Public Health Assessment for

ESCAMBIA WOOD-PENSACOLA
(A/K/A ESCAMBIA TREATING COMPANY)
PENSACOLA, ESCAMBIA COUNTY, FLORIDA
CERCLIS NO. FLD008168346
MAY 23, 1995

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

PUBLIC HEALTH ASSESSMENT

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Prepared by

The Florida Department of Health and Rehabilitative Services
Under a Cooperative Agreement with the
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.

Additional copies of this report are available from:
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FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, is an agency of the U.S. Public Health Service. It 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. (The legal definition of a health assessment is included on the inside front cover.) 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.

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 then evaluate whether or not there will be any harmful effects from these exposures. The report focuses on public health, or the health impact on the community as a whole, rather than on individual risks. Again, ATSDR generally makes use of existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries. 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 research studies are needed.

Conclusions: The report presents conclusions about the level of health threat, if any, posed by a site and recommends ways to stop or reduce exposure in its 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.

Interactive Process: The health assessment is an interactive process. ATSDR solicits and evaluates information from numerous city, state and federal agencies, the companies responsible for cleaning up the site, and the community. It then shares its conclusions with them. Agencies are asked to respond to an early version of the report to make sure that the data they have provided is accurate and current. When informed of ATSDR's conclusions and recommendations, sometimes the agencies will begin to act on them before the final release of the report.

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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SUMMARY

The Escambia Wood-Pensacola hazardous waste site (EWP), also known as the Escambia Treating Company, is in Pensacola, Escambia County, Florida. It is on Palafox Highway about one mile north of Fairfield Drive. The area around the site includes homes, light industries, and businesses. From 1942 to 1982, EWP treated wood poles and timbers. They used two chemicals to treat the wood: creosote and pentachlorophenol. The soil and groundwater on and around the site are contaminated. In 1991, EWP went out of business and abandoned the site. From 1991 to 1993, the U.S. Environmental Protection Agency (EPA) dug up contaminated soil and stored it under a secure high density polyethylene cover. During this time, nearby residents complained of odors coming from the site that irritated their eyes and skin and sometimes made it difficult for them to breathe.

Nearby residents believe that contamination released into the air during the excavation work has worsened their health problems. They are worried that breathing these contaminants may cause cancer or make them sick in the future. Residents are also worried that future work at the site will expose them to more hazardous chemicals and cause more health problems.

We focused our public health assessment on the following chemicals: arsenic, benzene, dioxins/furans, pentachlorophenol (PCP), and polycyclic aromatic hydrocarbons (PAHs). Former workers at the plant and trespassers on the EWP site may have accidentally eaten contaminated soil or breathed contaminated dust in the air. Arsenic and PCP in this soil or dust may have caused skin irritation. Arsenic and PCP may have also caused liver, kidney, and nervous system damage; and blood-forming and immune system problems. Arsenic and benzo(a)pyrene (a PAH) in the soil or dust may have increased the risk of skin, lung, and blood-forming system (leukemia) cancers. Former workers at the EWP site and site trespassers may be at an increased risk of liver, spleen or adrenal cancer from PCP.

Former workers at the plant, trespassers on the site, and nearby residents may have accidentally eaten soil contaminated by dioxins/furans. They may have also breathed dioxins/furans in contaminated air. The U.S. Public Health Service and EPA are currently reviewing studies on the health effects of these chemicals to estimate their toxicity.

Groundwater under and to the southeast of this site is contaminated and is moving toward the east-southeast. This groundwater has already mixed with contamination from the nearby Agrico Chemical Company hazardous waste site. Contaminated groundwater, however, is unlikely to affect people since there are no public or private drinking water wells in the area.

Based on the information we have, this site is a public health hazard. We recommend EPA maintain site security and put up more hazardous waste warning signs. We also recommend EPA take more surface soil samples in the neighborhood north of the site. This is necessary to find out how much soil contamination exists and how far it extends. We recommend EPA make sure cleanup companies protect their workers from hazardous chemicals. Finally, we recommend that the Agency for Toxic Substances and Disease Registry (ATSDR) conduct a comprehensive community health evaluation of residents near the site. This is necessary to

recommend that the Agency for Toxic Substances and Disease Registry (ATSDR) conduct a comprehensive community health evaluation of residents near the site. This is necessary to find any illnesses that may be connected to hazardous chemicals from this site.

BACKGROUND

The Florida Department of Health and Rehabilitative Services (Florida HRS), in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR), will evaluate the public health significance of the Escambia Wood - Pensacola site. Specifically, Florida HRS will determine whether health effects are possible and recommend actions to reduce or prevent them. ATSDR, located in Atlanta, Georgia, is a federal agency within the U.S. Department of Health and Human Services and is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) to conduct public health assessments at hazardous waste sites.

A. Site Description and History

The Escambia Wood - Pensacola (EWP) site, also known as the Escambia Treating Company site, occupies about 26 acres at 3910 North Palafox Highway, Pensacola, Escambia County, Florida (Figures 1-4, Appendix A). The site is bordered by Palafox Highway to the west, the Rosewood Terrace subdivision to the north, the CSX railroad yard to the east, and a light industrial area to the south. The facility began treating wooden utility poles and foundation pilings with creosote in 1942. The company switched to the use of pentachlorophenol (PCP) for the wood treatment process in 1963 and used it as the only preservative after 1970 (EPA 1991, Weston 1991). The company employed about 35 people (Sparks 1981). After the company ceased operations in 1982, much of the equipment and materials were salvaged from the grounds. The facility office building, several sheds and the wood treatment wastewater ponds remained (Hicks 1988).

In 1987, the Florida Department of Environmental Regulation (FDER) (now the Florida Department of Environmental Protection (FDEP)) found polycyclic aromatic hydrocarbons (PAHs) and PCP in groundwater on the EWP site. These compounds were similar to those found in groundwater at another hazardous waste site (Agrico Chemical Company) less than one mile hydraulically down-gradient from the EWP site (Hicks 1988). In 1991, EWP filed for bankruptcy and abandoned the site. That same year, EPA sampled the groundwater, soil and air at the site and found that soil and groundwater were contaminated with PAHs, PCP, and dioxins/furans (Weston 1991). EPA determined that removal of the contaminated soil was necessary to prevent further contamination of the groundwater. In October 1991, EPA's Environmental Response Team began excavating contaminated soil and stockpiling it on-site under a secure high density polyethylene liner. EPA completed excavation work and secured the site in early 1993.

During the soil excavation, nearby residents complained about strong odors that caused eye and skin irritation. As a result of these complaints, ATSDR held five public meetings to discuss the health concerns of local residents, document health problems, answer questions, and provide information about plans for a health education program and health evaluation study. EPA temporarily relocated two residents because of health problems. Based on the recommendations of a health consultation prepared by ATSDR (ATSDR 1992b), Florida

HRS provided a health educator to conduct community education programs to inform residents about health effects from exposure to contaminants at the site. Florida HRS, with support from ATSDR, also conducted four physician education seminars, attended by about 180 physicians, to inform them about the effects of environmental exposure to site-related contaminants.

Although exposure to contaminants in air and soil are also a concern at this site, EPA determined that groundwater contamination alone was a sufficient potential public health threat that cleanup of the site would be necessary. As a result, EPA proposed this site on August 23, 1994 for inclusion in the National Priorities List (NPL) of Superfund sites. The NPL is maintained by EPA and lists those hazardous waste sites that require cleanup action under the "Superfund" law, the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). This Public Health Assessment is being prepared by Florida HRS for ATSDR as part of the Superfund process.

B. Site Visit

Bruce Tuovila, Florida HRS; Robert Merritt, HRS Escambia County Public Health Unit (HRS Escambia CPHU); and the EPA On-Scene Coordinator, toured the site on February 5, 1992. Mr. Tuovila conducted additional site visits on July 16, 1992 and April 22, 1993 to observe on-going activities.

The site is surrounded by an 8-foot high chain link fence topped by barbed wire. EPA replaced this with sheet metal privacy fencing on the north, east and south sides following completion of excavation work in 1993. A sign facing Palafox Highway identifies the property as an EPA Superfund site. The number and location of warning signs is inadequate to warn the public about the hazards at this site and to meet the requirements of sections 403.704 and 403.7255, Florida Statutes, and FDEP Rule 17-736.

All the original structures on the site, except the office building, have been removed. Two large excavation pits containing standing water are in the central and northeastern portions of the site (Figure 4, Appendix A). Although an attempt has been made to stabilize the sides of the excavation pits with a grass groundcover, erosion is still occurring. EPA stockpiled all excavated material in one extended pile and covered this material with a 60 mil thick (about 1/16 inch) reinforced high density polyethylene plastic liner material. Seams in the material were heat sealed and the liner anchored at the base of the pile in gravel-filled drainage ditches. The remainder of the site is sparsely vegetated.

During the February site visit, we conducted a drive-through tour of the neighborhood north of the site, we observed that the homes along Lansdowne Avenue abut the site. One home near the east end of Lansdowne Avenue is abandoned. Most of the other homes, however, are well-maintained. There is a storm water impoundment pond at the east end of Lansdowne Avenue and a drum refurbishing/painting company along Spruce Street. We noticed a strong, irritating solvent odor near the drum company property. The CSX Railroad

yard runs along the east side of the site and Palafox Highway borders the site on the west. To the south are various light industrial businesses and a large warehouse under construction. Mr. Merritt indicated there are no public or private drinking water wells within a one mile radius of the site. All homes and businesses in the area are supplied by city water.

C. Demographics, Land Use, and Natural Resource Use

Demographics

According to 1990 census data (BOC 1992), about 925 people live within a one-quarter mile radius of the site and about 4,500 people live within one mile. The neighborhoods around the site are low to lower-middle income. The population within one-quarter mile is 99% African-American. Within one mile, the population is about 71% African-American. There are five daycare centers, one hospital and three public schools within one mile of the site.

Land Use

The area within one mile of the site is mixed residential/light industrial/commercial. There is an industrial park south of the site, the CSX railroad yard to the east, and commercial businesses along Palafox Highway on the west. Rosewood Terrace, a residential neighborhood, is adjacent to the northern border of the site, and the Escambia Arms apartment complex, a public housing project, is within one-quarter mile north of the site. The Agrico Chemical Company Superfund site is about two-thirds of a mile to the southeast.

Natural Resource Use

The main source of drinking water for Pensacola and Escambia County is the Sand-and-Gravel aquifer. This aquifer begins at a depth of 40-50 feet and consists of two water-bearing zones separated by clay or sandy clay layers. The upper zone extends from about 50 to 150 feet below land surface (BLS) and the lower zone from about 150 to 250 feet BLS. The lower zone provides most of the drinking water for the Pensacola area. There is a downward hydraulic gradient between the upper and lower zones of the aquifer, indicating that contamination from the upper zone can migrate into the lower zone. Although regional groundwater flow in this aquifer is southward, groundwater flow near the site is more toward the southeast (Hicks 1988).

There are fourteen public supply wells and six private wells within three miles of the EWP site (Geraghty & Miller 1992, Hankinson 1987). A groundwater contamination plume extends east-southeast from the EWP site and has joined with a groundwater contamination plume from the nearby Agrico Chemical Company site. This contamination is moving toward Bayou Texar, an environmentally sensitive estuary about two miles east-southeast of the site. No public or private wells are within this contamination plume (Chatham 1988, Geraghty & Miller 1992) and all households within this area use public water for drinking and other domestic purposes. Except for small backyard gardens, there is no agricultural use

of the land within one mile of the site.

D. Health Outcome Data

Guided by community health concerns, HRS epidemiologists reviewed information contained in the Florida Cancer Data System (FCDS). FCDS is a program of Florida HRS operated by the University of Miami School of Medicine and covers all cancers reported in Florida between 1981 and 1990, the most recent year for which information is available. Cancer registry information was available for zip codes 32503 and 32505. These zip codes include neighborhoods around the Escambia Wood - Pensacola site. We will discuss the results of this review in the Public Health Implications, Health Outcome Data Evaluation section.

COMMUNITY HEALTH CONCERNS

Residents of Rosewood Terrace, which borders the site, and the nearby neighborhoods of Oak Park, Goulding, and Escambia Arms have expressed a number of health concerns. We compiled these concerns from public meetings, telephone conversations with community members, newspaper articles, local health officials, and EPA reports. These concerns are addressed in the Public Health Implications, Community Health Concerns Evaluation section.

Community members have expressed the following health concerns:

1. Can any of the contaminants at the site cause non-cancerous health effects such as respiratory problems (i.e., asthma), itching and burning eyes, skin rashes, sinus problems, thyroid problems, heart murmurs, bladder stones, or tuberculosis?

2. Can any of the contaminants at the site cause emphysema, leukemia, bone cancer, colon cancer, or spinal cancer?

3. Dioxins/furans, pentachlorophenol, and polycyclic aromatic hydrocarbons have been found on the site. What health effects could result from exposure to these contaminants?

4. What contaminants cause the strong, burning odor coming from the site and what health effects could result from exposure to them?

5. What contaminants have migrated from the site to residential yards and what health effects may result from exposure to them?

6. Can any of the contaminants that may have migrated from the site to residential yards get into fruits and vegetables grown in that soil and what health effects could occur from eating them?

7. Could small game (i.e., rabbit, quail, squirrel, etc.) hunted in the past near the site have been contaminated and what health effects are likely from having eaten them?

8. Can benzene from the site get into the public water supply system?

9. Can the stressful situation experienced by residents near the site cause mental health problems in these individuals?

10. If soil incineration is chosen as the method for cleaning up the site, what effect will this have on the air quality and what monitoring will be done to check for contamination coming from the site?

In addition to health concerns, residents near the site have raised the issue of environmental equity/justice. They feel that they have been treated unfairly by the agencies involved with the site since work began there because the members of the community are a racial minority.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

In this section, we review the environmental data collected at this site. We evaluate the adequacy of the sampling that has been conducted, select contaminants of concern, and list the concentration and frequency of detection of the contaminants found in various media. The concentrations found are then compared to background levels and to standard comparison values. A comparison value is used as a means of selecting environmental contaminants for further evaluation to determine whether exposure to them has public health significance. The following comparison values are used in the data tables:

1. CREG--Cancer Risk Evaluation Guide--calculated from EPA's cancer slope factors, is the contaminant concentration that is estimated to result in no more than one excess cancer in a million persons exposed over a lifetime.

2. EMEG--Environmental Media Evaluation Guide--derived from ATSDR's Minimal Risk Level (MRL), which provides a measure of the toxicity of a chemical, is the estimate of daily human exposure to a chemical that is likely to be without an appreciable risk of adverse effects, generally for a period of a year or longer.

3. RMEG--Reference Dose Media Evaluation Guide--is calculated from the EPA Reference Dose (RfD)--EPA's estimate of the daily exposure to a contaminant that is unlikely to cause adverse health effects. Similar to EMEGs, RMEGs are estimated contaminant concentrations at which daily exposure would be unlikely to cause a noncarcinogenic health effect.

4. LTHA--Lifetime Health Advisory for Drinking Water--is EPA's estimate of the concentration of a contaminant in drinking water at which adverse health effects would not be anticipated to occur over a lifetime of exposure. LTHAs provide a safety margin to protect sensitive members of the population.

We have reviewed the environmental data collected at this site and selected the following chemicals as contaminants of concern:

Arsenic	Pentachlorophenol (PCP)
Benzene	Polycyclic Aromatic Hydrocarbons (PAHs)
Dioxins/Furans	

We selected these contaminants based on the following factors:

1. Concentrations of contaminants on and off the site.

2. Field data quality, laboratory data quality, and sample design.

3. Comparison of on-site and off-site concentrations with health assessment comparison values for (1) noncarcinogenic endpoints and (2) carcinogenic endpoints.

4. Community health concerns.

The PAHs of concern at the EWP site are: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-c,d)pyrene, and naphthalene. Benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene are possible or probable human carcinogens. However, an ATSDR comparison value is available only for benzo(a)pyrene. Although all of these chemicals are listed in the tables in Appendix B, analysis of the potential carcinogenic health effects from exposure to them will be based on the levels of benzo(a)pyrene found in various media at this site.

Dioxins/Furans refers to a general class of chlorinated dibenzodioxins and dibenzofurans, the most toxic of which is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). The toxicity of the other chlorinated dibenzodioxins and dibenzofurans can be related to TCDD by using EPA's Toxic Equivalency Factors (TEF) (EPA 1989) to calculate their Toxic Equivalents (TEQ). By adding the TEQ concentrations of all the forms of dioxins and furans in a sample, we can determine the total dioxin toxicity (dioxin-TEQ). In this report, we use the term dioxin-TEQ to refer to the combined toxicity of all forms of chlorinated dibenzodioxins and dibenzofurans found in samples of various media at this site. We use dioxin-TEQ to evaluate the possible health effects from exposure to these chemicals.

Fifty-four chemicals were detected in various media on the EWP site at a level below human health concern. In addition, 83 other chemicals were detected in various media at this site for which there is insufficient human health data available to determine their public health significance. The chemicals in both of these categories are listed in Appendix C.

Identification of a contaminant of concern in this section does not necessarily mean that exposure will cause adverse health effects. Identification serves to narrow the focus of the health assessment to those contaminants most important to public health. When selected as a contaminant of concern in one medium, we have also reported that contaminant in all other media. We will evaluate these contaminants in subsequent sections and determine whether exposure has public health significance.

To identify industrial facilities that could contribute to the contamination near the Escambia Wood - Pensacola site, we searched the EPA Toxic Chemical Release Inventory (TRI) data base for 1987-1991. EPA developed TRI from the chemical release information (air, water, and soil) provided by certain industries. The TRI search revealed two industries, Florida Drum Company at 10 Spruce Street and Precision Machining, Inc. at 3820 Hopkins St., within a one mile radius of the site, that reported releases of toxic chemicals. Between 1987 and 1991, Florida Drum Company reported releasing to the air a total of 151,223 pounds of mixed xylenes and 202,564 pounds of methyl ethyl ketone (2-butanone). Estimated annual air releases for 1992 and 1993 total 35,300 pounds of mixed xylenes and 41,700 pounds of methyl ethyl ketone. Between 1988 and 1991, Precision Machining reported releasing to the air a total of 60 pounds of cyclohexane, 1,769 pounds of ethylbenzene, 140,857 pounds of mixed xylenes, 48,777 pounds of methyl ethyl ketone (2-butanone), 68,850 pounds of toluene, 103,048 pounds of n-butyl alcohol, 4,812 pounds of methyl isobutyl ketone, 71 pounds of 1,1,1-trichloroethane, 803 pounds of dichloromethane, 19,055 pounds of acetone, and 17,925 pounds of methanol.

Methyl ethyl ketone (2-butanone), n-butanol, methylene chloride, acetone, and 1,1,1-trichloroethane have been detected in groundwater on the site, xylenes have been detected in on-site soil, groundwater and air, ethylbenzene has been detected in on-site groundwater and air, and toluene has been detected in on-site groundwater, air and waste oil sludge. Methyl isobutyl ketone, methanol, and cyclohexane were analyzed for but not detected at the site. All are used as paint thinners, solvents and cleaning agents. They evaporate easily into the air and exposure to them can cause irritation of the nose, throat, eyes, and skin. Based on limited information, only methylene chloride is believed to cause cancer (ATSDR 1990b, ATSDR 1990e, ATSDR 1992c, ATSDR 1993d, ATSDR 1993e, ATSDR 1994a, ATSDR 1994b, Lewis 1993). None of these chemicals, however, are present on the site at levels that could cause adverse health effects or increase the risk of cancer.

In this public health assessment, the contamination that exists **on** the site will be discussed first, separately from the contamination that occurs **off** the site.

A. On-site Contamination

For the purposes of this evaluation, "on-site" is defined as the Escambia Wood - Pensacola property within the fenced boundary as shown in Figure 4, Appendix A.

We compiled data in this subsection from the following sources: the 1988 FDER groundwater investigation report (Hicks, Martin and Stodghill 1988) and EPA reports (Bruner 1982, Ferguson 1992, Roy F. Weston, Inc. 1991, 1992a, 1992b, 1992c, 1993a, 1993b).

On-site Surface Soil

EPA collected a total of 168 surface soil samples (depth 0-6 inches) from various locations on the site between 1991 and 1993 (Ferguson 1992, Weston 1991, 1992c, 1993a) (Figure 5, Appendix A). Dioxin-TEQ was the only contaminant of concern that was detected in background surface soil samples on-site; its concentration was at a level below the comparison value.

Arsenic, benzo(a)pyrene, dioxin-TEQ, and pentachlorophenol (PCP) levels in on-site surface soil samples exceeded the corresponding comparison values (Table 1, Appendix B). Dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene were not detected in any samples. No samples were analyzed for benzene. Naphthalene was detected in 24 of 168 samples at a maximum concentration of 250,000 milligrams per kilogram (mg/kg). No ATSDR soil comparison value is available for naphthalene. For this assessment, these samples were adequate to characterize the on-site surface soil quality.

On-site Subsurface Soil

EPA collected a total of 262 subsurface soil samples (depth 1-47 feet) from various locations on the site between 1982 and 1993 (Bruner 1982, Weston 1991, 1992c, 1993a) (Figure 6, Appendix A). No contaminants of concern were found in any background samples.

Arsenic, benzo(a)pyrene, dioxin-TEQ, and PCP levels in on-site subsurface soil exceeded the corresponding comparison values (Table 2, Appendix B). Benzene was not detected in the subsurface soil on-site. Naphthalene was detected in 47 of 262 samples at a maximum concentration of 5,200 mg/kg. No ATSDR soil comparison value is available for naphthalene. For this assessment, these samples were adequate to characterize the on-site subsurface soil quality.

On-site Groundwater

FDEP and EPA collected a total of 39 groundwater samples (depth 50-69 feet) from monitoring wells on the site between 1982 and 1992 (Bruner 1982, Hicks 1988, Weston 1991, 1992a) (Figure 7, Appendix A). No contaminants of concern were found in any background samples.

Arsenic, benzene, benzo(a)pyrene, naphthalene, and PCP levels in on-site groundwater exceeded the corresponding comparison values (Table 3, Appendix B). Dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene were not detected in any samples. No

on-site groundwater samples were analyzed for dioxin-TEQ. For this assessment, these samples were adequate to characterize the on-site groundwater quality.

On-site Air

EPA collected a total of 66 air samples from various locations on the site between 1991 and 1993 (Weston 1991, 1992b, 1993b). Several samples were collected at each location shown in Figure 8, Appendix A. Dioxin-TEQ and PCP air samples were collected using high-volume samplers with polyurethane foam plugs and glass fiber filters. Samples for PAHs were collected using medium-volume samplers with XAD-2 tubes and filters. Volatile organic compounds were sampled using low-volume samplers with carbon tubes and carbon molecular sieve tubes. Samples were collected in the breathing zone (4-5 feet above the ground). Several sample stations were located along the northern property boundary of the site. No contaminants of concern were found in any background samples.

Benzene and dioxin-TEQ levels in on-site air exceeded the corresponding comparison values (Table 4, Appendix B). Benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene were not detected in any samples. No on-site air samples were analyzed for arsenic.

Naphthalene was detected in 38 of 66 samples, and PCP in 48 of 53 samples. No ATSDR air comparison values are available for these contaminants. For this assessment, these samples were adequate to characterize the on-site air quality.

On-site Liquid Waste

EPA collected two liquid waste samples from the site in 1982 (Bruner 1982) (Figure 9, Appendix A). Liquid waste at the EWP site consisted of wastewater from the cooling water tanks and the runoff holding pond.

Only PCP exceeded the corresponding comparison value (Table 5, Appendix B). No on-site liquid waste samples were analyzed for dioxin-TEQ. Because only a few of the contaminants of concern have been analyzed for in on-site liquid waste, we cannot fully evaluate the likely health effects from exposure to this medium. Consequently, we do not consider these samples adequate to characterize the on-site liquid waste. However, both the cooling water tanks and the runoff holding pond have been removed from the site, and the wastewater they contained has been treated and disposed of. There is currently no liquid processing waste on the site.

On-site Waste Sludge

EPA collected six waste sludge samples from the site in 1982 and 1991 (Bruner 1982, Weston 1991) (Figure 10, Appendix A). Waste sludge is the solid residue that settled out of wastewater in the cooling water tanks and runoff holding pond. This material was also

present in soil near these structures.

Arsenic, benzo(a)pyrene, dioxin-TEQ, and PCP levels in on-site waste sludge exceeded their corresponding comparison values (Table 6, Appendix B). Benzene, dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene were not detected in any samples. Naphthalene was detected in 3 of 6 samples at a maximum concentration of 220 mg/kg. No ATSDR comparison value is available for naphthalene. For this assessment, these samples were adequate to characterize the on-site solid waste. The cooling water tanks and runoff holding pond have been removed from the site. All sludge material remaining in the soil on-site was excavated and stockpiled on the site during the EPA excavation activities in 1991-93.

B. Off-site Contamination

For the purposes of this evaluation, "off-site" is defined as the area outside the boundary fence around the Escambia Wood - Pensacola property as shown in Figure 4, Appendix A.

We compiled data in this subsection from EPA reports (Ferguson 1992, Roy F. Weston, Inc. 1993b).

Off-site Surface Soil

In 1992, EPA collected 7 surface soil samples (depth 0-6 inches) from residential yards in the neighborhood adjacent to the northern border of the site (Ferguson 1992) (Figure 11, Appendix A). No background samples were collected.

Dioxin-TEQ levels in six of the seven off-site surface soil samples exceeded the corresponding comparison value (Table 7, Appendix B). No samples were analyzed for arsenic or benzene. Samples were collected mostly from the yards adjacent to the site. Residents have indicated that stormwater runoff from the site flooded the entire neighborhood several times in the past. Because off-site contamination may extend further than is now known, we do not consider these samples adequate to characterize the extent and nature of off-site surface soil contamination.

Off-site Air

EPA collected a total of 36 air samples from various locations off of the site in 1992 (Weston 1993b). Several samples were collected at each location shown in Figure 12, Appendix A. Dioxin-TEQ and PCP air samples were collected using high-volume samplers with polyurethane foam plugs and glass fiber filters. Samples for PAHs were collected using medium-volume samplers with XAD-2 tubes and filters. Volatile organic compounds were sampled using low-volume samplers with carbon tubes and carbon molecular sieve tubes. Samples were collected in the breathing zone (4-5 feet above the ground). No background samples were collected.

Only benzene and dioxin-TEQ levels in off-site air samples exceeded the corresponding comparison values (Table 8, Appendix B). Benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene were not detected in the air off-site. No off-site air samples were analyzed for arsenic.

Naphthalene was detected in 24 of 36 samples, and PCP was detected in all 22 samples. No ATSDR air comparison values are available for these contaminants. Benzene and dioxin-TEQ found in off-site air samples may have been produced by the excavation activities. Additional off-site air samples are needed to assess the long-term health risk from exposure to these contaminants.

C. Quality Assurance and Quality Control

An EPA data review summary is not available for the environmental samples collected at this site. We assume these data are valid, however, since the environmental samples were collected and analyzed by governmental agencies or their contractors. In preparing this public health assessment, we relied on the information provided by these agencies and assumed that the quality assurance and quality control measures described in their reports were followed with regard to chain-of-custody, laboratory procedures, and data reporting. The validity of the analysis and conclusions drawn for this public health assessment are determined by the completeness and reliability of the referenced information.

In each of the preceding On- and Off-Site Contamination subsections, we evaluated the adequacy of the data to estimate exposures. We assumed that estimated data (J) and presumptive data (N) were valid. This second assumption errs on the side of public health by assuming that a contaminant exists when actually it may not exist.

D. Physical and Other Hazards

Numerous physical hazards exist on the site, including the vacant office building, piles of concrete rubble, some machinery, the contaminated soil pile, and two excavation pits, both of which are about 40 feet deep and contain standing water. Persons trespassing on the site would be exposed to these hazards. However, to prevent trespassing, the site is securely fenced and periodically patrolled. Therefore, we consider the actual risk from these physical hazards to be negligible.

PATHWAYS ANALYSES

To determine whether nearby residents have been exposed to contaminants migrating from the site, we evaluated the environmental and human components of exposure pathways. Exposure pathways consist of five elements: a source of contamination, transport through an environmental medium, a point of exposure, a route of human exposure, and an exposed population.

An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present. We categorize exposure pathways that are not eliminated as either completed or potential. For completed pathways, all five elements exist and exposure to a contaminant has occurred, is occurring, or will occur. For potential pathways, at least one of the five elements is missing, but could exist. For potential pathways, exposure to a contaminant could have occurred, could be occurring, or could occur in the future.

A. Completed Exposure Pathways

For a summary of the completed exposure pathways at this site, refer to Table 9, Appendix B.

Surface Soil Pathway

Former workers at the plant may have been exposed to contaminants in on-site surface soil. Vagrants and other trespassers on the site in the past may have also been exposed. Future remediation workers may be exposed to contaminants in on-site surface soil.

Direct dermal contact and incidental ingestion of soil are the primary routes of exposure by this pathway. About 35 former workers may have been exposed to contaminants in on-site surface soil while the plant was in operation. EPA has excavated contaminated surface soil and placed it in a securely covered pile. Future remediation workers on the site may be exposed to contaminants in this soil. Although the site is now secured to prevent trespassing, vagrants and other individuals trespassing on the site in the past may have been exposed to contaminated surface soil by dermal contact and incidental ingestion. However, we have no information to estimate the number of vagrants and other trespassers who may have been on the site.

Residents in the community adjacent to the site may have been exposed to contaminants in off-site surface soil. Direct dermal contact and incidental ingestion of soil are the primary routes of exposure by this pathway. About 20 residents of homes immediately adjacent to the northern border of the site may be exposed to contaminants in surface soil in their yards. This contamination, which does not exceed ATSDR comparison values or soil action levels, may have been carried off-site by stormwater runoff. Residents have indicated that stormwater runoff from the site flooded the entire neighborhood several times in the past. We do not know how many other residential yards in the Rosewood Terrace neighborhood may have contaminated surface soil or how many of the other 75 residents may be exposed to this contamination.

Air Pathway

Former workers may have been exposed to air-borne contaminants while the plant was in operation. In the future, remediation workers on-site may also be exposed to contaminants in air-borne dust and volatile chemicals released from disturbed soil.

Inhalation of contaminated dust and volatile chemicals is the route of exposure by this pathway. About 35 former workers may have been exposed while the plant was in operation. Vagrants and other trespassers on the site between about 1982 and 1991 may have been exposed to contaminated dust; however, we have no information to estimate their numbers or the likely health effects from this exposure.

Individuals within one-quarter mile of the site may have been exposed to air-borne contaminants from plant operations in the past and from the 1991-1993 soil excavation activity. In the future, individuals within one-quarter mile of the site may also be exposed to contaminants in air-borne dust and volatile chemicals released from disturbed soil. About 925 people within one-quarter mile of the site may have been exposed by inhalation of contaminated dust and volatile chemicals while the plant was in operation.

Since access to the site is now restricted and excavated soil has been secured under a high density polyethylene liner , exposure to contaminated dust and volatile chemicals is currently unlikely. However, future exposure by this pathway is possible during remediation activities that produce dust and release volatile chemicals from contaminated soil stockpiled on-site.

Liquid Waste Pathway

Former workers at the plant and trespassers on-site may have been exposed in the past to contaminants in liquid process waste. About 35 former workers may have been exposed to contaminants in the liquid waste. An unknown number of trespassers may have been exposed to these contaminants before the holding ponds were drained and dismantled some time between 1988 and 1991. Exposure resulted from direct dermal contact and incidental ingestion. Since all liquid wastes have been treated and removed from the site, no current or future exposure is possible.

Waste Sludge Pathway

Former workers at the plant and trespassers on-site may have been exposed in the past to contaminants in solid waste sludge. About 35 former workers may have been exposed to contaminants in the sludge material while the plant was in operation. Although much of the sludge was removed and containerized shortly after the facility closed down, some contaminated residue still remained. Therefore, an unknown number of trespassers may have been exposed to these contaminants before EPA soil excavation occurred beginning in 1991. Direct dermal contact and incidental ingestion are the primary routes of exposure by this pathway.

Since all waste sludge has been excavated and stockpiled on-site and the site has been secured, current exposure is unlikely. However, future remediation workers may be exposed to contaminants in this material.

B. Potential Exposure Pathways

For a summary of the potential exposure pathways at this site, refer to Table 10, Appendix B.

Subsurface Soil Pathway

EPA has excavated contaminated subsurface soil from the site and stockpiled it on-site under a secured high density polyethylene liner. Some contaminated soil remains in the excavation pits. Since site access is restricted, current exposure to these contaminated soils is unlikely. However, future remediation workers may be exposed to the contaminants in the soil through direct dermal contact and incidental ingestion.

Fruits and Vegetables Pathway

Dioxin-TEQ found in off-site surface soil can be absorbed by fruit and vegetable plants. Although the concentration of dioxin-TEQ in the below-ground parts of plants may be the same as the soil concentration, the above-ground parts usually contain less than half the soil concentration (ATSDR 1989). PAHs in off-site surface soil can accumulate in plants (ATSDR 1990d). However, there is insufficient toxicological information about the PAHs found in off-site surface soil for us to assess their public health significance.

Fruit trees and small backyard gardens used for household consumption are present in off-site soil that may be contaminated. However, we do not know the full extent and nature of this contamination. In addition, no fruits and vegetables from contaminated areas off-site have been analyzed for any of the contaminants of concern at the EWP site. Therefore, we do not know if fruits and vegetables are a source of contamination and if exposure is possible by this pathway.

Small Game Pathway

Small game such as squirrel, rabbit and quail were hunted near the site in the past. Dioxin-TEQ, PAHs and PCP can be accumulated in animal tissues (ATSDR 1989, 1990c, 1992a). However, no animal tissue has been analyzed for site-related contaminants. Therefore, we do not know if small game were a source of contamination and if exposure occurred by this pathway.

C. Eliminated Pathways

Groundwater north of the site (hydraulically upgradient) is not contaminated and, in addition, all residences in this area are supplied by city water. Groundwater on the site and off of the site to the southeast, however, is contaminated. Although there are no private or public drinking water wells in the area of contamination, several irrigation wells are present (Geraghty & Miller 1992). According to the HRS Escambia CPHU, these wells have been

tested and are not currently contaminated. In addition, new wells located in a contaminated area that are permitted by the Northwest Florida Water Management District must be tested. If contamination is found, the well may have to be abandoned. Therefore, groundwater is not a likely exposure pathway.

PUBLIC HEALTH IMPLICATIONS

In this section we discuss the health effects on persons exposed to specific contaminants, evaluate state and local health databases, and address specific community health concerns.

A. Toxicological Evaluation

Introduction

To evaluate health effects, ATSDR has developed Minimal Risk Levels (MRLs) for contaminants commonly found at hazardous waste sites. The MRL is an estimate of daily human exposure to a contaminant below which non-cancer, adverse health effects are unlikely to occur. ATSDR developed MRLs for each route of exposure, such as ingestion, inhalation, and dermal contact, and for the length of exposure, such as acute (less than 14 days), intermediate (15 to 364 days), and chronic (greater than 365 days). ATSDR presents these MRLs in Toxicological Profiles. These chemical-specific profiles provide information on health effects, environmental transport, human exposure, and regulatory status. In the following discussion, we used ATSDR Toxicological Profiles for the following chemicals:

Arsenic	Pentachlorophenol (PCP)
Benzene	Polycyclic Aromatic Hydrocarbons (PAHs)
Dioxin-TEQ	

We use EPA's cancer slope factors to evaluate the increased risk of cancer from lifetime exposure to site-related contaminants. A slope factor is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical. We adjust for less than lifetime exposure and make a qualitative estimate of the increased cancer risk.

In this section, we used the following assumptions to estimate human exposure from incidental ingestion of contaminated soil and waste materials, and inhalation of contaminated air.

To adjust for less than lifetime exposure in estimating increased cancer risks, we assumed that adult workers on the site worked 5 days per week, 50 weeks per year for the entire 40 year period the plant was in operation. For trespassers on the site, we assumed they were on the site 1 day per week, 52 weeks per year for the 8 year period between the time the plant closed and soil excavation activities began. For off-site residents, we assumed they were exposed to off-site contamination 7 days per week, 50 weeks per year for the estimated 40 year period they could have resided near the site.

To estimate exposure to children from incidental ingestion of contaminated soil and solid waste materials, we made the following assumptions: 1) children between the ages of 1 and 6 ingest an average of 200 milligrams (mg) of soil per day, 2) these children weigh about 10 kilograms (kg), and 3) they ingested soil at the maximum concentration measured for each contaminant.

To estimate exposure to adults from incidental ingestion of contaminated soil and solid waste materials, we made the following assumptions: 1) adults ingest an average of 100 mg of soil per day, 2) they weigh about 70 kg, and 3) they ingested soil at the maximum concentration measured for each contaminant.

To estimate exposure to adults from incidental ingestion of contaminated liquid waste material, we made the following assumptions: 1) adults ingest an average of 0.05 milliliters (ml) of liquid waste per day, 2) they weigh about 70 kg, and 3) they ingested liquid waste at the maximum concentration measured for each contaminant.

To estimate exposure to children from inhalation of airborne contaminants, we made the following assumptions: 1) children between the ages of 1 and 6 breathe 15 cubic meters ($m^{3)}$ of air per day, 2) these children weigh about 10 kg, and 3) they breathe contaminants at the maximum measured concentration.

To estimate exposure to adults from inhalation of airborne contaminants, we made the following assumptions: 1) adults breathe 23 m^3 of air per day, 2) they weigh about 70 kg, and 3) they breathe contaminants at the maximum measured concentration.

Arsenic

Former workers at the plant and trespassers on the site may have been exposed to arsenic in surface soil and waste sludge by incidental ingestion and dermal contact. The estimated daily dose of arsenic from incidental ingestion exceeds ATSDR's chronic MRL. Incidental ingestion of arsenic may lead to darkening of the skin and the appearance of "corns" or "warts". Although skin absorption is minor, contact with arsenic-contaminated soil on the site may cause irritation, swelling and redness of the skin (ATSDR 1993a).

Arsenic is a known human carcinogen. Incidental ingestion of surface soil by workers at this site may result in a "low" increase in the risk of skin cancer. About 25% of all Floridians will develop some form of cancer during their lifetime. This means that 25% of the people who worked at the EWP site will likely develop cancer for reasons unrelated to exposure to chemicals from this site. A "low" increase in the risk of cancer means that out of a population of 10,000 persons, of whom 2,500 are expected to develop cancer for reasons unrelated to exposure at this site, an additional five cases of skin cancer may occur. This would increase the number of expected cancers of these 10,000 persons from 2,500 to 2,505. Incidental ingestion of surface soil by trespassers on the site would result in no apparent increase in the risk of cancer.

EPA did not detect arsenic in on-site liquid waste and did not analyze on-site and off-site air or off-site surface soil for arsenic. Therefore, we do not know if exposure to arsenic off of the site is possible and cannot estimate the likely health effects.

Benzene

Former workers at the plant, site trespassers, and nearby residents may have been exposed to benzene by inhalation. The estimated daily dose of benzene from inhalation exceeds ATSDR's acute inhalation MRL. No chronic inhalation MRL is available (ATSDR 1993b). Although the levels of benzene found on and off of the site are much lower than those at which adverse health effects have been observed, we do not have enough information to determine what levels may be safe for people.

Benzene is a known human carcinogen. Long-term inhalation of benzene at the levels found off of the site may increase the risk of leukemia. However, there is no known site-related source of benzene. Benzene detected in the air may have been produced by machinery and electrical generating equipment operated during the EPA soil excavation activities or from other, unknown, local sources. Since no air samples were taken prior to EPA's work at the site and none were taken after the work was completed, we do not have enough information to determine if exposure to benzene represents a long-term health threat to nearby residents.

Benzene was also detected in air samples on the site. However, inhalation of benzene at the levels found on the site would result in no apparent increase in the risk of leukemia.

Benzene was not detected in on-site subsurface soil, liquid waste or solid waste. EPA did not analyze on-site or off-site surface soil for benzene.

Dioxin-TEQ

Former workers at the plant and trespassers on the site may have been exposed to dioxin-TEQ in surface soil and waste sludge by incidental ingestion, and to dioxin-TEQ in the air by inhalation. The estimated daily dose of dioxin-TEQ from incidental ingestion exceeds ATSDR's chronic oral MRL. This MRL is extrapolated from the ATSDR intermediate oral MRL (ATSDR 1989). Incidental ingestion of dioxin-TEQ-contaminated on-site soil and waste sludge, and inhalation of contaminated air on-site may have affected the immune system, produced chloracne, and caused liver damage in former workers at the plant. These effects may also have occurred in trespassers on the site. However, there is insufficient information about the exposure of trespassers to dioxin-TEQ for us to estimate the likely health effects.

Residents in the neighborhood adjacent to the northern border of the site may have been exposed to dioxin-TEQ by incidental ingestion of off-site surface soil and by inhalation of contaminated air. The estimated daily dose of dioxin-TEQ from incidental ingestion of off-site surface soil exceeds ATSDR's chronic oral MRL for children, but not for adults. The

estimated daily dose for children, however, is at least ten times less than the level at which no adverse health effects have been observed in animals (ATSDR 1989). Although incidental ingestion of dioxin-TEQ in soil can affect the immune system, produce chloracne, and cause liver damage, these effects do not appear to be likely at the levels present in off-site surface soil. The estimated daily dose of dioxin-TEQ from inhalation of air off-site is at least one hundred times less than the level at which no effects have been observed in animals. Therefore, we do not expect any non-carcinogenic adverse health effects from inhalation exposure in people living near the site.

Dioxin-TEQ in soil is poorly absorbed through the skin. Skin contact with dioxin-TEQ may cause chloracne. Based on extrapolation from studies on ingestion of dioxin-TEQ and information from research on animals (ATSDR 1989), we estimate that dermal exposure of former workers at the plant to dioxin-TEQ in surface soil and waste sludge on the site could cause chloracne. These effects may also have occurred in trespassers on the site. However, there is insufficient information about dermal exposure of trespassers to dioxin-TEQ for us to estimate the likely health effects.

Dioxin-TEQ levels in off-site surface soil are much lower than those on the site. Therefore, it is unlikely that exposure of the skin to dioxin-TEQ-contaminated soil in residential yards could cause chloracne.

Based on animal studies, EPA has classified dioxin-TEQ as a probable human carcinogen. Although there is some indication that exposure to dioxin-TEQ may increase the incidence of soft tissue sarcoma, which is a rare cancer of tissues such as ligaments and tendons (Bertazzi et al 1993), the association of dioxin-TEQ exposure with other cancers in humans has not been clearly demonstrated (Tollefson 1991, Fingerhut et al 1991, Bertazzi et al 1992).

The U.S. Public Health Service and EPA are reviewing the data on risks of dioxin-TEQ exposure for human health. Because of the uncertainty involved in estimating the cancer risks from exposure to dioxin-TEQ, we are currently unable to determine the cancer risks for former workers at the plant and trespassers on the EWP site, or for residents in the adjacent neighborhoods.

EPA did not analyze on-site liquid waste for dioxin-TEQ.

Pentachlorophenol

Former workers at the plant and trespassers on-site may have been exposed to pentachlorophenol (PCP) in surface soil, waste sludge, and liquid waste by incidental ingestion and dermal contact, and in air by inhalation. The estimated daily dose of PCP from incidental ingestion exceeds ATSDR's intermediate oral MRL. No chronic oral MRL is available (ATSDR 1992a). Incidental ingestion of PCP-contaminated soil and waste material on the site may have affected the liver, kidney, central nervous system, and immune system of former workers at the plant and trespassers on the site.

The estimated daily dose of PCP from inhalation of contaminated air on the site is at least ten times less than ATSDR's intermediate oral MRL. No inhalation MRL is available. Although information on the health effects of chronic low-level inhalation exposure to PCP is limited, we do not expect any adverse non-carcinogenic health effects from this exposure.

PCP is readily absorbed through the skin. However, there is no information available regarding the level of PCP in soil that would produce an adverse health effect from dermal exposure.

Although PCP has not been demonstrated to cause cancer in humans, ingestion of PCP in rats and mice has been shown to increase the incidence of liver, spleen and adrenal cancer. Based on extrapolations from these animal studies, EPA has classified PCP as a probable human carcinogen. Long-term ingestion of PCP may also increase the risk of these cancers in humans. Based on the assumption that PCP may cause cancer in humans in a manner similar to that demonstrated in animal models, we estimate that incidental ingestion of PCP-contaminated soil and waste material by former workers at the plant may have resulted in a "moderate" to "high" increased risk of cancer. About 25% of all Floridians will develop some form of cancer during their lifetime. This means that 25% of the people who worked at the EWP site will likely develop cancer for reasons unrelated to exposure to chemicals from this site. A "moderate" to "high" increase in the risk of cancer means that out of a population of 1,000 persons, of whom 250 are expected to develop cancer for reasons unrelated to exposure at this site, four to twenty additional cases of liver, spleen or adrenal cancer may occur. This would increase the number of expected cancers of these 1,000 persons from 250 to 270.

Incidental ingestion of PCP-contaminated soil and waste material by trespassers on the site may have resulted in a "low" increased risk of cancer. About 25% of all Floridians will develop some form of cancer during their lifetime. This means that 25% of the people who trespassed on the EWP site will likely develop cancer for reasons unrelated to exposure to chemicals from this site. A "low" increase in the risk of cancer means that out of a population of 10,000 persons, of whom 2,500 are expected to develop cancer for reasons unrelated to exposure at this site, two to nine additional cases of liver, spleen or adrenal cancer may occur. This would increase the number of expected cancers of these 10,000 persons from 2,500 to 2,509.

Former workers at the plant, trespassers on the site and residents in the neighborhood adjacent to the northern border of the site may have been exposed to PCP in the air. However, the increased risk of cancer from this exposure is negligible.

EPA did not detect PCP in off-site surface soil.

Polycyclic Aromatic Hydrocarbons (PAHs)

Former workers at the plant and trespassers on-site may have been exposed to PAHs in surface soil and waste sludge by incidental ingestion and dermal contact. Individuals off of the site may have also been exposed to PAHs in surface soil. The PAHs of concern include: benzo(a)anthracene, benzo(a)pyrene, benzo(b)-fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)-anthracene, indeno(1,2,3-c,d)pyrene, and naphthalene.

Former workers at the plant and trespassers on the site may have been exposed to naphthalene by incidental ingestion of soil and solid waste material, and by inhalation. No ATSDR MRL is available for naphthalene (ATSDR 1990c). Therefore, we do not know if exposure to naphthalene is likely to have any adverse health effects. The estimated daily dose from incidental ingestion of the other PAHs is less than EPA's chronic oral RfD. No ATSDR chronic oral MRL is available (ATSDR 1990d). Therefore, it is unlikely that this exposure will produce any adverse non-carcinogenic health effects.

The estimated daily dose of benzo(a)pyrene from incidental ingestion is less than ATSDR's intermediate oral MRL. No chronic oral MRL is available. Exposure to benzo(a)pyrene at the concentrations found in on-site surface soil and waste sludge is unlikely to cause adverse non-carcinogenic health effects. Benzo(a)pyrene may also be absorbed through the skin; however, it is normally metabolized and rapidly excreted (ATSDR 1990a).

Benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, chrysene, dibenzo(a,h)-anthracene, and indeno(1,2,3-c,d)pyrene are possible or probable human carcinogens (ATSDR 1990d). Of these carcinogenic PAHs, only benzo(a)pyrene has an ATSDR comparison value (ATSDR 1990a). We do not have enough human health information to determine the health risks from exposure to the other carcinogenic PAHs. Consequently, our evaluation of the cancer risks from exposure to PAHs will focus on benzo(a)pyrene.

Benzo(a)pyrene is a probable human carcinogen based on animal studies, where it has been shown to induce leukemia and tumors of the stomach and lung. Although no information is available directly correlating human exposure to benzo(a)pyrene with cancer formation, reports of skin tumors among individuals exposed to mixtures of PAHs containing benzo(a)pyrene lend some qualitative support to its potential for human carcinogenicity (ATSDR 1990a). Based on information from animal studies, incidental ingestion of surface soil by former workers at the plant could result in a "low" increase in the risk of leukemia or lung cancer. About 25% of all Floridians will develop some form of cancer during their lifetime. This means that 25% of the people who worked at the EWP site will likely develop cancer for reasons unrelated to exposure to chemicals from this site. A "low" increase in the risk of cancer means that out of a population of 10,000 persons, of whom 2,500 are expected to develop cancer for reasons unrelated to exposure at this site, two additional cases of leukemia or lung cancer may occur. This would increase the number of expected cancers of these 10,000 persons from 2,500 to 2,502. Incidental ingestion of surface soil by trespassers

on the site would result in no apparent increase in the risk of cancer.

Incidental ingestion of subsurface soils, which are now stockpiled on the site, could result in a "moderate" increase in the risk of leukemia or lung cancer to persons coming in contact with them in the future. There is insufficient information to estimate the risk of skin cancer from past dermal contact with on-site surface soil and from future dermal contact with subsurface soil stockpiled on the site.

EPA did not detect dibenzo(a,h)anthracene or indeno(1,2,3-c,d)pyrene in on-site surface soil or solid waste. They did not detect benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)-fluoranthene, benzo(a)anthracene, chrysene, dibenzo(a,h)-anthracene, or indeno(1,2,3-c,d)pyrene in on-site air. No PAHs were detected in on-site liquid waste. EPA also did not detect benzo(a)pyrene, dibenzo(a,h)anthracene, or naphthalene in off-site surface soil and did not detect benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)-fluoranthene, benzo(a)anthracene, chrysene, dibenzo(a,h)-anthracene, or indeno(1,2,3-c,d)pyrene in off-site air.

B. Health Outcome Data Evaluation

Guided by community health concerns in the population living near the site, Florida HRS epidemiologists conducted an evaluation of cancer incidence in this area. Cancer information was available for the two zip code areas closest to the site. The incidence of cancer in these zip codes was compared with the incidence for the state of Florida. Since these zip code areas are much larger than the residential areas adjacent to the site, the majority of the people living in these zip codes have probably not been exposed to any contaminants from the EWP site.

Based on a comparison of cancer rates corrected for the influence of age and race, three cancer types, liver, kidney and lung, appear to be elevated in the 32503 and 32505 zip code areas (Hammond 1994). A cancer rate in these zip codes was considered elevated if it was greater than the Florida rate at the 95% confidence level. None of the contaminants of concern at this site is present at a level that would increase the risk of kidney cancer. Pentachlorophenol is present in on-site surface soil and waste sludge at a level that could increase the risk of liver cancer. Benzo(a)pyrene is present in on-site surface soil at a level that could increase the risk of lung cancer. However, we do not have any information about the incidence of liver or lung cancer among people who worked at or trespassed on the site, or among residents of the neighborhood north of the site.

C. Community Health Concerns Evaluation

We have addressed each community health concern as follows:

1. Can any of the contaminants at the site cause non-cancerous health effects such as respiratory problems (i.e., asthma), itching and burning eyes, skin rashes, sinus

problems, thyroid problems, heart murmurs, bladder stones or tuberculosis?

A number of the contaminants at the site, including arsenic, pentachlorophenol and PAHs, can irritate the skin, eyes and respiratory system. Contact with arsenic-contaminated soil at the maximum concentration found on the site may cause irritation, swelling and redness of the skin. The levels of pentachlorophenol present on the site are not likely to cause skin or lung irritation. The odor of some of the PAHs, such as naphthalene, may be irritating to sensitive individuals. None of the contaminants of concern at this site are known to cause thyroid problems, heart murmurs, bladder stones, or tuberculosis.

2. Can any of the contaminants at the site cause emphysema, leukemia, bone cancer, colon cancer, or spinal cancer?

Five of the contaminants of concern at this site, arsenic, benzene, benzo(a)pyrene, dioxin-TEQ, and pentachlorophenol, are known or suspected carcinogens. Long-term incidental ingestion of benzo(a)pyrene at the levels found on the site may increase the risk of leukemia or lung cancer. Long-term exposure to benzene at the levels found off of the site may increase the risk of leukemia. However, the benzene detected in the air off-site may have been produced by the machinery and electrical generating equipment used during the EPA soil excavation activities or by other unknown local sources. Additional air sampling is needed to determine if benzene levels in the air off-site have remained elevated. None of the carcinogens found at this site are known or suspected to cause emphysema, bone cancer, colon cancer, or spinal cancer.

3. Dioxins/furans, pentachlorophenol and polycyclic aromatic hydrocarbons have been found on the site. What health effects could result from exposure to these contaminants?

The likely health effects from exposure to dioxins/furans (dioxin-TEQ) and pentachlorophenol (PCP) are detailed in the Toxicological Evaluation section above. Briefly, exposure to dioxin-TEQ may affect the immune system, produce chloracne, and cause liver damage. Incidental ingestion of PCP-contaminated soil and waste material on the site may affect the liver, kidney, central nervous system, and immune system. Exposure to PCP may also increase the incidence of liver, spleen and adrenal cancer. A number of polycyclic aromatic hydrocarbons (PAHs), including benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-c,d)pyrene, and naphthalene, have been detected at the site. Exposure to one of these PAHs, benzo(a)pyrene, may increase the risk of leukemia, lung cancer, and skin cancer for former workers at the plant and trespassers on the site.

4. What contaminants cause the strong, burning odor coming from the site and what health effects could result from exposure to them?

Creosote, which is composed primarily of phenol and polycyclic aromatic hydrocarbons

(PAHs), was used during the wood treatment process on the site and has a sharp, smokey odor and burning taste. Exposure to these chemicals may be irritating to the skin and eyes of sensitive individuals. The chemicals released into the air from the Florida Drum Company and Precision Machining are also irritating to the nose, throat, eyes, and skin. However, none of these chemicals have been detected on the site at levels that could cause adverse health effects.

5. What contaminants have migrated from the site to residential yards and what health effects may result from exposure to them?

Dioxin-TEQ and several PAHs have been detected in surface soil in residential yards adjacent to the site. None of the PAHs are at concentrations that are likely to cause adverse health effects. The levels of dioxin-TEQ in off-site surface soil are unlikely to cause non-carcinogenic health effects. Because the cancer risk in people from exposure to dioxin-TEQ is currently under scientific review, we do not know what carcinogenic health effects are likely.

6. Can any of the contaminants that may have migrated from the site to residential yards get into fruits and vegetables grown in that soil and what health effects could occur from eating them?

Dioxin-TEQ and PAHs found in off-site surface soil can be taken up by fruit and vegetable plants (ATSDR 1989, 1990c). Although the levels of dioxin-TEQ and PAHs are likely to be very low, no fruits and vegetables from contaminated areas off-site have been analyzed for any of the contaminants of concern at the EWP site. Therefore, we do not know if fruits and vegetables are a source of exposure.

7. Could small game (i.e., rabbit, quail, squirrel, etc.) hunted in the past near the site have been contaminated and what health effects are likely from having eaten them?

Some of the contaminants of concern at this site can accumulate in animals. However, no animal tissue has been analyzed for site-related contaminants. Therefore, we do not know if small game were contaminated or if adverse health effects were likely from eating them.

8. Can benzene from the site get into the public water supply system?

Benzene has been detected in groundwater on the site. However, groundwater flow in this area is to the southeast and not toward any public drinking water supply wells. In addition, all public water supplies are routinely tested for contamination. Therefore, it is not likely that benzene will be of concern in the public water supply in the future.

9. Can the stressful situation experienced by residents near the site cause mental health problems in these individuals?

Exposure to stress can cause a variety of adverse physical and mental health effects in some individuals. However, an evaluation of the likelihood of mental health problems occurring in residents near the site is outside the scope of this public health assessment.

10. If soil incineration is chosen as the method for cleaning up the site, what effect will this have on the air quality and what monitoring will be done to check for contamination coming from the site?

We do not know what method EPA will use to clean up the contamination at this site. Prior to implementing any clean up operation, EPA will likely hold meetings with the community to get suggestions and input about their concerns regarding the proposed clean up methods. Whenever EPA clean up actions have any possibility of producing air-borne contamination, monitoring stations are routinely set up to ensure that any contamination is detected immediately and corrective action taken.

In addition to the health concerns addressed above, residents near the site have raised the issue of environmental equity/justice. They feel that they have been treated unfairly by the agencies involved with the site since work began there because the members of the community are a racial minority. This issue is of importance to the community. However, it is currently outside the scope of the public health assessment process.

CONCLUSIONS

Based on the information currently available, we classify this site as a public health hazard. Specific reasons for this classification are as follows:

1. Dioxin-TEQ is present in surface soil in the residential community adjacent to the north side of the site. Although no non-carcinogenic health effects are likely from this exposure, the cancer risk to people from exposure to dioxin-TEQ is currently under scientific review by the U.S. Public Health Service and EPA. Because of the uncertainty regarding the cancer-causing ability of dioxin-TEQ in humans, more information is needed before we can accurately assess the public health threat of dioxin-TEQ at this site.

2. While pentachlorophenol (PCP) has not been shown to cause cancer in humans, evidence from animal studies suggests that exposure to PCP could increase the risk of cancer for persons exposed to it. We estimate that former workers at the plant while it was operational, and trespassers and vagrants who have been exposed to these contaminants may be at a "moderate" to "high" risk of developing cancer.

Arsenic, dioxin-TEQ, and PCP are present on the site at levels that could produce non-carcinogenic health effects in persons exposed to them. We estimate that former workers at the plant, trespassers and vagrants may have been exposed to these contaminants at levels that could cause skin irritation, chloracne, damage to the liver, kidney and nervous system, and impairment of the blood-forming and immune systems.

3. The number and location of warning signs is inadequate to warn the public that the EWP site is a hazardous waste site and to meet the requirements of sections 403.704 and 403.7255, Florida Statutes, and FDEP Rule 17-736.

4. Future remediation activities could create contaminated dust and release volatile chemicals from soil that could expose remediation workers and nearby residents.

5. Except for dioxin-TEQ, all of the contaminants of concern have been detected in groundwater at this site. While it is not likely that this contamination will affect drinking water supplies, the groundwater contamination plume is migrating toward Bayou Texar, which is an environmentally sensitive aquatic breeding ground.

6. Air monitoring off of the site was conducted only during the EPA excavation work. Although long-term inhalation of benzene at the levels found off of the site may increase the risk of leukemia, we do not know if these levels have remained high. Therefore, we cannot determine if there is an increased risk of cancer from exposure to benzene in the air off-site.

7. The number and location of surface soil samples in residential yards adjacent to the site is insufficient to characterize the extent and nature of contamination of this medium. Until off-site surface soil is more fully characterized, we cannot fully assess the health threat

from incidental ingestion.

8. Dioxin-TEQ and PAHs found in off-site surface soil can be taken up by fruit and vegetable plants. However, no samples of fruits and vegetables grown in residential yards adjacent to the site and used for household consumption have been analyzed.

9. Residents near the site need assistance in understanding the nature of the contamination at this site, the potential for exposure to these contaminants, and the possible health risks.

10. Physicians and other health professionals in the area need information about possible health effects in residents near the site.

11. Former workers at the plant, site trespassers, and nearby residents may have been exposed to levels of site-related contaminants that could increase their risk of cancer. Compared to state of Florida averages, the rates of liver, kidney and lung cancer are elevated in the 32503 and 32505 zip code areas. These zip code areas, however, include a large number of people who were unlikely to have been exposed to contaminants from this site. We do not have any information about the incidence of these cancer types among people who actually worked at or trespassed on the site, or among residents of the neighborhood north of the site.

RECOMMENDATIONS

Toxicological Information Recommendations

1. Develop comprehensive, updated information on the health effects of human exposure to dioxin-TEQ. ATSDR and EPA should evaluate current research findings of the human health effects of dioxin-TEQ exposure to update toxicological profiles and provide improved methods for estimating the carcinogenic and non-carcinogenic health risks of human exposure to dioxin-TEQ.

Cease/Reduce Exposure Recommendations

2. Maintain site security to reduce the risk of exposure to trespassers and the nearby community. EPA should maintain security at this site and provide future remediation workers with appropriate protective equipment while on site.

3. Install warning signs indicating the area is a hazardous waste site. EPA should install additional warning signs as specified in FDEP Rule 17-736 to warn the public that the area is a hazardous waste site.

4. Suppress dust formation by implementing optimal dust control measures and conduct air monitoring during remediation. EPA should suppress dust formation and conduct air monitoring during remediation for worker protection and to ensure that air-borne contamination generated by remediation operations and machinery is not transported off the site.

5. Conduct periodic surface water sampling of Bayou Texar. The appropriate federal, state or local agency should periodically sample Bayou Texar to ensure that any increases in contaminants entering the bayou are discovered in a timely manner.

Site Characterization Recommendations

6. Conduct additional off-site air monitoring. EPA should collect and analyze air samples from a minimum of three locations in the neighborhood north of the site to determine the current levels of benzene. Additional samples are needed to determine if inhalation exposure to benzene represents a long-term health risk to local residents.

7. Analyze a minimum of twelve off-site surface soil (depth 0-3 inches) samples for all contaminants of concern. EPA should collect these samples from residential yards throughout the neighborhood adjacent to the north side of the site. Additional samples are needed to fully characterize the extent of off-site surface soil contamination.

8. Collect and analyze fruits and vegetables grown in residential yards for dioxin-TEQ and PAHs. If the levels of dioxin-TEQ, PAHs or other contaminants of concern in off-site

surface soil samples exceed soil action levels, EPA should collect a sample of each type of fruit and vegetable plant grown in residential yards adjacent to the site and analyze them for all contaminants of concern.

Public Education Recommendations

9. Continue health education programs to help residents near the site understand their potential for exposure and possible health risks. ATSDR and Florida HRS should continue to provide health information to residents near the site as recommended by the health consultation prepared by ATSDR in 1992 (ATSDR 1992b). This effort is necessary to assist community members in understanding the most recent findings concerning site-related contaminants and the possible health risks from exposure to them.

10. Continue health professional education programs that were implemented following the recommendations of the 1992 ATSDR health consultation (ATSDR 1992b). ATSDR and Florida HRS should continue to provide physicians and other health professionals treating members of the community with information about the health effects that may occur in individuals exposed to contaminants from the site.

11. Continue development of a health evaluation of residents near the site as recommended by the 1992 ATSDR health consultation (ATSDR 1992b). ATSDR should continue efforts to design a protocol for a comprehensive community health evaluation to assess the effects of past or possible on-going exposure to site-related contaminants.

Health Activities Recommendation Panel (HARP) Recommendations

The Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), as amended, requires ATSDR to perform public health actions needed at hazardous waste sites. To determine if public health actions are needed, ATSDR's Health Activities Recommendation Panel (HARP) has evaluated the data and information developed in the Escambia Wood - Pensacola Public Health Assessment.

Based on the HARP recommendations of the 1992 ATSDR health consultation for the EWP site and the findings of this public health assessment, the Panel has determined that the following actions are needed at this site:

1. Community education programs that have already been initiated as a result of the previous HARP recommendations should be continued. Residents in the community adjacent to the site will continue to need health education to assist them in understanding their potential for exposure to site-related contaminants and possible health risks, and of measures they may take to reduce their exposure.

2. Educational programs for health professionals that have already been initiated as a

result of the previous HARP recommendations should be continued. Physicians and other health professionals treating members of the community near the site may not be aware of the potential exposures to their patients. Continued education is needed to inform the local medical community about the health effects that may occur in their patients who may have been exposed to contaminants from the site.

3. Efforts to develop and implement an evaluation of the health status of members of the community near the site, that have already been initiated as a result of the previous HARP recommendations, should be continued. Members of the community adjacent to the site have alleged that exposure to site-related contaminants has produced adverse health effects. A comprehensive community health evaluation is needed to assess the effects of past or possible on-going exposure to site-related contaminants.

If additional information becomes available indicating exposure at levels of concern, ATSDR will evaluate that information to determine what actions, if any, are necessary.

PUBLIC HEALTH ACTIONS

This section describes what ATSDR and/or Florida HRS will do at the Escambia Wood - Pensacola site after the completion of this public health assessment report. The purpose of a Public Health Action Plan is to ensure that any existing health hazards are reduced and any future health hazards are prevented. ATSDR and/or Florida HRS will do the following:

1. Florida HRS will continue to develop and provide health education programs to residents near the site. These programs will assist local residents to understand the potential health effects from exposure to site-related contaminants and provide information about what actions they can take to reduce their exposure.

2. Florida HRS will continue to conduct health professional education programs to inform local doctors and other health professionals of the possibility that their patients may exhibit adverse health effects resulting from exposure to site-related contaminants. These programs will also provide information regarding actions that may be taken to mitigate the health effects resulting from these exposures.

3. ATSDR will assist Florida HRS in the development of these educational programs to ensure that the information presented is accurate and reflects the most recent scientific findings and agency guidelines.

4. Florida HRS and the HRS Escambia CPHU will assist ATSDR in conducting a comprehensive community health evaluation of residents near the site. This evaluation should be designed to assess the effects of past or possible on-going exposure to site-related contaminants.

ATSDR and/or Florida HRS will reevaluate the Public Health Action Plan when new environmental, toxicological, or health outcome data are available.

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CERTIFICATION

This Escambia Wood - Pensacola Public Health Assessment was prepared by the Florida Department of Health and Rehabilitative Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health assessment was begun.

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

for Robert C. Williams, P.E., DEE
Director, DHAC, ATSDR

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APPENDICES

A. Figures

Figure 1. State Map Showing Location of Escambia County

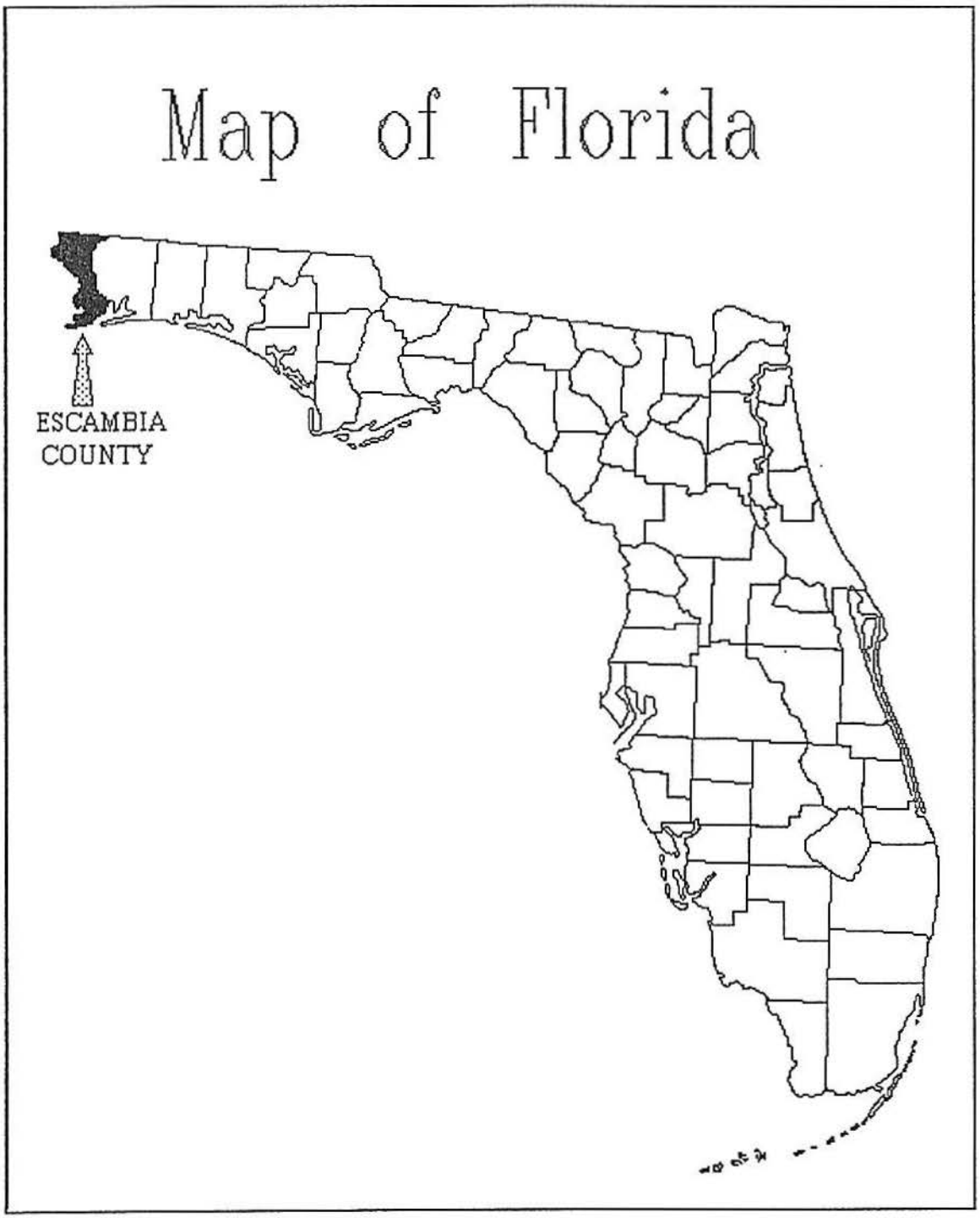


Figure 2. Location of Pensacola in Escambia County

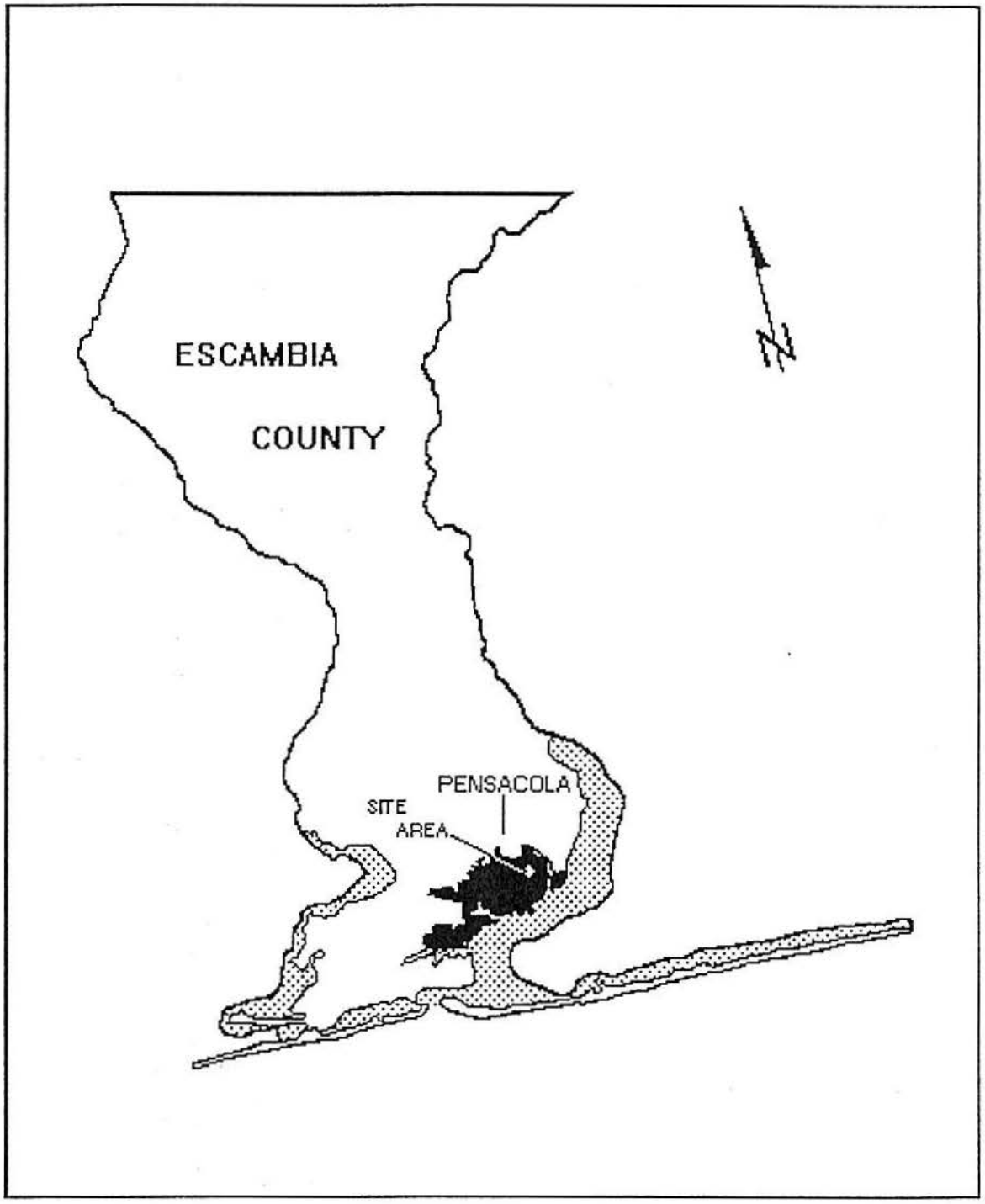


Figure 3. Location of Escambia Wood - Pensacola Site in Pensacola

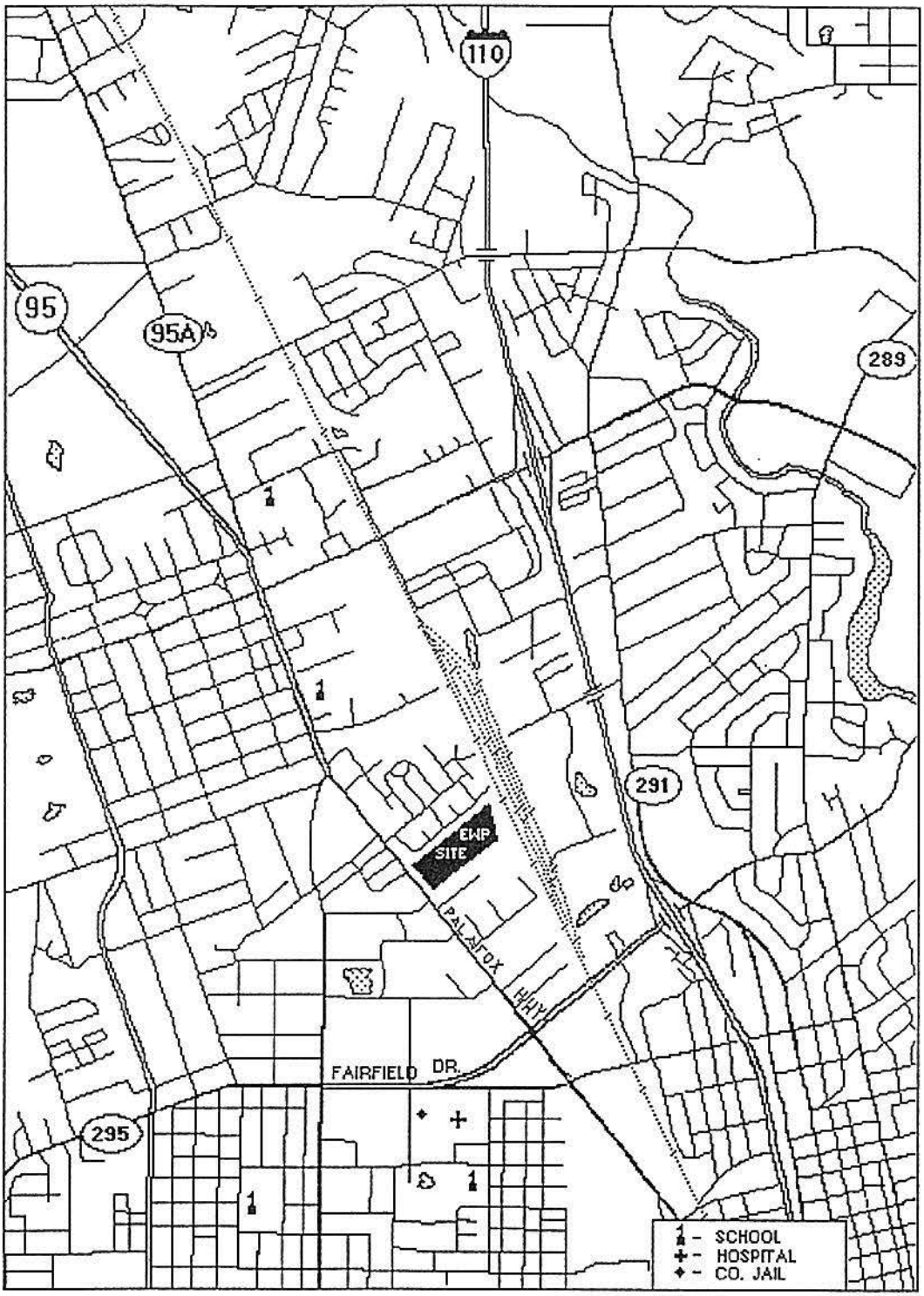


Figure 4. Detail--Escambia Wood - Pensacola Site

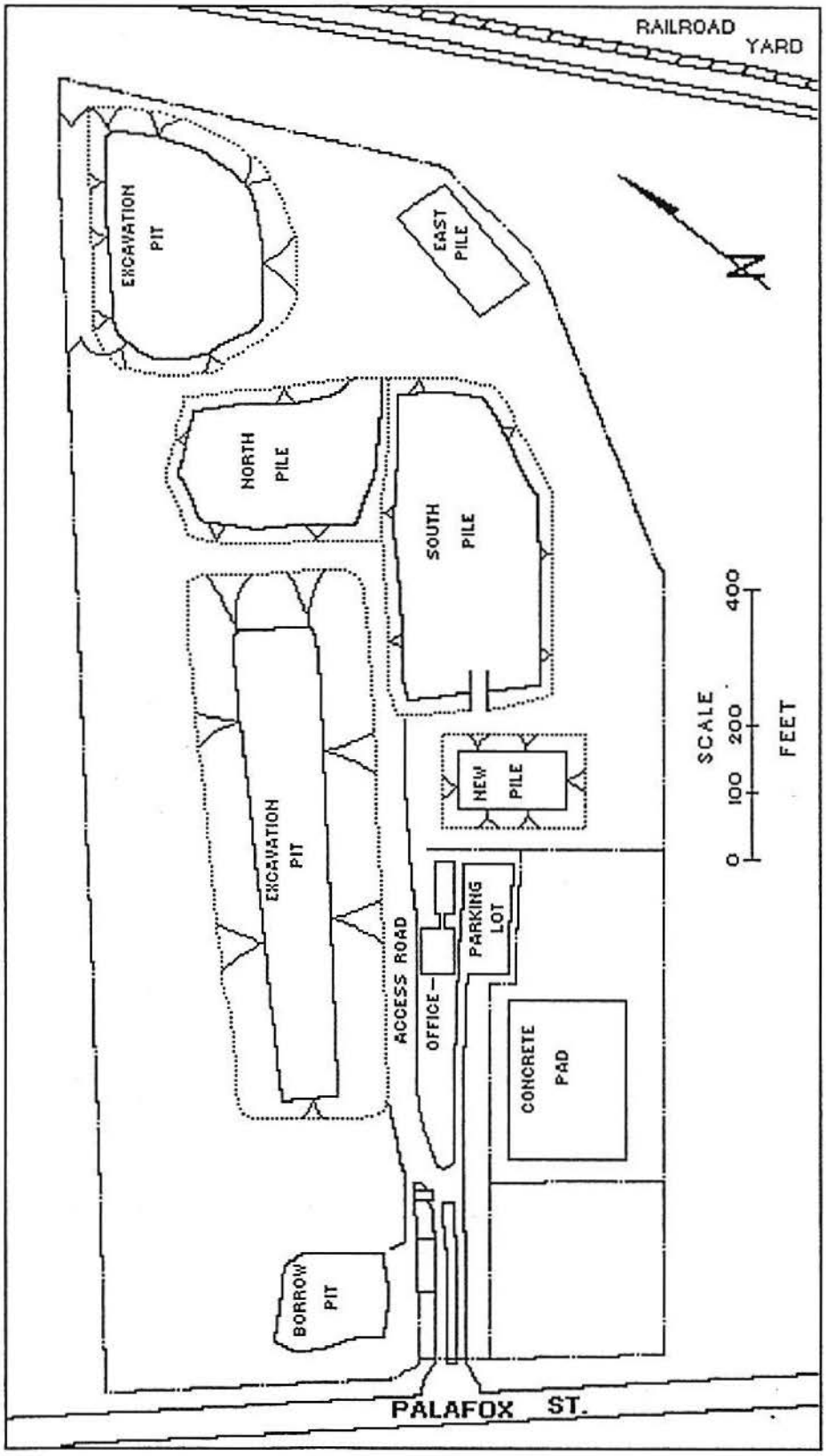


Figure 5. On-site Surface Soil Sample Location

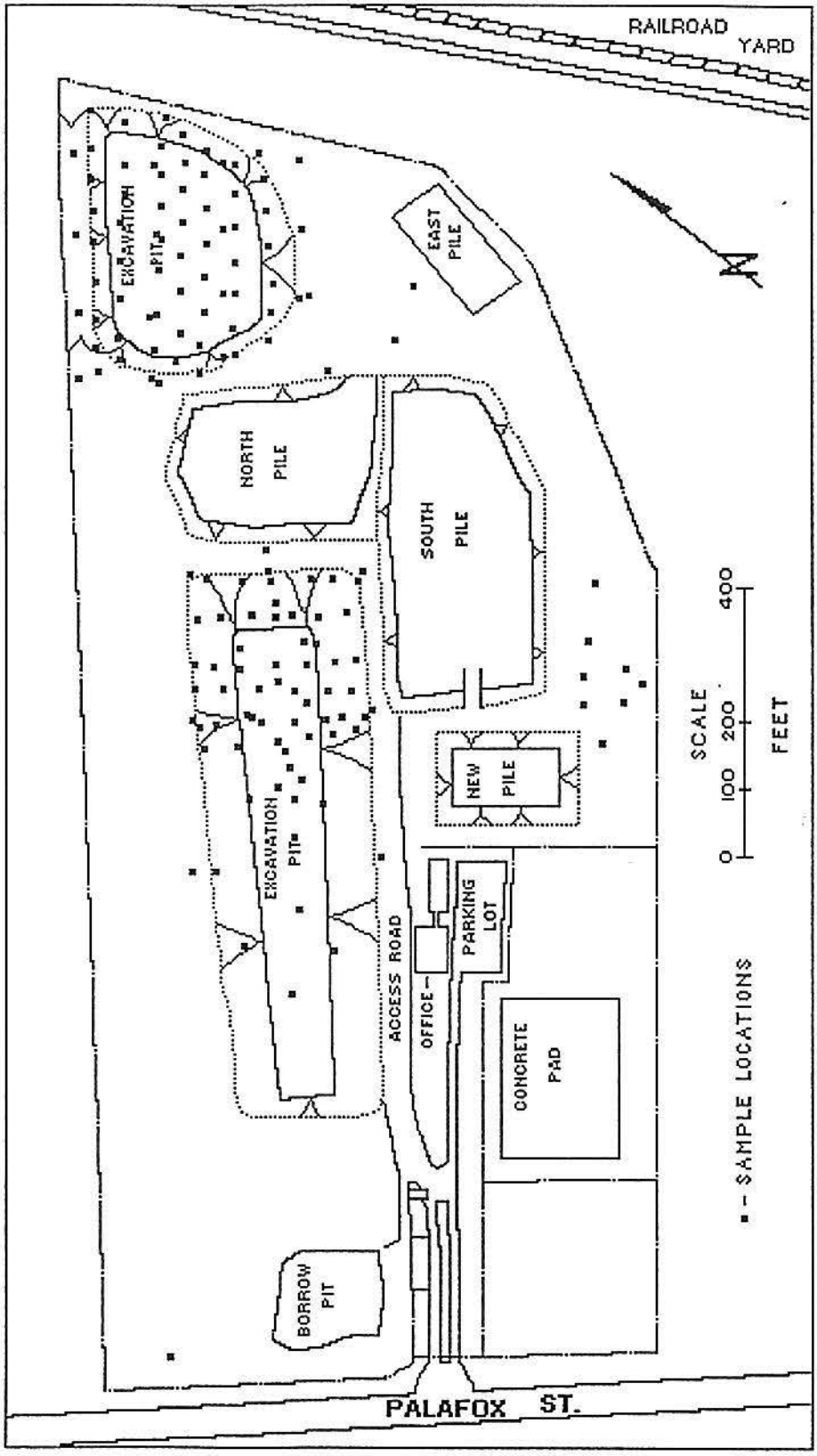


Figure 6. On-site Subsurface Soil Sample Locations

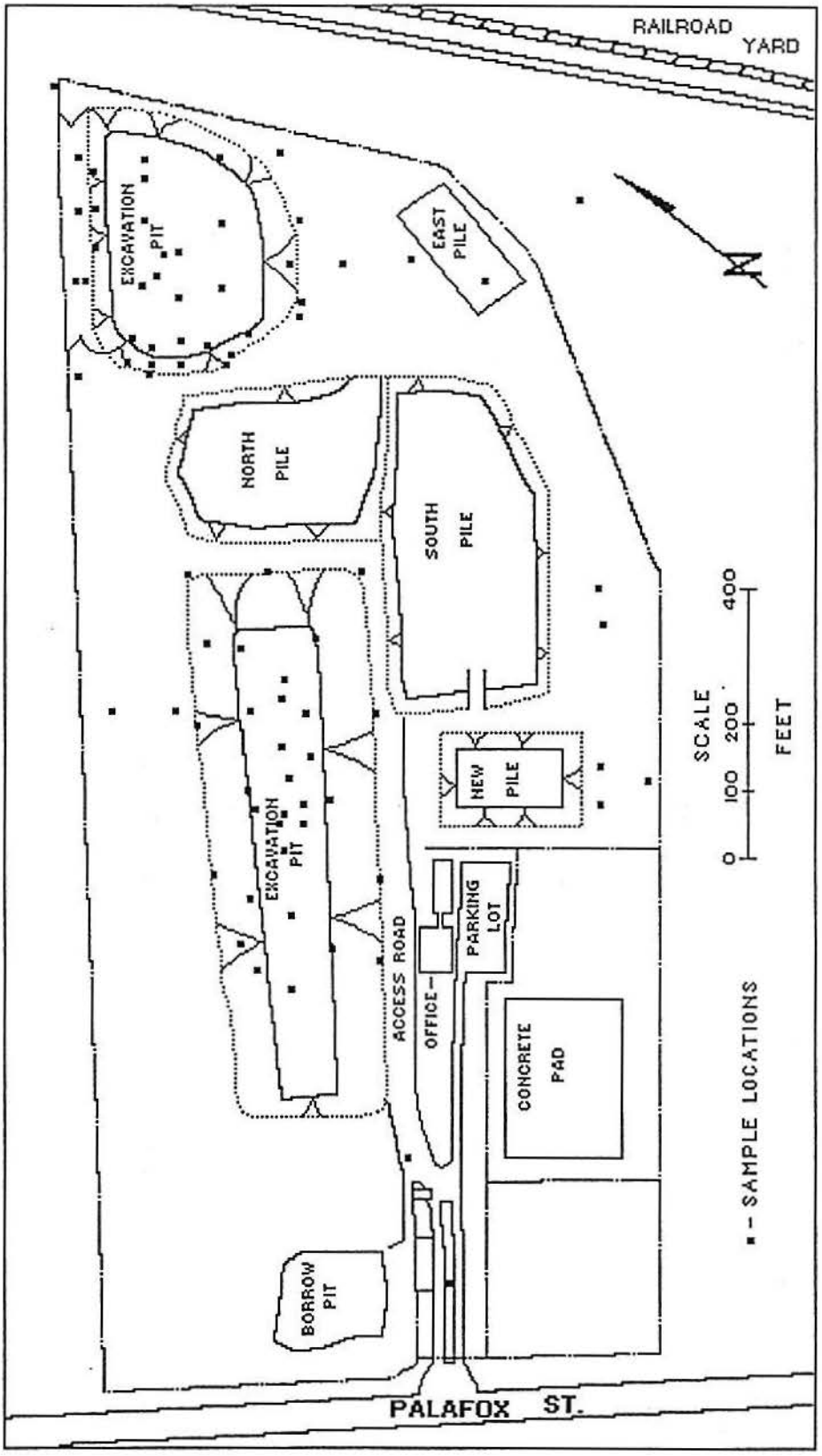


Figure 7. On-site Groundwater Sample Locations

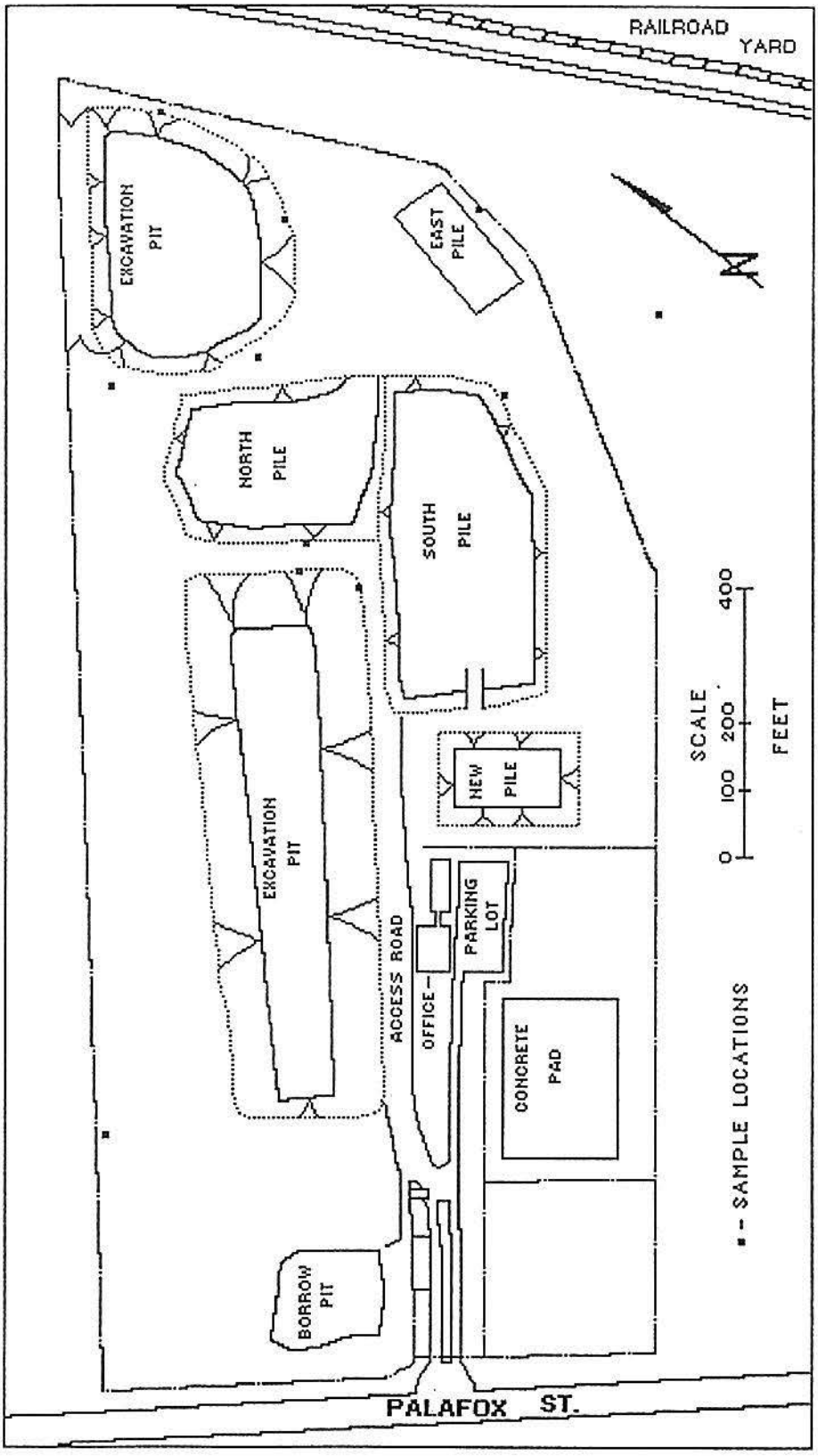


Figure 7. On-site Groundwater Sample Locations

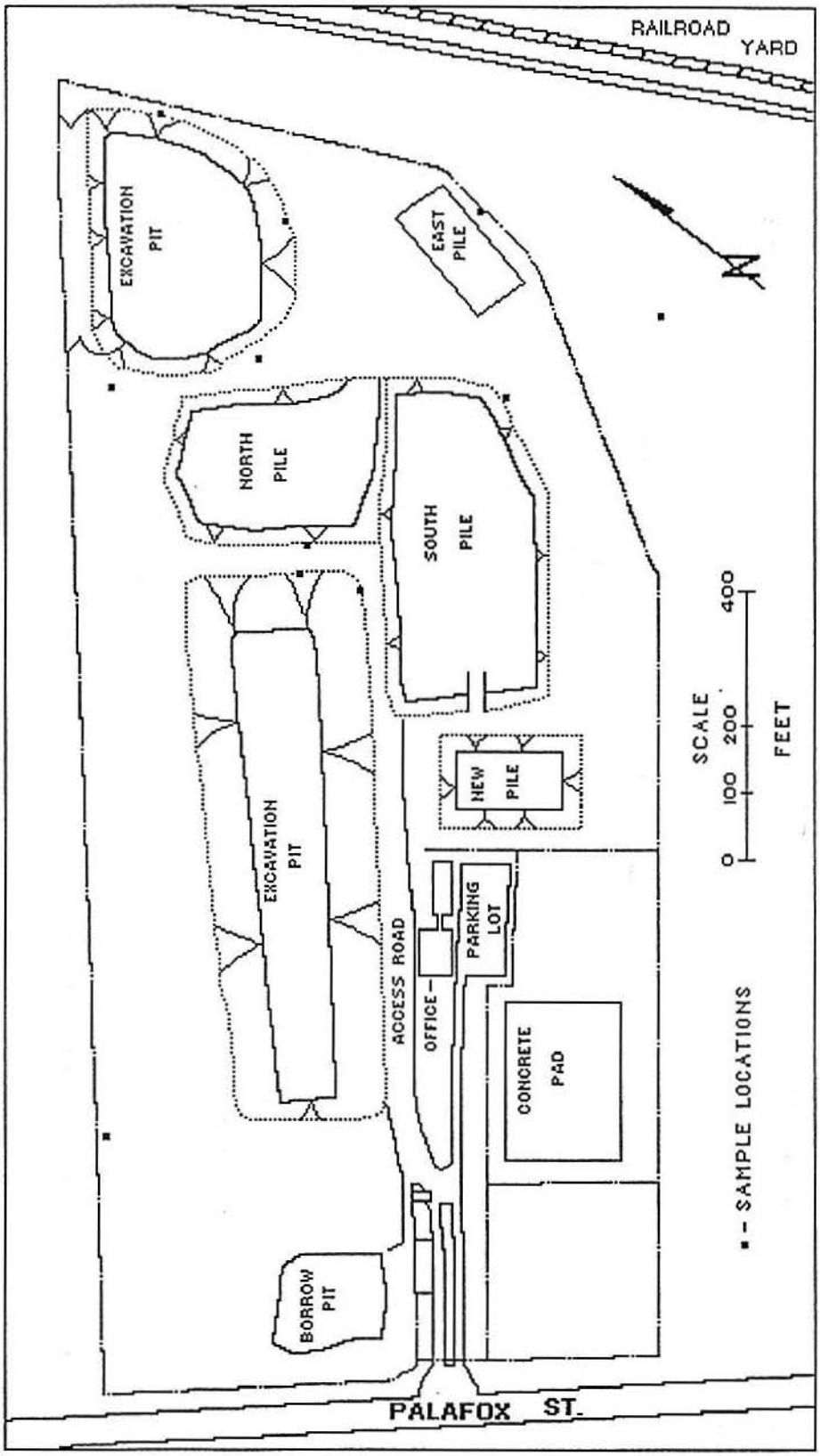


Figure 9. On-site Liquid Waste Sample Locations

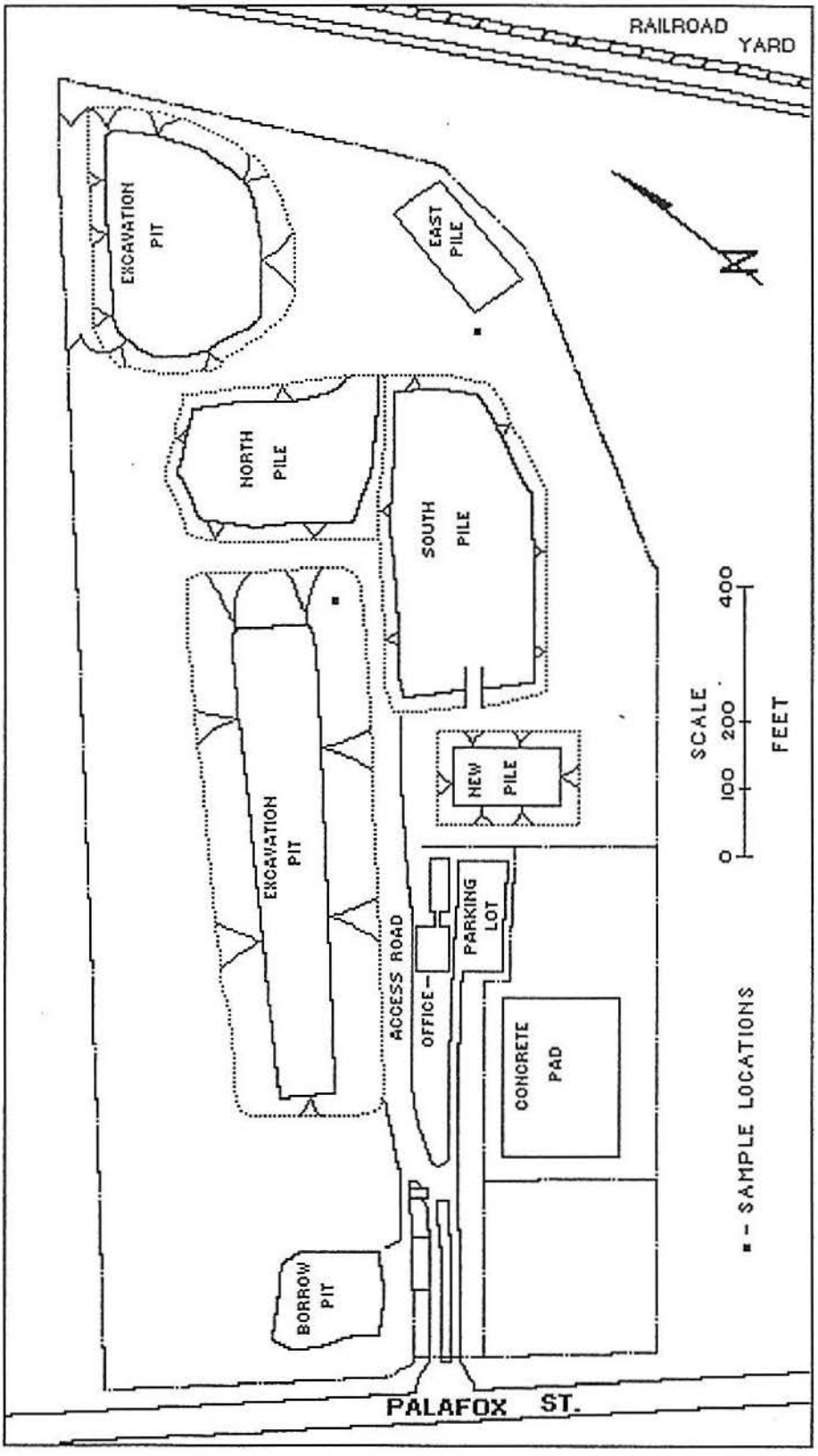


Figure 10. On-site Solid Waste Sample Locations

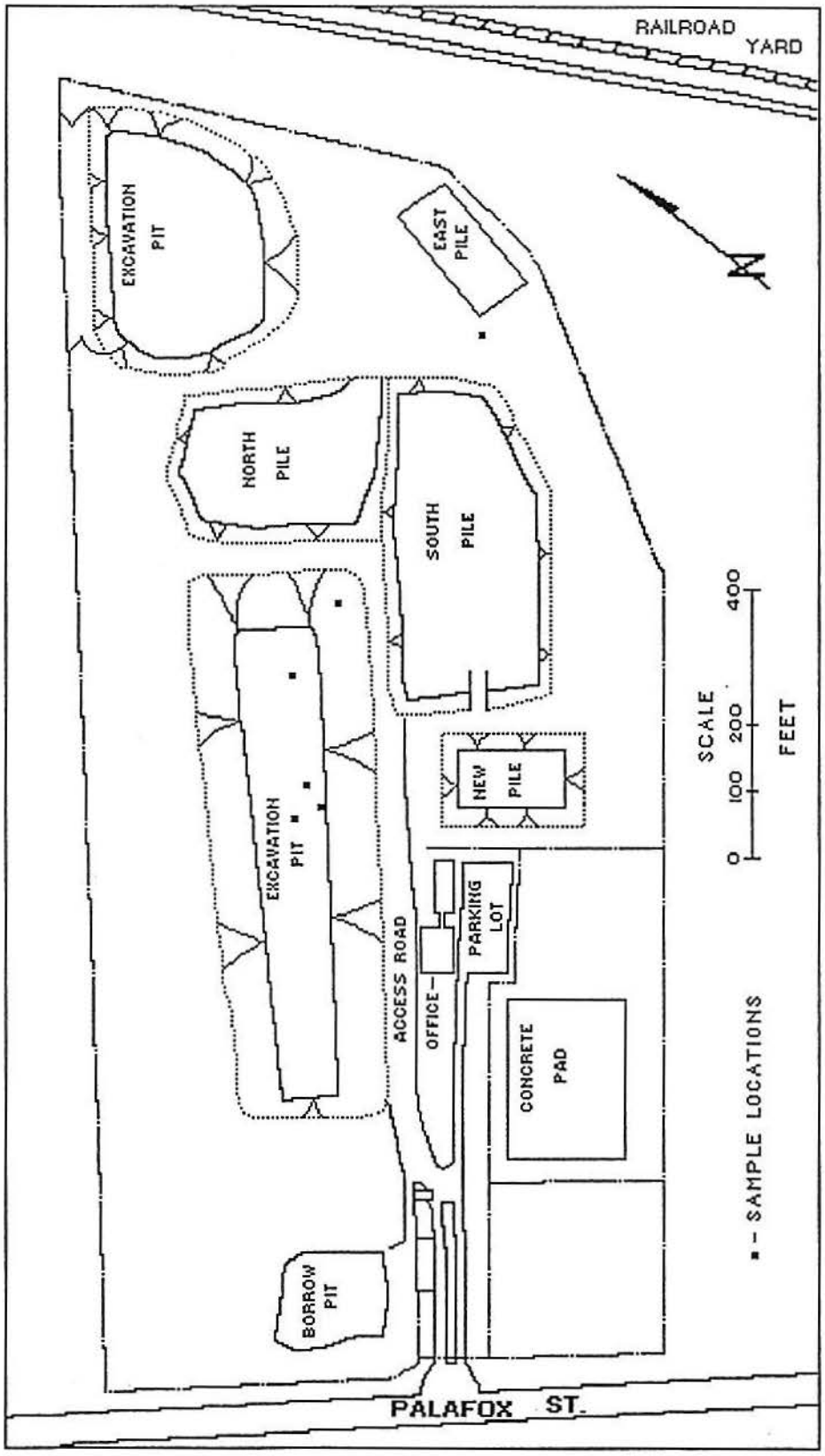


Figure 11. Off-site Surface Soil Sample Locations

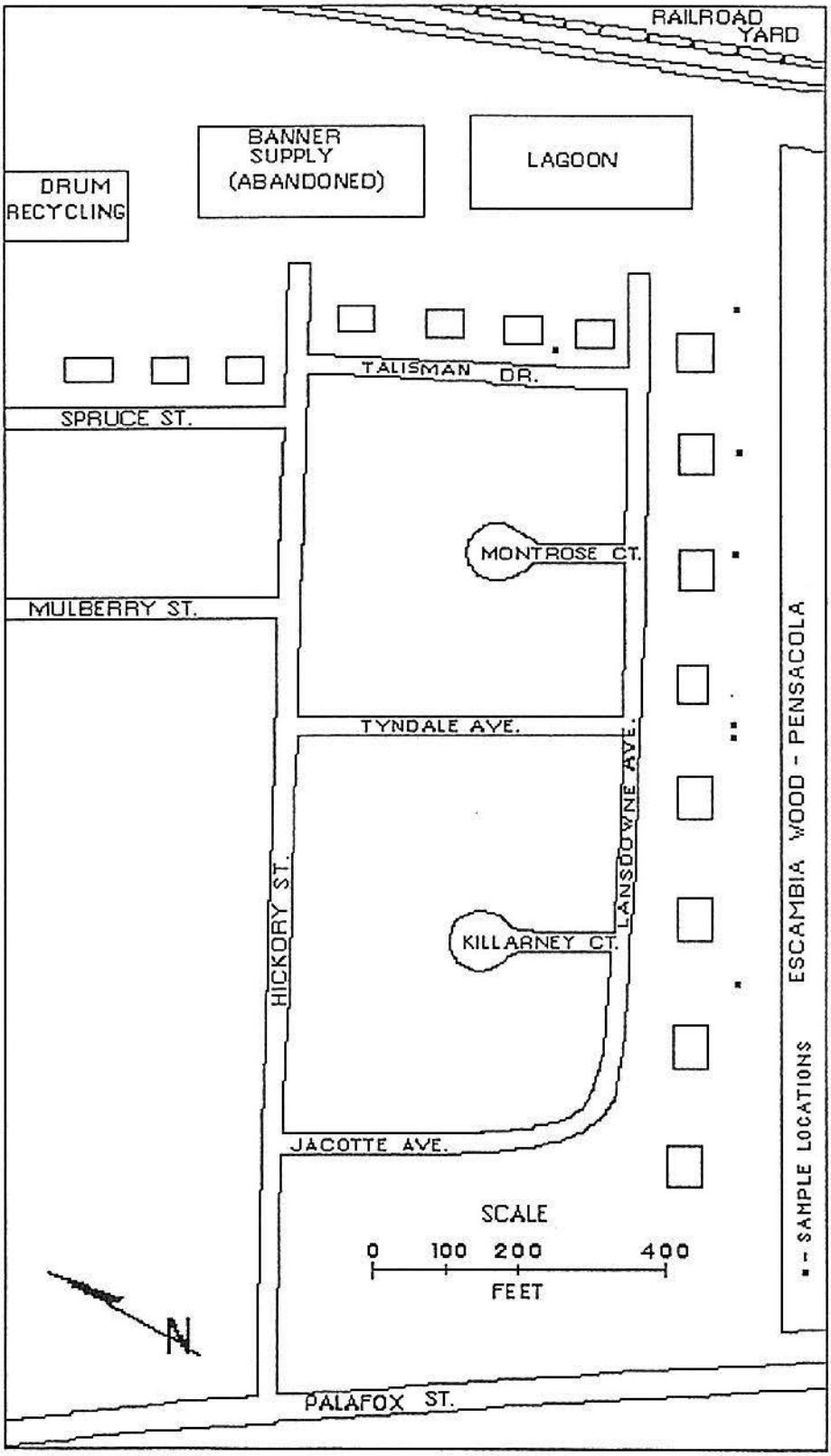
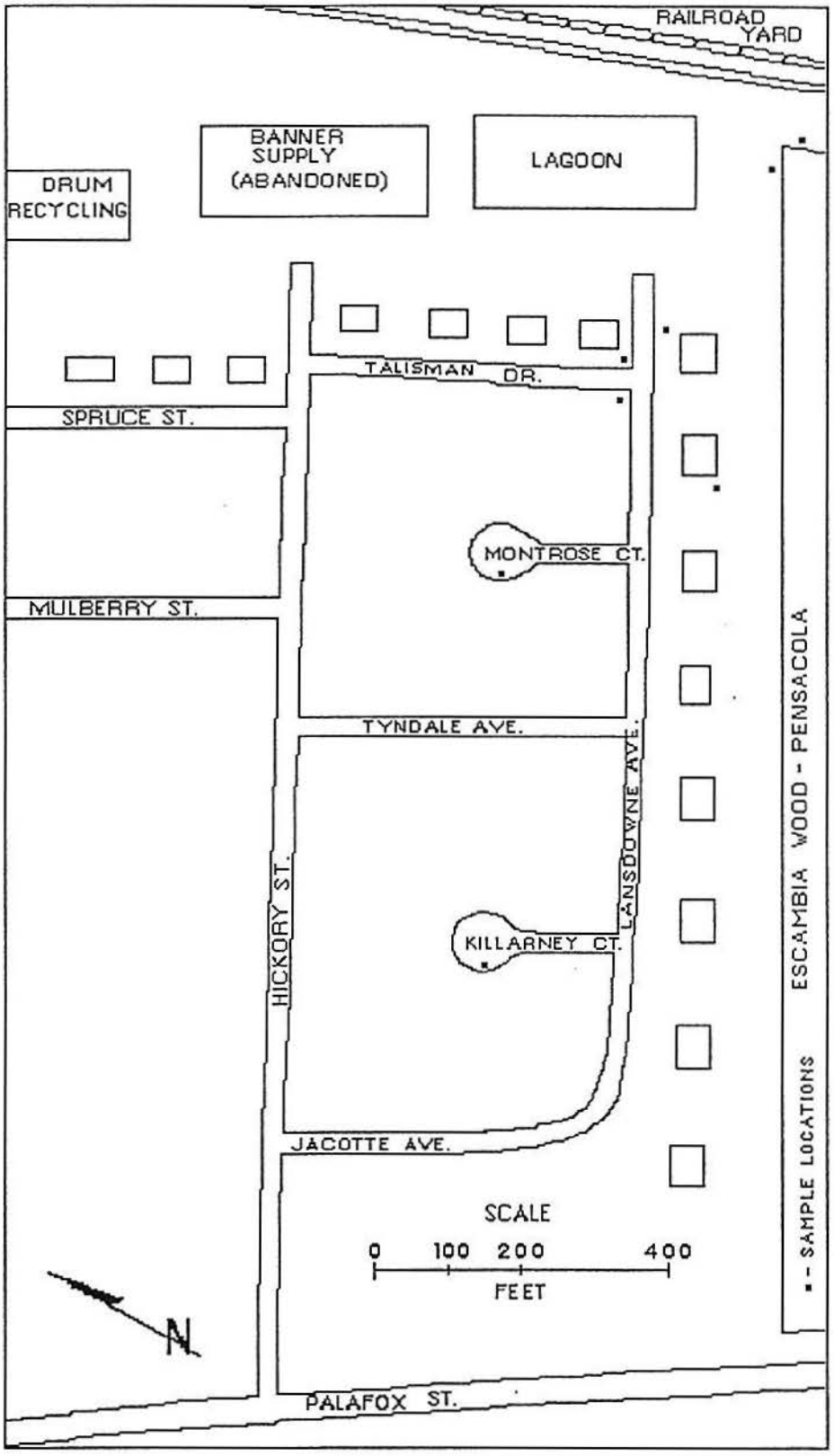


Figure 12. Off-site Air Monitoring Sample Locations



B. Tables

Table 1. Maximum Concentrations in On-Site Surface Soil

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # Exceeding Comparison Value/ Total # samples	Background Concentration (mg/kg)	Comparison Value	
				(mg/kg)	Source
Arsenic	580	12/17	NA	0.4	CREG
Benzene	NA	---	NA	---	---
Benzo(a)-pyrene	58.8	36/167	ND	0.1	CREG
Benzo(b)-fluoranthene	1900	-/168	ND	NONE	CARCIN
Benzo(k)-fluoranthene	1900	-/165	ND	NONE	CARCIN
Benzo(a)-anthracene	2700	-/168	ND	NONE	CARCIN
Chrysene	3600	-/168	ND	NONE	CARCIN
Dibenzo(a,h)-anthracene	ND	0/25	ND	NONE	CARCIN
Dioxin-TEQ	1.09	6/6	.000014	.00005	EMEG
Indeno(1,2,3-c,d)pyrene	ND	0/25	ND	NONE	CARCIN
Naphthalene	250000	-/168	ND	NONE	NONE
Pentachloro-phenol	320000	32/167	ND	6.0	CREG

NA - not analyzed
ND - not detected
CARCIN - carcinogen
mg/kg - milligrams per kilogram
Sources: Weston 1991, Ferguson 1992, Weston 1992c, Weston 1993a

Table 2. Maximum Concentrations in On-Site Subsurface Soil

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # Exceeding Comparison Value/ Total # samples	Background Concentration (mg/kg)	Comparison Value	
				(mg/kg)	Source
Arsenic	13	5/30	ND	0.4	CREG
Benzene	ND	0/3	ND	20	CREG
Benzo(a)-pyrene	300	38/262	ND	0.1	CREG
Benzo(b)-fluoranthene	550	-/262	ND	NONE	CARCIN
Benzo(k)-fluoranthene	110	-/262	ND	NONE	CARCIN
Benzo(a)-anthracene	1200	-/262	ND	NONE	CARCIN
Chrysene	250	-/262	ND	NONE	CARCIN
Dibenzo(a,h)anthracene	50	-/44	NA	NONE	CARCIN
Dioxin-TEQ	.16	6/6	NA	.00005	EMEG
Indeno(1,2,3-c,d)pyrene	210	-/46	ND	NONE	CARCIN
Naphthalene	5200	-/262	ND	NONE	NONE
Pentachloro-phenol	6300	39/262	ND	6.0	CREG

NA - not analyzed
ND - not detected
CARCIN - carcinogen
mg/kg - milligrams per kilogram
Sources: Bruner 1982, Weston 1991, Weston 1992c, Weston 1993a

Table 3. Maximum Concentrations in On-Site Groundwater

Contaminants of Concern	Maximum Concentration (μg/L)	Total # Exceeding Comparison Value/ Total # samples	Background Concentration (μg/L)	Comparison Value	
				(μg/L)	Source
Arsenic	260	6/25	ND	0.02	CREG
Benzene	6.7	1/26	ND	1.0	CREG
Benzo(a)-pyrene	470	2/33	ND	0.005	CREG
Benzo(b)-fluoranthene	620	-/33	ND	NONE	CARCIN
Benzo(k)-fluoranthene	12	-/33	ND	NONE	CARCIN
Benzo(a)-anthracene	1700	-/33	ND	NONE	CARCIN
Chrysene	1500	-/32	ND	NONE	CARCIN
Dibenzo(a,h)anthracene	ND	0/30	ND	NONE	CARCIN
Dioxin-TEQ	NA	---	NA	---	---
Indeno(1,2,3-c,d)pyrene	ND	0/33	ND	NONE	CARCIN
Naphthalene	18500	20/39	ND	20	LTHA
Pentachloro-phenol	2700	15/29	ND	0.3	CREG

NA - not analyzed
ND - not detected
CARCIN - carcinogen
μg/L - micrograms per liter
Sources: Bruner 1982, Hicks 1988, Weston 1991, Weston 1992a

Table 4. Maximum Concentrations in On-Site Air

Contaminants of Concern	Maximum Concentration ($\mu g/m^3$)	Total # Exceeding Comparison Value/ Total # samples	Background Concentration ($\mu g/m^3$)	Comparison Value	
				($\mu g/m^3$)	Source
Arsenic	NA	---	NA	---	---
Benzene	22.9	6/15	NA	0.1	CREG
Benzo(a)-pyrene	ND	0/53	ND	NONE	CARCIN
Benzo(b)-fluoranthene	ND	0/53	ND	NONE	CARCIN
Benzo(k)-fluoranthene	ND	0/53	ND	NONE	CARCIN
Benzo(a)-anthracene	ND	0/53	ND	NONE	CARCIN
Chrysene	ND	0/53	ND	NONE	CARCIN
Dibenzo(a,h)anthracene	ND	0/53	ND	NONE	CARCIN
Dioxin-TEQ	4.5×10^{-3}	18/50	NA	8×10^{-7}	CREG
Indeno(1,2,3-c,d)pyrene	ND	0/36	ND	NONE	CARCIN
Naphthalene	281.3	-/66	.29	NONE	NONE
Pentachlorophenol	0.2	-/53	NA	NONE	CARCIN

NA - not analyzed
ND - not detected
CARCIN - carcinogen
$\mu g/m^3$ - micrograms per cubic meter
Sources: Weston 1991, Weston 1992b, Weston 1993b

Table 5. Maximum Concentrations in On-Site Liquid Waste

Contaminants of Concern	Maximum Concentration (μg/L)	Total # Exceeding Comparison Value/ Total # samples	Background Concentration (μg/L)	Comparison Value	
				(μg/L)	Source
Arsenic	ND	0/2	NA	0.02	CREG
Benzene	ND	0/2	NA	1.0	CREG
Benzo(a)-pyrene	ND	0/2	NA	0.005	CREG
Benzo(b)-fluoranthene	ND	0/2	NA	NONE	CARCIN
Benzo(k)-fluoranthene	ND	0/2	NA	NONE	CARCIN
Benzo(a)-anthracene	ND	0/2	NA	NONE	CARCIN
Chrysene	ND	0/2	NA	NONE	CARCIN
Dibenzo(a,h)anthracene	NA	---	NA	---	---
Dioxin-TEQ	NA	---	NA	---	---
Indeno(1,2,3-c,d)pyrene	ND	0/2	NA	NONE	CARCIN
Naphthalene	ND	0/2	NA	20	LTHA
Pentachlorophenol	38000000	2/2	NA	0.3	CREG

NA - not analyzed
ND - not detected
CARCIN - carcinogen
μg/L - micrograms per liter
Source: Bruner 1982

Table 6. Maximum Concentrations in On-Site Waste Sludge

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # Exceeding Comparison Value/ Total # samples	Background Concentration (mg/kg)	Comparison Value	
				(mg/kg)	Source
Arsenic	52	4/5	NA	0.4	CREG
Benzene	ND	0/3	NA	20	CREG
Benzo(a)-pyrene	10	1/6	NA	0.1	CREG
Benzo(b)-fluoranthene	21	-/6	NA	NONE	CARCIN
Benzo(k)-fluoranthene	10	-/6	NA	NONE	CARCIN
Benzo(a)-anthracene	10	-/6	NA	NONE	CARCIN
Chrysene	18	-/6	NA	NONE	CARCIN
Dibenzo(a,h)anthracene	ND	0/3	NA	NONE	CARCIN
Dioxin-TEQ	.716	2/2	NA	.00005	EMEG
Indeno(1,2,3-c,d)pyrene	ND	0/6	NA	NONE	CARCIN
Naphthalene	220	-/6	NA	NONE	NONE
Pentachlorophenol	71000	6/6	NA	6.0	CREG

NA - not analyzed
ND - not detected
CARCIN - carcinogen
mg/kg - milligrams per kilogram
Sources: Bruner 1982, Weston 1991

Table 7. Maximum Concentrations in Off-Site Surface Soil

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # Exceeding Comparison Value/ Total # samples	Background Concentration (mg/kg)	Comparison Value	
				(mg/kg)	Source
Arsenic	NA	---	NA	---	---
Benzene	NA	---	NA	---	---
Benzo(a)-pyrene	ND	0/6	NA	0.1	CREG
Benzo(b)-fluoranthene	.62	-/6	NA	NONE	CARCIN
Benzo(k)-fluoranthene	.62	-/6	NA	NONE	CARCIN
Benzo(a)-anthracene	.14	-/6	NA	NONE	CARCIN
Chrysene	.25	-/6	NA	NONE	CARCIN
Dibenzo(a,h)anthracene	ND	-/6	NA	NONE	CARCIN
Dioxin-TEQ	.00095	6/7	NA	.00005	EMEG
Indeno(1,2,3-c,d)pyrene	.12	-/6	NA	NONE	CARCIN
Naphthalene	ND	0/6	NA	NONE	NONE
Pentachlorophenol	ND	0/6	NA	6.0	CREG

NA - not analyzed
ND - not detected
CARCIN - carcinogen
mg/kg - milligrams per kilogram
Source: Ferguson 1992

Table 8. Maximum Concentrations in Off-Site Air

Contaminants of Concern	Maximum Concentration ($\mu g/m^3$)	Total # Exceeding Comparison Value/ Total # samples	Background Concentration ($\mu g/m^3$)	Comparison Value	
				($\mu g/m^3$)	Source
Arsenic	NA	---	NA	---	---
Benzene	85.6	3/6	NA	0.1	CREG
Benzo(a)-pyrene	ND	0/28	NA	NONE	CARCIN
Benzo(b)-fluoranthene	ND	0/28	NA	NONE	CARCIN
Benzo(k)-fluoranthene	ND	0/28	NA	NONE	CARCIN
Benzo(a)-anthracene	ND	0/28	NA	NONE	CARCIN
Chrysene	ND	0/28	NA	NONE	CARCIN
Dibenzo(a,h)anthracene	ND	0/28	NA	NONE	CARCIN
Dioxin-TEQ	$1.5x10^{-6}$	1/27	NA	$8x10^{-7}$	CREG
Indeno(1,2,3-c,d)pyrene	ND	0/28	NA	NONE	CARCIN
Naphthalene	423.3	-/36	NA	NONE	NONE
Pentachlorophenol	0.11	-/22	NA	NONE	CARCIN

NA - not analyzed
ND - not detected
CARCIN - carcinogen
$\mu g/m^3$ - micrograms per cubic meter
Source: Weston 1993b

Table 9. Completed Exposure Pathways

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME
	SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
On-site Surface Soil	Escambia Site	Surface Soil	On-site	Ingestion/Dermal Contact	Workers On-site/ Trespassers	Past Future
Off-site Surface Soil	Resi-dential Yards	Surface Soil	Off-site	Ingestion/Dermal Contact	Residents	Past Present Future
On-site Ambient Air	Escambia Site	Air	On-site	Inhalation	Workers On-site/ Trespassers	Past Future
Off-site Ambient Air	Resi-dential Yards	Air	Off-site	Inhalation	Residents	Past Future
Liquid Waste	Escambia Site	Liquid Waste	On-site	Ingestion/Dermal Contact	Workers On-site/ Trespassers	Past

Solid Waste	Escambia Site	Solid Waste	On-site	Ingestion/Dermal Contact	Workers On-site/ Trespassers	Past

Table 10. Potential Exposure Pathways

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME
	SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
On-site Sub-surface Soil	Escambia Site	Subsurface Soil	Escambia Site	Ingestion/Dermal Contact	On-site Workers	Future
Fruits and Vege-tables	Resi-dential Yards	Garden Plants	Resi-dential Yards	Ingestion	Residents	Past Present Future
Small Game	Off-site	Game Animals	Off-site	Ingestion	Residents	Past

C. Additional Site Contaminants

The following chemicals were detected at this site at levels below human health concern.

1,1-Biphenyl
1,1-Dichloroethane
1,1-Dichloroethene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dichloroethane
1,2-Dichloroethene
1,2-Dichloropropane
1,3-Dichloropropane
2-Butanone (Methylethyl ketone)
2,3,4,6-Tetrachlorophenol
2,3,4,6-Tetrachlorophenol
Acenaphthene
Acetone
Anthracene
Barium
Benzaldehyde
Bromodichloromethane
Bromoform
Bromomethane
N-Butanol
Cadmium
Carbon tetrachloride
Carbon disulfide
Chlorobenzene
Chloroform
Chloromethane
Chromium
Cyanide
Dieldrin
Ethylbenzene
Fluoranthene
Fluorene
Furan
Heptachlor epoxide
Lead
Manganese
Mercury
Methylene chloride
Molybdenum
Nickel
Nitrate/nitrite
Polychlorinated biphenyls (PCB)
Pyrene
Strontium
Styrene
Tetrachloroethene
Toluene
Trichloroethene
Vanadium
Vinyl chloride
Xylene
Zinc

The following chemicals were detected at this site. There are insufficient toxicological data available upon which to base an assessment of their public health significance.

1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
2,6-Dimethylnaphthalene
4-Biphenylamine
Acenaphthalene
Acridine
Benzo(e)pyrene
Benzo(g,h,i)perylene
Benzo(j)fluoranthene
Benzothiphene
Bromomethyl(methylpropyl)-pyrimidione
C_2 Alkylphenanthrene
C_2 Alkylnaphthothiophene
C_2 Alkylbiphenyl
C_2 Alkylpyridine
C_2 Alkylnaphthalene
C_2 Alkylquinoline
C_3 Alkylnaphthalene
C_3 Alkylbenzene
C_3 Alkylbiphenyl
C_3 Alkylquinoline
C_3 Alkylpyridine
C_4 Alkylbenzene
C_4 Alkylnaphthalene
C_4 Alkylpyridine
C_5 Alkylbenzene
Carbazole
Carboxylic acid
Carene
Chloroethane
Chloro(trichloro(chlorophenyl)-ethyl)benzene
Copper
Cyclopenta(d,e,f)phenanthrene
Decylhydroxylamine
Dibenzofuran
Dibenzothiphene
Dihydrophenanthrene
Dimethylbutanol
Dimethyleneicycloheptane
Dimethylhexene
DimethylmethylenebicycloheptaneDimethylo ctanol
Dimethylpentanol
Dioctylphthalate
Ethylhexanoic acid
Ethylhexanol
Formic acid, butyl ester
Formic acid, methylpropyl ester
Hexadecanoic acid
Isopropanol
Methoxybutene
Methoxypropenylbenzene
Methylbiphenyl
Methylcarbazole
Methyldibenzofuran
Methyldibenzothiophene
Methylethylpentanol
Methylfluorene
Methylfluorene
Methylhexanal
Methylnaphthalene
Methyloctanol
Methylphenanthrene
Methylpropanal
Methylpropanol
Methylquinoline
n-Dodecane
n-Undecane
Nitrocarbazole
Octanydrodimethylphenanthrene
Oxybismethylpropane
Pentane
Pentylcyclohexane
Quinoline
Sulfate
Sulfide
Tetrachlorodibenzofuran
Tetramethylphenanthrene
Titanium
Trimethylbicycloheptane
Trimethylcyclohexene methanol
Vinyl acetate
Yttrium

D. Responses to Public Comments

Presented below is a summary of the comments received during the public comment period and our responses.

1. One comment inquired how certain on-site media could be judged to be adequately characterized despite a lack of analysis for a number of contaminants of concern.

For all media by which an individual could be exposed to site-related contaminants, we try to determine if the environmental data are adequate to conclude whether exposure is possible or not. If we cannot make a determination either way, then the medium has not been adequately characterized. In this case, enough environmental data is available for us to reasonably conclude that exposure to site-related contaminants is possible from contact with the on-site media in question (i.e., surface soil, groundwater and air).

2. One comment indicated that two companies,Precision Machining and Air Products, may be industrial sources of contaminants in the vicinity of the site.

We have reexamined the TRI data for the area near the site and found that Precision Machining has reported releases of a variety of organic chemicals. A detailed description of these chemicals has been incorporated into the health assessment in the Environmental Contamination and Other Hazards section. Air Products did not appear on the TRI list and apparently has no reporting requirements.

3. Several comments expressed concern about the generation of dust and volatile chemicals during remediation work that could adversely impact nearby communities.

We are also concerned about this source of potential exposure to the community and have recommended in the health assessment that EPA employ optimal dust suppression measures and conduct air monitoring during remediation to ensure that contaminants from the site are not transported into nearby neighborhoods.

4. One comment inquired if the information in two Action Memos from EPA (January 1992 and May 1992) was available to Florida HRS for use in producing the health assessment.

These two memos, as well as others, are available to us. Although they include relevant exposure and health effect information, they primarily deal with requests to increase spending and time limits to complete removal work at the site. Since the attached exposure and health effect information was available from other primary source documents, these memos were not referenced in the health assessment.

5. Several comments expressed concern about possible exposure to site-related contaminants through consumption of produce from backyard gardens, small game and seafood from Bayou Texar.

As stated in the health assessment, no samples of produce, small game or seafood have been analyzed for site-related contaminants. Therefore, we do not know if exposure is possible by these routes. The health assessment does recommend sampling of fruits and vegetables if they are found to be growing in contaminated soil. Small game is not a likely current exposure pathway since these animals are no longer found on the site and hunting within the Pensacola city limits is unlikely. Contamination of seafood in Bayou Texar may occur in the future if contaminant levels increase and the health assessment recommends that periodic sampling of the bayou be conducted to monitor conditions there.

6. One comment inquired about the nature of the public education sessions and why no mention was made concerning possible exposure by the routes addressed in comment 5, above.

Topics for the health education seminars were chosen based on the desires expressed by the community members who attended. At the time the seminars were being presented, no information was available about possible exposure by these routes and no concerns were expressed to the health educator about them by anyone from the community. Information on this topic can be included in future presentations to the community if desired.

7. Several comments expressed concern about current exposure by inhalation of contaminated off-site air.

Since all activity at the site has ceased and contaminated material is secured, exposure to contaminants in the air from the site is unlikely at this time. However, past exposure to airborne contaminants is likely, and exposure to contaminants in the air in the future during remediation work is possible. For this reason, the health assessment recommends that EPA employ optimal dust suppression measures and air monitoring to prevent exposure by this pathway.

8. One comment noted that the health assessment indicated the site was proposed for the NPL because of concern over air, soil, and groundwater contamination while EPA used only groundwater to actually rank the site.

This statement has been modified in the health assessment to indicate that EPA did use only groundwater to rank the site. EPA is also concerned about contamination in other media such as soil and air and this contamination will be addressed in the cleanup proposals EPA prepares for the site. However, the potential threat to the environment from groundwater contamination was great enough by itself to rank the site for the NPL.

9. One comment expressed concern that the non-cancer health effects of naphthalene exposure had not been evaluated in the health assessment.

The ATSDR toxicological profile for naphthalene acknowledges that little is known regarding the human health effects resulting from low-level exposure to naphthalene. Hemolytic anemia, the most frequent health effect from naphthalene exposure, has been reported from exposure to large numbers of mothballs. However, little is known about the actual amount of exposure in these instances. The maximum likely dose of naphthalene by inhalation is less than the Florida acceptable ambient air concentration. A No Observed Adverse Effect Level (NOAEL) of 55 mg/kg/day has been measured for ingestion of naphthalene in rats and mice. The maximum likely dose from incidental ingestion of surface soil on the site is less than one-tenth this level. However, we do not know if rats, mice and humans are affected by naphthalene in the same way.

10. Several comments indicated concern that exposure to dioxin contamination had not been adequately addressed in the health assessment.

From the environmental data available, we have been able to extimate the likely non-carcinogenic health effects from exposure to dioxin in air and soil, both on and off of the site. As stated in the health assessment, the carcinogenic effects of dioxin are currently under review by EPA and the U.S. Public Health Service. Pending completion of this review and development of a cancer slope factor, we are currently unable to estimate the cancer risk from exposure to dioxin.