

# Health Consultation

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CARVER SQUARE SUBDIVISION

DELRAY BEACH, PALM BEACH COUNTY, FLORIDA

NOVEMBER 14, 2005

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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HEALTH CONSULTATION

CARVER SQUARE SUBDIVISION

DELRAY BEACH, PALM BEACH COUNTY, FLORIDA

Prepared by:

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

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## Summary

The Florida Department of Health (DOH) evaluated the public health significance of chemicals measured in Carver Square subdivision air, soil, and groundwater at the request of the Florida Department of Environmental Protection (DEP). Air, soil, and groundwater samples did not contain levels of contaminants that would result in a public health hazard.

While only 20 of the 30 parcels in this subdivision have single-family homes built on them, some homes are subsiding due to the collapse of landfilled materials beneath them. The Delray Beach Community Redevelopment Association wants to help homeowners by purchasing their properties. Based on Florida DOH's evaluation of subdivision data, concerns about chemical contamination probably will not complicate this process. Only chlordane and polychlorinated aromatic hydrocarbons (PAHs) were measured above their residential Soil Cleanup Target Levels (SCTLs) in surface soil, 0-3 inches deep. These chemicals may not be related to landfilled-materials. In the past, builders applied chlordane for long-lasting termite control near the foundations of homes. PAHs are produced when organic substances are burned and PAHs are present in roofing tar and asphalt. Therefore, both chemicals are readily found in urban environments.

Even daily exposures to the highest surface soil levels of PAHs and chlordane measured in DEP's recent study are not likely to cause concern for non-cancer illness. The increased theoretical cancer risk DOH calculated for persons with daily exposures to the highest measured levels of these two chemicals (from accidentally eating soil or from breathing dust) is roughly 3 additional cases among 100,000 persons. All shallow water analyzed came from monitoring wells. While some residents have irrigation wells that may tap deeper water, no one is known to be drinking the shallow groundwater that contained low levels of the plasticizer bis (2-ethylhexyl) phthalate (in one monitoring well) and dieldrin (a pesticide) in another monitoring well, because municipal water is used. These levels of bis (2-ethylhexyl) phthalate and dieldrin would not present a risk for non-cancer illness or cancer for persons who might occasionally drink from them. Nonetheless, DOH advises that people should not drink irrigation well water or use it on food (such as when cleaning fish) or on food-contact surfaces (such as when cleaning grills) because shallow wells could contain bacteria from surface water.

## Background

The Carver Square subdivision occupies about five acres in the City of Delray Beach, Palm Beach County, Florida (Figure 1). While zoned for single-family homes, Palm Beach County also lists the subdivision property in its Inventory of Solid Waste Sites (in conjunction with Carver Square Dump). According to the inventory, the dump closed between the late 1960s and early 1970s. Dumping involved illegal fill of a property pond with garbage, trash, auto parts, and yard waste. The inventory indicates that the county discovered the dumpsite in 1988 due to home damage caused by subsidence. Subdivision test pits revealed fill material consisting of trash and debris mixed with sand in 2-4 foot layers, at depths from 2-8 feet below land surface. Trash included decomposing paper, wood, steel, rubbish, glass and plastic bottles, hoses, and glass fragments (Nutting Engineers of Florida, Inc., (Nutting) 1988, 2004).

Nutting's 2004 geotechnical report noted structural settlement damage in Carver Square homes. They noted separation of masonry blocks at mortar joints, step and diagonal cracks at the corners

and windows, foundation cracks, and major cracks in interior ground slabs. They reported deformed roof trusses and severe cracks in interior walls and ceilings, particularly around doors and windows (Figure 2). According to Mike Simon, of the Delray Beach Community Redevelopment Agency, a house formerly located on lot 26 had also exhibited major structural damage prior to being demolished in the summer of 2003.

Utility services for homes located in Carver Square subdivision include aboveground and underground power, telephone, gas, and cable television.

Single-family residential areas surround the neighborhood to the east, west and south, while the residential area north of the site includes multifamily residences. The area along Atlantic Avenue, located approximately 1000 feet north of the subdivision, is zoned for commercial properties. Carver High School is located approximately ¼ mile southwest of the site; the Pine Ridge Cemetery is located approximately ¼ mile south of the site. A nursery, Roy Maxwell Nursery and Landscaping, is located approximately 500 feet south of the subject property. The subdivision is about 1 mile west of the Intracoastal Waterway and is about 15 feet above mean sea level. Based on the site area topographic map, storm water runoff would be conveyed to the southwest. El Rio Canal is about 1 mile west of the subdivision and Lake Ida is about 1¼ mile to the north.

In 2000, about 110 persons lived within this three-block area. Approximately 66% were black, 14% were white, and 13% were Latino or Hispanic. The remaining 7% listed themselves as two or more races, and of those counted as blacks, whites, or Latino/Hispanic, 13% also claimed heritage from two or more races (Bureau of the Census 2000, accessed via LandView 5 software).

Environmental Scientists and Specialists from Florida DOH and DEP visited the Carver Square subdivision on January 12 and 13, 2005. They walked door-to-door with a representative of the Delray Beach Community Redevelopment Association and the Palm Beach County Health Department to deliver August 2004 air, soil, and shallow groundwater results to the individual residents who had had samples taken on their properties.

## Methods and Results

### Air Sampling

Post, Buckley, Schuh and Jernigan (PBS&J), DEP's contractor, collected 6 air samples from 6 vapor-monitoring points in the Carver Square neighborhood on August 25, 2004. The vapor monitoring points were slotted 10-foot lengths of polyvinyl chloride pipe set into soil above the water table. PBS&J staff withdrew an air sample from each monitoring point, which they analyzed with a portable gas analyzer (GEM™ 2000). They also took carbon dioxide and oxygen measurements to determine if potential gasses may have displaced oxygen levels.

PBS&J collected air samples inside 5 Carver Square residences. They selected the residences to sample based on observed damage related to building subsidence and/or resident's reports of health issues.

PBS&J staff did not detect methane in any of the samples collected from the vapor monitoring points or in any of the sampled residences. Carbon dioxide (0 to 0.5%) and oxygen (19.5 to 21%) measurements did not indicate the presence of landfill gasses in any of the air-sampled homes.

### **Soil Sampling**

PBS&J collected soil samples from 18 different properties in the Carver Square neighborhood. The City of Delray Beach owned one of the sampled properties and one was vacant, the remaining 16 has residences on them.

PBS&J collected:

- 13 samples from the surface to 3 inches below the surface (0-3" sample depths),
- 13 samples from 3 inches to 24 inches below the surface (3-24" sample depths), and
- 6 samples from 3 to 4 feet below the surface (3-4' sample depths).

The EPA contract laboratory analyzed these soil samples for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, and cyanide.

Table 1 shows the highest levels of chemicals measured above the levels state and federal governments have set for soil containing chemicals with potential cancer risks in surface soil and subsurface soil. DEP calls these levels residential Soil Cleanup Target Levels or SCTLs. When DOH evaluates the measured levels to determine if they are likely to present a public health risk, we assume children and adults will have daily exposure to soil containing these chemicals at these measured levels. We assume children and adults will get soil on their hands and accidentally eat it. We also assume they will breathe dust stirred up from this soil. Chlordane, a pesticide used in the past to treat building for termites, and PAHs, the products of burned organic compounds, and present in roofing tar and asphalt, were detected above their soil target cleanup levels in surface soil.

The EPA contract laboratory measured both chlordane and PAHs above their Soil Cleanup Target Levels, but neither dose DOH calculated from these levels was likely to cause non-cancer illness. The increased theoretical cancer risk DOH calculated for persons with daily exposures to the highest measured levels of these two chemicals (from accidentally eating soil or from breathing dust) is roughly 3 additional cases in 100,000 persons. All shallow water analyzed came from monitoring wells.

People may also have some contact with subsurface soil, but it probably will not be daily, for long periods, as surface soil exposures could be. The EPA contract laboratory measured PAHs and polychlorinated biphenyls (PCBs) above their residential Soil Cleanup Target Levels in subsurface soils.

In addition to the soil samples collected for analysis, PBS&J installed another 16 direct-push borings to characterize the buried waste (see photos, soil was collected to see whether or what types of wastes it contained, but these borings were not analyzed for chemicals).

### **Shallow groundwater sampling**

PBS&J installed 6 monitoring wells to approximately 18 feet, with slotted sections in the bottom 10 feet of casing. They sampled these wells using a peristaltic pump to assure quiescent sampling technique. The EPA contract laboratory analyzed the shallow groundwater samples from these

wells for VOCs, SVOCs, pesticides, PCBs, metals, and cyanide. They only measured bis (2-ethylhexyl) phthalate and dieldrin above Florida drinking water standards in these monitoring wells.

Because municipal water is available and irrigation wells tap water deeper than 15 feet below the surface, no one is known to have access to the shallow groundwater. This shallow groundwater contained low levels of the plasticizer bis (2-ethylhexyl) phthalate (in one monitoring well) and dieldrin (a pesticide) in another monitoring well. Nonetheless, these levels of bis (2-ethylhexyl) phthalate and dieldrin would not present a risk for non-cancer illness or cancer for persons who might occasionally drink from them.

Some residents have irrigation wells, but DEP did not take groundwater samples from these wells. Here and throughout the state, DOH advises people not to drink irrigation well water or use it on food (such as when cleaning fish) or on food-contact surfaces (such as when cleaning grills) because very shallow wells could contain bacteria from surface water.

## Discussion of Public Health Implications

Surface soil, 0-3 inches deep, only contained chlordane and PAHs above the residential Soil Cleanup Target Levels (SCTLs). These chemicals may not be related to land filled-materials, and neither is present at levels likely to cause non-cancer health concerns. The increased theoretical cancer risk DOH calculated for persons with daily exposure to the highest measured levels of these two chemicals (from accidentally eating soil they got on their hands or from breathing dust) is 3 additional cases in 100,000 persons<sup>†</sup>.

There are no known daily exposure pathways to groundwater and subsurface soil.

The air data indicate that landfill gases are not being produced at this time.

The Delray Beach Community Redevelopment Association plans to purchase the properties, remove the fill, and redevelop this area. Otherwise, the effects of land subsidence could cause future public health hazards. Subsidence could cause potable water, sewer, and natural gas lines to break or leak. Subsidence has caused home foundations and walls to crack, these cracks could allow insects, rodents, and other disease vectors to enter homes, in addition to landfill gases.

Until residents are relocated, they should take the following precautions:

- Residents should report strong outdoor odors to the Delray Beach Utilities Department; these could indicate a break in a natural gas or sewer line. Residents should report any visible potable water or sewer line breaks to the Delray Beach Utilities Department.
- Residents should report poor water quality to the Delray Beach Utilities Department.
- Residents, who are unable to watch the news or listen to the radio for the public service

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<sup>†</sup> Mice exposed to chlordane in a lifetime food study developed liver cancer; inhalation studies are limited to worker epidemiology, which did not show any links to cancer. Chlordane dermal studies were not located (ATSDR 1989). Worker exposures to high levels of PAHs show cancers (skin, bladder, lung, and gastrointestinal) are the most significant endpoint of PAH toxicity. Workers' dermal exposure studies indicate that although direct contact may be of concern at high exposure levels, they do not suggest that lower levels are likely to cause significant irritation (Goodfellow et al. 2001).

announcements that would tell about “boil water notices” that accompany water line breaks due to work or other obligations, should ask for special notification from the Delray Beach Utilities Department.

Until they are relocated, residents should report any landfill debris to DEP for removal, including material that works its way to the surface, or that they may encounter when they are digging.

## **Child Health Considerations**

ATSDR and Florida DOH recognize that in communities faced with the contamination of their environment, the unique vulnerabilities of infants and children demand special attention. Children are at a greater risk than adults are for certain kinds of exposure to hazardous substances emitted from waste sites. Because they play outdoors and because they may 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 close 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.

## **Conclusions**

DEP analyzed the air, soil, and shallow groundwater to determine if the chemical levels related to fill material under the three-block area known as the Carver Square subdivision might have public health significance. The Delray Beach Community Redevelopment Association (CRA) plans to assist homeowners by purchasing their properties. The CRA has discussed excavating the fill and redeveloping the properties. Florida DOH evaluated DEP’s analytical data for air, soil, and groundwater contaminants and determined that the levels measured present no apparent public health hazard.

If the subsiding properties were not reclaimed, the effects of land subsidence could have public health significance. Subsidence has caused home foundations and walls to crack, these cracks could allow insects, rodents, and other disease vectors to enter homes. Subsidence could cause potable water, sewer, and natural gas lines to break or leak.

## **Recommendations**

Until residents are relocated, they should take the following precautions:

- Residents should report strong outdoor odors to the Delray Beach Utilities Department; these could indicate a break in a natural gas or sewer line. Residents should report any visible potable water or sewer line breaks, or poor water quality to the Delray Beach Utilities Department.
- Residents, who are unable to watch the news or listen to the radio for the public service announcements that would tell about “boil water notices” that accompany water line breaks due to work or other obligations, should ask for special notification from the Delray Beach Utilities Department.



Until they are relocated, residents should report any landfill debris to DEP for removal, including material that works its way to the surface, or that they may encounter when they are digging.

### **Public Health Action Plan**

Florida DOH will continue to work with the Delray Beach Community Redevelopment Association, the Superfund Site Screening section of DEP in Tallahassee, and the Southeast DEP District. If requested, Florida DOH will provide technical assistance to address human health issues of the Carver Square Subdivision.

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USGS Topographic Map, Delray Beach, Florida.

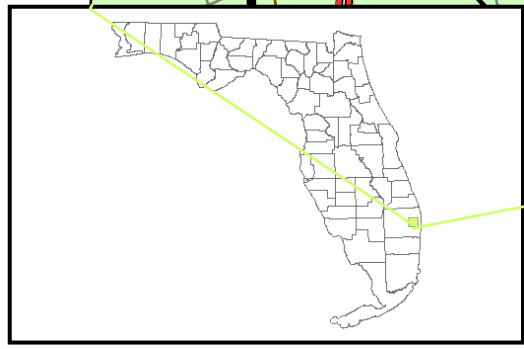
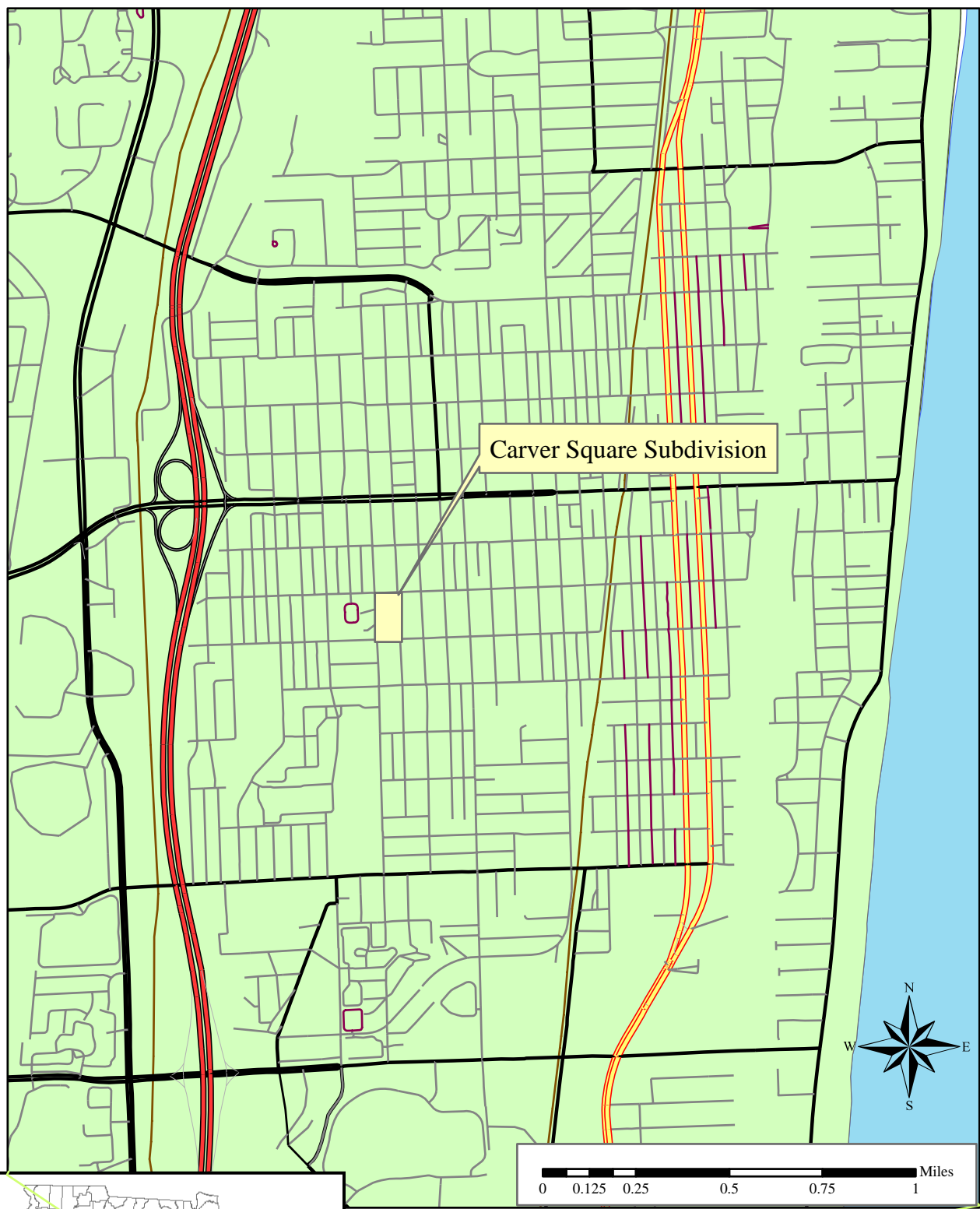


Figure 1. Location of Carver Square Subdivision in Palm Beach County, Florida



Figure 2

Carver Square  
Combined Site Screening Investigation  
Surface Soil Results  
exceeding residential Soil Target Cleanup Levels







Figure 3

Carver Square  
Combined Site Screening Investigation  
Monitoring Well Analytical Results



exceeding drinking water Maximum Concentration Level for bis (2 ethylhexyl) thalate and target cleanup level for dieldrin, a minimum criteria carcinogen





Photo 1: Natural soil DEP's contractors encountered installing a monitoring well.



Photo 2: Core borings from monitoring wells show natural soil variations and variations due to fill.



Photo 3: Structural damage due to subsidence in driveway.



Photo 4: Attempted repair of wall crack inside Carver Square Subdivision home.



**Table 1: TEQs for PAHs**

Analytical results are multiplied by the following factors and then added together to obtain one number to be compared with the screening value for Benzo[a]pyrene, the EPA adds half the detection level for all carcinogenic PAHs, if any carcinogenic PAHs are detected.

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, 1995b.

**Table 2. Surface Soil (0 to 3 inch samples) Concentrations for Contaminants of Concern**

Contaminants of Concern	Screening Value (mg/kg)		Highest Soil Concentration (mg/kg)	Location of Highest Concentration	Number Soil Samples Above Screening Value
	ATSDR: Children/adults	DEP:			
chlordanes	2 CREG	2.8 residential SCTL	41	csss09a	1/13
PAHs TEQ	0.1 CREG	0.1 residential SCTL	.8	csss15a	3/13

**Table 3. Surface Soil (3-24 inch and 3-4 foot samples) Concentrations for Contaminants of Concern**

Contaminants of Concern	Screening Value (mg/kg)		Highest Soil Concentration (mg/kg)	Location of Highest Concentration	Number Soil Samples Above Screening Value
	ATSDR: Children/adults	DEP:			
PAHs TEQ	0.1 CREG	0.1 residential SCTL	3.5	cssb01c	2/6
PCBs	0.4 CREG	0.5 residential SCTL	0.9	cssb05c	1/6

CREG—ATSDR’s Cancer Risk Evaluation Guide for 1 excess cancer case in 1 million people (ATSDR 1992a).

EMEG—Environmental Media Evaluation Guide

Mg/kg—milligrams per kilogram

PAHs—polycyclic aromatic hydrocarbons

PCBs—polychlorinated biphenyls

SCTL—FDEP’s Soil Target Cleanup Level for residential land uses.

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**Model Parameters and Assumptions for Public Health Action Plan Tables 4 and 5**

**Exposure Medium:** Soil  
Exposure Point: On-site soil and dust  
Scenario Time frame: Future  
Land Use Conditions: Residential

**Receptor Population:** Residents

These doses were calculated using Risk Assistant software and accepted values for soil consumption, dust inhalation exposure and dermal exposure parameters (EPA, 1997).

The following doses were calculated using the following values:

Adult body weight- 70 kg  
Child body weight- 15 kg  
Adult soil consumption- 100 mg/day  
Child soil consumption- 200 mg/day  
Adult/Child shower time- 0.2 hours  
Adult skin surface area- 23,000cm<sup>2</sup>  
Child skin surface area- 7,200cm<sup>2</sup>

\* 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; therefore it is the same for adults and children.

mg/kg = milligram per kilogram of soil

mg/kg/day = milligrams per kilogram body weight per day

**Table 4. Estimated doses from exposures to surface (0 to 3 inch samples) soil<sup>†</sup>.**

Contaminant of Concern (maximum concentration) (mg/kg)	Oral MRL (mg/kg/day)	Soil/dust- Ingestion (mg/kg/day)		Inhalation MRL (mg/m <sup>3</sup> )	Soil/dust- Inhalation (mg/m <sup>3</sup> )
		Child	Adult		Child and Adult
chlordane (41)	0.001 Acute 0.0006 Intermediate 0.0006 Chronic	0.0005	0.00006	Int 0.0002 Chronic 0.00002	0.000002
PAHs TEQ (0.8)	-	0.000009	0.000001	-	0.00000004

**Table 5. Estimated doses from exposures to subsurface (3-24 inch and 3-4 foot samples) soil<sup>†</sup>.**

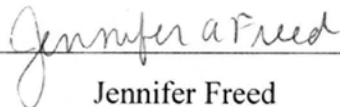
Contaminant of Concern (maximum concentration) (mg/kg)	Oral MRL (mg/kg/day)	Soil/dust- Ingestion (mg/kg/day)		Inhalation MRL (mg/m <sup>3</sup> )	Soil/dust- Inhalation (mg/m <sup>3</sup> )
		Child	Adult		Child and Adult
PAHs TEQ (3.5)	-	0.00005	0.000005	-	0.00000006
PCBs total (0.87)	0.03 Intermediate 0.02 Chronic	0.00001	0.000001	-	0.00000005

<sup>†</sup>doses calculated for the highest measured levels, **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 noncancer health effects over a specified duration of exposure. **Chr**—Chronic exposure length of more than 365 days. **Int**—Intermediate exposure length of more than 14 and less than 365 days. **Acute**—Exposure length of less than 14 days. **mg/kg**—milligrams per kilogram **mg/kg/day**—milligram chemical per kilogram body weight per day **PAHs TEQ**—polycyclic aromatic hydrocarbons **mg/m<sup>3</sup>**—microgram of chemical per cubic meter of air.

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## CERTIFICATION

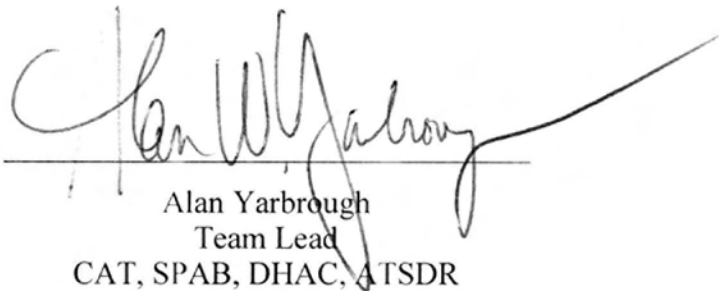
The Florida Department of Health, Bureau of Community Environmental Health prepared this Health Consultation under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. It followed approved methodology and procedures existing at the time it began. The Cooperative Agreement Partner 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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