Public Health Assessment

for

TYNDALL AIR FORCE BASE
PANAMA CITY, BAY COUNTY, FLORIDA
CERCLIS NO. FL1570024124
JULY 24, 2000

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

PUBLIC HEALTH ASSESSMENT

TYNDALL AIR FORCE BASE

PANAMA CITY, BAY COUNTY, FLORIDA

CERCLIS NO. FL1570024124

Prepared by:

Federal Facilities Assessment Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment 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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FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations - the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E-56), Atlanta, GA 30333.

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ACRONYMS, ABBREVIATIONS, AND GLOSSARY

AFB	Air Force Base
AFBCA	Air Force Base Conversion Agency
AAFES	Army Airforce Exchange Service; a military service providing merchandise and services to active duty military
AOC	Area of Concern. A natural or man-made area or unit that may contain hazardous chemicals or waste.
ATSDR	Agency for Toxic Substances and Disease Registry
adverse health effects	Negative or unwanted effects on the health of an individual; for example, effects may include a specific illness or a general decrease in the overall health of a person.
aerobic	Occurring in the presence of oxygen.
anaerobic	Occurring in the absence of oxygen.
aquifer	A geologic (rock) formation through which groundwater moves and that is capable of producing water in sufficient quantities for a well.
AVGAS	Aviation fuel
BHC	Benzene hexacbloride or hexachlorocyclohexane. An insecticide that has been used on fruit, vegetable, and forest crops.
BPW	Base production well
BRA	Baseline risk assessment; an analysis of the potential adverse health effects (current or future) caused by hazardous substance releases.
biodegradation	Decomposition of a substance through the action of microorganisms or other natural environmental factors.
blank sample	A sample collected and analyzed to determine the level of contamination introduced into the environmental samples from the sampling technique and analysis.
CDC	Centers for Disease Control and Prevention

CERCLA	Comprehensive Environmental Response Compensation and Liability Act also known as Superfund
CREG	Cancer risk evaluation guide is a concentration in air, soil, or water at which a person's risk of cancer after exposure for 24 hours a day, 365 days a year, and for 70 years is 1 in 1,000,000. Exposure assumptions for adults are used, since the majority of a person's exposure occurs as an adult.
CSF	Cancer slope factor. The CSF is the slope of the oral dose-response curve for cancer. This value is derived by EPA and maintained on its IRIS database and used to estimate the risk from carcinogens.
Comparison Values or CVs	A concentration of a given contaminant in soil, water, or air below which no adverse human health effects are expected to occur. Comparison values are used by ATSDR health assessors to select environmental contaminants for further evaluation and can be based on either carcinogenic effects or noncarcinogenic effects.
conduit	A natural or artificial channel through which materials such as fluids are transported; for example, a water well
Detection limit or method detection limit	A minimum concentration of chemical that is detectable at a known confidence limit.
DDD	1,1-dichloro-2,2- bis(p-chlorophenyl)ethane; a chemical contaminant and degradation product of DDT.
DDE	1,1-dichloro-2,2- bis(p-chlorophenyl)ethylene; a chemical contaminant and degradation product in DDT.
DDT	1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane; a chemical introduced in the United States and widely used to control insects on agricultural crops and insects that carry diseases like malaria and typhus.
DOD	United States Department of Defense

EMEG	Environmental media evaluation guide; a concentration in air, soil, or water below which no adverse noncancer health effects are expected to occur. EMEGs are derived from ATSDR's minimum risk levels (MRLs), and are expressed for acute, intermediate, and chronic exposures. They are used in selecting environmental contaminants for further evaluation.
EOD	Explosive ordnance disposal
EPA	United States Environmental Protection Agency
EBS	Environmental Baseline Survey is a report documenting the bases environmental status.
Feasibility study	A study conducted to determine the best alternative for remediating environmental contamination based on a number of factors including health risk and costs.
gpm	Gallons per minute
groundwater	Water beneath the earth's surface
HQ/HI hazard quotient/hazard index	Hazard quotient (HQ); a comparison of the daily human exposure to a substance to the minimum risk level (MRL). The HQ is used as an assessment of noncancer associated toxic effects of chemicals, e.g., kidney or liver dysfunction. It is independent of a cancer risk, which is calculated only for those chemicals identified as carcinogens. A hazard index or quotient of one or less is generally considered safe. A ratio greater than one suggests further evaluation. Hazard index (HI); a summation of the HQ for all chemicals being evaluated. A hazard index value of one or less means that no adverse human health effects (noncancer) are expected to occur. A ratio greater than one suggests further evaluation.
HUD	Housing and Urban Development
HVAC	Heating, ventilating, and air conditioning system
ingestion	Eating and drinking
IRP	Installation Restoration Program; a program of the Department of Defense to clean up environmental contamination.

isomers	Any of two or more substances that are composed of the same elements in the same proportions, but differ in properties because of differences in the arrangement of atoms (Houghton Mifflin 1996). The prefix of 2,4' for an isomer represents the positions of atoms on a molecule.
L	Liter
LRA	Local redevelopment authority; a group formed by the affected community and recognized by the Department of Defense. The LRA is the single entity responsible for base reuse planning activities at the local level.
MCL	Maximum contaminant level; a concentration of a chemical that cannot be legally exceeded in a public drinking water supply system. The MCL is devised and enforced by U.S. EPA. States may also enforce the MCL and they may develop more stringent values.
medical monitoring	A set of medical tests and physical exams specifically designed to evaluate whether an individual is being exposed to a particular chemical at concentrations that could negatively affect that person's health.
migration	Moving from one location to another
mg/kg	Milligram per kilogram
mg/cm^2	Milligram per square centimeter
mg/m^3	Milligrams per cubic meter; a measure of the concentration of a chemical in a known amount (a cubic meter) of air.
MOGAS	Automobile gasoline
MRL	Minimum risk level; an ATSDR estimate of the daily human exposure to a substance below which no adverse noncancer health effects are expected to occur. MRLs are available for acute, intermediate, and chronic exposures.
munitions	Explosive devices; for example, grenades and bombs.
ND	Not detected; used to indicate that a substance was not detected at the analytical limits of the equipment and procedures.

NPL	National Priorities List for Uncontrolled Hazardous Waste Sites. This is the list of EPA's most hazardous waste sites in the United States.
NOAEL	No observed adverse effect level; the dose of chemical at which there were no statistically or biologically significant increases in frequency or severity of adverse effects seen between the exposed population and its appropriate control. Effects may be produced at this dose, but they are not considered to be adverse.
ng/m^3	Nanograms per cubic meter
ordnance	Military materiel, such as weapons, ammunition, explosives, combat vehicles, and equipment.
PAHs	Polycyclic aromatic hydrocarbons; a group of chemicals that are formed during the incomplete burning of coal, oil, gas, wood, garbage, or other organic substances, such as tobacco and charbroiled meat. There are more than 100 different PAHs.
Pb	Lead
PbB	Lead in blood
PCBs	Polychlorinated biphenyls; a group of synthetic organic chemicals that contain 209 individual but similar compounds (known as congeners).
PCE	Perchloroethene, also known as tetrachloroethene
PHA	Public health assessment
POL	Petroleum, oils, and lubricates
ppb	Parts per billion
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act (1976, 1984); an act that 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 or Reference Dose	An estimate of the daily exposure to the people that is likely to have no measurable risk of harmful health effects during a lifetime exposure or exposure during a limited time interval.
RI/FS	Remedial investigation/feasibility study; the CERCLA process of determining the type and extent of hazardous material contamination at a site and the options for cleanup.
Restoration Advisory Board (RAB)	A committee of public and private citizens formed to serve as a focal point for information exchange between military bases, private citizens, and other public agencies.
Risk	A qualitative and quantitative expression of the probability of potential cancerous adverse health effects occurring at specific levels of exposure to chemical or physical hazards. Adverse health effects can be the result of noncancer and cancer. Risk from cancer adverse health effects are expressed as a probability such as 1 in 1,000,000 (also expressed 1×10^{-6} or 1E-6). This means that there is a probability of 1 in 1,000,000 that an excess cancer will occur in the population over a lifetime. Other risk values considered are 1 in 10,000 and 1 in 100,000. A noncancer health risk is expressed as a hazard quotient.
SWMU	Solid waste management unit. A term RCRA uses in RFAs to describe areas or man-made units that contain or handle waste materials.
solvent	A liquid capable of dissolving or dispersing another substance; for example, acetone or mineral spirits.
TCE	Trichloroethene
TDS	Total dissolved solids
treatment technique	A specific treatment method required by EPA to he used to control the level of a contaminant in drinking water. In specific cases where EPA has determined it is not technically or economically feasible to establish an MCL, EPA can instead specify a treatment technique.
µg/L	Micrograms per liter
µg/dL	Micrograms per deciliter; a measure of the concentration of a chemical in a known amount (deciliter) of liquid; for example, the concentration of lead in a blood sample

$\mu g/m^3$	Microgram per cubic meter.
VOC	Volatile organic compound

SUMMARY

Tyndall Air Force Base (TAFB) is an active United States Air Force base located in Bay County, Florida, approximately 1 mile southeast of Panama City, Florida.

TAFB was listed on the EPA National Priorities List for Uncontrolled Hazardous Waste Sites (NPL) in April 1997, effective May 1997, as a result of pesticides found in sediment in Fred Bayou (also known as Shoal Point Bayou, Site No.OT029, or IRP Site 29). TAFB is currently investigating and conducting a cleanup of contaminated areas in cooperation with EPA and the Florida Department of Environmental Protection.

The Agency for Toxic Substances and Disease Registry (ATSDR), located in Atlanta, Georgia, is a federal agency within the U.S. Department of Health and Human Services. ATSDR conducts public health assessments for sites the EPA has listed on the NPL. In response to the listing of TAFB on the NPL list, ATSDR evaluated the public health significance of environmental contamination at the base. For this evaluation, ATSDR conducted a site visit in January 1997 and evaluated the available environmental information. Based on this review, ATSDR has identified and evaluated the following four potential exposure situations. This evaluation is summarized below by exposure situations and ATSDR's public health conclusion categories.

No Apparent Public Health Hazard

- Exposure to DDT-contaminated fish in Fred Bayou (past, present, and future)
- Exposure to lead in soils at the Tyndall Elementary School (past, present and future)
- Past exposure to lead in tap water at 2451 Lincoln Drive in the Bay View Housing area

Indeterminate Public Health Hazard

- Potential exposure to contaminated surface soils or soil gas from Wherry Landfill at the Bay View Housing area.

These exposures are discussed in detail in this report. To summarize, ATSDR assigned the category of **"No Apparent Public Health Hazard"** to past, current and future exposure to DDT in fish and to lead in soils at the school because concentrations and expected exposure durations were below levels of health concern. Similarly, past exposure to lead in tap water in the Lincoln Drive home was classified as **"No Apparent Public Health Hazard"** because the concentrations of lead and the exposure durations involved were below levels likely to result in adverse health effects.

Exposure to contaminated surface soils or soil gas from Wherry Landfill at the Bay View Housing area is classified as an ***indeterminate public health hazard for past exposures***, because limitations of the sampling prevent ATSDR from making a definitive conclusion about exposure to volatile and semivolatile organic compounds in the soils. For this potential exposure, ATSDR recommends an explanation of the landfill boundaries, soil gas sampling, and additional

groundwater level readings. Potential current and future exposure have been reduced significantly and possibly eliminated because many of the houses adjacent to the landfill have been vacated awaiting demolition. The entire Bay View Housing area is scheduled for closure by 2008 because the area will be used as a natural buffer zone for the runway.

I. BACKGROUND

This public health assessment (PHA) evaluates the public health significance resulting from environmental contamination at Tyndall Air Force Base (TAFB). TAFB is an active United States Air Force base installation located in Bay County, Florida, approximately 1 mile southeast of Panama City, Florida. The base covers about 28,800 acres on a narrow 18-mile long peninsula connected to land on its southeastern boundary. TAFB is bordered by East Bay to the northeast, St. Andrew Bay to the northwest, and St. Andrew Bay and the Gulf of Mexico to the south and southeast (See Figure 1). TAFB is connected to the Panama City area by the Dupont Bridge via Highway 98.

TAFB also owns or leases six off-base properties comprising an additional 285 acres. These areas are currently used for housing and radio antennas. One of these areas was formerly used as a fuel tank farm. Soil and groundwater fuel contamination at this tank farm are currently being cleaned up.

Adjacent to or across the bays from TAFB, land is used for varied purposes. Across East Bay and St. Andrew Bay, land is used for heavy industrial, commercial, and residential purposes while land adjacent to the southeast is used for light industrial and commercial purposes. Across St. Andrew Bay, approximately 0.75 miles to the north of TAFB, are two abandoned hazardous waste sites known as Gulf Oil Company and Southwest Forest Products. Also nearby and across the Dupont Bridge are the Stone Container Corporation, a paper mill, and the Arizona Chemical Company. Information on the demographic make-up of the base and surrounding community is provided in Figure 1.

U.S. Highway 98 bisects the base with the air field and industrial operations north of the highway. Administrative and residential areas are to the south of the highway.

TAFB was activated in 1941 as a flexible gunnery school for the Army Air Corps and, beginning in 1946, it was an air tactical training school. In 1950, TAFB was transferred from the Air Training Command to the Aerospace Defense Command, and the mission changed to focus on weapons training and system evaluation as well as tactics, techniques, equipment testing, and tactical air defense.

In 1979, TAFB was assigned to the Tactical Air Command. The 325th Tactical Training Wing was established at TAFB in 1981 for the training and evaluation of personnel and weapons. TAFB was assigned to the Air Education and Training Command in 1993 (CH_2M Hill 1981, Black & Veatch 1996, Booz Allen & Hamilton 1996)

TAFB is a work place for military personnel and civilians and a home for military personnel and their dependents. As of September 1997, approximately 4,400 military personnel and 2,000

Figure 1. Site Map of Tyndall Air Force Base

Tyndall Air Force Base

INTRO MAP

Panama City, Florida

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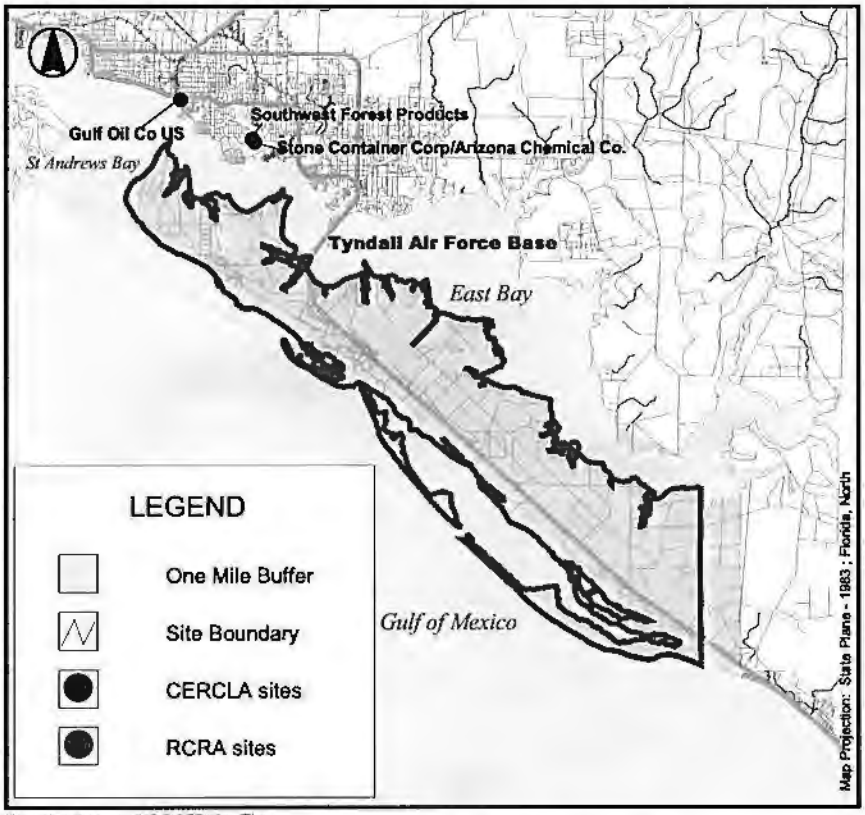


Bay County, Florida

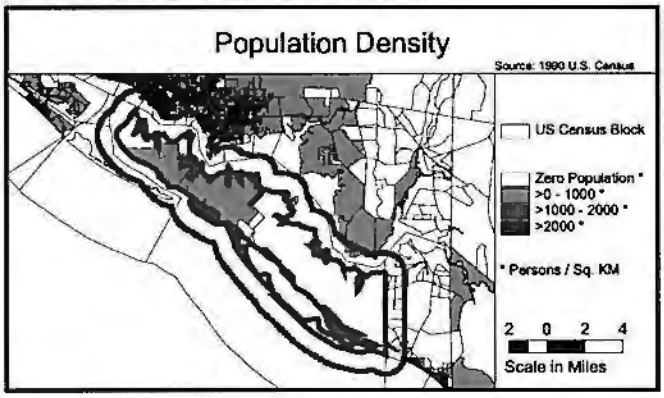
Demographic Statistics Within One Mile of Site*	
Total Population	6973
White	5868
Black	803
American Indian, Eskimo, Aleut	37
Asian or Pacific Islander	171
Other Race	96
Hispanic Origin	315
Children Aged 6 and Younger	964
Adults Aged 65 and Older	656
Females Aged 15 - 44	1592
Total Housing Units	2445

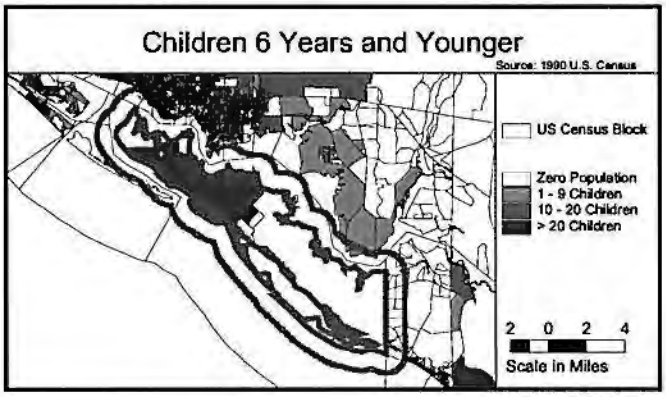
Base Map Source: 1995 TIGER/Line Files

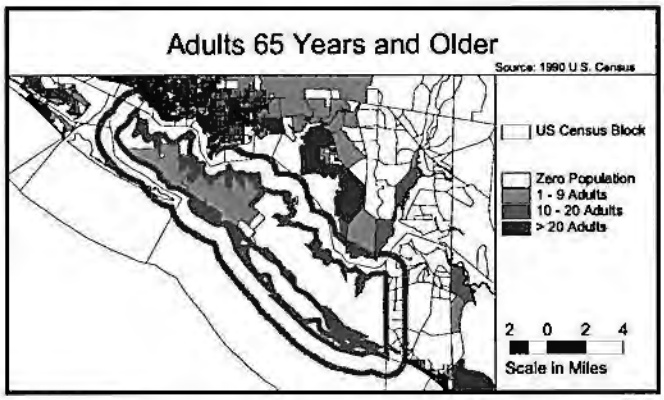
Polygons in these maps are official U.S. Census blocks and may include areas where people do not live. One example of this is the Census block that includes the flightline.

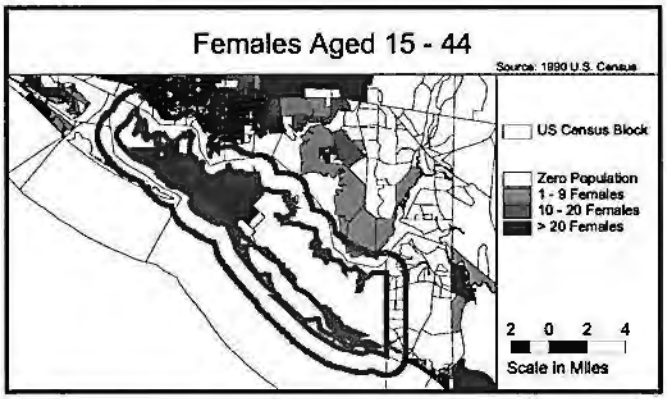
Demographics Statistics Source: 1990 US Census

*Calculated using an area-proportion spatial analysis technique









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civilians work at TAFB. Approximately 3,000 military personnel and their family members live on-base in 1,078 houses not including group quarters such as dormitories.

Industrial Operations.

TAFB has conducted a variety of industrial operations for maintenance of aircraft used in training, for the base infrastructure, and for the living quarters. These activities have included:

- Minor aircraft and vehicle maintenance, repair and painting including aircraft corrosion control, paint stripping, and cleaning of planes and components
- Construction and maintenance of buildings, roads, and runways
- Development and testing of rapid runway repair materials
- Fire training
- Wastewater treatment
- Explosive ordnance testing and disposal (CH_2M Hill 1981).

TAFB has generated 20 to 1,000 gallons per year of hazardous waste from these operations which is a relatively small amount based on Resource, Conservation, and Recovery Act (RCRA) standards (CH_2M Hill 1981). This amount is small because of TAFB's principal historic and current missions of testing and training and not industrial production or heavy maintenance and repair operations.

History of Waste Investigations

TAFB began investigating past disposal practices in 1981. Since then, TAFB has investigated and completed reports on many sites where past disposal or releases of hazardous substances have been identified. Currently, TAFB and EPA have identified 83 waste sites or areas of concern through the Installation Restoration Program (IRP) or Resource Conservation and Recovery Act (RCRA) program. Thirty-eight sites and two areas of concern (AOCs) have been identified through the IRP while 58 solid waste management units (SWMUs) and 11 AOCs have been identified by the RCRA Facility Assessment. Of the 58 SWMUs and 11 AOCs under RCRA, 26 are already addressed under the IRP (Booz Allen & Hamilton 1996).

These 83 sites are under different phases of investigation and some of these sites have been identified as requiring no further action. As of June 1996, 16 IRP sites and 22 SWMUs have been proposed for no further action (Booz Allen & Hamilton 1996).

TAFB was listed on the EPA National Priorities List for Uncontrolled Hazardous Waste Sites in April 1997, effective May 1997, as a result of DDT, DDD, and DDE found in sediment in Fred Bayou (also known as Shoal Point Bayou, Site No.OT029, or IRP Site 29) (U.S. Government Printing Office 1997). TAFB is currently investigating the source of DDT and evaluating options for remedial action at this site.

ATSDR Involvement

As required by CERCLA, ATSDR is preparing this PHA to evaluate the potential human health effects associated with exposure to environmental conditions at the base. To prepare this report, ATSDR visited TAFB in January 1997 to collect this environmental information and to identify community health concerns.

During our visit, we toured the base to observe the environmental conditions and met with the Air Force personnel and their contractors. We discussed the nature and extent of chemical contamination at the base, the proximity of chemically contaminated areas to on-base and off-base populations, and the types of human activities that could lead to exposures to the contamination. ATSDR staff members also met or talked to personnel from county, state and other federal agencies with knowledge of the base to identify their role and concerns. Information from these activities has been integrated with our review of environmental sampling data to draw the conclusions about the public health issues at the base which are presented in this document.

What is exposure?

ATSDR's public health assessments are exposure, or contact, driven. Chemical contaminants disposed of or released into the environment have the potential to cause adverse health effects. However, ***a release does not always result in exposure***. People can only be exposed to a chemical if they come in contact with the chemical. Exposure may occur by breathing, eating, or drinking a substance containing the contaminant or by skin (dermal) contact with a substance containing the contaminant.

When do health effects occur?

Exposure does not always result in health effects. The type and severity of health effects that occur in an individual from contact with a contaminant depend on the exposure concentration (how much), the toxic properties of the contaminant, the frequency and/or duration of exposure (how long), the route or pathway of exposure (breathing, eating, drinking, or skin contact), and the multiplicity of exposure (combination of contaminants). Once exposure occurs, characteristics such as age, sex, nutritional status, genetics, life style, and health status of the exposed individual influence how the individual absorbs, distributes, metabolizes, and excretes the contaminant. Together, these factors and characteristics determine the health effects that may occur as a result of exposure to a contaminant in the environment.

II. EVALUATION OF ENVIRONMENTAL CONTAMINATION, EXPOSURE PATHWAYS, AND THE PUBLIC HEALTH IMPLICATIONS

Based on the results of our site visit and a review of the data and information currently available, ATSDR concludes that there are no past, current, or future exposure situations at TAFB that pose a public health hazard. ATSDR reached this conclusion by reviewing the IRP sites, solid waste management units, and other environmental data. From this review, we identified and evaluated four potential exposure situations as shown in Table 1: (1) exposure to DDT-contaminated fish in Fred Bayou; (2) exposure to lead in soils at the Tyndall Elementary School; (3) exposure to lead in tap water at 2451 Lincoln Drive in the Bay View Housing area; and (4) exposure to contaminated surface soils and soil gas at Wherry Landfill. Our overall public health conclusion is no apparent public health hazard. Details of these exposure situations are summarized in Table 2 and discussed in the following sections. Conclusion categories are explained in Appendix C.

Table 1. Summary of ATSDR's public health conclusions for Tyndall Air Force Base

Exposure Situations	Conclusion Category
Exposure to DDT-contaminated fish in Fred Bayou (past, present, and future)	No Apparent Public Health Hazard
Exposure to lead in soils at the Tyndall Elementary School (past, present, and future)	
Past exposure to lead in tap water at 2451 Lincoln Drive, Bay View Housing	
Past exposure to contaminated surface soils or soil gas at Wherry Landfill	Indeterminate Public Health Hazard

A. EXPOSURE TO DDT IN FRED BAYOU (NO APPARENT PUBLIC HEALTH HAZARD)

Summary

Eating DDT contaminated fish from Fred Bayou was determined to present no apparent public health hazard to recreational and subsistence consumers in the past, currently and in the future for two reasons: (1) concentrations of DDT, DDD, and DDE in the fish evaluated with expected exposure scenarios were below levels of concern; and (2) warning signs are posted in Fred Bayou discouraging people from consuming fish caught there.

1. Site Description and Background

Fred Bayou (also known as Shoal Point Bayou, Site No.OT029, or IRP Site 29) is a large tidal creek on the north side of TAFB (Figure 1). The bayou is approximately 3,750 feet long and 300 to 400 feet wide. The Bayou flows into East Bay at its northern end. East Bay is part of the

Table 2. Exposure situations

Situation Name	Contaminants	Exposure Pathways Elements					Time	Comments
		Source	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population		
Exposure to DDT Contaminated Fish in Fred Bayou	DDT, DDD, DDE	Sediment/ Terrestrial	Fish	Consumption of fish caught in Fred Bayou	Ingestion	People consuming fish caught in Fred Bayou, 250 to 500 people per year.	Past, current, future	No Apparent Public Health Hazard
Exposure to Lead in Soils at the Tyndall Elementary School	Lead	Contaminated soil and lead pellets from former military training	Soil	School yard	Ingestion	Children, teachers, lawn care workers, parents (850 students enrolled per year with 50 to 75 teachers, administrators and other staff).	Past, current, future	No Apparent Public Health Hazard
Exposure to Lead in Tap Water	Lead	Water distribution system, plumbing	Water	Faucets	Ingestion	Military Family (estimated at four people)	Past	No Apparent Public Health Hazard
Wherry Landfill	Not known at this time	Wherry Landfill	Potentially soil and soil gas/indoor air	Potentially homes and fields at Bay View Housing	Potentially ingestion and inhalation	Residents at Bay View Housing	Past	Indeterminate Public Health Hazard, homes adjacent to the landfill are vacant awaiting demolition. Bay View Housing is scheduled for demolition by 2008 for area to become runway buffer.

St. Andrew Bay estuarine system that opens up to the Gulf of Mexico near Panama City, Florida. Two drainage ditches from the base flow into Fred Bayou at its southern end. The ditches drain portions of the flightline and the following areas:

IRP Site 5
6000 Area Landfill
IRP Site 14 POL Area A
IRP Site 16 Shell Bank Fire Training Area
IRP Site 36 6000 Area Construction Debris Landfill
Old Shell Pile/Old Pesticide Building

The discharge from the southwestern ditch is regulated under a discharge permit issued by EPA on January 26, 1977 (National Permit Discharge Elimination System [NPDES] No. F1003740). ATSDR found no permit violations since 1997 in EPA's database (EPA 1999).

Fred Bayou is used as a waterway for barges, tugboats, and small ships to access the base. The most common cargo transported in the bayou is bulk petroleum fuels and sand/gravel materials. Private boats also enter the bayou for recreation and fishing.

2. Site Investigations

The investigations of Fred Bayou began with studies of sediment by the U.S. Fish and Wildlife Service. The Fish and Wildlife Service sampled and analyzed sediment from Fred Bayou in 1985 and 1990. Subsequently, TAFB completed studies in 1993, 1995, 1996, and 1997 that included the sampling and analysis of sediment, water, biota (fish and macroinvertebrates), subsurface soil, and groundwater along with an evaluation of human health risk (Rust 1993a; Rust 1996; Rust 1998). TAFB continues to investigate Fred Bayou to determine the source of contamination, identify and evaluate potential clean-up options, and to evaluate the ecological risk. The source of contamination has not been confirmed. The main contaminants are the pesticides DDT, DDD, and DDE. A summary of the water and sediment sampling is provided in Appendix C and discussed in the following sections. A summary of the biota sampling results is presented in Appendix D. A description of the chemicals is provided in Appendix E. The contaminated groundwater and subsurface soils are not discussed here because the contamination is below ground surface and in remote areas and in areas where public access is prohibited. Sediment data are discussed because of the potential bioaccumulation of contaminants from sediment to fish. TAFB is conducting additional sediment and biota sampling and analysis under a remedial investigation (RI). The RI will include a baseline risk assessment which is scheduled to be completed by October 2000.

a. Biota Sampling and Analysis

TAFB collected and analyzed fish from Fred Bayou three times, once each in 1994, 1995, and 1997. In 1994, gulf flounder fillets were analyzed for DDT, DDD, and DDE. In 1995, fillets of black drum, sheepshead, southern flounder, sand trout, and spotted sea trout and composites of hogchoker, pinfish, and blue crab were analyzed for DDT, DDD, and DDE. The highest

concentrations of DDT, DDD, and DDE were detected in the same sand trout sample: 140 parts per billion (ppb) of DDT; 590 ppb of DDD; and 410 ppb of DDE.

In 1997, fillets of black drum, gulf flounder, sheepshead, silver seatrout, and spotted seatrout along with composite samples of longnose killifish, pinfish, sailfin mollys, tidewater silversides, and fiddler crabs were sampled and analyzed for 21 pesticides and 12 congeners of polychlorinated biphenyls (PCBs). DDT, DDD, and DDE concentrations in these samples were lower than the 1995 samples. No other pesticides were detected. PCBs were also not detected.

For the purposes of this report, only those fish species typically consumed by humans are considered further. Therefore, longnose killifish, sailfin mollys, tidewater silversides, and fiddler crabs are not discussed further. The Public Health Risk Evalnation and Conclusions section discusses the risk from consumption of contaminated fish.

b. Sediment Sampling

For ATSDR's public health evaluation, it is preferable to have analysis of the chemical contaminants in the fish. However, the current analytical data set on fish includes only DDT, DDD, DDE, other pesticides, PCBs, and mercury. As an indirect indicator of other contaminants that might be in the fish, ATSDR evaluated sediment samples collected in Fred Bayou.

Sediment samples in Fred Bayou were collected six times. The first two sets of samples were collected by the Fish and Wildlife Service as part of a general environmental contaminants evaluation of the greater St. Andrew Bay. In 1985, the Fish and Wildlife Service analyzed the Fred Bayou sediments for DDE, DDD, DDT, PCBs, polycyclic aromatic hydrocarbons (PAHs), and metals, including mercury. Five subsamples were collected and composited. DDT was measured at 4,600 µg/kg, DDD at 1730 µg/kg and DDE at 380 µg/kg (dry weight basis, 5 samples, isomers 2,4' and 4,4' added together). Individual PAH compounds were also analyzed with the sum of the ten detected PAH compounds equal to 861 µg/kg (dry weight). Total PCBs were reported at 3361 µg/kg (dry weight).

In 1990, the Fish and Wildlife Service analyzed 28 additional samples from Fred Bayou for DDT, DDD, and DDE and found results similar to those found in the 1985 sampling.

As part of the DOD Installation Restoration Program, TAFB and its contractors sampled the sediments and water in Fred Bayou in 1992, 1995, 1996, and 1997. In 1992 and 1995, TAFB analyzed sediment for DDT, DDD, and DDE. The highest concentrations detected were 12,000 µg/kg DDT, 2,600J µg/kg DDD (J=estimated), and 1,100J µg/kg DDE. Surface water was also sampled for DDT, DDD, and DDE in 1992 and these compounds were not detected above the detection limit of 0.1 µg/L.

In 1996 and 1997, TAFB analyzed sediment for volatile organics, semivolatile organics, metals, pesticides, and PCBs. Again, DDT, DDD, and DDE were detected. In addition, carbon disulfide, chlordane, chloromethane, heptachlor, PAHs, phthalates, and metals were detected. Chloromethane was detected in 1 of 24 samples at 15 µg/kg and carbon disulfide in 1 of 11 samples at 8.8 µg/kg. The PAHs detected were benzo(a)pyrene (detected in 1 of 24 samples at

370 µg/kg), fluoranthene (1 of 24 samples, 600 µg/kg), penanthrene (1 of 24 samples, 390 µg/kg), and pyrene (3/24 samples; maximum 1,400 µg/kg; mean 917 µg/kg). The phthalates detected were bis(2-ethylhexyl)phthalate (3/24 samples, mean 90 µg/kg) and diethylphthalate (1/24 samples, 340 µg/kg). Chlordane and heptachlor were analyzed in the fish and therefore are not discussed here.

Compounds detected in the sediment would be a concern if they bioaccumulate and if they are detected in many locations above background concentrations. Chloromethane and carbon disulfide do not significantly bioaccumulate (Hazardous Substance Database 1999; ATSDR 1994). In the case of PAHs, they do bioaccumulate and could be a problem. Detection of PAHs, in predominately one sample (FBSED97-1, 1 of 24 samples collected in 1997) may indicate that PAH contamination is localized in one area. The public health implications of PAHs are discussed in the next section.

In the case of metals, TAFB analyzed sediment for 22 metals with 19 metals detected. Metals are naturally occurring in the environment and their presence is expected. To evaluate metals, we compared the concentration of sediments in the bayou to background samples. The background samples were collected by TAFB from locations approved by EPA. These locations are, Chatterson Bayou, Farmdale Bayou, Freshwater Bayou, Pearl Bayou, and Smack Bayou. The background concentrations are similar to the metal concentrations in Fred Bayou. Therefore, concentrations of metals detected are not a concern.

3. Public Health Implications and Conclusions

For the public health implications of exposure to contaminated fish, we reviewed three items of information:

- Fish data collected from 1994, 1995, and 1997
- The Technical Memorandum, Human Health Risk Evaluation (RUST 1996)
- Sediment data for potential bioaccumulative compounds not analyzed in the fish.

The discussion of this data is in two parts. The first part discusses the fish tissue data and the Technical Memorandum. The second part discusses PAHs and sediment data.

a. Fish Tissue Data and the Human Health Risk Evaluation

The Technical Memorandum, Human Health Risk Evaluation (HHRE, RUST 1996) evaluated the human health risk from consumption of contaminated fish based on the 1994 and 1995 fish tissue data. In June 1997, ATSDR reviewed and commented on the HHRE and submitted comments to TAFB. Our review comments are discussed briefly here and presented in their entirety in Appendix F. In our review, we concurred with the assumptions and evaluation except for one item: the chemical compounds analyzed were limited to DDT, DDD, and DDE but the fish could have heen contaminated with other chemicals. In June 1997, data on additional chemicals were collected with the additional collection and analysis of flounder, black drum, pinfish, sand trout, and spotted sea trout for compounds other than DDT, DDD, and DDE. Other non-game fish collected included silversides and fiddler crab. These fish were analyzed for 21

pesticides and 12 PCBs (analyzed as Aroclors). DDT, DDD, or DDE were the only pesticides detected. PCBs were not detected. The concentrations of the pesticides detected in these fish were similar or lower than concentrations in the samples collected in 1994 and 1995. This means that the results of the HHRE were still applicable because the three sampling events produced similar results.

Based on current scientific literature, levels of contaminants found in fish in Fred Bayou have not been shown to cause adverse health effects in children or adults. The HHRE evaluated the cancer risk and noncancer hazards from ingesting DDD, DDE, and DDT in black drum, gulf flounder, sheepshead, southern flounder, sand trout, and spotted sea trout. The assumptions used in the HHRE are summarized in Appendix G. The assumptions in the risk evaluation were very protective. Adult recreational fish consumers were assumed to ingest 50 g/day (children 6.2 g/day) of the same fish everyday for 30 years (6 years for children). The ingestion rates are approximately the 95th percentile for saltwater anglers in the gulf. This means that 95 % of the population ingests less fish per year. Even more protective is the assumption of eating the same species of fish for 30 years. This is very unlikely. The HHRE overestimates the exposures to be very protective of human health.

The risk calculations in the HHRE show that the cancer risks are within EPA's acceptable range of 1 in 1,000,000 to 1 in 10,000. For noncancer, the hazard indices were all well below 1.0 except for sand trout for a child and adult at subsistence ingestion rates (1.90 and 2.45, respectively) and an adult at recreational ingestion rates (1.22). The hazard index is the ratio of the calculated dose divided by the reference dose (RfD). When the calculated dose is above the reference dose, the hazard index is greater than one. For a hazard index of 1.9, the calculated dose is 1.9 times greater than the reference dose. Reference doses serve as a screening tool to help public health professionals determine where potential health effects may be of concern and where pertinent toxicologic information should be evaluated. When the calculated dose is above the reference dose, health effects are not necessarily likely but a cause for further investigation.

The reference dose is set below the lowest observed adverse effect level (LOAEL) or no observed adverse effect level (NOAEL) to ensure safety. A LOAEL is the lowest dose at which an adverse health effect is seen in a particular study. These studies usually involve animal testing and human epidemiologic data. A NOAEL is the highest dose from which a study did not find any adverse health effects. For DDT, DDD, and DDE, the reference dose is set at a value 100 times below a NOAEL. The calculated doses for subsistence ingestion rates of fish from Fred Bayou fall 2.5 times above the reference dose but 40 times below the NOAEL.

ATSDR considered the reference dose, NOAEL, and the calculated dose in making a conclusion about the public health implications of contaminated fish in Fred Bayou. Although the calculated dose is above the reference dose, it is 40 times below the NOAEL. In addition, the calculated dose is based on very conservative consumption rates. More realistic consumption rates would reduce the calculated dose closer to or below the reference dose. Hence, ATSDR considers any past exposure not likely to result in any adverse health effects in children and adults.

The estimated calculated exposures overestimate the true exposure. To ensure additional safety

for any current or future exposure, TAFB has posted warning signs in the bayou discouraging consumption of fish. The sign reads:

> *"This area is under evaluation for elevated levels of DDT. Frequent regular consumption of fish from this area is discouraged. Children, pregnant or nursing women, and the elderly may be at greater risk. For further information contact public affairs at 283-2983."*

b. Polycyclic aromatic Hydrocarbons and Sediment Data

This section evaluates the polycyclic aromatic hydrocarbons (PAHs) found in the sediment in Fred Bayou. PAHs bioaccumulate and hence could appear in fish. Because the fish tissue was not analyzed for PAHs, ATSDR evaluated the potential health risk based on the sediment analysis and the possible transport of PAHs from sediments to fish. This evaluation could be completed through transport modeling or through comparison to existing sediment concentrations that were determined acceptable. ATSDR took the latter approach.

For these acceptable concentrations (screening values), ATSDR used the publication "Developing Health-Based Sediment Quality Criteria for Cleanup Sites: A Case Study Report" (Washington State Department of Ecology, December 1997, Publication Number 97-114). This report developed Human Health Sediment Criteria for Puget Sound based on consumption of seafood using site-specific biota-sediment accumulation factors (BSAFs). Since site-specific BSAFs are not available for Fred Bayou, we used the BSAFs referenced in the report. The BSAF for PAHs was 0.38 which is reasonable for fish since the BSAF data gathered by the US Army Engineers for PAHs in oysters and clams averaged 0.34 (Army 1999).

The sediment screening values in the Washington State report are based on eating 42 grams/day of seafood with a cancer risk of 1 in a million and noncancer calculated dose less than the reference dose. For the sum of PAHs, the report used toxicity equivalency factors and calculated screening value was 330 µg/kg, normalized to total organic carbon. In the case of sediment sample FBSED97-1 (the sample in Fred Bayou with the highest PAH concentration), the total toxicity equivalency factor for the sum of the individual PAHs is 435 µg/kg. Normalizing this value to the total organic carbon.value of 49000 ppm (4.9% in sample FBSED97-1) results in total organic carbon normalized value of 88.9 µg/kg. Normalizing the values is done because sediments with higher amounts of total organic carbons retain more organic contaminants with less contaminants available to the biota. This PAH value of 88.9 µg/kg is 3.7 times lower than the ATSDR screening value and hence, not a public health concern.

One major assumption this comparison is based on is the representativeness of the one sample for PAH concentrations in the bayou. A more appropriate approach would be to take a weighted concentration of PAH values from the bayou, even though 22 sediment samples show no PAHs. However, ATSDR used the single highest value as a protective measure. Hence, ATSDR concludes that the PAHs in the sediment are not a health hazard.

c. Conclusion

Based on the evaluation of over-protective ingestion estimates of DDT, DDD, and DDE, the fact that warning signs are posted to discourage eating fish from Fred Bayou, and the relative low concentrations of PAHs as compared to screening values, ATSDR considers that the consumption of contaminated fish from the bayou in the past, present, or future poses no apparent public health hazard to recreational and subsistence consumers.

4. Public Health Action Plan

a. Actions Taken and Proposed

1. TAFB has sampled sediments and fish in Fred Bayou and investigated potential sources of DDT contamination. Based on the fish data, TAFB has completed a Human Health Risk Evaluation.

2. TAFB has posted warning signs in the bayou to discourage catching and consuming fish in Fred Bayou and produced information brochure describing the contamination for distribution to anglers.

3. ATSDR reviewed and commented on the Human Health Risk Evaluation (June 3, 1997)

4. ATSDR reviewed and commented on TAFB's *Information Brochure* (May 8, 1997)

5. TAFB will be revising the Human Health Risk Evaluation based on additional data collected from the Installation Restoration Program investigations. Additionally, they will be revising the informational brochure based, in part, on comments received from ATSDR.

6. TAFB is currently conducting additional studies of the bayou under a remedial investigation which is scheduled to be completed by October 2000. TAFB will reevaluate the health risks when this new information is available.

b. Recommendations

No additional actions are needed to protect public health.

B. EXPOSURE TO LEAD IN SOILS AT THE TYNDALL ELEMENTARY SCHOOL (NO APPARENT PUBLIC HEALTH HAZARD)

Summary

Lead pellets found in surface soil at Tyndall Elementary School do not present a public health hazard to children who attended school in the past, children currently attending the school, or children attending the school in the future. Overall, lead levels in samples collected in the school yard were low. The highest lead levels detected were from locations outside the fenced area or beside the gate to the front entrance on Highway 98. The lead levels in the playground areas are low and not likely to cause adverse health effects in children or adults.

1. Site Description and Background

The Tyndall Elementary School is located off U.S. Highway 98. Approximately 850 students from pre-kindergarten to fifth grade attend this school. About 90% of the students are from military families. The school and school grounds occupy approximately 20 acres; the property is fenced and a front gate leads to U.S. Highway 98. A second gate also leads to Highway 98. The playgrounds at the school are south and to the west of the school buildings and are within the fenced area.

The Army used the area currently occupied by the elementary school as a gunnery range in the 1940s. In May 1992, Tyndall Elementary School personnel and students found lead pellets in the soils of the school grounds. TAFB sampled the soils in the school yards on May 11 and 12, 1992, and concluded that the lead levels were not a public health concern. As explained in the following section, ATSDR concurs with this assessment.

2. Site Investigations

TAFB sampled the Tyndall Elementary School grounds for lead in 1992. They collected 34 samples, 30 within the fenced area and 4 outside the fence. The concentrations ranged from 7.2 mg/kg to 20,000 mg/kg. The 20,000 mg/kg sample was taken from an area beside the front gate, a grass-covered area that is not part of the playground. It is unlikely that any children play in this area. The second highest concentration was 680 mg/kg. This sample was taken outside the rear fence in back of the building, an area unlikely to be visited by children. Children are very unlikely to be exposed to soil lead at these two areas. The third highest concentration, 340 mg/kg, was found in the southeastern corner of the school grounds, which is a part of the playground. The average concentration within the school yard, including 340 mg/kg but excluding the 20,000 mg/kg, 680 mg/kg values, and three other samples outside the fence is 97 mg/kg (±29.5 at the 95% confidence level, a range of 6.3 mg/kg to 340 mg/kg).

3. Public Health Implications and Conclusions

The average lead level found in the soil and the 95% upper confidence level are below the screening values of 400 mg/kg and 130 mg/kg (see the table below). The screening value of 400 mg/kg was devised by EPA Region 9 using an EPA Model (Integrated Exposure Uptake

Biokinetic Model for Lead in Children-IEUBK, EPA 1998). The screening value of 130 mg/kg was devised by the state of California as reported by EPA (EPA 1998). The 400 mg/kg level has been considered acceptable by the State of Florida (Saranko et al 1999). Therefore, exposure to lead in soils at Tyndall Elementary school is not a public health hazard.

Soil Sampling Results[1]		Screening Values	
Mean	95% Upper Confidence level	EPA	California
97 mg/kg	127 mg/kg	400 mg/kg	130 mg/kg

[1] Values exclude samples taken outside the perimeter fence of the school and the sample collected beside the main front gate.

The source of high lead levels detected beside the gate at the front entrance on Highway 98 could be from past automobile exhaust when lead was a common component in gasoline. This source however, would not account for some of the high levels outside the fence in the back of the school. Regardless of the source, the levels of lead in the soils accessible to children is not a public health hazard.

4. Public Health Action Plan

a. Actions Taken

TAFB responded readily to the identification of lead in the school yard by sampling the soils. After analyzing the results, TAFB concluded that no further action was needed.

b. Recommendations

ATSDR concurs with TAFB's conclusion that no further action is needed.

C. EXPOSURE TO LEAD IN TAP WATER AT 2451 LINCOLN DRIVE IN THE BAY VIEW HOUSING AREA (NO APPARENT PUBLIC HEALTH HAZARD)

Summary
Exposure to lead in tap water at 2451 Lincoln Drive does not pose a public health hazard. Although the base is in compliance with EPA's Lead and Copper Rule, ATSDR had concerns that this home, tested at 60 µg/L lead in 1992, would pose a health hazard for children or pregnant women. However, subsequent sampling in 1997 resulted in levels below concern. In addition, the Bay View Housing area is scheduled for close out and demolition in the next three years.

1. Site Description and Background

In 1992, TAFB began sampling the tap water of houses at the base for lead and copper in

accordance with EPA's Lead and Copper Rule. One house, at 2451 Lincoln Drive in the Bay View Housing area tested at 60 µg/L lead in 1992. During our visit in January 1997, base records indicated that this house was not retested.

The Bay View houses were built in the late 1940s. These houses are scheduled for demolition in the year 2001 to 2002 timeframe for flight operations/resident safety constraints and modernization purposes. Drinking water to these houses and other housing on the base is supplied from the Bay County Water System.

Lead and copper in drinking water systems are regulated in a treatment technique which requires water systems to take tap water samples from sites with lead pipes, copper pipes with lead solder, or have lead service lines. EPA then requires the water to be treated when the samples exceed 1.3 mg/L for copper and 0.015 mg/L for lead in more than 10% of the houses. Bay County requires TAFB to sample the water supply at the home taps for lead and copper every three years in approximately 20 homes. The most recent sampling episode was in 1998. All results in 1998 were below the 1.3 mg/L for copper and 0.015 mg/L for lead indicating that water treatment was not necessary and that the water is safe (i.e., not a public health hazard).

The Lead and Copper Rule relies on statistical sampling and results for compliance. Municipalities can be in compliance when up to 10% of the samples have concentrations exceeding the action levels. Hence, TAFB, with one of 20 houses exceeding the action level in 1992, was in compliance with the Lead and Copper Rule after the results from this one home were reported. However, ATSDR had public health concerns because the house at 2451 Lincoln Drive exceeded the screening value for lead.

2. Site Investigations and Conclusions

Although the base was in compliance with EPA's Lead and Copper Rule, ATSDR reviewed lead and copper sampling records during our site visit and identified the house at 2451 Lincoln Drive that was found to have 60 µg/L of lead in the tap water.

Lead levels above 15 µg/L could pose a health hazard for children or pregnant women consistently drinking water with elevated levels over time. As a result of our recommendations for further sampling, the Bioenvironmental Engineering Flight resampled this location on January 31, 1997. The new data for lead and copper levels, shown below, are below concentrations of concern.

	Bathroom	Kitchen	Levels of Concern
Lead	<1 µg/L	4 µg/L	15 µg/L
Copper	4 µg/L	104 µg/L	1,300 µg/L

Subsequent to our recommendations and these sampling results, TAFB reported that a follow-up sample was collected at 2451 Lincoln Drive on February 10, 1993 with a lead level of 3 µg/L (de Venoge 2000).

As a result, ATSDR concludes that there is no apparent public health hazard.

3. Public Health Action Plan

a. Actions Taken

In 1997, TAFB resampled the tap water of one house that had elevated lead concentrations in the 1992 sampling.

b. Recommendations

ATSDR recommends no further action since the current lead and copper concentrations are below levels of concern. There is no apparent public health hazard.

D. WHERRY LANDFILL (INDETERMINATE PUBLIC HEALTH HAZARD)

Summary

The Wherry Landfill is located in the Bay View housing area (formerly called Wherry II housing). In 1998 and 1999, subsurface and surface soil and groundwater samples were taken from locations on top of and adjacent to the landfill. Low levels of pesticides were found in the soils. These soils do not pose a public health hazard. In addition to these samples, ATSDR recommends soil gas sampling and a report providing additional information about the landfill for evaluating potential exposure pathways for past public health hazards for people living in this neighborhood. ***ATSDR has classified Wherry Landfill as an indeterminate public health hazard at this time for past exposure.*** *Potential current and future exposure have been reduced significantly and possibly eliminated (i.e. do not pose a hazard) because many of the houses adjacent to the landfill have been vacated awaiting demolition. The entire Bay View Housing area is scheduled for closure by 2008 because the area will be used as a natural buffer zone for the runway.*

1. Site Description and Background

The Wherry Landfill is located in the Bay View Housing area on-base. The landfill was used from approximately 1943 until 1948. Figure 2 shows the location of the landfill area within the housing area. The Installation Restoration Program Records search states that the landfill was used for disposal of general refuse including mess hall wastes. The landfill consisted of trenches, one-half mile long and 3 to 4 feet deep (CH_2M Hill, 1981). The Bay View Housing area was built in 1951 with 179 single-family, single-story houses. The

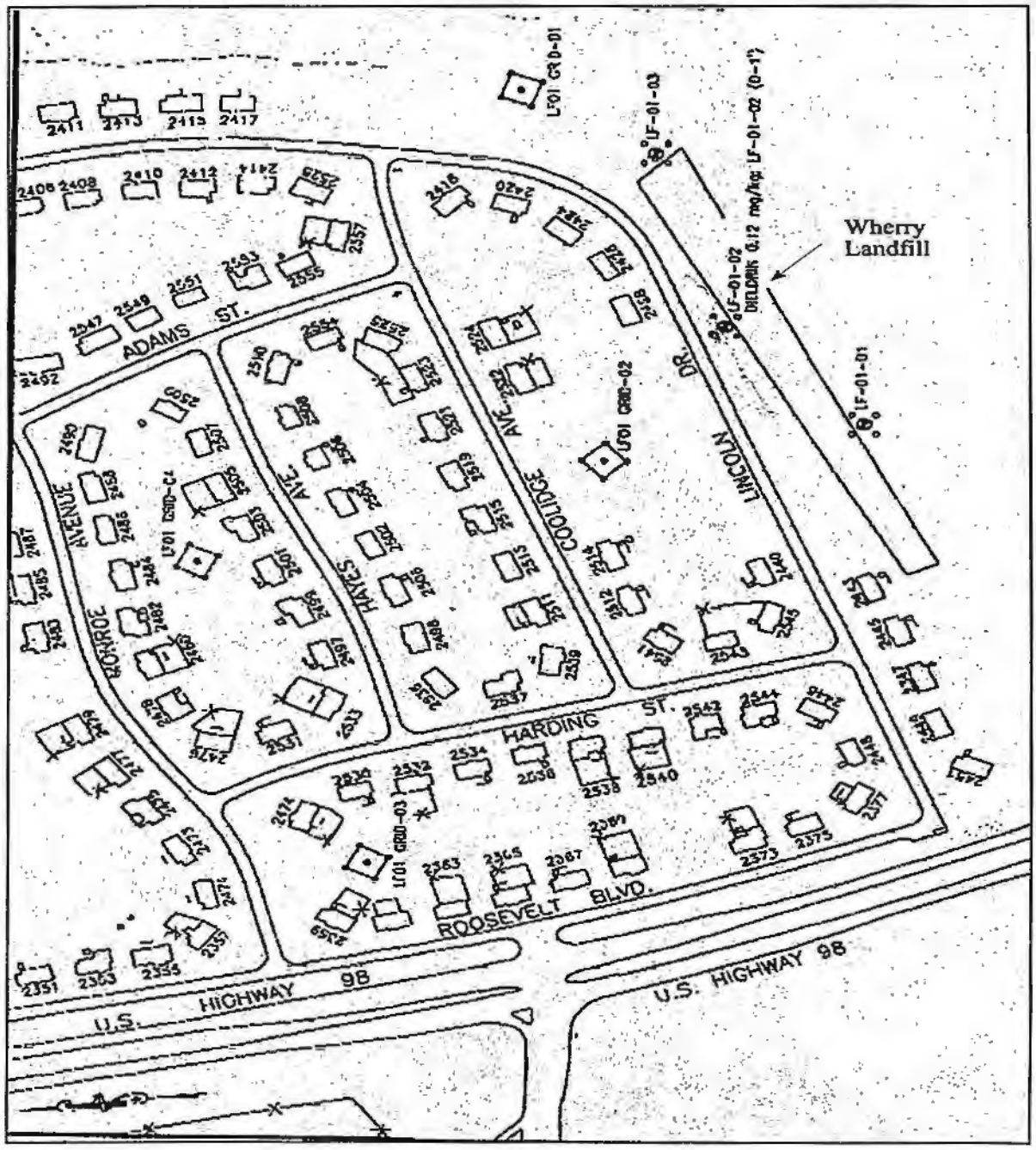

FIGURE 2
Tyndall Air Force Base, Panama City Florida
Bay View Housing (Formerly known as Wherry II Housing)
After Removal of 25 Homes with the Boundary of the Wherry Landfill
(Source: BCM no date)

houses are built on slabs and have 2 to 3 bedrooms. During the mid-1970s, 25 houses were removed because of foundations settling and cracking (CH_2M Hill, 1981). The landfill may have contributed to the settling. The following houses were removed:

Addresses on Lincoln Drive
2421, 2423, 2425, 2427, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2441

Addresses on Coolidge Avenue
2516, 2518, 2520, 2526, 2528

Addresses on Monroe Avenue
2472, 2481

Addresses on Taylor Avenue
2468, 2470

Figure 3 shows the housing area before removal of the 25 houses.

The closest currently existing house is 50 feet from the "perceived" boundary of the landfill; 9 houses are within 200 feet and 21 houses are within 400 feet.

TAFB has scheduled the entire housing area for closure by 2008, or sooner, if funding for replacement housing can be secured. As of February 2000, a demolition project was underway to remove all but 45 houses. The houses bordering the old landfill were scheduled for demolition during this project and have been vacated (de Venoge 2000 and Fugitt 2000).

2. Site Investigations and Conclusions

In 1998 and 1999, TAFB sampled surface soil, subsurface soil and groundwater at and beside the Wherry Landfill. This sampling does not provide ATSDR with sufficient information to rule out all exposure pathways.

In 1999, surface soil samples were also collected from the Bay View Housing area. Pesticides that exceeded screening values were detected in the surface soils. These screening values, however, are based on 30 years or more of exposure. Because the families living in these houses are serving tours of duty of approximately 3 years, the pesticides in the soils are not a public health hazard. Table 3 provides more detail on the sampling data, and Appendix H provides our comments on the sampling.

Groundwater samples exceeded screening values for metals, but this is not a public health hazard because the groundwater is not being used as a drinking water source.

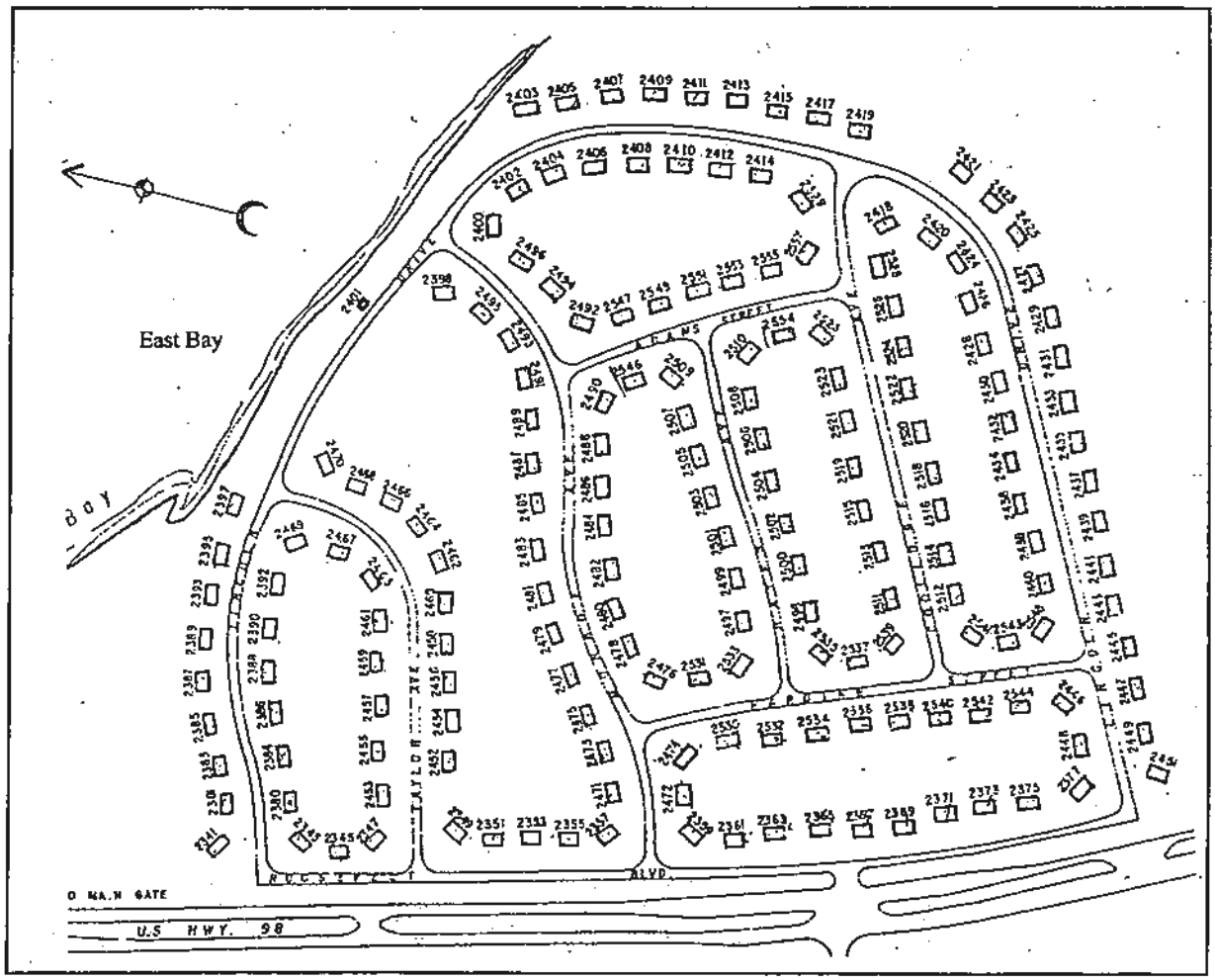

FIGURE 3
Tyndall Air Force Base, Panama City Florida
Bay View Housing (Formerly known as Wherry II Housing)
Before Removal of 25 Homes
(Source: Tyndall Air Force Base 1997)

Table 3. Description of Sampling and Summary of Results at Wherry Landfill

Description of Sampling	Results Summary
In 1998, two composite soil samples were collected from the landfill from the 0 to 1 foot level and analyzed for volatile organics, base neutral and acid extractable organics (semi-volatile organics), pesticides/PCBs, and chlorinated herbicides, cyanide, and metals. Each composite was created from five separate soil samples. One composite duplicate sample was also taken.	The composite samples detected aldrin and dieldrin above EPA guidance concentrations (U.S. EPA Region 3 Risk-based Concentrations). At the first landfill surface soil sample, LF-01-01, aldrin was detected at 0.33 mg/kg (duplicate at 0.41 mg/kg) and dieldrin at 0.36 mg/kg (duplicate 0.43 mg/kg). In the second surface soil landfill sample, only dieldrin was detected above EPA guidance concentrations at 0.24 mg/kg (LF-01-02).
In 1998, three monitoring wells were installed just outside the "perceived" boundaries of the landfill. The cuttings from the three well drillings were stockpiled in one central location, and one composite sample was taken for metals, base neutral and acid extractable organics, pesticides, PCBs and chlorinated herbicides. The groundwater from the wells was sampled for volatile organics, base neutral and acid extractable organics (semi-volatile organics), pesticides/PCBs, and chlorinated herbicides, cyanide, and metals.	No compounds were detected above EPA guidance concentrations from the cuttings pile. Groundwater samples identified aluminum, iron, and manganese above EPA or Florida screening values.
In 1999, twelve soil borings were completed, four borings around each monitoring well. Soils were composited from each set of four from each depth. For instance, the samples from each boring from 1 to 3 feet deep were combined. Discreet soil samples were also collected at each well location at the same depths as the composites. These samples were analyzed for pesticides (BCM 1999).	0.12 mg/kg of dieldrin was the only pesticide measured above EPA screening values. This result came from a composite sample collected from a boring at 0 to 1 foot at LF-01-02. A discreet sample at this location resulted in 0.043 mg/kg dieldrin at 0 to 1 foot below ground surface. The EPA screening values for dieldrin is 0.04 mg/kg.
Also in 1999, surface and subsurface soil samples collected in four different locations in the Bay View Housing area were analyzed for pesticides. Samples were collected for 0 to 2 feet and from 2 to 4 feet. Using a 50-foot by 50-foot square, four samples from each depth at the corners of the square were composited. A discrete sample at these depths was also collected at the center of the square.	Dieldrin was the only pesticide detected above EPA guidance concentrations at 0.095 mg/kg (Grid-03, 0 to 2 feet, discreet).

The landfill was not sampled for subsurface soil gases. Landfills may be a source of carbon dioxide, carbon monoxide, methane, and volatile organic compounds. These gases could migrate through the subsurface to adjacent homes via undisturbed soils or through soils in disturbed areas such as utility lines.

3. Public Health Action Plan

a. Actions Taken

TAFB sampled the soil above and beside the landfill for volatile organics, semivolatile organics, pesticides, PCBs and metals. TAFB also sampled the soil in the Bay View Housing area.

Potential current and future exposure to the landfill has been reduced significantly because the homes adjacent to the landfill have been vacated and are scheduled for demolition.

b. Recommendations

Because of the sampling and analytical limitations, ATSDR recommends that TAFB complete the following to evaluate past potential exposure pathways at the Wherry Landfill.

1. Provide information on the "perceived" boundaries of the landfill including information about the houses that were removed and any photographs or geophysical work. If necessary, revise the maps with the correct boundaries of the landfill.

2. Sample subsurface soil gas around the periphery of the landfill to determine if contaminated soil gas is present and migrating to the adjacent houses. If soil gas is present, determine the soil gas migration pathways and plume extent. If houses are located in these pathways or over the gas plumes, the indoor air of those houses should be sampled.

3. Take additional groundwater elevation readings to determine seasonal groundwater flow directions. Reevaluate the current theorized groundwater flow direction and provide information about the tidal influence on groundwater elevations. Provide information about wells in the vicinity to determine whether the flow direction is relevant to exposure and to confirm that there are no drinking water wells that could be contaminated.

III. COMMUNITY HEALTH CONCERNS

ATSDR conducted interviews of local, state, and other federal government officials to identify any community health concerns. During these interviews, no community health concerns were brought to our attention.

If you have concerns you would like to relay to ATSDR, please direct them to the following address.

Program Evaluation, Records, and Information Services Branch
Re: Tyndall Air Force Base
ATSDR, Division of Health Assessment and Consultation
1600 Clifton Road, MSE-56
Atlanta, GA 30333

Questions may also be directed to Robert Safay, the ATSDR regional representative in Region 4, at 404-562-1782 or to the ATSDR information line at 888-42ATSDR or 888-422-8737. Please mention that you are calling about Tyndall Air Force Base.

IV. ATSDR CHILD HEALTH INITIATIVE

ATSDR recognizes that infants and children may be more sensitive to environmental exposure than adults in communities faced with contamination of their water, soil, air, or food. This sensitivity is a result of the following factors: (1) children are more likely to be exposed to certain media (e.g., soil or surface water) because they play outdoors more often than adults; (2) children are shorter than adults, which means that they can breathe dust, soil, and vapors close to the ground; and (3) children are smaller and exposure results in higher doses of chemical exposure per body weight. Children can sustain permanent damage if these factors lead to toxic exposure during critical growth stages. ATSDR is committed to evaluating the special interests at sites such as TAFB as part of the ATSDR Child Health Initiative.

ATSDR evaluated the likelihood that children living on TAFB may have been or may be exposed to contaminants at levels of health concern. Based on the evaluation of the exposure pathways discussed in Section II, ATSDR did not identify any situations in which children were likely to be or have been exposed to chemical contaminants at levels of health concern. However, the potential migration of landfill gas from the Wherry Landfill to houses in the Bay View housing area is a data gap TAFB has said they will investigate.

V. HEALTH OUTCOME DATA

ATSDR conducts a review of existing health outcome data (e.g., birth and death certificates,

birth defects registries, cancer registries), when available, if people have been exposed to site contaminants or if the community has concerns related to specific health outcomes. The evaluation of health outcome data may give a general picture of the health of a community, or it may confirm the presence of excess disease or illness in a community. However, elevated rates of a particular disease may not necessarily be caused by hazardous substances in the environment. Other factors, such as personal habits, socioeconomic status, and occupation, also may influence the development of disease. In contrast, even if elevated rates of disease are not found, a contaminant may still have caused illness or disease.

At TAFB, ATSDR did not review health outcome data because the exposures identified were at levels that would not be expected to cause adverse health effects.

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APPENDICES

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[3]	IRP Site Name	Site History and Other Information
1	1		Wherry Landfill	From 1943 to 1948, this site was used for general refuse and mess hall wastes. No known hazardous waste was disposed of here. The Wherry II Family Housing complex was constructed on site in 1951 and 25 houses were removed in the 1970s due to settlement and cracking of house foundations.[1,5] TAFB will be conducting long-term groundwater monitoring at this site.[6]
2	2		Sabre Drive Landfill	From 1943 to 1965, this site was used for disposal of general refuse.[5] TAFB will be conducting long-term groundwater monitoring.[6]
3	3		Beacon Beach Road Landfill	From 1952 to 1965, this site was used for general refuse with no known hazardous waste disposed of here.[1,6] TAFB is conducting long-term groundwater monitoring.[6]
4/ OT-4	4	7	Southeast Runway Extension Burial Site	From 1945 to 1965, this site was used for disposal of used containers, drums, old batteries, and old parts.[1]
5/ LF-5	5	8	6000 Area Landfill	From 1945 to 1965, this 3-acres site was used for disposal of old parts, batteries, and empty containers.[1]
6	6	1	Sewage Plant Vicinity Landfill	From 1965 to 1973, this site was used for disposal of containers of waste oils and solvents, wrecked drones, and asbestos encased in concrete. Waste may have included methyl ethyl ketone, paint wastes, trichloroethene, chromic acid, cresylic acid, o-dichlorobenzene, and phenolic wastes.[1]
7	7	1	Spray Field Vicinity Landfill	From 1973 to 1977, this site was used for disposal of mostly household trash. Some of the same types of industrial and hazardous waste as IRP 6 was also disposed of here.[1] An earthen cap of 3.5 feet has been placed on this landfill.

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[3]	IRP Site Name	Site History and Other Information
8	8		Golf Course Trash Disposal Site	From 1962 to present, this site has been used for yard wastes.
9	9		Capehart Burial Site	This site use used for disposal of the debris from 40 homes demolished in a 1962 hurricane.
10	10		Capehart Marina Rubble Storage	From 1975 to present, this site is used for storage of rubble.
11	11		Boy Scout Road Yard Trash Disposal Area	From 1980 to present, this site is used for disposal of tree limbs and yard waste.
12	12		Highway 98 Burial Site	This site was used in the mid-1960s for burial of rubble and debris from the razing of Tyndall Air Force Base housing including the Magnolia housing area.
13	SWMU 13A Burn Pit, 13B Burial Pits, 29W EOD, and Waste Accumulation Area.		Explosive Ordnance Disposal (EOD) Burial Site	This site was used from 1950s to present for disposal of residue from incineration or detonation of unused ordnance.[1] Explosives were detonated using diesel fuel at this site and the residue was disposed of in pits. This area is currently used for training exercises that use explosives. Debris is now put into drums for disposal elsewhere. Area is fenced. Disposal into the pits ended in 1984.[5]
14/ SS-14	14	3	Petroleum, Oils, and Lubricates (AOL) Area "A"	This site is no longer used but was used from 1943 to an unknown date. This site was used in the past for disposal of tank sludge. Prior to 1974, the sludge disposed of here was from the storage of leaded aviation fuels (AVGAS).[1]

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[2]	SWMU/ AOC Number	Phase II Zone Number[3]	IRP Site Name	Site History and Other Information
15	15A POL Area B Sludge Trenches, 15B Bldg 509, and Former IRP Drum Holding Pad	9	POL Area "B"	This site was used from 1943 to 1987 for the disposal of sludges from storage tanks used to store JP-4, No. 2 diesel fuel, automobile fuel (MOGAS) and leaded AVGAS.
16/ FT-16	16A Fire Training Pit, 16B Orig. POL Tanks (USTs), and 16C New POL Holding Tanks	10	Shell Bank fire training area.	This site was used from 1943 to 1952 and from 1968 to 1980 for fire training. Fires were deliberately set by igniting POL waste after it was poured onto old aircraft. This site may also have received POL waste directly from a tank. Prior to 1971, a protein foam was used to put out the fires during the training. Since 1971, aqueous film-forming foams have been used to douse the fire. These foams consisted of fluorocarbon surfactants with a petroleum base. 16B: two 20,000-gallon USTs removed in 1952. 16C: two 20,000-gallon tanks (aboveground?) was moved here from site 17A in 1968 and used till 1980. 16B and C stored diesel fuel, MOGAS, and leaded AVGAS.

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[2]	IRP Site Name	Site History and Other Information
17/ FT-17	17A Fire Training Area, 17B Highway 98 Fire Training Area, Former PCB Transformer Site[5], and 17C Drum Burial Site[5, 15]	6	Highway 98 fire training area.	17A: This site was used from 1952 to 1968. This site was operated similar to Site 16 but used fuels stored in two 20,000-USTs. Containers of fuel were also emptied into the bermed area. Empty drums were seen near this site in 1968. 17B: This site is located east of 17A and was used to store PCB transformers removed from service. The transformers were stored in unlined areas on pallets. 17C. See site number 27.
18/ OT-18		2	Lynn Haven Defense Fuels Supply Point	This site was used from 1943 to an unknown date for the storage and dispensing of bulk fuels. This site is no longer used. Bunker C fuel may have been dumped outside of the west gate in early 1950s. This site was also used to steam clean drums and the wash water was dumped on the ground behind the drum loading station.[1] Six oil/water separators were used to treat stormwater and the effluent drained into North Bay.
18		2	Sludge disposal areas	Since the 1950s, AVGAS, JP-4, and JP-5 have been stored at a tank farm at this location. Prior to 1969, tank sludges were buried within the diked areas. Sludges may have been removed during regrading and resurfacing.[2]
18/ OT-18		2	Underdrain field	Minor spills have occurred at the truck loading and railcar loading areas. An underdrain field was installed in 1980 beneath the railcar area. This field discharges to a series of oil/water separators. Bunker C fuel has been collected in the separators.[2]

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[2]	IRP Site Name	Site History and Other Information
A/ 19	18	4	AAFES Service Station Former UST Area	Fuel tanks were installed in 1948 and found to be leaking in 1983. These tanks were replaced in 1988.[5] This site is also known as Bldg 968 leaking underground storage tank.
/SS-20	19		POL Area C[3], also known as the Former Facility 550 Waste Petroleum Products Storage Tanks[5]	This site was used from the 1970s to 1989 and consists of four 12,000-gallon USTs storing waste petroleum products.[5]
/OT-21			Explosive Ordnance and Disposal (EOD) Range[3]	Consists of the burn pit and four waste disposal cells located south of the access road.[9]
/OT-22	20		Pesticide Disposal Area[3]	Suspected disposal of pesticide adjacent to building 8702. TAFB has prepared no decision document for this site. The RFA reports that the groundwater was not contaminated from this site.[5]
/OT-23	21		Former Active Fire Training Area[3]	From 1981 to 1992, this area was used to simulate aircraft and fuel spill fires. The unit is reportedly equipped with a concrete liner. Drainage from the unit was gravity fed to an oil/water separator. Waste fuels were stored in a 10000-gallon aboveground tank. Fires were extinguished using a fluorocarbon surfactant with a petroleum base. In 1992, underground piping from the tank the to fire pit released 275 gallons of fuel, resulting in contamination on the northeast side of the pit near the tank.[5]

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[2]	IRP Site Name	Site History and Other Information
/OT-24	22		9700 Batch Asphalt Plant[3]	From 1978 to 1988, small batches of asphalt of varying composition were produced here.[5]
B/ OT-25	23A Burial Pit 23B UST Holding Area	5	Small Arms Repair Area	From 1965 to 1972, waste paints and solvents were disposed of in these pits.[2]
/26	24A-M and AOC G.	4?	Vehicle Maintenance Area	Includes 2 underground waste oil storage tanks, 5 oil/water separators, a vehicle washrack, a hazardous waste holding shed, a paint booth, and floor trenches at three vehicle maintenance areas with associated sumps. These areas have been used from the 1950s to present.[5] This site is actively used as a vehicle maintenance facility (Buildings 561 and 560), a machine shop (Building 560), a paint shop (Building 449), a car wash (Building 571), and a gasoline dispensing facility (Structure 562).[5]
/27			300 Drum Burial Area	This area was used to store transformers on wooden pallets. Transformer liquids have been spilled here. This area may also have been a drum burial site.
/28			Crooked Island[4]	Consists of two separate areas: a 10-acre area where explosives may have been detonated or disposed of and a 160-acre area that may have been contaminated by radioactive material. Some areas on Crooked Island have been used for "live fire" gunnery ranges for military pilots.[14]

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[2]	IRP Site Name	Site History and Other Information
/29	25		Shoal Point Bayou[4]	
30			Carrabelle Missile Tacking Annex.	Used from 1959 to present as an antenna site. No hazardous waste handled. Located off the base.
31			St. George Island ACMI Tower	Used from 1979 to present as an antenna receiving station. Located off the base.
32			Apalachicola Radio Relay Annex	Used from 1959 to present as a relay station. Located off the base.
34			Cove Gardens Military Family Housing Satellite	Used from 1942 to present as a housing area with 130 units. No known hazardous waste handled or disposed of here. Located off the base.
35			Bay County Wastewater Treatment Lagoon	32-million gallon per day aerated lagoon treatment facility located off the base. This facility began treatment of Southwest Forest Products papermill waste in August 1974; it was redesignated as a regional treatment plant with TAFB sending wastewater there in 1984. Sludge from the lagoon bottom was dredged in 1980 for dewatering, with sludge supernatant sent back to the wastewater treatment plant, and sludge disposition may have been sent off the site.

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[3]	IRP Site Name	Site History and Other Information
36	26		26A Unauthorized Drum Burial Pits 26B "6000" Area Construction Debris Landfill	26A consists of 2 unlined pits containing buried drums and tanks. It was excavated in November 1991. TAFB entered into a compliance agreement with the state for a RCRA closure permit. Contaminants included volatile organic carbons and PAHs.[5] 26B received construction rubble from the demolition of an old runway.[5]
AOC 1			Sky X Research Facility	Located on-base, approximately 7 miles from the main gate of TAFB. Consists of two areas: one area is a topographically lower east area that includes second and third generation aircraft shelters and two "TAB-VEE" shelters. The second generation shelter is used for small scale fire research. The third generation shelter is used for antipenetration and reactive structure systems. The second area consists of the Sky X facility and has been used for small scale fire research, shelter survivability and vulnerability testing, and rapid runaway repair testing since 1975. A NATO facility and "HYPAR" structure are located nearby.[6]
AOC 2			Combat Support Agency UST	Contamination assessment to be conducted.
	27		Waste Oil Bowsers	This is an area where mobile 250-gallon storage units for used oil were stored.

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LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[2]	IRP Site Name	Site History and Other Information
	28A -28GG		Oil/Water Separators	These separators are located throughout the base. The collected oil is discharged to the waste oil storage tanks. Separated water goes to the wastewater treatment plant. [5]
	29A-Z		Waste Accumulation Areas	
	30		Sanitary Sewer System	
	31		Wastewater Treatment Plant	From 1943 to 1999. Consisted of 2 trickling filters, 2 settling chambers, 2 chlorine contact chambers, 2 sludge digester tanks, and 4 sludge drying beds all constructed of concrete. Liquid effluent went to the Bay County publicly owned treatment plant. Sludge was trucked off for off-site disposal in a landfill. Prior to 1975, liquid effluent was discharged to Gulf of Mexico. From 1975 to 1984, treated effluent was applied to the Spray Irrigation Field (SWMU 33).[5]
	32		Wastewater holding pond	From 1975 to 1984, this unit received treated effluent from the SWMU 30 for storage prior to being applied to the Spray Irrigation Field (SWMU 33).[5]
	33		Spray Irrigation Field (SWMU 33)	This 83-acre field was used from 1975 to 1984 to receive treated effluent from the wastewater holding pond. Use of this field ceased due to ponding problems.[5]

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[2]	IRP Site Name	Site History and Other Information
	34		Stormwater Drainage Ditches	These ditches are unlined units located throughout base. The discharges from four ditches are regulated under the EPA National Permit Discharge Elimination System (NPDES). These permitted discharges are in the Fred Bayou area, munitions storage area, and two in the flightline area. These ditches managed potentially contaminated stormwater runoff. Two stormwater ditches run along the western and eastern side of the Spray Field Vicinity Landfill (SWMU 7) and empty into the Gulf of Mexico.[5] These ditches may have received leachate containing waste oils and solvents from this landfill.
	35		Former Building 158 Area	From 1941 to 1993, this area was used for washing of airplanes. No evidence of a release was identified in file material or observed, but the RFA requested more information since the wastewater may have included paint removers, alkaline cleaning solutions, paint, grease and a substance called PD680.[5]
	36		Building 83 Washrack	The building contained a sloping concrete floor that collected wash water and nonhazardous detergent. The water flowed to an oil/water separator (SWMU 28A).
	37		New Engine Test Cell Pad	This test cell produced oil and grease drippings that fell to a concrete pad. Floor washings from the pad drained to an oil/water separator (SWMU 28S).
	38		Building 264 "AGE" Wash Pad	This wash pad slopes to a drain. The pad was heavily stained and cracked. The pad managed oil and grease.[5]

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LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[3]	IRP Site Name	Site History and Other Information
	39		Building 264 "AGE" Maintenance Pad	This maintenance work area included a floor washing water drain that was connected to an oil/water separator (SWMU 28D).[5]
	40		Building 315 Paint Shop Area Trenches	Floor washwater from this building's trenches drained to an oil/water separator (SWMU 28F).[5]
	41		Building 316 Fuel Cell Maintenance Trench	Floor washwater from this building's trenches drained to an oil/water separator (SWMU 28G).[5]
	42		Building 325 Engine Test Cell Test Pad Floor Drains	Floor washwater from this building's trenches drained to an oil/water separator (SWMU 28H).[5]
	43		Building 522 Spent Lead Acid Battery Draining System	This system included racks where lead acid batteries were drained. The racks were underlain by a ceramic tile floor. The drains flowed into a limestone-filled pit beneath the floor. The pit drained to the sanitary sewer.[5]
	44		Building 934 Auto Hobby Shop Waste Oil Storage Tank	Possible release of waste oil.[5]
	45		Building 934 Auto Hobby Shop Waste Oil Collection Drums	Drums collecting waste oil for transfer to SWMU 44.[5]

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[3]	IRP Site Name	Site History and Other Information
	46		6000 Area Shop Waste Tanks	Three horizontal tanks within a diked area used to store waste oil.[5]
	47		Building 6011 Drum Receiving Area	Temporary storage of drums from the Waste Accumulation Areas (SWMUs 29A-W) for weighing and waste determinations.[5]
	48		Building 6011 Waste Storage Shed	RCRA "less than 90 storage area" for hazardous waste.[5]
	49		Building 9017 Vehicle Maintenance Wash Pad	Water from truck washing drained to an oil/water separator (SWMU 28Y).[5]
	50		Fuels Management Area Waste Oil UST	30,000-gallon steel UST receiving waste water overflow from the fuels management area Oil/Water Separator A (SWMU 28P). This unit discharged to the wastewater treatment plant. Prior to this use, the UST was used for fuel oil storage.[5]
	51		Former RCRA Container Storage Area	The Florida Department of Environmental Protection Unit confirmed this area as clean closed under RCRA regulations. Sampling from the closure operations detected trace amounts of methyl ethyl ketone (0.33ppm).[5]
	52		Former Capehart Wastewater Treatment Plant Site.	This plant treated sanitary wastewater from the Capehart Base Housing Development until Capehart was shut down in 1975. Effluent from the plant was discharged to Gulf of Mexico. The plant was razed in 1993, and the site is now a park.[5]

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[2]	IRP Site Name	Site History and Other Information
	53		Former Building 239 Engine Test Cell Waste Oil Storage Tank	This 1,000-gallon UST stored oil and grease from SWMU 28B (engine test cell oil/water separator) and was taken out of service in 1992. The RFA recommended an integrity check.[5] TAFB conducted some work on this unit as part of Site Number 4 with soil boring and monitoring wells.[6]
	54		Former Building 240 Engine Test Cell Storage Tank	This 2,000-gallon UST stored oil and grease from the 240 Engine Test Cell. It was removed in 1991. Base personnel reported during the RCRA RFA visual site inspection that there was known soil contamination in this building area.[5] TAFB has investigated this tank with soil borings and monitoring wells.[6]
	55		Building 451 Former PCB Transformer Storage Area	This area stored out-of-service transformers that contained PCBs. The RFA did not find any evidence of releases.[5]
	56		Building 530 Former Empty Drum Holding Area	This area held empty drums after they were triple rinsed. The drums were used to store trichloroethene. The RFA did not find any evidence of releases.[5]
	57		Building 3002 Former PCB Transformer Storage Area	This area stored out-of-service transformers that contained PCBs. The RFA did not find any evidence of releases.[5]
	58		Former Medical Waste Incinerator	This incinerator was located at the base hospital and operated under a Florida Department of Environmental Protection permit. The incinerator failed secondary combustion testing for residence time and shut down.[5]

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[2]	IRP Site Name	Site History and Other Information
	A		Building 182 Former UST Site	This 1000-gallon UST stored JP-4 and was removed in 1991. Contaminated soil was removed when the tank was removed. Groundwater was sampled during excavation and found to contain benzene (210 µg/L), total VOCs (1760 µg/L), and PAHs (2145 µg/L). The benzene concentrations exceeded Florida's maximum contaminant levels for drinking water of 1 µg/L.[5] TAFB conducted investigations with soil borings and wells.[6]
	B		Building 214 Diesel UST	This 1000-gallon UST stored diesel fuel. According to Contamination Assessment Report dated January 1993, groundwater contamination occurred due to overflow from the fill pipe.[5] Soil borings and wells were installed at this unit.[6]
	C		Building 239 Former 10,000 Gallon Jet Fuel UST	This UST stored JP-4 and was removed in 1991. Groundwater samples taken during excavation found benzene (2 µg/L), total VOCs (67 µg/L), and PAHs (197 µg/L).[5] TAFB is investigating this area with soil borings and wells.[6]
	D		Building 239 Former 5,000 Gallon Jet Fuel UST	This UST stored JP-4 and was removed in 1991. Groundwater samples taken during excavation found 130 µg/L, total VOCs (583 µg/L), and PAHs (266 µg/L). This UST was to be investigated with Contamination Assessment Report.[6]
	E		Building 242 Former Waste Oil Tank	This UST of unknown size was removed in 1991. Groundwater samples taken during excavation found benzene (130 µg/L), cadmium (42 µg/L), chromium (100 µg/L), and lead (790 µg/L).[5] TAFB investigated this tank with soil borings and wells and classified this tank as "no further action." The Florida Department of Environmental Protection concurred with this classification.[6]

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[2]	SWMU/ AOC Number	Phase II Zone Number[2]	IRP Site Name	Site History and Other Information
	F		Building 550 Groundwater Plume (IRP Site 26).	This site is a groundwater plume from the Vehicle Maintenance Area (IRP Site 26 (SWMU 24) which flows toward Bldg 550. Groundwater contamination includes total petroleum hydrocarbons, metals, and semivolatile organics.[5] Tyndall AFB will be investigating this SWMU.[6]
	G		Building 560 Product USTs	This site consists of two 10,000-gallon USTs that stored diesel fuel and MOGAS. These tanks were investigated with IRP Site 24 (SWMU 24).[5] The investigation includes soil borings and wells.[6]
	H		Building 722 Former Gasoline UST	This site consists of one 55-gallon UST that stored gasoline. The UST was removed in 1991. Groundwater samples taken during excavation found benzene (6000µg/L) and total VOCs (69,000 µg/L).[5] This site was investigated with soil borings and wells.[6]
	I		Building 1282 Diesel UST	This 1000-gallon UST stored diesel fuel.[5] This site was investigated with soil borings and wells.[6]
	J		Building 2706 product Storage Tank	This 5000-gallon aboveground storage tank stored MOGAS. Approximately 400 gallons of MOGAS was accidentally released from underground piping associated with this unit about 140 feet southwest of the tank about 150 feet from St. Andrew Bay.[5] This site was investigated with soil borings and wells.[6]

APPENDIX A
LIST OF INSTALLATION RESTORATION PROGRAM SITES AND SOLID WASTE MANAGEMENT UNITS (continued)

Phase I Site Number[1]/ Subsequent ID Number[3]	SWMU/ AOC Number	Phase II Zone Number[2]	IRP Site Name	Site History and Other Information
	K		Building 7022 Diesel Fuel Spill	This site consists of an area that received a diesel fuel spill. Run off would have flowed toward Lake Ammo approximately 50 feet away. Soil was excavated by TAFB confirmation sampling was not conducted.[5] This site was investigated with soil borings and wells.[6]
40	70	15	83	No information available.

References

1 CH_2M Hill 1981
2 Water and Air Research 1984
3 Geraghty & Miller 1991
4 Rust Environment and Infrastructure 1993b
5. A.T. Kearney 1994
6. Baughman 1995
7. Sirrine Environmental Consultants 1992
8. Wilkinson 1995

APPENDIX B
PUBLIC HEALTH ASSESSMENT CONCLUSION CATEGORIES

CATEGORY A : URGENT PUBLIC HEALTH HAZARD

This category is used for sites where short-term exposures (< 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.

This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.

Criteria:

Evaluation of available relevant information* indicates that site-specific conditions or likely exposures have had, are having, or are likely to have in the future, an adverse impact on human health that requires immediate action or intervention. Such site-specific conditions or exposures may include the presence of serious physical or safety hazards, such as open mine shafts, poorly stored or maintained flammable/explosive substances, or medical devices which, upon rupture, could release radioactive materials.

** Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data.*

ATSDR Actions:

ATSDR will expeditiously issue a health advisory that includes recommendations to mitigate the health risks posed by the site. The recommendations issued in the health advisory and/or health assessment should be consistent with the degree of hazard and temporal concerns posed by exposures to hazardous substances at the site.
Based on the degree of hazard posed by the site and the presence of sufficiently defined current, past, or future completed exposure pathways, one or more of the following public health actions can be recommended:

- biologic indicators of exposure study
- biomedical testing
- case study
- disease and symptom prevalence study
- community health investigations
- registries
- site-specific surveillance
- voluntary residents tracking system
- cluster investigation
- health statistics review
- health professional education
- community health education
- substance-specific applied research

APPENDIX B
PUBLIC HEALTH ASSESSMENT CONCLUSION CATEGORIES (continued)

CATEGORY B: PUBLIC HEALTH HAZARD

This category is used for sites that pose a public health hazard due to the existence of long-term exposures (> 1 yr) to hazardous substance or conditions that could result in adverse health effects.

This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.

Criteria:

Evaluation of available relevant information* suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse impact on human health that requires one or more public health interventions. Such site-specific exposures may include the presence of serious physical hazards, such as open mine shafts, poorly stored or maintained flammable/ explosive substances, or medical devices which, upon rupture, could release radioactive materials.

Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data.

ATSDR Actions:

ATSDR will make recommendations in the health assessment to mitigate the health risks posed by the site. The recommendations issued in the health assessment should be consistent with the degree of hazard and temporal concerns posed by exposures to hazardous substances at the site. Actions on the recommendations may have occurred before the actual completion of the public health assessment.

Based on the degree of hazard posed by the site and the presence of sufficiently defined current, past, or future completed exposure pathways, one or more of the following public health actions can be recommended:

- biologic indicators of exposure study
- biomedical testing
- case study
- disease and symptom prevalence study
- community health investigations
- registries
- site-specific surveillance
- voluntary residents tracking system
- cluster investigation
- health statistics review
- health professional education
- community health education
- substance-specific applied research

APPENDIX B
PUBLIC HEALTH ASSESSMENT CONCLUSION CATEGORIES (continued)

CATEGORY C: INDETERMINATE PUBLIC HEALTH HAZARD

This category is used for sites when a professional judgement on the level of a health hazard cannot be made because information critical to such a decision is lacking.

Criteria:

This category is used for sites in which "*critical*" data are *insufficient* with regard to extent of exposure and/or toxicologic properties at estimated exposure levels. The health assessor must determine, using professional judgement, the "criticality" of such data and the likelihood that the data can be obtained and will be obtained in a timely manner. Where some data are available, even limited data, the health assessor is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationale for the decision.

ATSDR Actions:

ATSDR will make recommendations in the health assessment to identify the data or information needed to adequately assess the public health risks posed by the site.

Public health actions recommended in this category will depend on the hazard potential of the site, specifically as it relates to the potential for human exposure of public health concern. Actions on the recommendations may have occurred before the actual completion of the public health assessment.

If the potential for exposure is high, initial health actions aimed at determining the population with the greatest risk of exposure can be recommended. Such health actions include:

- community health investigation
- health statistics review
- cluster investigation
- symptom and disease prevalence study

If the population of concern can be determined through these or other actions, any of the remaining follow-up health activities listed under categories A and B may be recommended.

In addition, if data become available suggesting that human exposure to hazardous substances at levels of public health concern is occurring or has occurred in the past, ATSDR will reevaluate the need for any followup.

APPENDIX B
PUBLIC HEALTH ASSESSMENT CONCLUSION CATEGORIES (continued)

CATEGORY D: NO APPARENT PUBLIC HEALTH HAZARD

This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.

This determination represents a professional judgement based on critical data which ATSDR considers sufficient to support a decision. This does not necessarily imply that the available data are complete, in some cases additional data may be required to confirm or further support the decision made.

Criteria:

Evaluation of available relevant information* indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present, or future are not likely to result in any adverse impact on human health.

****Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data; monitoring and management plans.***

ATSDR Actions:

If appropriate, ATSDR will make recommendations for monitoring or other removal and/or remedial actions needed to ensure that humans are not exposed to significant concentrations of hazardous substances in the future. Actions on the recommendations may have occurred before the actual completion of the public health assessment.

The following health actions, which may be recommended in this category, are based on information indicating that no human exposure is occurring or has occurred in the past to hazardous substances at levels of public health concern. One or more of the following health actions are recommended for sites in this category:

- community health education
- health professional education
- community health investigation
- voluntary residents tracking system

However, if data become available suggesting that human exposure to hazardous substances at levels of public health
concern is occurring, or has occurred in the past, ATSDR will reevaluate the need for any followup.

APPENDIX B
PUBLIC HEALTH ASSESSMENT CONCLUSION CATEGORIES (continued)

CATEGORY E: NO PUBLIC HEALTH HAZARD

This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.

Criteria:

Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future.

ATSDR Actions:

No public health actions are recommended at this time because no human exposure is occurring, has occurred in the past, or is likely to occur in the future that may be of public health concern.

APPENDIX C
FRED BAYOU
DDT, DDD, DDE AND WATER AND SEDIMENT SAMPLING DATA SUMMARY

Sampling Event	Sediment (µg/kg) dry weight	Surface Water (µg/L)	Comments
Collected October 1985 (dry weight)		Not sampled	Also analyzed for PAHs, PCBs, and metals. (FWS 1990)
2,4'- and 4,4'-DDD	1730 (mean)		
2,4'- and 4,4'-DDE	380 (mean)		
2,4'- and 4,4'-DDT	4600 (mean)		
Collected July 1990 (dry weight)	28 samples including wetland branch and upgradient drainage ditches, (4,4' isomer only)	Not sampled	Analyzed only for DDT, DDD, and DDE. (FWS 1990)
4,4'-DDD	<120 to 2400		
4,4'-DDE	<120 to 790		
4,4'-DDT	<120 to 2300		
Collected June 1992	7 samples	4 samples	Analyzed only for DDT, DDD, and DDE. (RUST 1993a)
4,4'-DDD	< 26 to 2600J*	<0.1	
4,4'-DDE	< 26 to 1100J*	<0.1	
4,4'-DDT	< 26 to 12000*	<0.1	
Collected March 1995	9 samples	Not sampled	Analyzed for DDT, DDD, and DDE only. (Rust 1996)
2,4'- and 4,4'-DDD	<0.1 to 850		
2,4' and 4,4'-DDE	<0.1 to < 790		
2,4'- and 4,4'-DDT	<0.1 to 5600		

APPENDIX C
FRED BAYOU
DDT, DDD, DDE AND WATER AND SEDIMENT
SAMPLING DATA SUMMARY (continued)

Sampling Event	Sediment (µg/kg) dry weight	Surface Water (µg/L)	Comments
Collected October 1996	13 samples	8 samples	Analyzed for volatile, semivolatiles, metals, mercury, pesticides and PCBs (Rust 1996)
2,4'- and 4,4'-DDD	<21 to 660	<0.1	
2,4'- and 4,4'-DDE	< 4.6 to <580 to 23	<0.1	
2,4'- and 4,4'-DDT	< 4.6 to 3000	<0.1	
Other organics detected Benzo(b)fluoranthene Bis(2-ethylhexyl)phthalate Choromethane Pyrene Toluene	 <400 to 790 <400 to 1000 <12 to 15 <400 to 100 < 6.1 to < 17	 <1 to 1.4	
Collected June 1997	10 samples	Not sampled	Analyzed for volatiles, semivolatiles, metals, mercury, pesticides, and PCBs (Rust 1998)
DDD	< 10 to 570		
DDE	< 3.3 to 170		
DDT	< 3.3 to 2800		

J represents an estimated value.

* Surrogate recovery outside of limits due to sample matrix interference but the method blank and data control spike both performed satisfactorily indicating that the data is valid.

APPENDIX D. SUMMARY OF FISH ANALYSIS[1]

Lab Sample ID(s)	Sample Date	Species	Sample Type	Other Compounds Analyzed for	Results of Other Compounds Detected	2,4'-DDT (µg/kg)	2,4'-DDD (µg/kg)	2,4'-DDE (µg/kg)	4,4'-DDT (µg/kg)	4,4'-DDD (µg/kg)	4,4'-DDE (µg/kg)	2,4'- and 4,4'-DDT (µg/kg)	2,4'- and 4,4'- DDD (µg/kg)	2,4'- and 4,4'-DDE (µg/kg)
29B-FL1	Oct 94	Gulf Flounder	fillet			< 3.3	< 3.3	< 3.3	< 3.3	16	8.2			
F29B-FL1/ duplicate	Oct 94	duplicate	fillet			< 3.3	< 3.3	< 3.3	4.4	45	31			
29B-FL2	Oct 94	Gulf Flounder	fillet			< 3.3	< 3.3	< 3.3	< 3.4	39	29			
29B-FL3	Oct 94	Gulf Flounder	fillet			< 3.3	< 3.3	< 3.3	5.1	32	28			
29B-FL4	Oct 94	Gulf Flounder	fillet			< 3.3	< 3.3	< 3.3	< 3.3	13	16			
29B-FL5	Oct 94	Gulf Flounder	fillet			< 3.3	< 3.3	< 3.3	< 3.3	13	11			
F97-A	Jun 97	Gulf Flounder	fillet	Full Pesticide and PCBs[2]	ND[3]	< 3.3	< 3.3	< 3.3	< 3.3	< 3.3	3.7			
F97-B	Jun 97	Gulf Flounder	fillet	Full Pesticide and PCBs	ND	< 3.3	< 3.3	< 3.3	< 3.3	3.8	< 3.3			
29B-HC1	Oct 94	Hogchoker	composite			< 3.3	< 3.3	< 3.3	< 3.3	54	45			
29B-HC2	Oct 94	Hogchoker	composite			< 3.3	< 3.3	< 3.3	< 3.3	37	19			
29B-HC3	Oct 94	Hogchoker	composite			< 3.3	< 3.3	< 3.3	< 3.3	32	18			
29B-HC4	Oct 94	Hogchoker	composite			< 3.3	< 3.3	< 3.3	< 3.3	42	27			
29B-HC5	Oct 94	Hogchoker	composite			< 6.6	< 6.6	< 6.6	< 6.6	74	46			
BD-A	Mar 95	Black Drum	fillet									< 45	< 45	< 45
BD-B	Mar 95	Black Drum	fillet									< 43	< 43	< 43
BD97-A	Jun 97	Black Drum	fillet	Full Pesticide and PCBs	ND	< 3.3	< 3.3	< 3.3	< 3.3	< 3.3	< 3.3			
BD97-B	Jun 97	Black Drum	fillet	Full Pesticide and PCBs	ND	< 3.3	< 3.3	< 3.3	< 3.3	4.9	< 3.3			
BD97-C	Jun 97	Black Drum	fillet	Full Pesticide and PCBs	ND	< 3.3	< 3.3	< 3.3	< 3.3	< 3.3	< 3.3			

APPENDIX D. SUMMARY OF FISH ANALYSIS[1] (continued)

Lab Sample ID(s)	Sample Date	Species	Sample Type	Other Compounds Analyzed for	Results of Other Compounds Detected	2,4'-DDT (µg/kg)	2,4'-DDD (µg/kg)	2,4'-DDE (µg/kg)	4,4'-DDT (µg/kg)	4,4'-DDD (µg/kg)	4,4'-DDE (µg/kg)	2,4'- and 4,4'-DDT (µg/kg)	2,4'- and 4,4'- DDD (µg/kg)	2,4'- and 4,4'-DDE (µg/kg)
BD97-D	Jun 97	Black Drum	fillet	Full Pesticide and PCBs	ND	< 3.3	< 3.3	< 3.3	< 3.3	4	5.8			
SF-A	May 95	Southern Flounder	fillet									43	< 14	33
SF-B	May 95	Southern Flounder	fillet									< 14	61	43
SF-C	May 95	Southern Flounder	fillet									< 16	96	63
SF-D	May 95	Southern Flounder	fillet									< 16	30	20
SH-A	Mar 95	Sheepshead	fillet									< 32	< 32	56
SH-B	Mar 95	Sheepshead	fillet									< 40	40	57
SH97-A	Jun 97	Sheepshead	fillet	PCBs and Pesticides	ND	< 3.3	< 3.3	< 3.3	< 3.3	7.4	12			
SH97-B	Jun 97	Sheepshead	fillet	PCBs and Pesticides	ND	< 3.3	< 3.3	< 3.3	3.9	4.8	9.8			
SST-A	May 95	Spotted Sea Trout	fillet									< 16	40	65
SST-B	May 95	Spotted Sea Trout	fillet									< 16	< 16	33
SST-C	May 95	Spotted Sea Trout	fillet									< 16	< 16	18
SST-D	May 95	Spotted Sea Trout	fillet									< 16	< 16	28
SST97-A	Jun 97	Spotted Sea Trout	fillet	PCBs and Pesticides	ND	< 6.6	< 6.6	< 6.6	< 6.6	< 6.6	12			
ST	Mar 95	Sand Trout	fillet									< 83	240	370
ST-A	May 95	Sand Trout	fillet									< 140	590	410
ST97-A	Jun 97	Silver Seatrout	fillet	PCBs and Pesticides	ND	< 3.3	< 3.3	< 3.3	< 3.3	< 3.3	4.5			
MT-1	May 95	Pinfish	composite									31	32	60
MT-B	May 95	Pinfish	composite									< 28	41	110

APPENDIX D. SUMMARY OF FISH ANALYSIS[1] (continued)

Lab Sample ID(s)	Sample Date	Species	Sample Type	Other Compounds Analyzed for	Results of Other Compounds Detected	2,4'-DDT (µg/kg)	2,4'-DDD (µg/kg)	2,4'-DDE (µg/kg)	4,4'-DDT (µg/kg)	4,4'-DDD (µg/kg)	4,4'-DDE (µg/kg)	2,4'- and 4,4'-DDT (µg/kg)	2,4'- and 4,4'- DDD (µg/kg)	2,4'- and 4,4'-DDE (µg/kg)
MT-D	May 95	Pinfish	composite									22	34	96
MT-E	May 95	Pinfish	composite									85	190	260
MT-J	May 95	Pinfish	composite									24	88	85
MT-M	May 95	Pinfish	composite									150	280	360
MT-O	May 95	Pinfish	composite									53	140	170
MT-2	Mar 95	Pinfish	composite	Data Not Found by ATSDR										
MT-3	Mar 95	Pinfish	composite	Data Not Found by ATSDR										
MT-4	Mar 95	Pinfish	composite	Data Not Found by ATSDR										
MT-5	Mar 95	Pinfish	composite	Data Not Found by ATSDR										
MT-A	May 95	Pinfish	composite	Data Not Found by ATSDR										
MT-C	May 95	Pinfish	composite	Data Not Found by ATSDR										
MT-H	May 95	Pinfish	composite	Data Not Found by ATSDR										
MT-L	May 95	Pinfish	composite	Data Not Found by ATSDR										
MT-N	May 95	Pinfish	composite	Data Not Found by ATSDR										

APPENDIX D. SUMMARY OF FISH ANALYSIS[1] (continued)

Lab Sample ID(s)	Sample Date	Species	Sample Type	Other Compounds Analyzed for	Results of Other Compounds Detected	2,4'-DDT (µg/kg)	2,4'-DDD (µg/kg)	2,4'-DDE (µg/kg)	4,4'-DDT (µg/kg)	4,4'-DDD (µg/kg)	4,4'-DDE (µg/kg)	2,4'- and 4,4'-DDT (µg/kg)	2,4'- and 4,4'- DDD (µg/kg)	2,4'- and 4,4'-DDE (µg/kg)
BC-A,B,C	Mar 95	Blue Crab	composite	Data Not Found by ATSDR								50	< 50	73
BC-A,B,C,D,E	May 95	Blue Crab	composite	Data Not Found by ATSDR								150	170	230
BS97-A	Jun 97	Pinfish	composite	PCBs and Pesticides	5.7 µg/kg dieldrin ND for others	< 3.3	< 3.3	< 3.3	50	22	34			
BS97-B	Jun 97	Pinfish	composite	PCBs and Pesticides	ND	31	< 16	< 16	22	97	66			
MT97-A	Jun 97	Pinfish	composite	PCBs and Pesticides	2.5 µg/kg alpha chlordane ND for others	< 3.3	< 3.3	< 3.3	14	32	50			
MT97-F	Jun 97	Pinfish-Smack Bay	composite	PCBs and Pesticides	ND	< 3.3	< 3.3	< 3.3	< 3.3	< 3.3	8.5			
FC97-A	Jun 97	Fiddler Crab	composite	PCBs and Pesticides	ND	< 3.3	< 3.3	< 3.3	3.5	12	27			
FC97-B	Jun 97	Fiddler Crab	composite	PCBs and Pesticides	ND	< 20	< 20	< 20	170	93	190			
FC97-C	Jun 97	Fiddler Crab	composite	PCBs and Pesticides	ND	< 33	< 33	< 33	770	290	350			
FC97-D	Jun 97	Fiddler Crab	composite	PCBs and Pesticides	ND	< 20	< 20	< 20	< 3.3	23	48			
MT97I	Jun 97	Killifish	composite	PCBs and Pesticides	alpha-chlordane ND for others	< 37	43	< 37	280	580	550			
PF-3 MT-A-1	Nov 97	Minnow Trap-Fish Unspecified	Not Specified	Mercury only	0.052 mg/kg									

APPENDIX D. SUMMARY OF FISH ANALYSIS[1] (continued)

Lab Sample ID(s)	Sample Date	Species	Sample Type	Other Compounds Analyzed for	Results of Other Compounds Detected	2,4'-DDT (µg/kg)	2,4'-DDD (µg/kg)	2,4'-DDE (µg/kg)	4,4'-DDT (µg/kg)	4,4'-DDD (µg/kg)	4,4'-DDE (µg/kg)	2,4'- and 4,4'-DDT (µg/kg)	2,4'- and 4,4'- DDD (µg/kg)	2,4'- and 4,4'-DDE (µg/kg)
PF-4 MT-A-1	Nov 97	Minnow Trap-Fish Unspecified	Not Specified	Mercury only	0.048									
GK-1 MT-C-1	Nov 97	Minnow Trap-Fish Unspecified	Not Specified	Mercury only	0.067									
GK-2 MT-C-1	Nov 97	Minnow Trap-Fish Unspecified	Not Specified	Mercury only	0.054									
GK-3 MT-C-1	Nov 97	Minnow Trap-Fish Unspecified	Not Specified	Mercury only	0.043									
PF-5 MT-A-2	Nov 97	Minnow Trap-Fish Unspecified	Not Specified	Mercury only	0.042									
PF-6 MT-A-2	Nov 97	Minnow Trap-Fish Unspecified	Not Specified	Mercury only	0.049									
GK-7 MT-C-Z	Nov 97	Minnow Trap-Fish Unspecified	Not Specified	Mercury only	0.056									
SFM-1 MT-C-Z	Nov 97	Minnow Trap-Fish Unspecified	Not Specified	Mercury only	0.038									
SFM-2 MT-C-1	Nov 97	Minnow Trap-Fish Unspecified	Not Specified	Mercury only	0.039									
SFM-3 MT-B-1 analyzed as composite with SFM-2	Nov 97	Minnow Trap-Fish Unspecified	Not Specified	Mercury only										

APPENDIX D. SUMMARY OF FISH ANALYSIS[1] (continued)

1. Source: Rust 1998
2. Compounds include: aldrin, alpha-BHC, beta-BHC, delta-BHC (Lindane), gamma-BHC, heptachlor, heptachlor epoxide, endosulfan I, endosulfan II, endosulfan sulfate, dieldrin, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, endrin, endrin aldehyde, endrin ketone, alpha-chlordane, beta-chlordane, methoxychlor, toxaphene, Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, thallium, vanadium, zinc.
3. ND - Not detected.

APPENDIX E
DESCRIPTION OF CHEMICALS FOUND IN FISH AND SEDIMENTS

DDT, DDE, and DDD

SUMMARY: Exposure to DDT, DDE, and DDD happens mostly from eating contaminated foods, such as root and leafy vegetables, meat, fish, and poultry. At high levels, it can damage the nervous system, causing excitability, tremors, and seizures in people. These chemicals have been found in at least 337 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What are DDT, DDE, and DDD?

DDT (1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane) was a manufactured chemical widely used to control insects on agricultural crops and insects that carry diseases like malaria and typhus. It does not occur naturally in the environment. DDT is a white, crystalline solid with no odor or taste.

Because of damage to wildlife and the potential harm to human health, the use of DDT was banned in the United States, except for public health emergencies. DDT is still used in some other countries.

Two similar chemicals that sometimes contaminate DDT products are DDE (1,1-dichloro-2,2-bis(chlorophenyl) ethylene) and DDD (1,1-dichloro-2,2-bis(p-chlorophenyl) ethane). DDD was also used to kill pests, but its use has also been banned. One form of it has been used medically to treat cancer of the adrenal gland. DDE has no commercial use.

What happens to DDT, DDE, and DDD when they enter the environment?

DDT entered the environment when it was used as an insecticide. DDT in air lasts for only a short time. Half the DDT in air is gone within two days. It does not dissolve easily in water. DDT sticks strongly to soil particles and does not move quickly to underground water. DDT lasts a very long time in soil; half the DDT in soil will break down in 2-15 years. Some DDT will evaporate from soil and surface water into the air and some is broken down by sunlight or by microorganisms in soil or surface water. DDT in soil usually breaks down to form DDE or DDD. Levels of DDT build up in plants and in the fatty tissues of fish, birds, and animals

How might I be exposed to DDT, DDE, and DDD?

- Eating domestic foods, such as root and leafy vegetables, fatty meat, fish, and poultry, but levels are very low.
- Eating imported foods from countries that still allow the use of DDT to control pests.
- Breathing contaminated air or drinking contaminated water; levels generally are low and of little concern except near waste sites and landfills that may contain higher levels of these chemicals.
- Infants fed on human breast milk from mothers who have been exposed.

APPENDIX E
DESCRIPTION OF CHEMICALS FOUND IN FISH AND SEDIMENTS (continued)

- Breathing or swallowing soil particles near waste sites or landfills that contain these chemicals.

How can DDT, DDE, and DDD affect my health?

DDT affects the nervous system. People who accidentally swallowed large amounts of DDT became excitable and had tremors and seizures. These effects went away after the exposure stopped. No effects were seen in people who took small daily doses of DDT by capsule for 18 months.

People who worked with DDT for a long time had some reversible changes in the levels of liver enzymes.

In animals, short-term exposure to large amounts of DDT in food affected the nervous system. In animals, long-term exposure to DDT affected the liver. Animal studies suggest that short-term exposure to DDT in food may have a harmful effect on reproduction.

How likely are DDT, DDE, and DDD to cause cancer?

The Department of Health and Human Services (DHHS) has determined that DDT may reasonably be anticipated to be a human carcinogen. DHHS has not classified DDE and DDD, but the Environmental Protection Agency (EPA) has determined that they are probable human carcinogens.

Liver cancer has been seen in animals that were fed DDT. Studies in DDT-exposed workers did not show increases in cancer.

Is there a medical test to show whether I've been exposed to DDT, DDE, and DDD?

Laboratory tests can detect DDT, DDE, and DDD in fat, blood, urine, semen, and breast milk. These tests may show low, moderate, or excessive exposure to these compounds. These tests cannot show the exact amount of DDT, DDE, or DDD to which a person was exposed or tell if harmful effects will occur. These tests are not routinely available at doctors' offices.

Has the federal government made recommendations to protect human health?

In 1972, the EPA banned all uses of DDT, except for public health emergencies. EPA requires spills or releases of DDT into the environment of 1 pound or more to be reported to EPA.

The Food and Drug Administration (FDA) has set limits on DDT levels in most foods.

The Occupational Safety and Health Administration (OSHA) set an exposure limit of 1

APPENDIX E
DESCRIPTION OF CHEMICALS FOUND IN FISH AND SEDIMENTS (continued)

milligram of DDT per cubic meter (1 mg/m^3) in workplace air for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends an exposure limit of 0.5 mg/m^3 in workplace air over a 10-hour workday, 40-hour workweek.

For More Information

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. Toxicological profile for 4,4'-DDT, 4,4'-DDE, 4,4'-DDD (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Source

ATSDR web page: http://www.atsdr.cdc.gov/tfacts35.html

APPENDIX E
DESCRIPTION OF CHEMICALS FOUND IN FISH AND SEDIMENTS (continued)

LEAD

SUMMARY: Exposure to lead happens mostly from breathing workplace air or dust, and eating contaminated foods. Children can be exposed from eating lead-based paint chips, or playing in contaminated soil. Lead can damage the nervous system, kidneys, and the immune systems. Lead has been found in at least 922 of 1,300 National Priorities List sites identified by the Environmental Protection Agency.

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. It has no special taste or smell. Lead can be found in all parts of our environment. Most of it came from human activities like mining, manufacturing, and the burning of fossil fuels.

Lead has many different uses, most importantly in the production of batteries. Lead is also in ammunition, metal products (solder and pipes), roofing, and devices to shield x-rays.

Because of health concerns, lead from gasoline, paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years.

What happens to lead when it enters the environment?

- Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- When released to the air from industry or burning of fossil fuels or waste, it stays in air about 10 days.
- Most of the lead in soil comes from particles falling out of the air.
- City soils also contain lead from landfills and leaded paint.
- Lead sticks to soil particles.
- It does not move from soil to underground water or drinking water unless the water is acidic or "soft".
- It stays a long time in both soil and water.

How might I be exposed to lead?

- Breathing workplace air (lead smelting, refining, and manufacturing industries)
- Eating lead-based paint chips
- Drinking water that comes from lead pipes or lead soldered fittings
- Breathing or ingesting contaminated soil, dust, air, or water near waste sites
- Breathing tobacco smoke

- Eating contaminated food grown on soil containing lead or food covered with

APPENDIX E
DESCRIPTION OF CHEMICALS FOUND IN FISH AND SEDIMENTS (continued)

lead-containing dust
- Breathing fumes or ingesting lead from hobbies that use lead (leaded-glass, ceramics)

How can lead affect my health?

Lead can affect almost every organ and system in your body. The most sensitive is the central nervous system, particularly in children. Lead also damages kidneys and the immune system. The effects are the same whether it is breathed or swallowed.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common after exposure to high levels of lead.

In adults, lead may decrease reaction time, cause weakness in fingers, wrists, or ankles, and possibly affect the memory. Lead may cause anemia, a disorder of the blood. It can cause abortion and damage the male reproductive system. The connection between these effects and exposure to low levels of lead is uncertain.

How likely is lead to cause cancer?

The Department of Health and Human Services (DHHS) has determined that lead acetate and lead phosphate may reasonably be anticipated to be carcinogens based on studies in animals. There is inadequate evidence to clearly determine lead's carcinogenicity in humans.

Is there a medical test to show whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your exposure to lead. Blood tests are commonly used to screen children for potential chronic lead poisoning. The Centers for Disease Control and Prevention (CDC) considers children to have an elevated level of lead if the amount in the blood is at least 10 micrograms per deciliter (10 µg/dL). Lead in teeth and bones can be measured with X-rays, but this test is not as readily available.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends all children be screened for lead poisoning at least once a year. This is especially important for children between six months and six years old.

The Environmental Protection Agency (EPA) requires lead in air not to exceed 1.5 micrograms

APPENDIX E
DESCRIPTION OF CHEMICALS FOUND IN FISH AND SEDIMENTS (continued)

per cubic meter (1.5 µg/m³) averaged over three months. The sale of leaded gasoline was illegal as of December 31, 1995. EPA limits lead in drinking water to 15 micrograms per liter (15 µg/L) for 90% of all samples.

The Consumer Product Safety Commission (CPSC), EPA, and the states control the levels of lead in drinking water coolers. Water coolers that release lead must be recalled or repaired. New coolers must be lead-free. Drinking water in schools must be tested for lead.

The Department of Housing and Urban Development (HUD) requires that federally funded housing and renovations, public housing, and Indian housing be tested for lead-based paint hazards. Hazards must be fixed by covering the paint or removing it.

The Occupational Safety and Health Administration (OSHA) limits the concentration of lead in workroom air to 50 µg/cubic meter for an 8-hour workday. If a worker has a blood lead level of 40 µg/dL, OSHA requires that worker to be removed from the workroom.

Glossary

Carcinogenicity: Ability to cause cancer.
Anemia: Low numbers of red blood cells or hemoglobin.
Ingesting: Taking food or drink into your body.
Microgram (µg): One millionth of a gram.

For More Information

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. Toxicological profile for lead. Atlanta: U.S. Department of Health and Human Services, Public Health Service.

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. Case studies in environmental medicine: Lead toxicity. Atlanta: U.S. Department of Health and Human Services, Public Health Service.

Source

ATSDR web page: http://www.atsdr.cdc.gov/tfacts13.html

APPENDIX E
DESCRIPTION OF CHEMICALS FOUND IN FISH AND SEDIMENTS (continued)

POLYCHLORINATED BIPHENYLS (PCBs)

What are polychlorinated biphenyls?

Polychlorinated biphenyls (PCBs) are a group of manufactured organic chemicals that contain 209 individual chlorinated chemicals (known as congeners). PCBs are either oily liquids or solids and are colorless to light yellow in color. They have no known smell or taste. There are no known natural sources of PCBs. Some commercial PCB mixtures are known in the United States by their industrial trade name, Aroclor.

PCBs don't burn easily and are good insulating material. They have been used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. The manufacture of PCBs stopped in the United States in 1977 because of evidence that they build up in the environment and cause harmful effects. Products containing PCBs are old fluorescent lighting fixtures, electrical appliances containing PCB capacitors, old microscope oil, and hydraulic fluids.

What happens to PCBs when they enter the environment?

Before 1977, PCBs entered the air, water, and soil during their manufacture and use. Today, PCBs can be released into the environment from hazardous waste sites that contain PCBs, illegal or improper dumping of PCB wastes, and leaks from electrical transformers containing PCBs. PCBs may be carried long distances in the air; they remain in the air for approximately 10 days. In water, a small amount of the PCBs may remain dissolved, but most sticks to organic particles and sediments. PCBs in water build up in fish and marine mammals and can reach levels thousands of times higher than the levels in water.

How might I be exposed to PCBs?

- Using old fluorescent lighting fixtures and old appliances such as television sets and refrigerators; these may leak small amounts of PCBs into the air when they get hot during operation.
- Eating food, including fish, meat and dairy products containing PCBs.
- Breathing air near hazardous waste sites that contain PCBs.
- Drinking PCB-contaminated well water.
- Repairing or maintaining PCB transformers.

How can PCBs affect my health?

Animal testing is sometimes necessary to find out how toxic substances might harm people or to treat those who have been exposed. Laws today protect the welfare of research animals and scientists must follow strict guidelines.

APPENDIX E
DESCRIPTION OF CHEMICALS FOUND IN FISH AND SEDIMENTS (continued)

People exposed to PCBs in the air for a long time have experienced irritation of the nose and lungs, and skin irritations, such as acne and rashes.

It is not known whether PCBs may cause birth defects or reproductive problems in people. Some studies have shown that babies born to women who consumed PCB-contaminated fish bad problems with their nervous systems at birth. However, it is not known whether these problems were definitely due to PCBs or other chemicals.

Animals that breathed very high levels of PCBs had liver and kidney damage, while animals that ate food with large amounts of PCBs had mild liver damage. Animals that ate food with smaller amounts of PCBs had liver, stomach, and thyroid gland injuries, and anemia, acne, and problems with their reproductive systems. Skin exposure to PCBs in animals resulted in liver, kidney, and skin damage.

How likely are PCBs to cause cancer?

It is not known whether PCBs causes cancer in people. In a long-term (365 days or longer) study, PCBs caused cancer of the liver in rats that ate certain PCB mixtures.

The Department of Health and Human Services (DHHS) has determined that PCBs may reasonably be anticipated to be carcinogens.

Is there a medical test to show whether I've been exposed to PCBs?

There are tests to find out if PCBs are in your blood, body fat, and breast milk. Blood tests are probably the easiest, safest, and best method for detecting recent exposures to large amounts of PCBs.

However, since all people in the industrial countries have some PCBs in their bodies, these tests can only show if you have been exposed to higher-than-normal levels of PCBs. However, these measurements cannot determine the exact amount or type of PCBs you have been exposed to or how long you have been exposed. In addition, they cannot predict whether you will experience any harmful health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 0.0005 milligrams PCBs per liter of drinking water (0.0005 mg/L). The EPA requires that spills or accidental releases into the environment of 1 pound or more of PCBs be reported to the EPA.

The Food and Drug Administration (FDA) requires that milk, eggs, other dairy products, poultry fat, fish, shellfish, and infant foods contain not more that 0.2–3 parts of PCBs per million parts

APPENDIX E
DESCRIPTION OF CHEMICALS FOUND IN FISH AND SEDIMENTS (continued)

(0.2–3 ppm) of food.

For More Information

Agency for Toxic Substances and Disease Registry. 1996. Toxicological profile for polychlorinated biphenyls (update). Atlanta, GA; U.S. Department of Health and Human Services, Public Health Service.

Source

ATSDR web page: http://www.atsdr.cdc.gov/tfacts17.html

APPENDIX E
DESCRIPTION OF CHEMICALS FOUND IN FISH AND SEDIMENTS (continued)

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

What are polycyclic aromatic hydrocarbons?

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

APPENDIX E
DESCRIPTION OF CHEMICALS FOUND IN FISH AND SEDIMENTS (continued)

- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

APPENDIX E
DESCRIPTION OF CHEMICALS FOUND IN FISH AND SEDIMENTS (continued)

Glossary

Carcinogen: A substance that can cause cancer.
Ingest: Take food or drink into your body.

For More Information

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Source

ATSDR web page: http://www.atsdr.cdc.gov/tfacts69.html

APPENDIX F
ATSDR COMMENTS ON HUMAN HEALTH RISK ASSESSMENT FOR FRED BAYOU

Mr. Michael Jones
325 CES/CEV-Bldg 421
119 Alabama Ave.
Tyndall AFB, Florida 32403-5014

Dear Mr. Jones:

Agency for Toxic Substances and Disease Registry (ATSDR) has reviewed the "Technical Memorandum, Human Health Risk Evaluation, Site 29- Fred Bayou Tyndall Air Force Base, Florida, prepared for: U.S. Army Corps of Engineers by Rust Environmental & Infrastructure, December 1996." In general, we find the calculations and consumption model data acceptable, but have five recommendations and questions regarding the fish selected and the conclusions and comparisons made.

1. The human health risk evaluation (HHRE) only evaluated DDT and its breakdown products, DDD and DDE in fish tissue collected from Fred Bayou. However, other chemical constituents from sources other than Tyndall AFB may be present in the fish tissue that could add to the human health risk. The carcinogenic health risks that were calculated for DDT, DDD, and DDE ranged from 4E-06 (recreational adult angler, gulf flounder) to 2E-04 (subsistence adult fisher, sand trout) and the noncarcinogenic risks were as high as 1.2 (adult recreational angler, sand trout) and 2.5 (adult subsistence angler, sand trout). Data from the EPA Environmental Monitoring and Assessment Program (EMAP) has identified PCBs, arsenic, chromium, cadmium, lindane, aldrin, and mirex in hardhead catfish and Atlantic croaker from St. Andrew Bay and East Bay (EPA-EMAP 1992 and 1993). Fred Bayou opens into East Bay and East Bay flows into St. Andrew Bay. The 1993 sampling location was in East Bay approximately 3 miles east of Fred Bayou while the 1992 sampling location was in St. Andrew Bay about 10 miles west of Fred Bayou. Therefore, it is likely that the mobile fish collected from Fred Bayou contained other contaminants.

   Although these other contaminants may have come from sources other than Tyndall AFB, the levels of uncertainty in the calculated risks and hazard quotients may be increased because of this data gap. To improve the confidence in the risk assessment and calculated meal consumption limits, ATSDR recommends sampling fish for additional constituents. The U.S. Fish and Wildlife Service, U.S. EPA, and the Florida Department of Environmental Protection should be consulted for assistance on this additional analysis.

2. The HHRE compares the FDA action levels for DDT to the concentrations in Fred Bayou fish tissue but this comparison is not appropriate for the population in the Panama City area. FDA levels are based on a population eating fish from many different sources, an

APPENDIX F
ATSDR COMMENTS ON HUMAN HEALTH RISK ASSESSMENT FOR FRED BAYOU (continued)

Page 2 - Michael Jones

average fish consumption rate based on the entire United States population, and the economics involved with loss of commercial fishing. Since recreational anglers or subsistence fishers tend to eat larger quantities of fish from local water bodies repeatedly, FDA's levels may not be appropriate for local risk issues (See enclosed letter, EPA and FDA, no date). Hence, Tyndall AFB should remove the reference to FDA's levels. Alternatively, the risk assessment could make comparisons to other state risk thresholds and hazard levels used to determine fish consumption advisories.

3. The HHRE examines the risk from consuming fish fillets from gulf and southern flounder, black drum, sheepshead, spotted sea trout, and sand trout. Total composite pinfish and blue crab were also sampled according to "Addendum Number 3 to A-E Chemical Data Acquisition Plan, Quality Assurance Project Plan, Rust E & I, October 1996", but they were not evaluated. Since blue crab is commonly harvested for consumption, it should be evaluated or an explanation presented why it isn't. ATSDR is not recommending the evaluation of pinfish for the human health risk assessment unless Tyndall AFB identifies subsistence fishing populations since pinfish are primarily harvested for bait and much less frequently for consumption. According to Ron Salz with the National Marine Fisheries Survey, approximately 10 percent of the pinfish catch in West Florida are harvested for consumption. Subsistence fishing populations could possibly consume greater percentages.

4. The meal consumption limits on Page 9 concludes that unlimited meals per month are allowed when considering the noncarcinogenic hazard level of one. However, a hazard index of 1.2 and 2.5 was calculated for sand trout. This seems inconsistent. Please explain why these values were not used in the meal consumption limits.

5. ATSDR suggests that the HHRE reference the source of the previously reported data as well as correct two editorial errors. These errors included the weight of the gulf flounder in Table 1 that is off by a factor of 10 and the meal size of 0.144 kg instead of 0.228 kg for adults in each footnote in Tables 2 through 33. We found these editorial errors did not effect the risk calculations.

We thank you for the opportunity for reviewing the HHRE. If you have any questions, please do not hesitate to contact me at 404-639-6001.

Sincerely,

Brian M. Kaplan
Environmental Health Scientist
Federal Facilities Assessment Branch
Division of Health Assessment and Consultation

APPENDIX G
SUMMARY OF ASSUMPTIONS USED IN THE HUMAN HEALTH RISK ASSESSMENT

Variable	Value	Comments
Concentrations	Evaluated arithmetic mean and the 95% upper confidence level. The maximum concentration was used when the 95% upper confidence level exceeded the maximum.	
Species	Spotted sea trout, the most contaminated fish.	
Child Assumptions		
Ingestion Rate	0.114 kg fish/meal	
•Recreational consumer	6.2 g/day	Equivalent to 0.114 kg/meal at 20 meals/year
•Subsistence consumer	16.5g/day	Equivalent 0.114 kg/meal at 53 meals/year
Exposure Duration	6 years	
Body Weight	15 kg	
Averaging Time	365 days per year	
Averaging Duration	70 years for carcinogens	
	6 years for noncarcinogens	
Fraction Ingested	1 (unitless)	

APPENDIX G
SUMMARY OF ASSUMPTIONS USED IN THE HUMAN HEALTH RISK ASSESSMENT (continued)

Adult Assumptions		
Ingestion Rate	0.228 kg fish/meal	
Recreational consumer	50 g/day	Equivalent to 0.228 kg/meal for 80 meals/year
Subsistence consumer	100 g/day	Equivalent to 0.228 kg/meal for 100 meals/year
Exposure Duration	30 years	
Body Weight	70 kg	
Averaging Time	365 days per year	
Averaging Duration	70 years for carcinogens	
	30 years for noncarcinogens	
Fraction Ingested	1 (unitless)	

APPENDIX H
ATSDR COMMENTS ON WHERRY LANDFILL SAMPLING

- The "perceived" boundaries of the landfill are not consistent with the locations of the houses that were removed. The "perceived" landfill boundary is located on the southern side of Lincoln Avenue. This area was the location of only 9 to10 of the 25 houses that were removed due to settling. The other removed houses were located at the northern and eastern side of Lincoln Avenue, Coolidge Avenue, Roosevelt Boulevard, and Monroe Avenue. In addition, the drawn map boundary is 900 feet long versus the 1/2-mile long trenches (2640 feet) described in the Installation Restoration Program Records (CH_2M Hill, 1981). If these removed houses indicate that the landfill covers a larger area than currently "perceived" or if the described trench lengths are accurate, additional exposure pathways could exist.

- Surface soil samples were composited and analyzed for volatile organics. EPA Region 4's manual on environmental sampling specify in Section 12.4 that samples collected for VOC analysis are not to be mixed (EPA 1997). As a result, the reported concentrations of VOCs are probably low and not representative of the nature and extent of possible contamination and potential exposure.

- The depth of the soil samples were 0 to 1 foot below ground surface. This depth is adequate for ATSDR's health evaluation. However, the locations may not be adequate do determine the nature and extent of the landfill. For each composite, four samples were taken at the "perceived" edge of the landfill and only one sample in the center. These sampling locations could also create a low bias and not be representative of contamination in the landfill.

- The sampling of the drill cuttings pile from the installation of the wells was used to make decisions about the nature and extent of contamination. The sampling of drill cuttings should only be used for determining the proper disposal of the soil because the cuttings are mixed from different soil horizons. Any conclusion about subsurface soil contamination is therefore not conclusive. Additional borings and sampling took place near these wells after they were installed, but the data is not complete because the additional sampling only included pesticides.

- The groundwater flow direction presented in the undated BCM report should be evaluated with additional groundwater level measurements during different seasons and during the tidal cycles. Also, the confidence in the groundwater flow direction presented in the report should be revised because the flow direction appears to be a regression line using the three wells as points. This direction could be an artifact of the close lineup of the three wells in a northeast direction versus a preferred triangle of well locations. A different groundwater direction could change the evaluation of exposure pathways.

- To identify the location of the DDT identified in the cuttings pile, four soil borings around each well were completed. Samples from each of the four borings around each well were composited from each depth. For instance, the samples from 1 to 3 feet from each of four borings around one well were composited. However, according to Figure 2

APPENDIX H
ATSDR COMMENTS ON WHERRY LANDFILL SAMPLING (continued)

in the February 1999 report (BCM 1999), one of the four borings for each of the three wells were inside the "perceived" boundary of the landfill and the other three were outside. Hence, the results of compositing of soil from "inside" and "outside" the landfill should not be used to determine the presence of contamination in the landfill or extent of contamination. This concern is partially offset by the boring drilled next to the wells with discreet samples taken.