Health Consultation

EXPOSURE INVESTIGATION

FISH AND CRABS IN ST. MARKS RIVER AT THE ST. MARKS REFINERY

ST. MARKS, WAKULLA COUNTY, FLORIDA

MARCH 18, 2003

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

Health Consultation: A Note of Explanation

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

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

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HEALTH CONSULTATION

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ST. MARKS, WAKULLA 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

Summary and Statement of Issues

In June 2002, the Florida Department of Environmental Protection (DEP) found dioxins in sediments of the St. Marks River, near the St. Marks Refinery hazardous waste site. Florida DEP requested that the Florida Department of Health (DOH) assess the public health threat from eating fish and crabs from the St. Marks River. In July 2002, the Florida DOH coordinated fish collection with the Florida Fish and Wildlife Conservation Commission (FFWCC). The fish and crab assessment involved collecting 55 fish for analysis of dioxins/furans and mercury. Florida DOH also assessed the public health threat from contaminated soil and groundwater at the St. Marks Refinery site. That soil and groundwater assessment is contained in a separate report.

The levels of dioxins/furans and mercury in fish and crabs collected from the St. Marks River near the St. Marks Refinery do not appear to pose a health risk to people who eat them. Florida DOH does not expect any adverse health effects from eating largemouth bass, redear sunfish, sheepshead, black striped mullet, or blue crabs containing the levels of dioxins/furans or mercury found in the fish or crabs taken from the St. Marks River near the St. Marks Refinery.

Financial support for this consultation is provided entirely by the U.S. Agency for Toxic Substances and Disease Registry (ATSDR). The conclusions and recommendations of this consultation are only applicable to those who eat fish and crab from the St. Marks River near the St. Marks Refinery.

Site Description and History

The St. Marks Refinery site is on Woodville Highway (Highway 363) in the town of St. Marks, in Wakulla County, Florida. (Figure 1). Built in 1954, the refinery processed crude oil for jet fuel and asphalt. Seminole Refining Corporation owned the refinery from 1985 to 1992. The site is now owned by American International Petroleum, Incorporated. The site comprises a refined product storage area, a process area, a waste asphalt pond, petroleum tanks, and refinery equipment. The refinery closed in 1985. Tallahassee's Purdom power plant and Murphy Oil are south and north of the refinery, respectively. The St. Marks historic railroad state trail is west of the site. The St. Marks River is east of the site. Wetlands laced with winding tributaries are northeast of the site. A storm water outfall on the site's east side leads to a drainage ditch, which empties into the St. Marks River (Figure 2). During the refinery's operation a dock on the St. Marks River allowed for barge transport of both crude petroleum and finished product.

In April 2002, the Florida DEP found chlorinated dibenzodioxins (CDD, or "dioxin") and pentachlorophenol (PCP) on the site. In June 2002, Florida DEP found dioxin in sediments of nearby St. Marks River. The DEP also found benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, ideno[1,2,3-cd]pyrene, 2-methylnaphthalene, 2-methylphenol, aluminum, arsenic, manganese and benzene on the site. Wood treatment chemicals stored on the site might have been the source of the PCP. An incinerator which operated on the site prior to 1985 could have been the source of the dioxin. The highest dioxin

levels are in a tributary near the crude oil storage area. In any event, Florida DEP is remediating the entire site.

In June 2002, the Wakulla County Health Department conducted a door-to-door survey and confirmed there are no private wells within ½ mile of the site—all nearby residences are supplied by City of Tallahassee water. Also, in June 2002 Florida DEP reported soil, sediment and groundwater results. In a separate health consultation Florida DOH will evaluate the public health threat from exposure to soil, ground water, and air at this site.

On July 19, 2002, Florida DOH surveyed nearby residents to determine the quantities and the species of fish the residents take from the St. Marks River for personal consumption. Florida DOH will report separately the survey results.

Near the St. Marks Refinery site, the St. Marks River is closed to oyster harvesting. The nearest oyster harvesting area is near Shell Point, approximately 7 miles southwest, across the Gulf of Mexico. It is unlikely that oysters near Shell Point have been affected by contamination from the site.

Demographics

According to the 2000 census, 270 persons live in St. Marks. They are 94% white, 3% black, and 3% Hispanic and other backgrounds. Eighty-four per cent of the residents are 18 years or older; 16% are less than 18 years old.

Florida DOH estimates that in any one year about 500 persons (adults and children) eat fish from the St. Marks River. This includes St. Marks residents as well as recreational and commercial fishers.

Discussion

Please see Appendix B for general information concerning chlorinated dibenzo-p-dioxins, chlorinated dibenzofurans, and mercury.

FISH EVALUATION

Because the Florida DEP found dioxins in soils on the St. Marks Refinery site and in sediments in the St. Marks River, dioxins can potentially bioaccumulate in fish in the St. Marks River. Because the Florida DEP found mercury on site, mercury can potentially bioacumulate in fish in the St. Marks River.

Fish Collection and Shipment

Using electro-fishing, on July 22, 2002, the Florida Fish and Wildlife Conservation Commission (FFWCC) and Florida DOH collected 65-70 fish from the St. Marks River within ½ mile upstream and downstream of the St. Marks Refinery site. They selected the largest 12 largemouth

bass, the largest 15 redear sunfish, the largest 15 sheepshead, and the largest 13 black striped mullet. FFWCC and the Florida DOH weighed and measured the fish. The fish were rinsed with deionized water and wrapped individually in heavy-duty aluminum foil using the drug store wrap-folding method. Each fish was placed in a labeled Ziploc bag to prevent cross-contamination and transported on ice to a FFWCC freezer. On July 24, 2002, Florida DOH packed the frozen fish in dry ice and shipped them overnight to the Geochemical and Environmental Research Group (GERG) laboratory at Texas A&M University. The shipment included the proper transportation labels and forms as wells as chain of custody and laboratory forms.

FFWCC and Florida DOH collected a water-column-dwelling predator game fish: Florida largemouth bass (Micropterus salmoides floridanus), two water-column-dwelling pan fish: redear sunfish (Lepomis microlophus) and sheepshead (Archosargus probatocephalus), and one bottom feeder: striped black mullet (Mugil cephalus). Largemouth bass, and redear sunfish are freshwater species. Black striped mullet and sheepshead are marine species. Large-mouth bass is a predator species and a good indicator of persistent pollutants that could be biomagnified through several trophic levels of the food web. The sheepshead stay close to the St. Marks Refinery site and the largemouth bass stay close to fresh water. Of the four species, the striped black mullet is most mobile. It is a bottom feeder, eating mostly algae and plants. See Attachment A for photos and detailed descriptions of these fish.

Fish Laboratory Methods and Analyses

The laboratory resected and filleted all 55 fish, leaving skins and scales intact. Using standard operating procedures, the laboratory composited the fish by species and analyzed four separate composite samples. The laboratory analyzed for dioxins/furans using EPA Method 1613B. This analysis included preparation (resection and filleting), homogenizing, compositing, and two quality assurance (QA) samples (one procedure blank and one duplicate). The laboratory also analyzed the fish for total mercury.

Interpretation of Fish Results

Table I summarizes the concentrations of dioxin/furans in fish from the St. Marks River near the St. Marks Refinery. Florida DOH used Toxicity Equivalents (TEQs) to calculate an ingestion dose of dioxin/furans for children and adults. A TEQ is the mean concentration of the total dioxin/furan toxic equivalents. The Florida DOH assumed that on average, adults eat 30 grams of fish per day and children eat 15 grams per day. These rates may overestimate average fish consumption, but err on the side of protecting human health.

The levels of dioxins/furans in the fish collected from the St. Marks River near the St. Marks Refinery do not appear to be a health risk. Florida DOH does not expect any illness from eating largemouth bass, redear sunfish, sheepshead, or black striped mullet containing the levels of dioxins found in the St. Marks River near the St. Marks Refinery. The calculated doses for dioxins and furans for each fish species were less than the Agency for Toxic Substances and Disease Registry (ATSDR's) Minimum Risk Level (MRL) for 2,3,7,8-tetrachlorodibenzo-*p*-

dioxin (2,3,7,8-TCDD). An MRL is an estimate of daily human exposure to a dose of a chemical that is likely to be without an appreciable risk of adverse noncancerous effect over a specified duration of exposure. The Florida DOH used the MRL for 2,3,7,8-TCDD as this congener is the most toxic of all the dioxins and furans. Using the highest TEQ value in the four fish species (0.001 parts per trillion or ppt), our estimate of a child's and an adult's maximum acute (1-14 days) exposure to 2,3,7,8-TCDD from eating the fish from the St. Marks River/St. Marks Refinery is 1,000,000 times less than the ATSDR's MRL. Our estimate of a child's and an adult's maximum intermediate (15-364 days) exposure to 2,3,7,8-TCDD from eating fish from the river is 100,000 times less than the ATSDR's MRL. Our estimate of a child's and an adult's maximum long-term (≥365 days) exposure to 2,3,7,8-TCDD from eating fish from the river is 10,000 times less than the ATSDR's MRL.

The calculated dose for dioxins and furans for each fish species was less than ATSDR's Cancer Effect Level (CEL) in animals for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD). A CEL establishes levels of exposure associated with carcinogenic effects. There are CELs for long-term (≥365 days) exposure but none for acute (1-14 days) or intermediate (15-364 days) exposure. The Florida DOH used the CELs for 2,3,7,8-TCDD as this congener is the most toxic of all the dioxins and furans. Using the highest TEQ value in the four fish species (0.001 parts per trillion or ppt), the Florida DOH estimate of a child's and an adult's maximum long-term (≥365 days) exposure to 2,3,7,8-TCDD from eating fish from the river is 10,000,000 times less than the ATSDR's CEL.

Table II summarizes the concentrations of mercury in fish for the St. Marks River near the St. Marks Refinery. The levels of mercury in the fish collected from the St. Marks River near the St. Marks Refinery do not appear to be a health risk. Florida DOH does not expect any illness from eating the largemouth bass, redear sunfish, sheepshead, or black striped mullet containing the levels of mercury found in the St. Marks River near the St. Marks Refinery.

BLUE CRAB EVALUATION

Because Florida DEP found dioxins in soils on the St. Marks Refinery site and in sediments in the St. Marks River, there is a potential for dioxins to bioaccumulate in crabs in the St. Marks River. Blue crabs are the most commonly netted and consumed crab near the St. Marks Refinery.

Blue Crab Collection

Between June 17 and June 20, 2002, the Florida DEP collected seven adult blue crabs from the St. Marks River near the St. Marks Refinery dock and vicinity. The laboratory analyzed one composite sample of the crabs' hepatopancreas glands. On August 20, 2002, Florida DEP collected seven more adult blue crabs: four from the St. Marks River at the St. Marks Refinery dock and three from the mouth of nearby Rattlesnake Branch, a St. Marks River tributary. The laboratory analyzed a composite of the hepatopancreas glands and a composite of muscle tissue. To determine background concentrations, the Florida DEP also collected two adult blue crabs on June 20, 2002, and six adult blue crabs on July 9, 2002, from the Aucilla River, 10 miles east of the St. Marks River.

Blue Crab Laboratory Methods and Analysis

The laboratory analyzed the blue crab composite samples for dioxins/furans using EPA Method 8290 (high resolution chromatography/high resolution mass spectrometry).

Evaluation of Blue Crab Results and Interpretation

Table III summarizes concentrations of dioxins/furans in blue crabs. The Florida DOH used the highest Toxicity Equivalent (TEQ) concentration in either hepatopancreas or muscle to calculate ingestion doses for adults and children. The Florida DOH assumed adults eat 30 grams of crab per day and children eat 15 grams per day. These rates may overestimate average fish consumption, but err on the side of protecting human health. Also most people usually only eat the crab muscle and discard the hepatopancreas.

The levels of dioxins/furans in the blue crabs collected from the St. Marks River near the St. Marks Refinery do not appear to be a health risk. The concentrations of dioxins/furans found in blue crabs from the St. Marks River are also unlikely to cause illness. The calculated doses of dioxins and furans for each crab composite sample were less than ATSDR's Minimum Risk Level (MRL) for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD). An MRL is an estimate of daily human exposure to a dose of a chemical that is likely to be without an appreciable risk of adverse noncancerous effect over a specified duration of exposure. The Florida DOH used the MRL for 2,3,7,8-TCDD as this congener is the most toxic of all the dioxins and furans. Using the highest TEQ value of the composite samples of blue crab (3.1 parts per trillion or ppt), our estimate of a child's and an adult's maximum acute (1–14 days) exposure to 2,3,7,8-TCDD from eating St. Marks River blue crab is more than 100 times less than the ATSDR's MRL. Our estimate of a child's and an adult's maximum intermediate (15–364 days) exposure to 2,3,7,8-TCDD from eating blue crab from the river is more than 30 times less than the ATSDR's MRL. Our estimate of a child's and an adult's maximum long-term (≥365 days) exposure to 2,3,7,8-TCDD from eating blue crab from the river is slightly less than the ATSDR's MRL.

The calculated doses of dioxins and furans for each crab composite sample were less than the ATSDR's Cancer Effect Levels (CEL) in animals for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD). A CEL establishes levels of exposure associated with carcinogenic effects. There are CELs for long-term (≥365 days) exposure but none for acute (1–14 days) or intermediate (15–364 days) exposure. The Florida DOH used the CELs for 2,3,7,8-TCDD as this congener is the most toxic of all the dioxins and furans. Using the highest TEQ value of the composite blue crab samples (3.1 parts per trillion or ppt), our estimate of a child's and an adult's maximum long-term (≥365 days) exposure to 2,3,7,8-TCDD from eating blue crab from the river is 10,000,000 times less than the ATSDR's lowest CEL.

Other Health-Based Standards

Currently, the U.S. Food and Drug Administration (FDA) does not have action levels for dioxins or furans in human food (DHHS 1998). Because dioxin analysis is costly and time-consuming, available data on background levels in most foods are limited. FDA is expanding its monitoring

program to obtain more comprehensive data on background levels, as well as to identify opportunities to reduce human exposure to dioxins (FDA 2002).

Consideration of Biological Testing

The Florida DOH also considered biological testing (blood, hair, urine, or a combination of two or three) for people eating the fish. The levels of dioxins/furans and mercury found in the fish, however, do not warrant a biological investigation.

Child Health Initiative

Because this health consultation involves children who eat fish and crabs from the St. Marks River near the St. Marks Refinery, children are a concern. Pregnant women, nursing mothers and children can be affected by dioxins/furans and mercury in fish. It is important to remember children are not small adults. Children are more sensitive to the effects of dioxins/furans and mercury than are adults. Few studies have looked at how dioxins/furans can affect a child's health. But in one such study, children were exposed to higher-than-current background levels of 2,3,7,8-TCDD; the children appeared more sensitive than adults. Florida DOH has no information showing any differences between children and adults in terms of how much dioxin enter one's body, where dioxins can be found in one's body, and how fast dioxins leave one's body (ATSDR 1998). As for mercury, children can be exposed to various forms of mercury in a variety of ways including eating methylmercury-contaminated fish and wildlife. Also, a child's mercury and dioxin exposures can differ substantially from an adult's exposure. Children drink more fluids, eat more food, and breathe more air per kilogram of body weight than do adults. A child's diet—that often differs from that of an adult's—and a child's behavior and lifestyle can also influence exposure (ATSDR 1999).

Thus DOH reviewed the results of the fish sample analysis, aware that sensitive populations such as pregnant women, nursing mothers and children are a particular concern. Still, we conclude that the dioxin/furans and mercury found in redear sunfish, sheepshead, black striped mullet, largemouth bass and blue crab from the St. Marks River near the St. Marks Refinery are not likely to cause illness in adults or children.

Conclusions

1. This site is categorized as a no apparent public health hazard from eating largemouth bass, redear sunfish, sheepshead, black striped mullet, and blue crab containing the levels of dioxin/furan and mercury found in fish taken from the St. Marks River near the St. Marks Refinery site.

2. The concentrations of dioxins/furans and mercury in fish and blue crabs from the St. Marks River near the St. Marks Refinery site do not warrant testing of people who eat these fish and crabs.

3. The St. Marks River near the St. Marks Refinery site is closed to oyster harvesting. It is unlikely that oysters near Shell Point, 7 miles to the southwest across the Gulf of Mexico, have been affected by contamination from the St. Marks Refinery site.

Recommendations/Public Health Action Plan

At this time and for this health consultation only, the Florida DOH does not offer any recommendations for this site.

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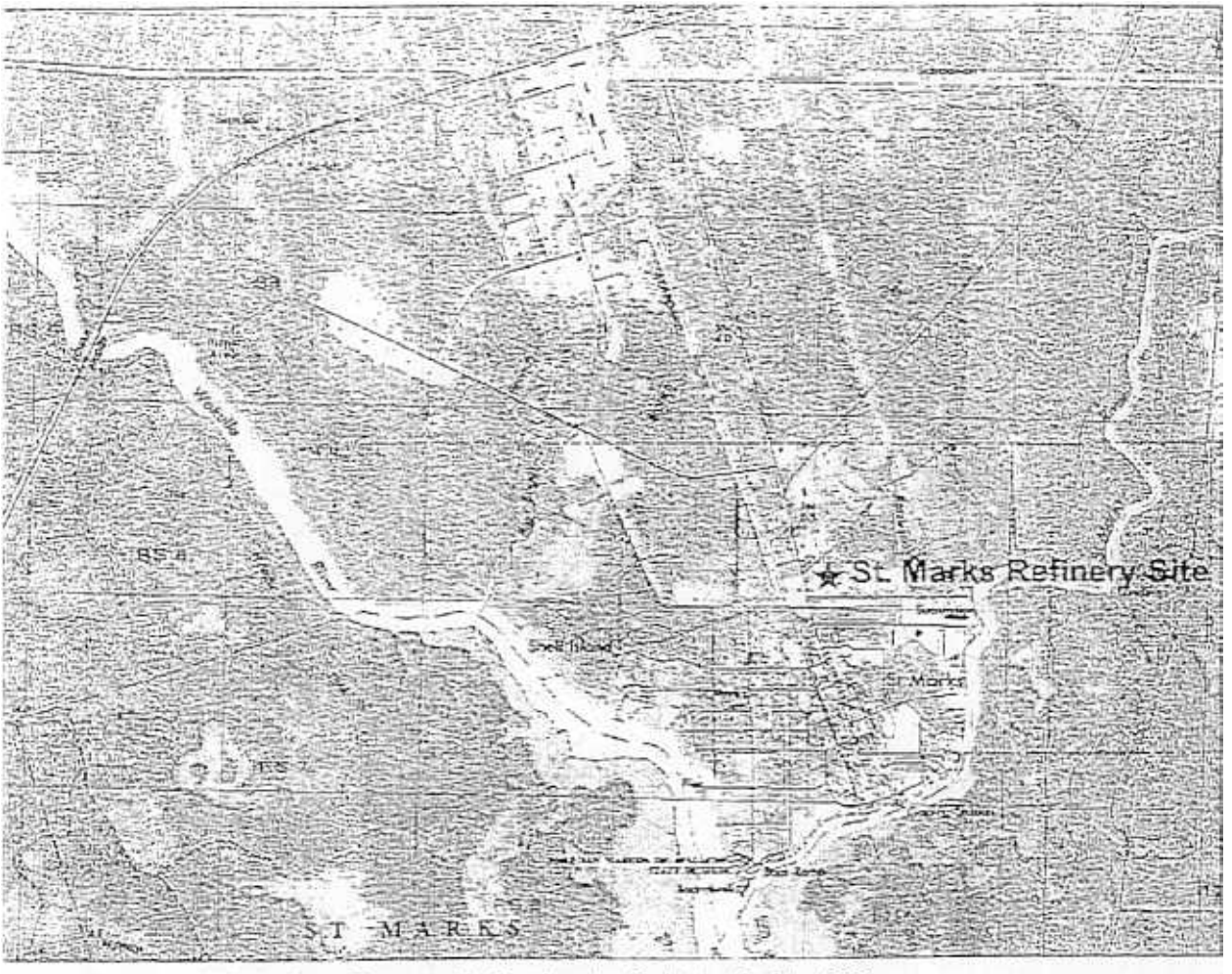
FIGURES



Source: U.S.G.S. 7.5 minute Topographic Quadrangle: St. Marks Florida, 1982

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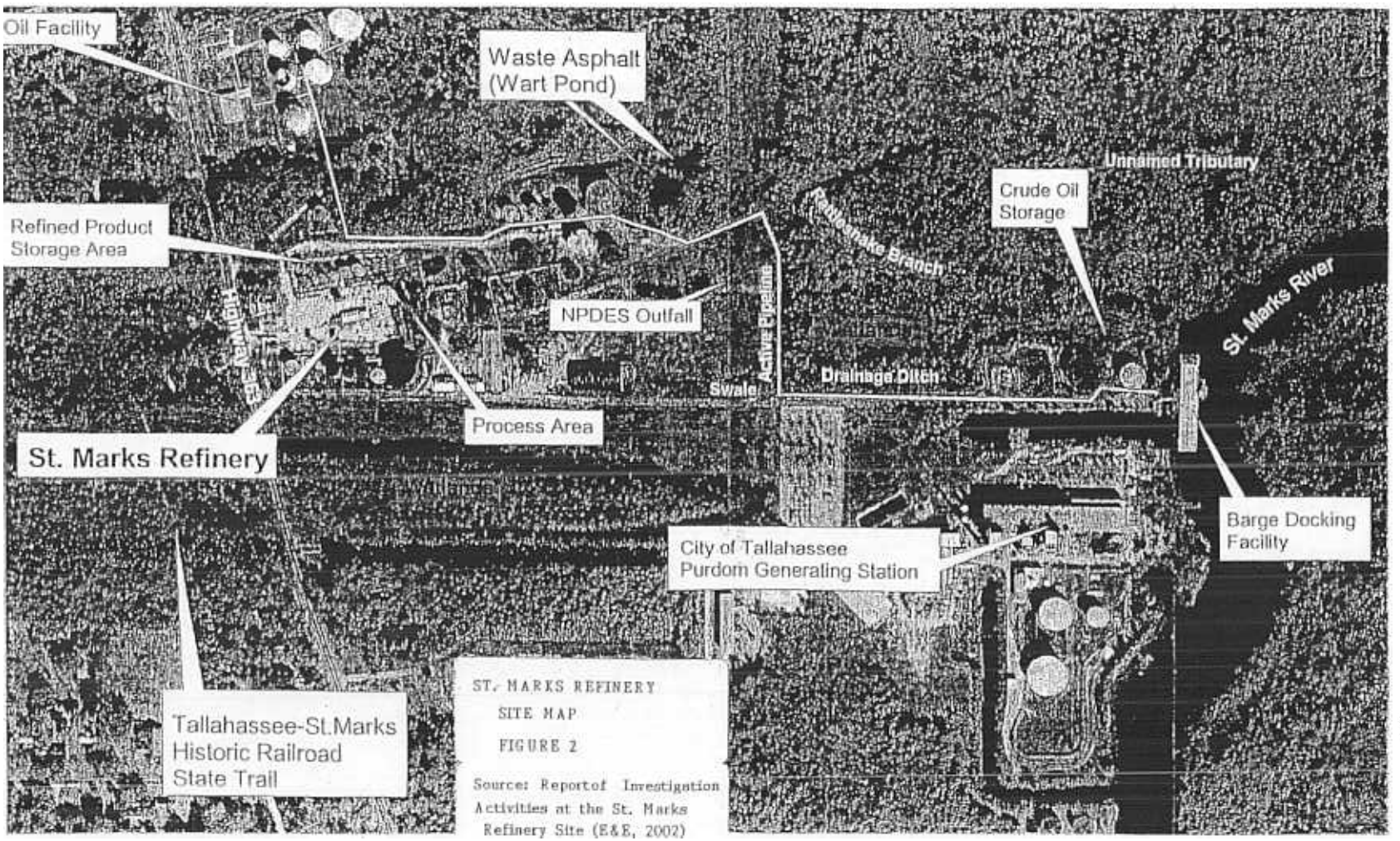
ST. MARKS REFINERY
LOCATION MAP
FIGURE 1

St. Marks, Wakulla County, Florida

Source: Report of Investigation
Activities at the St. Marks
Refinery Site (E&E, 2002)



ST. MARKS REFINERY

SITE MAP

FIGURE 2

Source: Report of Investigation Activities at the St. Marks Refinery Site (E&E, 2002)

TABLES

TABLE I - CONCENTRATIONS of DIOXINS/FURANS TEQ in FISH FROM the ST. MARKS RIVER NEAR the ST. MARKS REFINERY
(parts per trillion - ppt)

Fish Species	Collection Date	Collection Location	Number of Fish Composited	TEQ (ppt) *	Lab
Redear Sunfish	7/22/02	½ mile upstream and downstream	15	0.000	GERG Texas A&M
Sheepshead	7/22/02	½ mile upstream and downstream	15	0.001	GERG Texas A&M
Large Mouth Bass	7/22/02	½ mile upstream and downstream	12	0.001	GERG Texas A&M
Black Striped Mullet	7/22/02	½ mile upstream and downstream	13	0.000	GERG Texas A&M

*TEQs were calculated assuming non-detects were equal to zero since only one out of 17 congeners was detected for the LMB and sheepshead

TABLE II - CONCENTRATIONS OF TOTAL MERCURY IN FISH FROM THE ST. MARKS RIVER NEAR THE ST. MARKS REFINERY
(parts per million – ppm)

Fish Species	Collection Date	Collection Location	Number of Fish Composited	Total Mercury (ppm)	Laboratory
Redear Sunfish	7/22/02	½ mile upstream and downstream	15	0.106	GERG
Sheepshead	7/22/02	½ mile upstream and downstream	15	0.028	GERG
Large Mouth Bass	7/22/02	½ mile upstream and downstream	12	0.267D	GERG
Black Striped Mullet	7/22/02	½ mile upstream and downstream	13	0.012	GERG

D= sample diluted GERG = Geochemical & Environmental Research Group/College of Geosciences Texas A&M University

TABLE III - CONCENTRATIONS of DIOXINS/FURANS TEQ in BLUE CRAB FROM the ST. MARKS & AUCILLA RIVERS
(parts per trillion – ppt)

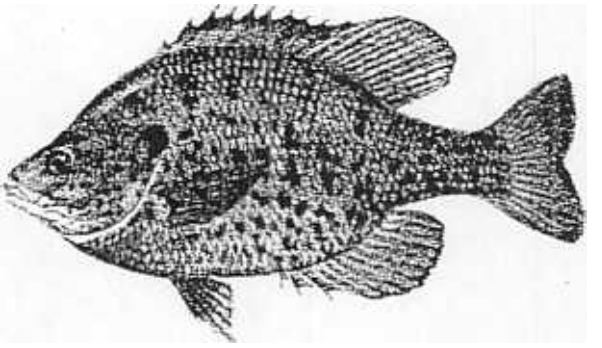
Collection Location	Collection Date	Number of Crabs Composited	TEQ(ppt) Hepatopancreas Composite	TEQ (ppt) Muscle Tissue Composite	Laboratory
ST. MARKS RIVER	6/17–20/02	7 crabs	1.11	Not sampled	STL - Sacramento
ST. MARKS RIVER	8/20/02	7 male crabs*	3.1	2.1	Triangle Labs
AUCILLA RIVER	6/20/02	2 crabs	0.00	Not sampled	STL - Sacramento
AUCILLA RIVER	7/9/02	6 crabs**	0.09	Not sampled	STL - Sacramento

Dioxins/Furans concentration results are reported in sample wet weight in parts per trillion
* Composite of 7 male crabs analyzed (hepatopancreatic portions - 23.9 grams; muscle tissue - 43.6 grams)
Crabs in Aucilla River used as a background comparison for crabs from the St. Marks River
** Composite of 6 crabs analyzed (hepatopancreatic portions – 26.9 grams; muscle tissue – 26.7 grams)

ATTACHMENT A

REDEAR SUNFISH

(*Lepomis microlophus*)



Common Names - Widely known as shellcracker because of its fondness for snails. Also called bream, yellow bream.

Description - The redear is similar in shape to the bluegill, but lacks the dark spot at the base of the posterior portion of the dorsal fin and has a red or orange border around the "ear" flap. The body coloration is light olive-green to gold, with red or orange flecks on the breast. The breast of a mature redear is typically a rather bright yellow. The body is heavily spotted and they have long, pointed pectoral fins. Five to 10 vertical bars are more or less evident on the sides, depending on the size of the fish. Males and females are similar in appearance, although the male is generally more colorful.

Subspecies - There are no recognized subspecies. Known to hybridize with other members of the sunfish family.

Range - Found throughout Florida and the southeastern United States. They are also one of the dominant sport fish in the vast Everglades marshes.

Habitat - Redear are found in almost every freshwater aquatic system in Florida. They are typically found on sandy or shell-covered areas of ponds and lakes, and are often located near grasses. Redear spend a great deal of time offshore in open water, particularly in the winter. Other redear found in rivers prefer, quiet waters and have a tendency to congregate around stumps, roots and logs. They are common in lower, more slowly flowing reaches of rivers. They tolerate brackish water better than other sunfish. Like black bass and spotted sunfish, they may be abundant in tidal areas near the mouths of rivers.

Spawning Habits - Spawning occurs during May, June and July (March through August in central Florida) when water temperatures reach 70 degrees. They prefer water three to four feet deep, and a firm, shelly bottom, often near a dropoff. Nesting sites are often near aquatic vegetation such as water lilies, cattails, lizardtails, and maidencane. Breeding behavior is similar to other sunfish, with the males doing the nest building and guarding the young. A female may lay between

15,000 to 30,000 eggs during a spawn.

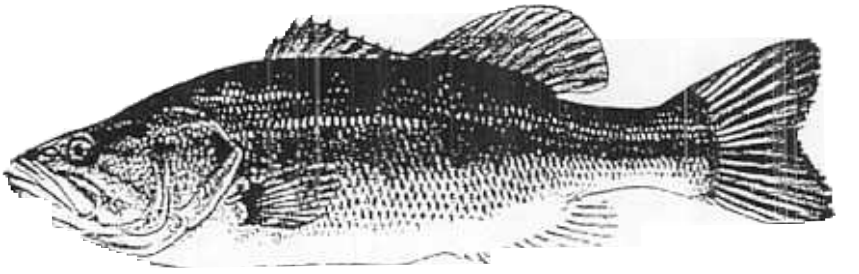
Feeding Habits - Redears are opportunistic bottom feeders, foraging mainly during daylight hours on a variety of invertebrates. Important food items include snails and clams which are crushed by grinding teeth in the throat; larval insects, fish eggs, small fish, and crustaceans. In some areas snails may be secondary to insects as a food preference.

Age and Growth - Redears grow faster than any other true sunfish. The maximum age is about eight years old. Nine- to 10-inch redears are common throughout Florida.

Sporting Quality - Strong fighters, but more difficult to catch than most other sunfish. The redear does not readily take artificial lures but is easily taken on natural baits. Most fish are taken on cane poles with small hooks, corks, and split shot for weight. Favorite baits are worms, crickets, grubs, and shrimp fished in the spring and summer during the bedding season. Later in the season they move to much deeper water or into heavy cover, where they are difficult to locate. As a sport fish, specific bag and size limit regulations apply, and you can register a qualifying catch as part of the Florida Fish and Wildlife Conservation Commission's "Big Catch" program.

Eating Quality - Similar to that of bluegill, with white, flaky, sweet-tasting meat. Prepared the same as bluegill.

State and World Records - 4 pounds, 13 ounces, caught in Merritt's Mill Pond, Florida, in 1986. (Please check link for updates). World record is 5 pounds, 3 ounces.



FLORIDA LARGEMOUTH BASS

(*Micropterus salmoides floridanus*)

Common Names - black bass, Florida bass, Florida (or southern) largemouth, green bass, bigmouth, bucketmouth, linesides, Oswego bass and green trout.

Description - The largemouth is the largest member of the sunfish family. It generally has light greenish to brownish sides with a dark lateral line which tends to break into blotches towards the tail. Often confused with smallmouth and spotted bass, it is easily distinguishable because the upper jaw extends beyond the rear edge of the eye. Also, its first and second dorsal fins are almost separated by an obvious deep dip, and there are no scales on the soft-rayed second dorsal fin or on the anal fin.

Subspecies - Two are recognized: the northern largemouth (*M. s. salmoides*) and the Florida largemouth (*M. s. floridanus*). The two look much the same, but the Florida largemouth has 69-73 scales along the lateral line compared to the northern largemouth's 59-65 scales. Florida bass grow to trophy size more readily than northern largemouth in warm waters.

Range - Originally, the Florida largemouth was found only in peninsular Florida, but they have been stocked in several other states including Texas and California. Pure northern largemouth bass are not found in Florida. Genetic intergrades between the subspecies, however, occur throughout north Florida.

Habitat - Prefers clear, nonflowing waters with aquatic vegetation where food and cover are available. They occupy brackish to freshwater habitats, including upper estuaries, rivers, lakes, reservoirs and ponds. Also, they can tolerate a wide range of water clarities and bottom types, prefer water temperatures from 65 to 85 degrees, and are usually found at depths less than 20 feet.

Spawning Habits - Spawning occurs from December through May, but usually begins in February and March in most of Florida when water temperatures reach 58 to 65 degrees and continues as temperatures rise into the 70s. The male builds saucer-shaped nests 20 to 30 inches in diameter by placing its lower jaw near the bottom and rotating around this central location. Bass prefer to build nests in hard-bottom areas along shallow shorelines or in protected areas such as canals and coves. Depending on her size, the female can lay up to 100,000 eggs, which are fertilized as they settle into the nest. After spawning is completed, usually five to 10 days, the male guards the nest and eggs and later the young (sometimes called fry) attacking anything that approaches the nest. The female bass stays near the nest or may swim a short distance and remain listless for up to a day. After hatching, the fry swim in tight schools, disbanding when the small fish reach a length of about one inch.

Feeding Habits - The diet of bass changes with its size. Young fish feed on microscopic animals (zooplankton) and small crustaceans such as grass shrimp and crayfish. Fingerling bass feed on insects, crayfish, and small fishes. Adult bass will eat whatever is available, including fish, crayfish, crabs, frogs, salamanders, snakes, mice, turtles and even birds.

Age and Growth - Growth rates are highly variable with differences attributed mainly to their food supply and length of growing season. Female bass live longer than males and are much more likely to reach trophy size. By age two or three, females grow much faster than male bass. Males seldom exceed 16 inches, while females frequently surpass 22 inches. At five years of age females may be twice the weight of males. One-year old bass average about seven inches in length and grow to an adult size of 10 inches in about 1-1/2 to 2-1/2 years. The oldest bass from Florida whose age has been determined by fisheries biologists was 16 year of age. Generally, trophy bass (10 pounds and larger) are about 10 years old. The formula used by Florida scientists to estimate weight based on length and girth is: log(weight, in grams) = -4.83 + 1.923 x log(total length, in mm) + 1.157 x log(girth, in mm). Click here for an automated formula, and here to determine how to properly measure your fish.

Sporting Qualities - The largemouth bass is Florida's most popular freshwater game fish. Much of its popularity is due to its aggressive attitude and willingness to strike a lure or bait with explosive force. They will strike almost any kind of artificial lure or live bait, but most are taken on plastic worms, surface plugs, spinnerbaits, crankbaits, bass bugs and shiner minnows. The value of the largemouth as a sport fish has prompted a movement toward catch-and-release fishing. As a sport fish, specific bag and size limit regulations apply, and you can register a qualifying catch as part of the Florida Fish and Wildlife Conservation Commission's "Big Catch" program.

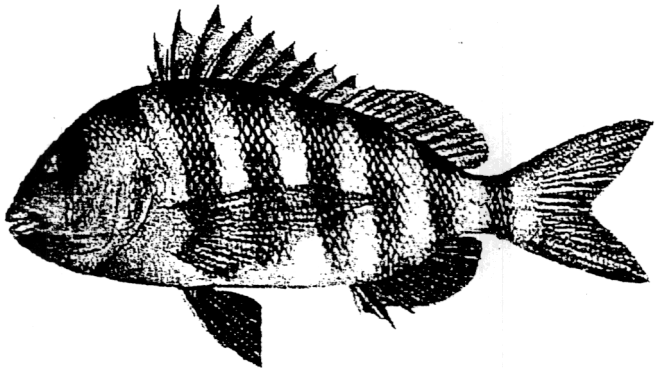
Eating Quality - The meat is white, flaky and low in oil content. The flavor depends upon the way the fish are cleaned and prepared. The strong weedy taste of bass caught in some waters may be eliminated by skinning the fish and salting and peppering the fillets before battering. Fillets usually are fried, while larger ones may be baked.

World Record - 22 pounds, 4 ounces, caught in Montgomery Lake, Georgia in 1932. See the Big Bass Record Club (BBRC) for a history of this historic fish. BBRC also sponsors our "go fishing" bass tag by giving a free t-shirt to anyone who buys or renews their bass tag, and offers a discount membership and free hat to Florida fishing license holders.

Certified State Record - 17 pounds, 4-1/4 ounces, caught in an unnamed lake in Polk County in 1986. (Please check link for updates)

Uncertified State Record - 20 pounds, 2 ounces, caught in Big Fish Lake (private pond) in Pasco County in 1923.

Sheepshead



Family Sparidae, PORGIES
Archosargus probatocephalus

Description: basic silvery color; with 5 or 6 distinct vertical black bands on sides, not always the same on both sides; prominent teeth, including incisors, molars, and rounded grinders; no barbels on lower jaw; strong and sharp spines on dorsal and anal fins.

Similar Fish: black drum, *Pogonias cromis*; Atlantic spadefish, *Chaetodipterus* (black drum have barbels on lower jaw, sheepshead do not; vertical barring on sides of black drum and spadefish disappear as fish mature; spadefish have small, brush-like teeth).

Where found: INSHORE species around oyster bars, seawalls and in tidal creeks; moves NEARSHORE in late winter and early spring for spawning, gathering over debris, artificial reefs and around navigation markers.

Size: INSHORE, 1 to 2 pounds; OFFSHORE, common to 8 pounds.

***Florida Record:** 12 lbs., 2 ozs.

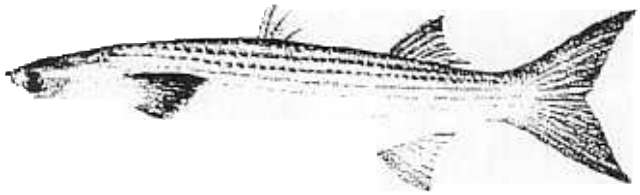
Remarks: feeds on mollusks and crustaceans such as fiddler crabs and barnacles; famed nibblers, prompting the saying that "anglers must strike just before they bite."

* The Florida records quoted are from the Department of Environmental Protection's printed publication, Fishing Lines and are not necessarily the most current ones. The records are provided as only as a benchmark.

[Fish Identification] [Fishing in Indian River County]

Living | Learning Working | Playing

Striped (Black) Mullet



Family Mugilidae, MULLETS
Mugil cephalus

Description: color bluish-gray or green above, shading to silver on sides with distinct horizontal black barrings, white below; fins lightly scaled at base, unscaled above; blunt nose and small mouth; second dorsal fin originates behind that of the dorsal fin.

Similar Fish: white mullet, *M. curema*; fantail mullet, *M. gyrans* (both white and fantail mullet have black blotch at base of pectoral fin, which is lacking in the black mullet).

Where found: INSHORE.

Size: roe mullet common to 3 pounds but in aquariums known to reach 12 pounds or more.

***Florida Record:** n/a

Remarks: adults migrate OFFSHORE in large schools to spawn; juveniles migrate INSHORE at about 1 inch in size, moving far up tidal creeks; frequent leapers; feeds on algae, detritus and other tiny marine forms.

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[Fish Identification] [Fishing in Indian River County]

Living | Learning Working | Playing

ATTACHMENT B

Chlorinated Dibenzo-p-Dioxins: General Information

Chlorinated dibenzo-p-dioxins (CDDs) are a family of 75 different compounds with varying harmful effects. CDDs are divided into eight groups of chemicals based on the number of chlorine atoms in the compound. A few examples are di-chlorinated dioxin (DCDD), tri-chlorinated dioxin (TrCDD) and tetra-chlorinated dioxin (TCDD). 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) has four chlorine atoms, one each in the 2, 3, 7, and 8 positions. 2,3,7,8-TCDD is odorless. Whether the other CDDs are also odorless is unknown. CDDs are known to occur naturally; they are also produced by human activities. They occur naturally from the incomplete combustion of organic material, such as from forest fires or volcanic activity. CDDs are not purposefully manufactured by industry, except in small amounts for research purposes. But they are unintentionally produced by industrial, municipal, and domestic incineration and combustion processes (ATSDR 1998).

If a person is exposed to CDDs, many factors determine whether they will be harmed. These factors include the dose (how much), the duration (how long) and how they come in contact with the chemicals. Other factors include other chemicals to which a person is exposed, as well as that person's age, sex, diet, family traits, lifestyle and state of health (ATSDR 1998).

CDDs are found everywhere in the environment, albeit at generally low levels. Most people are exposed to very small background levels of CDDs when they breath air, consume food or milk, or have skin contact with materials contaminated with CDDs (ATSDR 1998). CDDs enter the environment as mixtures containing a variety of individual components and impurities. They tend to be associated with ash, soil, or any surface with a high organic content, such as plant leaves. CDDs adhere strongly to soils and sediments. Estimates of the half-life of 2,3,7,8-TCDD on the soil surface range from 9 to 15 years, whereas the half-life in subsurface soil might range from 25 to 100 years (Paustenback et al. 1992). Sunlight and atmospheric chemicals break down only a small portion of the CDDs.

Of the 126 waste sites on the EPA National Priorities List that contain CDDs, 2,3,7,8-TCDD has been detected at 91 of them (ATSDR 1998). People living around these sites could be exposed to above-background levels of 2,3,7,8-TCDD and other CDDs. CDDs can enter the body when one breathes contaminated air, eats contaminated food, or has skin contact with contaminated soil or other materials. The most common way CDDs can enter the body is by eating food contaminated with CDDs.

Chlorinated Dibenzofurans: General Information

Chlorinated dibenzofurans (CDFs) are a family of chemicals containing 1 to 8 chlorine atoms attached to the carbon atoms of the parent chemical, dibenzofuran. The CDF family contains 135 individual compounds (known as congeners) with varying harmful health and environmental effects. Of the 135 compounds, those that contain chlorine atoms at the 2,3,7,8 positions are especially harmful. Other than for research and development purposes, these chemicals are not deliberately produced by industry. Most CDFs are produced in very small amounts as unwanted

impurities of certain products, and as processes utilizing chlorinated compounds. Only a few of the 135 CDF compounds have been produced in large enough quantities that their properties, such as color, smell, taste, and toxicity could be studied. The few CDF compounds that have been produced in those quantities are colorless solids. They do not dissolve in water easily. There is no known use for these chemicals. Most commonly, CDFs enter the body when one eats food contaminated with CDFs—in particular, fish and fish products, meat and meat products, and milk and milk products. Exposure to CDFs from drinking water is less than that from food (ATSDR 1994).

Like the CDDs, if a person is exposed to CDFs, many factors determine whether they will be harmed. These factors include the dose (how much), the duration (how long) and how that person comes in contact with the chemicals. Other factors include other chemicals the person is or has been exposed to, their age, sex, diet, family traits, lifestyle and state of health (ATSDR 1994).

Chlorinated Dibenzo-p-dioxins and Chlorinated Dibenzofurans

Chlorinated dibenzodioxins (CDDs) are found in the environment together with structurally related chlorinated dibenzofurans (CDFs). 2,3,7,8-TCDD is one of the most toxic and extensively studied of the CDDs and serves as a prototype for the toxicologically relevant or "dioxin-like" CDDs and CDFs. Based on results from animal studies, scientists have learned they can express the toxicity of dioxin-like CDDs and CDFs as a fraction of the toxicity attributed to 2,3,7,8-TCDD. For example, the toxicity of dioxin-like CDDs and CDFs can be ½ or 1/10 or any fraction of 2,3,7,8-TCDD. Scientists call that fraction a Toxicity Equivalent Factor (TEF). CDD and CDF exposures are usually reported in Toxicity Equivalency Factors (TEFs). It should also be noted that CDDs and CDFs are highly persistent compounds—they have been detected in air, water, soil, sediments, animals and foods. (ATSDR 1998).

The concentration of chlorinated dibenzo dioxins (CDDs) in samples of air, water, or soil is often reported as parts per trillion. One part per trillion (ppt) is one part CDD per trillion parts of air, water, or soil. For the general population, more than 90% of the daily intake of CDDs, chlorinated dibenzofurans (CDFs), and other dioxin-like compounds comes from food—primarily meat, dairy products, and fish. That said, however, the actual intake of CDDs from food for any one person would depend on the amount and type of food consumed and the level of contamination.

As stated, CDDs remain in the environment for a long time. Because CDDs do not dissolve easily in water, most will attach strongly to small particles of soil sediment or organic matter and eventually settle to the bottom. CDDs might also attach to microscopic plants and animals (plankton), which are eaten by larger animals, which are in turn eaten by even larger animals. This is known as a "food chain." Concentrations of chemicals such as the most toxic, 2,3,7,8-chlorine-substituted CDDs, which are difficult for the animals to break down, usually increase at each step in the food chain. This process, referred to as "biomagnification," is the reason why undetectable levels of CDDs in water can result in measurable concentrations in aquatic animals. The food chain is the main route by which CDD concentrations build up in larger fish, although

some fish can accumulate CDDs by eating particle-containing CDDs directly off the bottom (ATSDR 1998). Concentrations of dioxins in aquatic organisms can be hundreds to thousands of times higher than the concentrations found in the surrounding waters or sediments (EPA 1999). Bioaccumulation factors vary among the congeners and generally increase with chlorine content up through the tetracongeners and then generally decrease with higher chlorine content (EPA 1999).

CDDs bioaccumulate in aquatic organisms, plants, and terrestrial animals. Shellfish (including crustaceans and bivalve mollusks) appear to accumulate CDDs from nonselectively to relatively high concentrations in their tissues (Bopp et al. 1991, Brown et al. 1994, Cai et al. 1994, Conacher et al. 1993, Hauge et al. 1994, Rappe et al. 1991). In contrast, finfish appear to selectively accumulate primarily 2,2,7,8-TCDD and other 2,3,7,8-substituted isomers in their tissues (Rappe et al. 1991).

Elevated levels of CDDs have been reported in fish, shellfish, birds, and mammals collected in areas surrounding chemical production facilities, hazardous waste sites, and pulp and paper mills using the chlorine bleaching process. Sometimes these findings have resulted in closure of these areas to both commercial and recreational fishing. People who eat food from these contaminated areas are at risk of increased exposure to CDDs (ATSDR 1998).

Individuals who could be exposed to higher than average levels of dioxins include those who ingest food containing higher concentrations of dioxins than are found in the commercial food supply. These groups specifically include recreational and subsistence fishers who routinely consume large amount of locally caught fish (EPA 1999).

Lipophilic (fat-loving) chemicals—such as dioxins—accumulate mainly in fatty tissues of fish (e.g., belly, flap, lateral line, subcutaneous and dorsal fat, dark muscle, gills, eye, brain and internal organs). Therefore, removal of fish internal organs and skin and trimming the fat before cooking will decrease exposure.

Mercury

Several forms of mercury occur naturally in the environment. The most common natural forms are metallic mercury, mercuric sulfide (cinnabar ore), mercuric chloride, and methylmercury. Some microorganisms (bacteria and fungi) and natural processes can change the mercury in the environment from one form to another. The most common organic mercury compound that microorganisms and natural processes generate from other forms is methylmercury. Methylmercury is of particular concern because it can bioaccumulate in certain edible freshwater and saltwater fish and marine mammals to levels that are many times greater than levels in the surrounding water (ATSDR 1999).

Approximately 80% of the mercury released from human activities is elemental mercury. It is released to the air, primarily from fossil fuel combustion, mining, and smelting, and from solid waste incineration. Some 15% is released to the soil from fertilizers, fungicides, and municipal

solid waste (e.g., from waste containing discarded batteries, electrical switches, or thermometers). An additional 5% is released from industrial wastewater to water in the environment (ATDSR 1999).

With the exception of mercury ore deposits, the amount of mercury found naturally in any one place is usually very low. By contrast, the amount of mercury found in soil at a particular hazardous waste site because of human activity can be high (over 200,000 times natural levels). The mercury in air, water, and soil at hazardous waste sites can originate from both natural sources and human activity (ATSDR 1999).

Mercury can enter and accumulate in the food chain. The form of mercury that accumulates in the food chain is methylmercury. Inorganic mercury does not accumulate up the food chain to any extent. When small fish eat the methylmercury with their food, it goes into their tissues. When larger fish eat smaller fish or other organisms containing methylmercury, most of the methylmercury originally present in the small fish will then be stored in the bodies of the larger fish. As a result, the larger and older fish living in contaminated waters bioaccumulate the highest amounts of methylmercury. Saltwater fish (especially sharks and swordfish) that live a long time and grow to a large size tend to have the highest levels of mercury in their bodies. By contrast, plants (e.g., corn, wheat, and peas) have low levels of mercury, even if grown in soils containing mercury at significantly higher than background levels (ATSDR 1999).

ATTACHMENT C

ATSDR Glossary of Environmental Health Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices in the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR is not a regulatory agency, unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces environmental laws to protect the environment and human health.

This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR (1-888-422-8737).

Absorption
The process of taking in. For a person or animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.

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.

Ambient
Surrounding (for example, *ambient* air).

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.

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 indicators of exposure study
A study that uses (a) **biomedical testing** or (b) the measurement of a substance [an **analyte**], its **metabolite**, or another marker of exposure in human body fluids or tissues to confirm human exposure to a hazardous substance [also see **exposure investigation**].

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.

Biomedical testing
Testing of persons to find out whether a change in a body function might have occurred because of exposure to a hazardous substance.

Biota
Plants and animals in an environment. Some of these plants and animals might be sources of 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 occurs when cells in the body become abnormal and grow or multiply out of control.

Cancer risk
A theoretical risk of 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.

Central nervous system
The part of the nervous system that consists of the brain and the spinal cord.

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

Chronic
Occurring over a long time (more than 1 year) [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.

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

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.

Disease prevention
Measures used to prevent a disease or reduce its severity.

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.

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.

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
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 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**.

Feasibility study
A study by EPA to determine the best way to clean up environmental contamination. A number

of factors are considered, including health risk, costs, and what methods will work well.

Groundwater
Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with **surface water**].

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**].

Health education
Programs designed with a community to help it know about health risks and how to reduce these risks.

Health promotion
The process of enabling people to increase control over, and to improve, their health.

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.

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**].

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.

Medical monitoring
A set of medical tests and physical exams specifically designed to evaluate whether an individual's exposure could negatively affect that person's health.

Metabolism
The conversion or breakdown of a substance from one form to another by a living organism.

Metabolite
Any product of **metabolism**.

mg/kg
Milligram per kilogram.

mg/cm^2
Milligram per square centimeter (of a surface).

mg/m^3
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**].

National Priorities List for Uncontrolled Hazardous Waste Sites (National Priorities List or NPL)
EPA's list of the most serious uncontrolled or abandoned hazardous waste sites in the United States. The NPL is updated on a regular basis.

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)
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.

NPL [see **National Priorities List for Uncontrolled Hazardous Waste Sites**]

Pica
A craving to eat nonfood items, such as dirt, paint chips, and clay. Some children exhibit pica-related behavior.

Plume
A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.

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).

Potentially responsible party (PRP)
A company, government, or person legally responsible for cleaning up the pollution at a hazardous waste site under Superfund. There may be more than one PRP for a particular site.

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 availability session
An informal, drop-by meeting at which community members can meet one-on-one with ATSDR

staff members to discuss health and site-related concerns

Public health action
A list of steps to protect public 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, no apparent public health hazard, indeterminate public health hazard, public health hazard**, and **urgent public health hazard.**

Public health statement
The first chapter of an ATSDR **toxicological profile**. The public health statement is a summary written in words that are easy to understand. The public health statement explains how people might be exposed to a specific substance and describes the known health effects of that substance.

Public meeting
A public forum with community members for communication about a site

RCRA [See **Resource Conservation and Recovery Act (1976, 1984)**]

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.

Registry
A systematic collection of information on persons exposed to a specific substance or having specific diseases [see **exposure registry** and **disease registry**].

Remedial Investigation
The CERCLA process of determining the type and extent of hazardous material contamination at a site.

Resource Conservation and Recovery Act (1976, 1984) (RCRA)
This Act regulates management and disposal of hazardous wastes currently generated, treated, stored, disposed of, or distributed.

RFA
RCRA Facility Assessment. An assessment required by RCRA to identify potential and actual releases of hazardous chemicals.

RfD
See **reference dose**.

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.

Risk communication
The exchange of information to increase understanding of health risks.

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**].

Safety factor [see **uncertainty factor**]

SARA [see **Superfund Amendments and Reauthorization Act**]

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 environment.

Solvent

A liquid capable of dissolving or dispersing another substance (for example, acetone or mineral spirits).

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.

Stakeholder
A person, group, or community who has an interest in activities at a hazardous waste site.

Statistics
A branch of mathematics that deals with collecting, reviewing, summarizing, and interpreting data or information. Statistics are used to determine whether differences between study groups are meaningful.

Substance
A chemical.

Substance-specific applied research
A program of research designed to fill important data needs for specific hazardous substances identified in ATSDR's **toxicological profiles**. Filling these data needs would allow more accurate assessment of human risks from specific substances contaminating the environment. This research might include human studies or laboratory experiments to determine health effects resulting from exposure to a given hazardous substance.

Superfund Amendments and Reauthorization Act (SARA)
In 1986, SARA amended CERCLA and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from substance exposures at hazardous waste sites and to perform activities including health education, health studies, surveillance, health consultations, and toxicological profiles.

Surface water
Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with **groundwater**].

Survey
A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted by telephone, by mail, or in person. Some surveys are done by interviewing a

group of people.

Teratogen
A substance that causes defects in development between conception and birth. A teratogen is a substance that causes a structural or functional birth defect.

Toxic agent
Chemical or physical (for example, radiation, heat, cold, microwaves) agents which, 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 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.

Tumor
An abnormal mass of tissue that results from excessive cell division that is uncontrolled and progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).

Uncertainty factor
Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a **safety factor**].

Urgent public health hazard
A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.

Volatile organic compounds (VOCs)
Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Other glossaries and dictionaries:

Environmental Protection Agency http://www.epa.gov/OCEPAterms/

National Center for Environmental Health (CDC)
http://www.cdc.gov/nceh/dls/report/glossary.htm

National Library of Medicine http://www.nlm.nih.gov/medlineplus/dictionaries.html

CERTIFICATION

The St. Marks Refinery Health Consultation was prepared by the Florida Department of Health, Bureau of Environmental Epidemiology, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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

for Roberta Erlwein
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