill

until 1992. It was reported that pesticides as well as other materials that were not classified as demolition debris were inadvertently dumped at the 36th Street Landfill in 1984. The Tennessee Department of Environment and Conservation (TDEC) ordered an Emergency Removal Action to remediate the pesticides. The actual removal date of the pesticides is unknown (Aquaterra 2008, 2009a). However it is likely in 1996, when the *Chattanooga Free Press* newspaper reported on the Emergency Removal Action. The landfill is a recognized environmental condition (REC) on the Tax parcel 155M C 001 portion of the site (Aquaterra 2008).

Between 1992 and 1999, the 36th Street demolition debris landfill was properly capped and closed under the direction of the TDEC Division of Remediation (Superfund) (Aquaterra 2008). There is a chain link fence surrounding the entire landfill with one access gate located near Central Avenue and East 36th Street. There are two improved access roads on-site. One access road leads to the top of the capped landfill cell. The other access road is located along the southeastern portion of the capped landfill. TDEC closure regulations outline that, for proper closure, the landfill would had to have been covered with 2 feet of clean, compacted, low permeability soils (or alternative low density polyethylene membrane) and a 1 foot thick vegetative cover soil layer. The Alton Park Site #1 reportedly has adequate ground vegetative cover to prevent exposure to surface soil. The 36th Street Landfill parcel is fenced such that there are no trespassers using the site. With this proper closure there is no access to the contaminated soils below. This engineering control, and any associated land use restriction, prevents contact to the subsurface chemicals and eliminates any exposure routes.

Parcel 155M C 003 is owned by the Hamilton County Board of Education. The Alton Park Junior High School was built from 1960 to 1964 on the site. It remained in use as the Alton Park Junior High until the school changed its name to Franklin Middle School in 1998 (Figure 2). The school is no longer used. Hence, no students attend classes in the building.

Since 1980, The Alton Park Southside Health Department has been housed in the western portion of the former Alton Park Junior High School building. It continues to operate in the western portion of the school building. The eastern portion of the school building is unused, with the exception that it is sometimes used as a training facility by the City of Chattanooga Police Department (Aquaterra 2008, 2009a).

The school grounds contain two concrete pads with drains. These pads were used to store solid waste containers used to contain school waste. Concern arose that the drains may be linked to septic tanks or “wet wells” on-site perhaps creating an environmental concern. These drains were also considered a recognized environmental condition on the property. During Aquaterra’s Limited Phase 2 ESA, it was determined that the drains were properly connected to the City of Chattanooga sewer system. Hence, environmental concern for these drain pads has diminished (Aquaterra 2009a).

The two Tax Parcels 155M C 001 and 155M C 003 were considered together as a single Brownfield redevelopment opportunity. Central Avenue borders the two parcels on the west, while Chattanooga Creek borders the parcels on the east. To the north is densely wooded, undeveloped property and to the south are residential properties. Historically, the adjoining properties have been a mix of residential dwellings, undeveloped properties, and industrial facilities (Aquaterra 2008, 2009a).

Two EPA National Priorities List (NPL) sites lie within a one-mile radius of Alton Park Site #1. Chattanooga Coke & Chemical (also known as Tennessee Products) owns both of the NPL sites. Both NPL sites are located about 0.5 miles southwest of the subject property. The first is a former coke manufacturing facility. The other is the Southern Wood Piedmont site located on the west bank of Chattanooga Creek. In the past, Chattanooga Creek has flooded the NPL sites.

The Alton Park Site #1 is located in a relatively flat and low lying area within approximately 1.5 miles of the Tennessee River and in the floodplain of Chattanooga Creek. When water levels rise rapidly, the Tennessee River may temporarily flow upstream into its tributaries flooding low lying areas. According to Mr. Troy Keith, with the TDEC Chattanooga Environmental Field Office, this phenomenon is due to the manipulation of the Tennessee River by the Tennessee Valley Authority and/or flooding. Due to the flooding potential of the area adjacent to Chattanooga Creek and the documented change in flow direction of the creek, contamination from the upstream industries had the potential to impact properties adjacent to the creek and in its flood plain. Since the Alton Park Site #1 is located in the flood plain of the creek the potential existed for the site to have been impacted by contamination originating from an off-site source due to creek flooding carrying contaminants onto the site. These potential contaminants have been identified as polycyclic aromatic hydrocarbons (PAHs). Additional samples were collected from Chattanooga Creek to assess if sediment and surface water transported hazardous materials on to the Alton Park Site #1 (Aquaterra 2008 and 2009a). This additional sampling of sediment in Chattanooga Creek both upstream and downstream of the site did not indicate any contaminants above applicable action levels in either sediment or the surface water. Therefore, it is unlikely that the site has been impacted by flooding of the creek.

As part of the Limited Phase 2 ESA, groundwater monitoring wells were installed. Materials noted in the well borings included fill material (wood, shingles, tar, brick, other construction debris) to a maximum of 8 feet below ground surface (bgs). Wells were installed to determine the groundwater flow direction across the site. Based on data collected as part of the Phase 2 ESA, groundwater flow direction is from west to the southeast across the site (Aquaterra 2009a).

A May 7, 2009, Chattanooga-Hamilton County Health Department site visit confirmed Aquaterra's finding that trash, discarded furniture, and tires have been dumped on the former school parcel. The likely reason this unregulated dumping is happening is because the former school parcel is open and unsecured. This trash could be a physical hazard to nearby residents who could use the site for open space or recreation. An additional hazard could be the state of repair of the former school. The outside of the school appeared reasonably secure during the CHCHD site visit (Sabrina Novak, personal communication).

In their Limited Phase 2 ESA, Aquaterra (2009a) found chemicals in both soils and groundwater. Aquaterra therefore recommended that potential future uses of the site could be recreational and/or non-residential. Aquaterra (2009b) recommended the former Franklin Middle School property could be reused for non-residential development without any further investigation or remediation, with the exception of school uses. The former 36th Street Landfill parcel could be used for recreational purposes. Ball fields could be constructed on the landfill and any associated buildings could be constructed on portions of the landfill parcel that do not have waste (Aquaterra 2009b).

Soil samples were also collected to identify if there were any pre-existing chemicals present on the Alton Park Site #1. Both surface (0 to 6-inches in depth) and subsurface soil samples (greater than 1 foot in depth) were collected by CHCRPA's consultant Aquaterra, and analyzed by a contracted laboratory.

According to Aquaterra (2009b), there are limited economically-viable future uses for the site. Aquaterra suggested site use be recreational or non-residential. If the site were used as residential or for a school, additional assessment would be necessary. It is also Aquaterra's opinion that ball fields could be created on the former 36th Street Landfill. However, any associated structure(s) should be located off of the landfill itself (Aquaterra 2009b).

It is our understanding that the entire former 36th Street Landfill parcel was closed in accordance with TDEC landfill closure regulations. This remedial measure has eliminated the exposure pathway to potentially contaminated soil. The site is already cleared, roughly maintained, and secured by a fence.

At a community meeting held on August 10, 2009, the results of the Phase I ESA and the Limited Phase II ESA were presented and discussed. At this meeting, EEP presented findings of the health evaluation of the chemicals found to be present in soil and groundwater at the site.

Discussion

Potentially Exposed Populations

The Alton Park Site #1 could be potentially reused as a site with a recreational focus. Potentially exposed populations include both children and adults who use the site now and those who would potentially recreate on the site in the future. The landfill parcel, the land-filled materials, flooded creek materials, and the NPL wastes are all potential past sources of pollution at Alton Park Site #1. Additionally, the state of repair of the 1960 former junior high school and the unregulated dumping on the former school grounds are potential physical hazards. Both adults and children would potentially use the site as part of its reuse. It is prudent to prevent these populations from being exposed to chemicals remaining at Alton Park Site #1.

The restricted entry into the former landfill and the cap of the landfill prevents any potential exposure from chemicals on the landfill parcel. Groundwater is not used as a source of drinking water on the landfill nor the former school parcel.

The idea of using the former 36th Street Landfill parcel as a recreational center has merit. During a period in public health when being overweight is normal, asthma rates are on the rise, diabetes rates are increasing, and cardiovascular disease is a leading killer, opportunities for outdoor recreation and physical fitness are vital. The Centers for Disease Control and Prevention (CDC) state that, "Regular physical activity substantially reduces the risk of dying of coronary heart disease, the nation's leading cause of death, and decreases the risk for stroke, colon cancer, diabetes, and high blood pressure. It also helps to control weight; contributes to healthy bones, muscles, and joints; reduces falls among older adults; helps to relieve the pain of arthritis; reduces symptoms of anxiety and depression; and is associated with fewer hospitalizations, physician visits, and medications. Moreover, physical activity need not be strenuous to be

beneficial; people of all ages benefit from participating in regular, moderate-intensity physical activity, such as 30 minutes of brisk walking five or more times a week (ATSDR 2007a).

Exposure Assessment

The term chemical of concern (COC) is often applied when the amount of a site-related chemical exceeds its comparison value. Comparison values used were the Agency for Toxic Substances and Disease Registry's (ATSDR) minimal risk levels (MRLs) and cancer risk evaluation guides (CREGs) or EPA's regional screening levels (RSLs). The presence of chemicals of concern on a site suggests further evaluation is needed. When chemicals of concern are identified on a site, the exposure potential, exposure dose, exposure duration, and exposure frequency need to be thoughtfully considered. People have to come into physical contact with contaminated soils and there must be a *completed exposure pathway* for adverse health effects to occur. A completed exposure pathway consists of five main parts including:

1. a source of the chemical in the environment;
2. a means for the chemical to migrate from its source to the soil;
3. a place where people come into contact with the chemical;
4. a pathway (route) by which people come into contact with the chemical such as ingesting, touching, or breathing; and,
5. people who could potentially be exposed (receptor population).

Pathways are also characterized based on whether the exposure occurred in the past, is occurring in the present, or may occur in the future.

Physical contact with chemicals present at this Brownfield site or in the environment does not necessarily mean that a person would develop adverse health effects. The chemical's ability to affect a person's health is also controlled by a number of other factors, including:

- how much chemical a person is exposed to (dose)
- how long a person is exposed to the chemical (duration)
- how often a person is exposed to the chemical (frequency)
- the person's age
- the person's diet and nutritional habits.

Chemicals identified at the site were in soils and groundwater. Incidental ingestion of soil could occur if adults and children are allowed to recreate on the Alton Park Site #1. If there were areas of bare soil there could be accidental incidental ingestion of site chemicals, if they were present. The potential for this type of exposure should be prevented for future site users.

Municipal water is supplied to the Alton Park area of Chattanooga. Therefore, drinking Alton Park Site #1 groundwater by people recreating is not thought to be a concern as the groundwater is not used as a potable water source in this area.

Inhalation of chemicals is not believed to be a major pathway of exposure at the site. This is because chemicals found at the site are usually tightly bound to soil particles. As such, the chemicals present on-site may not readily volatilize. Even if volatilization were to occur, the

contaminated soil is located on or below ground surface whereas the breathing zone is several feet above ground surface. Over an area of this size, any chemicals that may volatilize into the air are likely to be diluted, wind-mixed, and not detectable.

Aquaterra, CHCRPA's consultant, stated the former 36th Street Landfill was closed in accordance with the Tennessee Department of Environment and Conservation Division (TDEC) of Solid and Hazardous Waste Management (DSWM) Open Dump Closure regulations (Aquaterra 2009a). Any contact of chemicals contained in on-site soils should have been mitigated by the proper closure of the landfill site.

Property use restrictions could also be placed on the parcels to guide redevelopment activities to prevent further exposure. The deed to the former 36th Street Landfill parcel could be, if not already, amended to state there is a landfill present on the property. If not already done, further restrictions could also be placed on the property deed to prevent groundwater use at the site and to prevent excavation through the soil cap thickness of the former 36th Street Landfill (Aquaterra 2009b) to protect the health of potential recreators.

Health Comparison Values

Scientists today cannot precisely determine at what level a particular chemical in the environment presents a clear and predictable risk to human health. Sometimes scientists in various government and private agencies disagree on the amount of a chemical necessary to harm a person. At this time, predicting risk from exposure to chemicals in the environment is based on the professional judgments of scientists skilled in toxicology, pharmacology, biochemistry, and other similar disciplines. A collection of studies, opinions, and experiments on chemical exposure makes up what is referred to as the environmental literature.

The Agency for Toxic Substances and Disease Registry (ATSDR), an agency under the Centers for Disease Control and Prevention (CDC), is charged by Congress with providing support in the assessment of any health hazard posed by Superfund or other hazardous waste sites. For non-carcinogenic effects of toxic chemicals, ATSDR derives a minimal risk level (MRL) for each chemical using the environmental literature as the basis for their predictions of a level of that chemical this is without appreciable health risk.

MRLs are derived from 'no observed adverse effects levels' (NOAELs) or from levels at which the first signs of effects are observed, called 'lowest observed adverse effects levels' (LOAELs). NOAELs are the highest tested dose of a chemical that has been reported to have no harmful health effects on people or animals. A LOAEL is the lowest test dose of a chemical that has been reported to cause human health effects in people or animals. LOAELs do not cause serious health effects.

From these MRLs, ATSDR has derived health comparison values, often called EMEGs (environmental media evaluation guidelines) for soil, air, and water. EMEGs serve as a comparison to help scientists look more closely at the people who might be exposed to harmful levels of chemicals. To use these comparison values we must know how much of a chemical someone is exposed to, for how long the exposure has been or will be occurring, how frequent the exposure is or will be, and the age of the exposed person. If concentrations are below the

EMEG for a particular chemical, scientists can be reasonably certain that no adverse health effects will occur in people who are exposed.

In addition, ATSDR derives EMEGs for chronic, intermediate, and acute exposure frequencies. Chronic exposure is defined as one year or more. Intermediate exposure is defined as 15 to 364 days. Acute exposure is defined as 14 days or less. EPA has derived RfDs and RfCs are for chronic or lifetime exposure. If ATSDR does not have a published EMEG for a particular chemical, TDH EEP uses EPA's comparison values.

EPA is also mandated to publish toxicity information. EPA's comparison values are very similar to ATSDR's. EPA's reference dose (RfD) and reference concentration (RfC) are analogous to ATSDR's MRL. One difference is that ATSDR must use information that is published, while EPA may use results of studies that are not published. There are other policy decisions that may result in ATSDR and EPA deriving different comparison values for the same exposure frequencies.

If a chemical is a probable or known carcinogen, EPA derives a cancer-risk value for the chemical. EPA uses data from animal studies (and human epidemiology studies, if they are available) to extrapolate from high doses with known carcinogenic end points to very low doses using complex models. Often EPA assumes there is no threshold; that is, any exposure will result in some risk of cancer. This is an assumption that is valid in some cases and not in others, but for most chemicals we lack sufficient data to know the validity of the assumption. EPA then uses one of several models to determine the slope of the 95% upper confidence level of the extrapolated response at low concentrations. This derived slope factor is the number that represents the theoretical risk of excess cancer from exposure to the chemical in question per unit dose (EPA 1992). It is important to note that the cancer risk value is a statistically-derived number representing an upper 95% confidence level of a theoretical straight line predicting one extra cancer case in one million people, when the background lifetime risk of cancer is one in two for men and one in three for women (ACS 2005). ATSDR may use a comparison value called a Cancer Risk Evaluation Guide (CREG), derived from EPA's slope factor, that equates to a theoretical risk of one excess cancer in a million people.

EPA also has Regional Screening Levels (RSLs). RSLs are used to determine whether levels of contamination found at the site may warrant further investigation or site cleanup, or whether no further investigation or action may be required (EPA 2009).

When a health comparison value is exceeded for a particular chemical, it does not immediately indicate that people would be expected to develop adverse health effects. Instead, it simply means that the exposure scenario for that chemical needs further investigation. For example, the comparison values referenced are for residential exposure to bare soil or drinking contaminated water. These comparison values were derived from a scenario of constant, daily exposure over a lifetime. The Alton Park Site #1 reportedly has adequate ground vegetative cover to prevent exposure to surface soil (Aquaterra 2009a, Chattanooga/Hamilton County Health Department personnel communication). The 36th Street Landfill parcel is fenced such that there are no trespassers using the site. As one can see, health comparison values or screening levels can be used for a variety of purposes. They also should not be used in certain ways. A few of these uses are outlined below.

Health comparison values may be properly used as:

- screening values to identify substances/chemicals of concern at hazardous waste sites that need further investigation into the toxicology of the substances,
- substance-specific trigger levels to identify possible need for further investigation of potential exposure scenarios,
- identification of populations at potential risk, and
- computation of other health comparison values.

Health guidance values should not be used as:

- threshold levels for a toxic effect,
- predictors of toxicity at any given level above the health guidance value,
- absolute values (since there is an inherent area of uncertainty surrounding the values),
- comparison values for all effects and populations (without first evaluating the relevance of the critical effect upon which the health comparison value is based).

Environmental Sampling

Aquaterra performed environmental soil sampling at 9 locations across the site. Surface soil samples were collected on November 5, 2008. Subsurface soil samples were collected on November 17 and 19, 2008.

Surface soil samples were collected from the 0 to 6-inch depth interval at 6 locations across both the landfill parcel and the school parcel (Figure 3). All surface soil samples were collected and tested for the following groups of chemicals: semi-volatile organic compounds (SVOCs) which include polycyclic aromatic hydrocarbons (PAHs), 8 Resource Conservation and Recovery Act (RCRA) metals, polychlorinated biphenyls (PCBs), pesticides, and herbicides. Only two surface soil samples from the school parcel were analyzed for volatile organic compounds (VOCs). The remainder of the surface soil sample locations were not analyzed for VOCs. This is because it was thought there should be no impact by VOCs to surface soils on the landfill parcel as all soil used to close the landfill was clean soil brought onto the site.

One subsurface soil sample was also collected from chosen depths from each boring converted into a groundwater monitoring well (Figure 3). The subsurface soil samples were collected from depths below the fill material encountered in 2 of the 3 well borings. The fill and debris were measured to be a maximum of 8 feet deep in the area of investigation (Aquaterra 2009a). Subsurface soil samples were collected from depths of 8 to 10 feet below ground surface (bgs) in wells MW-2 and MW-4 and from 12 to 14 feet bgs in well MW-3 (Aquaterra 2009a). All subsurface soil samples collected were tested for the following groups of chemicals: volatile organic compounds (VOCs), SVOCs including PAHs, 8 RCRA metals, PCBs, pesticides, and herbicides.

Groundwater was investigated using the 3 groundwater monitoring wells installed in the deeper borings (MW-2, MW-3, and MW-4) and an additional groundwater monitoring well (MW-1) already existing on the site. Samples were collected from each well. Groundwater samples collected were tested for the same chemicals as the subsurface soil samples.

Analytical results of the surface soil samples indicated several PAH concentrations above the applicable EPA RSLs levels for benzo[a]anthracene, benzo[b]fluoranthene, benzo[a]pyrene, and indeno[1,2,3,-cd]pyrene. Analytical results of the subsurface samples indicated concentrations of benzo[a]anthracene, and benzo[a]pyrene above applicable comparison values.

Groundwater analytical results of Aquaterra's Limited Phase 2 ESA (2009a) indicated the presence of lead and naphthalene above applicable EPA Maximum Contaminant Levels (MCLs) for drinking water. EPA MCLs are legally enforceable standards that apply to public water systems. These standards protect drinking water quality by limiting the levels of specific contaminants that can cause harmful effects to public health. These drinking water standards apply to public water systems that provide water for human consumption through at least 15 service connections, or regularly serve at least 25 individuals. However, MCLs are routinely used as comparison values at sites where no one uses groundwater as the source for drinking water.

Although not truly a part of the Alton Park Site #1, surface water from Chattanooga Creek was sampled by Aquaterra (Aquaterra 2009b). This sampling was done during a storm event to understand the potential for chemicals to be deposited on the Alton Park Site #1 from upstream industries. Aquaterra (2009b) sampled Chattanooga Creek both at the farthest upstream and the farthest downstream points in the Alton Park area. The results of the testing did not reveal any chemicals in the surface water of the creek during the storm event (Dallas Whitmill, personal communication).

Environmental Sampling Results

Results of the Phase 1 ESA (Aquaterra 2008) suggested that the landfill parcel has soil and groundwater contamination caused by previous activities that took place when it was the landfill. The presence of the individual chemicals in soil and groundwater will be evaluated as part of a screening process. This process is explained in this and the next several sections. Each chemical that was identified either in surface soil, subsurface soil, or groundwater, will be evaluated more fully to understand if it may be a concern based on potential site re-use.

Results from the testing done as part of Aquaterra's Limited Phase 2 (2009a) are evaluated based on ATSDR and EPA comparison values. If a test result for a chemical exceeds a comparison value, this chemical is identified as a chemical of concern and further evaluation is done.

Soil Results and Evaluation

The following tables were used as part of the screening process for evaluation of chemicals identified in soil at the site. Table 1 lists the soil data for metals, PCBs, pesticides, and herbicides for the 6 surface and 3 subsurface soil samples analyzed. Also listed in Table 1 are the ATSDR EMEGs and CREGs and EPA RSL comparison values. Only one metal, arsenic, was found in surface soils above any comparison value, and hence is a chemical of concern (COC).

Table 2 lists the soil data for each surface or subsurface soil sample where a PAH constituent was identified as well as the ATSDR EMEG and CREG comparison values, the EPA RSL

comparison values, and the PAH toxicity equivalency factors. Benzo[a]pyrene is the only PAH that has a CREG, and the toxicity of the other PAHs is weighted compared to the toxicity of benzo[a]pyrene. Of the 9 surface and subsurface soil samples tested, 7 had detectable concentrations of PAHs. Table 2 also lists the PAH toxicity equivalency factors for each PAH present in surface and subsurface soil. PAHs are COCs at the site.

Table 3 lists the VOC subsurface soil data for each sample. No VOCs were detected in concentrations exceeding their respective comparison values. VOCs are not considered to be a health concern in either surface or subsurface soils at the Alton Park Site #1.

Based on the results of the environmental sampling and the screening process, the soil COCs at the Alton Park Site #1 are arsenic and PAHs. These chemicals will be further evaluated below.

The total arsenic concentration (inorganic and organic) for the 9 surface and subsurface soil samples ranged from 1.2 milligrams per kilogram (mg/kg) to 6.4 mg/kg with an arithmetic mean of 3.61 mg/kg (Table 1). Arsenic was the only metal detected in the surface and subsurface soil samples at concentrations greater than its respective EPA Region 3 residential soil RSL of 0.43 mg/kg. It has a CREG of 0.5 mg/kg. These default comparison values are less than the established naturally-occurring “background” arsenic level in Tennessee. The background level of arsenic in Tennessee soils is 10 mg/kg (TDEC 2001). Specifically for Hamilton County, Tennessee, the range of arsenic in soils was 0.9 to 19.4 mg/kg (TDEC 2001). The Tennessee background value is slightly greater than the average background arsenic concentration in U.S. soils of 7.2 mg/kg (Shacklette and Boerngen 1984). All 9 surface and subsurface soil sample arsenic results were lower than the naturally-occurring Tennessee soil arsenic background concentration. Considering the arsenic concentrations are in the range of those found by TDEC in Hamilton County, arsenic in soil at the Alton Park Site #1 is not considered to pose a health concern.

Analytical results of the surface soil samples collected indicated concentrations of PAHs above the applicable ATSDR and EPA comparison values. PAHs such as benzo[a]anthracene, benzo[b]fluoranthene, benzo[a]pyrene, and indeno [1,2,3,-cd]pyrene, were measured above their respective comparison values. Table 2 shows the SVOC analytical results of the soil samples tested.

Of the 7 soil samples where PAHs were detected, the total PAH concentration ranged from 0.034 to 4.6 mg/kg with an arithmetic mean of 0.39 mg/kg. Soil sampling locations SS-4 from 0 to 6-inches and MW-2 from 8 to 10 feet below ground surface (bgs) had PAH concentrations exceeding the average with location MW-2 nearly 7 times the average. The MW-2 location is in the site’s east-central portion and near the toe of the eastern sloping topography. With this in mind, PAHs in soil will be evaluated further below. PAH-contaminated soil was not detected in the extreme northeastern portion or the southwestern portion of the site. The concentration of all PAHs weighted for toxicity (EPA 2001) of the 7 soil samples ranged from 0.000054 to 0.28 mg/kg with an arithmetic mean of 0.03 mg/kg. The highest surface soil total TEQ was 0.59 at location SS-4. The highest total TEQ at a subsurface soil sampling location was for sample MW-2, at a depth of 8 to 10 feet bgs. The TEQ was calculated to be 1.96 mg/kg (Table 6).

PAHs are a group of chemicals derived following the incomplete combustion of organic materials such as coal, oil, gas, wood, garbage, tobacco, or meat. PAHs usually are found as complex mixtures of chemicals rather than just as individual chemicals. Many of the PAHs are ever-present in the environment. PAHs occur naturally or can be manufactured. More than 100 types of PAHs are known to exist throughout the environment, including in the air, water, and soil. Only a few of these PAHs are known to be harmful. The ATSDR Toxicological Profile (1995) is an excellent source of information on the toxicology of polycyclic aromatic hydrocarbons.

There are many uncertainties in the toxicological assessment of PAHs. It is known that different PAHs have different toxic potencies. A Toxicity Equivalents (TEQ) methodology has been developed that combines the relative toxicities of individual potentially carcinogenic PAHs in relation to benzo[a]pyrene, the PAH determined to be the most hazardous (EPA 2004a). Tables 2 and 4 contain TEQ values for each PAH compound identified in surface and subsurface soils, respectively. TEQ totals above 0.1 mg/kg may be harmful to humans (EPA 2004). Table 6 lists the TEQs for all samples collected and the total TEQs for the site.

Inhalation of PAHs is not believed to be a major pathway of exposure at the site. This is because the PAHs identified at this site are high molecular weight compounds. As such, the PAHs present on-site do not readily volatilize. Even if volatilization were to occur, the contaminated soil is located on or below ground surface whereas the breathing zone is several feet above ground surface. Over an area of this size, any PAHs that volatilize into the air are likely to be diluted, wind-mixed, and not detectable.

Similar to the inhalation of PAHs, dermal contact with the PAHs at the site is also not expected to be a major pathway for exposure. Some dermal absorption of PAHs may occur through direct contact with skin. However, PAHs bind to organic matter in the soil, which decreases its bioavailability through skin absorption (ATSDR 1998).

Incidental ingestion would be the main pathway of exposure of humans to PAHs at the Alton Park Site #1. Therefore, the following evaluation of PAHs concentrates on exposures from this pathway. Using the detected concentrations and one-half the detection limit for constituents reported as non-detect, the toxicity equivalents concentrations for surface soil ranged from 0.0000165 to 0.28 mg/kg (Table 2) with an arithmetic mean of 0.06 mg/kg. The concentration range for benzo[a]pyrene (B[a]P) was <0.033 (non-detect) to 0.28 mg/kg with an arithmetic mean of 0.1 mg/kg. The highest surface soil sample cumulative TEQ value was at location SS-4 while the highest subsurface soil cumulative TEQ value was at location MW-2 at a depth of 8 to 10 feet bgd. Many of the surface soil B[a]P concentrations exceed the ATSDR health screening CREG of 0.1 mg/kg for a one-in-a-million (10^{-6}) excess cancer risk (ATSDR 2004). Toxicity values for each surface soil sample analyzed are shown in Table 2.

Calculating an Intake Dose for PAHs

To determine if people are at an increased risk of adverse health effects from a contaminant, a health investigator will often calculate the dose received when various exposure scenarios are considered. Data collected during the Limited Phase 2 ESA (Aquaterra 2009a) was used as the basis for calculating a potential dose. The following equation can determine the amount of a contaminant a person ingests by incidentally eating contaminated soil:

$$\text{Dose} = \frac{\text{Concentration} \times \text{Amount Eaten} \times \text{Fraction Ingested} \times \text{Exposure Duration} \times \text{Exp Frequency}}{\text{Body Weight} \times \text{Averaging Time}}$$

As the Alton Park Site #1 may be reused as a recreational area, recreational exposure scenarios will be considered. For an adult site recreator, taking the maximum concentration of a contaminant coupled with a 5 hour per day exposure duration would make a worst case scenario example. Standard assumptions of 70 kg adult body weight and 6-year exposure duration were incorporated. The amount of soil incidentally ingested is also a standard assumption of 100 mg/day for adults. In this scenario, exposure to contaminated soil happens for 6 hours, 3 days per week, or 156 days per year. Assuming exposure for 6 years for adults, this equals a total exposure (averaging time) of 936 days for an adult recreator.

Children would likely visit the site as a recreator with their parents. Therefore a worst-case child exposure is calculated based on standard assumptions of 16 kg child body weight and 10-year exposure duration. The amount of soil incidentally ingested is also a standard assumption of 200 mg/kg for children. We can assume the fraction ingested was 1 or it is assumed that complete contaminant absorption occurs by the human body. All soil eaten is assumed to be of maximum contaminant concentration, a worse-case scenario. The exposure scenario for a child recreator assumes an exposure to contaminated soil for 6 hours per day 220 days per year for 10 years.

The Appendix contains calculated site-specific intake doses for incidental ingestion of PAHs in surface soil at the site. Intake doses were calculated for surface soil ingestion PAHs. These intake doses were evaluated to determine if a worst-case scenario will affect recreators at the site. There is the possibility of contact with surface soils as site recreators may not have immediate access to bathing facilities and hence soil may adhere longer to their clothes and bodies. The theoretical risk for an adult is conservatively estimated to be 3.6 excess cancers per 1,000,000 adults (3.6×10^{-6}). The theoretical risk for a child is conservatively estimated to be 2.3 excess cancers per 100,000 children (2.3×10^{-5}). Calculated exposure doses show that the risk for adults and children at the site now and in the future, given current site conditions, are in the EPA's acceptable range of risk (EPA 1991).

For subsurface soil, intake doses were calculated for PAHs as a worst-case scenario. Contact with subsurface soil at the site would be achieved through digging or excavation. There is no evidence at the site to show that this is a current exposure pathway. Subsurface soil is buried beneath site surface soils. Subsurface soil PAHs are not expected to affect human health, especially since the site is capped and closed in accordance with TDEC regulations. The former landfill has vegetation growing on it and the soil/vegetative cap is maintained. With the closure of the site through the installation of a soil cap, the routes of exposure for humans to contact concentrations of PAHs in the subsurface soils were removed.

As a worst-case scenario, the risk to adults and children ingesting subsurface soil was calculated. The theoretical risk for an adult is conservatively estimated to be 1.2 excess cancers per 100,000 adults (1.2×10^{-5}). The theoretical risk for a child is conservatively estimated to be 7.3 excess cancers per 100,000 children (7.3×10^{-5}). Calculated exposure doses show that the risk for adults and children at the site now and in the future, given current site conditions, are in the EPA's acceptable range of risk (EPA 1991).

Groundwater Results and Evaluation

The following tables were used as part of the screening process for evaluation of chemicals identified in groundwater at the site. Table 4 lists the groundwater data for metals, PCBs, pesticides, and herbicides and the ATSDR EMEG and CREG comparison values, tap water RSL, and EPA MCL comparison values. Only one metal, lead, was identified in concentrations above one of its comparison values, and hence is a COC.

Table 5 lists VOCs and SVOCs identified in groundwater. Only naphthalene, in 1 of the 4 well samples, was identified in concentrations above its respective comparison value, and hence is a COC.

No chemicals were detected above comparison values in the two surface water samples collected from Chattanooga Creek. Therefore, the creek, which is prone to flooding some of the area within the Alton Park Site #1, is not considered a pathway by which chemicals can be deposited on the site from upstream industries.

Based on these results, the groundwater COCs at the Alton Park Site #1 are lead and naphthalene in groundwater. These chemicals will be further evaluated below.

No one is drinking groundwater from the landfill parcel or the school parcel of Alton Park Site #1. No one is anticipated to drink groundwater from these parcels in the future. Chemicals detected in groundwater sampling of the onsite wells were compared to EPA MCLs for relevance only. Lead is the only metal identified in groundwater exceeding its health comparison screening values. Lead was not detected in samples collected from two wells (MW-1 and MW-3, Figure 3). In the other two wells on-site (MW-2 and MW-4, Figure 3), lead was detected at 32 µg/L and 120 µg/L, respectively (Table 4). These two lead concentrations exceed the MCL for drinking water of 15 µg/L established for public drinking water systems. However, since no one is drinking the water at the site, the Alton Park Site #1 is served by municipal water services, and there are no plans to use the groundwater at the site in the future, lead in groundwater does not pose a health concern.

VOCs are a variety of carbon-containing chemicals that readily evaporate into air at room temperature. Many VOCs are man-made. They are used in a wide variety of products such as paint, cleaning supplies, pesticides, building materials, petroleum fuels, and office equipment such as copiers and printers. Such products emit VOCs as gases which can be released during use and, to some degree, when stored. VOCs are also common groundwater contaminants (EPA 2009). One VOC was identified in one groundwater well, MW-4, at a concentration that exceeded its MCL. The VOC naphthalene ranged from non-detect to 13 µg/L (Table 5) in the groundwater samples. The concentration of naphthalene in groundwater does not exceed its EPA

Lifetime Health Advisory of 100 µg/L. Therefore, naphthalene in groundwater does not pose a health concern.

Again, the Alton Park Site #1 is served by municipal water services, no one is using the groundwater as a source of drinking water source now and there are no plans to use the groundwater as a source of drinking in the future. There is not a completed exposure pathway for groundwater ingestion at the site. No wells were identified on-site other than the monitoring wells installed for site evaluation. These wells are locked and protected by a steel casing when they are not being sampled. Future adult and child recreators would not have access to groundwater. If the site is redeveloped, the likely redevelopment options include non-residential development on the school parcel and recreational athletic fields on the former 36th Street Landfill parcel. There reportedly is a low permeability cap and established vegetative cover on the former 36th Street Landfill parcel. This cap prevents access to groundwater. Additionally, if not already in place, there may be future institutional controls placed on these property parcels to restrict the use of groundwater.

Physical Hazards

Physical hazards were identified at the Alton Park Site #1. A site visit conducted by the Chattanooga-Hamilton County Health Department on May 7, 2009 revealed that there was some minor trash dumping within the school parcel (Figure 4). There was also some trash dumping around the fenced landfill area. Piles of furniture and old tires were noted. All materials dumped on-site are easily accessible to the public and any children who may wander onto the site (Figure 5).

Children's Health Considerations

In the preparation of this public health document, the health and wellbeing of children was thoughtfully considered.

In communities faced with environmental contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than adults from certain kinds of exposure to hazardous substances (ATSDR 1997, 1998). Children's bodily systems are still developing. These systems can sustain permanent damage if toxic exposure levels are high enough during critical growth stages. Children also eat more food, drink more liquids, and breathe more air in proportion to their body weight. This lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body size. Behavior patterns of children as well as their limited ability to understand environmental public health can also result in more exposure to hazardous substances. Because children are dependent on adults for access to housing, medical care, and risk identification, adults need as much information as possible to make informed decisions regarding their children's health (ATSDR 1997a).

Hand-to-mouth behavior of young children requires special attention. Although unlikely to be on the Alton Park Site #1 alone, toddlers will sometimes display increased dirt-eating behavior. This dirt-eating behavior, called pica behavior, may cause a toddler to have an increased dose of chemicals if dirt containing chemicals is eaten. Older children and teenagers are likely to be the

main population using this area for future recreational purposes. In addition to incidental ingestion, chemicals adhered to soils can travel on clothes and pets into homes exposing more people to incidental ingestion. Thus, the outdoor activities of children and teenagers, in relation to potential future recreational activities at the site, require thoughtful consideration.

Future Landfill Re-Use Considerations

The idea of the former 36th Street Landfill parcel being redeveloped into a potential future recreational use area is a good redevelopment use for the property. It is our understanding that the entire former 36th Street Landfill parcel was closed in accordance with TDEC landfill closure regulations. This remedial measure has eliminated the exposure pathway to subsurface contaminated soil.

Any future construction activities such as improvements to irrigation and drainage, digging of goalposts, fence posts, and light posts, as well as installation of bleachers, benches, scoreboards, signs, and playground equipment should be carried out carefully so as not to disturb the existing landfill cap. Any potentially contaminated soil that is unearthed during the construction process should be removed and a minimum of 2-feet of clean fill should be used to cover the area. By doing so this would prevent any new exposure to future recreators.

If the site is redeveloped into a recreational use, maintenance and erosion control should be considered during the planning process. Materials such as mulch, fill, and gravel are likely to be worn away with use. The former landfill does and will continue to require upkeep. Therefore, a plan should be established by the City of Chattanooga for future maintenance to ensure that any contaminated soil that is unearthed would be prudent. Overall, ensuring public safety needs to be a main concern when considering future recreational uses of this site.

It is certainly viable for small sections of the larger 53 acre site to be redeveloped separately for separate uses. Various parts of the site could be redeveloped for recreational or community uses while others closer to the existing roads or containing the existing buildings could be redeveloped for commercial uses. The environmental data collected by CHCRPA's consultant Aquaterra does not restrict a commercial use alternative from being feasible.

Conclusions

The Tennessee Department of Health's Environmental Epidemiology Program (EEP) reached five important conclusions in this health consultation:

EEP concludes that with the proper institutional controls and re-use plan the site could be redeveloped and be protective of human health. Because the landfill is closed in accordance with the TDEC closure regulations and because of the fact there are relatively minor amounts of chemicals in surface soil, subsurface soil, and groundwater, and access to subsurface soil and groundwater is not readily available, redevelopment can proceed. Once institutional controls are placed on the landfill and former school parcels preventing access to chemicals in soil and groundwater, the site could potentially be redeveloped for recreational or community uses. EEP agrees with CHCRPA consultant's opinion that the site is not recommended to be redeveloped for residential use.

EEP concludes that contact with chemicals present in the surface soil of the site is not expected to harm the health of children or adults. All chemicals in surface soil were either below the levels expected to harm the health of adults and children or were in low enough concentrations that the conservatively estimated theoretical risks for adults and children exposed to the chemicals in the surface soil were in an acceptable range.

EEP concludes that contact with chemicals in the subsurface soil of the site is not expected to harm the health of adults or children. Subsurface soils are not accessible during normal use or during future recreational activities. Considering the subsurface soil could be contacted like surface soil, the chemicals in subsurface soil were below the levels expected to harm the health of adults and children or were present in low enough concentrations given the worst case scenario, such that the conservatively estimated theoretical risks for adults and children exposed to chemicals in the subsurface soil are in an acceptable range.

EEP concludes that groundwater, is not expected to harm the health of adults or children. Municipal water is provided to the area of the Alton Park Site #1. No water supply wells are currently installed and groundwater is not used as a drinking water source on either of the two property parcels making up the site. As a worst-case scenario, the risk of drinking site groundwater was calculated. Using the calculated information the conservatively estimated theoretical risk for adults and children exposed to chemicals present in site groundwater is in the acceptable range.

EEP concludes that there are some minor physical hazards because of trash dumping that may cause physical harm to children or adults. Scattered trash including discarded furniture, wood, and tires were observed in and around the former Franklin Middle School and the fenced 36th Street Landfill.

Recommendations

The main focus of this health consultation is to provide guidance to the Chattanooga / Hamilton County Regional Planning Agency (CHCRA) in understanding the scope of potential human health exposures by inhaling, ingesting, or touching soil or groundwater having site-related chemicals. EEP was also asked to assist the CHCRA in understanding the potential obstacles to safe redevelopment and reuse of the Alton Park Site #1 if it was redeveloped into a recreational reuse. With that in mind, the following recommendations are believed to be appropriate based on EEP's review of the sampling data.

- Institutional controls for land and groundwater use restrictions should be placed on the property parcels, if not already properly administered. Aquaterra, the environmental consultant that performed the investigation of the Alton Park Site #1, recommended that unless more detailed investigation is completed on these property parcels, the parcels should not be allowed to be redeveloped for residential use.
- Upkeep of the former 36th Street Landfill should be continued. Measures should be taken to maintain the grassy cover and prevent access to the buried waste in this portion of the site.
- Remove physical hazards presented by the trash and discarded furniture and tires from the former Franklin Middle School property. Measures to prevent future disposal of unwanted items on the property is also needed.

Public Health Action Plan

The public health action plan for the Alton Park Site #1 contains a list of actions that have been or will be taken by EEP and/or other agencies. This health consultation was completed to provide guidance to the Chattanooga / Hamilton County Regional Planning Agency (CHCRA) in understanding the scope of potential human health exposures by inhaling, ingesting, or touching soil or groundwater having site-related chemicals. This public health action plan offers a plan of action designed to lessen and/or prevent potential harmful health effects that result from breathing, eating, drinking, or touching hazardous substances in the environment. Included is a commitment on the part of EEP to follow up on this plan to ensure that it is implemented.

Actions that public health agencies are concerned about that have been taken included:

- Chattanooga-Hamilton County Health Department site visit on May 7, 2009.
- EEP Attendance at the Alton Park Brownfield sites investigation community meeting on August 10, 2009.
- This TDH EEP health consultation.

Public health actions that are to be taken include:

- TDH EEP will provide copies of this health consultation to state, federal, and local government, academia, environmental groups, community groups, and others interested in the Alton Park's Brownfield redevelopment.
- TDH EEP will maintain dialogue with the Agency for Toxic Substances and Disease Registry, the U.S. Environmental Protection Agency, the Tennessee Department of Environment and Conservation, the Chattanooga and Hamilton County Health Department, the Chattanooga and Hamilton County Regional Planning Agency, the City of Chattanooga, and other interested stakeholders to safeguard public health at the Alton Park Site #1.
- TDH EEP will be available to review additional environmental data, as requested.

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Tables and Figures

Table 1. Selected metals, PCB, pesticide, and herbicide grab soil sample analytical results at the Alton Park Site #1, Chattanooga, Hamilton County, TN. Soil sample results and comparison values are reported in milligrams per kilogram (mg/kg). January 14, 2009 (Aquaterra 2009b).

Sample ID	Sample Depth	Metals								PCBs	Pesticides	Herbicides
		Arsenic	Barium	Cadmium	Chromium	Lead	Selenium	Silver	Mercury	PCB 1260	Pesticides	Herbicides
SS-1	0-6"	2.5	88	<0.25	16	18	<1.0	<0.50	0.041	<0.017	None Detected	None Detected
SS-2	0-6"	4.2	77	<0.25	16	69	<1.0	<0.50	0.065	<0.017		
SS-3	0-6"	4.1	31	<0.25	7.8	37	<1.0	<0.50	0.058	<0.017		
SS-4	0-6"	1.2	25	<0.25	5.3	14	<1.0	<0.50	<0.020	0.058		
SS-5	0-6"	4.0	46	0.66	7.1	26	<1.0	<0.50	0.089	<0.017		
SS-6	0-6"	6.4	30	<0.25	8.2	12	<1.0	<0.50	0.034	<0.017		
SS-Duplicate	0-6"	4.2	74	<0.25	15	60	<1.0	<0.50	0.064	<0.017		
MW-2	8-10'	4.4	130	0.49	20	160	<1.0	<0.50	<0.020	<0.017		
MW-3	12-14'	2.4	68	0.33	11	17	2.7	0.68	0.066	<0.017		
MW-4	8-10'	3.3	120	<0.25	14	40	<1.0	<0.50	0.035	<0.017		
ATSDR CREG*		0.5	NE	NE	NE	NE	NE	NE	NE	0.4	various	various
ATSDR EMEG (Child/Adult)		20/ 200	10,000/ 100,000	10/ 100	NE	NE	300/ 4,000	300/ 4,000	NE	NE	various	various
EPA Residential RSLs		0.39	15,000	70	280	400	390	390	3.1	0.22	various	various
Tennessee Soil Background		10	144	1.0	20	45	1.2	1.2	0.18	NE	NE	NE

Notes:
 ATSDR CREG – Agency for Toxic Substances and Disease Registry Cancer Risk Evaluation Guide Concentration for 1 excess cancer in 1,000,000, June 30, 2009
 ATSDR EMEG - Agency for Toxic Substances and Disease Registry Environmental Media Evaluation Guide for chronic (greater than 365 day) exposure for child and adult, June 30, 2009.
 RSLs – Regional Screening Values, US Environmental Protection Agency, April 2009.
 <0.25 – less than the detection limit (shown). NE – No comparison value established for chemical.

Table 2. Detected Polycyclic aromatic hydrocarbon (PAH) grab soil sample analytical results at the Alton Park Site #1, Chattanooga, Hamilton County, TN. Soil sample results and comparison values are reported in milligrams per kilogram (mg/kg). January 14, 2009 (Aquaterra 2009b).

Sample ID	Sample Depth	Semi-Volatile Organic Compounds (SVOCs)															
		Ace-naphthene	Anthracene	Benzo(a)-anthracene	Benzo(b)fluoranthene	Benzo(k)-fluoranthene	Benzo(g,h,i)-perylene	Benzo(a)-pyrene	Chrysene	Dibenz(a,h)-anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phene-anthrene	Bis(2ethyl-hexyl)-phthalate	Pyrene
SS-1	0-6"	<0.033	<0.033	<0.033	0.040	<0.033	<0.033	<0.033	<0.033	<0.033	0.049	<0.033	<0.033	<0.033	<0.033	<0.33	0.044
SS-2	0-6"	<0.033	<0.033	0.21	0.28	0.14	0.15	0.22	0.18	<0.033	0.38	<0.033	0.15	<0.033	0.18	<0.33	0.34
SS-3	0-6"	<0.033	<0.16	0.051	<0.033	<0.033	<0.033	0.034	<0.033	<0.033	0.038	<0.033	<0.033	<0.033	<0.033	<0.33	0.039
SS-4	0-6"	<0.16	<0.033	<0.36	0.33	<0.16	<0.54	0.28	0.39	0.18	0.28	<0.033	0.50	<0.16	0.24	7.2	0.28
SS-5	0-6"	<0.033	<0.033	<0.033	0.034	<0.033	<0.033	<0.033	<0.033	<0.033	0.054	<0.033	<0.033	<0.033	<0.033	<0.33	0.042
SS-6	0-6"	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.33	<0.033
SS-Dup	0-6"	<0.033	0.038	0.24	0.29	0.20	0.11	0.25	0.22	<0.033	0.49	<0.033	0.12	<0.033	0.20	<0.33	0.40
MW-2	8-10'	<1.6	0.48	1.7	<1.6	<1.6	<1.6	<1.6	1.7	<1.6	4.6	<1.6	<1.6	<1.6	2.4	<16	3.0
MW-3	12-14'	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<6.6	<0.66
MW-4	8-10'	0.14	0.086	0.15	0.11	0.034	0.039	0.092	0.14	<0.033	0.41	0.10	0.038	0.039	0.32	14	0.30
PAH Toxicity Equivalency Factors		NE	0.01	0.1	0.1	0.01	0.01	1	0.001	1	0.001	0.001	0.1	0	0.001	--	0.001
ATSDR CREG		NE	NE	NE	NE	NE	NE	0.1	NE	NE	NE	NE	NE	NE	NE	NE	NE
ATSDR EMEG or RMEG (Child/Adult)		NE	NE	NE	NE	NE	NE	NE	NE	NE	2,000/30,000	2,000/30,000	NE	1,000/10,000	NE	NE	2,000/20,000
EPA RSLs (Residential/Industrial)		3,400/33,000	17,000/170,000	0.15/2.1	0.15/2.1	1.5/21	NE/NE	0.015/0.21	15/210	0.015/0.21	2,300/22,000	2,300/22,000	0.15/2.1	150/670	NE/NE	35/120	1,700/17,000

Notes:

ATSDR CREG – Agency for Toxic Substances and Disease Registry Cancer Risk Evaluation Guide Concentration for 1 excess cancer in 1,000,000, June 30, 2009.

ATSDR EMEG - Agency for Toxic Substances and Disease Registry Environmental Media Evaluation Guide for chronic (greater than 365 day) exposure for child and adult, June 30, 2009.

RSLs – Regional Screening Values, US Environmental Protection Agency, April 2009. <0.033 – less than the detection limit (shown).

Bold indicates exceedance of comparison value; NE – No comparison value established for chemical. -- = Compound not a PAH and hence does not have a toxicity equivalency factor.

Table 3. Summary of Volatile Organic Compound (VOC) grab soil sample detections for the Alton Park Site #1, Chattanooga, Hamilton County, Tennessee. Soil sample and comparison value results are reported in milligrams per kilogram (mg/kg). January 14, 2009 (Aquaterra 2009b)

Sample ID	Sample Depth	Volatile Organic Compounds (VOCs)		
		Acetone	p-Isopropyltoluene	Naphthalene
MW-2	8-10'	0.35	0.27	<0.025
MW-3	12-14'	<0.25	<0.0050	<0.025
MW-4	8-10'	<0.25	<0.0050	0.10
ATSDR CREG		NE	NE	NE
ATSDR EMEG (Child/Adult)		50,000/ 600,000	NE	1,000/ 10,000
EPA Regional Screening Levels (Residential/ Industrial)		61,000/ 610,000	NE/NE	NE/NE

Notes:

ATSDR CREG – Agency for Toxic Substances and Disease Registry Cancer Risk Evaluation Guide Concentration for 1 excess cancer in 1,000,000, June 30, 2009

ATSDR EMEG – Agency for Toxic Substances and Disease Registry Cancer Environmental Media Evaluation Guide Concentration for chronic (greater than 365 day) exposure for child and adult, June 30, 2009.

Regional Screening Levels - US Environmental Protection Agency, April 2009.

<0.25 – less than the detection limit (shown).

NE – Health comparison value not established for chemical.

Table 4. Selected metals, PCBs, pesticide, and herbicide grab groundwater sample analytical results at the Alton Park Site #1, Chattanooga, Hamilton County, TN. Results and drinking water comparison values are reported in micrograms per liter (µg/L). . PCB, pesticides, and herbicides samples collected November 20, 2008. Metal samples collected December 11, 2008 (Aquaterra 2009b).

Sample ID	Sample Date	Metals		PCBs	Pesticides	Herbicides
		Barium	Lead			
MW-1	11/20/2008 12/11/2008	620	<5.0	None	None	None
MW-2	11/20/2008 12/11/2008	150	32			
MW-3	11/20/2008 12/11/2008	240	<5.0			
MW-4	11/20/2008 12/11/2008	200	120			
Duplicate	11/20/2008 12/11/2008	250	<5.0			
ATSDR CREG		NE	NE	Detected	Detected	Detected
ATSDR EMEG (Child / Adult)		2,000/ 7,000	NE/ NE			
EPA MCLs		2,000	15			
EPA Regional Screening Levels Cancer / Non-cancer		NE/ 7,300	NE/ NE			

Notes:

µg/L – micrograms per liter

ATSDR CREG – Agency for Toxic Substances and Disease Registry Cancer Risk Evaluation Guide Concentration for 1 excess cancer in 1,000,000, June 30, 2009.

ATSDR EMEG - Agency for Toxic Substances and Disease Registry Environmental Media Evaluation Guide for chronic (greater than 365 day) exposure for child and adult, June 30, 2009.

EPA MCLs – US EPA Maximum Contaminant Levels for individual chemical in micrograms per liter.

Regional Screening Levels - US Environmental Protection Agency, April 2009.

<5.0 – less than the detection limit (shown).

Bold indicates exceedance of health comparison value

NE – Health comparison value not established for chemical.

Table 5. Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs) groundwater sample analytical results where 1 out of 4 groundwater samples were identified as having a VOC concentration and 0 out of 4 groundwater samples were identified having a SVOC concentration above health comparison values at the Alton Park Site #1, Chattanooga, Hamilton County, TN. Results and drinking water comparison values are reported in micrograms per liter (µg/L). Samples collected December 11, 2009 (Aquaterra 2009b)

Sample ID	Sample Date	Volatile Organic Compounds (VOCs)			SVOCs				
		Acetone	p-Isopropyl-toluene	Naphthalene	Ace-naphthalene	Anthracene	Fluoranthene	Fluorene	Phenanthrene
MW-1	12/11/2008	<50	<1.0	<5.0	1.3	<1.0	<1.0	<1.0	<1.0
MW-2	12/11/2008	<50	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0
MW-3	12/11/2008	<50	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0
MW-4	12/11/2008	<50	37	13	15	1.1	2.0	8.1	5.7
Duplicate	12/11/2008	<50	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0
ATSDR CREG		NE	NE	NE	NE	NE	NE	NE	NE
ATSDR EMEG (Child/Adult)		200/700	NE	200/700	600/2,000	3,000/10,000	400/1,000	400/1,000	NE
EPA MCLs		NE	NE	NE	NE	NE	NE	NE	NE
EPA Regional Screening Levels Cancer/Non-cancer		NE/22,000	NE/NE	100*	NE/2,200	NE/11,000	NE/1,500	NE/1,500	NE/NE

Notes:

ATSDR CREG – Agency for Toxic Substances and Disease Registry Cancer Risk Evaluation Guide Concentration for 1 excess cancer in 1,000,000

ATSDR EMEG - Agency for Toxic Substances and Disease Registry Cancer Environmental Media Evaluation Guide Concentration for chronic (greater than 365 day) exposure for child and adult.

* - US EPA Lifetime Health Advisory concentration for ingestion of drinking water with naphthalene. <1.0 – less than the detection limit (shown).

Bold indicates exceedance of health comparison value; NE – Health comparison value not established for chemical.

Table 6. Total PAHs and PAH toxicity equivalency (TEQ) by sample location at the Alton Park Site #1, Chattanooga, Hamilton County, TN. TEQs are reported in milligrams per kilogram (mg/kg).

Sample Location	Sample Depth	Total PAHs by Location	PAH Toxicity Equivalency by Location
SS-1	0 to 6 inches	0.133	0.04
SS-2	0 to 6 inches	2.23	0.30
SS-3	0 to 6 inches	0.162	0.06
SS-4	0 to 6 inches	3.46	0.59
SS-5	0 to 6 inches	0.096	0.04
SS-6	0 to 6 inches	—	0.04
MW-2	8 to 10 feet	13.88	1.96
MW-3	12 to 14 feet	—	0.77
MW-4	8 to 10 feet	1.77	0.14
TEQ totals of sample locations where PAH concentrations are greater than detection limit.		19.96	3.14

FIGURE 1. USGS topographic map showing the Alton Park Site #1, Chattanooga, Hamilton County, Tennessee

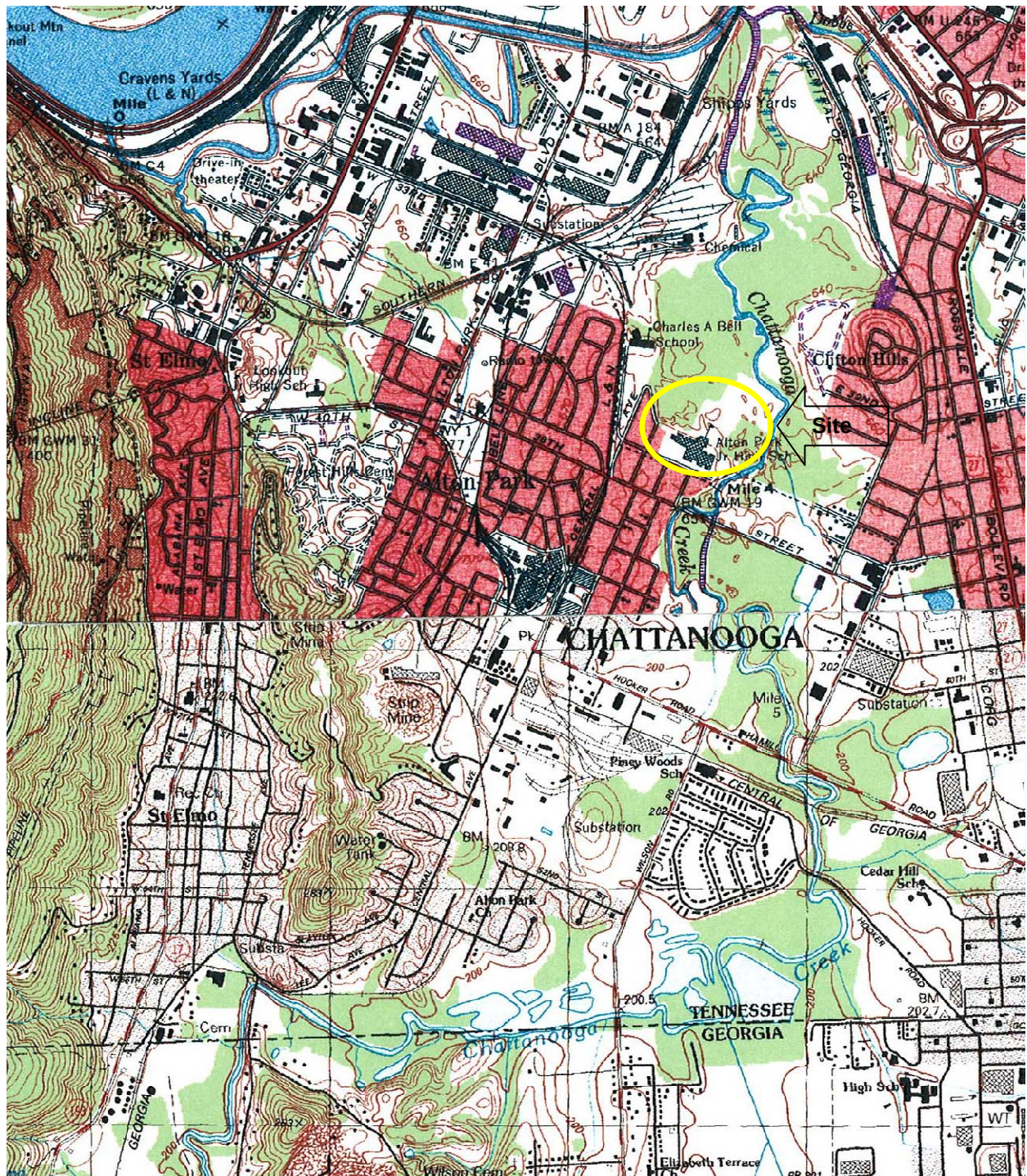


FIGURE 2. Aerial image showing the Alton Park Site #1, Chattanooga, Hamilton County, TN. (Image credit: Google 2009)



FIGURE 3. Environmental sampling locations at the Alton Park Site #1, Chattanooga, Hamilton County, TN. (Image credit: Aquaterra 2009b)

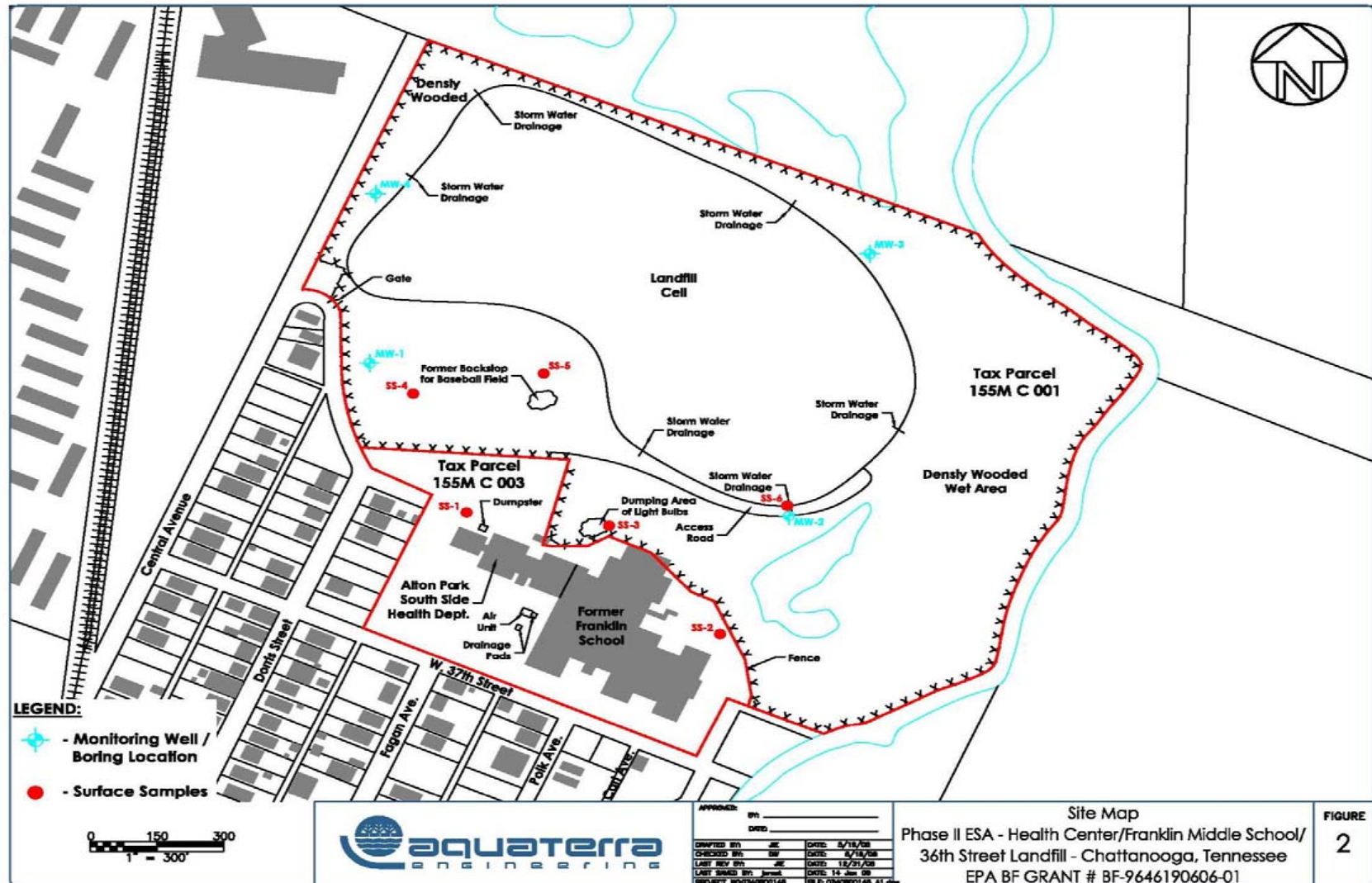


FIGURE 4. Photo of Site showing materials dumped at the former Franklin Middle School. Dumping of brush and furniture was noted on the opposite side of the school as well. (Image credit: S. Novak, Chattanooga and Hamilton County Health Department)



FIGURE 5. View of Site showing former entrance to closed 36th Street Landfill. Note the rise in landfill at right center. (Image credit: J. George, Tennessee Department of Health).



Appendix

In an effort to understand if chemicals found on a site could harm the health of users of the site or the general public near the site, there is a step-wise process that a health assessor goes through. First, the results of environmental testing are compared to the Agency for Toxic Substances and Disease Registry's (ATSDR) and the U.S. Environmental Protection Agency's health comparison values. If a chemical is present in amounts in the site soil or groundwater above these comparison values, then these chemicals become "chemicals of concern" and are evaluated further. This Appendix outlines the steps that were done to further evaluate the polycyclic hydrocarbons (PAHs) found in soils of the Alton Park Site #1. This further evaluation includes calculating a theoretical intake dose that future users of the site may encounter.

Calculating an Intake Dose

To determine if people are at an increased risk of adverse health effects from a contaminant, a health investigator will often calculate the dose received when various exposure scenarios are considered. Data collected during the Limited Phase 2 ESA (Aquaterra 2009a) is used as the basis for calculating a potential dose. The following equation can determine the amount of a contaminant a person ingests by incidentally eating contaminated soil:

$$\text{Dose} = \frac{\text{Concentration} \times \text{Amount Eaten} \times \text{Fraction Ingested} \times \text{Exposure Duration} \times \text{Exp Frequency}}{\text{Body Weight} \times \text{Averaging Time}}$$

For an adult site recreator, taking the maximum concentration of a contaminant coupled with a 5 hour per day exposure duration would make a worst case scenario example. Standard assumptions of 70 kg adult body weight and 6-year exposure duration were incorporated. The amount of soil incidentally ingested is also a standard assumption of 100 mg/day for adults. In this scenario, exposure to contaminated soil happens for 5 hours, 3 days per week, or 156 days per year. Assuming exposure for 6 years for adults, this equals a total exposure (averaging time) of 936 days for an adult recreator.

Children would likely visit the site as a recreator with their parents. Therefore a worst-case child exposure is calculated based on standard assumptions of 16 kg child body weight and 10-year exposure duration. The amount of soil incidentally ingested is also a standard assumption of 200 mg/kg for children. We can assume the fraction ingested was 1 or all soil eaten is of maximum contaminant concentration, a worse-case scenario. Also, it is assumed that complete contaminant absorption occurs by the human body. The exposure scenario for a child recreator assumes an exposure to contaminated soil for 5 hours per day 220 days per year for 10 years.

PAH in Soils Dose

Surface Soil

The maximum total PAH toxic equivalency concentration in site surface soils was 0.59 mg/kg (Table 6). All other PAH concentrations detected were below this equivalency. The following are worst case scenario calculations for adults and children exposed to PAHs at the site, respectively:

$$\frac{0.59mg}{kg} \times \frac{1kg}{10^6 mg} \times \frac{100mg}{day} \times 1 \times \frac{6hrs}{day} \times \frac{1day}{24hrs} \times 6yrs \times \frac{365days}{yr} = 4.9 \times 10^{-7} \frac{mg}{kg \times day}$$
$$\frac{0.59mg}{kg} \times \frac{1kg}{10^6 mg} \times \frac{200mg}{day} \times 1 \times \frac{6hrs}{day} \times \frac{1day}{24hrs} \times 10yrs \times \frac{365days}{yr} = 3.1 \times 10^{-6} \frac{mg}{kg \times day}$$

$$\frac{0.59mg}{kg} \times \frac{1kg}{10^6 mg} \times \frac{200mg}{day} \times 1 \times \frac{6hrs}{day} \times \frac{1day}{24hrs} \times 10yrs \times \frac{365days}{yr} = 3.1 \times 10^{-6} \frac{mg}{kg \times day}$$

To determine if this worst case scenario dose is problematic for public health, the EPA established 7.3E+0 as the slope factor for the carcinogenic effects of benzo[a]pyrene. A slope factor is a line derived from dose-response research outcomes that predicts a theoretical risk of excess cancers from exposure to the chemical. It has units of (mg/kg-day)⁻¹ and when multiplied by the dose provides a value for risk. The adult dose of 4.9x10⁻⁷ mg/kg-day produces a conservatively estimated theoretical risk of 3.6 excess cancers per 1,000,000 adults (3.6x10⁻⁶). The child dose of 3.1x10⁻⁶ mg/kg-day equals a conservatively estimated theoretical risk of 2.3 excess cancers per 100,000 children (2.3x10⁻⁵).

Risk assessment aims for less than a one-in-a-million (10⁻⁶) risk. Risk estimated to be less than one-in-ten thousand (10⁻⁴) is often acceptable (EPA 1991). Therefore, given that the worst case scenario is in the acceptable range, lesser exposure scenarios would have even lower associated risk.

Subsurface Soil

The maximum total PAH toxic equivalency concentration in subsurface soils was 1.96 mg/kg (Table 6). All other PAH concentrations detected were below this equivalency. The following are worst case scenario calculations for adults and children exposed to PAHs at the site, respectively:

$$\frac{1.96mg}{kg} \times \frac{1kg}{10^6 mg} \times \frac{100mg}{day} \times 1 \times \frac{6hrs}{day} \times \frac{1day}{24hrs} \times 6yrs \times \frac{365days}{yr} = 1.6 \times 10^{-6} \frac{mg}{kg \times day}$$

$$\frac{1.96mg}{kg} \times \frac{1kg}{10^6 mg} \times \frac{200mg}{day} \times 1 \times \frac{6hrs}{day} \times \frac{1day}{24hrs} \times 10yrs \times \frac{365days}{yr} = 1.0 \times 10^{-5} \frac{mg}{kg \times day}$$

To determine if this worst case scenario dose is problematic for public health, the EPA established 7.3E+0 as the slope factor for the carcinogenic effects of benzo[a]pyrene. A slope factor is a line derived from dose-response research outcomes that predicts a theoretical risk of excess cancers from exposure to the chemical. It has units of (mg/kg-day)⁻¹ and when multiplied by the dose provides a value for risk. The adult dose of 1.6x10⁻⁶ mg/kg-day produces a conservatively estimated theoretical risk of 1.2 excess cancers per 100,000 adults (1.2x10⁻⁵). The child dose of 1.0x10⁻⁵ mg/kg-day equals a conservatively estimated theoretical risk of 7.3 excess cancers per 100,000 children (7.3x10⁻⁵). These risk values are in an acceptable range.

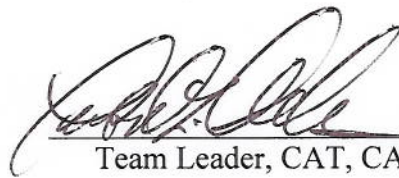
Certification

This Public Health Consultation: *Alton Park Site #1, Chattanooga, Hamilton County, Tennessee*, was prepared by the Tennessee Department of Health's Environmental Epidemiology program under a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It was prepared in accordance with the approved methodology and procedures that existed at the time the health consultation was begun. Editorial review was completed by the Cooperative Agreement Partner.



Technical Project Officer, CAT, CAPEB, DHAC, ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health assessment and concurs with the findings.

 for Grey Wirsch

Team Leader, CAT, CAPEB, DHAC, ATSDR