Health Consultation

LEESBURG THERMOMETER SITE

LEESBURG, LAKE COUNTY, FLORIDA

JANUARY 29, 2002

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

LEESBURG THERMOMETER SITE

LEESBURG, LAKE COUNTY, FLORIDA

Prepared by:

Florida Department of Health
Bureau of Environmental Epidemiology
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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Background and Statement of Issues

In October 2001, the Florida Department of Environmental Protection (DEP) asked the Florida Department of Health (DOH) if concentrations of mercury in soil samples at a private residence in Leesburg, Lake County, Florida are hazardous to human health. The Florida DOH, through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR) in Atlanta, Georgia, evaluates the public health significance of hazardous waste sites in Florida. This is the first review of the Leesburg Thermometer Site by either the Florida DOH or the ATSDR.

The Leesburg Thermometer Site is an approximately 1 acre parcel of residential land located at 14 Ginger Circle in Leesburg, Lake County, Florida (Figure 1). Prior to construction of the current residence in 1992, the property was undeveloped land. According to a neighbor and former employee, the property was owned by a medical manufacturing company prior to 1978. In 1994, the current property owner purchased the home from another individual who had the house built in 1992. The property is surrounded by single family residences, with Lake Harris being located approximately 500 feet to the east and south of the subject property.

In 1998, the current property owner was installing an irrigation line in the back yard (north side of the property) when he uncovered several broken thermometers. According to his neighbor to the north, broken thermometers had been uncovered on that property in the past. On July 22, 1998, the Florida DEP Site Investigation Section (SIS) received a request for assistance with this property, and subsequently performed a Preliminary Contamination Assessment. This assessment found detectable concentrations of mercury in 23 soil samples collected from 15 sampling locations on the northern portion of the subject property. Concentrations of mercury ranged from 0.0072 milligrams per kilogram (mg/kg) to 210 mg/kg. The highest mercury concentrations were found in the top 12 inches of soil, where the concentration of broken thermometers was also the highest. A subsequent Preliminary Assessment performed by the Florida DEP Site Screening Superfund Subsection concluded that soil exposure and air migration exposure pathways represent the central concerns to mercury contamination at the property.

The Florida DEP Preliminary Contamination Assessment analyzed soil samples for mercury at depths ranging from the soil surface to seven (7) feet below land surface (BLS). The Florida DOH relies on soil analytical data that are in surface soil ($\leq$ 12 inches BLS). People do not frequently come into contact with soil deeper than three (3) inches BLS. Therefore, this health consultation is limited to a review of the soil sample analytical results reported for mercury at less than or equal to twelve inches BLS.

Discussion

A. Exposure

The Florida DOH calculated ingestion and inhalation exposure rates for children (the most sensitive population) assuming a "worst-case" scenario of 3 hour exposures per day, 350 days per year, for 30 years. Generally, an exposure rate (also called a daily dose) is given in milligrams of chemical per kilogram of body weight per day (mg/kg/day). A milligram is one-thousandth of a gram (a raisin or paperclip weigh about one gram). A kilogram is about two pounds. The Florida DOH assumed that a 10 kilogram child accidentally ingests 200 milligrams of soil per day, as children are more likely than adults to put their hands and other objects into their mouth on a frequent basis. Children, the ill and pregnant women are the most susceptible to metallic mercury exposure. Metallic mercury exposure is more likely to occur through dermal contact and inhalation of vapors.

Exposure to metallic mercury by inhalation of mercury vapor is the most significant route of entry into the body. As much as 80% of the vapor is absorbed by the lungs and transferred to the bloodstream, where it can travel to the brain. Inhaled metallic mercury vapors are most likely to affect the brain, the central nervous system and the kidneys. Very small amounts of metallic mercury (approximately one-half teaspoon, or the amount contained in one oral thermometer) can raise air concentrations to levels harmful to human health. This is why persons working with or around metallic mercury should avoid tracking metallic mercury into the home where vapors can be released over a long period of time. Vacuuming mercury spreads the vapors in indoor air.

Dermal (skin) exposure to metallic mercury is another possible route of entry into the body, especially after contact with the pure liquid element. Metallic mercury in soil is more likely to bind with small soil particles, and the rate of skin absorption would be reduced.

Research indicates that ingesting metallic mercury is not a significant exposure route. Metallic mercury (such as that found in thermometers) passes through the body mostly unabsorbed. Swallowing one-half teaspoon of metallic mercury will cause little to no adverse health effect.

B. Screening Values

The Florida DOH compared the soil/metal analytical results with health-based screening values. Screening values or comparison values serve to narrow the focus of the health consultation to those contaminants most important to public health. Screening values are health protective numbers, but do not necessarily mean that concentrations in excess of these values will cause illness. The ATSDR does not have a screening value for metallic mercury. Therefore, the Florida DOH used the Florida DEP Soil Cleanup Target Level (SCTL) for residential land, 3.4 mg/kg. Based on the soil analytical results, five of the soil samples between 0 - 12 inches BLS exceeded the screening value. The analytical results in excess of the screening value ranged between 5.6 mg/kg and 210 mg/kg.

C. Metallic Mercury Concentrations

The metallic mercury concentrations in surface soil (≤ 12 inches) for the five samples above the Florida DEP Soil Cleanup Target Level (SCTL) were 5.6 mg/kg, 16 mg/kg, 22 mg/kg, 32 mg/kg and 210 mg/kg. Children playing in the surface soil may have accidentally eaten small amounts of mercury-contaminated surface soil, or inhaled metallic mercury vapors. To estimate children's potential daily exposure rates, the Florida DOH assumed exposure to the maximum mercury surface soil concentration reported, 210 mg/kg.

D. Public Health Implications

The Florida DOH calculated a dose and compared it to doses of mercury known to cause illness in people. The Florida DOH found that accidentally ingesting mercury-contaminated surface soil at this level would not cause any non-cancer illness in children and adults. The Florida DOH found that inhaling metallic mercury vapors at this level also would not cause any non-cancer illness in children and adults. No studies were located regarding adverse health effects in humans or animals after dermal exposure to metallic mercury. Ingestion, absorption and/or inhalation of metallic mercury has not been shown to cause cancer in humans (ATSDR, 1999).

E. Additional Data Needs

Because testing of this property found elevated concentrations of mercury less than 12 inches BLS, the Florida DOH recommends additional sampling to further characterize the lateral extent of mercury contamination of the surface soil. Surface soil samples were collected and analyzed in 1998. Mercury adheres to soil and does not readily migrate in the environment. Metallic mercury will vaporize into the atmosphere over time. Also, it can be converted to inorganic and organic forms that can cause more serious health effects than metallic mercury.

Additional analyses of surface soil at this site should include samples from no more than three inches below land surface (≤ 3 inches BLS). The Florida DOH also suggests that samples be collected from the property immediately to the north of the site where thermometers were noted to exist in the surface soil but where soil sampling was not performed. Soil sample analyses should include tests for total mercury.

F. ATSDR Child Health Initiative

The ATSDR and the Florida DOH, through the ATSDR's Child Health Initiative, 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 are adults for certain kinds of exposure to hazardous substances emitted from waste sites. 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 means they breathe dust,

soil, and heavy vapors (such as those released by metallic mercury) 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 accordingly guide their children.

G. Sensitive Populations

Sensitive populations exhibit a different or enhanced response to contaminants than will most persons exposed to the same level of a contaminant in their environment. Reasons may include genetic makeup, age, health and nutritional status, and exposure to other toxic substances. Persons unusually susceptible to mercury exposure include unborn children, children, the elderly, and persons with diseases of the liver, kidneys, lungs and nerves, as well as those with dietary insufficiencies. Children were used to calculate exposure rates for this health consultation because they are smaller, are more likely to ingest larger amounts of soil, and are more susceptible to contaminants in the environment.

Conclusions

The Leesburg Thermometer Site is an "Indeterminate Public Health Hazard". The extent of contamination of surface soil at the property immediately north of the site has not been adequately characterized. Future testing of the site should include more surface soil samples ($\leq$ 3 inches BLS) to delineate the lateral extent of mercury contamination. The Florida DOH can not rule out possible exposure to elevated concentrations of metallic mercury not detected during the 1998 sampling event, or to other forms of mercury such as inorganic mercury.

Children and adults exposed via ingestion and/or inhalation to the maximum detected concentration (210 mg/kg) of mercury in the surface soil ($\leq$ 12 inches) at the site are not likely to suffer any non-cancer, adverse health effects. There is insufficient evidence to determine whether or not metallic mercury causes cancer when it is ingested, absorbed or inhaled.

Recommendations

Collect and analyze additional surface soil ($\leq$ 3 inches BLS) samples to further characterize the lateral extent of mercury contamination, especially north of the site. Analyze for total mercury.

Avoid tracking mercury-contaminated soil indoors where small amounts of mercury can release harmful vapors over time. Do not attempt to vacuum indoor areas where there is mercury-contaminated soil.

If areas of buried thermometers and/or mercury-contaminated soil are disturbed during excavation or cleanup activities, avoid breathing vapors or coming into contact with mercury-contaminated soil.

Public Health Action Plan

The Florida DOH will provide copies of this health consultation to the Florida Department of Environmental Protection and to the Lake County Health Department.

The Florida DOH will continue to assist the Florida Department of Environmental Protection and Lake County Health Department by reviewing additional environmental data as it becomes available.

References

Florida DEP Preliminary Contamination Assessment, SIS Report 385, January, 1992.

Florida DEP Preliminary Assessment, Site Screening Superfund Subsection, September 28, 2001

ATSDR, 1999. Toxicological Profile for Mercury (Update). Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services.

Risk*Assistant for Windows, Software Version 1.1, Hampshire Research Institute, 1996.

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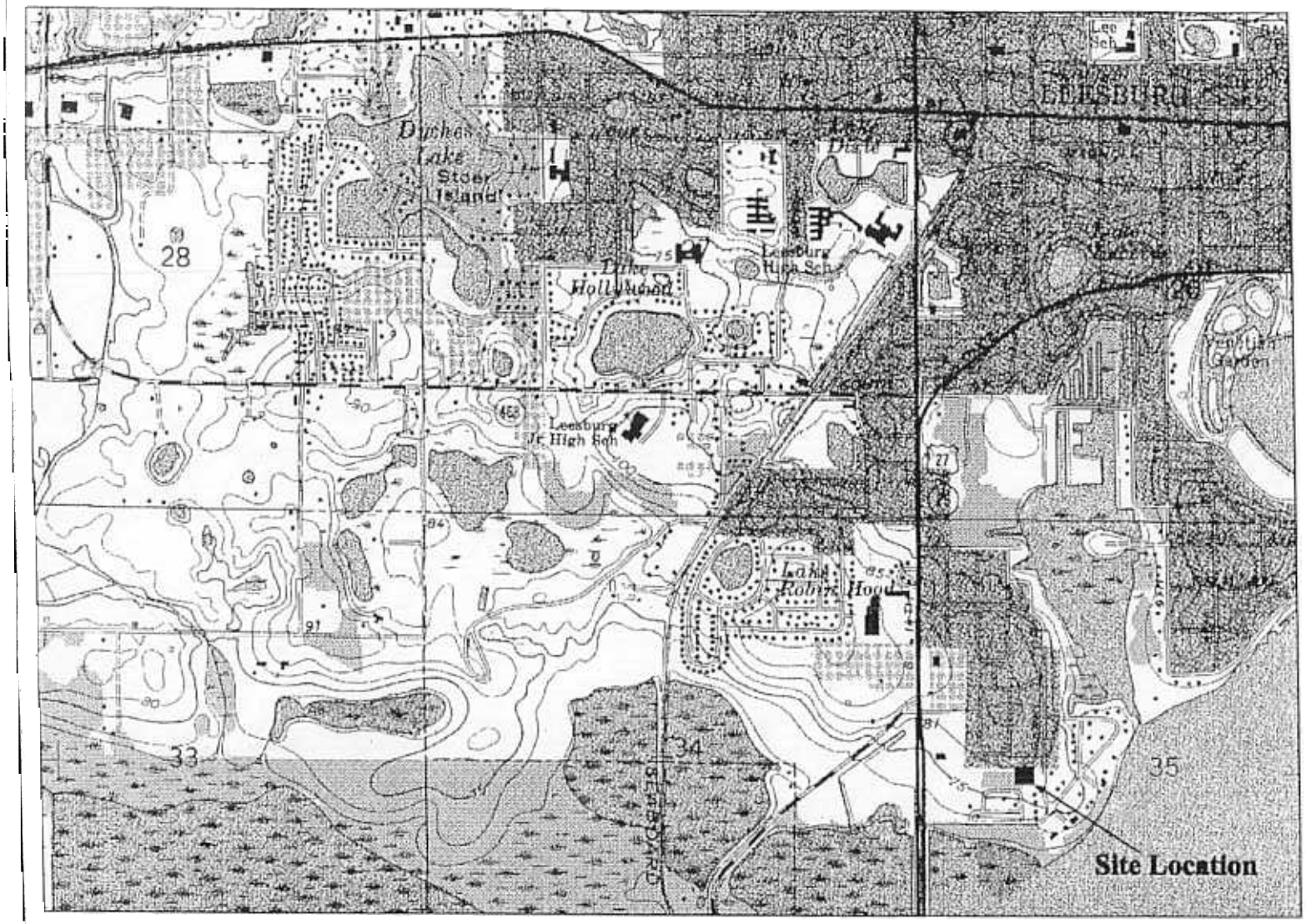
Appendix A - Site Maps

Figure 1: Location Map

Figure 2: Sampling Map



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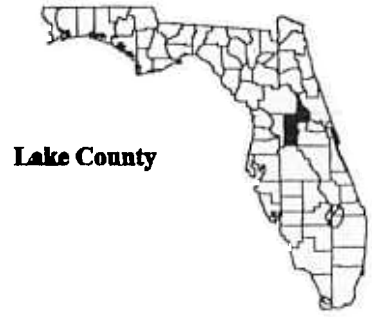

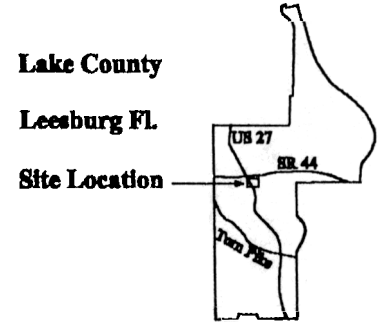

Ginger Circle
Site Location Map
Leesburg Florida, Lake County

DEPARTMENT OF ENVIRONMENTAL PROTECTION
FLORIDA

Figure 1: Location Map

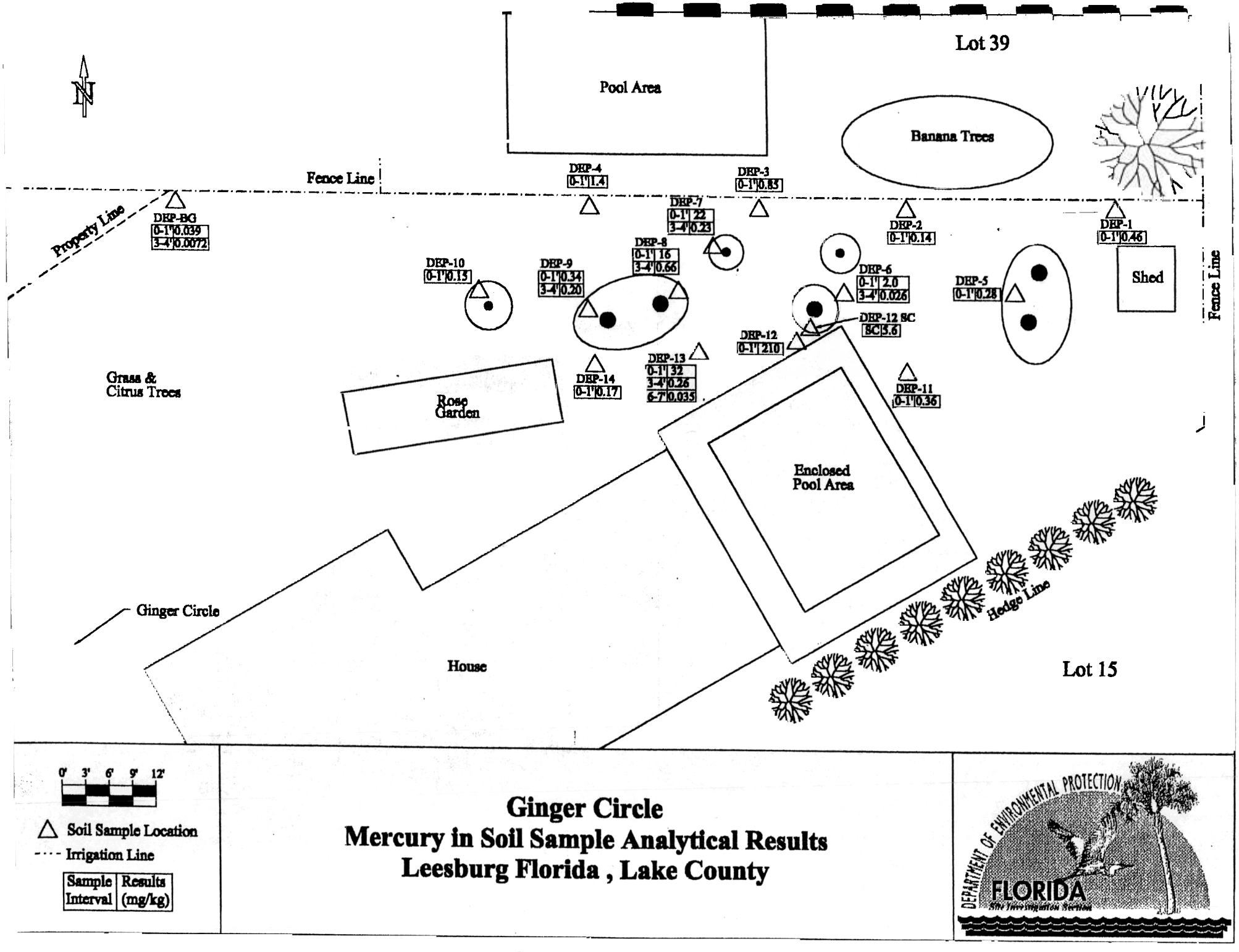

Figure 2: Sampling Map

Certification

This Health Consultation was prepared by the Florida Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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

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