

## **Health Consultation**

**Miami Civic Center Site /  
Evaluation of Fish from Nearby Wagner Creek**

**Miami, Miami-Dade 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  
Department of Health and Human Services**



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## Foreword

This health consultation summarizes findings and addresses public health concerns from eating fish from Wagner Creek near the Miami Civic Center site in Miami, Florida. It is based on a site evaluation prepared by the Florida Department of Health (DOH). A site evaluation involves a number of steps:

*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 people might be exposed to it. Usually, Florida DOH does not collect its own environmental sampling data. We rely on information provided by the Florida Department of Environmental Protection (DEP), the U.S. Environmental Protection Agency (USEPA), and other government agencies, businesses, and the public.

*Evaluating health effects:* If evidence is found that people are being exposed—or could be exposed—to hazardous substances, Florida DOH scientists will take steps to determine whether that exposure could be harmful to human health. Their assessment focuses on public health; that is, the health impact on the community as a whole, and is based on existing scientific information.

*Developing recommendations:* In an evaluation report—such as this health consultation—Florida DOH outlines its conclusions regarding any potential health threat posed by a site, and offers recommendations for reducing or eliminating human exposure to contaminants. The role of Florida DOH in dealing with hazardous waste sites is primarily advisory. For that reason the evaluation report will typically recommend actions to be taken by other agencies—including the EPA and Florida DEP. If, however, the health threat is immediate, Florida DOH will issue a public health advisory warning people of the danger and will work to resolve the problem.

*Soliciting community input:* The evaluation process is interactive. Florida DOH starts by soliciting and evaluating information from various government agencies, the organizations or individuals responsible for cleaning up the site, and from community members who live near the site. Any conclusions are shared with the organizations and individuals who provided information. Once an evaluation report has been prepared, Florida DOH seeks feedback from the public. *If you have questions or comments about this health consultation, we encourage you to contact us.*

*Please write to:*

Susan Bland  
Health Assessment Team  
Bureau of Community Environmental Health  
Florida Department of Health  
4052 Bald Cypress Way, Bin # A-08  
Tallahassee, FL 32399-1712

*Or call us at:* (850) 245-4299, or toll-free during business hours: 1-877-798-2772

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## Summary and Statement of Issues

This health consultation evaluates dioxins, polychlorinated biphenyls (PCBs), and heavy metals in three species of fish from Wagner Creek near the Miami Civic Center (MCC) site in Miami, Florida. The Florida Department of Health (DOH), in cooperation with the U.S. Agency for Toxic Substances and Disease Registry (ATSDR), addresses community health concerns regarding fish consumption near hazardous waste sites and recommends fish advisories if necessary.

### Purpose

In May 2003, the Miami-Dade Department of Environmental Resources Management (DERM) requested the Florida DOH's assistance to assist with coordinating a fish collection from Wagner Creek and to evaluate the fish results for dioxins, PCBs, and heavy metals. This health consultation summarizes the findings of the fish evaluation and makes recommendations about eating fish from Wagner Creek.

## Site Description and History

### Wagner Creek Background

Wagner Creek flows along the northeast corner of the MCC site and is 2–2.5 miles long. The upper portion of the river is fresh to brackish, while the lower region is brackish to marine. Development has eliminated the historic “head” source and flow of the creek. Storm water runoff and tides also influence flow in the creek. This creek “flows” southeast from NW 26th Street to NW 7th Avenue, and then to the Miami River.

The Wagner Creek drainage basin drains a highly urbanized and commercial region of the city. The creek is bordered by and receives drainage from various industrial, institutional (i.e., hospitals, care centers), and governmental (federal, state and county) facilities as well as residential areas.

Local commercial fishermen and residents dock boats along the navigable lower portion of the creek, known as “Seybold Canal.” The lower third has a depth of 8–12 feet. The upper two-thirds of the creek has very limited access and is relatively shallow (4–6 feet).

Adjacent development and land use affects water quality in Wagner Creek. Since 1987, DERM and the South Florida Water Management District have monitored the creek. Although water quality has improved over the years, multiple water quality parameters, including total coliform and fecal coliform, still do not meet state or county water standards.

In 1995-1996, the City of Miami dredged Wagner Creek from NW 20th Street to NW 14th Avenue and has further plans to dredge the entire length of the creek. Upland soil contamination and other contamination concerns prompted the City to test additional sediment samples from Wagner Creek.

In May 2003, because of concerns about fecal coliform bacteria in the water and dioxins in sediments and fish, the city installed 24 warning signs along both sides of Wagner Creek. The signs, printed in both English and Spanish (Photo1), run from NW 20th Street to NW 11th Street and along the Seybold Canal section at the NW 7th Street Bridge. The city also posted signs at other bridges and access points. The distance between signs is currently unavailable. Most of Wagner Creek is fenced and there are few locations for public access. Most public access is for fishing from bridges.

In June 2003, the Florida DOH reviewed DERM's April 2003 surface soil test results (0–6 inches) from 20 homes within a one-mile radius of the MCC site near Wagner Creek (area wide study). DERM tested surface soil samples for metals including arsenic, barium, chromium, and lead. The levels of arsenic, barium, and chromium were all below the ATSDR health-based screening levels for soil and are not likely to cause illness. The lead levels in all the samples were below the Florida Department of Environmental Protection's Soil Cleanup Target Level for residential soils and are not likely to cause illness.

Similarly, the levels of dioxins in all the samples were below the ATSDR screening level of 50 parts per trillion (ppt) toxicity equivalent (TEQ) and are not likely to cause illness.

### **Site Description and Background: Miami Civic Center**

The Miami Civic Center (MCC) property at 1700 NW 14th Avenue in Miami, Florida (Figures 1, 2, and 3), is about 3-acres in size. In the 1930s, the property was residential, and from approximately 1949 until the mid-1980s, it supported a plant nursery in its northwest portion. The residences and nursery had been cleared by 1986, and since then the property has remained vacant. A rolling field with tall grass and a few trees, the lot is surrounded by a small residential housing community to the southeast, a high-rise residential building to the north, a canal to the northeast and major roads to the south, east and west.

From 1989 to 1999, environmental assessments found elevated concentrations of lead and cadmium in the subsurface soil and elevated concentrations of total lead, arsenic, and barium in a non-native layer of ash possibly originating from an incinerator. In 2001, DERM analyzed soil samples for arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, nickel, silver, and zinc. They collected soil samples primarily from the area west of NW 14th Avenue between the small residential housing community to the south and the high-rise residential building to the north.

### **Discussion**

Florida DEP found dioxins in soils on the Miami Civic Center site and in sediments in Wagner Creek. They also tested soils on-site for metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, silver and zinc). After evaluating DEP's data, the Florida DOH found arsenic, cadmium, and lead at levels that could possibly cause health effects. Metals, PCBs and dioxins found in sediments can also potentially bioaccumulate in the creek's fish.

### **Fish Collection**

In May 2003, DERM collected 99 fish from four locations along Wagner Creek. DERM collected yellowfin mojarra, striped mojarra, checkered pufferfish, striped mullet, jaguar guapote

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and common snook (Fish Photos 1–6). After separating all the fish by species and location, DERM used 10 fish samples from Wagner Creek (Table I).

DERM collected fish from four stations (Figure 4). At WCR-1 and WCR-3, Wagner Creek is not fenced and is accessible for fishing. Individuals fish at WCR-3. Houses line Wagner Creek between WCR-1 and WCR-2 (Appendix A).

Appendix B includes general information about PCBs, metals and dioxins in fish and the environment.

### **Laboratory Fish Analyses and Results**

In June 2003, Severn Trent Laboratories (STL) in Miami analyzed the fish (fillets with skins on) for DERM. Because DERM only collected two jaguar guapote and two common snook, the Florida DOH did not include these species. Florida DOH requires at least 10 fish to be representative of a particular species. Tables II-VI contain the results for the four species of fish evaluated by the Florida DOH.

### **Evaluation of Fish Results**

In June 2003, Florida DOH received and evaluated the fish results for dioxins, PCBs, and metals. The concentrations of PCBs and metals in fish from Wagner Creek were within normal limits. The levels of dioxins in checkered puffer and striped mojarra samples were above the Florida DOH's fish advisory level of 7 ppt.

For all chemicals, we assumed adults eat 30 grams of fish per day (about one eight ounce meal per week) and a child eats 15 grams of fish per day (about one four ounce meal per week). We assumed a child weighs 15 kilograms and an adult weighs 70 kilograms. We calculated doses in milligrams per kilogram per day (mg/kg/day). We then compared these doses to ATSDR's Minimal Risk Levels (MRLs) or Lowest Observed Adverse Effect Level (LOAELs).

### ***PCBs***

Table I summarizes the concentrations of PCBs in fish from Wagner Creek near the Miami Civic Center site. DERM analyzed for 18 of 209 PCBs congeners. These 18 represent the PCBs that persist longest in fish. In the four fish species analyzed, concentrations of the 18 PCB congeners ranged from 79–308 ppb).

Most national fish studies do not include fish species included in this health consultation. Using the highest PCB level found in the striped mojarra (308 ppb), we estimated a dose for people eating these fish. We compared this dose with the LOAEL from animal studies using the most toxic PCB mixture (Arochlor 1254). The estimated dose for the most contaminated Wagner Creek fish is 25 times less than the LOAEL. Therefore, we do not expect any illness from eating PCBs in the fish from Wagner Creek.

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***Metals (Arsenic, Cadmium, Lead and Mercury)***

Tables 2-5 summarize the concentrations of arsenic, cadmium, lead, and mercury in striped mojarra, yellowfin mojarra, checkered puffer, and striped mullet from Wagner Creek. Most of the metal concentrations were lower than the laboratory detection limit. None of the metal levels in the four fish species tested are likely to cause illness.

***Arsenic (Total)***

DERM tested fish from Wagner Creek for arsenic even though fish convert most of their arsenic to its non-toxic organic form. We do not expect any illness from arsenic found in the fish from Wagner Creek.

***Cadmium***

The concentrations of cadmium in fish from Wagner Creek were below laboratory detection limits. Therefore, we do not expect any illness from eating cadmium in the fish from Wagner Creek.

***Lead***

The concentrations of lead in fish from Wagner Creek were below laboratory detection limits. Therefore, we do not expect any illness from eating lead in the fish from Wagner Creek.

***Mercury***

Of all the fish samples tested, only one checkered puffer fish had a level (0.26 ppm) above the laboratory detection limit. This level is lower than the EPA fish guidance level of 0.30 ppm. Therefore, we do not expect any illness from eating mercury in the fish from Wagner Creek.

***Dioxins***

DOH used Toxicity Equivalents (TEQs) to calculate an ingestion dose of dioxins/furans for children and adults. A TEQ is the mean concentration of the total dioxin/furan toxic equivalents. TEQ dioxin levels in the tested checkered puffer fish (8.5 ppt) and striped mojarra (8.5 ppt) were above the DOH's fish advisory level of 7 ppt.

***Fish Advisory Issued***

Because dioxin levels found in the checkered puffers and striped mojarras were above DOH's fish advisory level, DOH issued a fish advisory in July 2003. At the same time, the Miami-Dade County Health Department issued a press release. The advisory stated people should not eat checkered puffer or striped mojarra from Wagner Creek. DOH also recommended caution in eating yellowfin mojarra, because they look similar to striped mojarras (Attachments G and H).

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## Other Health-Based Standards

Currently, the U.S. Food and Drug Administration (FDA) has published action levels for methylmercury and PCBs in fish. FDA's action level is 1 ppm methylmercury in the edible portion of fish, and 2 ppm for total PCBs (FDA 2002). Both action levels are based on commercial fish.

The FDA does not have action levels for arsenic, cadmium, lead, dioxins, or furans in human food (DHHS 1998). Because dioxin analysis is costly and time-consuming, only limited data are available on background levels in most foods. FDA is expanding its monitoring program to obtain more comprehensive data on background levels and to identify opportunities to reduce human exposure to dioxins (FDA 2002).

## Child Health Consideration and Other Susceptible Populations

ATSDR recognizes that developing young people, whether fetuses, infants, or children, have unique vulnerabilities. Children are not small adults; a child's exposure can differ from an adult's exposure in many ways. A child drinks more fluids, eats more food, and breathes more air per kilogram of body weight than an adult and, furthermore, has a larger skin surface area in proportion to body volume. A child's behavior and lifestyle also influence exposure. Children crawl on floors, put things in their mouths, play close to the ground, and spend more time outdoors. These behaviors may result in longer exposure durations and higher intake rates (ATSDR 1999).

The effect of hormonal variations, pregnancy, and lactation can change the way a woman's body responds to some substances. Past exposures experienced by the mother, as well as exposure during pregnancy and lactation, can expose a fetus or infant to chemicals through the placenta or breast milk. Depending on the stage of pregnancy, the nature of the chemical involved and the dose of that chemical, fetal exposure can result in problems such as miscarriage, stillbirth, and birth defects.

The Florida DOH included women and children in their fish evaluation for dioxins, PCBs and metals. The dioxin fish advisory for mojarra and puffer fish applies to children and adults alike. Therefore, the Florida DOH recommends children and adults follow the fish advisory (Attachment G and H) and not eat checkered puffer or striped mojarra from Wagner Creek. As an extra precaution against mistaking one species for the other, DOH also recommends that children and adults avoid eating yellowfin mojarra because these fish look similar to striped mojarra.

## Conclusions

Because of elevated dioxin levels, children and adults should not eat checkered puffer and striped mojarra fish from Wagner Creek. As an extra precaution against mistaking one species for the other, DOH also recommends that children and adults avoid eating yellowfin mojarra because these fish look similar to striped mojarra.

Fish advisory signs are already posted and a press release was issued in July 2003. Therefore, the Miami Civic Center/Wagner Creek site poses no apparent public health hazard from eating fish from Wagner Creek.

## **Recommendations**

The Florida DOH recommends the warning signs posted by the City of Miami along Wagner Creek remain until contamination is cleaned-up and fish are retested with levels below health concern.

The Florida DOH recommends DERM continue to evaluate dioxins in the sediments in and along Wagner Creek and submit new environmental or biota data to the Florida DOH for evaluation as needed.

## **Public Health Action Plan**

### ***Past Actions:***

In September 2001, the Florida DOH prepared a health consultation report evaluating soil sampling and analyses at the site conducted by the Miami-Dade Department of Environmental Resources Management (DERM). Based on these metal results in soils, the Florida DOH found the Miami Civic Center property an “Indeterminate Public Health Hazard.” The Florida DOH could not rule out possible exposure to elevated concentrations of incinerator wastes other than heavy metals.

In the 2001 health consultation report, the concentrations of barium, chromium, iron, mercury, nickel, silver, and zinc in the Miami Civic Center property surface soil ( $\leq 3$  inches) were all below health-based screening values. Therefore, these soil levels are unlikely to cause any illness.

DOH’s recommendations were as follows:

1. DERM collected and analyzed 8–10 additional surface soil (3 inches) samples to characterize further the extent of incinerator ash contamination at the property. DERM analyzed these samples for arsenic, barium, cadmium, chromium, lead, mercury, dibenzodioxins (PCDD) and dibenzofurans (PCDF).
2. The property owner should restrict access to the MCC property.
3. If the vegetative cover is removed and/or the surface soil disturbed, dust suppression and air monitoring activities would probably reduce inhalable dust generation and exposure potential at the Miami Civic Center property.

In June 2003, the Florida DOH reviewed DERM’s April 2003 surface soil test results (0–6 inches) from an area-wide study involving 20 homes within a one-mile radius of the MCC site near Wagner Creek.

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DERM tested surface soil samples for metals including arsenic, barium, chromium and lead. The levels of arsenic, barium, and chromium were all below ATSDR's health-based screening levels for soil and are not likely to cause illness. The levels of lead in all the samples were below the Florida Department of Environmental Protection's soil cleanup target level for residential soils and are not likely to cause illness. DERM also tested for dioxins. Dioxin levels in all the samples fell below ATSDR's screening level of 50 ppt toxicity equivalent (TEQ) and are not likely to cause illness.

In May 2003, the Florida DOH prepared a health consultation evaluating blood cadmium and lead results from two children, ages 1½ and 2 years, who lived in the nearby apartment complex. DOH found the blood cadmium and lead levels were in the acceptable range and are unlikely to cause illness. In July 2003, Florida DOH issued a fish advisory and the Miami-Dade County Health Department issued a press release. The advisory stated people should not eat checkered puffer or striped mojarra from Wagner Creek. DOH also recommended caution in eating yellow fin mojarra, as they look similar to striped mojarra (Attachments G and H).

Planned Actions:  
None.

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## **Preparers of the Report**

### **Author**

Susan Ann Bland  
Biological Scientist  
Bureau of Community Environmental Health  
Florida Department of Health

### **Florida Department of Health Designated Reviewer**

Randy Merchant  
Program Administrator  
Bureau of Community Environmental Health  
Florida Department of Health

### **ATSDR Technical Project Officer**

Debra Gable  
Division of Health Assessment and Consultation  
Superfund Site Assessment Branch  
Agency for Toxic Substances and Disease Registry

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## Glossary

*Note: Not all definitions provided below necessarily appear in the preceding health document.*

### **Acute**

Occurring over a short time [compare with chronic].

### **Acute exposure**

Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with intermediate duration exposure and chronic exposure].

### **Adverse health effect**

A change in body function or cell structure that might lead to disease or health problems

### **Analyte**

A substance measured in the laboratory. A chemical for which a sample (such as water, air, or blood) is tested in a laboratory. For example, if the analyte is mercury, the laboratory test will determine the amount of mercury in the sample.

### **Analytic epidemiologic study**

A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.

### **ATSDR**

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

### **Background level**

An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.

### **Biodegradation**

Decomposition or breakdown of a substance through the action of microorganisms (such as bacteria or fungi) or other natural physical processes (such as sunlight).

### **Biologic monitoring**

Measuring hazardous substances in biologic materials (such as blood, hair, urine, or breath) to determine whether exposure has occurred. A blood test for lead is an example of biologic monitoring.

### **Biologic uptake**

The transfer of substances from the environment to plants, animals, and humans.

### **Biota**

Plants and animals in an environment. Some of these plants and animals might be sources of

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food, clothing, or medicines for people.

**Body burden**

The total amount of a substance in the body. Some substances build up in the body because they are stored in fat or bone or because they leave the body very slowly.

**Cancer**

Any one of a group of diseases that occur when cells in the body become abnormal and grow or multiply out of control.

**Cancer risk**

A theoretical risk for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.

**Carcinogen**

A substance that causes cancer.

**CERCLA** [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980]

**Chronic**

Occurring over a long time [compare with acute].

**Chronic exposure**

Contact with a substance that occurs over a long time (more than 1 year) [compare with acute exposure and intermediate duration exposure]

**Comparison value (CV)**

Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

**Completed exposure pathway** [see exposure pathway].

**Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)**

CERCLA, also known as Superfund, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances. This law was later amended by the Superfund Amendments and Reauthorization Act (SARA).

**Concentration**

The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

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**Contaminant**

A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

**Dermal**

Referring to the skin. For example, dermal absorption means passing through the skin.

**Dermal contact**

Contact with (touching) the skin [see route of exposure].

**Detection limit**

The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

**Dose (for chemicals that are not radioactive)**

The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

**Dose-response relationship**

The relationship between the amount of exposure [dose] to a substance and the resulting changes in body function or health (response).

**Environmental media**

Soil, water, air, biota (plants and animals), or any other parts of the environment that can contain contaminants.

**Environmental media and transport mechanism**

Environmental media include water, air, soil, and biota (plants and animals). Transport mechanisms move contaminants from the source to points where human exposure can occur. The environmental media and transport mechanism is the second part of an exposure pathway.

**EPA**

United States Environmental Protection Agency.

**Epidemiology**

The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

**Exposure**

Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].

**Exposure assessment**

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The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.

**Exposure-dose reconstruction**

A method of estimating the amount of people's past exposure to hazardous substances. Computer and approximation methods are used when past information is limited, not available, or missing.

**Exposure investigation**

The collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.

**Exposure pathway**

The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.

**Hazard**

A source of potential harm from past, current, or future exposures.

**Hazardous Substance Release and Health Effects Database (HazDat)**

The scientific and administrative database system developed by ATSDR to manage data collection, retrieval, and analysis of site-specific information on hazardous substances, community health concerns, and public health activities.

**Hazardous waste**

Potentially harmful substances that have been released or discarded into the environment.

**Health consultation**

A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical [compare with public health assessment].

**Indeterminate public health hazard**

The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.

**Incidence**

The number of new cases of disease in a defined population over a specific time period [contrast with [prevalence](#)].

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**Ingestion**

The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see [route of exposure](#)].

**Inhalation**

The act of breathing. A hazardous substance can enter the body this way [see [route of exposure](#)].

**Intermediate duration exposure**

Contact with a substance that occurs for more than 14 days and less than a year [compare with [acute exposure](#) and [chronic exposure](#)].

**Lowest-observed-adverse-effect level (LOAEL)**

The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

**mg/kg**

Milligram per kilogram.

**mg/cm<sup>2</sup>**

Milligram per square centimeter (of a surface).

**mg/m<sup>3</sup>**

Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.

**Migration**

Moving from one location to another.

**Minimal risk level (MRL)**

An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see reference dose].

**Morbidity**

State of being ill or diseased. Morbidity is the occurrence of a disease or condition that alters health and quality of life.

**Mortality**

Death. Usually the cause (a specific disease, a condition, or an injury) is stated.

**No apparent public health hazard**

A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.

**No-observed-adverse-effect level (NOAEL)**

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The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

**No public health hazard**

A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.

**Point of exposure**

The place where someone can come into contact with a substance present in the environment [see exposure pathway].

**Population**

A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).

**ppb**

Parts per billion.

**ppm**

Parts per million.

**Prevention**

Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.

**Public health action**

A list of steps to protect public health.

**Public health advisory**

A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human health.

**Public health assessment (PHA)**

An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The PHA also lists actions that need to be taken to protect public health [compare with health consultation].

**Public health hazard**

A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or radionuclides that could result in harmful health effects.

**Public health hazard categories**

Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are no public health hazard,

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no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.

**Receptor population**

People who could come into contact with hazardous substances [see exposure pathway].

**Reference dose (RfD)**

An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.

**Risk**

The probability that something will cause injury or harm.

**Risk reduction**

Actions that can decrease the likelihood that individuals, groups, or communities will experience disease or other health conditions.

**Route of exposure**

The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].

**Sample**

A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see population]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

**Sample size**

The number of units chosen from a population or an environment.

**Source of contamination**

The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an exposure pathway.

**Special populations**

People who might be more sensitive or susceptible to exposure to hazardous substances because of factors such as age, occupation, sex, or behaviors (for example, cigarette smoking). Children, pregnant women, and older people are often considered special populations.

**Substance**

A chemical.

**Toxic agent**

Chemical or physical (for example, radiation, heat, cold, microwaves) agents that, under certain circumstances of exposure, can cause harmful effects to living organisms.

**Toxicological profile**

An ATSDR document that examines, summarizes, and interprets information about a hazardous

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substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.

**Toxicology**

The study of the harmful effects of substances on humans or animals.