Health Consultation

On- and Off-Site Surface Soil

FORMER PROCTOR ROAD LANDFILL

SARASOTA COUNTY, FLORIDA

EPA FACILITY ID: FLN000409986

SEPTEMBER 30, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR 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 which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared By:

Florida Department of Health
Division of Environmental Health
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

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Foreword

This document summarizes the Florida Department of Health's evaluation of on-site and off-site soil test results from the former Proctor Road Landfill in Sarasota, Florida. The soil testing was completed by U.S. Environmental Protection Agency (EPA) and Florida Department of Environmental Protection (DEP). The Florida Department of Health (DOH) evaluates site-related public health issues through the following processes:

- Evaluating exposure: Florida DOH scientists begin by reviewing available information about environmental conditions at the site. The first task is to find out how much contamination is present, where it is on the site, and how human exposures might occur. Usually, the Florida DOH does not collect its own environmental sampling data. The Florida DEP provided the information for this Health Consultation.
- Evaluating health effects: If there is evidence that people are contacting, or might contact hazardous substances in the future, Florida DOH scientists will determine whether that exposure could be harmful to human health. We focus this report on public health; that is, the health impacts on the community as a whole, and base it on existing scientific information.
- Developing recommendations: In this evaluation report, the Florida DOH outlines its conclusions regarding any potential health threat posed by contaminated soils from the former Proctor Road Landfill site. Recommendations are made for reducing or eliminating human exposure to contaminants. The role of the Florida DOH in dealing with hazardous waste sites is primarily advisory. For that reason, the evaluation report will typically recommend actions for other agencies, including the Florida DEP and Sarasota County Health Department (CHD). If, however, an immediate health threat exists or is imminent, the Florida DOH will issue a public health advisory warning people of the danger, and will work with other agencies to resolve the problem.
- Soliciting community input: The evaluation process is interactive. The Florida DOH starts by soliciting and evaluating information from various government agencies, individuals or organizations responsible for cleaning up the site, and those living in communities near the site. We share any conclusions about the site with the groups and organizations providing the information. Once we prepare an evaluation report, the Florida DOH seeks feedback from the public.

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

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Summary and Statement of Issues

This health consultation report assesses the public health threat from exposure to contaminated surface soils on the former Proctor Road Landfill and in the nearby Ashley neighborhood. In 2007, the Florida Department of Environmental Protection asked the Florida Department of Health to evaluate the public health threat. Golfers and trespassers on the former Proctor Road Landfill (a portion later became the Foxfire Golf Club) may have been exposed to contaminated soil. Ashley neighborhood residents may have been exposed to contaminated soil from storm water runoff. Golfers, trespassers, and nearby Ashley residents may have been exposed to contaminated soils via incidental ingestion (accidentally swallowing small amounts of soil) or by inhalation (breathing dust created from the contaminated soil).

The Florida Department of Environmental Protection and U.S. Environmental Protection Agency tested soil/sediment from the former Proctor Road Landfill in 2005 and 2007. They tested soil from the nearby Ashley neighborhood in 2007. Florida Department of Health estimated a dose and inhalation concentration for each chemical and potential exposure scenario. They then compared these dose and inhalation concentrations to Agency for Toxic Substances and Disease Registry health guidelines and toxicological profiles.

Florida Department of Health categorizes the surface soil at the former Proctor Road Landfill and in the Ashley Subdivision as “No Apparent Public Health Hazard”. The highest measured levels of arsenic and polycyclic aromatic hydrocarbons in on-site and off-site surface soil are not likely to cause illness. For best public health practice, Florida Department of Health recommends restricting site access to the former Proctor Road Landfill/Foxfire Golf Club and prevention of stormwater runoff into the Ashley neighborhood. In addition, Florida Department of Health recommends a more detailed site characterization.

Background

Site Description and History

The former Proctor Road Landfill is located at 7200 Proctor Road in a predominantly residential area that is southeast of the City of Sarasota in unincorporated Sarasota County, Florida (Figures 1 and 2). It is known by various other names including Sugar Bowl Landfill, Foxfire Landfill, and Sommers Landfill [DEP 2006]. Originally, the site was thought to consist of two landfills, a 20-acre landfill and 70-acre landfill. The county first obtained an agreement in 1959 for using approximately 20 acres west of Proctor Road as a landfill. It purchased 70 acres in 1966 to operate as an expanded landfill [Ryan 1998; Sarasota Herald-Tribune staff 1998]. Sarasota County burned trash in the landfills until 1967 and buried it there until the landfills closed in March 1972. All classes and types of debris as well as construction materials were likely discarded at the site [DEP 2006; EAC 1996a].

After the landfills were closed, the property was converted into golf courses. Two golf courses, the Oak and Pine Courses, were constructed on the former 20-acre landfill and opened in 1975. The Palm Golf Course was constructed on the former 70-acre landfill and opened in 1989 [DEP 2006; EAC 1996a; Tippin 1998]. Collectively, these courses formed the Foxfire Golf Club (FGC).

Common maintenance practices at FGC included the application of both liquid and granular fertilizers. Insecticides, herbicides, fungicides, surfactants, and grass growth retardants were also applied to manage the turfgrass. Petroleum products were used to operate equipment on the property. Petroleum was originally stored in regulated underground storage tanks (USTs) that were later replaced by regulated aboveground storage tanks (ASTs). A 1,000-gallon UST holding unleaded gasoline and a 550-gallon UST containing diesel fuel were removed and replaced with two 500-gallon ASTs. Waste oil produced at the site was stored in an unregulated AST, approximately 120-gallons in size, and disposed of by a contract service [EAC 1996a]. Equipment rinsing and washing occurred onsite, and runoff from this activity may have contained petroleum products [EAC 1996a, 1996b]. Lastly, various chemicals may have been used for cleaning. The mixing of the chemicals, storage of petroleum, and washing of equipment occurred within the vicinity of the driving range and maintenance building (Figure 3).

In July 2006, the FGC closed. The land could potentially be used in the future for residential development [McQuaid 2006]. During a site visit in fall 2007, the Florida Department of Health (DOH) observed the grounds unused and overrun with vegetation.

Foxfire Subdivision lies to the east of the former 70-acre and 20-acre landfills (Figure 2). During the construction of two homes in 1989, solid waste was uncovered. This led to the discovery of a third landfill, approximately three acres in size, near the intersection of Proctor Road and Wild Horse Circle [DEP 2006; Ryan 1998; Tippin 1998]. The Florida Department of Environmental Protection (DEP) and U.S. Environmental Protection Agency (EPA) identify this landfill area as part of the Proctor Road Landfill site [DEP 2006; EPA 2007a]. This smaller landfill was developed, and is currently occupied by residential properties within the Foxfire Subdivision.

Part of the Foxfire neighborhood is connected to County water supply, and a portion of it has private potable wells. In addition, some of the residents have private wells that are exclusively used for irrigation purposes (Marc Swartz, Sarasota County Health Department, personal communication, 2008). Previous sampling of the private potable wells in this neighborhood by the Sarasota County Health Department (CHD) showed most of the chemical concentrations below detection limits. Concentrations exceeding the detection limits were below Maximum Contaminant Levels (MCLs) for drinking water quality [Sarasota County Health Department 2007].

During 2005 and 2007, the Florida DEP and U.S. EPA collected soil samples along Wild Horse Circle in the Foxfire Subdivision to evaluate any potential for contamination. In reviewing these data, Florida DOH found that the number of samples collected were too few to adequately assess the nature and extent of soil contamination. As a result, Florida DOH did not include the Foxfire Subdivision soil data in this report.

The Ashley Subdivision is adjacent to the western boundary of the former 70-acre landfill (Figure 2). Fifteen properties are contiguous with the former landfill. Residents in the Ashley Subdivision are connected to the County water supply (Sarasota County Health Department, personal communication, 2007; Sarasota County Health Department, unpublished data, 2007).

In 1995, a resident living in the Ashley Subdivision contacted Sarasota County Natural Resources Department to file a complaint about runoff coming from the golf course onto residential properties on the east side of Ashley Parkway. He also expressed concerns about possible contamination of this water from either golf course maintenance practices or the former landfill. County staff met with this resident as well as the manager at FGC. A swale between the Ashley residences and FGC appeared to have been filled by the homeowners limiting the flow of water away from their properties. Additionally, the golf course appeared to have poor drainage. Because the land was privately owned, the County could not perform maintenance to remedy these problems. County staff collected sediment samples at a creek bend downstream of FGC to screen for possible contaminants [Sarasota County Natural Resources Department 1995].

In 1998, another resident in the Ashley Subdivision contacted Sarasota County with similar concerns about runoff from FGC onto residential property during heavy rains and the possibility of contamination from the former landfill [Sarasota County Pollution Control Division 1998]. Later in 2000 and 2001 this resident submitted letters about the stormwater runoff to Sarasota County Public Works. Based upon reply letters from the County, the FGC apparently responded to these concerns by performing ditch maintenance and constructing a berm to direct runoff into the ditch and away from the residences in 2001 [Cork 2000, 2001].

Lastly, in 2006, a homeowner reported to Florida DEP that stormwater was running onto the Ashley Subdivision properties from the former 70-acre landfill. Photographic evidence confirmed this claim. Consequently, in March 2007, the Florida DEP collected samples of the former landfill and residential soils to determine the chemical condition as part of a site inspection of the former Proctor Road Landfill [DEP 2007]. As part of this health consultation, Florida DOH will use these data to evaluate possible exposures and health effects.

Investigational History

Various ground water, soil/sediment, and surface water data have been collected within the vicinity of the former Proctor Road Landfill and nearby neighborhoods (Appendix B). Florida DOH examined the results of the soil/sediment analyses.

In 1995, Sarasota County Natural Resources Department collected a sediment sample at FGC in response to an Ashley resident's complaint about potentially contaminated runoff coming into his neighborhood from the golf course. The County collected the sample at a creek bend downstream of FGC and analyzed it for organics and metals. Arsenic, cadmium, chromium, lead, mercury and methyl-tert-butyl ether were detected. The County reported to the resident that the limited screening revealed no excessive contamination [Sarasota County Natural Resources Department 1995]. Because these data are of unknown quality, Florida DOH did not include them as part of our detailed evaluation of soils within this health consultation. However, the concentrations do not appear to be a health concern because they are below screening values developed by the Agency for Toxic Substances and Disease Registry (ATSDR).

Florida DEP and U.S. EPA jointly conducted an Expanded Pre-CERCLIS Screening Assessment at the former Proctor Road Landfill in June 2005. They focused on obtaining surface water and sediment samples from on-site and down-gradient ditches and soil samples from residential

properties located on the former 3-acre landfill (i.e. residences along Wild Horse Circle within the Foxfire Subdivision). Sample locations are shown in Figure 4 and described in Table 1.

All sediment samples were collected at a depth from 0 to 6 inches (Jesus Diaz, Florida Department of Environmental Protection, personal communication, 2008). They were analyzed for metals and dioxins. The sampling agencies found arsenic in sediment collected from the canal bordering the eastern margin of the 70-acre landfill. The background sample contained lead and the highest level of dioxin. Although this sample was originally thought to represent background levels of chemicals, it may have been collected from an area receiving runoff from the 3-acre landfill [DEP 2006]. Because the ditches can dry up allowing adults and children access to the sediments, these analytical results are further evaluated in this health consultation (Jesus Diaz, Florida Department of Environmental Protection, personal communication, 2008).

For this Pre-CERCLIS assessment, Florida DEP and U.S. EPA first screened soils from eight locations on two residential properties along Wild Horse Circle using X-Ray fluorescence (Figure 4). The agencies did not detect any heavy metal contamination. As a result, they selected soil sample sites based on visible signs of contamination. Figure 4 illustrates the selected sample sites including the background sample site. The agencies collected soil samples at land surface to six inches below land surface and analyzed them for metals and dioxins. Analytical results revealed that metals (aluminum, arsenic, calcium, copper, iron, lead, magnesium, manganese, nickel, potassium, vanadium, and zinc) were generally at concentrations in the residential soil samples above those measured in the background sample. Additionally, one sample of residential soil indicated releases of several dioxin/furan congeners [DEP 2006]. Florida DEP collected another sample from this area in March 2007 to retest the chemical conditions of the soil.

In March 2007, Florida DEP and U.S. EPA conducted a soil/sediment assessment to evaluate reports from a property owner in the Ashley Subdivision regarding stormwater runoff from the 70-acre landfill onto residential properties. The agencies also further assessed the possible contamination within the Foxfire Subdivision. Soil samples were collected at a depth of 0 to 3 inches. Sample locations are marked in red in Figure 5, and location descriptions are listed in Table 1. Metals, semi-volatiles, and pesticides/polychlorinated biphenyls (PCBs) were analyzed in all of the samples. Dioxins/furans were also analyzed in samples collected near residential properties. Because fuel was previously stored in the maintenance area, volatile organic compounds (VOCs) were analyzed in the samples collected within the vicinity. Lastly, VOC analyses were performed on the sample from the Foxfire neighborhood [DEP 2007].

Analyses indicated the presence of various metals in the soils/sediments. Arsenic was measured in all of the on-site samples (i.e., samples collected from the former landfill, the golf course maintenance area, the receiving ditch, and the ditch overflow adjacent to the Ashley residences). All on-site and off-site samples showed evidence of barium, chromium, and lead. The highest concentrations were in soils collected from the ditch and ditch overflow. Mercury and selenium were detected only in trace amounts in the maintenance area and background surface soil, respectively. Cadmium and silver concentrations were below detection limits. Polycyclic aromatic hydrocarbons (PAHs) were identified in various on-site samples. In all soils, PCBs were below the detection limits. Trace levels of pesticides were measured in only a few samples. The surface soil collected from the ditch overflow area contained the highest concentration of

dioxin and furan congeners. Lastly, low levels of VOCs were identified in the background sample, the single sample collected from the Foxfire neighborhood, and samples from the maintenance area [DEP 2007].

In this health consultation, Florida DOH evaluates possible adverse health effects from the chemicals measured at levels of concern in the Ashley Subdivision. However, the data from the Foxfire Subdivision are not included because the number of soil samples collected were too few to adequately assess the nature and extent of soil contamination.

Demographics and Land Use

According to the 2000 Census, Sarasota County contains 325,957 residents. It has 182,467 housing units with 149,937 occupied. The average household size is 2.13 people. The median household income in 1999 totaled $41,957. The county's population is predominantly white, 93%, and has a median age of 50.5 years. In 2000, 8% of the population was less than 10 years old and 38% of the population was 60 years old and older. Sarasota County occupies 572 square miles [U.S. Census Bureau 2000]. Multiple land uses are present in the county including residential, commercial, industrial, and recreational.

The former Proctor Road Landfill is located southeast of the City of Sarasota in unincorporated Sarasota County. Much of the former landfill was converted to recreational land as part of FGC. Some was converted to residential land as part of Foxfire Subdivision. The area surrounding the former landfill is primarily residential with several homes already built as well as new development occurring. While sampling, Florida DEP observed Red Hawk Subdivision being developed approximately 0.1 mile south of the former 70-acre landfill (Florida Department of Environmental Protection, personal communication, 2008). These residential areas contain people of various ages. Two schools, Lakeview Elementary School and Oak Park School, are within one mile of the Proctor Road Landfill. Lakeview has students ranging from kindergarten to fifth grade [Lakeview Elementary School 2008]. Oak Park School serves students with a broad range of special needs, ages 3 to 22 years [Oak Park School 2008]. Additionally, two churches are nearby where children and adults of all ages are present.

The Ashley Subdivision lies to the west of the former 70-acre landfill. This is a higher income suburban neighborhood with homes around 3,000 square feet.

Community Health Concerns

Many of the complaints submitted by nearby residents during the 1990's included concerns about health effects to humans and animals as a result of the former Proctor Road Landfill and/or maintenance activities at the golf course. For example, in 1994, a resident in a neighborhood located southeast of FGC contacted Sarasota County Natural Resources Department with concerns about runoff from the golf course entering into a nearby pond. She was afraid the stormwater contained pesticides and her pets and other animals were affected by these compounds when they drank from the pond. She was also concerned about the contaminated water eventually getting into her well water. County staff analyzed a surface water sample from the pond and reported that all pesticides tested were below detection limits [Sarasota County

Natural Resources Department 1994]. Nearby residents also complained to the Sarasota County Natural Resources Department in 1996 and 1998 about reddish- or rusty-colored water in ditches/canals as evidence of contamination within the vicinity of the former landfill and golf course. County staff inspected the water at these sites and informed those concerned that iron bacteria were present in the canal/ditch and the water appeared turbid [Sarasota County Natural Resources Department 1996, 1998].

Since 1995, Ashley residents have submitted complaints to County and State agencies regarding stormwater running onto their properties from the former landfill/golf course. They also expressed concerns about the runoff being contaminated [Sarasota County Natural Resources Department 1995; Sarasota County Pollution Control Division 1998]. In 2001, maintenance appeared to have been performed on the ditch separating the neighborhood and golf course and a berm constructed [Cork 2000, 2001]. However, Ashley residents continued to have problems with runoff. In 2007, a couple of Ashley residents spoke with Florida DEP regarding their concerns about contaminated runoff in the nearby ditch and possible health effects to their children and grandchildren as well as neighboring children who have easy access to this area (Joe McGarrity, Florida Department of Environmental Protection, personal communication, 2007).

Site Visit

A representative of the Florida DOH visited the area around the former Proctor Road Landfill on September 25, 2007. No significant barriers were found separating FGC from the public. Small gates and the overgrown conditions of the golf course restricted vehicular access. However, trespassers could easily walk onto the property. Spilled cans of paint on some of the structures in the maintenance area indicated recent trespassers. In addition, residents or visitors in the Ashley neighborhood could easily access the ditch separating the homes and FGC (Figure 6). Upon walking through the closed golf course, swales were evident in the western area (Figure 7). These swales may possibly direct stormwater towards the Ashley residences.

Discussion

In this report, Florida DOH evaluates soil test data. The U.S. EPA and Florida DEP collected five soil/sediment samples at 0 to 6 inches below ground surface from down-gradient ditches at the former Proctor Road Landfill. They also collected twenty soil/sediment samples at a depth of 0 to 3 inches from the former landfill and residences in the Ashley neighborhood. To assess the public health implications of soil exposures, we separated these soil data into on-site and off-site. On-site includes the data collected from the former landfill/golf course (including the golf course maintenance area), receiving ditches, and ditch overflow adjacent to the Ashley residences. Off-site data consist of those data collected from the Ashley residences as well as the background samples. Specific details about the samples evaluated are available in Table 1 and sample locations are displayed in Figures 4 and 5.

Pathways Analysis

Florida DOH determines exposure to environmental contamination by identifying exposure pathways. An exposure pathway consists of five elements:

1. A source of contamination (e.g., a landfill),
2. An environmental medium such as water, soil, or air that can contain or move the contamination,
3. A point or area where people can come into contact with a contaminated medium (e.g., soil in a backyard),
4. An exposure route (e.g., inhalation, ingestion, or dermal contact), and
5. A population who could come into contact with the contaminants.

An exposure pathway is eliminated if at least one of the five elements is missing and will not occur in the future. For a completed pathway, all five components must exist and exposure to a contaminant must have occurred, is occurring, or will occur. A potential pathway exists when some, but not all, of the five elements are present and the potential exists that the missing element(s) have been present, are present, or will be present in the future [ATSDR 2005]. It should be noted that the identification of a completed or potential exposure pathway does not necessarily result in human health effects.

Florida DOH reviewed the site's history, community concerns, and available environmental sampling data. Based on this review, we determined two completed exposure pathways: on-site soil and off-site soil (Tables 2A and 2B).

Possible soil contamination sources include the former landfills and past golf course management practices (e.g., pesticide application). Various populations could be exposed to contaminants. For example, golfers who were on-site for the 31 years that Foxfire Golf Club (FGC) was operational may have been exposed. The absence of barriers provides both adults and children easy access to the site near the entrance and through the ditch area bordering the residences. Ashley residents have expressed concerns about children playing in the ditch. Additionally, older trespassers may have been on the FGC site. Lastly, adults and children living in Ashley Subdivision may contact contaminated surface soil and dust.

Exposure can occur through accidental ingestion of contaminated soil and/or by inhalation of contaminated dust. Dermal contact may also occur. However, the contaminants of concern at this site were measured at levels at which dermal contact is generally not an exposure route of concern. Thus, ingestion and inhalation are the only exposure routes further addressed in this health consultation. Exposure to contaminants may have occurred in the past, may be currently occurring, or may occur in the future.

Evaluation Process

After determining how people may be exposed to a contaminant through completed and potential exposure pathways, Florida DOH next examines contaminant types and concentrations. Florida DOH uses ATSDR comparison values and other established agencies' reference values to screen chemical and exposure levels that may warrant further evaluation. Comparison values are substance concentrations or doses that are well below levels known or anticipated to cause adverse health effects. These values are not thresholds of toxicity, and should not be used to

predict adverse health effects. They only provide an initial screening of the contaminant data [ATSDR 2005].

To identify contaminants of concern, Florida DOH determines the maximum concentration of each chemical for the various exposure scenarios and compares the concentrations to guidelines developed by ATSDR. If a comparison value is not available from ATSDR, we may compare the chemical concentration to a screening value established by another agency. A chemical having a concentration that exceeds the screening value is considered a contaminant of concern.

For each identified contaminant of concern, Florida DOH calculates a dose. The dose is the estimated amount of contaminant to which a person may have been exposed. Florida DOH compares this calculated dose to ATSDR's health guidelines as well as studies presented in ATSDR's chemical-specific toxicological profiles. This in-depth toxicological evaluation determines the likelihood of illness.

Environmental Contamination

In this section, Florida DOH reviews chemical concentrations in soil samples collected by the U.S. EPA and Florida DEP in June 2005 and March 2007. We used the following standard comparison values to select the contaminants of concern from the chemicals found:

1. Cancer Risk Evaluation Guides (CREGs). A CREG is the contaminant concentration estimated to result in no more than one excess cancer per one million (10^{-6}) persons exposed during their lifetime (i.e., over a period of 70 years). ATSDR's CREGs are calculated from U.S. EPA's cancer slope factors (CSFs) for oral exposures or unit risk values for inhalation exposures. These values are based on U.S. EPA evaluations and assumptions about hypothetical cancer risks at low levels of exposure [ATSDR 2005].
2. Environmental Media Evaluation Guides (EMEGs). An EMEG is an estimated contaminant concentration that is not expected to result in adverse noncarcinogenic health effects based on ATSDR evaluation. An EMEG is derived from the ATSDR-established Minimal Risk Level (MRL) and conservative assumptions about exposure, such as intake rate, exposure frequency and duration, and body weight [ATSDR 2005].
3. Soil Cleanup Target Levels (SCTLs). Additionally, we took into consideration SCTLs established by Florida DEP. A SCTL is developed based on direct human contact and soil acting as a source of ground or surface water contamination. It is based on default assumptions and is intended to be broadly applicable [CEHT 2005].

The maximum concentration of each chemical for on-site and off-site data was compared to the appropriate ATSDR screening value. If an ATSDR comparison value was not available, the concentration was evaluated using the Florida DEP SCTL.

Both dioxins/furans and PAHs occur as complex mixtures in the environment rather than as single compounds. To assess the risk of exposure to these mixtures, concentrations are expressed in terms of toxic equivalents (TEQs). The TEQs are calculated using the World Health Organization (WHO) and ATSDR methods for dioxins/furans and PAHs, respectively. A TEQ is determined by multiplying the exposure level of the compound by its toxicity equivalency factor

(TEF). The TEFs for the various compounds are shown in Appendix C. A total TEQ for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and total TEQ for benzo(a)pyrene are calculated and compared to appropriate screening values.

After screening all of the chemicals, Florida DOH determined that arsenic and PAHs are contaminants of concern for the former Proctor Road Landfill and Ashley neighborhood (Tables 3 and 4). Arsenic and PAH concentrations occurred in four of the on-site samples at levels exceeding their ATSDR comparison values. Thus, these compounds are further evaluated.

The compound n-butylbenzene does not have any screening values for comparison. Because not enough information is available to judge the toxicity of this compound and it was detected at a low concentration in only one on-site sample, Florida DOH did not further evaluate n-butylbenzene.

Quality Assurance and Quality Control

Florida DOH used data from the Florida DEP and U.S. EPA for this health consultation. All sampling appears in accordance with the Florida DEP Standard Operating Procedures (http://www.dep.state.fl.us/labs/sop/index.htm) and U.S. EPA Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (http://www.epa.gov/Region4/sesd/eisopqam/eisopqam.html). All samples were analyzed by the U.S. EPA Region IV Laboratory, which adheres to the National Environmental Laboratory Accreditation Conference (NELAC) Standards. Florida DOH assumes these data are valid and representative of the environmental conditions at the site. The completeness and reliability of the referenced environmental data determine the validity of the analyses and conclusions drawn for this health consultation.

Public Health Implications

For arsenic and PAHs, Florida DOH estimated daily exposure doses and concentrations for children and adults and cancer risk estimates for adults. These calculations approximate the dose individuals may have been exposed to and the likelihood of non-cancer and cancer health impacts. They are based on the types of activities that individuals may be involved with that result in contact with chemicals in the soil and sediment.

The calculated exposure doses and concentrations are compared to ATSDR Minimal Risk Levels (MRLs) to assess non-cancer health risks. An MRL is an estimate of daily human exposure to a substance that is likely to be without noncarcinogenic health effects during a specified duration of exposure based on ATSDR evaluations. The units are milligrams per kilogram per day (mg/kg/day) for oral exposures and parts per billion (ppb) or micrograms per cubic meter (ug/m^3) for inhalation exposures [ATSDR 2005].

A theoretical excess cancer risk is estimated for adults with chronic exposure to a contaminant. The highest estimated average daily dose or exposure concentration is adjusted to a dose or concentration that would yield an equivalent exposure if exposure continued for the entire lifetime, which is assumed a 70-year period. Because children change in size and weight as they

grow into adults, an excess cancer risk cannot be appropriately calculated from the parameters used to estimate the maximum exposure dose and concentration for a child.

To determine a theoretical cancer risk, the lifetime average daily dose (for ingestion) or adjusted exposure concentration (for inhalation) is multiplied by a cancer slope factor (CSF) or inhalation unit risk (IUR), respectively. This estimated risk indicates the additional number of cancer cases that may result from exposure to the carcinogen, in addition to the number normally expected in an unexposed population. It is expressed as the proportion of a population that may be affected during a lifetime of exposure [ATSDR 2005]. Florida DOH also describes the excess cancer risk in qualitative terms like high, moderate, low, no apparent, or minimal increased risk. A high increased risk is a possibility of one additional cancer case over background in one hundred persons exposed over a lifetime, and moderate increased risk is an additional case per one thousand persons. A low increase in cancer risk indicates a possibility of one additional cancer case over background in a population of ten thousand persons exposed over a lifetime. No apparent increased risk is an estimate of one additional cancer case per one hundred thousand, and a minimal increased risk is one or less than one additional cancer case per one million persons exposed over a lifetime. We base our theoretical calculation on the assumption that there is no safe level of exposure to a chemical that causes cancer. Nonetheless, the theoretical calculated risk is not exact and tends to overestimate the actual risk associated with exposures that may have occurred.

Chemical-specific toxicological profiles are also consulted to assess potential non-cancer and cancer health risks. The ATSDR toxicological profiles on contaminants discuss toxicity from three exposure routes: inhalation, ingestion, and dermal (skin) exposure. For each of these exposure routes, ATSDR also groups health effects by duration (length) of exposure. Acute exposures are those with duration of 14 days or less; intermediate exposures are those having duration of 15 to 364 days; and chronic exposures are those that occur for 365 days or more (or an equivalent period for animal exposures). In addition, the ATSDR toxicological profiles provide information on the environmental transport and regulatory status of contaminants.

For the Proctor Road Landfill site, the primary exposure routes for arsenic and PAHs are incidental ingestion of soil/sediments and inhalation of dust. Florida DOH uses Risk Assistant™, a software model that uses U.S. EPA risk assessment guidelines, to calculate ingestion doses and inhalation concentrations. To assess the public health implications of soil exposures, we separated the data into on-site and off-site. We examined the on-site concentrations in terms of exposures to former adult golfers, adult trespassers, and children trespassers. The off-site concentrations were evaluated in terms of exposures to nearby adult and children residents. We used the following assumptions:

1. Children 1 – 6 years of age weigh an average of 15 kilograms (33 pounds).
2. Adults weigh an average of 70 kilograms (154 pounds).
3. Children 1 – 6 years of age ingest an average of 200 milligrams of soil per exposure event.
4. Adults ingest an average of 100 milligrams of soil per exposure event.
5. Children and adults ingest contaminated soil at the maximum concentration measured for each contaminant.

6. Children and adults breathe suspended dust from contaminated soil/sediments.
7. Children breathe suspended dust at a moderate rate of 2 cubic meters per hour.
8. Adults breathe suspended dust at a moderate rate of 2.1 cubic meters per hour.

Each of the exposure scenarios and additional assumptions used to estimate exposures are discussed in detail with Tables 5, 6, and 7.

Contaminants of Concern

Arsenic

Arsenic is a naturally occurring element that can be found widely distributed in the Earth's crust. It can be found naturally in soils and minerals at various concentrations. These natural levels of arsenic are often referred to as background levels. Arsenic may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching. While arsenic can be released into the environment from natural sources, releases from man-made sources are much more prevalent. Synthetic sources include wood treating, pesticide application, and copper or lead smelting. Arsenic may be found in inorganic compounds or combined with carbon and hydrogen in organic compounds. The inorganic form is considered more toxic [ATSDR 2007]. To be protective of human health, Florida DOH assumes that the arsenic found in the soils within the vicinity of the former Proctor Road Landfill is in the inorganic form.

Arsenic may enter a human if swallowed in water, soil, or food. The amount that enters depends upon how much and the type of arsenic that is swallowed. Ingestion is the most common way to be exposed near a waste site. Additionally, a person may breathe air that contains arsenic dusts. This exposure can occur if one lives near waste sites where arsenic-contaminated soils are allowed to blow into the air or if the person works with arsenic-containing soils or products. If arsenic-contaminated soil or water touches a person's skin, only a small amount will go through the skin into the body. Thus, skin contact is usually not of concern [ATSDR 2007].

Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons are chemicals that form during the incomplete burning of coal, oil, gas, wood, garbage, or other organic substances. In addition, some are manufactured to use in medicines or make dyes, plastics, and pesticides. More than 100 different PAHs exist, generally occurring as complex mixtures in the environment rather than single compounds [ATSDR 1995]. Fifteen PAH compounds are evaluated in this health consultation (Appendix C). These are considered to be the greatest concern because they are potentially the most harmful, have been found in some of the highest concentrations at hazardous waste sites, and have the highest likelihood of humans being exposed to them [ATSDR 1995].

Natural releases of PAHs into the environment may occur through volcanoes and forest fires. Man-made sources of PAHs include residential wood burning, agricultural burning, municipal and industrial waste incineration, vehicle exhaust, coal, coal tar, fertilizer application, and hazardous waste sites (e.g., former manufactured-gas factory sites and wood-preserving facilities). A person may be exposed to PAHs through the inhalation of air containing the compounds (they are usually stuck to particles or dust). Exposure may also occur by drinking

water and swallowing food, soil, or dust particles containing PAHs. These compounds may also enter a person's body through the skin if present in high amounts in soil or man-made products, e.g., crankcase oil [ATSDR 1995]. Because the PAHs measured in the soils from the former Proctor Road Landfill are at low levels, inhalation and ingestion are the only exposure routes addressed in this health consultation.

On-Site Surface Soils

Arsenic

Former Golfers - The highest concentration of arsenic observed in on-site soils at the former Proctor Road Landfill was 49 mg/kg (Table 3). Adults who played golf at Foxfire Golf Club during the 31 years that the facility was open could have potentially been exposed to this contamination through incidental ingestion of soil and inhalation of dust from soil/sediments. Incidental ingestion may occur if a person does not wash his or her hands before meals, smokes, or has other activities resulting in his or her hands being near the mouth.

The maximum estimated incidental ingestion dose for former golfers is 0.00001 milligrams/ kilograms/day (mg/kg/day), which is 30 times lower than the ATSDR chronic oral MRL of 0.0003 mg/kg/day (Table 5). The chronic oral MRL is based on studies of the incidence of Blackfoot Disease and dermal lesions in humans after exposure to inorganic arsenic. Blackfoot Disease is a serious type of peripheral vascular disease that leads to gangrene in the extremities. The MRL is derived from a No Observed Adverse Effect Level (NOAEL) of 0.0008 mg/kg/day. The maximum estimated dose is 120 times less than the Lowest Observed Adverse Effect Level (LOAEL), 0.0012 mg/kg/day, shown to result in an increased risk of premalignant skin lesions [ATSDR 2007]. Thus, the highest level of arsenic detected in the 2005 and 2007 sampling does not appear to increase the risk of non-cancer health effects in former golfers.

Studies have linked ingestion of arsenic to skin, lung, bladder, and liver cancer. The estimated maximum dose for former golfers, however, is 110 times less than the lowest chronic dose in a human study that caused cancer, 0.0011 mg/kg/day [ATSDR 2007]. To evaluate a theoretical cancer risk from incidental ingestion of arsenic, the U.S. EPA developed a cancer slope factor (1.5 mg/kg/day) based on a human study in which subjects developed skin cancer [EPA 2007b]. The calculated theoretical increased cancer risk for arsenic exposure in former golfers is six additional cancer cases in a population of one million persons. This is considered a "no apparent increased risk."

As shown in Table 5, the highest estimated exposure for golfers inhaling arsenic-contaminated dust is 0.000003 milligrams per cubic meter (mg/m^3). No inhalation MRLs are available for inorganic arsenic because of the lack of suitable studies on which to base the MRLs. The estimated concentration for former golfers is, however, 26,000 times less than the lowest concentration exhibiting observable human health effects (0.078 mg/m^3). Notably this LOAEL is based on a study conducted on workers at a factory where sodium arsenite is prepared [ATSDR 2007]. The exposure conditions for a worker are very different from that of a person who is occasionally exposed to arsenic contamination during recreation. The worker is likely at greater risk for health effects from continuous exposure to arsenic. For former golfers, inhalation of dust

containing the highest measured concentration of arsenic, 49 mg/kg, is not expected to cause non-cancer illness.

To evaluate a theoretical cancer risk from inhalation of arsenic, the U.S. EPA developed an inhalation unit risk of 0.0043 ug/m^3, from a human study in which the human subjects developed lung cancer [EPA 2007b]. Upon multiplying this unit risk by the maximum inhalation concentration adjusted for a 70-year period, the estimated maximum theoretical excess cancer risk is less than one additional cancer case per one million people. Thus, the former golfers have a minimal increased risk for cancer from inorganic arsenic exposure at the former Proctor Road Landfill.

Former and Current Trespassers - Adults and children trespassing on the site may be exposed to arsenic. Children in particular are likely to access the ditch separating Ashley residences from the former golf course, which is the area where the highest arsenic concentration was found (Table 3). Florida DOH assumed adult trespassers were exposed for an intermediate duration based on the limited number of trespassing events possible in the period of approximately one year that FGC has been closed (Table 6). However, we assumed children had chronic exposure to arsenic because of the long-term accessibility of the ditch area.

The estimated maximum dose for adult trespassers ingesting arsenic-contaminated soil is 0.00001 mg/kg/day (Table 6). Because of inadequate study data, an intermediate-duration oral MRL for inorganic arsenic is not available for comparison. The calculated dose is 5,000 times less than the lowest dose (0.05 mg/kg/day) found to cause health effects in humans, specifically serious dermal effects of hyperpigmentation with keratosis that is possibly pre-cancerous [ATSDR 2007]. As a result, incidental ingestion of arsenic is not expected to increase the risk of non-cancer health effects for adult trespassers.

For children, the estimated maximum arsenic dose is 0.0004 mg/kg/day (Table 6). This dose is slightly higher than the chronic oral MRL of 0.0003 mg/kg/day. Further evaluation using ATSDR's toxicological profiles for arsenic reveals that the calculated maximum dose is 3 times less than the lowest dose, 0.0012 mg/kg/day, shown to result in an increased incidence of skin lesions in humans [ATSDR 2007]. Additionally, the estimated maximum dose is 4 times less than the lowest exposure level, 0.0017 mg/kg/day, that resulted in decreased performance in neurobehavioral tests of children who ingested arsenic in drinking water for an extended period. Florida DOH used a high event frequency for children trespassing into the ditch and considered 100% of the soil ingested to be contaminated. As a result, the maximum dose calculated for children likely results in a higher estimated dose than the true exposure. In conclusion, the highest level of arsenic detected in the 2005 and 2007 sampling does not appear to increase the risk of non-cancer health effects in children who incidentally ingest the soil while trespassing on the former Proctor Road Landfill.

An intermediate inhalation concentration was calculated for adult trespassers and a chronic inhalation concentration for child trespassers who may have been exposed to arsenic-contaminated dust. Both had an estimated concentration of 0.000003 mg/m^3 (Table 6). As mentioned previously, no inhalation MRLs have been developed for arsenic to which this concentration can be compared. Further assessment of the ATSDR toxicological profiles reveals

that the estimated intermediate exposure concentration is more than 80,000 times less than the lowest concentration of 0.245 mg/m^3 that caused health effects in mice. The study showed that mice exposed to this inhalation concentration for an intermediate duration experienced a decrease in bactericidal activity and an increase in susceptibility to bacterial pathogens in the lungs. Because the calculated dose for adult trespassers is significantly lower than the study data and adult trespassers have such limited exposure periods, non-cancerous effects are not expected with this type of arsenic exposure. In addition, given the studies available, primarily for workers, the chronic exposure to child trespassers is estimated to be far lower than those exposures causing health effects.

Polycyclic Aromatic Hydrocarbons (PAHs)

Former Golfers - The highest level of PAHs observed in on-site soils within the vicinity of the former Proctor Road Landfill was 2 mg/kg (Table 3). The calculated incidental ingestion dose for former golfers is 0.0000004 mg/kg/day, expressed in terms of toxic equivalents of benzo(a)pyrene (Table 5). No chronic MRLs have been derived for PAHs because adequate human or animal dose-response data are not available that provide threshold levels for appropriate non-cancer health effects [ATSDR 1995]. As a result, studies provided in ATSDR toxicological profiles for PAHs were used to evaluate health effects. The calculated dose for golfers is millions of times lower than the lowest dose, 120 mg/kg/day of benzo(a)pyrene, that caused aplastic anemia and eventually death in mice after intermediate exposure [ATSDR 1995]. Consequently, the highest level of PAHs is not expected to increase the risk of non-cancer health effects for former golfers.

Certain PAHs cause cancer in humans and animals. The evidence in humans comes mostly from studies of workers in oil refining, roofing, coal gasification, or coke production. Route of exposure influences the incidence of cancer in animal studies; stomach cancer follows ingestion, lung cancer follows inhalation, and skin cancer follows dermal contact [ATSDR 1995]. To evaluate a theoretical cancer risk from incidental ingestion, the U.S. EPA determined a cancer slope factor of 7.3 mg/kg/day based on a study of squamous cell papillomas and carcinomas in mice [EPA 2007c]. The calculated theoretical increased cancer risk for incidental ingestion of PAH-contaminated soils by former golfers is one additional cancer case in a population of one million persons. Given the relatively low level of the estimated dose of PAHs in comparison to studies that associated PAHs with cancer, and given the intermittent exposure periods for golfers, it is unlikely that the estimated exposure would result in an increased cancer rate.

As shown in Table 5, the highest estimated exposure for golfers inhaling PAH-contaminated dust is 0.0000001 mg/m^3. No inhalation MRLs have been determined for PAHs because adequate dose-response data identifying threshold levels for non-cancer health effects are not available in humans or animals for any exposure duration. The estimated exposure concentration is 1,000 times less than the lowest concentration exhibiting observable human health effects (0.0001 mg/m^3). This LOAEL is based on a study conducted on workers at a rubber factory. Reduced lung function, abnormal chest x-rays, cough, bloody vomit, and throat and chest irritation were observed at this inhalation concentration [ATSDR 1995]. However, the exposure conditions for a worker are very different than those of someone who is occasionally at a site for recreation. The worker is likely more at risk from exposure to the contaminant and its subsequent health effects.

In conclusion, for former golfers inhalation of dust containing the highest estimated concentration of PAHs is not expected to cause non-cancer illness.

No inhalation unit risk is available to determine the theoretical increased cancer risk for former golfers who inhaled PAH-contaminated dust [EPA 2007c]. A theoretical increased cancer risk was estimated by first converting the adjusted inhalation concentration from micrograms per cubic meter (ug/m^3) to parts per million (ppm). This value is then compared to the cancer levels in the "Estimated Upper-Bound Human Cancer Risk Levels" chart provided in the ATSDR toxicological profile for PAHs [ATSDR 1995]. The maximum theoretical cancer risk was estimated as less than one additional cancer case in a million persons exposed over a lifetime. Florida DOH considers this a minimal increased cancer risk for former golfers.

The ATSDR toxicological profiles indicate that a dose-dependent increase in malignant lung tumors occurred in mice exposed to 0.05 or 0.09 mg/m^3 benzo(a)pyrene. Additionally, hamsters were found to have a Cancer Effect Level (CEL) of 9.5 mg/m^3. A CEL is the lowest exposure level associated with the onset of carcinogenesis in experimental or epidemiologic studies. Respiratory tract tumors and neoplasms of the upper digestive tract were observed at this level [ATSDR 1995]. Thus, the estimated inhalation concentration for golfers, 0.0000001 mg/m^3, is millions of times less than the CEL and will likely not result in an increased cancer rate.

Former and Current Trespassers - Adults and children who trespass onto the site may be exposed to PAHs. Children in particular are likely to access the ditch separating Ashley residences from FGC. However, Florida DEP and U.S. EPA detected the highest concentration of PAHs near the maintenance area where pesticides and other chemicals were mixed (Table 3). During the site visit, Florida DOH observed paint spilled on some of the structures in this area indicating possible trespassers. To calculate a maximum dose for adult trespassers, we assumed they would have an intermediate exposure to the contaminants because of the limited number of trespassing events possible in the period of approximately one year since closure of FGC. However, we assumed a chronic exposure for children because of the potential of a longer frequency for exposure with the easily accessible ditch area.

The estimated maximum dose for adult trespassers ingesting PAH-contaminated soil is 0.0000004 mg/kg/day expressed in terms of toxic equivalents of benzo(a)pyrene (Table 6). Because of inadequate study data, an intermediate-duration oral MRL for benzo(a)pyrene toxic equivalents has not been derived. The lowest observed dose in an animal study that resulted in adverse health effects after intermediate exposure was 120 mg/kg/day. Mice developed aplastic anemia and eventually died at this dose [ATSDR 1995]. The calculated dose for an adult trespasser is millions of times less. Additionally, trespassers would be exposed to PAHs only intermittently instead of having continuous exposure as used in scientific studies. Thus, incidental ingestion of PAHs in this scenario is not expected to result in non-cancer health effects.

For children trespassing on the site, the estimated maximum dose is 0.00002 mg /kg/day (Table 6). Because a chronic MRL is not available for comparison, this dose was simply compared to studies in the ATSDR toxicological profiles. The calculated dose for child trespassers is millions of times lower than the lowest dose, 120 mg/kg/day, in an animal study that caused adverse

health effects. Additionally, the exposure scenario for calculating a maximum dose in children likely results in a higher estimated dose than the true exposure. Thus, we would expect that child trespassers exposed to the maximum concentration of PAHs would not experience adverse non-cancer health effects.

Florida DOH calculated an intermediate inhalation concentration for adult trespassers and a chronic inhalation concentration for child trespassers exposed to PAH-contaminated dust. Both had an estimated concentration of 0.0000001 mg/m^3 (Table 6). No inhalation MRLs have been determined for PAHs because adequate dose-response data identifying threshold levels for non-cancer health effects are not available in humans or animals for any exposure duration. In addition, no LOAELs have been determined for intermediate exposures. These levels, however, have been determined for chronic exposures as discussed for former golfers.

The estimated chronic exposure concentration for child trespassers is 1,000 times less than the lowest concentration exhibiting observable human health effects (0.0001 mg/m^3). This LOAEL was determined in an occupational study in which reduced lung function, abnormal chest x-rays, cough, bloody vomit, and throat and chest irritation were observed with workers [ATSDR 1995]. Because workers are likely at a greater risk for exposure and subsequent health effects, comparison of the child inhalation concentration to this LOAEL may be conservative. In conclusion, Florida DOH does not expect the development of non-cancer health effects in adult or child trespassers inhaling PAH-contaminated dust.

Off-Site Surface Soils

Arsenic

Nearby Residents - The highest concentration of arsenic found in off-site surface soils was 1.4 mg/kg (Table 4). From this concentration, we determined maximum doses and inhalation concentrations for the adults and children in the Ashley neighborhood (Table 7). The estimated maximum dose for the incidental ingestion of arsenic-contaminated soil by adults is 0.000002 mg/kg/day. For children, the maximum dose is 0.00002 mg/kg/day. These doses are 150 times and 15 times less for adults and children, respectively, than the chronic oral MRL of 0.0003 mg/kg/day. Additionally, the doses are greatly less than the lowest dose, 0.0012 mg/kg/day, found to cause an increased risk of premalignant skin lesions in humans. The adult's estimated dose is 600 times less than this LOAEL; whereas, the child's dose is 60 times less. Therefore, the arsenic measured in the off-site surface soils was not at a level that would cause non-cancer health effects in adult or child residents through incidental ingestion.

The theoretical increased cancer risk from ingesting arsenic-contaminated soils was estimated for adult residents in the Ashley neighborhood. The cancer risk is less than one additional cancer case in a million persons exposed over a lifetime. Florida DOH considers this a minimal increased risk.

The estimated inhalation dust concentration for both adults and children in the Ashley Subdivision is 0.00000008 mg/m^3 (Table 7). No chronic inhalation MRLs are available for comparison with this concentration; thus, it was compared to studies available in the ATSDR

toxicological profiles. This concentration is 975,000 times less than the lowest concentration, 0.078 mg/m^3, found to cause mild pigmentation keratosis of the skin in workers at a plant preparing sodium arsenite [ATSDR 2007]. Therefore, the arsenic measured in the off-site surface soils was not at a level that would cause non-cancer health effects in either adults or children as a result of breathing arsenic-contaminated dust.

The theoretical increased cancer risk from inhalation of arsenic-contaminated dust was estimated for adult residents. Less than one additional cancer case is expected in a million persons exposed over a lifetime. Florida DOH considers this a minimal increased cancer risk for the adult residents.

Polycyclic Aromatic Hydrocarbons (PAHs)

No PAHs were detected in off-site surface soil.

Child Health Considerations

The ATSDR and Florida DOH recognize that the unique vulnerabilities of infants and children demand special attention when faced with contamination in their environment. Children are at a greater risk than are adults to certain kinds of exposure to hazardous substances. Because they play outdoors and because they often carry food into contaminated areas, children are more likely to be exposed to contaminants in the environment. Children are shorter than adults, which mean they breathe dust, soil, and heavy vapors closer to the ground. They are also smaller, resulting in higher doses of chemical exposure per body weight. If toxic exposures occur during critical growth stages, the developing body systems of children can sustain permanent damage. Probably most important, however, is that children depend on adults for risk identification and risk management, housing, and access to medical care. Thus, adults should be aware of public health risks in their community, so they can guide their children accordingly.

Children in the Ashley neighborhood have access to the ditch bordering the former Proctor Road Landfill. Because of stormwater runoff from the landfill, chemical concentrations within the soil in this area may fluctuate. In 2007, Florida DEP and U.S. EPA found the highest level of arsenic in the soil collected from the ditch. Florida DOH determined that this level was unlikely to cause non-cancer health effects in children. However, as a best public health practice, Florida DOH recommends keeping children out of the ditch on the former Proctor Road Landfill to minimize exposure to arsenic-contaminated soil.

Other susceptible populations may have different or enhanced responses to toxic chemicals than will most persons exposed to the same levels of that chemical in the environment. Reasons may include genetic makeup, age, health, nutritional status, and exposure to other toxic substances (like cigarette smoke or alcohol). These factors may limit that person's ability to detoxify or excrete harmful chemicals or may increase the effects of damage to their organs or systems. Thus, if there is a concern about greater sensitivity or susceptibility to chemical effects, a person should avoid areas around the former Proctor Landfill where chemicals of concern have been quantified.

Conclusions

Florida DOH categorizes the surface soil at the former Proctor Road Landfill and in the nearby Ashley neighborhood as "No Apparent Public Health Hazard". Florida DOH bases health hazard categories on the concentrations measured by Florida DEP and U.S. EPA in 2005 and 2007 and the exposure to the contaminants (i.e., arsenic and PAHs). Specific conclusions follow:

1. Residents in the Ashley Subdivision informed Florida DEP that children have been known to play in the ditch bordering their homes and the former Proctor Road Landfill. The highest level of arsenic was measured in the on-site surface soil within this ditch.

   Florida DOH categorizes the on-site surface soil as "No Apparent Public Health Hazard". Florida DOH determined that incidental ingestion of arsenic-contaminated soil and inhalation of arsenic-contaminated dust was unlikely to cause non-cancer health effects in children. In addition, incidental ingestion and inhalation of dust contaminated with the highest measured level of arsenic was found to be unlikely to cause non-cancer health effects in adult golfers or trespassers. The theoretical statistical increased cancer risk to arsenic for adults ranged from a minimal increased risk (i.e. less than one additional cancer case is expected in a million persons exposed over a lifetime) to no apparent increased risk (i.e. an estimated six additional cancer cases in a population of one million persons).

2. Stormwater runs off the site into neighboring backyards of Ashley Subdivision. The residents have particular concerns that contaminated soils are moving into the ditch and onto their backyards.

   Florida DOH categorizes off-site surface soil as "No Apparent Public Health Hazard". No PAHs were detected in residential soils. In addition, Florida DOH determined that the level of arsenic measured was unlikely to cause non-cancer health effects in children or adults. For both children and adults, daily and long-term exposure to the highest measured level of arsenic through incidental ingestion or inhalation of dust was assumed. For adults, the theoretical statistical increased cancer risk to arsenic was a minimal increased risk (i.e. less than one additional cancer case is expected in a million persons exposed over a lifetime).

3. The highest level of PAHs was measured in the maintenance area of the former golf course. Florida DOH determined that this level was unlikely to cause non-cancer health effects in children or adults for incidental ingestion or inhalation of dust after chronic or intermediate exposure. For adults, the theoretical statistical increased cancer risk to PAHs was a minimal increased risk (i.e. one to less than one additional cancer case in a population of one million persons exposed over a lifetime).

   This assessment was based on a small number of samples for a limited land use. Concentrations of chemicals in soils can vary throughout the former Proctor Road Landfill/Foxfire Golf Club site because of the heterogeneous distribution of wastes in a landfill and various maintenance practices used around the grounds at a golf course. Thus, soils at the site need to be further characterized if a change in land use is planned, especially if the site is considered for future residential development.

4. Testing has been inadequate to assess public health risks to residents in the Foxfire Subdivision.

Recommendations

1. As a best public health practice, keep children out of the ditch on the former Proctor Road Landfill to minimize exposure to arsenic-contaminated soil. In addition, site access should be restricted.

2. As a best public health practice to reduce exposure to contaminated soil, institute engineering controls that prevent runoff from the former landfill/golf course into the backyards of the Ashley Subdivision.

3. If, in the future, land use on the former Proctor Road Landfill/Foxfire Golf Club site changes, conduct further assessment of on-site contaminant levels. In addition, the data should be reviewed to determine the public health threat.

4. Collect additional soil data in the Foxfire subdivision.

Public Health Action Plan

1. Florida DOH will inform the community of the findings of this health consultation report and post the report on-line at www.myfloridaeh.com/community/superfund/pha.html.

2. If future land use on the former Proctor Landfill site changes, on-site contaminant levels should be further reviewed to determine the public health threat.

3. Florida DOH will review additional soil and other environmental data from this site as warranted.

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Appendix A – Figures and Tables

Figure 1. Location of Site in Sarasota County, Florida

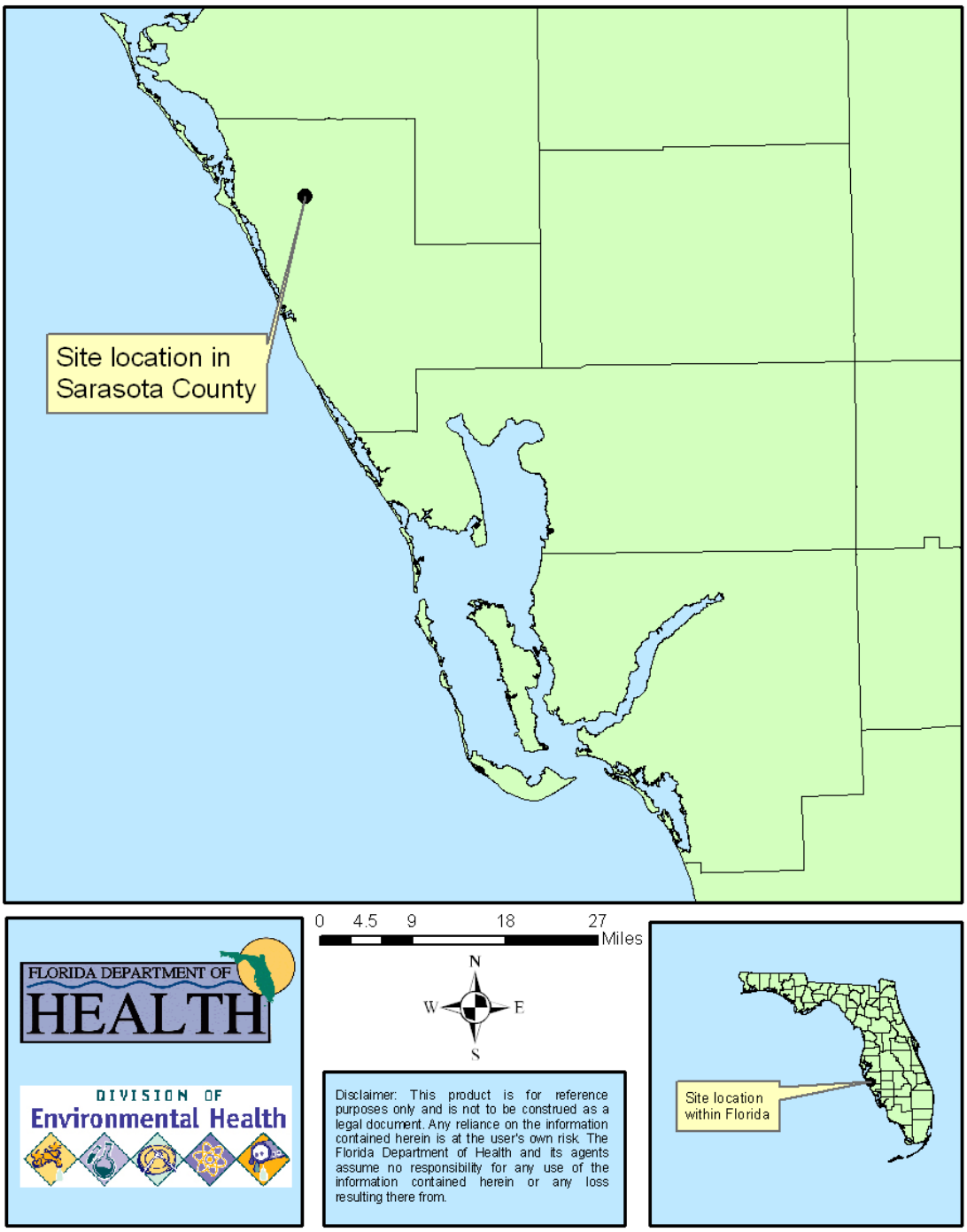


Figure 2. Locations of Former Proctor Road Landfill, Foxfire Golf Club, and Nearby Neighborhoods

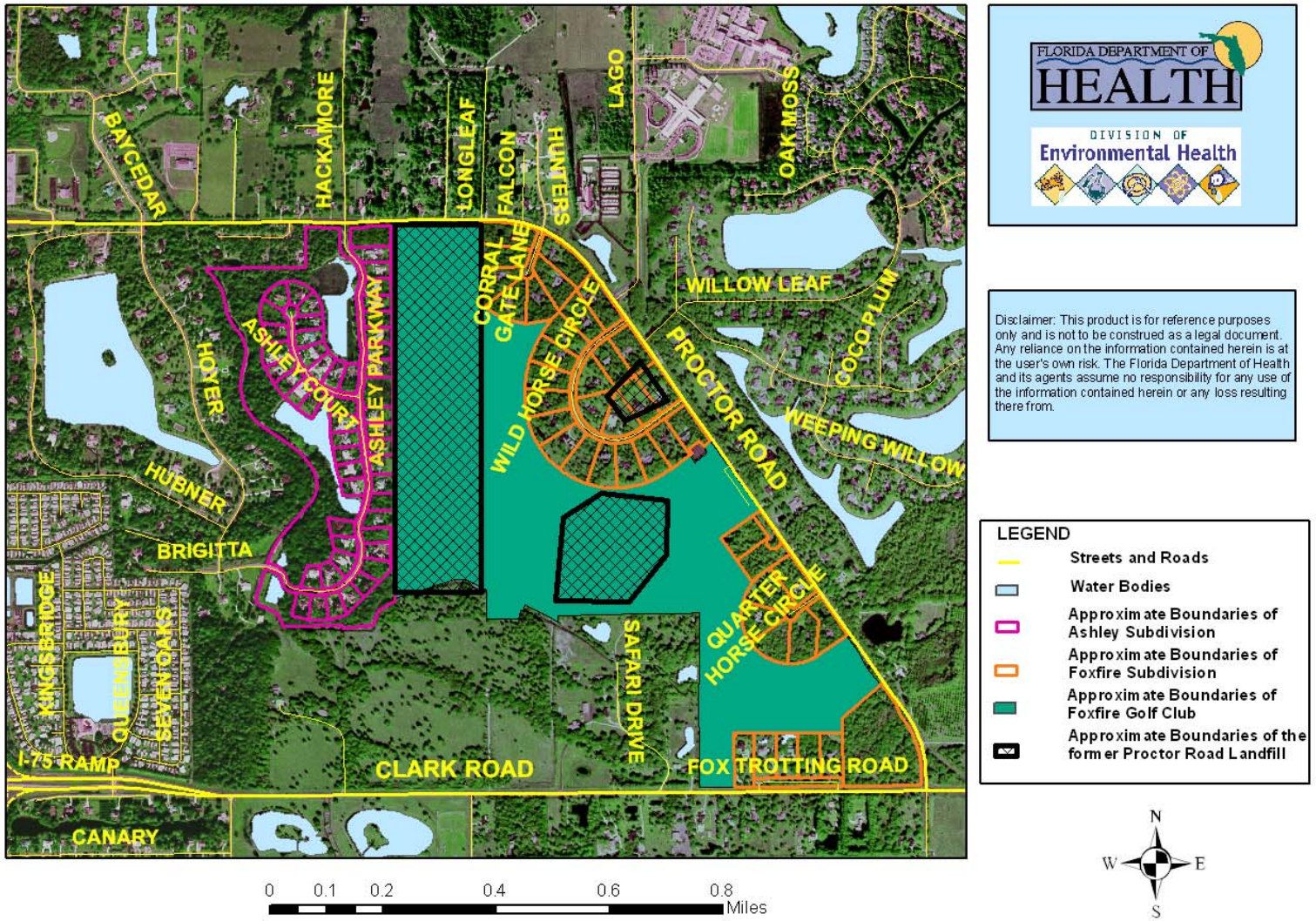
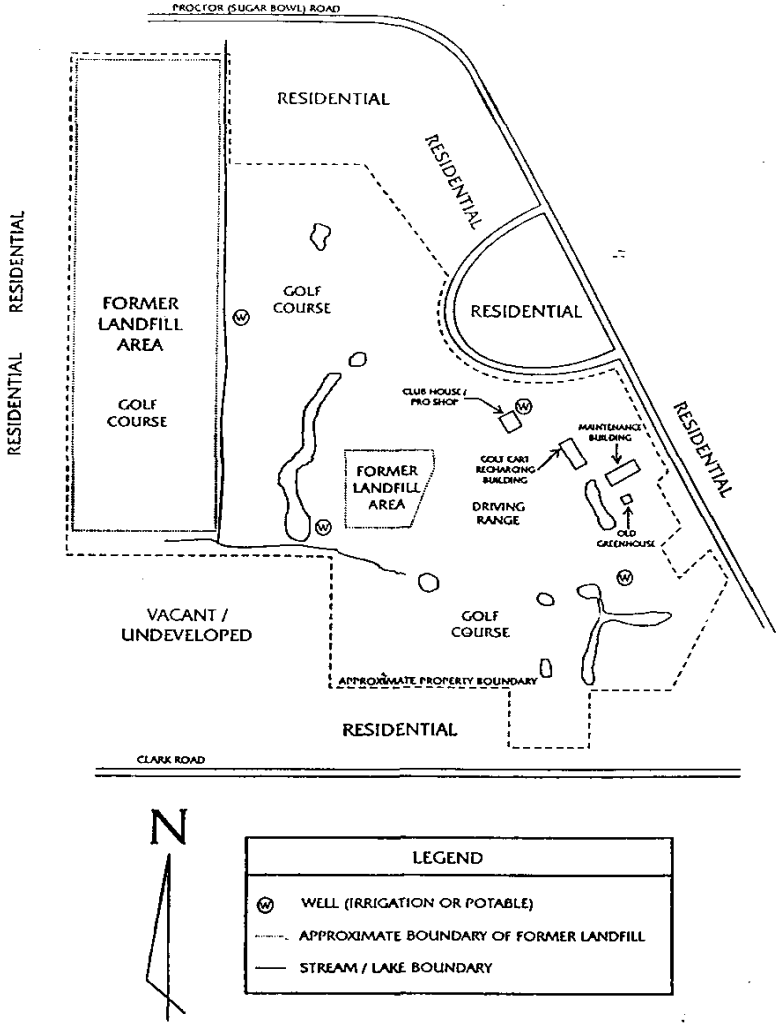
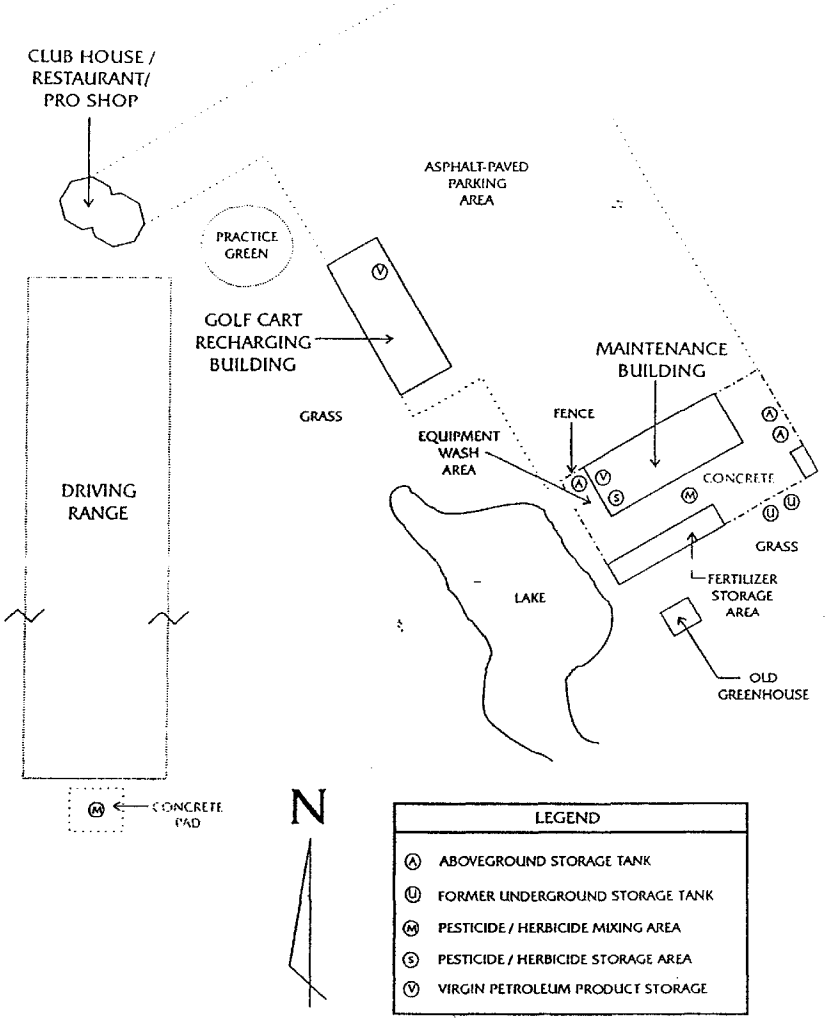


Figure 3. Boundaries and Structures at Foxfire Golf Club [Source: EAC 1996a]



A. Overview of Foxfire Golf Club (not to scale)



B. Detailed View of Maintenance Area, Club House, and Driving Range (not to scale)

Figure 4. 2005 Sample Locations [Source: DEP 2006]
Expanded Pre-CERCLIS Screening Assessment for Sugarbowl Landfill

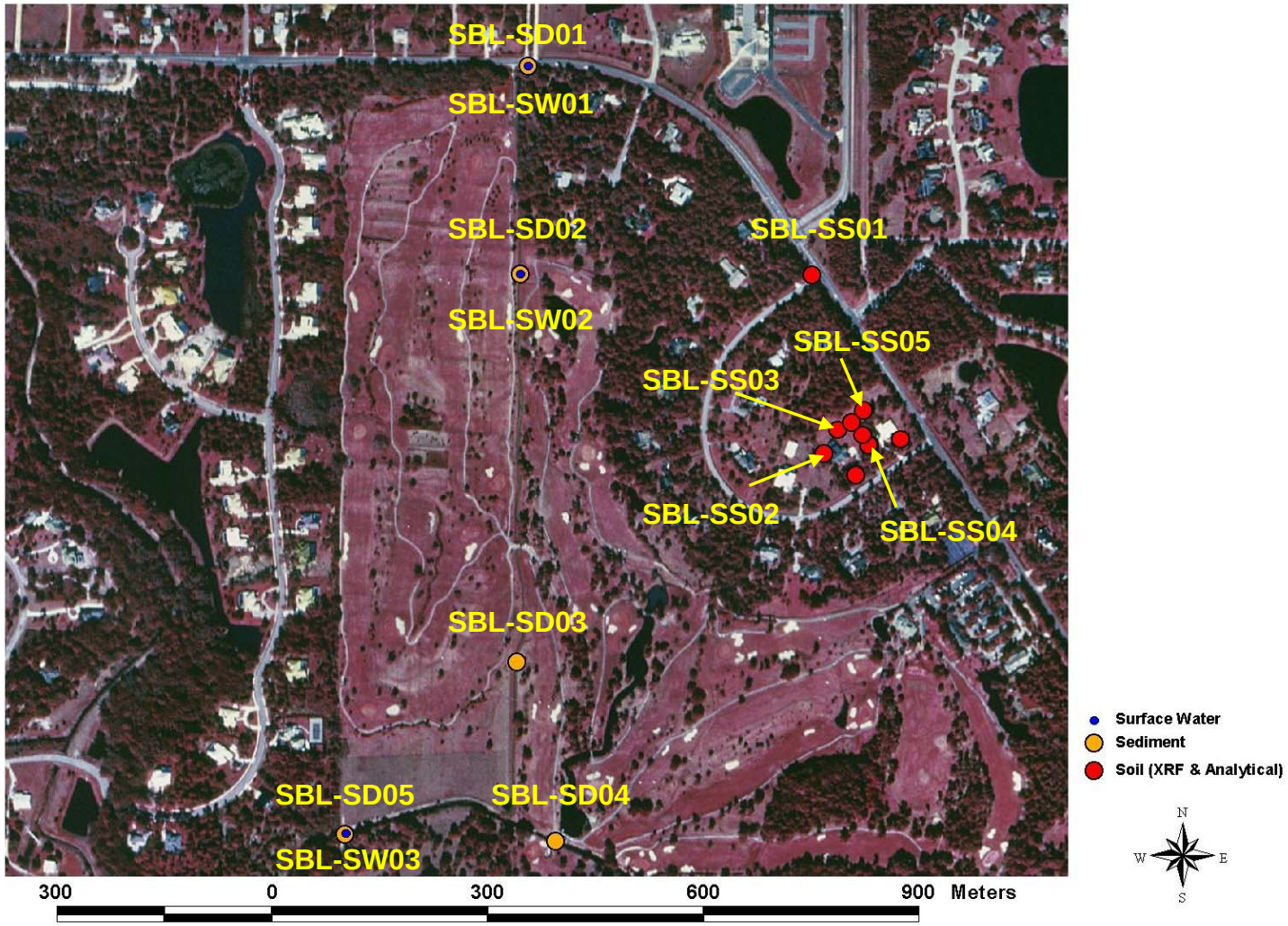


Figure 5. 2007 Soil/Sediment Sample Locations [Source: DEP 2007] Site Inspection for Proctor Road Landfill

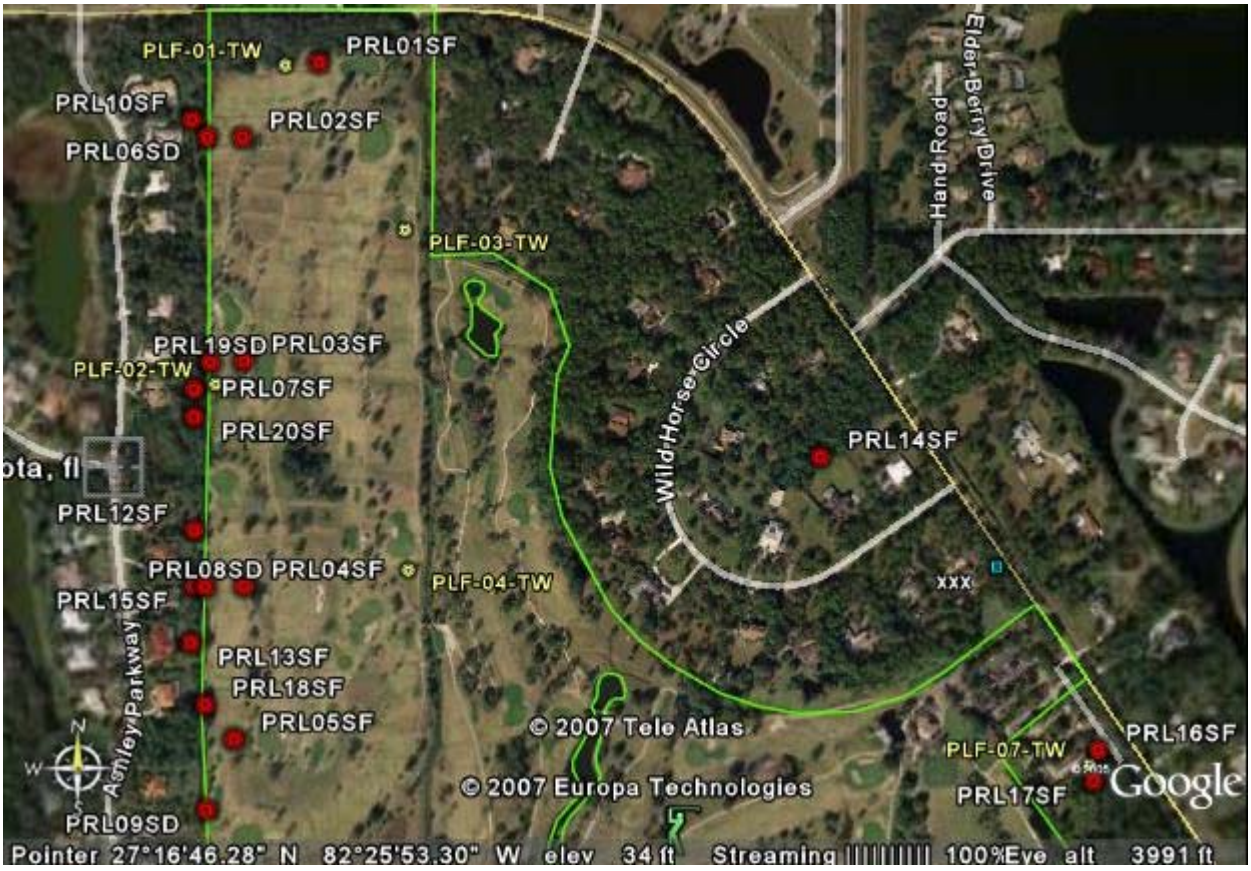


Figure 6. Ditch and Easement between Foxfire Golf Club and Ashley Residences

Figure 7. View of Grounds at Foxfire Golf Club Showing Swale, Bordering Trees, and Nearby Ashley Neighborhood

Table 1. Soil/Sediment Samples from the Former Proctor Road Landfill and Nearby Ashley Subdivision [DEP 2006; DEP 2007]

Sample Number	Sample Date	Sample Depth	Sample Location
SBL-SD01	June 2005	0-6 inches	Off-site: Collected upstream of on-site ditches near Proctor Road ditch outfall into north-south drainage ditch
SBL-SD02	June 2005	0-6 inches	On-site: Drainage ditch adjacent to former 70 acre landfill
SBL-SD03	June 2005	0-6 inches	On-site: Drainage ditch adjacent to former 70 acre landfill
SBL-SD04	June 2005	0-6 inches	On-site: Drainage ditch adjacent to southern end of former 20-acre landfill
SBL-SD05	June 2005	0-6 inches	On-site: Drainage ditch adjacent to southern end of former 70 - acre landfill
PRL-01SF	March 2007	0-3 inches	Off-site: North of former 70-acre landfill
PRL-02SF	March 2007	0-3 inches	On-site: Landfill swale 1
PRL-03SF	March 2007	0-3 inches	On-site: Landfill swale 2
PRL-04SF	March 2007	0-3 inches	On-site: Landfill swale 3
PRL-05SF	March 2007	0-3 inches	On-site: Landfill swale 4
PRL-06SD	March 2007	0-3 inches	On-site: Swale 1 discharge point in ditch
PRL-07SF	March 2007	0-3 inches	Off-site: Backyard of residence at 5077 Ashley Parkway
PRL-08SD	March 2007	0-3 inches	On-site: Swale 3 discharge point in ditch
PRL-08SD Duplicate	March 2007	0-3 inches	On-site: Swale 4 discharge point in ditch

Table 1. Soil/Sediment Samples from the Former Proctor Road Landfill and Nearby Ashley Subdivision (continued) [DEP 2006; DEP 2007]

Sample Number	Sample Date	Sample Depth	Sample Location
PRL-09SD	March 2007	0-3 inches	On-site: Southernmost sample from ditch
PRL-10SF	March 2007	0-3 inches	On-site: Ditch overflow abutting 4931 Ashley Parkway and 4937 Ashley Parkway
PRL-12SF	March 2007	0-3 inches	Off-site: Backyard of residence at 5231 Ashley Parkway
PRL-13SF	March 2007	0-3 inches	Off-site: Backyard of residence at 5293 Ashley Parkway
PRL-15SF	March 2007	0-3 inches	Off-site: Backyard of residence at 5271 Ashley Parkway
PRL-16SF	March 2007	0-3 inches	On-site: East of maintenance building at Foxfire Golf Club
PRL-17SF	March 2007	0-3 inches	On-site: South of maintenance building and near the old greenhouse at Foxfire Golf Club
PRL-17SF Duplicate	March 2007	0-3 inches	On-site: South of maintenance building and near the old greenhouse at Foxfire Golf Club
PRL-18SF	March 2007	0-3 inches	Off-site: Backyard of residence at 5325 Ashley Parkway
PRL-19SD	March 2007	0-3 inches	On-site: Swale 2 discharge point in ditch
PRL-20SF	March 2007	0-3 inches	Off-site: Backyard of residence at 5099 Ashley Parkway

Table 2. Completed Exposure Pathways

A. Exposure to On-Site Soils

Pathway Name	Exposure Pathway Elements					Time
	Source	Environmental/ Exposure Media	Point of Exposure	Route of Exposure	Exposed Population and Land Use	
Contaminated on-site surface soil, dust	Former landfill; previous golf course management practices	Soil	On-site	Incidental ingestion and inhalation	Former golfers and former and current trespassers	Past Current Future

B. Exposure to Off-Site Soils

Pathway Name	Exposure Pathway Elements					Time
	Source	Environmental/ Exposure Media	Point of Exposure	Route of Exposure	Exposed Population and Land Use	
Contaminated off-site surface soil, dust	Former landfill; previous golf course management practices	Soil	Backyards of Ashley subdivision homes adjoining former golf course	Incidental ingestion and inhalation	Nearby residents	Past Current Future

Table 3. Maximum Concentrations in On-Site* Surface Soil (0 to 6 inches below ground surface)

Contaminants of Concern	ATSDR Screening Value (mg/kg) Child/Adult	Highest Soil Concentration (mg/kg)	Location of Highest Concentration	Number of Soil Samples Above ATSDR Screening Value
Arsenic	20/200 EMEG	49	PRL-08SD	4/17
PAHs TEQ	0.1 CREG	2	PRL-16SF	4/13

* On-site = former landfill/golf course (including golf course maintenance area), receiving ditches, and ditch overflow adjacent to residences

EMEG— Environmental Media Evaluation Guide, for long-term daily exposures lasting longer than a year
CREG— Cancer Risk Evaluation Guide, for 1 excess cancer case in 1 million people
TEQ— toxic equivalent as compared to 2,3,7,8-tetrachlorodibenzo-p-dioxin and benzo(a)pyrene
mg/kg— milligrams per kilogram
PAHs— polycyclic aromatic hydrocarbons
Source: [DEP 2006; DEP 2007]

Table 4. Maximum Concentrations in Off-Site* Surface Soil (0 to 6 inches below ground surface)

Contaminants of Concern	ATSDR Screening Value (mg/kg) Child/Adult	Highest Soil Concentration (mg/kg)	Location of Highest Concentration	Number of Soil Samples Above ATSDR Screening Value
Arsenic	20/200 EMEG	1.4	SBL-SD01	0/8
PAHs TEQ	0.1 CREG	BDL	—	0/7

* Off-site = residential properties and background

EMEG— Environmental Media Evaluation Guide, for long-term daily exposures lasting longer than a year
CREG— Cancer Risk Evaluation Guide, for 1 excess cancer case in 1 million people
TEQ— toxic equivalent as compared to benzo(a)pyrene
mg/kg— milligrams per kilogram
BDL— below detection limit
PAHs— polycyclic aromatic hydrocarbons
Source: [DEP 2006; DEP 2007]

Table 5. Estimated Maximum Dose from Exposure to On-Site* Surface Soil (0-6 inches below ground surface) for Former Golfers

Contaminant of Concern (maximum concentration) (mg/kg)	Chronic Oral MRL (mg/kg/day)	Estimated Maximum Soil Ingestion Dose (mg/kg/day)	Chronic Inhalation MRL (mg/m^3)	Estimated Maximum Dust Inhalation (mg/m^3)
		Adult		Adult
Arsenic (49)	0.0003	0.00001	None	0.000003
PAHs TEQ (2)	None	0.0000004	None	0.0000001

* On-site = former landfill/golf course (including golf course maintenance area), receiving ditches, and ditch overflow adjacent to residences

MRL = Minimal Risk Level. An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure
Chronic = Chronic exposure length of more than 365 days
Intermediate = Intermediate exposure length of 15 to 365 days
mg/kg = milligrams per kilogram
mg/m^3 = milligrams of chemical per cubic meter air
mg/kg/day = milligrams of chemical per kilogram of body weight per day
PAHs = polycyclic aromatic hydrocarbons
TEQ = toxic equivalent as compared to benzo(a)pyrene

Table 6. Estimated Maximum Dose from Exposure to On-Site* Surface Soil (0-6 inches below ground surface) for Current Adult Trespassers and Former and Current Child Trespassers

Contaminant of Concern (maximum concentration) (mg/kg)	Intermediate/ Chronic Oral MRL (mg/kg/day)	Estimated Maximum Soil Ingestion Dose (mg/kg/day)		Intermediate/ Chronic Inhalation MRL (mg/m^3)	Estimated Maximum Dust Inhalation (mg/m^3)
		Child	Adult		Child and Adult
Arsenic (49)	None/0.0003	0.0004	0.00001	None/None	0.000003
PAHs TEQ (2)	None/None	0.00002	0.0000004	None/None	0.0000001

* On-site = former landfill/golf course (including golf course maintenance area), receiving ditches, and ditch overflow adjacent to residences

MRL = Minimal Risk Level. An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure
Chronic = Chronic exposure length of more than 365 days
Intermediate = Intermediate exposure length of 15 to 365 days
mg/kg = milligrams per kilogram
mg/m^3 = milligrams of chemical per cubic meter air
mg/kg/day = milligrams of chemical per kilogram of body weight per day
PAHs = polycyclic aromatic hydrocarbons
TEQ = toxic equivalent as compared to benzo(a)pyrene
BDL = below detection limit

Table 7. Estimated Maximum Dose from Exposure to Off-Site* Surface Soil (0-6 inches below ground surface) for Nearby Residents

Contaminant of Concern (maximum concentration) (mg/kg)	Chronic Oral MRL (mg/kg/day)	Estimated Maximum Soil Ingestion Dose (mg/kg/day)		Chronic Inhalation MRL (mg/m^3)	Estimated Maximum Dust Inhalation (mg/m^3)
		Child	Adult		Child and Adult
Arsenic (1.4)	0.0003	0.00002	0.000002	None	0.00000008
PAHs TEQ (BDL)	None	—	—	None	—

*Off-site = residential properties and background

MRL = Minimal Risk Level. An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure
Chronic = Chronic exposure length of more than 365 days
Intermediate = Intermediate exposure length of 15 to 365 days
mg/kg = milligrams per kilogram
mg/m^3 = milligrams of chemical per cubic meter air
mg/kg/day = milligrams of chemical per kilogram of body weight per day
PAHs = polycyclic aromatic hydrocarbons
TEQ = toxic equivalent as compared to benzo(a)pyrene
BDL = below detection limit

Model Parameters and Assumptions for Tables 5 - 7

Exposure Medium: **Soil**
Exposure Point: **On-site surface soil and dust**
Scenario Time frame: Past
Land Use Conditions: Former landfill/golf course

Receptor Population: **Former adult golfers**

These doses and inhalation concentrations were calculated using Risk Assistant software by Hampshire Research Institute, Version 1.1. The part of this software Florida DOH uses allows us to set custom exposures that we can use for every site with accepted values for soil consumption, dust inhalation exposure and dermal exposure parameters (EPA, 1991). Doses and inhalation concentrations were calculated using the following values:

Adult body weight-	70 kilograms
Adult soil consumption-	100 milligrams/exposure event
Adult inhalation rate -	2.1 cubic meters/hour*
Soil fraction contaminated-	100%
Lifetime-	70 years
Exposure period-	31 years (FGC open 1975-2006)
Event frequency-	50 events/year
Event duration-	2 hours/event

* The air concentration is given in milligrams per cubic meter because the values for inhalation studies in most of the Toxicological Profiles are given in these units. The air concentration is not a dose. This rate is for moderate activity in the average adult.

Exposure Medium: **Soil**
Exposure Point: **On-site surface soil and dust**
Scenario Time frame: Past and current
Land Use Conditions: Former landfill/golf course

Receptor Population: **Past and current adult and child trespassers**

These doses and inhalation concentrations were calculated using Risk Assistant software by Hampshire Research Institute, Version 1.1. The part of this software Florida DOH uses allows us to set custom exposures that we can use for every site with accepted values for soil consumption, dust inhalation exposure and dermal exposure parameters (EPA, 1991). Doses and inhalation concentrations were calculated using the following values:

Adult body weight-	70 kilograms
Adult soil consumption-	100 milligrams/exposure event
Adult inhalation rate -	2.1 cubic meters/hour*
Soil fraction contaminated-	100%
Lifetime-	70 years
Adult exposure period-	1 year (duration of FGC closure)
Adult event frequency-	50 per year
Adult event duration-	0.5 hour/event
Child body weight-	15 kilograms
Child soil consumption-	200 milligrams/exposure event
Child inhalation rate -	2.0 cubic meters/hour*
Soil fraction contaminated-	100%
Child exposure period-	6 years (time estimate for activity)
Child event frequency-	250 events/year
Child event duration-	2 hours/event

* The air concentration is given in milligrams per cubic meter because the values for inhalation studies in most of the Toxicological Profiles are given in these units. The air concentration is not a dose. This rate is for moderate activity in the average adult and child at 6 years of age.

Model Parameters and Assumptions continued

Exposure Medium: Soil

Exposure Point:	**Off-site soil and dust**
Scenario Time frame:	Past and current
Land Use Conditions:	Residential

Receptor Population: Adult and child residents

These doses and inhalation concentrations were calculated using Risk Assistant software by Hampshire Research Institute, Version 1.1. The part of this software Florida DOH uses allows us to set custom exposures that we can use for every site with accepted values for soil consumption, dust inhalation exposure and dermal exposure parameters (EPA, 1991).

Doses and inhalation concentrations were calculated using the following values:

Adult body weight-	70 kilograms
Adult soil consumption-	100 milligrams/exposure event
Adult inhalation rate -	2.1 cubic meters/hour*
Soil fraction contaminated-	100%
Lifetime-	70 years
Adult exposure period-	18 years (Ashley 1st built in 1989)
Adult event frequency-	365 events/year
Adult event duration-	8 hours/event
Child body weight-	15 kilograms
Child soil consumption-	200 milligrams/exposure event
Child inhalation rate -	2.0 cubic meters/hour*
Soil fraction contaminated-	100%
Child exposure period-	6 years (time estimate for activity)
Child event frequency-	365 events/year
Adult event duration-	8 hours/event

* The air concentration is given in milligrams per cubic meter because the values for inhalation studies in most of the Toxicological Profiles are given in these units. The air concentration is not a dose. This rate is for moderate activity in the average adult and child at 6 years of age.

Appendix B – History of Environmental Sampling within the Vicinity of the Former Proctor Road Landfill, 1990s - Current

Assessment of soil and ground water for petroleum contamination at Foxfire Golf Club in 1991, 1999, and 2004 – In February 1991, Adams Tank & Lift, Inc., was contracted by Foxfire Golf Club (FGC) to remove two steel underground storage tanks (USTs). Following the removal of the tanks, Water Equipment Services, Inc. (WES), collected soil samples from the excavation area. Head space vapors were measured over each soil sample using an Organic Vapor Analyzer and found to not exceed State criteria. Additionally, WES collected ground water samples from a temporary well located in the center of the tank pit area. One sample had a total volatile organic aromatics concentration exceeding the State criteria [WES 1991]. As a result, Sarasota County Natural Resources Department sent a warning notice to FGC in June 1991 requesting that a contamination assessment be performed [Sarasota County Natural Resources Department 1991].

In 1999, the consultant Environmental Assessments + Consulting, Inc. (EAC) further assessed soil and ground water samples for contamination. According to laboratory analytical results, the area around the former USTs did not have petroleum-contaminated soil. However, petroleum-related compounds were found at significant concentrations in the ground water. Three monitoring wells were installed in the vicinity of the former UST area; one in the source area, one up gradient, and one down gradient. In the sample collected from the down gradient well, some of the polycyclic aromatic hydrocarbons (PAHs) were found at concentrations greater than the State-mandated Groundwater Cleanup Target Levels [EAC 1999].

In 2004, EAC collected samples from the down gradient well. The concentrations of all petroleum-related compounds analyzed were below the detection limits, indicating the ground water was no longer contaminated [EAC 2004a, 2004b].

Monitoring of potable wells at Foxfire Golf Club and nearby neighborhoods during the 1990s and 2000s – Sarasota County Health Department (CHD) collected samples from potable wells at Wild Horse Circle, Quarter Horse Road, Safari Lane, and Proctor Road during the 1990s and early 2000s. In March 1992, a ground water sample collected from a potable supply well operated by FGC contained benzene in excess of the Maximum Contaminant Level (MCL) for drinking water quality (0.001 milligrams/liter or mg/L). Manganese and iron were found at concentrations exceeding their Secondary Maximum Contaminant Levels (SMCLs) of 0.05 mg/L and 0.3 mg/L, respectively [Sarasota County Health Department 1993]. The SMCLs are based on aesthetic problems rather than health problems. Subsequent sampling of the well did not continue to detect these excessive levels. However, potable use was terminated [DEP 2007].

In 1999, the total concentration of trihalomethanes, a byproduct of disinfection, collected from a residential well on Proctor Road was found to exceed the MCL (0.1 mg/L in 1999). Samples collected from this well in 2000, 2001, and 2003 showed the total concentration to be below detection limits. Any compounds found in other residential wells were at concentrations below MCLs [Sarasota County Health Department 2007]. Because contamination was not consistently observed in the wells, routine monitoring of them by the CHD ceased [DEP 2007].

Surface water sampling of nearby pond in 1994 – A resident living in a neighborhood located southeast of FGC contacted Sarasota County Natural Resources Department in 1994 with concerns that runoff from the golf course was going into a nearby pond. The resident particularly questioned whether the stormwater runoff was possibly contaminated with pesticides that were

applied at FGC, and if this water that collects in the pond could eventually contaminate her well. In response, County staff collected a water sample from the pond for analysis of organochlorine pesticides and polychlorinated biphenyls (PCBs). The results showed that all of the compounds tested were below detection limits [Sarasota County Natural Resources Department 1994].

Sediment sampling at Foxfire Golf Club in 1995 – A resident living in the Ashley Subdivision filed a complaint with the Sarasota County Natural Resources Department in 1995 about runoff coming from the golf course onto residential properties on the east side of Ashley Parkway. In addition, he expressed concerns about possible contamination of this water from either golf course maintenance practices or the former landfill. In response, Sarasota County Natural Resources Department collected a sediment sample at a creek bend downstream of FGC. The sample was tested for organics and metals. Arsenic, cadmium, chromium, lead, mercury and methyl-tert-butyl ether were detected. After comparison of the measured concentrations with Florida Department of Environmental Protection (DEP) criteria (e.g. the State's Sediment Quality Assessment Guidelines) and discussion with DEP staff, the County reported to the resident that the limited screening revealed no excessive contamination [Sarasota County Natural Resources Department 1995].

Environmental site assessments conducted within the vicinity of Foxfire Golf Club in 1996 – Environmental Assessments + Consulting, Inc. (EAC) conducted Phase I and Phase II Environmental Site Assessments at FGC in 1996. As part of the Phase II assessment, soil samples were collected in the locations of the former 70-acre and 20-acre landfills, area for mixing pesticides and herbicides, removal site of the USTs, equipment wash area, and locations of the aboveground storage tanks (ASTs). The soils were screened for hydrocarbons using an Organic Vapor Analyzer. Elevated levels of organic vapors were found in the soil collected near the equipment wash area, which were attributed to a high organic content in the soil matrix [EAC 1996a].

To evaluate the ground water, EAC installed five temporary monitoring wells. Benzene concentrations were found to exceed the MCL, 0.001 mg/L, in some of the samples collected from wells within the former 70-acre landfill and 20-acre landfill and the equipment wash area. Lead exceeded the MCL, 0.015 mg/L, in ground water collected from a well in the former 70-acre landfill; and phenol exceeded the MCL, 0.010 mg/L, in ground water collected from a well near the equipment wash area. During August 1996, EAC also collected a surface water sample from a creek bordering the eastern side of the former 70-acre landfill. Chlorobenzene and 1,4-dichlorobenzene were detected in small concentrations that fell below State criteria [EAC 1996a].

Lastly, EAC conducted a Phase II Environmental Site Assessment for a nearby residence on Ashley Parkway in August 1996. Ground water collected from a temporary monitoring well contained benzene, cadmium, chromium, and lead concentrations exceeding State MCLs (0.001 mg/L, 0.005 mg/L, 0.1 mg/L, and 0.015 mg/L, respectively). The consultant indicated that the nearby FGC was a possible contributor to the contamination [EAC 1996b].

Pre-Comprehensive Environmental Response, Compensation, and Liability Information System screening of former Proctor Road Landfill in 2004 and 2005 – In 2003, Florida DEP Southwest

District referred the former Proctor Road Landfill site to Florida DEP Federal Programs Section (FPS) for a Pre-Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) screening. This involved the FPS reviewing available data and determining whether the site should be recommended to the U.S. Environmental Protection Agency (EPA) for inclusion in the CERCLIS inventory. In May 2004 DEP FPS completed a Pre-CERCLIS screening assessment, and recommended that the site be entered into CERCLIS as well as further evaluation be conducted via soil and sediment testing within the vicinity of the former landfill [DEP 2004, 2006].

Florida DEP FPS and U.S. EPA jointly conducted an Expanded Pre-CERCLIS Screening Assessment at the site in June 2005. They focused on obtaining surface water and sediment samples from on-site and down-gradient ditches and soil samples from residential properties located on the former 3-acre landfill (i.e. residences along Wild Horse Circle within the Foxfire Subdivision). The agencies found aluminum, arsenic, barium, manganese, magnesium, potassium, iron, and vanadium at higher concentrations in surface water samples collected downstream of Proctor Road in comparison to those measured in the control sample obtained upstream of the road. Aluminum and iron were detected in the three downstream samples at concentrations above U.S. EPA Freshwater Chronic Screening Values (0.087 mg/L and 1 mg/L, respectively). Acetone, toluene, chlorobenzene, p-isopropyltoluene, 1,2-dichlorobenzene, and 1,4-dichlorobenzene were also detected in the surface water samples collected from the ditch on the eastern side of the former landfill. None of the concentrations exceeded freshwater standards [DEP 2006].

All sediment samples were collected at a depth from 0 to 6 inches (Jesus Diaz, Florida Department of Environmental Protection, personal communication, 2008). A sediment sample collected downstream had an arsenic concentration that was higher than the concentrations observed in the upstream samples, and exceeded the 7.24 milligrams/kilogram (mg/kg) established as the U.S. EPA Region 4 Ecological Screening Value and DEP Sediment Quality Assessment Guideline. Lead was observed in the background sample at a concentration exceeding these Federal and State criteria of 30.2 mg/kg. The background sample also contained the highest level of dioxin; however, no dioxin standard was exceeded. Originally thought to be a sample that represented background levels of chemicals, it was later identified as possibly coming from an area that receives runoff from the 3-acre landfill [DEP 2006].

For this Pre-CERCLIS assessment, DEP FPS and U.S. EPA first screened soils from eight locations on two residential properties along Wild Horse Circle using X-Ray fluorescence. The agencies did not detect any heavy metal contamination during the screening; as a result, they selected the sites for soil sampling according to visible signs of contamination [DEP 2006]. All soil samples were collected at land surface to 6 inches below land surface (Jesus Diaz, Florida Department of Environmental Protection, personal communication, 2008).

Analytical results revealed that metals (aluminum, arsenic, calcium, copper, iron, lead, magnesium, manganese, nickel, potassium, vanadium, and zinc) were generally at concentrations in the residential soil samples above those measured in the background sample. The metals were measured at values below remediation goals with the exception of one arsenic concentration, which exceeded both State and Federal remediation goals (2.1 mg/kg and 0.39 mg/kg,

respectively). The residential soil sample also contained dioxin/furan congeners that yielded a Toxic Equivalent (TEQ), as compared to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), exceeding the U.S. EPA Region 9 preliminary remediation goal (0.0000039 mg/kg). All other soils collected were below this value. Consequently, Florida DEP recommended a more comprehensive soil sampling be conducted at Wild Horse Circle [DEP 2006].

Ground water sampling at Foxfire Golf Club in 2006 – In December 2006, Environmental Evaluations, Inc. conducted a ground water investigation at FGC. The consultant collected ground water samples from eight Geoprobe borings installed in the former 70-acre and 20-acre landfills. Benzene, mercury, arsenic, chromium, and lead were measured in some of the samples at concentrations higher than State Groundwater Cleanup Target Levels (GCTLs). Environmental Evaluations stated that degradation of the ground and surface waters would continue because of the former landfill. The consultant recommended that the operation of the golf course be discontinued and additional assessments of the ground water, surface water, and soil conducted [Environmental Evaluations 2007].

Soil/sediment assessment of former Proctor Road Landfill and Ashley neighborhood in 2007 (Site Inspection, Phase 1) – In March 2007, Florida DEP FPS and U.S. EPA conducted a soil/sediment assessment to evaluate reports from a property owner in the Ashley Subdivision regarding stormwater runoff from the 70-acre landfill onto residential properties. Additionally, the agencies further assessed the possible contamination within the Foxfire Subdivision. Soil samples were collected at a depth of 0 to 3 inches. Metals, semi-volatiles, and pesticides/PCBs were analyzed in all of the samples. Dioxins/furans were also analyzed in samples collected near residential property. Volatile organic compounds (VOCs) were analyzed in samples collected from the maintenance area because fuel had been stored nearby. Additionally, VOC analyses were performed on the sample from the Foxfire neighborhood [DEP 2007].

Arsenic was present in all of the samples collected on-site (i.e. from the former landfill, golf course maintenance area, receiving ditch, and ditch overflow adjacent to the residences). Except for one sample and duplicate collected in the golf course maintenance area, the arsenic concentrations in these samples exceeded the Soil Cleanup Target Level (SCTL) for residential areas (2.1 mg/kg). In addition, five of the samples had levels exceeding the SCTL for industrial areas (12 mg/kg). Notably the re-sampling of the soil within Wild Horse Circle did not show the arsenic contamination previously indicated in 2005 [DEP 2007].

Analyses revealed the presence of various other metals in the soils. Barium was found in all of the samples, with the highest concentrations measured in soils collected from the ditch and ditch overflow near Ashley residences. One of the samples exceeded the residential SCTL for barium (120 mg/kg). All samples also contained chromium, with two samples from the ditch having the highest levels. Concentrations did not exceed the SCTL for residential settings. Lead was detected in all samples. However, levels were at least 25 times lower than the SCTL for contact in residential settings (400 mg/kg). Mercury and selenium were detected in only trace amounts in a sample. Lastly, cadmium and silver concentrations were below detection limits [DEP 2007].

Semi-volatile compounds, PAHs were identified in samples collected from the ditch, ditch overflow adjacent to residences, and maintenance area. The DEP FPS calculated TEQs, based on

benzo(a)pyrene-equivalent toxicity, for the samples of concern. Samples collected from the ditch overflow and maintenance areas had TEQs that exceeded the SCTL for direct contact in residential settings, 0.1 mg/kg [DEP 2007].

The DEP FPS calculated TEQs for dioxin/furan concentrations as compared to 2,3,7,8-TCDD-equivalent toxicity. Only the surface soil collected from the ditch overflow area contained a concentration of dioxin and furan congeners that exceeded the State SCTL (0.000007 mg/kg). Thus, the compounds were not at the same excessive level in the residential soil from Wild Horse Circle as observed during the 2005 sampling [DEP 2007].

The remaining organic compounds analyzed were not at significant levels of contamination. The concentrations of PCBs were below detection limits in all samples. Trace levels of pesticides were identified in only a few samples. Low levels of VOCs were identified in the background sample, a single sample collected from the Foxfire neighborhood, and samples from the maintenance area. Concentrations did not exceed State SCTLs [DEP 2007].

Ground water assessment of former Proctor Road Landfill (Site Inspection, Phase 2) – Florida DEP FPS and U.S. EPA conducted a ground water assessment in November 2007 to evaluate the quality of the ground water on-site and determine any possible effects that the site may have on nearby wells. The agencies installed seven shallow monitoring wells near the FGC maintenance area, at the 70-acre and 20-acre landfills, and at a background location. They collected samples from these wells and a pre-existing on-site monitor well, and analyzed the ground water for metals and VOCs [DEP 2008].

The eight primary ground water samples and a duplicate contained only a few metals with limited concentrations. Barium was measured in all of the samples, with the highest levels in the area of the former 70-acre landfill. A trace amount of chromium was found in ground water collected from the southwestern corner of the 20-acre landfill. Lastly, vanadium was present in three samples, with the highest concentration being in the background sample. No metal concentrations exceeded the state or federal standards for ground water [DEP 2008].

Florida DEP FPS and U.S. EPA analyzed the nine samples for twenty-four VOCs. These analytes were detected throughout the ground water. The greatest number of VOCs and some of the highest levels were found in the sample collected from the southern portion of the former 70-acre landfill. This sample and one collected from the western margin of the former 70-acre landfill contained benzene at concentrations exceeding the GCTL, 0.001 mg/L. Benzene was the only VOC exceeding its GCTL [DEP 2008].

Florida DEP FPS and U.S. EPA found contamination at the former Proctor Road Landfill during both the 2005 and 2007 sampling events. As a result, the DEP FPS recommended further assessment of the site. Additionally, DEP FPS recommended that Florida DEP's Southwest District identify the person(s) responsible for site rehabilitation (PRSR) to implement corrective action at the site [DEP 2008].

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Appendix C – Toxicity Equivalency Factor (TEF) Approach for Dioxins and Polycyclic Aromatic Hydrocarbons (PAHs)

TEFs for Dioxins/Furans—Analytical results are multiplied by the following factors and then added together to obtain a total toxic equivalent (TEQ) for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). This total is compared to screening values. According to U.S. EPA methods, half of the detection level is used for a dioxin/furan concentration measured below the detection limit if any congeners are detected in a sample.

Dioxin/Furan	***Toxicity Equivalency Factor***
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin	1
1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin	1
1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin	0.1
1,2,3,6,7,8- Hexachlorodibenzo-*p*-dioxin	0.1
1,2,3,7,8,9- Hexachlorodibenzo-*p*-dioxin	0.1
1,2,3,4,6,7,8- Heptachlorodibenzo-*p*-dioxin	0.01
Octachlorodibenzo-*p*-dioxin	0.0003
2,3,7,8-Tetrachlorodibenzofuran	0.1
1,2,3,7,8-Pentachlorodibenzofuran	0.03
2,3,4,7,8-Pentachlorodibenzofuran	0.3
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01
Octachlorodibenzofuran	0.0003

Source: [WHO 2005]

TEFs for PAHs—Analytical results are multiplied by the following factors and then added together to obtain a total toxic equivalent (TEQ) for benzo[a]pyrene. This total is compared to screening values. According to U.S. EPA methods, half of the detection level is used for a PAH concentration measured below the detection limit if any PAHs are detected in a sample.

PAH	***Toxicity Equivalency Factor***
Dibenz[a,h]anthracene	5
Benzo[a]pyrene	1
Benzo[a]anthracene	0.1
Benzo[b]fluoranthene	0.1
Benzo[k]fluoranthene	0.1
Indeno[1,2,3-c,d]pyrene	0.1
Anthracene	0.01
Benzo[g,h,i]perylene	0.01
Chrysene	0.01
Acenaphthene	0.001
Acenaphthylene	0.001
Fluoranthene	0.001
Fluorene	0.001
Phenanthrene	0.001
Pyrene	0.001

Source: [ATSDR 1995]

Appendix D – Glossary of Environmental Health Terms

Absorption: How a chemical enters a person's blood after the chemical has been swallowed, has come into contact with the skin, or has been breathed in.

Acute Exposure: Contact with a chemical that happens once or only for a limited period of time. ATSDR defines acute exposures as those that might last up to 14 days.

Adverse Health Effect: A change in body function or the structures of cells that can lead to disease or health problems.

The Agency for Toxic Substances and Disease Registry (ATSDR): ATSDR is a federal health agency in Atlanta, Georgia, that deals with hazardous substance and waste site issues. ATSDR gives people information about harmful chemicals in their environment and tells people how to protect themselves from coming into contact with chemicals.

Arsenic: A naturally occurring element that is widely distributed in the earth's crust. Arsenic can combine with other chemical elements to form inorganic or organic compounds. The inorganic form is considered more toxic.

Background Level: An average or expected amount of a chemical in a specific environment. Or, amounts of chemicals that occur naturally in a specific environment.

Biota: Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.

Cancer: A group of diseases that occur when cells in the body become abnormal and grow, or multiply, out of control.

Carcinogen: Any substance shown to cause tumors or cancer in experimental studies.

CERCLA: See **C**omprehensive **E**nvironmental **R**esponse, **C**ompensation, and **L**iability **A**ct.

Chronic Exposure: A contact with a substance or chemical that happens over a long period of time. ATSDR considers exposures of more than one year to be *chronic*.

Completed Exposure Pathway: See **Exposure Pathway**.

Comparison Value: **(CVs)** Concentrations or the amount of substances in air, water, food, and soil that are unlikely, upon exposure, to cause adverse health effects. Comparison values are used by health assessors to select which substances and environmental media (air, water, food and soil) need additional evaluation while health concerns or effects are investigated.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): **CERCLA** was put into place in 1980. It is also known as **Superfund**. This act concerns releases of hazardous substances into the environment, and the cleanup of these substances and hazardous waste sites. ATSDR was created by this act and is responsible for looking into the health issues related to hazardous waste sites.

Concern: A belief or worry that chemicals in the environment might cause harm to people.

Concentration: How much or the amount of a substance present in a certain amount of soil, water, air, or food.

Contaminant: See **Environmental Contaminant**.

Dermal Contact: A chemical getting onto your skin. (see **Route of Exposure**).

Dose: The amount of a substance to which a person may be exposed, usually on a daily basis. Dose is often explained as "amount of substance(s) per body weight per day".

Dose / Response: The relationship between the amount of exposure (dose) and the change in body function or health that result.

Duration: The amount of time (days, months, years) that a person is exposed to a chemical.

Environmental Contaminant: A substance (chemical) that gets into a system (person, animal, or the environment) in amounts higher than that found in **Background Level**, or what would be expected.

Environmental Media: Usually refers to the air, water, and soil in which chemicals of interest are found. Sometimes refers to the plants and animals that are eaten by humans. **Environmental Media** is the second part of an **Exposure Pathway**.

Epidemiology: The study of the different factors that determine how often, in how many people, and in which people will disease occur.

Exposure: Coming into contact with a chemical substance.(For the three ways people can come in contact with substances, see **Route of Exposure**.)

Exposure Assessment: The process of finding the ways people come in contact with chemicals, how often and how long they come in contact with chemicals, and the amounts of chemicals with which they come in contact.

Exposure Pathway: A description of the way that a chemical moves from its source (where it began) to where and how people can come into contact with (or get exposed to) the chemical.

ATSDR defines an exposure pathway as having 5 parts:

- Source of Contamination,
- Environmental Media and Transport Mechanism,
- Point of Exposure,
- Route of Exposure, and
- Receptor Population.

When all 5 parts of an exposure pathway are present, it is called a **Completed Exposure Pathway**. Each of these 5 terms is defined in this Glossary.

Florida Department of Environmental Protection (DEP): The lead governmental agency in the State of Florida for environmental management and stewardship. The agency works to protect the State's air, water, and land.

Florida Department of Health (DOH): The governmental agency that works to promote, protect, and improve the health of all people in the State of Florida.

Frequency: How often a person is exposed to a chemical over time; for example, every day, once a week, twice a month.

Hazardous Waste: Substances that have been released or thrown away into the environment and, under certain conditions, could be harmful to people who come into contact with them.

Health Effect: ATSDR deals only with **Adverse Health Effects** (see definition in this Glossary).

Indeterminate Public Health Hazard: The category is used in Public Health Assessment documents for sites where important information is lacking (missing or has not yet been gathered) about site-related chemical exposures.

Ingestion: Swallowing something, as in eating or drinking. It is a way a chemical can enter your body (See **Route of Exposure**).

Inhalation: Breathing. It is a way a chemical can enter your body (See **Route of Exposure**).

LOAEL: **L**owest **O**bserved **A**dverse **E**ffect **L**evel. The lowest dose of a chemical in a study, or group of studies, that has caused harmful health effects in people or animals.

MRL: **M**inimal **R**isk **L**evel. An estimate of daily human exposure B by a specified route and length of time -- to a dose of chemical that is likely to be without a measurable risk of adverse, noncancerous effects. An MRL should not be used as a predictor of adverse health effects.

NPL: The **N**ational **P**riorities **L**ist. (Which is part of **Superfund**.) A list kept by the U.S. Environmental Protection Agency (EPA) of the most serious, uncontrolled or abandoned hazardous waste sites in the country. An NPL site needs to be cleaned up or is being looked at to see if people can be exposed to chemicals from the site.

NOAEL: **N**o **O**bserved **A**dverse **E**ffect **L**evel. The highest dose of a chemical in a study, or group of studies, that did not cause harmful health effects in people or animals.

No Apparent Public Health Hazard: The category is used in ATSDR's Public Health Assessment documents for sites where exposure to site-related chemicals may have occurred in the past or is still occurring but the exposures are not at levels expected to cause adverse health effects.

No Public Health Hazard: The category is used in ATSDR's Public Health Assessment documents for sites where there is evidence of an absence of exposure to site-related chemicals.

PAHs: Polycyclic **A**romatic **H**ydrocarbons. a group of more than 100 different chemicals formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances. Some are manufactured to use in medicines or make dyes, plastics, and pesticides. They are usually found as a mixture, containing two or more of the compounds.

PHA: **P**ublic **H**ealth **A**ssessment. A report or document that looks at chemicals at a hazardous waste site and tells if people could be harmed from coming into contact with those chemicals. The PHA also tells if possible further public health actions are needed.

Plume: A line or column of air or water containing chemicals moving from the source to areas further away. A plume can be a column or clouds of smoke from a chimney or contaminated underground water sources or contaminated surface water (such as lakes, ponds and streams).

Point of Exposure: The place where someone can come into contact with a contaminated environmental medium (air, water, food or soil). For examples: the area of a playground that has contaminated dirt, a contaminated spring used for drinking water, the location where fruits or vegetables are grown in contaminated soil, or the backyard area where someone might breathe contaminated air.

Population: A group of people living in a certain area; or the number of people in a certain area.

PRP: **P**otentially **R**esponsible **P**arty. A company, government or person that is responsible for causing the pollution at a hazardous waste site. PRP's are expected to help pay for the clean up of a site.

Public Health Assessment(s): See **PHA**.

Public Health Hazard: The category is used in PHAs for sites that have certain physical features or evidence of chronic, site-related chemical exposure that could result in adverse health effects.

Public Health Hazard Criteria: PHA categories given to a site which tell whether people could be harmed by conditions present at the site. Each are defined in the Glossary. The categories are:

- Urgent Public Health Hazard
- Public Health Hazard
- Indeterminate Public Health Hazard
- No Apparent Public Health Hazard
- No Public Health Hazard

Receptor Population: People who live or work in the path of one or more chemicals, and who could come into contact with them (See **Exposure Pathway**).

Reference Dose (RfD): An estimate, with safety factors (see **safety factor**) built in, of the daily, lifetime exposure of human populations to a possible hazard that is <u>not</u> likely to cause harm to the person.

Route of Exposure: The way a chemical can get into a person's body. There are three exposure routes:

- breathing (also called inhalation),
- eating or drinking (also called ingestion), and
- or getting something on the skin (also called dermal contact).

Safety Factor: Also called **Uncertainty Factor**. When scientists don't have enough information to decide if an exposure will cause harm to people, they use "safety factors" and formulas in place of the information that is not known. These factors and formulas can help determine the amount of a chemical that is not likely to cause harm to people.

SARA: The **S**uperfund **A**mendments and **R**eauthorization **A**ct in 1986 amended CERCLA and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from chemical exposures at hazardous waste sites.

Sample Size: The number of people that are needed for a health study.

Sample: A small number of people chosen from a larger population (See **Population**).

Source (of Contamination): The place where a chemical comes from, such as a landfill, pond, creek, incinerator, tank, or drum. Contaminant source is the first part of an **Exposure Pathway**.

Special Populations: People who may be more sensitive to chemical exposures because of certain factors such as age, a disease they already have, occupation, sex, or certain behaviors (like cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Superfund Site: See **NPL**.

Survey: A way to collect information or data from a group of people (**population**). Surveys can be done by phone, mail, or in person. ATSDR cannot do surveys of more than nine people without approval from the U.S. Department of Health and Human Services.

Toxic: Harmful. Any substance or chemical can be toxic at a certain dose (amount). The dose is what determines the potential harm of a chemical and whether it would cause someone to get sick.

Toxicology: The study of the harmful effects of chemicals on humans or animals.

Urgent Public Health Hazard: This category is used in ATSDR's Public Health Assessment documents for sites that have certain physical features or evidence of short-term (less than 1 year), site-related chemical exposure that could result in adverse health effects and require quick intervention to stop people from being exposed.

U.S. Environmental Protection Agency (EPA): The federal agency that develops and enforces environmental laws to protect the environment and the public's health.

CERTIFICATION

The Florida Department of Health, Division of Environmental Health prepared this Health Consultation under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. It followed approved methodology and procedures existing at the time it began and completed editorial review.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation, and concurs with its findings.

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