Health Consultation

PUBLIC COMMENT VERSION

Springstead and Hogtown Creek Sediments

CABOT CARBON-KOPPERS HAZARDOUS WASTE SITE
GAINESVILLE, ALACHUA COUNTY, FLORIDA

EPA FACILITY ID: FLD980709356

Prepared by
Florida Department of Health

JUNE 23, 2010

COMMENT PERIOD ENDS: AUGUST 23, 2010

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

Health Consultation: A Note of Explanation

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

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

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Under Cooperative Agreement with
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Agency for Toxic Substances and Disease Registry (ATSDR)

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Foreword

The Florida Department of Health (DOH) evaluates the public health threat of hazardous waste sites through a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR) in Atlanta, Georgia. This health consultation is part of an ongoing effort to evaluate health effects associated with contamination from the Cabot Carbon-Koppers hazardous waste site. The Florida 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. The US Environmental Protection Agency (EPA), the Florida Department of Environmental Protection (DEP), and the Alachua County Environmental Protection Department (EPD) provided the information for this assessment.

■ Evaluating health effects: If we find evidence that exposures to hazardous substances are occurring or might occur, 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 impact on the community as a whole, and base it on existing scientific information.

■ Developing recommendations: In this report, the Florida DOH outlines, in plain language, its conclusions regarding any potential health threat posed by nearby creek sediments, and offers recommendations 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 US EPA and the Florida DEP. If, however, an immediate health threat exists or is imminent, 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. 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.

Please write to: Bureau of Environmental Public Health Medicine
Florida Department Health
4052 Bald Cypress Way, Bin # A-08
Tallahassee, FL 32399-1712

Or call us at: 850 245-4299 or toll-free in Florida: 1-877-798-2772

Summary

INTRODUCTION

Along Springstead and Hogtown creeks, the Florida Department of Health's (DOH) top priority is providing trusted health information.

The Cabot Carbon-Koppers hazardous waste site is northwest of the intersection of NW 23rd Avenue and North Main Street in Gainesville. In 1967 and 1977 developers released large volumes of pine tar waste from the former Cabot Carbon site into a ditch leading to Springstead Creek. Stormwater runoff from the Koppers site also drains into Springstead Creek. As a result, sediments in off-site ditches, Springstead Creek, and Hogtown Creek, up to 5 miles downstream of the site, are contaminated.

CONCLUSION

Florida DOH concludes that incidental ingestion (swallowing) of very small amounts of contaminated sediments in off-site ditches, Springstead Creek, or Hogtown Creek downstream of the Cabot Carbon-Koppers site will not harm people's health. Because sediments were not tested for dioxins prior to 2009, Florida DOH can't evaluate the past health risk from exposure to dioxin-contaminated sediments. Contaminant concentrations are, however, still above state cleanup target levels and should be cleaned up.

BASIS FOR DECISION

The highest concentrations of arsenic, polycyclic aromatic hydrocarbons (PAHs), and dioxins in the sediments are below levels likely to cause non-cancer illness. The highest concentrations of these contaminants would result in, at most, a very low to extremely low theoretical increased cancer risk.

NEXT STEPS

The US Environmental Protection Agency is working with the responsible party on a plan to remove contaminated sediments.

FOR MORE INFORMATION

If you have concerns about your health or the health of your family, you should contact your health care provider. You may also call the Florida DOH toll-free at 877 798-2772 and ask for information about the Cabot Carbon-Koppers hazardous waste site.

Background and Statement of Issues

The purpose of this health consultation report is to assess the public health threat from contaminated sediments in the North Main Street ditch, the North Main Terrace ditch, Springstead Creek and Hogtown Creek downstream of the Cabot Carbon-Koppers hazardous waste site. The Alachua County Health Department (CHD) requested this assessment. The Cabot Carbon-Koppers hazardous waste site is northwest of the intersection of NW 23rd Avenue and North Main Street in Gainesville (Figure 1).

Health scientists look at what chemicals are present and in what amounts. They compare those amounts to national guidelines. These guidelines are set far below known or suspected levels associated with health effects. Florida Department of Health (DOH) uses guidelines developed to protect children. If chemicals are not present at levels high enough to harm children, they would not likely harm adults.

This assessment considers health concerns of nearby residents and explores possible associations with site-related contaminants. This assessment requires the use of assumptions, judgments, and incomplete data. These factors contribute to uncertainty in evaluating the health threat. Assumptions and judgments in this assessment err on the side of protecting public health and may overestimate the risk.

This assessment estimates the health risk for individuals exposed to the highest measured level of contamination in the creek sediments. For those individuals who don't come into contact with the creek sediments, the health risk is essentially zero.

Site Description

The 140-acre Cabot Carbon-Koppers hazardous waste site is at 200 N.W. 23rd Blvd. northwest of the intersection of NW 23rd Avenue and North Main Street in Gainesville, Alachua County, Florida 32601 (Figure 1).

The 90-acre Koppers site has been used for wood treatment since 1916. Historically, Koppers preserved wood utility poles and timber using three different chemicals: creosote, pentachlorophenol (PCP) and chromated copper arsenate (CCA). Past waste disposal caused soil and groundwater contamination. Contaminants from Koppers have impacted soil west of the site. In December 2009, Koppers announced it was ceasing operations.

The 50-acre Cabot Carbon site was used to process pine trees beginning in the early 1900s. The Cabot Carbon Company bought the site in 1945 and began making chemicals and charcoal from pine trees. The processing, which consisted of the destructive distillation of pine stumps, resulted in the generation of a large number of liquid products that in the past were marked as "blended solvents." Like the Koppers site, past waste disposal at Cabot Carbon caused soil and groundwater contamination. Cabot Carbon ceased operations in 1966.

Surface water runoff from the former Cabot Carbon portion of the site discharges to the North Main Street ditch which discharges into the North Main Terrace ditch. This ditch empties into Springstead Creek. Springstead Creek parallels the site's northern boundary. Surface water runoff from the Koppers portion of the site also discharges into Springstead Creek. Springstead Creek discharges into Hogtown Creek west of the site (Figures 1 & 2). Hogtown Creek drains southward for about 10 miles where it ultimately discharges to the Floridan aquifer by way of Haile Sink.

In 1967 and 1977, developers released large volumes of pine tar waste from the former Cabot Carbon site into a ditch leading to Springstead Creek [EPA 1990]. Subsequent investigations confirmed citizens' complaints of black, tarry wastes in both Springstead and Hogtown creeks. A "sump" in the Hogtown Creek flood plain was used to collect these tarry wastes [ACEPD 2007]. A commercial shopping mall, a car dealership, and a series of smaller stores and businesses now occupy the former Cabot Carbon site.

Starting in 1979, the US Environmental Protection Agency (EPA) and Florida DEP detected various organic chemicals, including aromatic and polycyclic aromatic hydrocarbons (PAHs) in soil and groundwater on both the Koppers and Cabot Carbon sites. In 1983, EPA added the Cabot Carbon-Koppers site to their Superfund National Priorities List (NPL). Most nearby homes and businesses receive municipal water from distant wells. Water quality in the several private drinking water wells within 0.25 miles of the site meets safe drinking water standards (Alachua CHD, unpublished data, 2010).

In 1985, the party responsible for the former Cabot Carbon site installed a surface water interceptor system to prevent contamination from entering the ditch leading to Springstead Creek. In 1995, they also excavated sediments from a short section of the North Main Street ditch and installed a trench to intercept contaminated shallow aquifer groundwater. The responsible party has been treating contaminated groundwater under the Koppers site since 1995. In December 2009, Koppers announced plans to cease operations.

In the near future, the responsible party plans to cleanup the soil on the Koppers site. There has been no cleanup of contaminated sediments in the North Main Terrace ditch, Springstead or Hogtown creeks. EPA and the party responsible for the former Cabot Carbon site are discussing plans to cleanup these sediments.

Previous Health Assessments

In 1989, Florida DOH (then known as Health and Rehabilitative Services or HRS) reviewed the existing environmental data. They found the Cabot Carbon-Koppers site a potential health risk, recommended warning signs around the site, and recommended additional environmental testing [ATSDR 1989]. In 1993, Florida HRS found most of its 1989 recommendations had been followed but recommended warning signs around the site and a more complete public health assessment [ATSDR 1993]. In 1995, Florida HRS again reviewed environmental data from the site. They found arsenic levels in Springstead Creek sediments at the Koppers drainage ditch outfall in 1981 if ingested for

more than a year could cause gastrointestinal irritation, pigmentation changes, and hyperkeratosis. In subsequent years, sediment arsenic levels dropped and were not likely to cause illness. Levels of chromium, phenol and benzene in sediments were not likely to cause illness. Florida HRS recommended warning signs around the site, restricted site access, and additional environmental testing [ATSDR 1995a].

In 1990, consultants for the responsible parties estimated 7 to 13 year-old adolescents playing in Springstead Creek were at a 1 in 10,000 (1×10^{-4}) increased risk of cancer from incidental ingestion (swallowing) of PAH contaminated sediments [Hunter/ESE 1990].

In a July 2009 report, Florida DOH reviewed the results of surface soil testing in the Stephen Foster neighborhood west of Koppers. They concluded that incidental ingestion (swallowing) of very small amounts of dioxin-contaminated surface soil from the City of Gainesville easement just west of Koppers for more than a year could possibly harm children's health. They recommended more testing and that parents keep their children from playing in this easement [ATSDR 2009].

In a June 2010 report, Florida DOH found that incidental ingestion (swallowing) of very small amounts of dioxin-contaminated surface soil tested in June and December 2009 along Stephen Foster roadsides is not expected to harm people's health. They concluded, however, that the extent of testing was inadequate and recommended surface soil testing in residential yards [ATSDR 2010].

Site Visit

On June 11, 2009, Florida DOH staff viewed the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek downstream of the Cabot Carbon-Koppers site. They observed both Springstead and Hogtown Creek beds were 10 to 15 feet across, had sandy bottoms, were lined with vegetation, and were heavily shaded by trees. At the time of their visit, water in the creeks was clear and less than one foot deep. Land use near the creeks was mostly residential. The ditch and creeks were readily accessible to the public. Site conditions have not changed since then.

Demographics

Approximately 7,170 people live within 1 mile of the Cabot Carbon-Koppers site. Sixty-three percent (63%) are white, 31% are African-American, 4% are Hispanic origin, and 2% are other. Twenty-five percent (22%) are less than 18 years old and 78% are older than 18. Forty-four percent (44%) have a high school diploma or less and 56% have at least two years of college. Ninety-one percent (91%) speak only English and 82% make less than $50,000 a year [EPA 2010a].

Land Use

Land use south, west, and north of the Koppers site is residential. Land use on and east of the former Cabot Carbon site is commercial. Land use near Springstead and Hogtown creeks is mostly residential.

Community Health Concerns

Since 1967, nearby residents have been concerned about the health risk from exposure to contaminated sediments in Springstead and Hogtown creeks [EPA 1990, ACEPD 2007].

Discussion

Pathway Analyses

Chemical contamination in the environment can harm people's health but only if they have contact with those contaminants (exposure). Without contact or exposure, there is no harm to health. If there is contact or exposure, how much of the contaminants they contact (concentration), how often they contact them (frequency), for how long they contact them (duration), and the danger of the contaminant (toxicity) all determine the risk of harm.

Knowing or estimating the frequency with which people could have contact with hazardous substances is essential to assessing the public health importance of these contaminants. To decide if people can contact contaminants at or near a site, Florida DOH looks at human exposure pathways. Exposure pathways have five parts. They are:

1. a source of contamination like a hazardous waste site,
2. an environmental medium like air, water, or soil that can hold or move the contamination,
3. a point where people come into contact with a contaminated medium like water at the tap or soil in the yard,
4. an exposure route like ingesting (contaminated soil or water) or breathing (contaminated air),
5. a population who could be exposed to contamination like nearby residents.

Florida DOH eliminates an exposure pathway if at least one of the five parts referenced above is missing and will not occur in the future. Exposure pathways not eliminated are either completed or potential. For completed pathways, all five pathway parts exist and exposure to a contaminant has occurred, is occurring, or will occur. For potential pathways, at least one of the five parts is missing, but could exist. Also for potential pathways, exposure to a contaminant could have occurred, could be occurring, or could occur in the future.

Compared to ingestion (eating/drinking) and inhalation (breathing), the risk from dermal exposure (skin absorption) is usually insignificant. Therefore, human health risk assessments don't typically quantify the risk from skin absorption.

For this assessment we evaluated the long-term health threat from incidental ingestion (swallowing) of very small amounts of sediment from the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek downstream of the Cabot Carbon-Koppers site. These sediments are contaminated with arsenic, PAHs, and dioxins. We considered past, current, and future exposures for this completed pathway (Table 1).

Past Exposure – The Cabot Carbon-Koppers site was a source of contamination. Sediments carried by stormwater runoff were the environmental media. North Main Street ditch, North Main Terrace ditch, Springstead Creek, and Hogtown Creek downstream of the site were points of exposure. Between 1967 and 2006, people who walked in or along these ditches and creeks were the exposed population.

Current Exposure – The Cabot Carbon-Koppers site is a source of contamination. Sediments carried by stormwater runoff are the environmental media. In 2009, surface sediments (0 – 6 inches deep) in the North Main Street ditch, the North Main Terrace Ditch, Springstead Creek, and Hogtown Creek downstream of the site were points of exposure. People who walk in or along these ditches and creeks are the exposed population.

Future Exposure – The Cabot Carbon-Koppers site would be a source of contamination. Sediments carried by stormwater runoff would be the environmental media. Subsurface sediments (6 – 24 inches deep) in the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek downstream of the site would be points of exposure. Although sediments 6 -24 inches deep are currently buried below other sediments, heavy rainfall can cause flooding to uncover them. People who walk in or along these ditches and creeks would be the exposed population.

Environmental Data

Stormwater runoff from the former Cabot Carbon site into Springstead Creek started when operations began in the early 1900s. Stormwater runoff from the Koppers site into Springstead Creek started when operations began in 1916. Although the University of Florida reported in 1961 and 1962 that site runoff was having a detrimental effect on Hogtown Creek, there was little interest until 1967 when a developer released a large volume of pine tar waste from the former Cabot Carbon site. Shortly afterwards, residents along Springstead and Hogtown creeks downstream of the site began complaining of a black, smelly, tarry waste. In 1977, another developer released more liquid waste from the former Cabot Carbon site [EPA 1990].

In 1977, Florida Department of Environmental Protection (DEP) surveyed Springstead and Hogtown creeks 1 mile downstream of the site and, except for bacteria, found them devoid of life [IT 1987].

In 1979, EPA investigated and observed a black residue staining the banks and stream bed downstream of the site. They tested this residue and three downstream sediment samples from an unspecified depth (Figure 2) and found contaminants associated with Cabot Carbon. They found the biological health of Springstead and Hogtown creeks was damaged up to 5 miles downstream of the site [IT 1987]. In 1983, EPA again investigated and found PAHs associated with Cabot Carbon in the sediments of the North Main Street ditch and Springstead Creek downstream of site [EPA 1984].

In 1986, Florida DEP tested three sediments samples (depth unspecified) from the North Main Street ditch (Figure 2) and found metals and PAHs [Gradient 2008]. In 1987, consultants for Florida DEP tested five sediment samples (depth unspecified) from the North Main Street and North Main Terrace ditches and found metals and PAHs [IT 1987]. In 1988 consultants collected five more sediment samples (depth unspecified) from the North Main Street ditch and found metals [Gradient 2008].

Between 1994 and 2000, the Alachua County Environmental Protection Department (CEPD) found site-related metals and PAHs in eight Springstead and Hogtown creeks sediment samples downstream of the site (Figure 2). Testing, however, did not include dioxins or furans [ACEPD 2007]. In 2006, Alachua CEPD collected six sediment samples from Springstead Creek (Figure 2) and found low levels of arsenic and PAHs at the Koppers drainage ditch outfall [ACEPD 2006]. Table 2 summarizes sediment contaminant concentrations between 1979 and 2006.

In 2007, Alachua CEPD reported tar-like sediments from the Cabot Carbon-Koppers site were visible along the banks of Hogtown Creek [ACEPD 2007].

In December 2008, Alachua CEPD visually surveyed the North Main Terrace ditch, Springstead Creek, and Hogtown Creek 0.5 mile below its confluence with Springstead Creek. They identified areas of stained sediments and sediments with chemical odors. Between January and February 2009, Alachua CEPD collected 21 sediment samples (10 at 0-6" and 11 at 6-24" deep) from ditch/creek areas with stained and/or odorous sediments (Figure 3). They analyzed these samples for metals (copper, chromium, arsenic, aluminum, and iron), VOCs, semivolatile organic chemicals (SVOCs), pentachlorophenol, dioxins, and furans. They found elevated concentrations of arsenic, PAHs and dioxins (Tables 3 & 4) [ACEPD 2009].

In November 2009, the Alachua CEPD collected two composite sediment samples (0-6 inches deep) from Springstead Creek about 0.1 miles east of NW 6th Street (Figure 4). They analyzed for metals, SVOCs, dioxins, and furans. They found elevated concentrations of arsenic, PAHs and dioxins (Table 3) (Alachua CEPD, unpublished data, 2009).

For the purpose of this assessment, 2009 testing of sediments in the North Main Terrace ditch, Springstead Creek, and Hogtown Creek was adequate to assess the current and future public health threat.

Identifying Contaminants of Concern

Florida DOH compared the maximum contaminant concentrations to ATSDR and other comparison values. Comparison values are specific for the medium contaminated (soil, water, air, etc.). We screened the environmental data using these comparison values:

- ATSDR Environmental Media Evaluation Guides (EMEGs)
- ATSDR Reference Media Evaluation Guides (RMEGs)
- Florida DEP Soil Cleanup Target Levels (SCTLs)
- EPA Maximum Contaminant Levels (MCLs)
- Other guidelines

When determining which comparison value to use, Florida DOH follows ATSDR's general hierarchy and used professional judgment when no clear comparison values were available.

We selected for further evaluation contaminants with maximum concentrations above a comparison value. Comparison values, however, are not thresholds of toxicity and can not be used to predict health effects of establish clean-up levels. A concentration above a comparison value does not necessarily mean harm will occur, but does, however, indicate the need for further evaluation. We also selected for further evaluation all carcinogens, regardless of their concentration.

Contaminant concentrations below comparison values are safe and were not evaluated further.

Comparing the highest measured sediment concentrations to the ATSDR cancer risk evaluation guide (CREG), Florida DOH selected arsenic and benzo(a)pyrene toxicity equivalence (BaP–TEQ) as contaminants of concern. Florida DOH also selected 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalence (TCDD–TEQ) as a contaminant of concern because it is a carcinogen (Tables 2, 3, & 4). Selection of these contaminants does not necessarily mean there is a public health risk. Rather, Florida DOH selected these contaminants for closer scrutiny. Concentrations of other contaminants were below screening guidelines, are not likely to cause illness, and were not evaluated further.

Public Health Implications

Florida DOH provides site-specific public health recommendations on the basis of toxicological literature, levels of environmental contaminants, evaluation of potential exposure pathways, duration of exposure, and characteristics of the exposed population. Whether a person will be harmed depends on the type/amount of contaminant, how they

are exposed, how long they are exposed, how much contaminant is absorbed, genetics, and individual lifestyles.

After identifying contaminants of concern, Florida DOH evaluated exposures by estimating daily doses for children and adults. Karmin [1988] explains the concept of dose as follows:

> "…all chemicals, no matter what their characteristics, are toxic in large enough quantities. Thus, the amount of a chemical a person is exposed to is crucial in deciding the extent of toxicity that will occur. In attempting to place an exact number on the amount of a particular compound that is harmful, scientists recognize they must consider the size of an organism. It is unlikely, for example, that the same amount of a particular chemical that will cause toxic effects in a 1-pound rat will also cause toxicity in a 1-ton elephant.
>
> Thus instead of using the amount that is administered or to which an organism is exposed, it is more realistic to use the amount per weight of the organism. Thus, 1 ounce administered to a 1-pound rat is equivalent to 2,000 ounces to a 2,000-pound (1-ton) elephant. In each case, the amount per weight is the same; 1 ounce for each pound of animal."

This amount per weight is the *dose*. Toxicology uses dose to compare toxicity of different chemicals in different animals. We use the units of milligrams (mg) of contaminant per kilogram (kg) of body weight per day (mg/kg/day) to express doses in this assessment. A milligram is 1/1,000 of a gram; a kilogram is approximately 2 pounds.

To calculate the daily doses of each contaminant, Florida DOH used standard and other factors needed for dose calculation [ATSDR 2005; EPA 1997]. We assumed that people are exposed daily to the maximum concentration measured. We also assumed that 100% of the ingested chemical was absorbed into the body. The percent actually absorbed into the body is likely less. The general formula for estimating a dose is:

Dose = (concentration X ingestion rate) / body weight

ATSDR groups health effects by duration (length) of exposure. Acute exposures are those with duration of 14 days or less; intermediate exposures are those with duration of 15 – 364 days; and chronic exposures are those that occur for 365 days or more (or an equivalent period for animal exposures). ATSDR Toxicological Profiles also provide information on the environmental transport and regulatory status of contaminants.

To estimate exposure from incidental ingestion (swallowing) of contaminated sediments, Florida DOH used the following assumptions:

1) children incidentally ingest (swallow) an average of 200 milligrams (mg) of sediments per day (about the weight of a postage stamp),

2) adults incidentally ingest (swallow) an average of 100 mg of sediments per day,
3) children weigh an average of 10 kilograms (kg) or about 22 pounds,
4) adults weigh an average of 70 kg, or about 155 pounds,
5) children an adults ingest (swallow) contaminated sediments at the maximum concentration measured for each contaminant.

We assumed that in the past, nearby residents were exposed to contaminants in the sediments. We assumed sediment exposure even though sediment depth was not always specified.

We assumed nearby residents could currently be exposed to contaminants in the top 6 inches of sediments. In the future, however, flooding after heavy storms could uncover contaminated sediments currently buried deeper than 6 inches. We therefore considered exposure to buried sediments (6 to 24 inches deep) a potential future exposure.

We assumed that both children and adults could currently be exposed to the top 6 inches of sediments, regardless if above or below the water line. Some of these sediment samples are in, at most, 12 inches of water. Sediments in water this shallow are easily accessible to elementary school children and adults. Viscous, tarry wastes in sediments below the water line are not likely to wash off a hand or foot withdrawn up through the water column. These tarry wastes did not wash off of metal rods thrust into contaminated sediments and withdrawn up through the water column [ACEPD 2009].

We estimated the dose for incidental ingestion (swallowing) of sediments using the following formula:

$$D = (C \times IR \times EF \times CF) / BW$$

D = exposure dose (milligrams per kilogram per day or mg/kg/day)
C = contaminant concentration (milligrams per kilogram or mg/kg)
IR = intake rate of contaminated sediment (milligrams per day or mg/day)
EF = exposure factor (unitless)
CF = conversion factor (10^{-6} kilograms per milligram or kg/mg)
BW = body weight (kilograms or kg)

$$EF = F \times ED / AT$$

EF = exposure factor (unitless)
F = frequency of exposure (days/year)
ED = exposure duration (years)
AT = averaging time (ED x 365 days/year)

We estimated an exposure factor for both children and adults of 0.27. Exposure to the sediments in the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek, is likely less than the standard residential exposure of 365

days a year. For elementary school children (6 to 12 years old), we assumed they play in these creeks 5 days/week during the summer (12 weeks), 1 day/week during the school year (38 weeks), for a total of about 100 days/year. For adults, we assumed they cross or walk along these creek 2 days/week for 50 weeks/year for a total of about 100 days/year.

EF children = (100 days per year) (6 years) / (6 years x 365 days/year) = 0.27
EF adults = (100 days per year) (35 years) / (35 years x 365 days/year) = 0.27

For example, the estimated current maximum dose of arsenic for children from incidental ingestion (swallowing) of creek sediments is:

Dose = (1.2 mg As/kg sediment) x (200 mg sediment/day) x (0.27) x (10^{-6} mg/kg) / 10 kg
= 6 x 10^{-6} mg/kg/day

Tables 5, 6, and 7 list estimated maximum children/adult doses of arsenic, BaP-TEQ, and TCDD-TEQ from past, current, and future exposures to contaminated sediments.

We compared estimated exposure doses to ATSDR chemical specific minimal risk levels (MRLs). MRLs are comparison values that establish exposure levels many times lower than levels where no effects were observed in animals or human studies. The MRL is designed to protect the most sensitive, vulnerable individuals in a population. The MRL is an exposure level below which non-cancerous harmful effects are unlikely, even after daily exposure over a lifetime. Although we considered concentrations at or below the relevant comparison value reasonably safe, exceeding a comparison value does not imply that we expect adverse health effects.

If contaminant concentrations were above comparison values, we further analyzed exposure variables (for example, duration and frequency), toxicology of the contaminants, past epidemiology studies, and the weight of evidence for health effects. We used chronic MRLs where possible because exposures are usually longer than a year. If chronic MRLs were not available we used intermediate length MRLs [ATSDR 2005].

For non-cancer illnesses, we first estimated the health risk for children. Because children are smaller and swallow more soil than adults, their exposure is higher. Therefore, if children are not at risk, then adults are not either.

For cancer, we quantified the increased theoretical risk by multiplying the estimated dose by the EPA cancer slope (potency) factor. This is the highest estimated increased cancer risk. The actual increased cancer risk is likely lower. Because of large uncertainties in the way scientists estimate cancer risks, the actual cancer may be as low as zero. If no cancer slope factor existed, risk could not be quantified.

We usually estimate the cancer risk from lifetime (70 year) exposure. In some cases we estimate the cancer risk from exposure over a significant portion of the lifetime (at least 35 years). Studies of animal exposed over their entire lifetime are the basis for calculating most cancer slope factors. Usually, little is known about the cancer risk in

animals from less than lifetime exposures. Therefore, lifetime exposure is the more appropriate estimate of cancer risk in people. Estimating the cancer risk for children, or from less than 35 years exposure, is generally not appropriate.

Too little is known about the combined toxic effect of multiple contaminants to assess the health risk from exposure to mixtures. The science of toxicology is only now addressing this issue. Therefore this report assessed the health threat based on exposure to individual contaminants.

Arsenic

Arsenic is a naturally occurring metal widely distributed in soil. It is usually found combined with oxygen, chlorine, and sulfur. Most arsenic compounds have no smell or special taste [ATSDR 2007]. Koppers used arsenic to make wood resistant to rotting and decay ("pressure treated" wood).

Non-cancer risk – Children and adults who in the past incidentally ingested or now incidentally ingest (swallow) very small amounts of surface or subsurface sediments from the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek with the highest arsenic levels are not likely to suffer any non-cancer illnesses. The maximum arsenic dose for children and adults contacting these sediments is less than the ATSDR chronic oral MRL and thus is not likely to cause any non-cancer illnesses (Tables 5, 6, & 7).

Cancer risk – In the past, people who incidentally ingested (swallowed) very small amounts of sediment from the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek with the highest arsenic levels over an entire lifetime (70 years) are at a very low increased theoretical risk of skin cancer (Table 5). Multiplying the maximum arsenic dose by the EPA cancer slope factor results in a very low additional increased theoretical cancer risk of 2 in 100,000 (0.00002 or 2×10^{-5}). This means if you are exposed in the past to the highest level of arsenic in the creek sediments for 70 years, you have a 2 in a 100,000 increased chance of cancer from this exposure. This is the highest estimate of the risk. The actual risk is likely lower and may be as low as zero.

To put this risk into context, the American Cancer Society estimates that one out of every three Americans (or 33,333 in 100,000) will be diagnosed with some form of cancer in their lifetime. Adding this estimate of the theoretical increased cancer risk from lifetime exposure to arsenic in these sediments would increase the cancer incidence from 33,333 in 100,000 to 33,335 in 100,000.

Currently and in the future, people incidentally ingesting (swallowing) very small amounts of surface or subsurface sediment from the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek with the highest arsenic levels over an entire lifetime (70 years) are at an extremely low increased theoretical risk of skin cancer (Tables 6 & 7). Multiplying the maximum arsenic dose by the EPA cancer

slope factor results in an extremely low additional increased theoretical cancer risk of 1 in a million (0.000001 or 1 x 10^{-6}). This means if you are exposed to the highest level of arsenic in the creek sediments for 70 years you have a one in a million increased chance of cancer from this exposure. This is the highest estimate of the risk. The actual risk is likely lower and may be as low as zero.

To put this risk into context, the American Cancer Society estimates that one out of every three Americans (or 333,333 in 1,000,000) will be diagnosed with some form of cancer in their lifetime. Adding this estimate of the theoretical increased cancer risk from lifetime exposure to arsenic in these sediments would increase the cancer incidence from 333,333 in 1,000,000 to 333,334 in 1,000,000.

Benzo(a)pyrene Toxicity Equivalence (BaP-TEQ)

Polycyclic aromatic hydrocarbons (PAHs) are a group of chemicals formed during the incomplete burning of coal, oil, gas, wood, garbage, tobacco, and charbroiled meat. More than 100 different PAHs exist. PAHs generally occur as complex mixtures. PAHs are contained in asphalt used in road construction, crude oil, coal, coal tar pitch, creosote, and roofing tar. PAHs are found throughout the environment in air, soil, and water. Other sources include cigarette smoke, vehicle exhaust, wildfires, agricultural burning, and residential wood burning. PAHs do not easily dissolve in water but stick tightly to soil particles [ATSDR 1995b].

In the past, Cabot Carbon produced PAHs as byproduct of charcoal and pine product production. In the past, Koppers treated wood with creosote which contains PAHs. To summarize the toxicity of the mixture of carcinogenic PAHs, the laboratory reported PAH concentrations in relation to the toxicity of benzo(a)pyrene, one of the most studied PAHs. In animals, ingestion of benzo(a)pyrene causes cancer of the stomach, esophagus, and larynx. Florida DOH evaluated the toxicity of the carcinogenic PAHs in terms of benzo(a)pyrene toxicity equivalents or BaP-TEQ.

Non-cancer risk - Children and adults who in the past incidentally ingested or now incidentally ingest (swallow) very small amounts of surface or subsurface sediments from the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek with the highest BaP-TEQ levels are not likely to suffer any non-cancer illnesses. Since ATSDR does not have an MRL and EPA does not have an RfD, Florida DOH compared BaP-TEQ dose estimates directly to animal studies in the ATSDR toxicological profile for PAHs [ATSDR 1995b]. The maximum BaP-TEQ incidental ingestion (swallowing) dose for children and adults is millions of times less than the dose causing liver toxicity in mice.

Cancer risk – In the past, people who incidentally ingested (swallowed) very small amounts of sediment from the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek with the highest BaP-TEQ levels over an entire lifetime (70 years) are at a very low increased theoretical risk of skin cancer (Table 5). Multiplying the maximum BaP-TEQ dose by the EPA cancer slope factor results in a

very low additional increased theoretical cancer risk of 6 in a million (0.000006 or 6 x 10^{-6}). This means if you are exposed in the past to the highest level of BaP-TEQ in the creek sediments for 70 years, you have a 6 in a million increased chance of cancer from this exposure. This is the highest estimate of the risk. The actual risk is likely lower and may be as low as zero.

To put this risk into context, the American Cancer Society estimates that one out of every three Americans (or 333,333 in 1,000,000) will be diagnosed with some form of cancer in their lifetime. Adding this estimate of the theoretical increased cancer risk from lifetime exposure to arsenic in these sediments would increase the cancer incidence from 333,333 in 1,000,000 to 333,339 in 1,000,000.

Currently and in the future, people incidentally ingesting (swallowing) very small amounts of surface or subsurface sediment from the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek with the highest BaP-TEQ levels over an entire lifetime (70 years) are at a very low increased theoretical risk of stomach, esophagus, or larynx cancer (Tables 6 & 7). Multiplying the maximum BaP-TEQ dose by the EPA cancer slope factor results in a very low additional increased theoretical cancer risk of 4 to 7 in a million (4 to 7 x 10^{-6}). This means if you are exposed to the highest level of BaP-TEQ in the creek sediments for 70 years you have a four to seven in a million increased chance of cancer from this exposure.

To put this risk into context, the American Cancer Society estimates that one out of every three Americans (or 333,333 in 1,000,000) will be diagnosed with some form of cancer in their lifetime. Adding this estimate of the theoretical increased cancer risk from lifetime exposure to BaP-TEQ in these sediments would increase the cancer incidence from 333,333 in 1,000,000 to 333,337 or 333,340 in 1,000,000.

Even though the increase theoretical cancer risk from exposure to BaP-TEQ in sediments is "low," the concentrations are still above state cleanup target levels and should be cleaned up.

2,3,7,8-Tetrachlorodibenzo-p-dioxins Toxicity Equivalence (TCDD-TEQ)

Dioxins are a family of chlorinated compounds with similar structures but varying toxicities. They have very low solubility in water and tend to stick to ash, soil, or any surface with a high organic content such as plant leaves. Forest fires, manufacture of pentachlorophenol wood preservative, manufacture of bleached paper, and burning municipal garbage containing plastic all produce small amounts of dioxins [ATSDR 1998].

In the past, Koppers used commercial grade pentachlorophenol which contained low levels of dioxins. Combustion (burning) at both Koppers and Cabot Carbon may have also produced dioxins. To summarize the toxicity of the mixture of dioxins, the laboratory reported dioxin concentrations in relation to the toxicity of 2,3,7,8-

tetrachlorodibenzo-*p*-dioxin (TCDD), one of the most studied dioxins. Florida DOH evaluated the toxicity of dioxins in terms of TCDD toxicity equivalents or TCDD-TEQ.

Non-cancer risk – Prior to 2009, sediments were not tested for TCDD-TEQ. Therefore, we can not estimate the past health risk from exposure to TCDD-TEQ contaminated sediments.

Currently and in the future, children and adults who incidentally ingest (swallow) very small amounts of surface or subsurface sediments from the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek with the highest TCDD-TEQ levels are not likely to suffer any non-cancer illnesses. The maximum TCDD-TEQ dose for children and adults contacting these sediments is less than the ATSDR chronic oral MRL and thus is not likely to cause any non-cancer illnesses (Tables 6 & 7).

Cancer risk - Prior to 2009, sediments were not tested for TCDD-TEQ. Therefore, we can not estimate the past increased cancer risk from exposure to TCDD-TEQ contaminated sediments.

Currently and in the future, people incidentally ingesting (swallowing) very small amounts of surface or subsurface sediment from the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek with the highest TCDD-TEQ levels over an entire lifetime (70 years) are at an extremely low increased theoretical risk of cancer (Tables 6 & 7). Multiplying the maximum TCDD-TEQ dose by the California cancer slope factor [Cal 2010] results in an extremely low additional increased theoretical cancer risk of 1 to 3 in a million (1 to 3 x 10^{-6}). This means if you are exposed to the highest level of TCDD-TEQ in the creek sediments for 70 years you have a one to three in a million increased chance of cancer from this exposure. This is the highest estimate of the risk. The actual risk is likely lower and may be as low as zero.

To put this risk into context, the American Cancer Society estimates that one out of every three Americans (or 333,333 in 1,000,000) will be diagnosed with some form of cancer in their lifetime. Adding this estimate of the theoretical increased cancer risk from lifetime exposure to TCDD-TEQ in these sediments would increase the cancer incidence from 333,333 in 1,000,000 to 333,334 or 333,336 in 1,000,000.

Even though the increase theoretical cancer risk from exposure to TCDD-TEQ in sediments is "low," the concentrations are still above state cleanup target levels and should be cleaned up.

Health Outcome Data

Florida DOH epidemiologists did not evaluate area cancer rates because the maximum theoretical increased cancer risk for exposure to arsenic, BaP-TEQ, and TCDD-TTEQ in sediments is very low to extremely low.

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometime engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than adults; this means they breathe dust, soil and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body system of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus, adults need as much information as possible to make informed decisions regarding their children's health.

This assessment takes into account the special vulnerabilities of children. It specifically assesses the health risk for children that play in Springstead and Hogtown creeks and incidentally ingest (swallow) contaminated sediments.

Community Health Concerns Evaluation

Concern – For many years nearby residents have been concerned about the health risk from exposure to tar-like, odorous sediments in Springstead and Hogtown creeks.

Evaluation – Since the last major spill in 1977, the amount and smell of the pine tar waste in Springstead and Hogtown Creek sediments has declined. Over a period of 33 years, many of the lighter-weight chemicals have either broken down, evaporated into the air, or dissolved in the water. The residue left behind is less water soluble and less odorous. Although tar-like sediments remain in some scattered spots, people who incidentally ingest (swallow) very small amounts are not likely to suffer any non-cancer illnesses. Over entire lifetimes (70 years), nearby residents are at a very low to extremely low theoretical increased risk of cancer. Because from 1979 to 2006, sediments were not tested for dioxins, Florida DOH can not estimate the past health risk from exposure to this contaminant.

Conclusions

1. Florida DOH concludes that incidental ingestion (swallowing) of very small amounts of contaminated sediments in off-site ditches, Springstead Creek, or Hogtown Creek downstream of the Cabot Carbon-Koppers site will not harm people's health. Between 1979 and 2006, children and adults who incidentally ingested (swallowed) very small amounts of sediments from the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek with the highest levels of arsenic and PAHs are not likely to suffer any non-cancer illnesses. The highest theoretical increased cancer risk

from exposure to arsenic and PAHs is low: 2 in 100,000 (0.00002 or 2 x 10^{-5}). This is the highest estimate of the risk. The actual risk is likely lower and may be as low as zero.

2. Because from 1979 to 2006, sediments from the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, or Hogtown Creek downstream of the Cabot Carbon-Koppers hazardous waste site were not tested for dioxins, Florida DOH can not estimate the past health risk from exposure to this contaminant.

3. Florida DOH concludes that currently and in the future, incidental ingestion (swallowing) of very small amounts of contaminated surface or subsurface sediments from the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, or Hogtown Creek downstream of the Cabot Carbon-Koppers hazardous waste site will not harm people's health. The highest concentrations of arsenic, PAHs, and dioxins are below levels likely to cause non-cancer illness. The highest concentrations of these contaminants would result in, at most, a very low theoretical increased cancer risk. This is the highest estimate of the risk. The actual risk is likely lower and may be as low as zero.

4. Contaminant concentrations are still above state cleanup target levels and should be cleaned up. Existing contaminant levels may harm the environment.

Recommendations

1. The responsible parties should cleanup, to state standards, contaminated sediments in the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek. Although the contaminants levels are not likely to harm people's health, they are still above state standards and should be cleaned up.

Public Health Action Plan

Actions Undertaken

In 1995, the responsible party excavated sediments from a short section of the North Main Street ditch. There has been no cleanup of contaminated sediments in North Main Terrace ditch, Springstead Creek or Hogtown Creek. Until recently, local, state, and federal environmental agencies focused on testing and cleanup of contaminated soil and ground water.

Actions Underway

The EPA and the responsible party are discussing options for cleanup of contaminated sediments in the North Main Street ditch, North Main Terrace ditch, Springstead Creek, and Hogtown Creek.

Actions Planned

The responsible party may cleanup contaminated sediments in the North Main Street ditch, the North Main Terrace ditch, Springstead Creek, and Hogtown Creek, but has not proposed a timetable.

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Appendices

Table 1. Completed Human Exposure Pathways in the North Main Street ditch, the North Main Terrace Ditch, Springstead Creek, and Hogtown Creek Sediments Downstream of Cabot Carbon-Koppers

COMPLETED PATHWAY NAME	COMPLETED EXPOSURE PATHWAY ELEMENTS					TIME
	SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
Past Ditch/Creek Sediments	Cabot Carbon-Koppers site	Sediments	North Main Street and Terrace ditches, Springstead and Hogtown creeks	Incidental Ingestion	Nearby residents	Past (1967-2006)
Current Ditch/Creek Sediments	Cabot Carbon-Koppers site	Sediments 0 - 6 inches deep (as of January/February 2009)	North Main Street and Terrace ditches, Springstead and Hogtown creeks	Incidental Ingestion	Nearby residents	Present (January/ February 2009)
Future Ditch/Creek Sediments	Cabot Carbon-Koppers site	Sediments 6 – 24 inches deep (as of January/February 2009)	North Main Street and Terrace ditches, Springstead and Hogtown creeks	Incidental Ingestion	Nearby residents	Future

Table 2. Contaminants of Concern in North Main Street Ditch, North Main Terrace Ditch, Springstead Creek, and Hogtown Creek Sediments Downstream of Cabot Carbon-Koppers: Past (1979 -2006) Exposure

Contaminants of Concern	Concentration Range (mg/kg)	Screening Guideline* (mg/kg)	ATSDR Screening Guideline	# Above Screening Guideline/Total #
Arsenic	BDL – 29.9	0.5	CREG	12/31
BaP – TEQ	BDL – 2.1	0.1	CREG	6/31
TCDD – TEQ	Not Analyzed	---	---	---

BaP – TEQ = benzo(a)pyrene toxicity equivalence
TCDD – TEQ = 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalence
CREG = ATSDR cancer risk evaluation guide for 10^{-6} excess cancer risk
BDL = below detection limit
mg/kg = milligrams per kilogram
* Screening guidelines only used to select chemicals for further scrutiny, not to the judge the risk of illness.
Sources of data: EPA 1980, Hunter/ESE 1990, IT 1987, ACEPD 2006, and ACEPD 2007

Table 3. Contaminants of Concern in North Main Street Ditch, North Main Terrace Ditch, Springstead Creek, and Hogtown Creek Surface Sediments (0 - 6 inches deep) Downstream of Cabot Carbon-Koppers: Current (2009) Exposure

Contaminants of Concern	Concentration Range (mg/kg)	Screening Guideline* (mg/kg)	ATSDR Screening Guideline	# Above Screening Guideline/Total #
Arsenic	BDL – 1.2	0.5	CREG	7/12
BaP – TEQ	0.03 – 1.66	0.1	CREG	4/12
TCDD – TEQ	3.9 – 41 (ng/kg)	50 (ng/kg)	Chronic Child EMEG	0/12

BaP – TEQ = benzo(a)pyrene toxicity equivalence
TCDD – TEQ = 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalence
CREG = ATSDR cancer risk evaluation guide for 10^{-6} excess cancer risk
EMEG = environmental media evaluation guide
BDL = below detection limit
mg/kg = milligrams per kilogram
ng/kg = nanograms per kilogram
* Screening guidelines only used to select chemicals for further scrutiny, not to the judge the risk of illness.
Source of data: [ACEPD 2009] and Alachua CEPD, unpublished data, 2009

Table 4. Contaminants of Concern in North Main Street Ditch, North Main Terrace Ditch, Springstead Creek, and Hogtown Creek Subsurface Sediments (6 – 24 inches deep) Downstream of Cabot Carbon-Koppers: Potential Future Exposure

Contaminants of Concern	Concentration Range (mg/kg)	Screening Guidelines* (mg/kg)	ATSDR Screening Guideline	# Above Screening Guideline/Total #
Arsenic	0.44 – 2.1	0.5	CREG	8/11
BaP – TEQ	0.05 – 3.13	0.1	CREG	10/11
TCDD – TEQ	1.5 – 20 (ng/kg)	50 (ng/kg)	Chronic Child EMEG	0/11

BaP – TEQ = benzo(a)pyrene toxicity equivalence
TCDD – TEQ = 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalence
CREG = ATSDR cancer risk evaluation guide for 10^{-6} excess cancer risk
EMEG = ATSDR environmental media evaluation guide
mg/kg = milligrams per kilogram
ng/kg = nanograms per kilogram
BDL = below detection limit
* Screening guidelines only used to select chemicals for further scrutiny, not to the judge the risk of illness.
Source of data: [ACEPD 2009]

Table 5. Estimated Past Maximum Dose and Increased Lifetime Cancer Risk from Incidental Ingestion of Contaminated Sediments in the North Main Street Ditch, the North Main Terrace Ditch, Springstead Creek, and Hogtown Creek

Contaminant	Maximum Sediment Concentration	Estimated Maximum Dose (mg/kg/day)	Non-Cancer Comparison Value (mg/kg/day)	Source of Non-Cancer Comparison Value	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Source of Oral Cancer Slope Factor	Theoretical Increased Lifetime Cancer Risk
Arsenic	29.9 mg/kg	child – 160×10^{-6} adult – 12×10^{-6}	0.0003	ATSDR chronic, oral MRL	1.5	EPA IRIS	2×10^{-5}
BaP - TEQ	2.1 mg/kg	child – 11×10^{-6} adult – 0.8×10^{-6}	none	---	7.3	EPA IRIS	6×10^{-6}
TCDD - TEQ	Not Analyzed	---	---	---	---	---	---

mg/kg = milligrams per kilogram
mg/kg/day = milligrams per kilogram per day
BaP – TEQ = benzo(a)pyrene toxicity equivalence
TCDD – TEQ = 2,3,7,8-tetrachlorodibenzo-*p*-dioxin toxicity equivalence
MRL = ATSDR minimal risk level
EPA IRIS = US Environmental Protection Agency Integrated Risk Information System [EPA 2010b]

Table 6. Estimated Current* Maximum Dose and Increased Lifetime Cancer Risk from Incidental Ingestion of Contaminated Sediments in the North Main Street Ditch, the North Main Terrace Ditch, Springstead Creek, and Hogtown Creek

Contaminant	Maximum Sediment Concentration (0-6" deep)	Estimated Maximum Dose (mg/kg/day)	Non-Cancer Comparison Value (mg/kg/day)	Source of Non-Cancer Comparison Value	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Source of Oral Cancer Slope Factor	Theoretical Increased Lifetime Cancer Risk
Arsenic	1.2 mg/kg	child - 6×10^{-6} adult - 0.5×10^{-6}	0.0003	ATSDR chronic, oral MRL	1.5	EPA IRIS	1×10^{-6}
BaP - TEQ	1.66 mg/kg	child – 9×10^{-6} adult – 0.6×10^{-6}	none	---	7.3	EPA IRIS	4×10^{-6}
TCDD - TEQ	41 ng/kg	child – 2×10^{-10} adult – 0.2×10^{-10}	1×10^{-9}	ATSDR chronic oral MRL	130,000	California OEHHA	3×10^{-6}

* Current exposure to surface sediments (0-6" deep)
mg/kg = milligrams per kilogram
ng/kg = nanograms per kilogram
mg/kg/day = milligrams per kilogram per day
BaP – TEQ = benzo(a)pyrene toxicity equivalence
TCDD – TEQ = 2,3,7,8-tetrachlorodibenzo-*p*-dioxin toxicity equivalence
MRL = ATSDR minimal risk level
EPA IRIS = US Environmental Protection Agency Integrated Risk Information System [EPA 2010b]
California OEHHA = California Office of Environmental Health Hazard Assessment [Cal 2010]

Table 7. Estimated Future* Maximum Dose and Increased Lifetime Cancer Risk from Incidental Ingestion of Contaminated Sediments in the North Main Street Ditch, the North Main Terrace Ditch, Springstead Creek, and Hogtown Creek

Contaminant	Maximum Sediment Concentration (6-24" deep)	Estimated Maximum Dose (mg/kg/day)	Non-Cancer Comparison Value (mg/kg/day)	Source of Non-Cancer Comparison Value	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Source of Oral Cancer Slope Factor	Theoretical Increased Lifetime Cancer Risk
Arsenic	2.1 mg/kg	child – 11×10^{-6} adult – 0.8×10^{-6}	0.0003	ATSDR chronic, oral MRL	1.5	EPA IRIS	1×10^{-6}
BaP - TEQ	3.13 mg/kg	child – 17×10^{-6} adult – 1×10^{-6}	none	---	7.3	EPA IRIS	7×10^{-6}
TCDD - TEQ	20 ng/kg	child – 1×10^{-10} adult – 0.1×10^{-10}	1×10^{-9}	ATSDR chronic, oral MRL	130,000	California OEHHA	1×10^{-6}

* Future exposure to subsurface sediments (6-24" deep)
mg/kg = milligrams per kilogram
ng/kg = nanograms per kilogram
mg/kg/day = milligrams per kilogram per day
BaP – TEQ = benzo(a)pyrene toxicity equivalence
TCDD – TEQ = 2,3,7,8-tetrachlorodibenzo-*p*-dioxin toxicity equivalence
MRL = ATSDR minimal risk level
EPA IRIS = US Environmental Protection Agency Integrated Risk Information System [EPA 2010b]
California OEHHA = California Office of Environmental Health Hazard Assessment [Cal 2010]

Figure 1. Cabot Carbon-Koppers Hazardous Waste Site and Surface Water Drainage

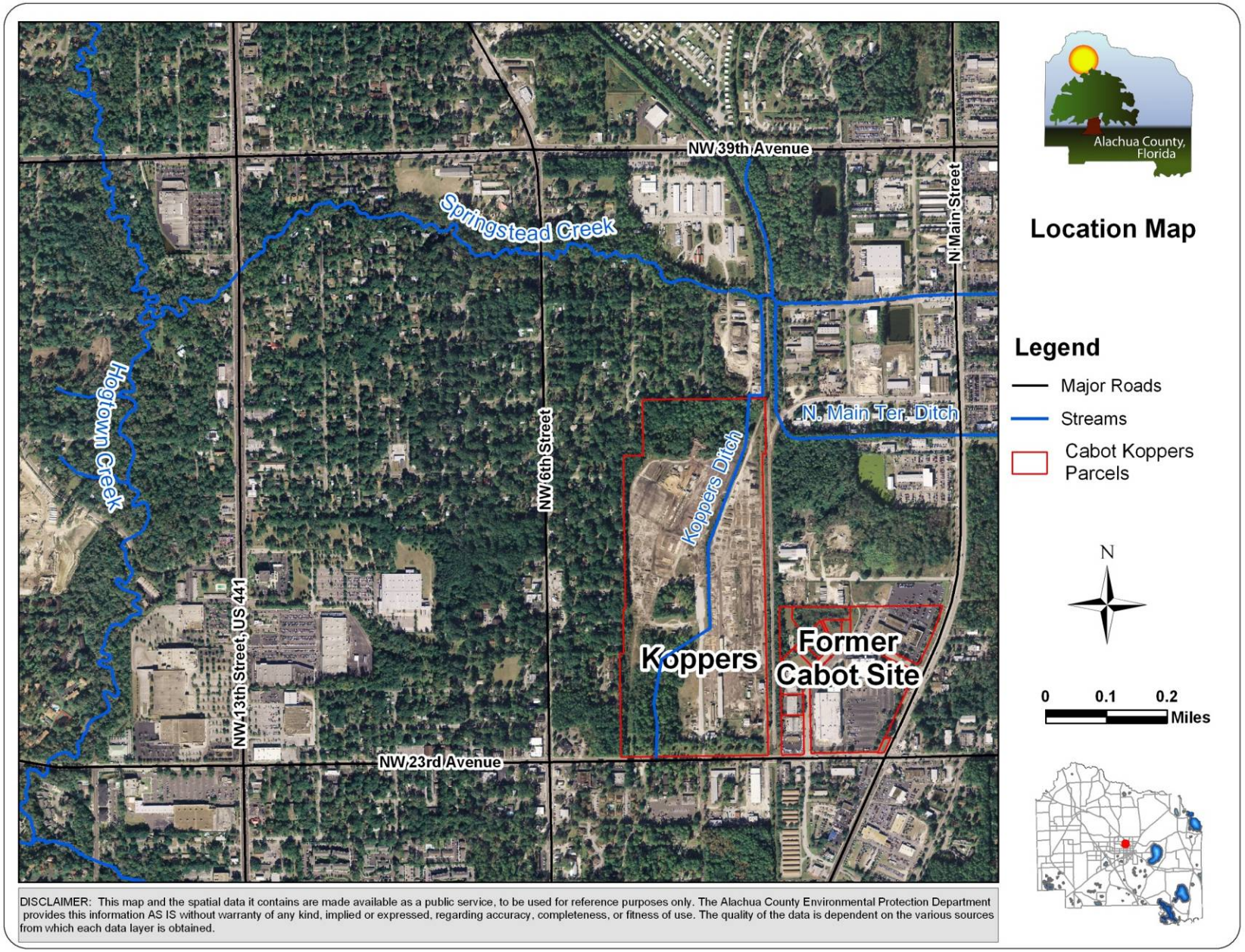

Figure 2. North Main Street Ditch, North Main Terrace Ditch, Springstead Creek, and Hogtown Creek Sediment Sample Locations: 1979 to 2006.

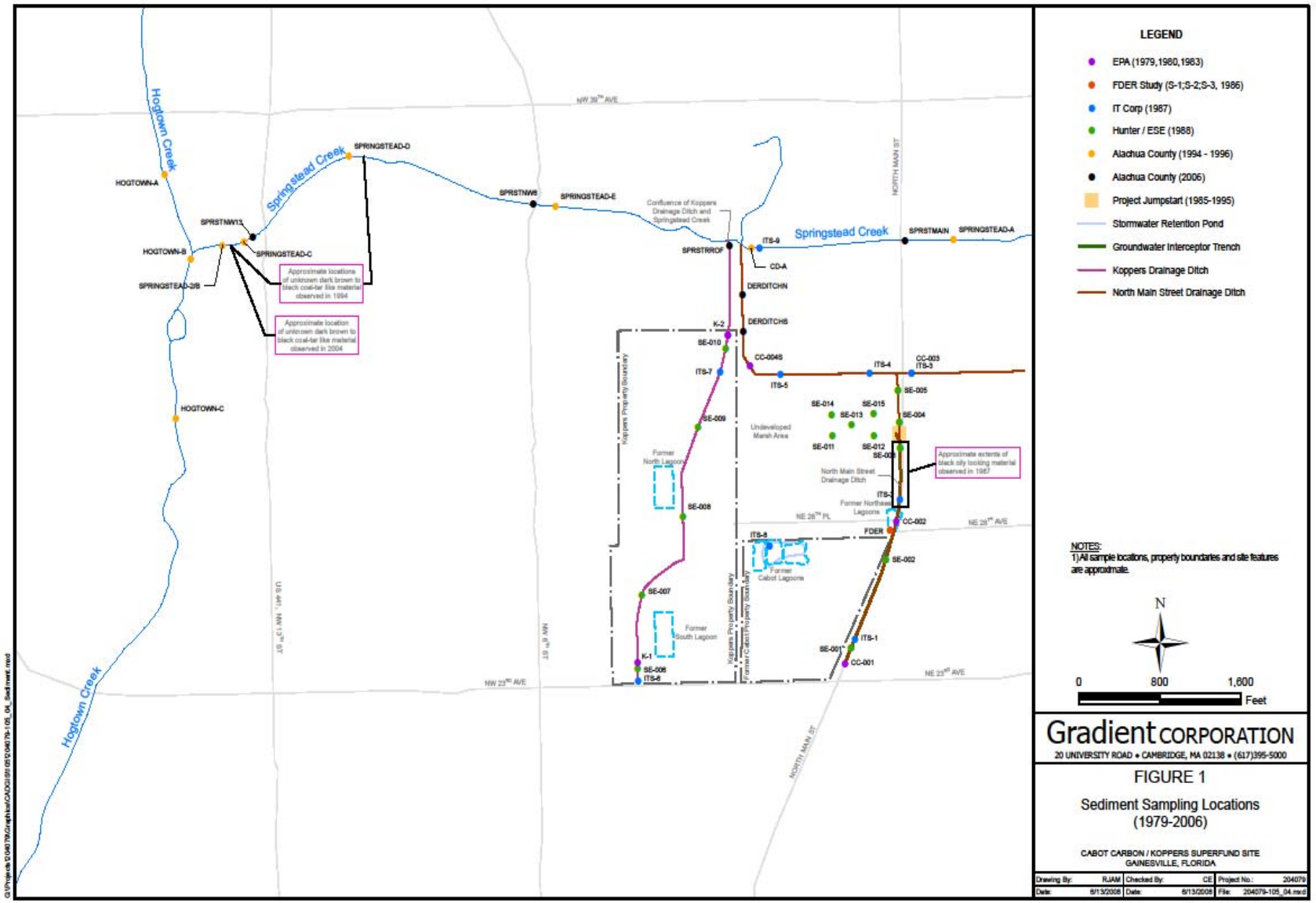

Figure 3. North Main Terrace Ditch, Springstead Creek, and Hogtown Creek Sediment Sample Locations: January/February 2009

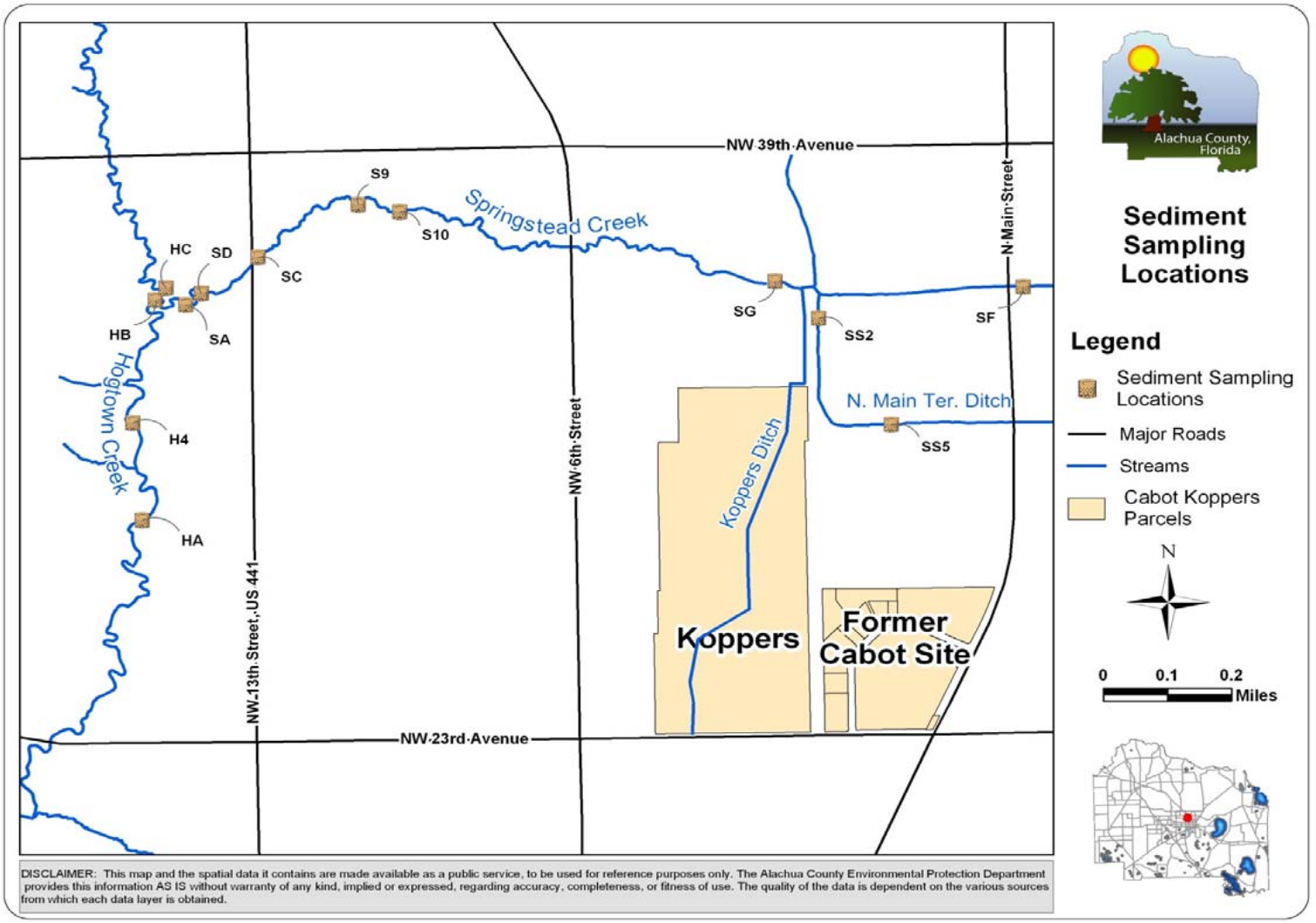

Figure 4. Springstead Creek Sediment Sample Locations, November 2009 (Alachua CEPD, unpublished data, 2009)

Certification

The Florida Department of Health, Bureau of Environmental Public Health Medicine prepared this health consultation report under a cooperative agreement with the US Agency for Toxic Substances and Disease Registry. Florida DOH followed approved methodologies and procedures existing at the time it began its assessment. Florida DOH completed an editorial review of this document.

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

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