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PRELIMINARY Public Health Assessment for

STAUFFER CHEMICAL COMPANY/TAMPA
TAMPA, HILLSBOROUGH COUNTY, FLORIDA
CERCLIS NO. FLD004092532
JANUARY 6, 1994

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

PRELIMINARY PUBLIC HEALTH ASSESSMENT

STAUFFER CHEMICAL COMPANY/TAMPA

TAMPA, HILLSBOROUGH COUNTY, FLORIDA

CERCLIS NO. FLD004092532

Prepared By:

Toxicology and Hazard Assessment
The Florida Department of Health and Rehabilitative Services
Under 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.

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ATSDR and its Public Health Assessment

ATSDR is the Agency for Toxic Substances and Disease Registry, a federal public health agency. ATSDR is part of the Public Health Service in the U.S. Department of Health and Human Services. ATSDR is not a regulatory agency. Created by Superfund legislation in 1980, ATSDR's mission is to **prevent or mitigate adverse human health effects and diminished quality of life resulting from exposure to hazardous substances in the environment.**

The Superfund legislation directs ATSDR to undertake actions related to public health. One of these actions is to prepare public health assessments for all sites on or proposed for the Environmental Protection Agency's National Priorities List, including sites owned or operated by the federal government.

During ATSDR assessment process the author reviews available information on

- the levels (or concentrations) of the contaminants,
- how people are or might be exposed to the contaminants, and
- how exposure to the contaminants might affect people's health

to decide whether working or living nearby might affect peoples' health, and whether there are physical dangers to people, such as abandoned mine shafts, unsafe buildings, or other hazards.

Four types of information are used in an ATSDR assessment.

1) **environmental data;** information on the contaminants and how people could come in contact with them

2) **demographic data;** information on the ethnicity, socioeconomic status, age, and gender of people living around the site,

3) **community health concerns;** reports from the public about how the site affects their health or quality of life

4) **health data;** information on community-wide rates of illness, disease, and death compared with national and state rates

The sources of this information include the Environmental Protection Agency (EPA) and other federal agencies, state, and local environmental and health agencies, other institutions, organizations, or individuals, and people living around and working at the site and their representatives.

ATSDR health assessors visit the site to see what it is like, how it is used, whether people can walk onto the site, and who lives around the site. Throughout the assessment process, ATSDR health assessors meet with people working at and living around the site to discuss with them their health concerns or symptoms.

A team of ATSDR staff recommend actions based on the information available that will protect the health of the people living around the site. When actions are recommended, ATSDR works with other federal and state agencies to carry out those actions.

A public health action plan is part of the assessment. This plan describes the actions ATSDR and others will take at and around the site to prevent or stop exposure to site contaminants that could harm peoples' health. ATSDR may recommend public health actions that include these:

- restricting access to the site,
- monitoring,
- surveillance, registries, or health studies,
- environmental health education, and
- applied substance-specific research.

ATSDR shares its initial release of the assessment with EPA, other federal departments and agencies, and the state health department to ensure that it is clear, complete, and accurate. After addressing the comments on that release, **ATSDR releases the assessment to the general public.** ATSDR notifies the public through the media that the assessment is available at nearby libraries, the city hall, or another convenient place. Based on comments from the public, ATSDR may revise the assessment. ATSDR then releases the final assessment. That release includes in an appendix ATSDR's written response to the public's comments.

If conditions change at the site, or if new information or data become available after the assessment is completed, ATSDR will review the new information and determine what, if any, other public health action is needed.

For more information about ATSDR's assessment process and related programs please write to:

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SUMMARY

The Stauffer Chemical Co. (Tampa Plant) site is a former pesticide formulating and packaging operation in Tampa, Florida. Past disposal practices have contaminated on-site air, soil, surface water, sediments, and ground water. We classify this site as an indeterminate public health hazard. Neither the Environmental Protection Agency nor Stauffer have fully delineated the vertical and lateral extent of contamination in the Floridan aquifer. The one on-site caretaker has been exposed to contaminants via inhalation and incidental soil ingestion. Future workers may also be exposed to contaminants. The available data, however, do not indicate that these exposures would cause adverse health effects. The data are inadequate, however, to assess the risk for the 5-50 people who eat fish from the nearby Tampa Bypass Canal.

Former nearby residents are concerned that some of their health problems are a result of exposures to chemicals from Stauffer in the 1940s and 1950s. Chemicals used at Stauffer could have caused or aggravated the reported cases of asthma, nausea, headaches, and burning eyes and nose. Without environmental data from the 1940s and 1950s from which to estimate exposure, however, we cannot definitely link these health effects to chemicals used at Stauffer. In early 1993, Stauffer excavated buried drums and highly contaminated soils, storing them in an on-site building. This reduced, but did not eliminate, the risk from inhalation of contaminated dust or incidental ingestion of contaminated soil. Methyl mercaptan released into the air during this excavation could have caused strong odors and eye and respiratory irritation reported by seven nearby residents and businesses.

During any future remediation, Stauffer should control contaminated dust and monitor air quality. Stauffer should collect and analyze 7-10 more sediment samples and 5-10 fish samples from the bypass canal. Stauffer should fully delineate the vertical and lateral extent of contamination in the Floridan aquifer. Stauffer should also post signs to warn the public of hazardous waste at this site. Stauffer, the Occupational Safety and Health Administration, or the National Institute for Occupational Safety and Health should consider medical evaluation and monitoring of the site caretaker.

The Florida Department of Health and Rehabilitative Services, in cooperation with the Agency for Toxic Substances and Disease Registry, prepared this public health assessment. Because the available data and information do not indicate that adverse health effects are likely, the ATSDR Health Activities Recommendation Panel determined that there is no need for additional health follow-up actions at this time. Florida HRS will reassess the public health threat of this site as soon as more information is available.

BACKGROUND

In this preliminary public health assessment, the Florida Department of Health and Rehabilitative Services (Florida HRS), in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR), evaluates the public health significance of the Stauffer Chemical Co. (Tampa Plant) Superfund hazardous waste site. Florida HRS determines whether health effects are possible and recommends actions to reduce or prevent them. ATSDR, a federal agency within the U.S. Department of Health and Human Services, is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) to conduct public health assessments at hazardous waste sites. The Superfund Amendments and Reauthorization Act of 1986 (SARA) requires ATSDR to assess the public health threat at Superfund sites within a year of their proposal to the Superfund National Priorities List.

Deliberate differences exist between the Environmental Protection Agency's (EPA) risk assessments and ATSDR's public health assessments. The two agencies have distinct purposes that necessitate different goals for their assessments. While an EPA risk assessment conducted under their Remedial Investigation/ Feasibility Study (RI/FS) process is used to support the selection of a remedial measure at a site, an ATSDR public health assessment is a mechanism to provide the community with information on the public health implications of a specific site, identifying those populations for which further health actions or studies are needed. The health assessment also makes recommendations for actions needed to protect public health, which may include issuing health advisories.

A. Site Description and History

The Stauffer Chemical Company (Tampa plant) is at 2009 Orient Road in Tampa, Florida (Figures 1, 2, and 3, Appendix A). The site, still owned by Stauffer, covers 40 acres in an industrial section of Hillsborough County, about 3 miles northeast of Tampa Bay. The site is mostly flat with a slight slope to the east. It is bounded on the north by the Seaboard Coastline Railroad, on the east by the Tampa Bypass Canal, on the south by the Hillsborough County Detention Facility, and on the west by Orient Road.

A large warehouse and several smaller buildings are on the northern half of the site. Also on the northern half of the site are two 1-2 acre ponds. These ponds are believed to be remnants of Six Mile Creek that were cut off by construction of the Tampa Bypass Canal. The rest of the northern half of the site is covered with grass except for a 1.4 acre area east of the warehouse which is devoid of any vegetation.

The southern half of the site is mostly wooded and is drained by a ditch that discharges into the Tampa Bypass Canal. A 100-foot wide levee separates the bypass canal from the site. The Tampa Bypass Canal, begun in 1966 and completed in 1973, allows flood waters from the upper Hillsborough River to bypass downtown Tampa and flow through McKay and Hillsborough Bays into Tampa Bay. The canal was built in the basin of Six Mile Creek

which previously drained the area. A spillway 1,000 feet downstream of Stauffer regulates discharge of the canal into McKay Bay which is about 2.5 miles downstream.

Stauffer began formulating and packaging agricultural chemicals at this site in 1951. Stauffer received bulk shipments of insecticides and herbicides; reformulated them into dusts, granules, and liquids; and then packaged them for distribution. Table 1 (Appendix B) contains a list of the chemicals reportedly use by Stauffer at this site. Stauffer produced about 2,500 tons of dust and granules, and 500,000 gallons of liquid pesticides yearly. Stauffer reportedly used about 12 million gallons of No. 1 fuel oil and 240,000 gallons of xylene yearly as pesticide solvents. Between 1953 and 1973, Stauffer reportedly disposed of 70-80 drums of methylparathion, over 8,000 gallons of toxaphene, and other pesticide and solvent waste in on-site, unlined pits. Stauffer also used an incinerator to burn the bags and boxes that had contained the pesticides and herbicides, but reportedly disposed of the ash off site. We were unable to determine the source of drinking water for Stauffer employees. Stauffer ceased production at this site in 1986. This site is now fenced and patrolled during the day.

In 1982 the Florida Department of Environmental Protection (Florida DEP, formerly the Department of Environmental Regulation) inspected this site to determine compliance with state hazardous waste regulations. Because of past waste disposal practices and proximity to the Tampa Bypass Canal, Florida DEP recommended an Environmental Protection Agency (EPA) inspection. EPA inspected the site and found evidence of buried drums and possible ground-water contamination (Hundley and Leggett 1982). Beginning in 1984, Florida DEP required Stauffer to sample the water in the on-site ditch and the nearby Tampa Bypass Canal for pesticides. Stauffer found low levels of pesticides in the ditch but not in the Tampa Bypass Canal (ERM 1991; Harris 1991; McClellan 1984a, 1984b, 1986, 1987). EPA conducted site investigations in 1987 and 1988 and found on-site air, soil, surface water, sediment, and ground-water contamination (NUS 1988a and 1988b). In 1991 and 1992, as part of a supplemental site investigation, Stauffer consultants collected and analyzed 52 soil samples. They also installed and sampled 8 new and 12 existing monitor wells (CDM 1992). EPA proposed this site to the Superfund National Priorities List on February 7, 1992. From January to April 1993, Stauffer contractors removed approximately 500 crushed 55-gallon drums and 230 5-gallon containers from the site. During this time Stauffer contractors also stockpiled approximately 3,000 cubic yards of highly contaminated soil (soil with >1,000 milligrams per kilogram total pesticides) in an on-site building (CDM 1993). In February and March 1993, seven nearby residents and business owners complained of strong odors that caused runny noses, burning eyes, headaches, nausea, and one instance of coughing up blood. EPA identified methyl mercaptan from the soil excavation as the source of the odor and concluded it was not a significant health risk (EPA 1993). Following removal of the highly contaminated soil, Stauffer consultants collected and analyzed 143 confirmatory surface soil samples (CDM 1993). Stauffer has agreed to perform a formal remedial investigation/ feasibility study at this site.

B. Site Visit

Randy Merchant, of Florida HRS, and the EPA Remedial Project Manager (RPM) visited the site on September 10, 1992. They met with a representative of Stauffer Chemical and the site caretaker. The site caretaker has been an employee of Stauffer at this site since at least 1970. The Stauffer representative explained past operations and conducted a tour of the site. Neither Mr. Merchant nor the EPA RPM collected any environmental samples during this visit. Mr. Merchant spent two hours on the site and made the following observations:

* The site was surrounded by a well-maintained 8-foot chain-link fence and patrolled by the caretaker during the day.

* There were no hazardous waste warning signs.

* There was no evidence of site trespass.

* There was a 1-2 acre area in the northeast quarter of the site devoid of vegetation. The rest of the site is either covered with buildings, pavement, grass, or woods.

* There was dense vegetation and several wading birds around the large pond on the east side of the site

* A shallow ditch on the southern half of the site drains into the Tampa Bypass canal.

* The southern half of the site is wooded and does not appear to have been used for formulating or packaging pesticides.

On September 11, Mr. Merchant drove through the area around the site. The area immediately around the site is mixed industrial/commercial. The Helena Chemical Superfund site is about 50 feet northwest of Stauffer. There is a cement mixing facility immediately north of the site across the railroad tracks. The Tampa Bypass Canal forms the eastern site boundary. Mr. Merchant observed people fishing from the bridge over the bypass canal just north of the site. On the south side of the site is the Hillsborough County Detention Facility, formerly the Hillsborough County Animal Control Board shelter, and a Florida Department of Transportation maintenance building. There are bail bond and light industrial/commercial businesses along Orient Road which forms the eastern site boundary. The southern boundary of the Orient Park residential subdivision is about 1,000 feet northwest of the site.

We obtained information about the area from various local officials: Hillsborough County Public Health Unit, Environmental Health section; the Hillsborough County Environmental Protection Commission; and the Florida DEP Southwest District Office. We incorporated information from these agencies into the appropriate sections of this report.

C. Demographics, Land Use, and Natural Resource Use

Demographics

According to the 1990 census data, about 5,600 people live within 1.5 mile of this site, mostly in the Orient Park community and along Broadway Avenue. These residents are mostly white (77%) with a black (15%) and Hispanic (8%) minority. The population is relatively young: the median age is 31 and 17% are under 10 years old. Most (57%) of the 2,200 homes in this area are owner occupied. The median yearly family income in this area is about $22,000 (BOC 1992).

Land Use

Stauffer ceased operations in 1986 and does not plan to formulate or package pesticides at this site again. Hillsborough County has expressed an interest in buying the southern half of this site to expand their detention facility.

The area within about 1.5 miles of the site is mostly industrial/commercial and residential. The Helena Chemical Superfund site is 50 feet northwest of Stauffer. The 62nd St. Landfill and Kassouf-Kimerling Superfund sites are about 2 miles west of Stauffer. A steel recycling facility, a secondary lead smelter, and the Uceto Railroad Yard are all within 1.5 miles of Stauffer. The nearest house is about 700 feet northwest of the site. The Kenly Elementary School and two day-care facilities are in the Orient Park neighborhood about 0.5 mile northwest of the site.

Natural Resource Use

The Tampa Bypass Canal is located about 100 feet east of the site. It discharges into McKay Bay 2.5 miles downstream. Florida DEP classifies the Tampa Bypass Canal and McKay Bay as Class-III surface waters (recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife). Although the canal and McKay Bay are not used as drinking water sources and commercial fishing is prohibited, individuals do catch and eat fish from both.

Ground water from the Floridan aquifer is the source of drinking water for most municipal and private water supply systems in Hillsborough County. The four supply wells for Seaboard Utilities, which serves 2,600 connections, are 1.75 miles south-southeast of Stauffer. The two supply wells for USA Utilities, which serves 851 connections, are 2.25 miles north-northwest of Stauffer. The supply wells for the Shady Oak Trailer Park (1.25 miles, 40 trailers), the Paradise Mobile Home Park (2.25 miles, 307 trailers), and the Riverbreeze Motor Home Park (2.35 miles, 19 trailers) are all northeast of Stauffer (EPA 1991).

Most of the houses within 0.5 mile of Stauffer are served by a municipal water supply. A few homes, however, still use private wells. An accurate survey of private wells in this area is needed.

There is little agriculture, hunting, or recreation in this area.

D. Health Outcome Data

We did not evaluate health outcome data for this site. See the Public Health Implications, Community Health Concerns Evaluation section for details.

COMMUNITY HEALTH CONCERNS

On May 19, 1993 Mr. Merchant attended an EPA sponsored public meeting for the adjacent Helena Chemical Superfund site. At this meeting, and in subsequent letters and phone calls, five to ten former residents expressed health concerns relating to both the Stauffer and Helena sites. Five residents expressed health concerns in writing during the draft public health assessment comment period. We address these health concerns in the Public Health Implications, Community Health Concerns Evaluation section. The following is a summary of the community health concerns:

1. One person was concerned that their private well is contaminated.

2. One person was concerned that their cancer, other unusual illnesses, and their child's birth defects are the result of drinking contaminated well water when they used to live in this area.

3. One person was concerned that health problems in their family were caused by exposure to pesticides and other chemicals from Stauffer and the Flag Sulphur Company (now Helena Chemical Company). Their family lived within 0.25 mile of these sites during the 1940s and 1950s. This person reported contaminated dust from these sites frequently covered their house, and children played in contaminated run-off from these sites. This person reported nausea, headaches, and burning sensation of the eyes and nose when the facility "cooked" or after a tank exploded. This person reported their father worked at Stauffer in the early 1950s, was diagnosed with periarteritis nodosa in 1961, and later died from complications of this disease. Other reported health problems in this family include: Grave's disease, difficulty in conceiving and spontaneous abortions, asthma, hiatal hernia, impaired circulation, and kidney problems.

4. One person was concerned that their fibromyalgia was caused by pesticide exposure. This person forwarded a copy of the laboratory analysis of their blood for chlorinated pesticides, trimellitic anhydride, isocyanate, and formaldehyde exposure. This person's family also lived within 0.25 mile of the site during the 1940s and 1950s and reported breathing contaminated dust and playing in the contaminated run-off as a child.

5. One person was concerned that their family's health problems (kidney, bladder, and lung) are related to living in this area during the 1940s and 1950s.

6. During contaminated soil excavation in February and March 1993, seven nearby residents and business owners complained of strong odors that caused runny noses, burning eyes, headaches, nausea, and one instance of coughing up blood.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

In this section, we review the environmental data collected at the site, evaluate the adequacy of the sampling, select contaminants of concern, and list the maximum concentration and frequency of detection in the various media.

We selected the following chemicals as contaminants of concern at this site:

alpha-BHC	DDT, DDD, DDE	Toxaphene
Chlordane	Dieldrin	Arsenic

Alpha-BHC (benzene hexachloride) is also known as alpha-HCH (hexachlorocyclohexane).

We selected these contaminants of concern based on the following factors:

1. Concentrations of contaminants on and off the site. Although background concentrations are useful in determining if contaminants are site related, contaminants are only eliminated from further consideration if both the background and on-site concentrations are below standard comparison values. This is necessary to assess the public health risk to all contaminants detected, whether site-related or not. We identify those contaminants that are not site-related.

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

3. Community health concerns.

4. Comparison of on- and off-site concentrations with ATSDR standard comparison values. ATSDR standard comparison values are media-specific concentrations used to select contaminants for further evaluation. They are not used to predict health effects or to set clean-up levels. Contaminants with media concentrations above an ATSDR standard comparison value do not necessarily represent a health threat, but are selected for further evaluation. These contaminants are evaluated in subsequent sections to determine their health threat. Contaminants with media concentrations below an ATSDR standard comparison values are unlikely to cause health effects and are not evaluated further. The following standard comparison values (in order of priority) were used to select contaminants of concern:

a. Environmental Media Evaluation Guide (EMEG): derived from ATSDR's Minimal Risk Level (MRL) using standard exposure assumptions such as ingestion of two liter of water per day and body weight of 70 Kg for adults. MRLs are an estimate of daily human exposure to a chemical likely to be without an appreciable risk of adverse effects, generally for a period of a year or longer.

b. Reference Dose Media Evaluation Guide (RMEG): derived from EPA's Reference Dose (RfD) using standard exposure assumptions. RfDs are an estimate of daily human exposure to a chemical likely to be without an appreciable risk of adverse effects, generally for a period of a year or longer.

c. Cancer Risk Evaluation Guide (CREG): calculated from EPA's cancer slope factor using standard exposure assumptions. EPA cancer slope factor is the contaminant concentration estimated to result in one excess cancer in a million persons exposed over a lifetime.

d. Lifetime Health Advisory (LTHA): EPA's estimate of the concentration of a contaminant in drinking water at which adverse health effects would not be expected to occur over a lifetime of exposure. LTHAs provide a safety margin to protect sensitive members of the population.

e. Maximum Contaminant Level (MCL): the contaminant concentration that EPA considers protective of public health over a 70 year lifetime at an exposure rate of 2 liters of water per day. MCLs are regulatory concentrations.

ATSDR standard comparison values are used only to select contaminants of concern for further consideration. 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 also reported that contaminant in all other media. Once contaminants of concern are selected, we evaluate these contaminants in subsequent sections and determine whether exposure has public health significance.

We summarize the environmental sampling data for the eight selected contaminants of concern in Tables 2 through 13, Appendix B. We eliminated from further consideration about 40 other chemicals detected in various media at concentrations below standard comparison values (Table 14, Appendix B). Sixty other chemicals, however, have no standard comparison values and the human health data are insufficient to determine their public health significance. We list these chemicals in Table 15, Appendix B.

To find industrial facilities that could add to the contamination near the Stauffer site, we searched the 1987-1990 EPA Toxic Chemical Release Inventory (TRI) data base. EPA developed TRI from the chemical release information (air, water, and soil) provided by

certain industries. Thirteen facilities in the 33619 ZIP code reported releases from 1987-1990. This ZIP code covers a rectangular area about 2 miles west, north and east and 5 miles south of Stauffer (Figure 4, Appendix A). Gulf Coast Lead, 1901 N. 66th St. was the only facility to report releases of contaminants that are of concern at Stauffer. Gulf Coast Lead reported the release of 250 pounds of arsenic into the air during 1989. Gulf Coast Lead did not report any releases of arsenic in 1987, 1988, or 1990.

Woodruff & Sons (Florida Mining & Materials) is a construction materials facility at 2409 Orient Road immediately adjacent to, and northwest of, Stauffer. Woodruff & Sons has requested reimbursement from Florida DEP for cleanup of a leaking underground petroleum storage tank. In 1987 Woodruff & Sons sampled the surficial aquifer monitor well on their property and found 20 micrograms per liter of total volatile organic chemicals. Concentrations of benzene, ethylbenzene, toluene, and xylenes were all below detection limits (Thornton 1987).

We discuss the contamination that exists **on** the site first, separately from the contamination that occurs **off** the site. We further divide our discussion of on- and off-site contamination by media:

<u>On-Site</u>

air
surface soil
(0-12 inches deep)
subsurface soil
(> 1 foot deep)
pond water
pond sediments
drainage ditch sediments
shallow ground water
deep (Floridan aquifer) ground water
drainage ditch water

<u>Off-Site</u>

surface water (Tampa Bypass Canal)
sediments (Tampa Bypass Canal)
private drinking water wells
deep (Floridan aquifer) ground water
biota

A. On-Site Contamination

For the purposes of this assessment, we define "on-site" as the area within the Stauffer property boundary plus the Tampa Bypass Canal levee adjacent to Stauffer (Figure 3). Including the bypass canal levee in the definition of "on-site" allows us to combine the data from the one monitor well installed on the levee with the rest of the ground-water monitoring data.

We compiled data in this subsection from reports of investigations by Stauffer (McClellan 1984a, 1984b, 1986, 1987; ERM 1991; Harris 1991; and CDM 1992, 1993) and EPA (NUS 1988a, 1988b).

On-Site Air

There is no record of air monitoring before Stauffer ceased operations in 1986. On February 2-4, 1988, EPA subcontractor NUS Corporation collected air samples in the breathing zone from 12 on-site locations (Figure 5, Appendix A)(NUS 1988b). The wind was calm and there was no other on-site activity when NUS collected these samples. We considered air sample locations "C" and "K" upwind on the west side of the site as representative of the background air quality. EPA analyzed these samples for pesticides only. For this public health assessment, these air samples adequately characterize the ambient on-site air quality.

Of the fourteen pesticides detected, three (alpha-BHC, chlordane, and DDT) were above their respective comparison values (Table 2, Appendix B). One (heptachlor) was below its comparison value and the other 10 pesticides lacked comparison values. Pesticide levels will likely be higher during activities that disturb the surface soil and create dust.

On-Site Surface Soil

Between 1987 and 1992, EPA and Stauffer collected and analyzed 81 surface soil samples (0-12 inches deep) from all areas of the site (Figures 6 through 11, Appendix A) (ERM 1991; NUS 1988a, 1988b; CDM 1992). The locations of surface soil samples SS-01 through SS-06 in Figure 6 differ from the location of surface soil samples SS-01 through SS-06 in Figure 7. The samples in Figure 6 were collected in 1987 (NUS 1988a) and those in Figure 7 were collected in 1988 (NUS 1988b). Unfortunately, the EPA contractor, NUS Corporation, used the same numbering scheme for both sampling events.

From January to April 1993, Stauffer contractors excavated approximately 3,000 cubic yards of highly contaminated soil (soil with >1,000 milligrams per kilogram total pesticides). Stauffer stored this soil in an on-site building. Stauffer consultants then collected and analyzed 143 confirmatory surface soil samples (CDM 1993). We consider surface soil samples SS-01, C5, and BG-01 as representative of background surface soil quality. For this public health assessment, these samples are adequate to characterize the on-site surface soil quality.

EPA and Stauffer found 26 different pesticides, the highest concentrations in the barren area east of the warehouse. The highest pesticide concentration found was 20,800 milligrams of butylate per kilogram soil. Concentrations of all of the contaminants of concern (alpha-BHC, chlordane, DDT, DDE, DDD, dieldrin, toxaphene, and arsenic) were above their respective comparison values (Table 3, Appendix B). EPA and Stauffer also found other pesticides, solvents, metals, and polyaromatic hydrocarbons (PAHs). Concentrations of these

contaminants, however, were either below their respective comparison values or they lacked comparison values.

On-Site Subsurface Soil

Between 1987 and 1992, EPA and Stauffer collected and analyzed 152 on-site subsurface soil samples (1-10 feet deep) (ERM 1991; NUS 1988a, 1988b; CDM 1992). Sample locations are shown in Figures 9 through 14, Appendix A. We consider subsurface soil samples SC-01, SC-02, SC-03, SB-01, SB-02, A22, and BG-1 representative of the background subsurface soil quality. For this public health assessment, these samples are adequate to characterize the on-site subsurface soil quality. The concentrations of all contaminants of concern were above their respective comparison values (Table 4, Appendix B). EPA and Stauffer also found other pesticides, solvents, metals, and polyaromatic hydrocarbons (PAHs). Concentrations of these contaminants, however, were either below their respective comparison values or they lacked comparison values.

On-Site Pond Water

Between 1987 and 1990, EPA and Stauffer collected and analyzed five surface water grab samples from the on-site ponds (Figures 15 and 16, Appendix A)(ERM 1991; NUS 1988a). There are no other on-site surface water bodies representative of background surface water quality. For this public health assessment, these samples are adequate to characterize the on-site pond water quality. The concentrations of alpha-BHC, DDT, DDE, DDD, and dieldrin were above their respective comparison values (Table 5, Appendix B). EPA and Stauffer also found other pesticides and a few solvents. Concentrations of these contaminants, however, were either below their respective comparison values or they lacked comparison values.

On-Site Drainage Ditch Water

Between 1984 and 1990, EPA and Stauffer collected and analyzed 14 surface water grab samples from the on-site drainage ditch (Figure 15, Appendix A) (Harris 1991; McClellan, 1984a, 1984b, 1986, 1987; NUS 1988a). There are no other on-site surface water bodies representative of background surface water quality. For this public health assessment, these samples are adequate to characterize the on-site drainage ditch water quality. The concentrations of alpha-BHC, DDD, dieldrin, and arsenic were above their respective comparison values (Table 6, Appendix B). EPA and Stauffer also found other pesticides and metals. Concentrations of these contaminants, however, were either below their respective comparison values or they lacked comparison values.

On-Site Pond Sediments

Between 1987 and 1990, EPA and Stauffer collected and analyzed 19 sediment grab samples from the on-site ponds (Figures 15, 16, and 17, Appendix A)(ERM 1991; NUS 1988a). There are no other on-site sediments representative of background sediment quality. For this public

health assessment, these samples are adequate to characterize sediment quality in the on-site ponds. The highest pesticide concentration EPA or Stauffer found was 8,700 milligrams of DDT per kilogram of sediment. The concentrations of chlordane, DDT, DDE, DDD, dieldrin, and arsenic were above their respective comparison values (Table 7, Appendix B). EPA and Stauffer also found other pesticides, metals, polyaromatic hydrocarbons (PAHs), and components of gasoline and/or diesel fuel. Concentrations of these contaminants, however, were either below their respective comparison values or they lacked comparison values.

On-Site Drainage Ditch Sediments

Between 1987 and 1990, EPA and Stauffer collected and analyzed 9 sediment grab samples from the on-site drainage ditch (Figures 8, 15, and 17, Appendix A)(ERM 1991; NUS 1988a, 1988b). There are no other on-site sediments representative of background sediment quality. For this public health assessment, these samples are adequate to characterize sediment quality in the on-site drainage ditch. The concentrations of chlordane, DDE, DDD, and arsenic were above their respective comparison values (Table 8, Appendix B).

On-Site Shallow Ground Water

Between 1987 and 1992, EPA and Stauffer collected and analyzed 28 ground-water samples from monitor wells in the surficial aquifer (3-14 feet deep)(ERM 1991; NUS 1988a; CDM 1992). Monitor well locations are shown in Figures 12, 18 and 19, Appendix A. Stauffer determined that ground water in the surficial aquifer flows to the southeast toward the bypass canal. We consider ground-water samples from monitor wells SC-01, SC-02, SC-03, MWT-1A, and MWT-3A representative of the background shallow ground-water quality. For this public health assessment, these samples are adequate to characterize on-site shallow ground-water quality. The concentrations of alpha-BHC, DDT, DDE, DDD, dieldrin, and arsenic were above their respective comparison values (Table 9, Appendix B). EPA and Stauffer also found other pesticides, metals, and solvents. Concentrations of these contaminants, however, were either below their respective comparison values or they lacked comparison values.

On-Site Deep Ground Water

In 1990 and 1991, Stauffer collected and analyzed 13 ground-water samples from monitor wells in the Floridan aquifer (38-60 feet deep) (ERM 1991; CDM 1992). The monitor well locations are shown in Figures 18 and 19, Appendix A. Stauffer determined that ground water in the Floridan aquifer flows to the southeast toward the bypass canal. We consider ground-water samples from monitor wells MWT-1B and MWT-3B representative of the background deep ground-water quality. The concentration of alpha-BHC was above its comparison value (Table 10, Appendix B). Stauffer found other pesticides in the wells near the barren area east of the warehouse. Concentrations of these pesticides, however, were either below their respective comparison values or they lacked comparison values. Stauffer also found pesticides, arsenic, and solvents in "background" well MWT-1B located in the northwest corner of the property. This may indicate a previously unknown source of

contamination, migration from an off-site source, or ground-water flow in a direction other than to the southeast. Further investigation is necessary to delineate the source of this contamination.

B. Off-Site Contamination

For the purposes of this assessment, we define "off site" as the area outside the Stauffer property and the adjacent Tampa Bypass Canal levee (Figure 3, Appendix A). We compiled data in this subsection from reports of investigations by Stauffer (Harris 1991; McClellan 1984a, 1984b, 1986, 1987), EPA (NUS 1988a), the Hillsborough County Public Health Unit (CPHU 1993), and the Hillsborough County Environmental Protection Commission (EPC 1987).

Off-Site Surface Water

Between 1984 and 1990, Stauffer collected and analyzed 11 surface water grab samples from the Tampa Bypass Canal near the southeast corner of the site. Stauffer also collected and analyzed background samples from the canal at the railroad bridge upgradient of the site (Figure 20, Appendix A) (Harris 1991; McClellan, 1984a, 1984b, 1986, 1987). In 1987 EPA collected and analyzed one sample from the canal below the spillway (S-160) 1,600 feet downstream of the site and a background sample at the railroad bridge (Figure 15, Appendix A)(NUS 1988a). Concentrations of the contaminants of concern were all below detection limits (Table 11, Appendix B). For this public health assessment, these samples are adequate to characterize off-site surface water quality.

Off-Site Sediments

Given past disposal practices, site drainage patterns, and proximity to the Six Mile Creek/Tampa Bypass Canal, it is likely that stormwater run-off from this site deposited pesticides and metals in the sediments of the creek/bypass canal. In 1987 EPA collected and analyzed 3 sediment grab samples from the bypass canal near the site (Figure 17, Appendix A) (NUS 1988b). EPA did not collect a background sediment sample upstream from the site. EPA detected DDD and arsenic in the two downstream sediment samples. Only arsenic however exceeded its comparison value (Table 12, Appendix B). EPA detected 19 unidentified compounds, at concentrations up to 30 milligrams per kilogram, in one of the downstream sediment samples. The sediment sample collected at the northern site boundary did not contain any pesticides or metals but did contain low concentrations of polyaromatic hydrocarbons (PAHs). Concentrations of these PAHs, however, were either below their respective comparison values or they lacked comparison values.

Three sediment samples are inadequate to characterize the sediment quality of the bypass canal adjacent to Stauffer. Seven to ten more samples from the bypass canal between the site and spillway S-160, downstream from the site, will be necessary to adequately characterize the sediment quality. To help isolate contributions from other sources, two of these sediment

samples should be background samples collected from the bypass canal about 500 and 1,000 feet north (upstream) of the northern site boundary. These sediment samples should be analyzed for pesticides including the proprietary pesticides specific to Stauffer. Although there are other sources in this area that may have added to the sediment contamination, past disposal practices, site drainage patterns, and proximity to the bypass canal make Stauffer a likely source.

The on-site pond sediments may be representative of the sediments in the bypass canal. Stauffer was in operation next to Six Mile Creek for about 15 years before construction of the bypass canal. The on-site ponds are thought to be remnants of Six Mile Creek that were cut off by construction of the bypass canal. The sediments in these on-site ponds contain high levels of pesticides and metals and may be indicative of the bypass canal sediment quality. Additional samples are necessary, however, to determine the extent of sediment contamination in the bypass canal.

Off-Site Private Drinking Water Wells

In 1987 EPA sampled and analyzed two private drinking water wells northwest of the site (Figure 21, Appendix A)(NUS 1988a). These wells are in the Floridan aquifer 60-350 feet deep. In March 1993 personnel from the Hillsborough County Public Health Unit sampled the only three private drinking water wells (depth unknown) currently in service within 0.25 mile of Stauffer (Figure 22, Appendix A) (CPHU 1993). The two wells sampled by EPA in 1987 are no longer in service. None of these wells contained any contaminants of concern (Table 13, Appendix B). An accurate survey of private wells in this area is needed.

Off-Site Deep Ground Water

Neither EPA nor Stauffer consultants have sampled the Floridan aquifer, hydraulically downgradient from Stauffer. Although the Tampa Bypass Canal intersects the upper Floridan aquifer and appears to be a discharge point, it may not intercept contamination deeper in the Floridan aquifer. We recommend that Stauffer fully delineate the vertical and lateral extent of contamination in the Floridan aquifer.

Off-Site Biota

The lack of analysis of fish from the Tampa Bypass Canal is a significant data gap because people eat fish caught in this canal. These fish may be contaminated as a result of past waste disposal practices at Stauffer. Although EPA and Stauffer did not find contamination in the bypass canal water itself, they did find low concentrations of pesticides and metals in the bypass canal sediments. They also found significant concentrations of alpha-BHC, chlordane, DDE, DDD, dieldrin, and arsenic in the water and sediments in the on-site drainage ditch that flows into the bypass canal. If the bypass canal sediments are contaminated, they could act as a source of contamination of the food chain. People who eat fish from the bypass canal may be exposed to these pesticides. Stauffer should collect 5-10 fish samples from the

bypass canal between the spillway downstream of the site (S-160) and the spillway upstream of the site (S-162). These fish samples should be of the kind and size that people catch and eat from this canal. They should analyze these fish samples for pesticides including Stauffer proprietary pesticides such as EPTC, Butylate, Vernolate, Fonofos, Pebulate, Molinate, Cycloate, etc.

C. Quality Assurance and Quality Control

In preparing this public health assessment, we relied on the information in the referenced reports and assumed that adequate quality assurance and quality control measures were followed regarding 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.

We requested but were unable to obtain a data review summary from EPA. We assume the data collected and analyzed by EPA are valid, however, since the environmental samples were collected and analyzed by a government agency or its contractor. We also assume the data collected and analyzed by Stauffer are valid. We assume that estimated data (J) and presumptive data (N) were valid. Assuming that presumptive data (N) are valid errors on the side of public health by assuming that a contaminant exists when actually it may not.

D. Physical and Other Hazards

If the site were not secured, the on-site ponds could be a drowning hazard for young children. The site is, however, surrounded by an 8-foot chain-link fence and patrolled by a caretaker during the day. Likewise, the empty buildings at the site could be a physical hazard if the site were not secured. We did not see any other potential physical hazards during our site visit.

PATHWAYS ANALYSES

To determine if people are exposed to contaminants migrating from this 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.

Table 16 (Appendix B) identifies the completed exposure pathways and Table 17 (Appendix B) identifies potential exposure pathways. We discuss in detail only those pathways that are relevant to this site.

A. Completed Exposure Pathways

Ambient Air Pathway

Inhalation of pesticide vapors and contaminated dust is a past, current, and future completed exposure pathway (Table 16, Appendix B). Surface soil, contaminated as the result of past disposal practices, is the source of contamination. Air is the medium and on site (including the Tampa Bypass Canal levee adjacent to Stauffer) is the point of exposure. The point of exposure may extend beyond the site boundaries but there are no off-site air monitoring data to confirm this possibility. The route of exposure is inhalation. One on-site caretaker and 1-5 people who fish daily from the levee adjacent to Stauffer are the exposed population. The exposed population may also include nearby workers, jail inmates, and residents but we cannot confirm this without off-site air sampling. Removal of highly contaminated soils by Stauffer in early 1993 reduced, but did not eliminate, the source of contamination for this pathway.

Incidental Soil Ingestion Pathway

Incidental ingestion of contaminated surface soil is a completed exposure pathway (Table 16, Appendix B). The on-site caretaker has been exposed to contaminants from incidental ingestion of the surface soil. Past disposal practices are the source, surface soil the medium, on site the point of exposure, and incidental ingestion the route of exposure. The caretaker is the person exposed. Removal of highly contaminated soils by Stauffer in early 1993 reduced, but did not eliminate, the source of contamination for this pathway.

B. Potential Exposure Pathways

Fish Consumption Pathway

Ingestion of pesticide-contaminated fish from the Tampa Bypass Canal is a past, current, and future potential exposure pathway (Table 17, Appendix B). Soil and water contaminated as the result of past disposal practices is the source of contamination. Stormwater run-off, sediment transport, and ground-water discharge have transported contaminants from the site to the Tampa Bypass Canal. Ingestion is the route of exposure. We estimate that between 5 and 50 people are potentially exposed. We base our estimate of the exposed population on the number of people we observed fishing from the levee and bridges near Stauffer. We categorize this exposure pathway as potential since there are no data to confirm that the fish are contaminated.

Incidental Soil Ingestion Pathway

Incidental ingestion of contaminated surface soil and sediment is a future potential exposure pathway (Table 17, Appendix B). Hillsborough County has expressed an interest in purchasing the southern half of the site for expansion of their detention facility. Although contamination is concentrated in the northern half of the site, pesticides were disposed of and have been found in low levels in the surface soil, drainage ditch water, and drainage ditch sediments of the southern half of the site. If soil and/or sediments on the southern half of the site are disturbed, construction workers, staff, and inmates could be exposed.

Past disposal practices are the source of the contamination. Surface soil and sediments would be the media, on site the point of exposure, and incidental ingestion the route of exposure. The size of the exposed population would depend on the number of workers and inmates on site. Removal of highly contaminated soils by Stauffer in early 1993 reduced, but did not eliminate, the source of contamination for this pathway. We categorize this exposure pathway as potential since it may occur in the future.

Ground-Water Ingestion Pathway

Ingestion of contaminated ground water is a potential past and future exposure pathway (Table 17, Appendix B). Much of Hillsborough County relies on the Floridan aquifer for their drinking water supply. Two large and three small water supply systems have wells within 2.5 miles of Stauffer. Although the nearest private wells are not contaminated, the extent of ground-water contamination has not yet been determined. In addition, former Stauffer employees may have ingested contaminated ground water.

Past disposal practices are the source of the contamination. Ground water would be the medium, on- and off-site wells the point of exposure, and ingestion the route of exposure. The size of the exposed population would depend on the number of workers and nearby residents drinking contaminated ground water. We categorize this exposure pathway as potential since it may have occurred in the past and may occur in the future.

C. Eliminated Pathways

We eliminated soil ingestion, surface water ingestion, and dermal contact by children as an exposure pathway since site trespass is unlikely and there are no plans for residential development. We also eliminated skin contact with, or ingestion of, pond water or sediments for the same reason. We eliminated exposure to the shallow ground water since data collected by Stauffer (ERM 1991) indicates flow in the shallow aquifer is southeast towards the Tampa Bypass Canal. Also, shallow ground water is not used in this area for drinking water or irrigation.

PUBLIC HEALTH IMPLICATIONS

In this section we discuss possible health effects for persons exposed to site contaminants and address community health concerns.

A. Toxicological Evaluation

Introduction

In this subsection, we discuss health effects that could occur in people exposed to site contaminants. To understand the health effects that might be caused by a specific chemical, it is helpful to review factors related to how the human body processes such a chemical. Those factors include the exposure concentration (how much), the duration of exposure (how long), and the route of exposure (breathing, eating, and drinking, or skin contact). Once exposure occurs, a person's individual characteristics such as age, sex, diet, general health, lifestyle, and genetics influence how the body absorbs, distributes, metabolizes, and excretes the chemical. Together these factors determine health effects that exposed people might have.

To evaluate health effects, ATSDR has developed Minimal Risk Levels (MRLs) for some contaminants commonly found at hazardous waste sites. An MRL is an estimate of daily human exposure to a contaminant (dose) below which non-cancer, adverse health effects are unlikely to occur. For some contaminants, ATSDR has developed MRLs by route of exposure; such as ingestion and inhalation, and for length of exposure, such as acute (less than 14 days), intermediate (15 to 364 days), and chronic (greater than 365 days). ATSDR publishes MRLs in a series of chemical-specific documents called Toxicological Profiles--documents that describe health effects, environmental transport, human exposure, and regulatory status of contaminants. MRLs are different from the standard comparison values used to select contaminants of concern in the previous Environmental Contamination and Other Hazards section. MRLs are dose estimates (milligrams per kilogram per day - mg/kg/day) while standard comparison values are media specific concentrations (micrograms per liter - µg/L in water, milligrams per kilogram - mg/kg in soil, milligrams per cubic meter - mg/m^3 in air). ATSDR derives standard comparison values from MRLs, which are derived from the toxicological literature.

In this section, we used standard assumptions to estimate human exposure from inhalation of contaminated air and dust, incidental ingestion of contaminated surface soil, and ingestion of contaminated ground water. Since neither EPA nor Stauffer have collected or analyzed fish from the Tampa Bypass Canal, we could not estimate the potential exposure from ingestion of contaminated fish.

To estimate exposure from inhalation of pesticide vapors or contaminated dust, we made the following assumptions: 1) adults working on this site or fishing on the levee adjacent to the site inhale about 1 cubic meter (m^3) of air per hour, or 8 m^3 of air per day, assuming an 8

hour workday, 2) these adults weigh 70 kilograms (kg), 3) these adults have been exposed for 35 years, and 4) these adults were exposed to the maximum air concentrations measured for each contaminant.

To estimate the potential exposure from incidental ingestion of contaminated surface soil (0-12 inches deep), we made the following assumptions: 1) adults working outdoors at this site ingest, incidentally, an average of 100 milligrams (mg) of soil per day, 2) these adults weigh about 70 kilograms (kg), 3) these adults have been exposed for about 35 years, and 4) they ingest surface soil at the maximum concentration measured for each contaminant.

alpha-BHC

The on-site caretaker has been exposed to alpha-BHC in the air and from incidental ingestion of the contaminated surface soil. Future on-site workers and inmates may also be exposed. The people who fish from the bypass canal levee near Stauffer have also been exposed to alpha-BHC in the air they breathe and possibly from the fish they catch and eat. We do not know if the fish in the bypass canal contain alpha-BHC or the risk from eating these fish. The maximum air and surface soil concentrations, however, are unlikely to cause adverse health effects.

Little is known about the noncancerous health effects of breathing alpha-BHC. ATSDR has not determined a Minimum Risk Level (MRL) for inhalation of alpha-BHC. The estimated daily dose of alpha-BHC from incidental ingestion of the contaminated surface soil, however, is less than the draft ATSDR intermediate Minimum Risk Level (MRL) (ATSDR 1989a, 1992a). Although there is no evidence of alpha-BHC causing cancer in humans, EPA has classified it as a probable human carcinogen based on limited animal testing. The air and surface soil concentrations are so low, however, that there is no apparent increased risk of cancer. Therefore, breathing alpha-BHC in the air and incidentally ingesting alpha-BHC in the surface soil at this site are unlikely to cause adverse health effects.

Chlordane

The on-site caretaker has been exposed to chlordane in the air and from incidental ingestion of the contaminated surface soil. Future on-site workers and inmates may also be exposed. The people who fish from the bypass canal levee near Stauffer have also been exposed to chlordane in the air they breathe and possibly from the fish they catch and eat. We do not know if the fish in the bypass canal contain chlordane or the risk from eating these fish. The maximum air and surface soil concentrations, however, are unlikely to cause adverse health effects.

The concentrations of chlordane in the air at Stauffer are less than the ATSDR intermediate Minimum Risk Level (MRL) for inhalation (ATSDR 1989c, 1992c). The estimated dose from incidental ingestion is also less than the acute, intermediate, and chronic MRLs for ingestion. Although there is no evidence of chlordane causing cancer in humans, EPA has

classified it as a probable human carcinogen based on limited animal testing. The air and surface soil concentrations are so low, however, that there is no apparent increased risk of cancer. Therefore, breathing the chlordane in the air and incidentally ingesting chlordane in the surface soil at this site are unlikely to cause adverse health effects.

DDT

The on-site caretaker has been exposed to DDT in the air and from incidental ingestion of the contaminated surface soil. Future on-site workers and inmates may also be exposed. Inhalation of DDT in the air or incidental ingestion of DDT in the surface soil at this site, however, is unlikely to cause noncancerous adverse health effects. There is no apparent increased risk of cancer from inhalation or incidental ingestion. The people who fish from the bypass canal near Stauffer may have been exposed to DDT in the fish they catch and eat. We do not know if the fish in the bypass canal contain DDT or the risk from eating these fish.

DDT is one of best known and widely studied pesticides. It was used extensively during World War II to control lice and other insects by application directly to humans. Numerous studies have been conducted in a variety of animal species. The human data, however, are more limited.

There is no ATSDR Minimum Risk Level (MRL) for inhalation of DDT (ATSDR 1989d, 1992b). Although the estimated dose of DDT from incidental ingestion of the contaminated surface soil for an adult working outdoors at this site is 16 times greater than the acute MRL for ingestion, we do not believe this dose will cause any acute health effects. The estimated dose of DDT from incidental ingestion of the contaminated surface soil for an adult working outdoors at this site is 60 times less than the dose shown to cause subtle behavioral changes in mice fed DDT one time (Eriksson et al. 1990a, 1990b; Eriksson and Nordberg 1986). Also, the estimated dose of DDT from incidental ingestion of the contaminated surface soil for an adult working outdoors at this site is 80 times less than the dose ingested by human volunteers without any observable adverse health effects (Hayes, et al. 1956).

Although there is no evidence of DDT causing cancer in humans, EPA has classified it as a probable human carcinogen based on limited animal testing. The air and surface soil concentrations at Stauffer are so low, however, that there is no apparent increased risk of cancer.

DDE

The on-site caretaker has been exposed to DDE from incidental ingestion of the contaminated surface soil. Future on-site workers and inmates may also be exposed. EPA did not detect DDE in the air. The people who fish in the bypass canal near Stauffer may have been exposed to DDE in the fish they catch and eat. We do not know, however, if the fish in the bypass canal contain DDE or the risk from eating these fish.

Since the estimated dose from incidental ingestion is less than the ATSDR acute Minimum Risk Level (MRL), it is unlikely on-site workers or inmates will suffer any noncancerous adverse health effects (ATSDR 1989d, 1992b). Although there is no evidence of DDE causing cancer in humans, EPA has classified it as a probable human carcinogen based on limited animal testing. The soil concentrations are so low that there is no increased risk of cancer from incidental ingestion of DDE in the surface soil.

DDD

The on-site caretaker has been exposed to DDD from incidental ingestion of the contaminated surface soil. Future on-site workers and inmates may also be exposed. EPA did not detect DDD in the air. The people who fish from the bypass canal near Stauffer may have been exposed to DDD from the fish they catch and eat. We do not know if the fish in the bypass canal contain DDD or the risk from eating these fish.

Since there is much more toxicity information on the closely related pesticide DDT, in this section we relate the concentrations of DDD to those of DDT. There is no ATSDR Minimum Risk Level (MRL) for inhalation of DDD or DDT (ATSDR 1989d, 1992b). Although the estimated dose of DDD from incidental ingestion of the contaminated surface soil for an adult working outdoors at this site is 6 times greater than the acute MRL for ingestion of the closely related pesticide DDT, we do not believe this dose will cause any acute health effects. The estimated dose of DDD from incidental ingestion of the contaminated surface soil for an adult working outdoors at this site is 170 times less than the dose shown to cause subtle behavioral changes in mice fed the closely related pesticide DDT one time (Eriksson et al. 1990a, 1990b; Eriksson and Nordberg 1986). Also, the estimated dose of DDD from incidental ingestion of the contaminated surface soil for an adult working outdoors at this is 200 times less than the dose of DDT ingested by human volunteers without any observable adverse health effects (Hayes, et al. 1956).

Although there is no evidence of DDD or DDT causing cancer in humans, EPA has classified it as a probable human carcinogen based on limited animal testing. The surface soil concentrations of DDD at Stauffer are so low, however, that there is no increased risk of cancer.

Dieldrin

The on-site caretaker has been exposed to dieldrin from incidental ingestion of the contaminated surface soil. Future on-site workers and inmates may also be exposed. EPA did not detect dieldrin in the air. The people who fish in the bypass canal near Stauffer may have been exposed to dieldrin in the fish they catch and eat. We do not know, however, if the fish in the bypass canal contain dieldrin or the risk from eating these fish.

Since the estimated dose from incidental ingestion is less than the draft acute and chronic ATSDR Minimum Risk Levels (MRLs), it is unlikely on-site workers or inmates will suffer

any noncancerous adverse health effects (ATSDR 1991a). Although there is no evidence of dieldrin causing cancer in humans, EPA has classified it as a probable human carcinogen based on limited animal testing. There is a low increased risk of cancer from incidental ingestion of dieldrin in the surface soil.

Toxaphene

The on-site caretaker has been exposed to toxaphene from incidental ingestion of the contaminated surface soil. Future on-site workers and inmates may also be exposed. EPA did not detect toxaphene in the air. The people who fish in the bypass canal near Stauffer may have also been exposed to toxaphene in the fish they catch and eat. We do not know, however, if the fish in the bypass canal contain toxaphene or the risk from eating these fish.

The dose we estimated from incidental ingestion of toxaphene in the surface soil slightly exceeds the ATSDR intermediate Minimum Risk Level (MRL) (ATSDR 1990). Although human health effects from ingestion of toxaphene in the surface soil at this site are not known for sure, we think they are unlikely. The MRL is based on inferior swimming ability in rats fed toxaphene at doses 100 times higher than the dose we estimated from incidental ingestion at this site.

Although there is no evidence of toxaphene causing cancer in humans, EPA has classified it as a probable human carcinogen based on limited animal testing. The surface soil concentrations at Stauffer are so low, however, that there is no apparent increased risk of cancer from incidental ingestion.

Arsenic

The on-site caretaker has been exposed to arsenic from incidental ingestion of the contaminated surface soil. Future on-site workers and inmates may also be exposed. EPA did not analyze for arsenic in the air. The people who fish in the bypass canal near Stauffer may have also been exposed to arsenic in the fish they catch and eat. The form of arsenic stored in fish, however, is not toxic to humans. Although there is no ATSDR Minimum Risk Level (MRL) for arsenic, the dose we estimated from incidental ingestion of the surface soil is less than the EPA chronic oral Reference Dose (RfD) (ATSDR 1989b, 1991b). Therefore, we do not expect any noncancerous adverse health effects from this exposure. Although arsenic is a known human carcinogen, the surface soil concentrations at Stauffer are so low there is no apparent increased risk of cancer from incidental ingestion.

B. Health Outcome Data Evaluation

We did not evaluate community health outcome data. Available environmental data indicate that nearby residents are not currently exposed to concentrations of site-related contaminants likely to cause adverse health effects. Although former residents may have been exposed to higher concentrations of chemicals, this area was sparsely populated in the 1940s and 1950s.

It is unlikely a search of state-wide health outcome data would detect an effect in such a small group. Therefore, there is little justification or community demand for an evaluation of health outcome data at this time. If future environmental investigations find other contaminants, we will evaluate health outcome data as appropriate.

C. Community Health Concerns Evaluation

We address community health concerns as follows:

1. One person was concerned that their private well is contaminated.

Although it is unlikely that contaminants from Stauffer have contaminated this person's well, we referred them to the Hillsborough County Public Health Unit for testing.

2. One person was concerned that their cancer, other unusual illnesses, and their child's birth defects are the result of drinking contaminated well water when they used to live in this area.

Since this person's well was between 0.5 and 0.75 mile hydraulically upgradient from Stauffer, it is unlikely that contaminants from Stauffer contaminated their well.

3. One person was concerned that health problems in their family were caused by exposure to pesticides and other chemicals from Stauffer and the Flag Sulphur Company (now Helena Chemical Company). Their family lived within 0.25 mile of these sites during the 1940s and 1950s. This person reported contaminated dust from these sites frequently covered their house, and children played in contaminated run-off from these sites. This person reported nausea, headaches, and burning sensation of the eyes and nose when the facility "cooked" or after a tank exploded. This person reported their father worked at Stauffer in the early 1950s, was diagnosed with periarteritis nodosa in 1961, and later died from complications of this disease. Other reported health problems in this family include: Grave's disease, difficulty in conceiving and spontaneous abortions, asthma, hiatal hernia, impaired circulation, and kidney problems.

It is likely people living near this site in the 1940s and 1950s were exposed to more chemicals and at much higher concentrations than today. We searched the toxicological literature for an association between the reported health effects and site-related chemicals. The causes of periarteritis nodosa and Graves' disease are unknown. Although the literature suggests an association between infertility and exposure to high levels of arsenic, there are no environmental data from the 1940s and 1950s to link the reported infertility with exposure to arsenic. Similarly, it is possible the reported asthma attacks, nausea, headaches, and burning sensation of the eyes and

nose could have all been caused or made worse by chemicals used at this site. Yet, without environmental data from the 1940s and 1950s on which to estimate exposure, we cannot link these health effects to chemicals from Stauffer. The following is a more detailed discussion of all of these health effects and possible causes.

Nausea, headaches, and burning sensation of the eyes and nose can be caused by any number of chemicals including, but not limited to, chemicals used at Stauffer. Although emissions from Stauffer are a possible source, without air sampling data from the 1940s and 1950s, we cannot link these health effects to chemicals from this site.

The cause of periarteritis nodosa, also known as polyarteritis nodosa (PAN) or Kussmaul's disease, is not known. Since its cause is not known, we do not know if there is any association with exposure to the chemicals used at this site. Although some of the pesticides found at Stauffer can cause nervous system effects such as headaches, dizziness, muscle twitching, tremors, convulsions, and seizures, their association with polyarteritis nodosa (PAN) is unknown. PAN is characterized by inflammation and necrosis (deterioration) of small and medium sized arteries. PAN is an uncommon, but not a rare disease. It is twice as common in males as females. The mean age at onset is 45 years. PAN is characterized by various symptoms depending on which organ the artery damage is most severe. Nonspecific signs and symptoms are the hallmark of classic PAN. Fever, weight loss, and malaise are present in over one-half of cases. Patients usually have vague symptoms such as weakness, malaise, headache, stiff and painful joints (arthritis), and muscle pain. The kidneys are often affected resulting in high blood pressure (hypertension) and kidney failure. The gastrointestinal tract may also be affected resulting in abdominal pain, nausea, vomiting, and bleeding. The nervous system, skin, and heart may also be affected. If left untreated PAN usually results in death from kidney failure, bowel perforations, or heart failure (Wilson et al. 1991).

The cause of Graves' disease is unknown. Since the cause of Graves' disease is not known, we do not known if there is an association with exposure to the chemicals used at Stauffer. Results from studies with rats and dogs given the site-related pesticide toxaphene in their food suggests that prolonged exposure may induce thyroid injury (Chu et al. 1986; 1988; NCI 1977). We do not know, however, if exposure to toxaphene or other site-related chemicals is associated with Graves' disease in humans. Graves' disease is characterized by an overactive and chronically enlarged (hyperplastic) thyroid gland. This condition is also known as a diffuse toxic goiter. An overactive thyroid (hyperthyroidism) releases too much of the thyroid hormone, thyroxine, in to the blood stream. This in turn causes excessive nervousness, excitability, tremors, and inability to sleep; excessive sweating and heat intolerance; increased heart rate and blood pressure; and frequent bowel movements and weight loss. Graves' disease is sometimes accompanied by bulging of the eyes (exophthalmos). In view of the varied manifestations of Graves' disease and their

differing courses, it is possible that no single factor is responsible for the entire syndrome. Graves' disease is a relatively common disorder that occurs at any age but is especially common in the third and fourth decade. It is more common in women than men. Genetic factors play an important role; there is a distinct familial predisposition to Graves' disease (Wilson et al. 1991).

Although there is evidence that one contaminant found at Stauffer, arsenic, can interfere with normal pregnancy, there is no environmental data from the 1940s or 1950s on which to a estimate exposure. Without this information, we cannot link arsenic exposures in the 1940s and 1950s to infertility in the 1970s and 1980s. Concentrations of arsenic at Stauffer now are not likely to interfere with a normal pregnancy. Difficulty in conceiving or infertility is defined as the failure to become pregnant after 1 year of unprotected intercourse. Infertility affects 10 to 15% of all couples. Male infertility is responsible for 40% of infertile couples. In women, tubal disease and endometriosis is responsible for 50% of the cases of female infertility, failure to ovulate for 30% of the cases, and a cervical factor for 10%. No cause is known for 10% of the infertile women (Wilson et al. 1991). There are several human epidemiological studies that have reported an association between exposure to inorganic arsenic and increased risk of adverse reproductive effects (birth defects, low birth weight, and spontaneous abortion), both by inhalation (Nordstrom et al. 1978a, 1978b, 1979a, 1979b) and by ingestion (Aschengrau et al. 1989; Zierler et al. 1988). However, in all of these studies the populations were exposed to a number of other chemical and risk factors which may have contributed to the observed effects, and these studies provide only suggestive evidence that arsenic was the cause. Studies with mice, rats, and hamsters also suggest that arsenic is toxic to the developing fetus, but only at levels that are also toxic to the pregnant female (ATSDR 1991b).

It is possible that inhalation of sulphur compounds from Stauffer in the 1940s and 1950s may have caused respiratory problems or made asthma attacks worse. Without air sampling data from this period, however, we cannot establish an association with reported cases of asthma. Asthma is a disease characterized by narrowing of the airways of the lungs and difficulty breathing. Asthma attacks usually only last a few minutes or few hours. Asthma occurs in about 10% of children and 5% of adults in the United States. Although the basic mechanism causing asthma is not known, factors that bring on asthma attacks or make them worse can be grouped into seven categories: allergens, drugs, air pollution, occupational exposures, infections, exercise, and emotional stress. Inhalation of sulfur dioxide or persulfates can cause respiratory problems or make asthma attacks worse. Ingestion of sulfiting agents, such as potassium metabisulfite, potassium and sodium bisulfite, sodium sulfite, and sulfur dioxide, can also produce acute airway obstruction in sensitive individuals (Wilson et al. 1991).

There is no known association of hiatal hernias with chemical exposure. A hiatal hernia is a protrusion of part of the stomach through the opening where the esophagus

passes through the diaphragm. It is usually caused by a weakening of the attachment between the esophagus and the diaphragm. The incidence of hiatal hernias increase with age to about 60% of the population by age 60 years. Hiatal hernias by themselves usually do not cause any clinical symptoms (Wilson et al. 1991).

The report of impaired circulation and kidney problems is not specific enough to assess. We were unsuccessful in obtaining more details about this complaint.

4. One person was concerned that their fibromyalgia was caused by pesticide exposure. This person forwarded a copy of the laboratory analysis of their blood for chlorinated pesticides, trimellitic anhydride, isocyanate, and formaldehyde exposure. This person's family also lived within 0.25 mile of Stauffer during the 1940s and 1950s and reported breathing contaminated dust and playing in the contaminated run-off as a child.

It is likely that people living near this site in the 1940s and 1950s were exposed to more chemicals and at much higher concentrations than today. We searched the toxicological literature for an association between fibromyalgia and site-related chemicals. Since the cause of fibromyalgia is not known, we do not know if there is an association with exposure to the chemicals used at Stauffer.

An analysis of this person's blood found the pesticide DDE at a concentration of 13.7 nanograms per milliliter liter (ng/ml). Since the biological half-lives for elimination of the DDT family members are: DDE>DDT>DDD; the low ratio of DDT and DDD to DDE in this person's blood indicates a past, as opposed to a recent, exposure. Unfortunately, there is not enough information to quantitatively correlate blood levels of DDT, DDD, or DDE with levels in the environment or with toxic effects (ATSDR 1989c).

An analysis of this person's blood also found the pesticide beta-BHC at a concentration of 0.6 nanograms per milliliter liter (ng/ml). Blood levels of beta-BHC have been found to reflect both the intensity and duration of exposure. Studies of pesticide production workers found that blood levels increase at a uniform rate for every year of exposure (Baumann et al. 1980). Other studies have found elevated blood levels of beta-BHC 10 to 15 years after the last exposure (Morgan 1978). Although it is apparent that this person has been exposed to beta-BHC, it is difficult to estimate their exposure based on pesticide production workers with blood concentrations 30 to 600 times higher. Nigam et al. (1986) and Kashyap (1986) documented complaints of paraesthesia (burning, pricking, tingling, or tickling sensation) of the face and extremities, headache, giddiness, malaise, vomiting, tremors, apprehension, confusion, loss of sleep, impaired memory, and loss of libido in pesticide production workers with concentrations of 0.07 to 0.72 parts per million (ppm) of beta-BHC in their blood. These blood levels, however, are about 100 to 1000 times higher than the levels in this person's blood (0.0006 ppm). We do not

know if the levels of beta-BHC in this person's blood could cause any or all of these same health effects.

The pesticides heptachlor epoxide, oxychlordane, and trans-nonachlor were also found in this person's blood at levels above the laboratory reported average. Detection of oxychlordane and trans-nonachlor indicates they have been exposed to chlordane. They may have also been exposed to heptachlor since heptachlor epoxide is a breakdown product of both chlordane and heptachlor. Unfortunately, there is no information to quantitatively correlate the blood levels of these pesticides with levels in the environment or with toxic effects (ATSDR 1993).

The reported antibody assay of this person's blood was inconclusive for exposure to trimellitic anhydride and isocyanate, but positive for exposure to formaldehyde. We do not believe that exposure to trimellitic anhydride, isocyanate, or formaldehyde, however, is related to Stauffer.

The cause of fibromyalgia is not known. Fibromyalgia, also known as fibrositis, is a common disorder characterized by musculoskeletal pain, stiffness, and easy fatigue. It affects mostly women between the ages of 25 and 45 years. Symptoms include generalized muscle pain and weakness, and generalized aching and stiffness of the trunk, hip and shoulders. Patients complain of waking up frequently at night, having trouble falling back to sleep, waking up tired, and feeling exhausted. Symptoms are made worse by stress or anxiety, cold, damp weather, and overexertion. Disorders commonly associated with fibromyalgia include irritable bowel syndrome, irritable bladder, headaches, and difficult or painful menstruation. Fibromyalgia is characterized by tender sites on the back and along the spine which are extremely more painful to the touch than adjacent areas (Wilson et al. 1991).

5. One person was concerned that their family's health problems (lung, kidney, and bladder) are related to living in this area during the 1940s and 1950s.

It is likely that people living in this area in the 1940s and 1950s were exposed to more chemicals and at much higher concentrations than today. We searched the toxicological literature for an association between the reported health effects and site-related chemicals. It is possible that inhalation of sulphur compounds from Stauffer in the 1940s and 1950s may have caused respiratory problems or made asthma attacks worse. Without air sampling data from this period, however, we cannot establish an association with the reported lung problems. Asthma is a disease characterized by narrowing of the airways of the lungs and difficulty breathing. Asthma attacks usually only last a few minutes or few hours. Asthma occurs in about 10% of children and 5% of adults in the United States. Although the basic mechanism causing asthma is not known, factors that bring on asthma attacks or make them worse can be grouped into seven categories: allergens, drugs, air pollution, occupational exposures,

infections, exercise, and emotional stress. Inhalation of sulfur dioxide or persulfates can cause respiratory problems or make asthma attacks worse. Ingestion of sulfiting agents, such as potassium metabisulfite, potassium and sodium bisulfite, sodium sulfite, and sulfur dioxide, can also produce acute airway obstruction in sensitive individuals (Wilson et al. 1991).

Without environmental data from the 1940s and 1950s on which to estimate exposure, we cannot link kidney or bladder problems to chemicals from Stauffer.

6. During contaminated soil excavation in February and March 1993, seven nearby residents and business owners complained of strong odors that caused runny noses, burning eyes, headaches, nausea, and one instance of coughing up blood.

During the February and March 1993 soil excavation, Stauffer contractors enclosed the work area in a tent to reduce the migration of contaminated dust and odors. Stauffer consultants monitored the air inside the tent and at the site boundary for methyl mercaptan. The average concentration of methyl mercaptan inside the tent was 10 parts per million (ppm). They detected methyl mercaptan once at the site boundary at a concentration of 0.1 ppm (EPA 1993). Methyl mercaptan can be smelled in the air at a concentration of about 0.002 ppm. Although the concentration measured at the site boundary was less than the standard for air in the work place, there is insufficient toxicological data to predict the health effects from breathing this concentration of methyl mercaptan (ATSDR 1992d).

CONCLUSIONS

Based on the information currently available, we classify this site as an indeterminate public health hazard. The limited available data do not indicate that humans are being exposed to levels of contamination expected to cause adverse health effects. Information is not available, however, for all environmental media to which humans may be exposed.

1. On-site air is contaminated with low levels of pesticide vapors and/or pesticide contaminated dust. On-site surface soil, subsurface soil, pond sediments, and drainage ditch sediments are also contaminated with pesticides. In early 1993, Stauffer reduced the risk of exposure to contaminants at this site by removing buried drums and storing highly contaminated surface and subsurface soil in an on-site building. Any future remediation that disturbs the soil or sediments, however, may still increase air concentrations beyond safe levels.

2. The on-site caretaker, a long-term Stauffer employee, has been exposed to pesticides at this site via inhalation and incidental ingestion for at least 20 years. Although the data do not indicate that current exposures are likely to result in adverse health effects, past exposures may have been much higher. This caretaker may have suffered health effects from past exposures and/or may suffer health effects in the future.

3. It is likely that stormwater run-off and ground-water discharge from this site have deposited pesticides in the Six Mile Creek/Tampa Bypass Canal sediments. EPA detected pesticides in the bypass canal sediments. EPA and Stauffer also found high levels of pesticides in the on-site pond sediments. These ponds are thought to be remnants of Six Mile Creek that were left after construction of the bypass canal. Three sediment samples are not enough, however, to adequately characterize the extent of contamination in the bypass canal.

4. Because people eat fish caught in the Tampa Bypass Canal adjacent to this site, the lack of fish analyses is a significant data gap. EPA found low concentrations of pesticides in the bypass canal sediments. Canal sediments can act as a source of contamination for the food chain in the canal. People who eat fish from the canal may be exposed to these pesticides.

5. Much of Hillsborough County relies on the Floridan aquifer for their drinking water supply. Two large and three small water supply systems have wells within 2.5 miles of Stauffer. Ingestion of contaminated ground water is a potential human exposure pathway. Although the nearest private wells are not contaminated, neither EPA nor Stauffer consultants have determined the vertical and lateral extent of contamination in the Floridan aquifer. Neither EPA nor Stauffer has determined the location and depth of nearby private wells.

6. We were unable to determine the source of drinking water for Stauffer employees from 1951 to 1986. Ingestion of contaminated ground water by Stauffer employees is a potential past exposure pathway. It is important to know the drinking water source for Stauffer employees in order to assess their health risk from past exposures.

7. There are no hazardous waste warning signs around this site. Although this site is fenced, Florida Statutes 403.704 and 403.7255 and Florida DEP Rule 17-736 require warning signs at all Superfund hazardous waste sites.

8. Sixty chemicals found in various media at this site lack enough toxicological data to determine their public health significance (Table 15, Appendix B).

RECOMMENDATIONS

Cease/Reduce Exposure Recommendations

1. Control contaminated dust generated during any future remediation and monitor ambient air concentrations. Stauffer should control the generation of contaminated dust during any future remediation that disturbs the surface soil or its vegetative cover, the subsurface soil, pond sediments, or drainage ditch sediments. Stauffer should also monitor the air, both on and off site, during any remediation to insure that health-based standards are not exceeded.

2. Consider medical evaluation and monitoring of the site caretaker. Stauffer, the Occupational Safety and Health Administration, or the National Institute for Occupational Safety and Health should consider medical evaluation and monitoring of this caretaker.

Site Characterization Recommendations

3. Collect and analyze 7-10 more sediment grab samples from the Tampa Bypass Canal between the site and spillway S-160. To adequately characterize the sediment quality in the bypass canal, Stauffer should collect 7-10 more sediment samples and analyze for pesticides including the proprietary pesticides specific to Stauffer.

4. Collect and analyze 5-10 fish samples from the Tampa Bypass Canal. To characterize the extent of site related fish contamination, Stauffer should collect 5-10 fish samples from the bypass canal between the spillway downstream of the site (S-160), and the spillway upstream of the site (S-162). These fish should be of the kind and size that people catch and eat. They should analyze these fish samples for pesticides including Stauffer's proprietary pesticides such as EPTC, Butylate, Vernolate, Fonofos, Pebulate, Molinate, Cycloate, etc.

5. Fully delineate the vertical and lateral extent of site-related contaminants in the Floridan aquifer. Determine the location and depth of nearby private wells.

6. Determine the source of drinking water for Stauffer employees from 1951 to 1986.

Public Education Recommendations

7. Post hazardous waste warning signs around this site as required by Florida Statutes 403.704 and 403.7255. To warn the public of the existence of hazardous waste at this site, Stauffer should post hazardous waste warning signs that comply with the requirements of Florida Statutes 403.704 and 403.7255 and DEP Rule 17-736.

Health Activities Recommendation Panel (HARP) Recommendations

The Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), as amended, requires ATSDR to take actions needed at hazardous waste sites. The data and information developed in the Stauffer Chemical Co. (Tampa Plant) Preliminary Public Health Assessment have been evaluated for appropriate public health actions. Because the available data and information do not indicate that adverse health effects are likely, the Health Activities Recommendation Panel (HARP) determined that there is no need for additional health follow-up actions at this time. If information becomes available indicating exposure at levels of concern, ATSDR will evaluate that information to determine what actions, if any, are needed.

PUBLIC HEALTH ACTIONS

This section describes what ATSDR and/or Florida HRS will do at the Stauffer Chemical Co. (Tampa Plant) site after the completion of this preliminary 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. ATSDR, Division of Toxicology, will develop oral and inhalation Minimal Risk Levels for intermediate and chronic exposures to DDT/DDE/DDD.

2. ATSDR, Division of Toxicology, will consider developing Toxicological Profiles for some of the 60 chemicals listed in Table 15, Appendix B.

3. ATSDR will recommend the Occupational Safety and Health Administration or the National Institute for Occupational Safety and Health consider a medical evaluation and monitoring of the site caretaker.

4. Florida HRS will review additional site data as they become available.

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

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CERTIFICATION

This Stauffer Chemical Co. (Tampa Plant) 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.

Technical Project Officer, SPS, RPB, DHAC

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

Director, DHAC, ATSDR

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APPENDIX A. FIGURES

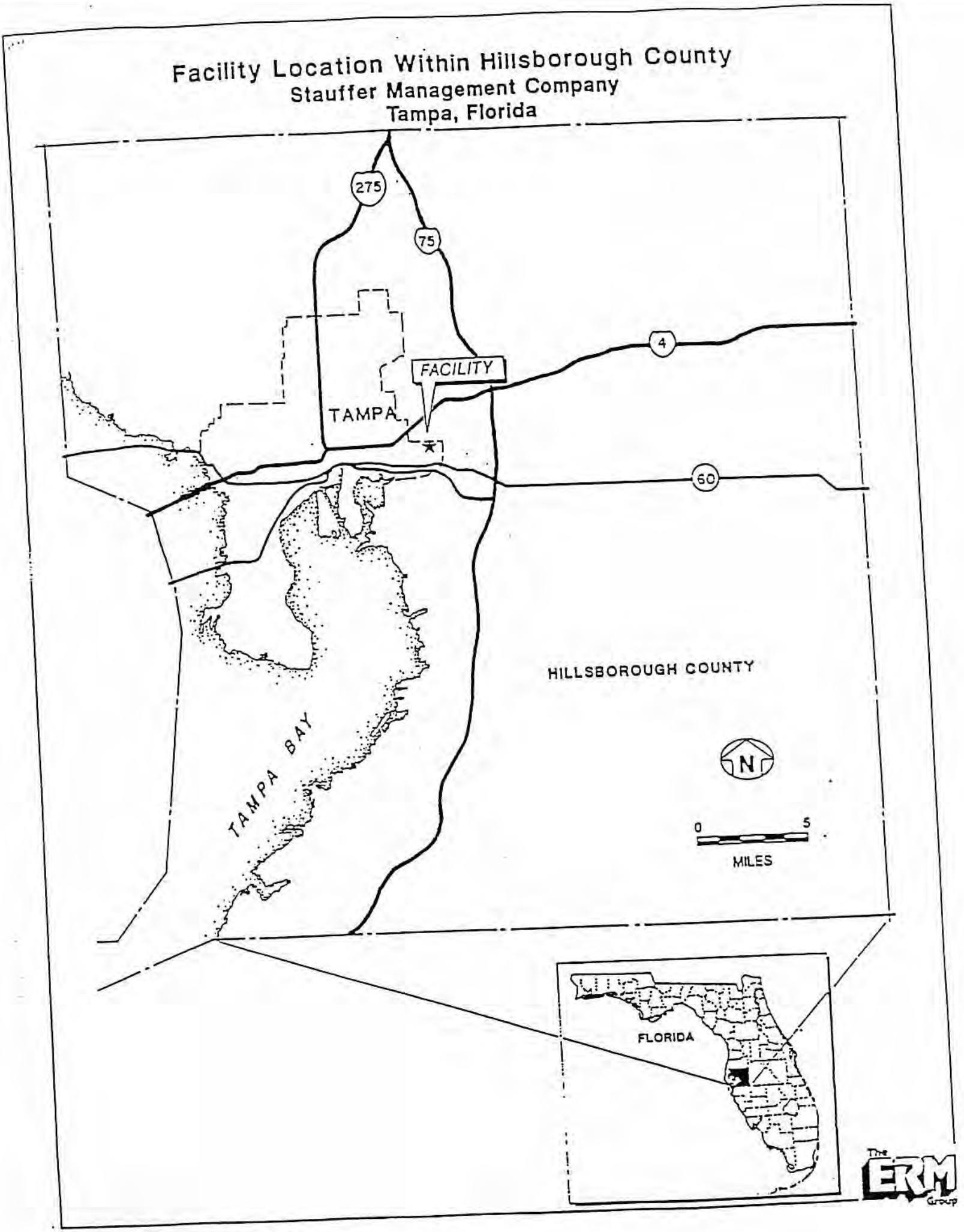
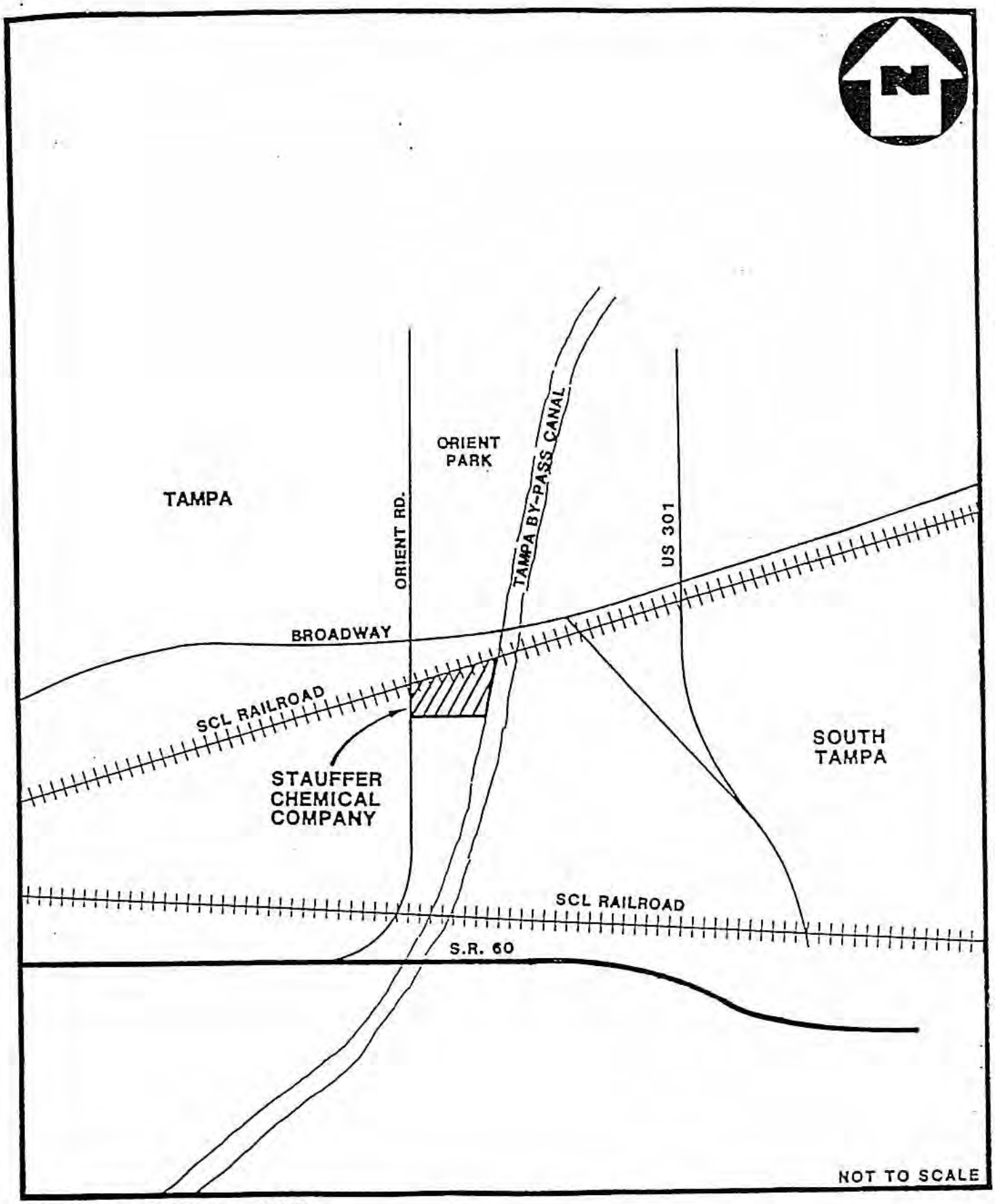


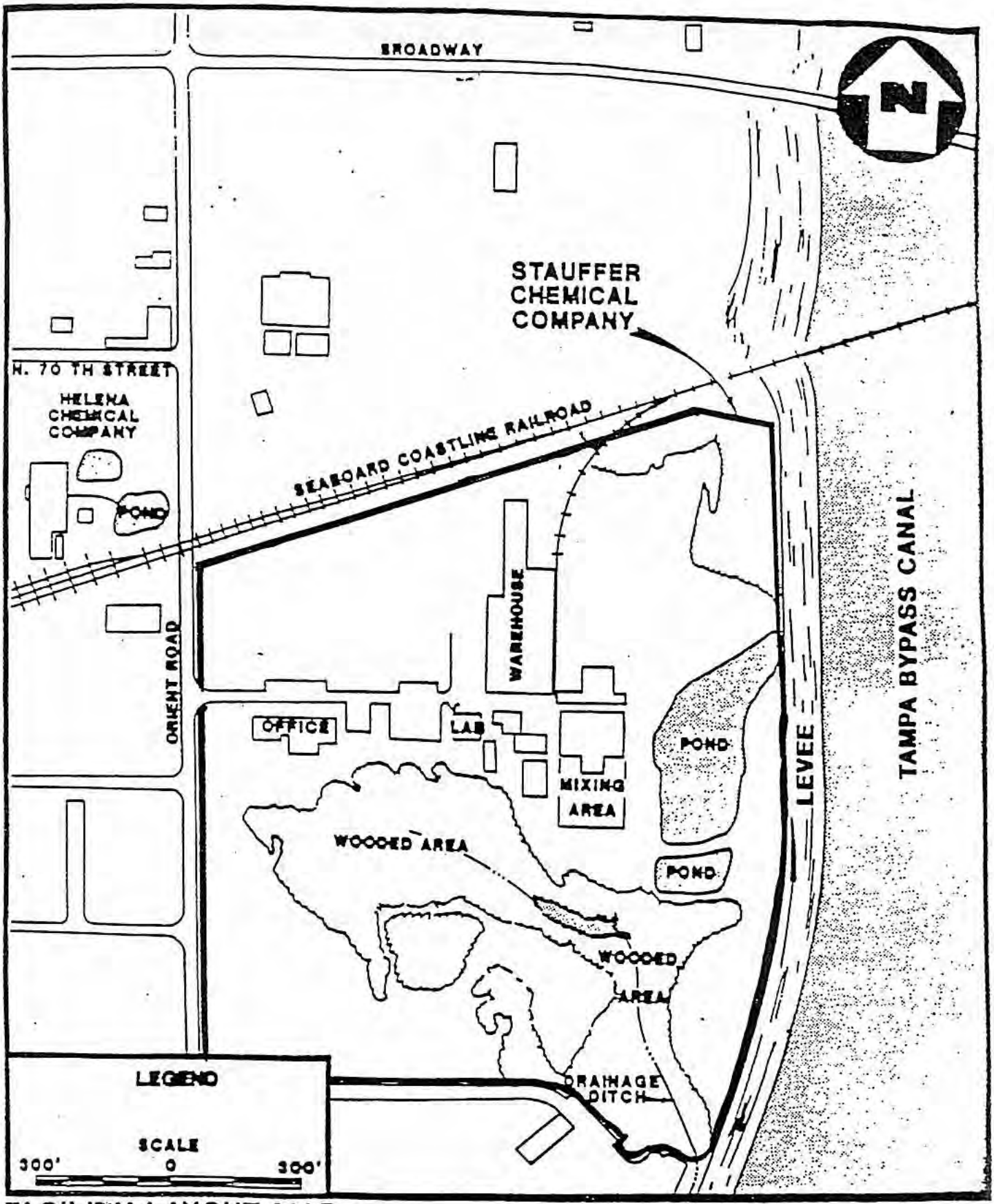
Figure 1. Regional Map



SITE LOCATION MAP
STAUFFER CHEMICAL COMPANY
HILLSBOROUGH COUNTY, FLORIDA

Figure 2. Area Map

NUS CORPORATION



FACILITY LAYOUT MAP
STAUFFER CHEMICAL COMPANY
TAMPA, FLORIDA

Figure 3. Site Map

NUS CORPORATION

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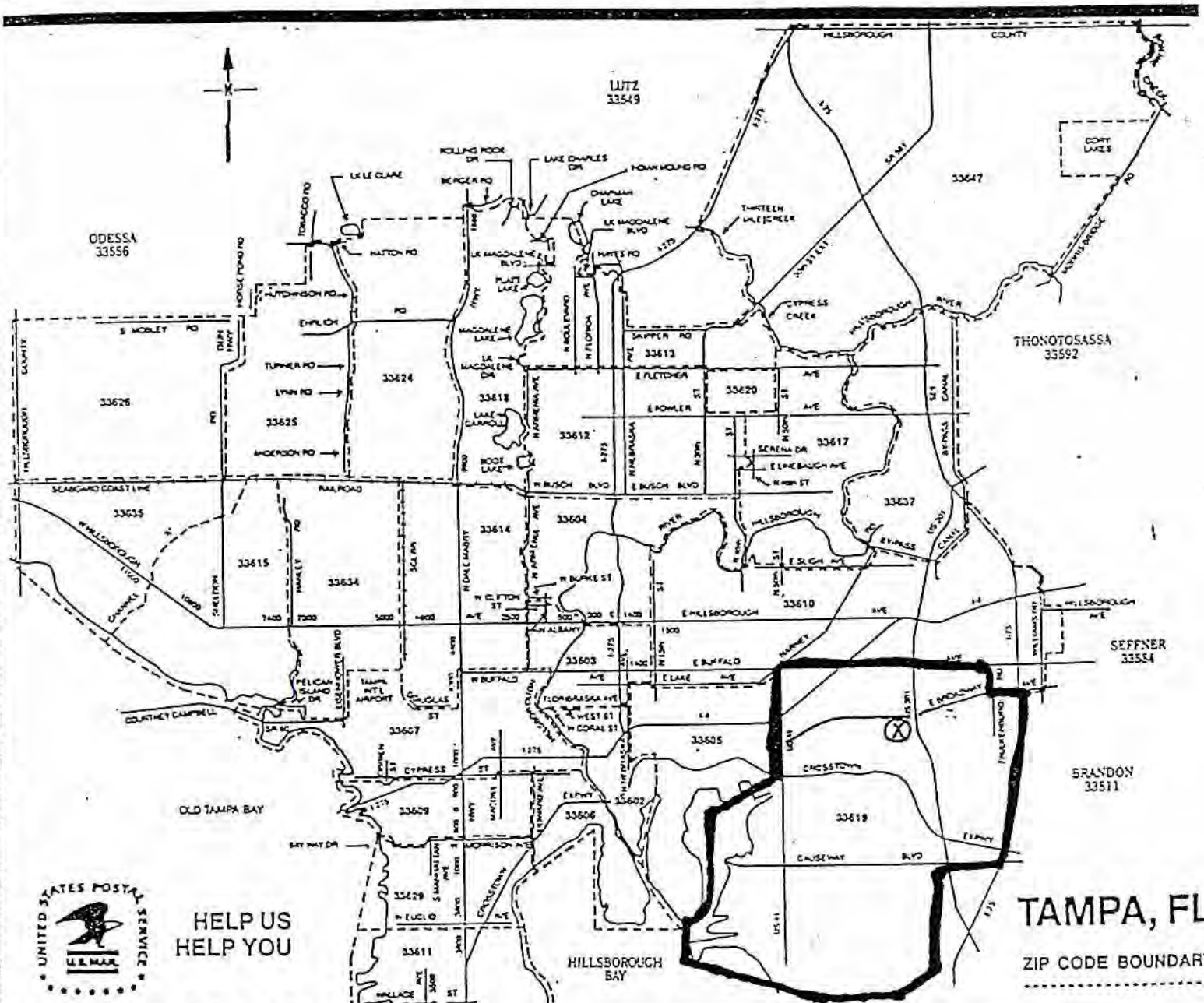
ZIP CODE MAP



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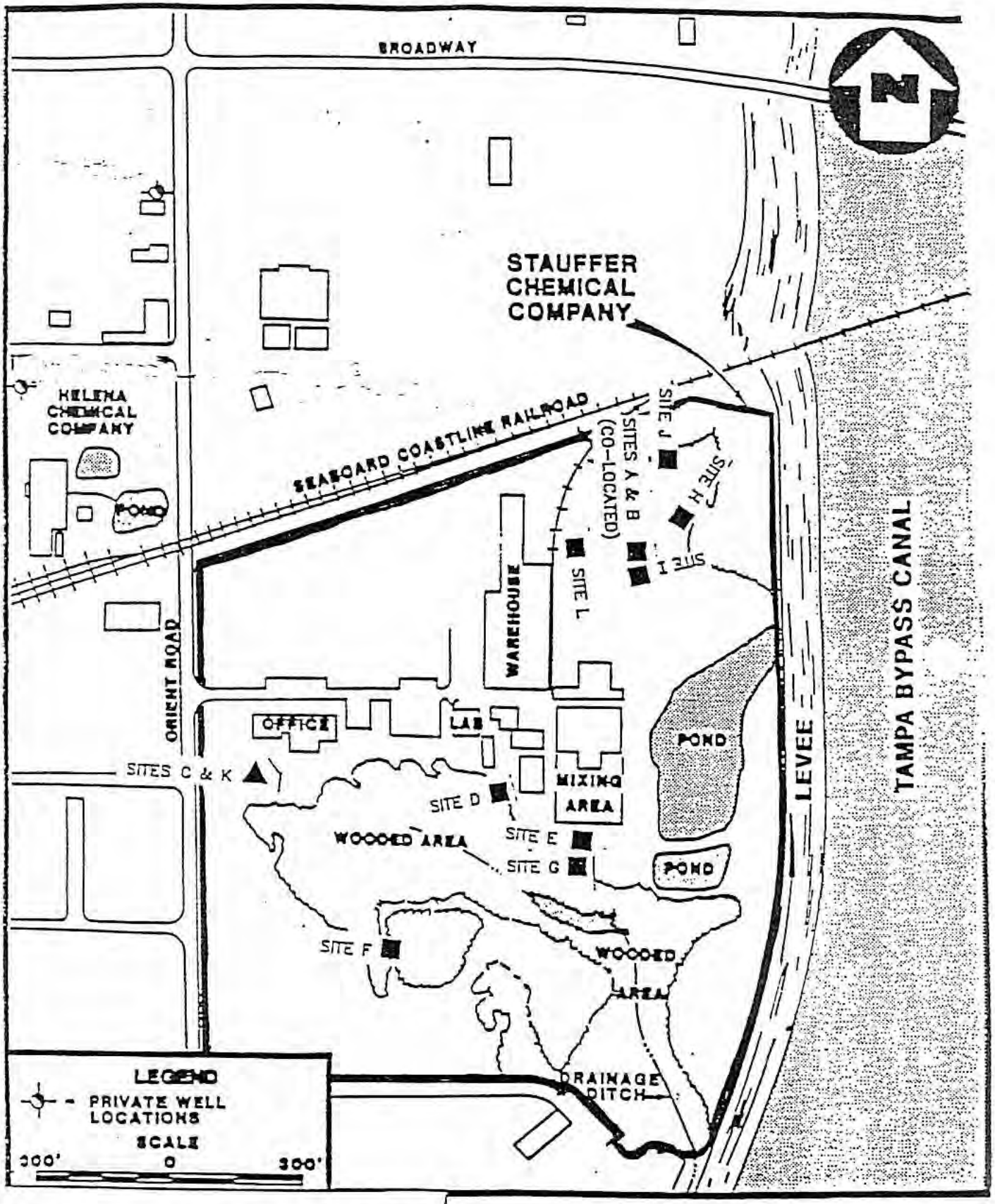
TAMPA POST OFFICE BOXES

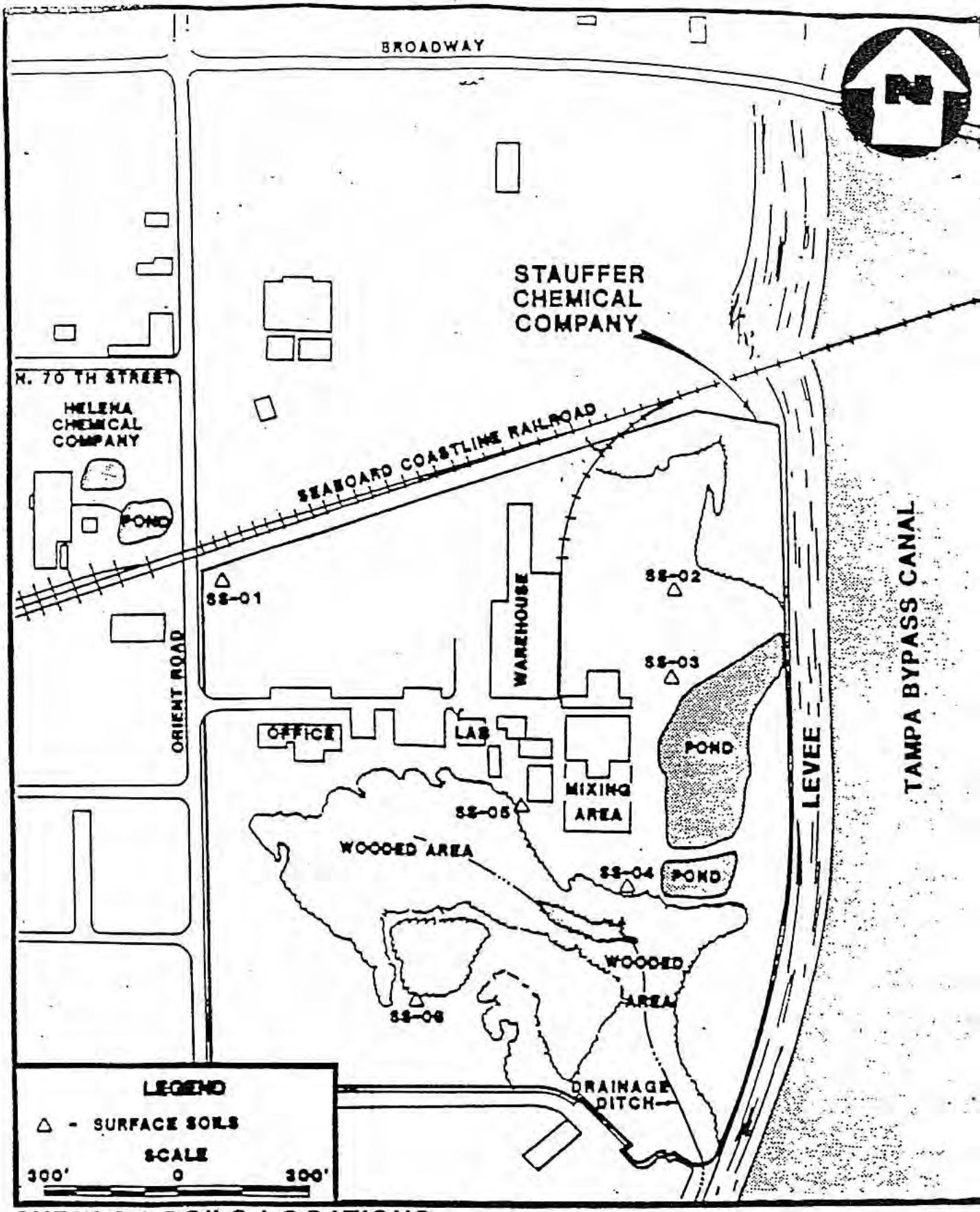
Box Nos.	Station	ZIP	Box Nos.	Station	ZIP
1-3999	Downtown	33601	151000-153198	Hilldale	33684
72001-72416	Downtown	33602	16001-16999	Temple Terrace	33687
172001-173736	Commerce	33672	290001-291589	Temple Terrace	33687
4001-4998	West Tampa	33677	17001-17994	Forest Hills	33682
5001-5998	Ybor City	33675	82001-82998	Forest Hills	33682
75001-76919	Ybor City	33675	280001-280598	Forest Hills	33682
6001-6844	MacDill AFB Branch	33608	19001-19538	Port Tampa City	33686
7000-7944	Seminole Heights	33673	20001-22997	Main Office	33622
8001-9800	Sulphur Springs	33674	23001-24994	Main Office	33623
10001-10944	Peninsula	33679	25001-25982	Main Office	33622
18001-18998	Peninsula	33679	26001-27996	Main Office	33623
320001-320956	Peninsula	33679	30000-30999	Main Office	33630
11001-11994	Produce	33680	31000-31999	Main Office	33631
310001-310999	Produce	33680	260061-263724	Town N Country	33665
13001-13999	Interbay	33681	270001-273575	Carrollwood	33658
130001-130540	Interbay	33681	340001-340617	Northdale Contract	33654
14151-14508	Palma Ceia Contract	33690	350001-350474	East Fletcher Contract	33695
79001-79300	Broadway Contract	33619	360001-360448	Seminole Heights	33673
15001-15999	Hilldale	33684	370001-370181	Bearss Plaza Contract	33697



STAUFFER CHEMICAL COMPANY
TAMPA, FLORIDA

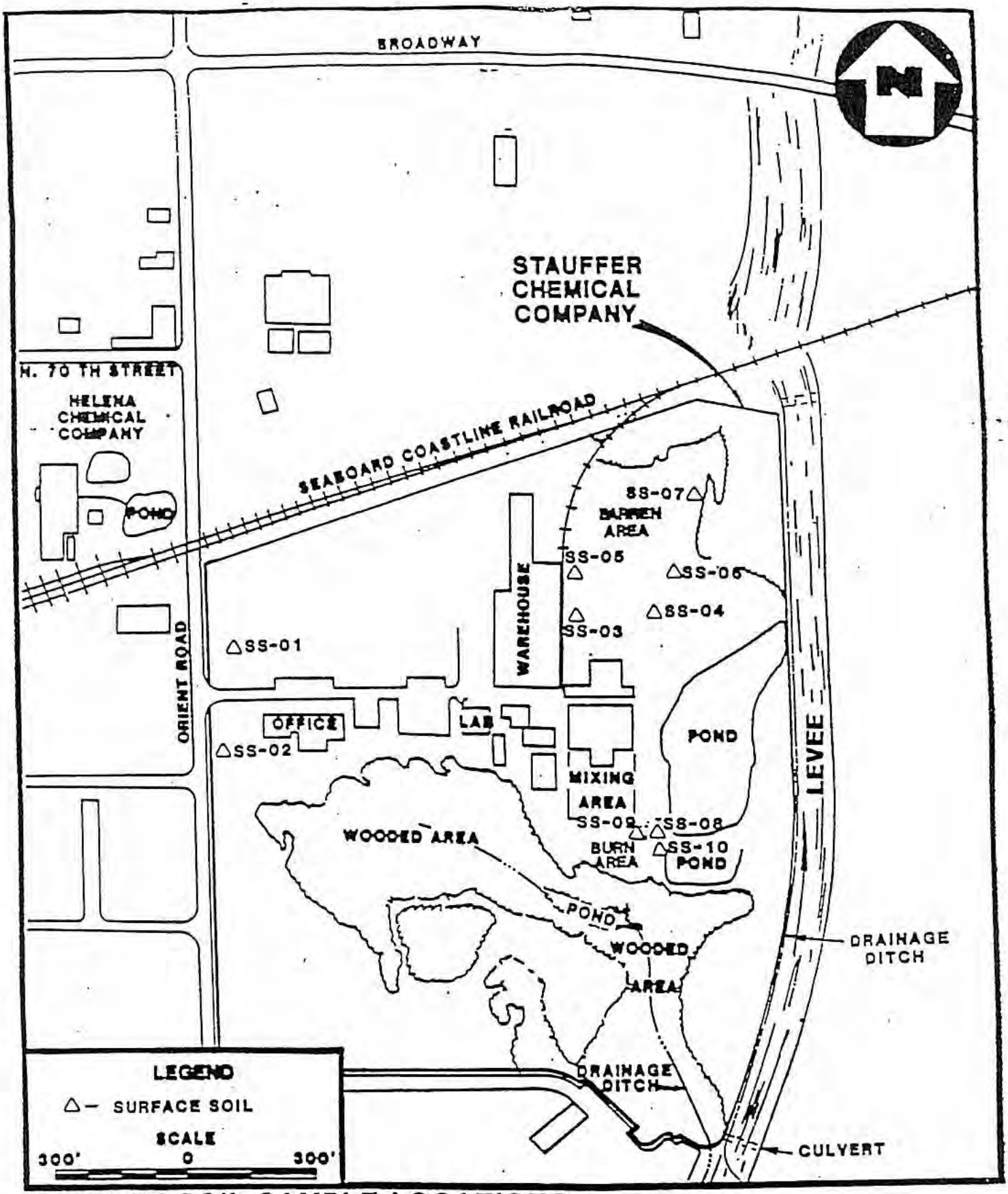
Figure 5. Air Monitoring Locations

▲ = BACKGROUND SITE



SURFACE SOILS LOCATIONS
STAUFFER CHEMICAL COMPANY
TAMPA, FLORIDA

Figure 6. 1987 Surface Soil Sample Locations



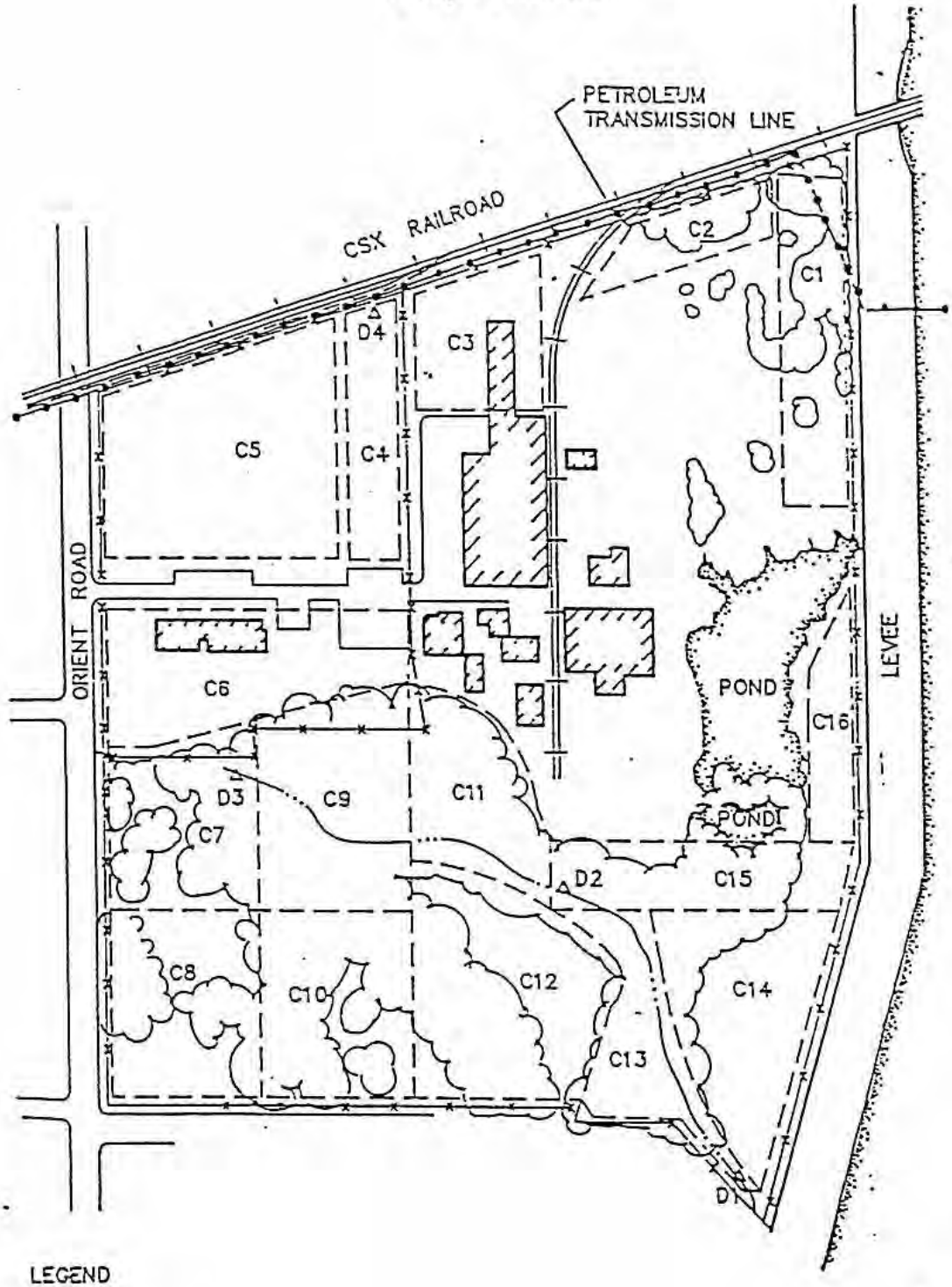
SURFACE SOIL SAMPLE LOCATIONS
STAUFFER CHEMICAL COMPANY
TAMPA, FLORIDA

Figure 7. 1988 Surface Soil Sample Locations

NUS CORPORATION

Location of Ditch Sample Points and Composite Soil Sample Areas

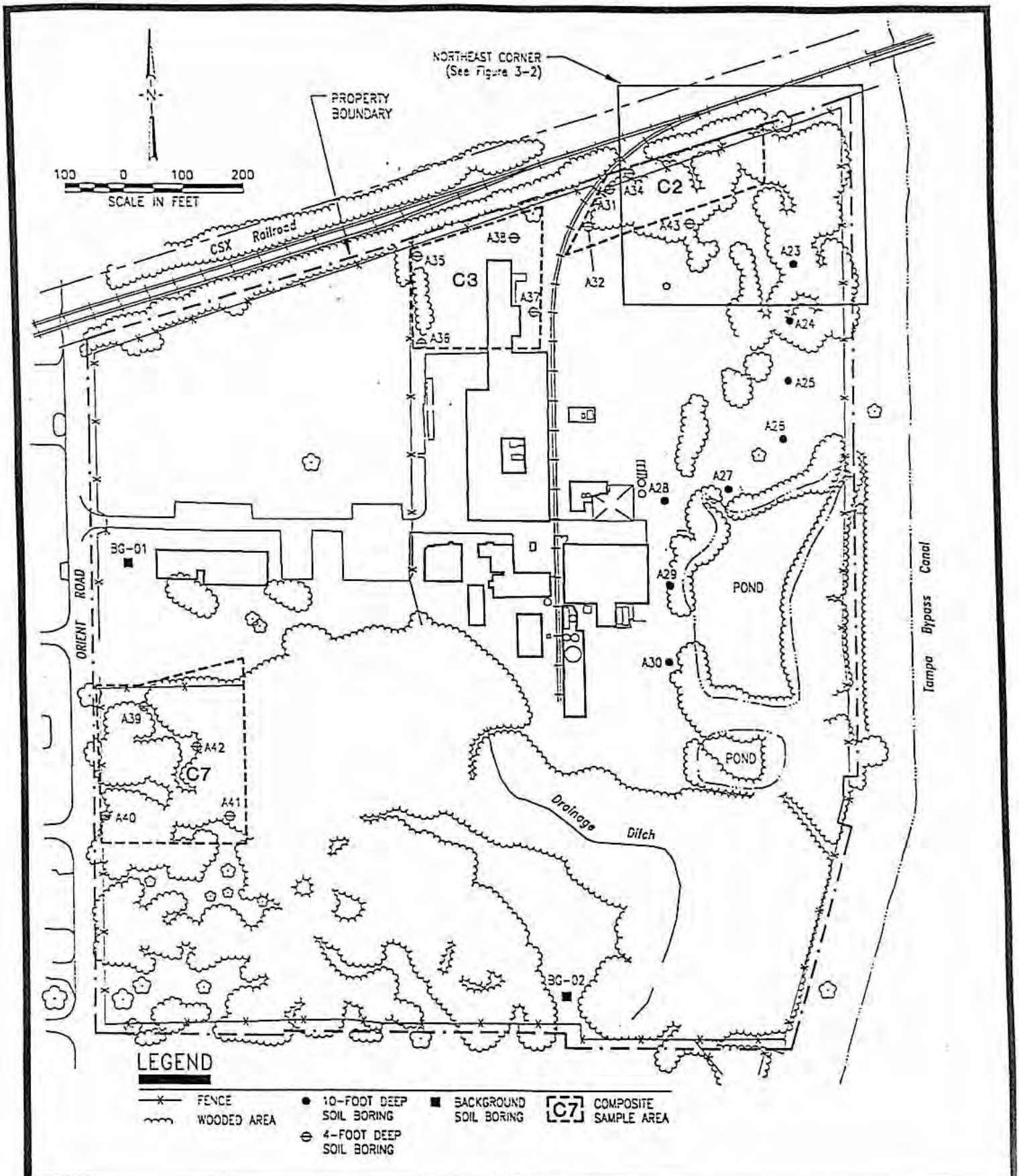
Stauffer Management Company
Tampa, Florida



LEGEND

- WOODED AREA
- DRAINAGE DITCH
- ΔD1 DITCH SAMPLE POINT
- C1 COMPOSITE SAMPLE AREA

The ERM

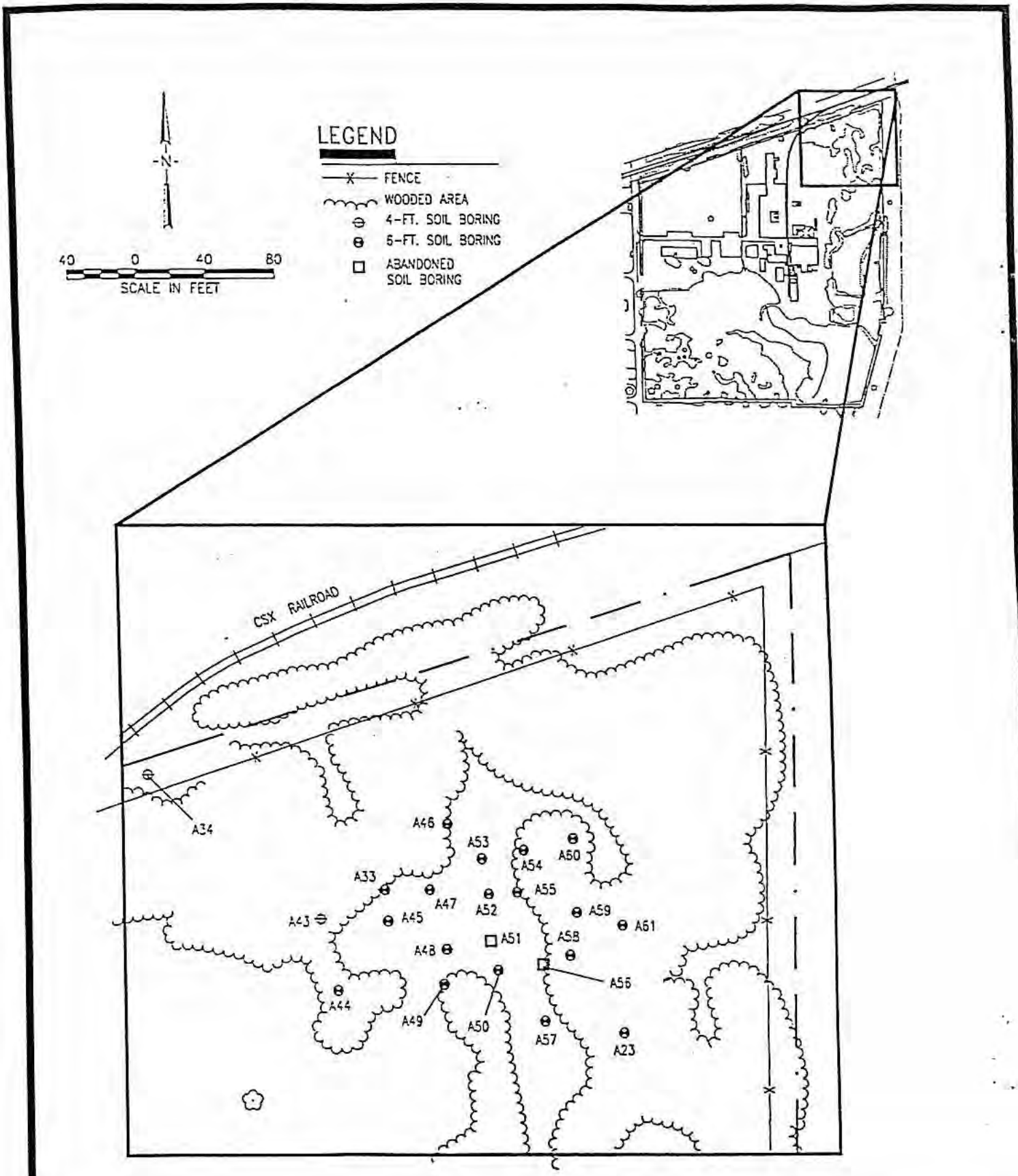


CAMP DRESSER & McKEE INC.

SOIL BORING LOCATIONS
1991 CDM SITE INVESTIGATION
STAUFFER MANAGEMENT COMPANY
TAMPA, FLORIDA

CDM

Figure 9. Soil Sample Locations

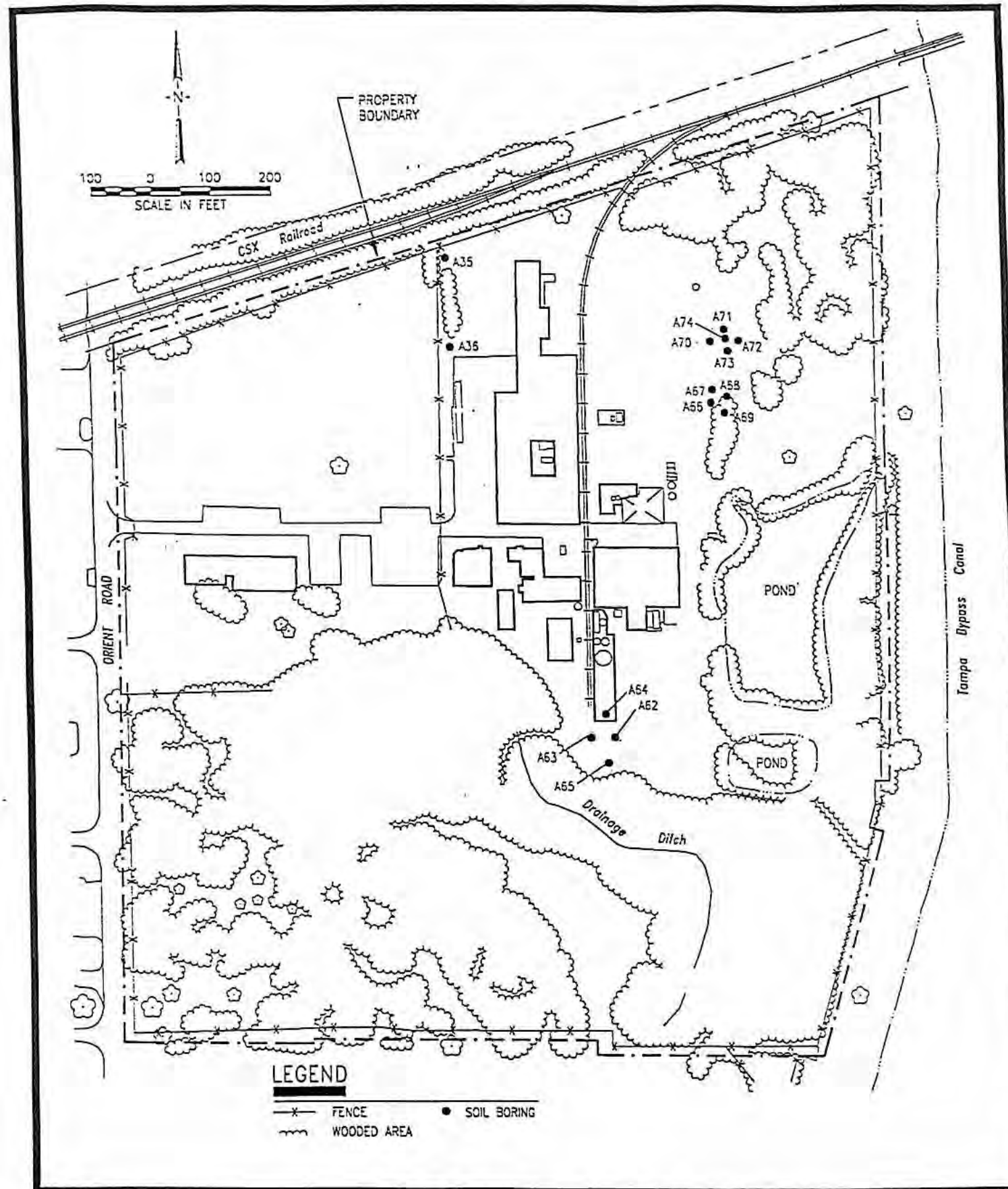


CAMP DRESSER & McKEE INC.

SOIL BORING LOCATIONS IN NORTHEAST CORNER OF STORAGE AREA
1991 CDM SITE INVESTIGATION
STAUFFER MANAGEMENT COMPANY
TAMPA, FLORIDA

CDM

Figure 10 Soil Sample Locations

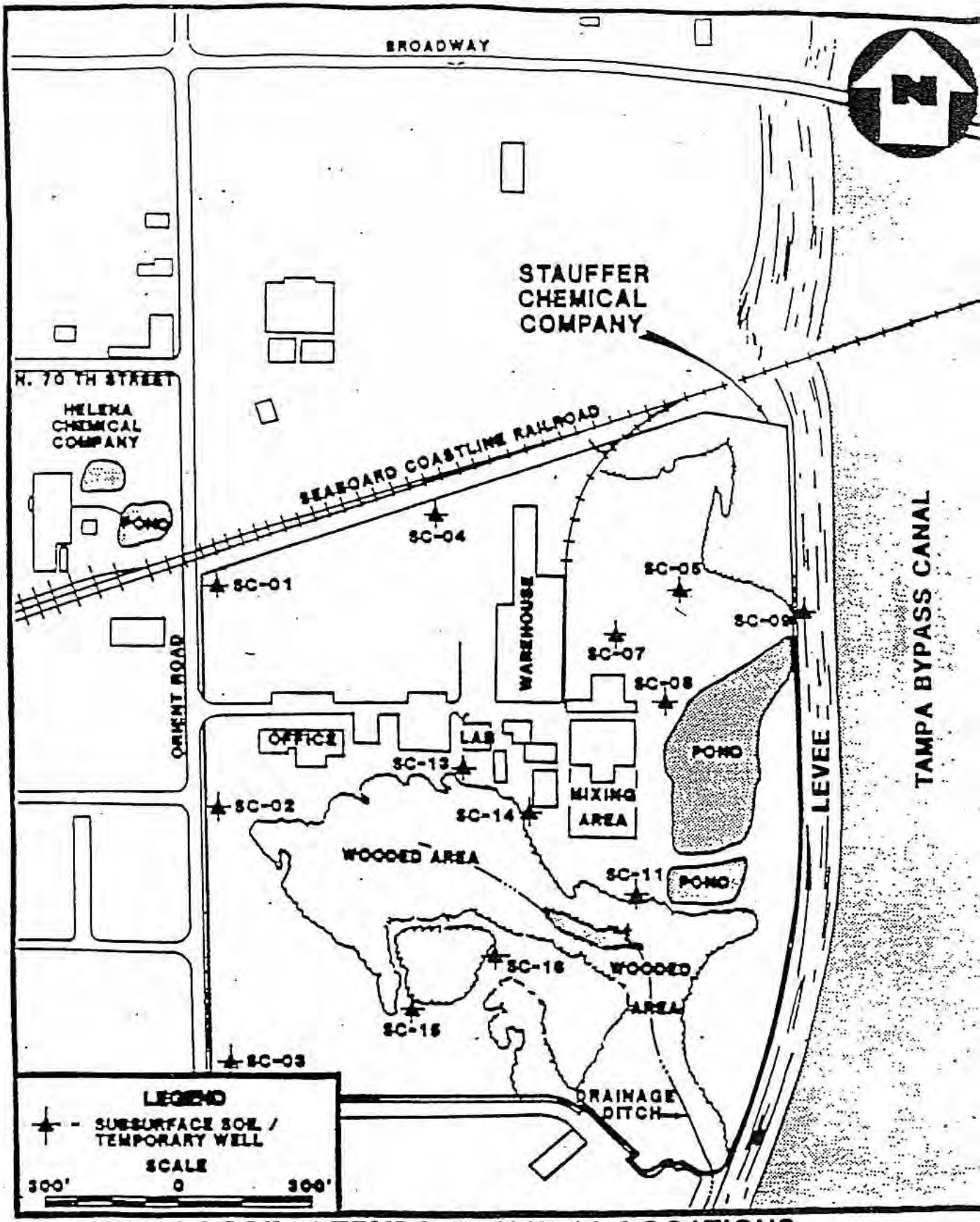


CAMP DRESSER & McKEE INC.

SOIL BORING LOCATIONS
1992 CDM SITE INVESTIGATION
STAUFFER MANAGEMENT COMPANY
TAMPA, FLORIDA

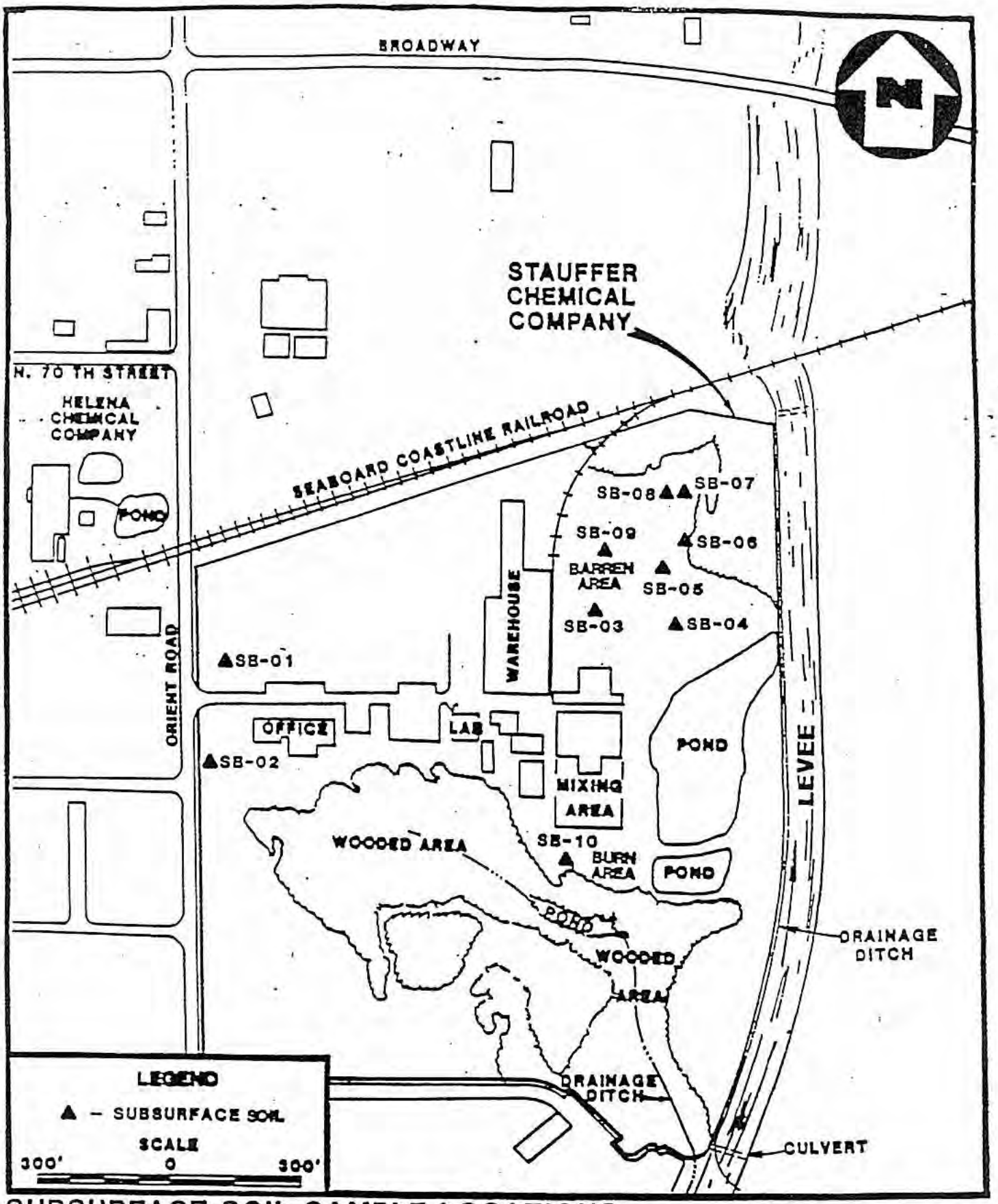
CDM

Figure 11. Soil Sample Locations



SUBSURFACE SOIL / TEMPORARY WELL LOCATIONS
STAUFFER CHEMICAL COMPANY
TAMPA, FLORIDA

Figure 12. Subsurface Soil and Shallow Ground Water Sample Locations

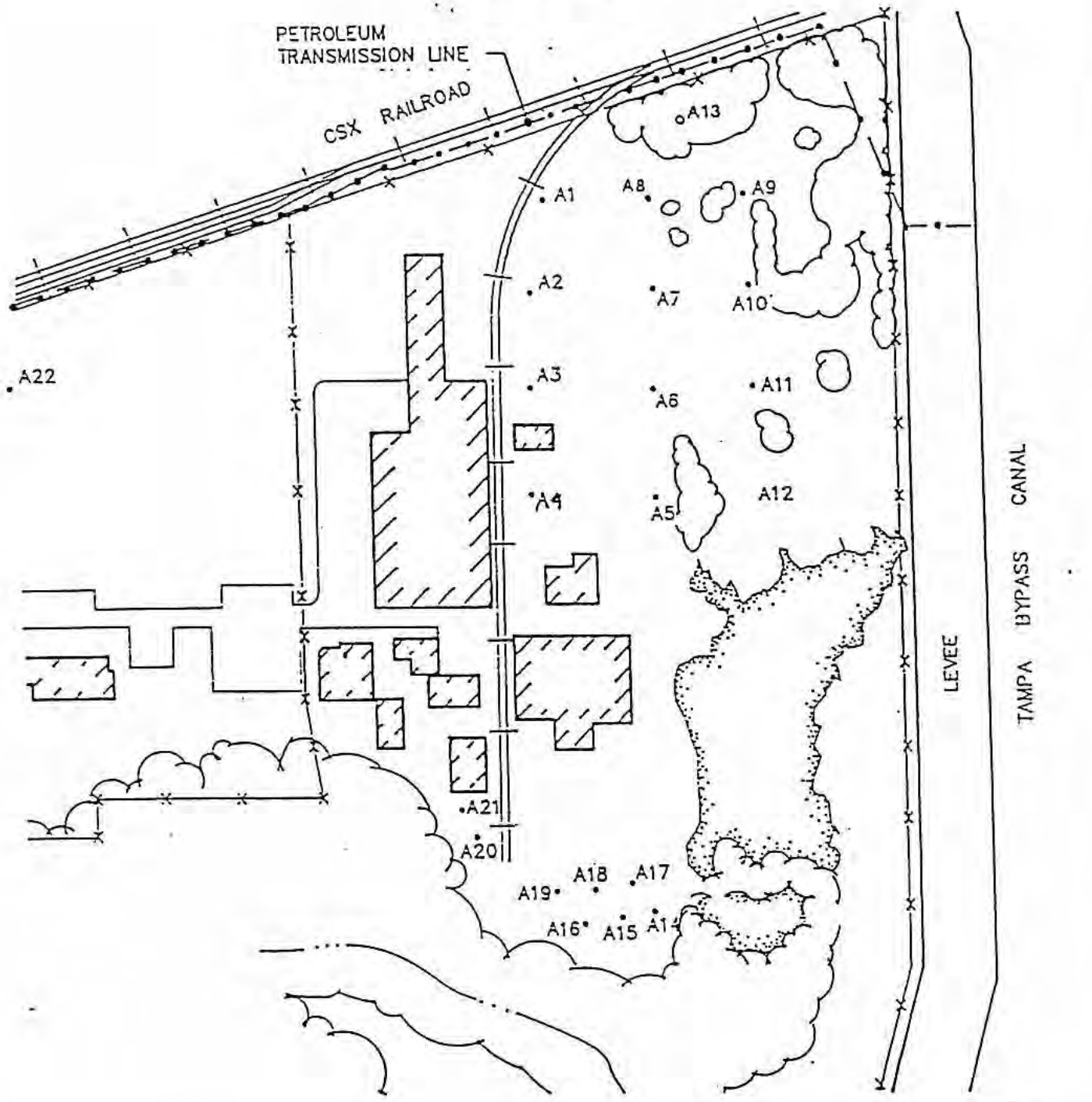


SUBSURFACE SOIL SAMPLE LOCATIONS
STAUFFER CHEMICAL COMPANY
TAMPA, FLORIDA

Figure 13. Subsurface Soil Sample Locations

NUS CORPORATION

Deep Soil Boring Sample Locations
Stauffer Management Company
Tampa, Florida

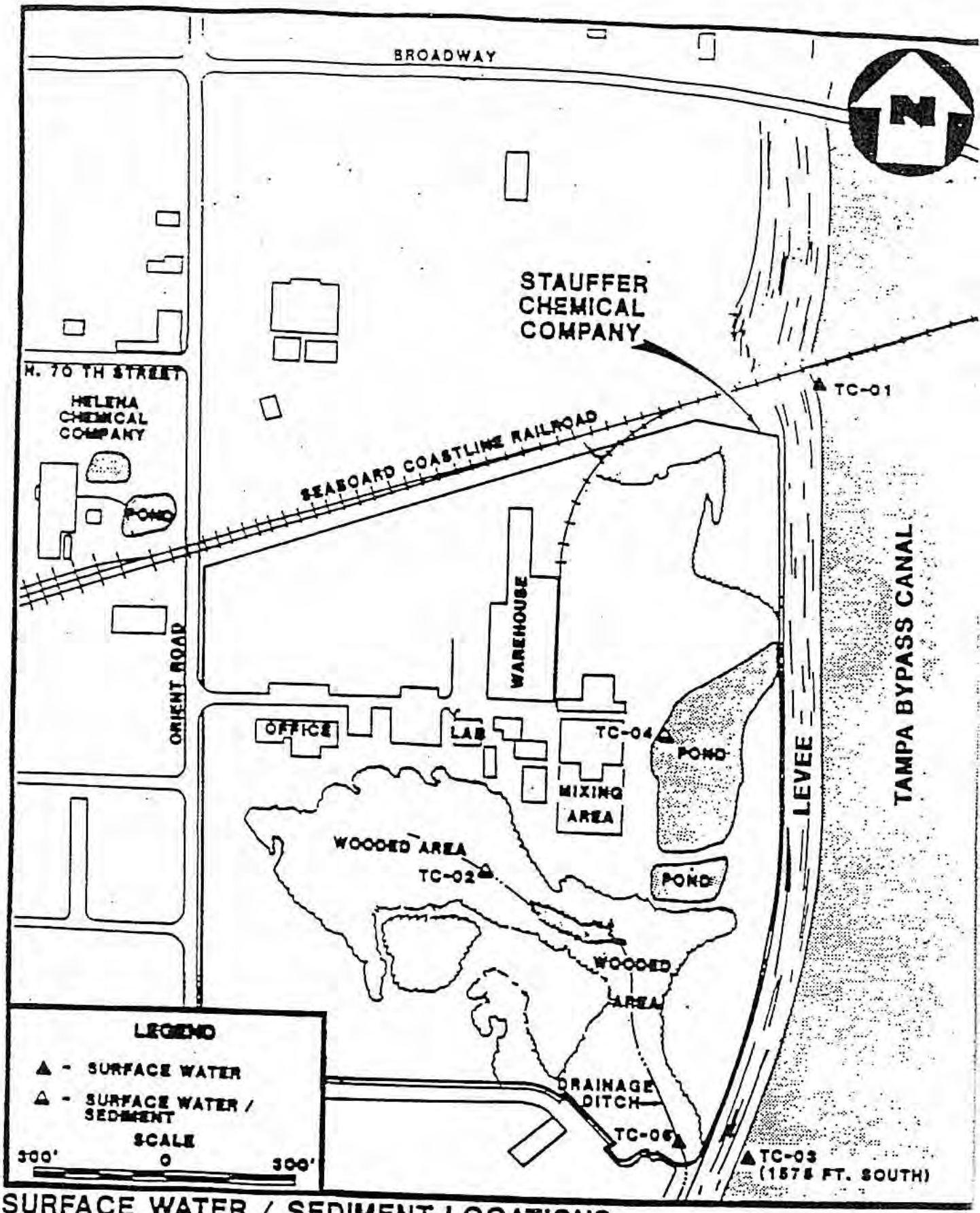


LEGEND

- BUILDINGS & STRUCTURES
- ● A1–A22 10 FT. DEEP SOIL BORINGS
- ○ A13 SAMPLE NOT COLLECTED DUE TO LIMITED ACCESS

The ERM

14082.01/408DSB/121190

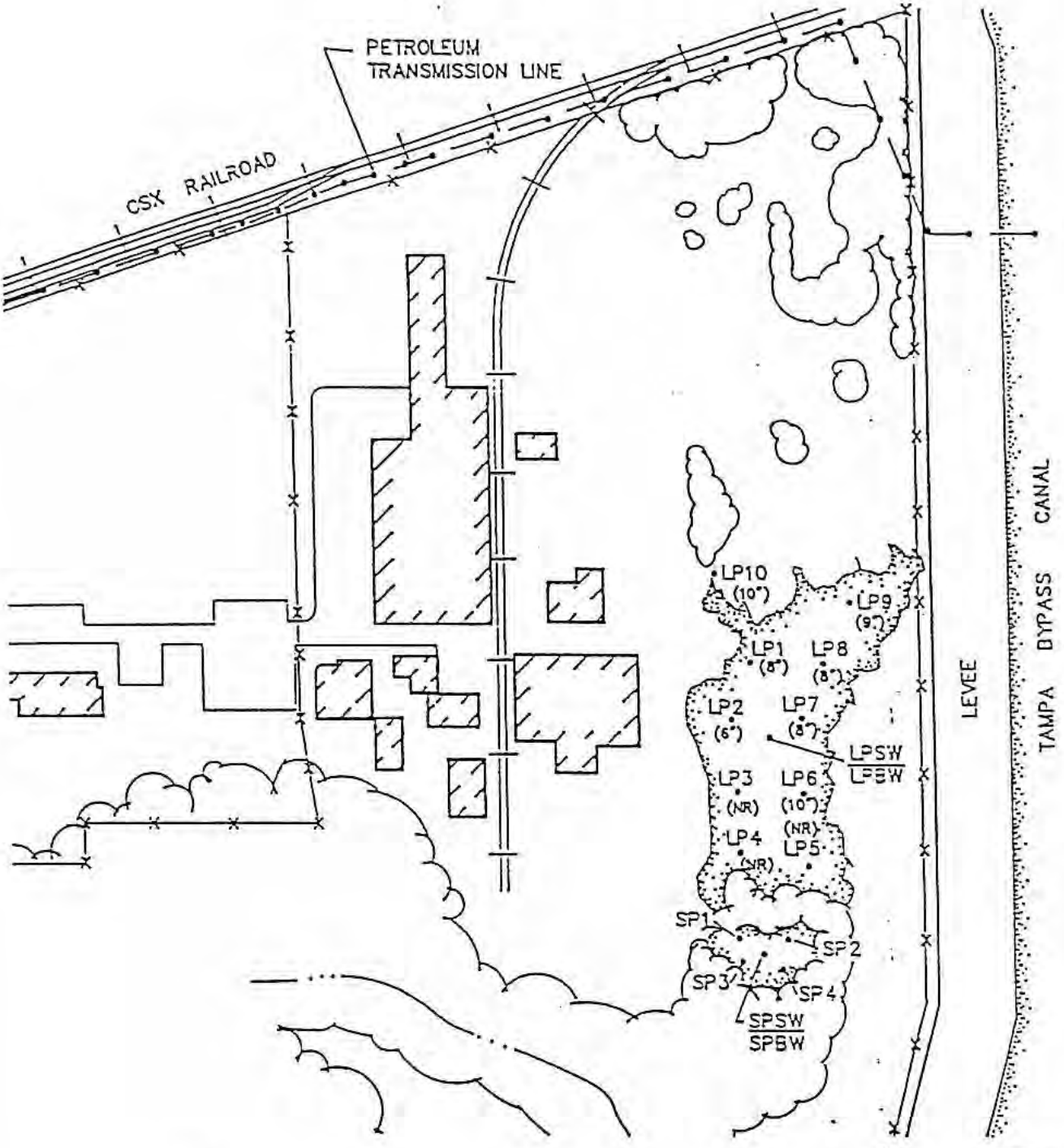


SURFACE WATER / SEDIMENT LOCATIONS
STAUFFER CHEMICAL COMPANY
TAMPA, FLORIDA

Figure 15. Surface Water and Sediment Sample Locations

NUS CORPORATION

Pond Sampling Locations
Stauffer Management Company
Tampa, Florida

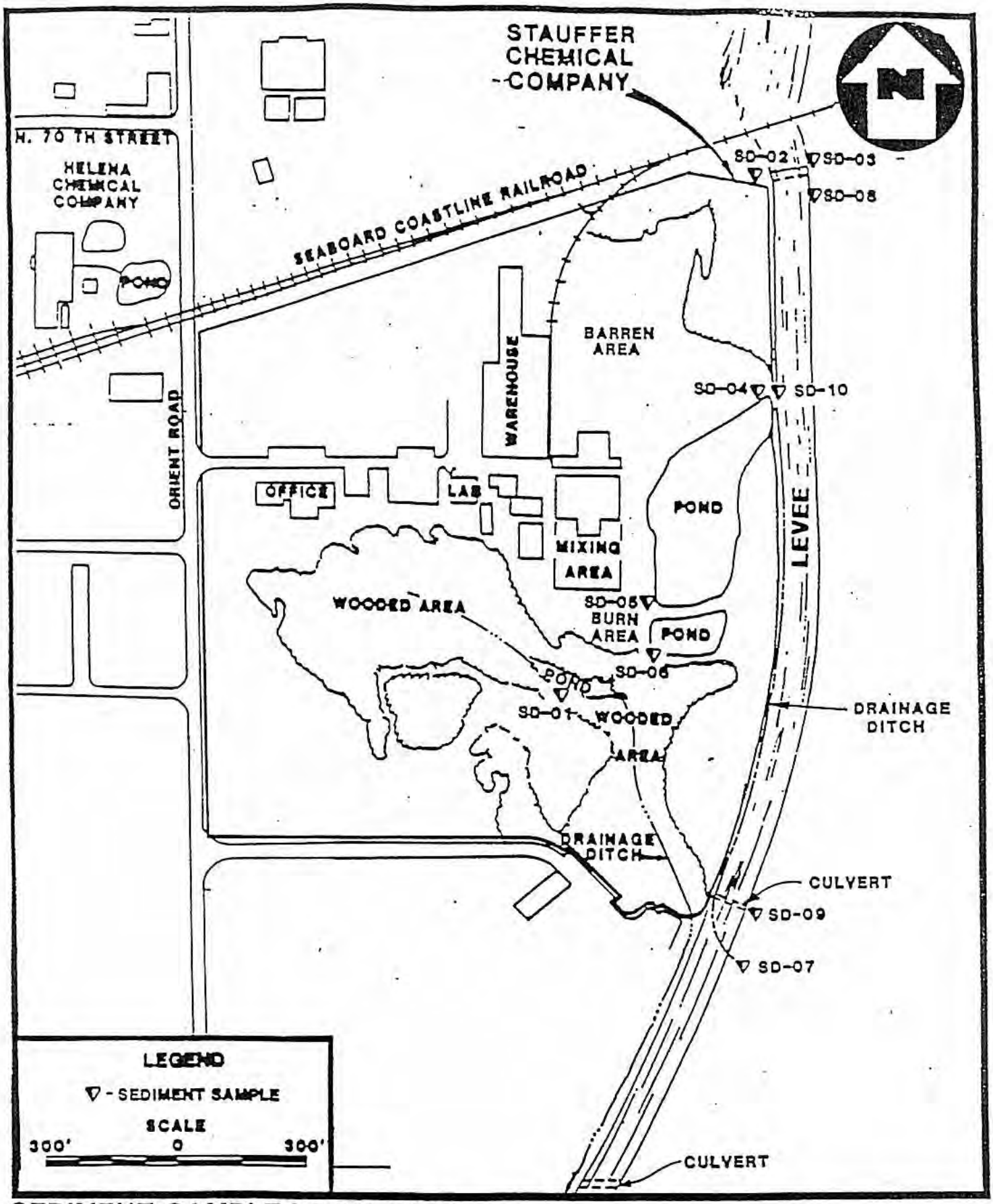


LEGEND

▨	BUILDINGS & STRUCTURES
(NR)	SEDIMENT DEPTH NOT RECORDED
• LP1–LP10	LARGE POND SEDIMENT SAMPLE
• SP1–SP4	SMALL POND SEDIMENT SAMPLE
• LP & SPSW	LARGE/SMALL POND SURFACE WATER SAMPLE
• LP & SPBW	LARGE/SMALL POND BOTTOM WATER SAMPLE
(10")	APPROXIMATE THICKNESS OF SEDIMENT

0 200
FEET

14082.01/

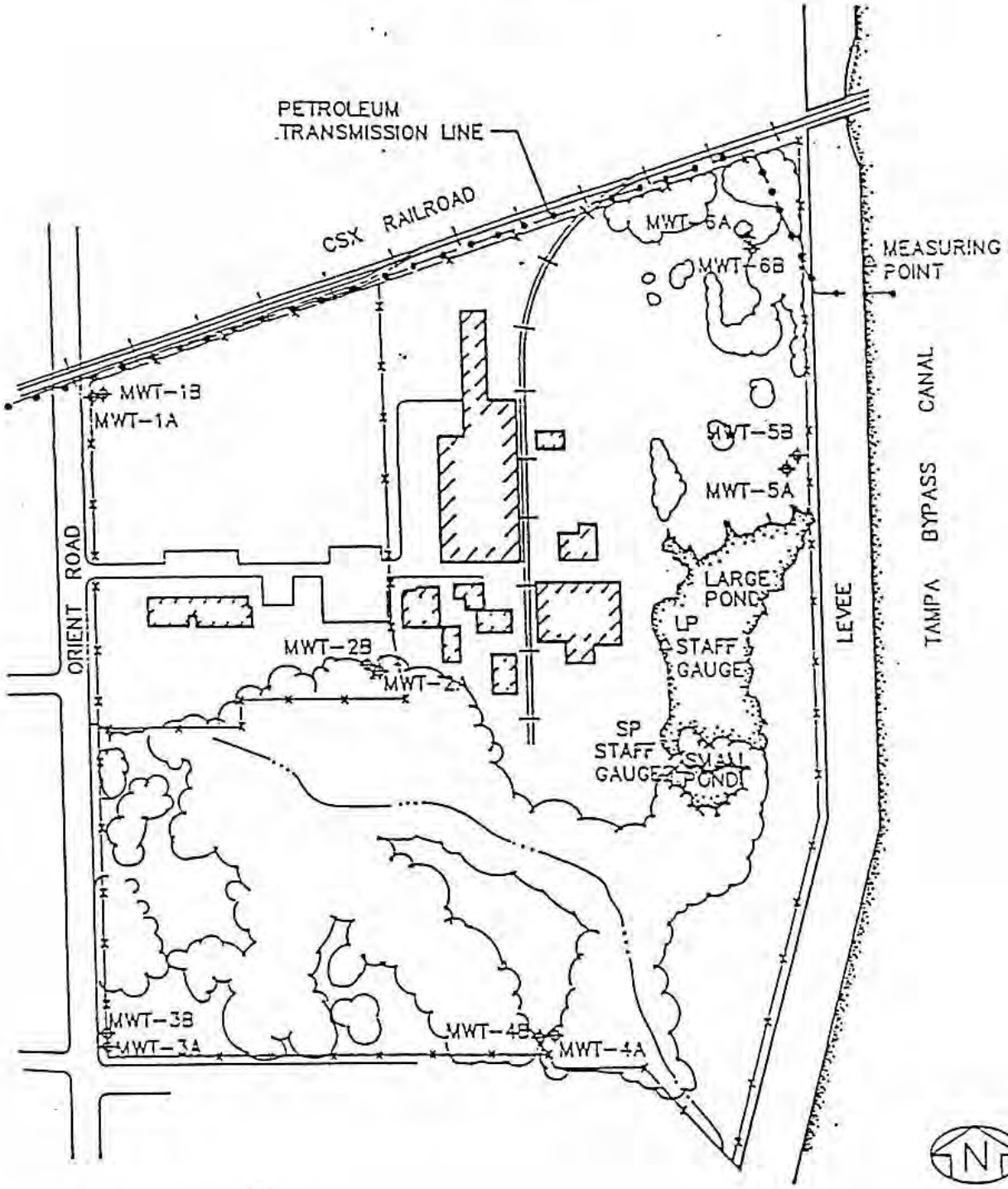


SEDIMENT SAMPLE LOCATIONS
STAUFFER CHEMICAL COMPANY
TAMPA, FLORIDA

Figure 17. Sediment Sample Locations

NUS CORPORATION

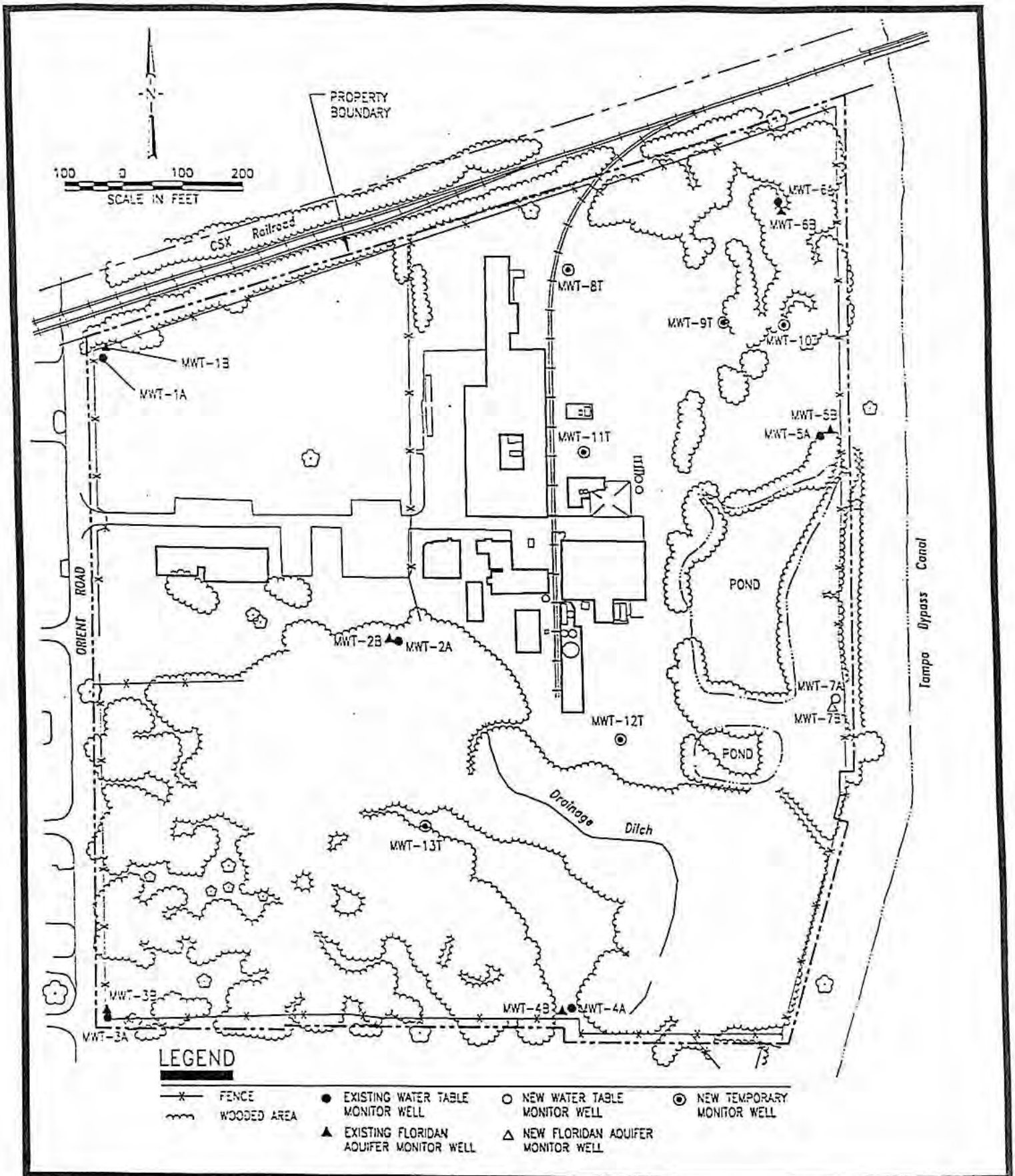
Ground Water Monitor Well Locations
Stauffer Management Company
Tampa, Florida



14082.01/408GMW/102090

Figure 18 Shallow and Deep (Floridan) Ground Water Sample Locations

The ERM Group



CAMP DRESSER & McKEE INC.

GROUNDWATER SAMPLING LOCATIONS

1991 CDM SITE INVESTIGATION

STAUFFER MANAGEMENT COMPANY

TAMPA, FLORIDA

CDM

Figure 19. Ground Water Sample Locations

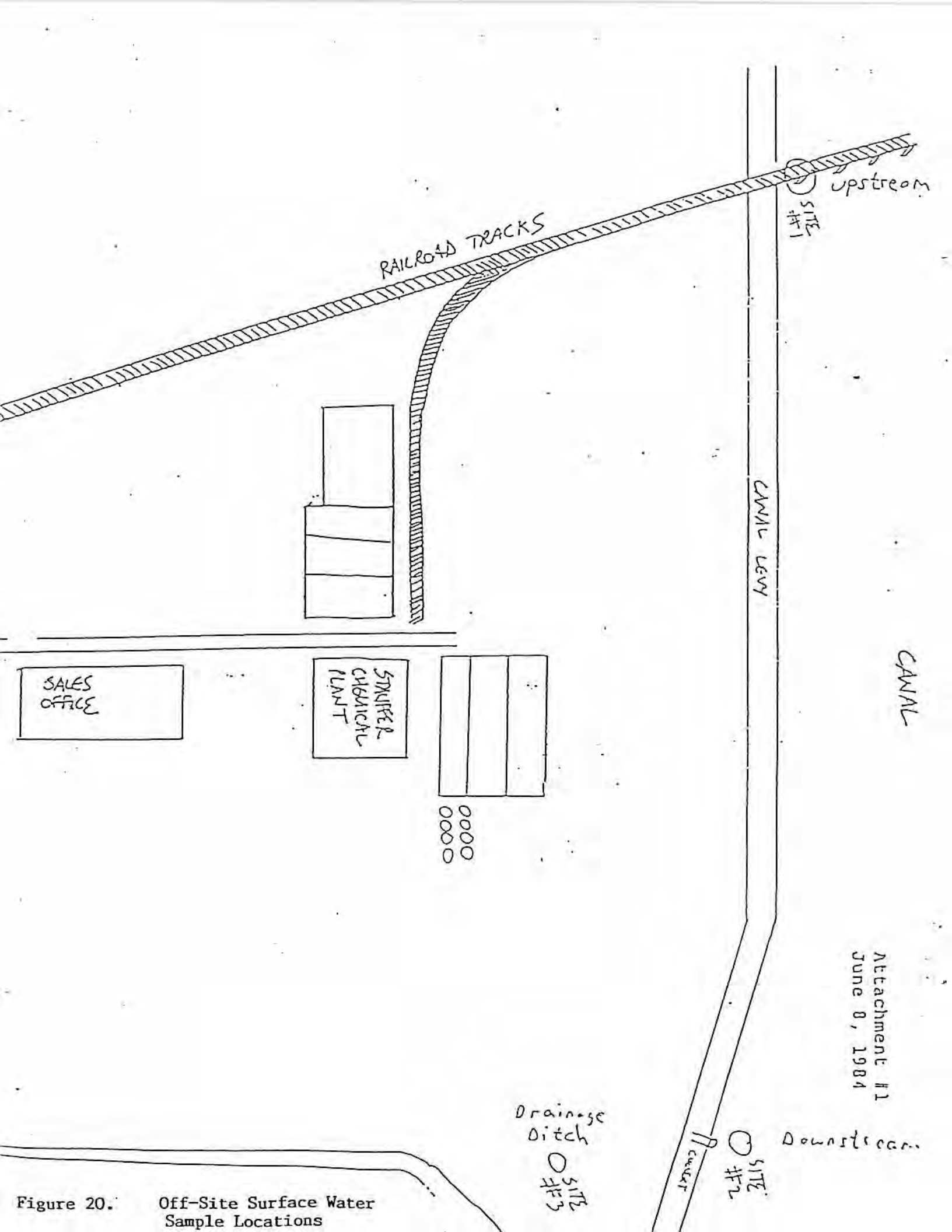
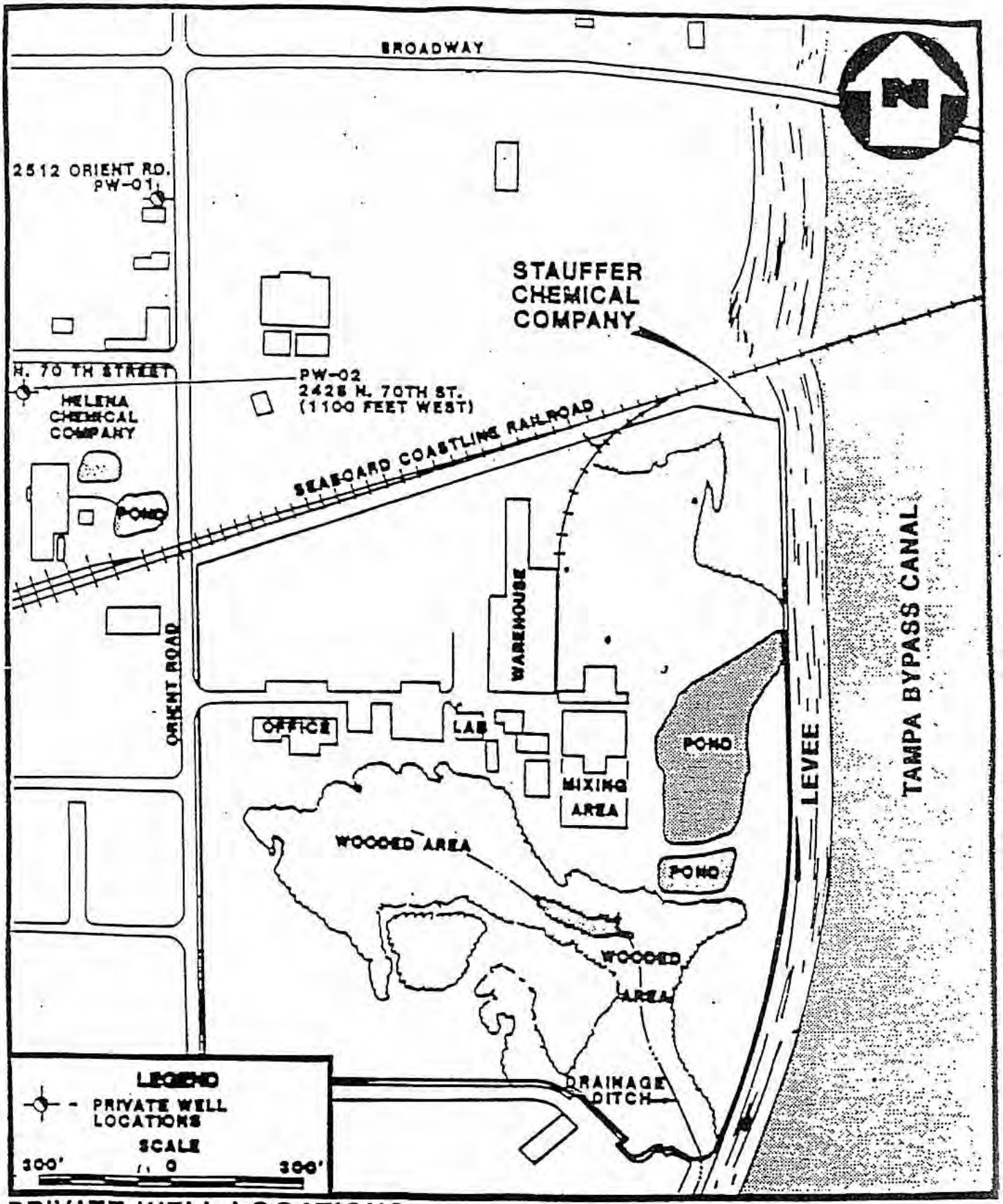


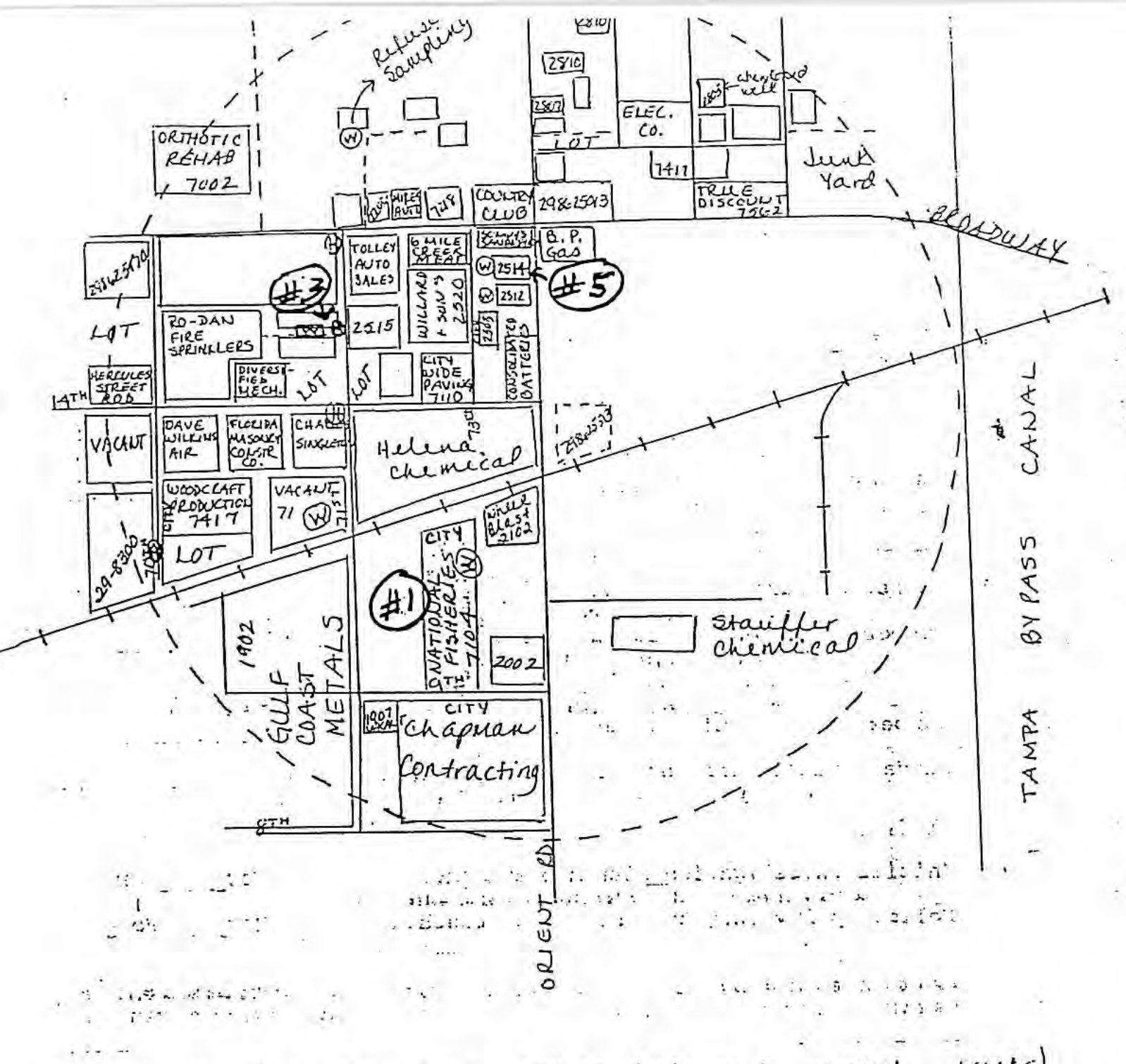
Figure 20. Off-Site Surface Water Sample Locations



PRIVATE WELL LOCATIONS
STAUFFER CHEMICAL COMPANY
TAMPA, FLORIDA

Figure 21. Private Well Sample Locations

NUS CORPORATION



① National Fisheries - 7104 9TH ST. (Only used to wash trucks) on city

② Ruth Bird - 2512 Orient Rd - refused sampling (pump out)

③ Harris - 2516 71ST ST

④ warehouse - 2110 N. 71ST ST - vacant - Being hooked up due to 1-5-93 results

⑤ Gils Bail Bonds - 2514 Orient Rd

⑥ Resident - 2428 N. 70TH - Vacant.

TCE = 350 ppb

PCE = 1200 ppb.

Figure 22. Private Well Sample Locations - Hillsborough CPHU

APPENDIX B. TABLES

Table 1. Chemicals Reportedly Used at the Stauffer Chemical Company in Tampa

alpha-BHC	Isophorone
beta BHC	Malathion
delta BHC	Methyl Trithion
gamma-BHC (Lindane)	Molinate (Ordram)
Aldrin	No. 1 Fuel Oil
Atrazine	Parathion (methyl and ethyl)
Benzene	Pebulate (Tillam)
Butylate (Sutan)	R-25788 (Eradicane)
Captan	Sumithion (Fenithrothion)
Chlordane	Thiodan
Cycloate (Roneet)	Toluene
DDT and DDD	Toxaphene
Dieldrin	Trithion
Endrin	Various Solvents
EPTC (Eptam)	Vapam
Ethion	Vernam (Vernolate)
Fonofos (Dyfonate)	Xylenes
Heptachlor	

Source: NUS 1988b

Table 2. Maximum Concentrations in On-Site Air

Contaminants of Concern	Maximum Concentration (ng/m^3)	Total # positive---- ---- Total # samples	Background Concentration (ng/m^3)	Comparison Value	
				(ng/m^3)	Source
alpha-BHC	19.1	10/10	3.25	0.56	CREG
Chlordane	12.1	9/10	ND	3	CREG
DDT	10.2	7/10	ND	10	CREG
DDE	ND	0/10	ND	----	----
DDD	ND	0/10	ND	----	----
Dieldrin	ND	0/10	ND	----	----
Toxaphene	ND	0/10	ND	----	----
Arsenic	NA	----	NA	----	----

NA-not analyzed; ND-not detected; ng/m^3-nanograms per cubic meter; CREG-Cancer Risk Evaluation Guide; Source: NUS 1988b

Table 3. Maximum Concentrations in On-Site Surface Soil (0-12 Inches Deep)

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # positive---- ---- Total # samples	Background Concentration (mg/kg)	Comparison Value	
				(mg/kg)	Source
alpha-BHC	10	9/25	ND	0.11	CREG
Chlordane	340	9/15	ND	0.54	CREG
DDT	5,900	22/48	0.12	2.1	CREG
DDE	58	20/48	0.063	2.1	CREG
DDD	2,020	24/48	0.17	2.9	CREG
Dieldrin	38	9/19	ND	0.044	CREG
Toxaphene	457	4/13	ND	0.64	CREG
Arsenic	45	10/48	1.4	0.4	CREG

NA-not analyzed; ND-not detected; mg/kg-milligrams per kilogram; CREG-Cancer Risk Evaluation Guide; Sources: NUS 1988a; NUS 1988b; ERM 1991; CDM 1992.

Table 4. Maximum Concentrations in On-Site Subsurface Soil (1 to 10 Feet Deep)

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # positive---- ---- Total # samples	Background Concentration (mg/kg)	Comparison Value	
				(mg/kg)	Source
alpha-BHC	36	27/63	ND	0.11	CREG
Chlordane	0.93	4/31	ND	0.54	CREG
DDT	1,440	40/74	ND	2.1	CREG
DDE	47	19/74	ND	2.1	CREG
DDD	278	33/74	ND	2.9	CREG
Dieldrin	12	3/17	ND	0.044	CREG
Toxaphene	9.5	2/23	ND	0.64	CREG
Arsenic	9.8	17/68	ND	0.4	CREG

NA-not analyzed; ND-not detected; mg/kg-milligrams per kilogram; CREG-Cancer Risk Evaluation Guide; Sources: NUS 1988a; NUS 1988b; ERM 1991; CDM 1992.

Table 5. Maximum Concentrations in On-Site Pond Water

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive---- ---- Total # samples	Background Concentration (µg/L)	Comparison Value	
				(µg/L)	Source
alpha-BHC	0.06	1/5	NA	0.0056	CREG
Chlordane	ND	0/5	NA	----	----
DDT	2.9	2/5	NA	0.1	CREG
DDE	0.23	2/5	NA	0.1	CREG
DDD	1.7	2/5	NA	0.15	CREG
Dieldrin	0.26	1/5	NA	0.0022	CREG
Toxaphene	ND	0/5	NA	----	----
Arsenic	ND	0/5	NA	----	----

NA-not analyzed; ND-not detected; µg/L-micrograms per liter;
CREG-Cancer Risk Evaluation Guide; Sources: NUS 1988a; ERM 1991

Table 6. Maximum Concentrations in On-Site Drainage Ditch Water

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive---- ---- Total # samples	Background Concentration (µg/L)	Comparison Value	
				(µg/L)	Source
alpha-BHC	0.54	2/14	NA	0.0056	CREG
Chlordane	ND	0/7	NA	----	----
DDT	ND	0/14	NA	----	----
DDE	0.021	1/14	NA	0.1	CREG
DDD	2.7	4/14	NA	0.15	CREG
Dieldrin	1.0	6/14	NA	0.0022	CREG
Toxaphene	ND	0/7	NA	----	----
Arsenic	20	1/1	NA	0.02	CREG

NA-not analyzed; ND-not detected; µg/L-micrograms per liter; CREG-Cancer Risk Evaluation Guide; Sources: Harris 1991; McClellan 1984a, 1984b, 1986, 1987; NUS 1988a

Table 7. Maximum Concentrations in On-Site Pond Sediments

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # positive---- ---- Total # samples	Background Concentration (mg/kg)	Comparison Value	
				(mg/kg)	Source
alpha-BHC	ND	0/14	NA	----	----
Chlordane	48	4/5	NA	0.54	CREG
DDT	8,700	4/19	NA	2.1	CREG
DDE	710	7/19	NA	2.1	CREG
DDD	3,600	15/19	NA	2.9	CREG
Dieldrin	320	3/5	NA	0.044	CREG
Toxaphene	ND	0/19	NA	----	----
Arsenic	10.4	14/19	NA	0.4	CREG

NA-not analyzed; ND-not detected; mg/kg-milligrams per kilogram; CREG-Cancer Risk Evaluation Guide; Sources: NUS 1988a; ERM 1991

Table 8. Maximum Concentrations in On-Site Drainage Ditch Sediments

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # positive---- ---- Total # samples	Background Concentration (mg/kg)	Comparison Value	
				(mg/kg)	Source
alpha-BHC	ND	0/9	NA	----	----
Chlordane	17	3/5	NA	0.54	CREG
DDT	0.031	2/9	NA	2.1	CREG
DDE	4.1	5/9	NA	2.1	CREG
DDD	39	6/9	NA	2.9	CREG
Dieldrin	ND	0/5	NA	----	----
Toxaphene	ND	0/9	NA	----	----
Arsenic	14	4/9	NA	0.4	CREG

NA-not analyzed; ND-not detected; mg/kg-milligrams per kilogram; CREG-Cancer Risk Evaluation Guide; Sources: NUS 1988a; NUS 1988b; ERM 1991

Table 9. Maximum Concentrations in On-Site Shallow Ground Water (3-14 Feet Deep)

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive---- ---- Total # samples	Background Concentration (µg/L)	Comparison Value	
				(µg/L)	Source
alpha-BHC	104	8/25	0.41	0.0056	CREG
Chlordane	ND	0/28	ND	----	----
DDT	4.1	8/20	0.05	0.1	CREG
DDE	5.9	5/20	ND	0.1	CREG
DDD	17	5/20	ND	0.15	CREG
Dieldrin	0.53	1/28	ND	0.0022	CREG
Toxaphene	ND	0/20	ND	----	----
Arsenic	3,800	3/11	49	0.02	CREG

NA-not analyzed; ND-not detected; µg/L-micrograms per liter; CREG-Cancer Risk Evaluation Guide; Sources: NUS 1988a; ERM 1991; CDM 1992.

Table 10. Maximum Concentrations in On-Site Deep Ground Water (38-60 Feet Deep)

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive---- ---- Total # samples	Background Concentration (µg/L)	Comparison Value	
				(µg/L)	Source
alpha-BHC	0.08	1/13	0.06	0.0056	CREG
Chlordane	ND	0/13	ND	----	----
DDT	0.08	2/13	0.05	0.1	CREG
DDE	ND	0/13	ND	----	----
DDD	ND	0/13	ND	----	----
Dieldrin	ND	0/13	ND	----	----
Toxaphene	ND	0/13	ND	----	----
Arsenic	ND	0/8	220	----	----

NA-not analyzed; ND-not detected; µg/L-micrograms per liter; CREG-Cancer Risk Evaluation Guide; Sources: ERM 1991; CDM 1992.

Table 11. Maximum Concentrations in Off-Site Surface Water (Tampa Bypass Canal, Downstream of Site)

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive---- ---- Total # samples	Background Concentration (µg/L)	Comparison Value	
				(µg/L)	Source
alpha-BHC	ND	0/12	ND	----	----
Chlordane	ND	0/12	ND	----	----
DDT	ND	0/12	ND	----	----
DDE	ND	0/12	ND	----	----
DDD	ND	0/12	ND	----	----
Dieldrin	ND	0/12	ND	----	----
Toxaphene	ND	0/12	ND	----	----
Arsenic	ND	0/1	ND	----	----

NA-not analyzed; ND-not detected; µg/L-micrograms per liter; CREG-Cancer Risk Evaluation Guide; Source: Harris 1991; NUS 1988a

Table 12. Maximum Concentrations in Off-Site Sediments (Tampa Bypass Canal)

Contaminants of Concern	Maximum Concentration (mg/kg)	Total # positive---- ---- Total # samples	Background Concentration (mg/kg)	Comparison Value	
				(mg/kg)	Source
alpha-BHC	ND	0/3	NA	----	----
Chlordane	ND	0/3	NA	----	----
DDT	ND	0/3	NA	----	----
DDE	ND	0/3	NA	----	----
DDD	0.012	1/3	NA	2.9	CREG
Dieldrin	ND	0/3	NA	----	----
Toxaphene	ND	0/3	NA	----	----
Arsenic	2.5	2/3	NA	0.4	CREG

NA-not analyzed; ND-not detected; mg/kg-milligrams per kilogram; CREG-Cancer Risk Evaluation Guide; Source: NUS 1988b

Table 13. Maximum Concentrations in Off-Site Private Drinking Water Wells

Contaminants of Concern	Maximum Concentration (µg/L)	Total # positive---- ---- Total # samples	Background Concentration (µg/L)	Comparison Value	
				(µg/L)	Source
alpha-BHC	ND	0/5	NA	----	----
Chlordane	ND	0/5	NA	----	----
DDT	ND	0/5	NA	----	----
DDE	ND	0/5	NA	----	----
DDD	ND	0/5	NA	----	----
Dieldrin	ND	0/5	NA	----	----
Toxaphene	ND	0/5	NA	----	----
Arsenic	ND	0/5	NA	----	----

NA-not analyzed; ND-not detected; µg/L-micrograms per liter; CREG-Cancer Risk Evaluation Guide; Source: NUS 1988a, CPHU 1993

Table 14. Site-Related Chemicals With Concentrations Below Standard Comparison Values

1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dichloroethene, cis and trans
1,2,4-Trichlorobenzene
1,4-Dichlorobenzene
2-Butanone (methyl ethyl ketone)
2-Chlorophenol
2,4-Dimethylphenol
Acetone
Aldrin
Atrazine
Barium
Benzoic acid
Beta-BHC
Butylate
Captan
Carbon disulfide
Chlorobenzene
Chloroform
Chromium
Cobalt
Copper
Cyanide
Di(2-ethylhexyl)phthalate
Endosulfan
Endrin
EPTC (Eptam)
Ethylbenzene
Fonofos (Dyfonate)
Gamma-BHC
Heptachlor
Mercury
Methyl parathion
Methylene chloride
Ordram (Molinate)
Phenol
Polyaromatic hydrocarbons (PAHs), total
Toluene
Trichloroethene
Vernolate (Vernam)
Xylenes

Table 15. Site-Related Chemicals With Insufficient Toxicological Data

Benzene acetic acid
Benzobutyl phthalate
Benzodicarboxylic acid
Bis(methylpropyl)carbamothoic acid, ethyl ester
Bischlorophenyldisulfide
Bischlorophenylmethanone
Butylethylcarbamothothioc acid, propyl ester
Carbophenthion
Chlorobenzenethiol
Chloromethylthiobenzene
Chlorophenothane
Chlorophenylmethylpunnamine
Cycloate
delta-BHC
Di-N-octylphthalate
Diazion
Dibenzofuran
Dichlorobenzophenone
Dimethoate
Dimethylcyclohexane
Dimethyldisulfide
Dimethylheptadecane
Dimethyltetradecane
Dimethyltrisulfide
Dimethylundecane
Dipropylcarbamothioic acid
Dipropylcarbamothioic acid, propyl ester
Dipropylcarbamothioic acid, ethyl ester
Endrin ketone
EPN
Eradicane
Ethyl Parathion
Ethylhexanoic acid
Ethylmethyl benzene
Ethylmethylcyclohexane
Hexadecane
Hexadecanoic acid
Hexahydroazepine carbothioc acid, ethyl ester
Lead
Methylcyclohexane
Methylethylheptane
Methylisobutyl ketone (4-methyl-2-pentanone)
Methylpropyldisulfide
Naphthanol
Nickel
Pebulate (Tillam)
Phenanthrene
Propylbenzene
Propylcyclohexane
Sulfonylbis benzene
Tetradecanal
Tetrahydrodimethylfuran
Tetramethylbutylphenol
Tetramethylpentadecane
Thiobismethane
Trimethylbenzene
Trimethylcyclohexane
Trimethyldecane
Trithiolane
Vanadium

Table 16. Completed Exposure Pathways

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME
	SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
Ambient Air	Past Waste Disposal	Air	On site and Canal Levee	Inhalation	Caretaker, 1-5 Nearby Fishermen	1951 to Present Future
Incidental Soil Ingestion	Past Waste Disposal	Surface Soil	On Site	Ingestion	On-Site Caretaker	1951 to Present Future

Table 17. Potential Exposure Pathways

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME
	SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
Fish Consump-tion	Past Waste Disposal	Surface Water Ground Water and Sediment Transport	Fish from Tampa Bypass Canal	Ingestion	5-50 Fishermen Daily	1951 to Present Future
Incidental Soil Ingestion	Past Waste Disposal	Surface Soil	On Site	Incidental Ingestion	Workers, Inmates	Future
Ground-Water Ingestion	Past Waste Disposal	Ground Water	On Site	Ingestion	Workers, Nearby Residents	Past and Future

APPENDIX C. SUMMARY OF PUBLIC COMMENT ON THE DRAFT PUBLIC HEALTH ASSESSMENT AND FLORIDA HRS RESPONSE

Summary of Public Comment and Florida HRS Response:
Draft Public Health Assessment

At a May 19, 1993 EPA public meeting, we passed out copies of the Stauffer Chemical draft preliminary public health assessment. EPA mailed notices of this meeting to about 200 nearby residents as well as the appropriate governmental agencies. About 10 former residents of this area and a reporter for the Tampa Tribune attended this meeting. We also passed out copies of a fact sheet that summarized our findings, announced the availability of the report, and solicited public comment through July 16, 1993. Stories regarding our draft assessment appeared in the Tampa Tribune on May 21 and June 9, 1993. We received seven sets of comments on the draft assessment. Following is a summary of these comments and our responses:

Comment #1

One person strongly agreed with our recommendation Stauffer control contaminated dust and odor generation during any remediation and monitor the air quality.

Response:

We will work with the appropriate environmental agencies to ensure our recommendations are carried out and public health is protected.

Comment #2

One person was concerned their private well is contaminated.

Response:

Although it is unlikely that contaminants from Stauffer have contaminated this person's well, we referred them to the Hillsborough County Public Health Unit for testing.

Comment #3

One person was concerned their cancer, other unusual illnesses, and their child's birth defects are the result of drinking contaminated well water when they used to live in this area.

Response:

Since this person's well was between 0.5 and 0.75 mile hydraulically upgradient from Stauffer, it is unlikely that contaminants from Stauffer contaminated their well.

Comment #4

One person was concerned their families health problems were caused by exposure to pesticides and other chemicals from Stauffer and the Flag Sulphur Company (now Helena Chemical Company). Their family lived within 0.25 mile of these sites during the 1940s and 1950s. This person reported contaminated dust from these sites frequently covered their house, and children played in contaminated run-off from these sites. This person reported nausea, headaches, and burning sensation of the eyes and nose when the facility "cooked" or after a tank exploded. This person reported their father worked at Stauffer in the early 1950s, was diagnosed with periarteritis nodosa in 1961, and later died from complications of this disease. Other reported health problems in this family include: Grave's disease, difficulty in conceiving and spontaneous abortions, asthma, hiatal hernia, impaired circulation, and kidney problems.

Response:

It is likely people living near this site in the 1940s and 1950s were exposed to more chemicals and at much higher concentrations than today. We searched the toxicological literature for an association between the reported health effects and site-related chemicals. The causes of periarteritis nodosa and Graves' disease are unknown. Although the literature suggests an association between infertility and exposure to high levels of arsenic, there are no environmental data from the 1940s and 1950s to link the reported infertility with exposure to arsenic. Similarly, it is possible the reported asthma attacks, nausea, headaches, and burning sensation of the eyes and nose could have all been caused or made worse by chemicals used at this site. Yet, without environmental data from the 1940s and 1950s on which to estimate exposure, we cannot link these health effects to chemicals from Stauffer. The following is a more detailed discussion of all of these health effects and possible causes.

Nausea, headaches, and burning sensation of the eyes and nose can be caused by any number of chemicals including, but not limited to, chemicals used at Stauffer. Although emissions from Stauffer are a possible source, without air sampling data from the 1940s and 1950s, we cannot link these health effects to chemicals from this site.

The cause of periarteritis nodosa, also known as polyarteritis nodosa (PAN) or Kussmaul's disease, is not known. Since its cause is not known, we do not know if there is any association with exposure to the chemicals used at this site. Although some of the pesticides found at Stauffer can cause nervous system effects such as headaches, dizziness, muscle twitching, tremors, convulsions, and seizures, their association with polyarteritis nodosa (PAN) is unknown. PAN is characterized by inflammation and necrosis (deterioration) of small and medium sized arteries. PAN is an uncommon, but not a rare disease. It is twice as common in males as females. The mean age at onset is 45 years. PAN is characterized by various symptoms depending on which organ the artery damage is most severe. Nonspecific signs and symptoms are the hallmark of classic PAN. Fever, weight loss, and malaise are present in over one-half of cases. Patients usually have vague symptoms such as weakness,

malaise, headache, stiff and painful joints (arthritis), and muscle pain. The kidneys are often affected resulting in high blood pressure (hypertension) and kidney failure. The gastrointestinal tract may also be affected resulting in abdominal pain, nausea, vomiting, and bleeding. The nervous system, skin, and heart may also be affected. If left untreated PAN usually results in death from kidney failure, bowel perforations, or heart failure (Wilson et al. 1991).

The cause of Graves' disease is unknown. Since the cause of Graves' disease is not known, we do not known if there is any association there is with exposure to the chemicals used at this site. Results from studies with rats and dogs given the site-related pesticide toxaphene in their food suggests that prolonged exposure may induce thyroid injury (Chu et al. 1986; 1988; NCI 1977). We do not know, however, if exposure to toxaphene or other site-related chemicals is associated with Graves' disease in humans. Graves' disease is characterized by an overactive and chronically enlarged (hyperplastic) thyroid gland. This condition is also known as a diffuse toxic goiter. An overactive thyroid (hyperthyroidism) releases too much of the thyroid hormone, thyroxine, in to the blood stream. This in turn causes excessive nervousness, excitability, tremors, and inability to sleep; excessive sweating and heat intolerance; increased heart rate and blood pressure; and frequent bowel movements and weight loss. Graves' disease is sometimes accompanied by bulging of the eyes (exophthalmos). In view of the varied manifestations of Graves' disease and their differing courses, it is possible that no single factor is responsible for the entire syndrome. Graves' disease is a relatively common disorder that occurs at any age but is especially common in the third and fourth decade. It is more common in women than men. Genetic factors play an important role; there is a distinct familial predisposition to Graves' disease (Wilson et al. 1991).

Although there is evidence that one contaminant found at Stauffer, arsenic, can interfere with normal pregnancy, there is no environmental data from the 1940s or 1950s on which to a estimate exposure. Without this information, we cannot link arsenic exposures in the 1940s and 1950s to infertility in the 1970s and 1980s. Concentrations of arsenic at Stauffer now are not likely to interfere with a normal pregnancy. Difficulty in conceiving or infertility is defined as the failure to become pregnant after 1 year of unprotected intercourse. Infertility affects 10 to 15% of all couples. Male infertility is responsible for 40% of infertile couples. In women, tubal disease and endometriosis is responsible for 50% of the cases of female infertility, failure to ovulate for 30% of the cases, and a cervical factor for 10%. No cause is known for 10% of the infertile women (Wilson et al. 1991). There are several human epidemiological studies that have reported an association between exposure to inorganic arsenic and increased risk of adverse reproductive effects (birth defects, low birth weight, and spontaneous abortion), both by inhalation (Nordstrom et al. 1978a, 1978b, 1979a, 1979b) and by ingestion (Aschengrau et al. 1989; Zierler et al. 1988). However, in all of these studies the populations were exposed to a number of other chemical and risk factors which may have contributed to the observed effects, and these studies provide only suggestive evidence that arsenic was the cause. Studies with mice, rats, and hamsters also suggest that arsenic is toxic to the developing fetus, but only at levels that are also toxic to the pregnant female (ATSDR 1991b).

It is possible that inhalation of sulphur compounds from Stauffer in the 1940s and 1950s may have caused respiratory problems or made asthma attacks worse. Without air sampling data from this period, however, we cannot establish an association with reported cases of asthma. Asthma is a disease characterized by narrowing of the airways of the lungs and difficulty breathing. Asthma attacks usually only last a few minutes or few hours. Asthma occurs in about 10% of children and 5% of adults in the United States. Although the basic mechanism causing asthma is not known, factors that bring on asthma attacks or make them worse can be grouped into seven categories: allergens, drugs, air pollution, occupational exposures, infections, exercise, and emotional stress. Inhalation of sulfur dioxide or persulfates can cause respiratory problems or make asthma attacks worse. Ingestion of sulfiting agents, such as potassium metabisulfite, potassium and sodium bisulfite, sodium sulfite, and sulfur dioxide, can also produce acute airway obstruction in sensitive individuals (Wilson et al. 1991).

There is no known association of hiatal hernias with chemical exposure. A hiatal hernia is a protrusion of part of the stomach through the opening where the esophagus passes through the diaphragm. It is usually caused by a weakening of the attachment between the esophagus and the diaphragm. The incidence of hiatal hernias increase with age to about 60% of the population by age 60 years. Hiatal hernias by themselves usually do not cause any clinical symptoms (Wilson et al. 1991).

The report of impaired circulation and kidney problems is not specific enough to assess. We were unsuccessful in obtaining more details about this complaint.

Comment #5

One person was concerned that their fibromyalgitis was caused by pesticide exposure.

Response:

It is likely that people living near this site in the 1940s and 1950s were exposed to more chemicals and at much higher concentrations than today. We searched the toxicological literature for an association between fibromyalgia and site-related chemicals. Since the cause of fibromyalgia is not known, we do not known if there is any association with exposure to the chemicals used at Stauffer.

An analysis of this person's blood found the pesticide DDE at a concentration of 13.7 nanograms per milliliter liter (ng/ml). Since the biological half-lives for elimination of the DDT family members are: DDE>DDT>DDD; the low ratio of DDT and DDD to DDE in this person's blood indicates a past, as opposed to a recent, exposure. Unfortunately, there is not enough information to quantitatively correlate blood levels of DDT, DDD, or DDE with levels in the environment or with toxic effects (ATSDR 1989c).

An analysis of this person's blood also found the pesticide beta-BHC at a concentration of 0.6 nanograms per milliliter liter (ng/ml) or parts per billion (ppb). Blood levels of beta-BHC

have been found to reflect both the intensity and duration of exposure. Studies of pesticide production workers found that blood levels increase at a uniform rate for every year of exposure (Baumann et al. 1980). Other studies have found elevated blood levels of beta-BHC 10 to 15 years after the last exposure (Morgan 1978). Although it is apparent that this person has been exposed to beta-BHC, it is difficult to estimate their exposure based on pesticide production workers with blood concentrations 30 to 600 times higher. Nigam et al. (1986) and Kashyap (1986) documented complaints of paraesthesia (burning, pricking, tingling, or tickling sensation) of the face and extremities, headache, giddiness, malaise, vomiting, tremors, apprehension, confusion, loss of sleep, impaired memory, and loss of libido in pesticide production workers with concentrations of 0.07 to 0.72 parts per million (ppm) of beta-BHC in their blood. These blood levels, however, are about 100 to 1000 times higher than the levels in this person's blood (0.0006 ppm). We do not know if the levels of beta-BHC in this person's blood could cause any or all of these same health effects.

The pesticides heptachlor epoxide, oxychlordane, and trans-nonachlor were also found in this person's blood at levels above the laboratory reported average. Detection of oxychlordane and trans-nonachlor indicates they have been exposed to chlordane. They may have also been exposed to heptachlor since heptachlor epoxide is a breakdown product of both chlordane and heptachlor. Unfortunately, there is no information to quantitatively correlate the blood levels of these pesticides with levels in the environment or with toxic effects (ATSDR 1993).

The reported antibody assay of this person's blood was inconclusive for exposure to trimellitic anhydride and isocyanate, but positive for exposure to formaldehyde. We do not believe that exposure to trimellitic anhydride, isocyanate, or formaldehyde, however, is related to Stauffer.

The cause of fibromyalgia is not known. Fibromyalgia, also known as fibrositis, is a common disorder characterized by musculoskeletal pain, stiffness, and easy fatigue. It affects mostly women between the ages of 25 and 45 years. Symptoms include generalized muscle pain and weakness, and generalized aching and stiffness of the trunk, hip and shoulders. Patients complain of waking up frequently at night, having trouble falling back to sleep, waking up tired, and feeling exhausted. Symptoms are made worse by stress or anxiety, cold, damp weather, and overexertion. Disorders commonly associated with fibromyalgia include irritable bowel syndrome, irritable bladder, headaches, and difficult or painful menstruation. Fibromyalgia is characterized by tender sites on the back and along the spine which are extremely more painful to the touch than adjacent areas (Wilson et al. 1991).

Comment #6

One person was concerned that their family's health problems (kidney, bladder, and lung) are related to living in this area during the 1940 and 1950s.

Response:

It is likely that people living in this area in the 1940s and 1950s were exposed to more chemicals and at much higher concentrations than today. We searched the toxicological literature for an association between the reported health effects and site-related chemicals. It is possible that inhalation of sulphur compounds from Stauffer in the 1940s and 1950s may have caused respiratory problems or made asthma attacks worse. Without air sampling data from this period, however, we cannot establish an association with the reported lung problems. Asthma is a disease characterized by narrowing of the airways of the lungs and difficulty breathing. Asthma attacks usually only last a few minutes or few hours. Asthma occurs in about 10% of children and 5% of adults in the United States. Although the basic mechanism causing asthma is not known, factors that bring on asthma attacks or make them worse can be grouped into seven categories: allergens, drugs, air pollution, occupational exposures, infections, exercise, and emotional stress. Inhalation of sulfur dioxide or persulfates can cause respiratory problems or make asthma attacks worse. Ingestion of sulfiting agents, such as potassium metabisulfite, potassium and sodium bisulfite, sodium sulfite, and sulfur dioxide, can also produce acute airway obstruction in sensitive individuals (Wilson et al. 1991).

Without environmental data from the 1940s and 1950s on which to estimate exposure, we cannot link kidney or bladder problems to chemicals from the Stauffer.

Comment #7

One person was concerned with a number of technical issues in the draft preliminary public health assessment:

a. This assessment did not consider data in the December 1992 Site Assessment Report prepared for Stauffer by Camp Dresser & McKee, Inc.

b. This assessment did not consider the January-April 1993 contaminated soil excavation. The public health threat of the site has been significantly reduced by this remediation.

c. Since there are other sources of pesticide contamination in this area, results of water and sediment from the Tampa Bypass Canal should be considered before analysis of fish samples.

d. Since the north or west sides of the site border on industrial areas, they may be more appropriate locations for background air samples than the east side.

e. The distinction between the ATSDR public health assessment and the EPA baseline risk assessment should be explained.

f. Use of the maximum detected values as opposed to the 95% upper confidence limit of the mean as exposure point concentration should be explained.

g. The process of selecting potential contaminants of concern should be clarified.

h. This assessment should clarify the distinction between the standard comparison values used in the tables and the Minimal Risk Levels emphasized in the text.

i. The assessment of the health threat from DDT and DDD is inconsistent and not well documented.

j. A rationale should be given for identifying the drinking water source for Stauffer employees between 1951 and 1986.

k. This assessment should explain why locations of soil samples differ between Figures 6 and 7.

l. This assessment should include detection limits in Tables 2 - 13.

m. Toxicological data exists for four contaminants listed in Table 15: di-n-octylphthalate, methyl isobutyl ketone, vanadium, and nickel.

Response:

a. We have incorporated surface soil, subsurface soil and ground-water analytical data from the December 1992 Site Assessment Report prepared for Stauffer by Camp Dresser & McKee, Inc. into this assessment. Although Stauffer consultant CDM installed and sampled one additional monitor well in the Floridan aquifer, the vertical and lateral extent of contamination in this important drinking water aquifer has still not been fully delineated.

b. We have modified this assessment to reflect the January-April 1993 contaminated soil excavation. This preliminary public health assessment considers past exposures, as well as current and future exposures.

c. Although it is likely that other area sources contributed to contamination of the bypass canal sediment and fish, it is also likely that Stauffer is a major source due to its close proximity and past waste disposal practices. Since consumption of fish from the bypass canal is a known completed human exposure pathway, it is important that these fish be sampled as soon as possible.

To distinguish between pesticides from Stauffer and other sources, fish from the bypass canal should be analyzed for Stauffer's proprietary pesticides such as EPTC, Butylate, Vernolate, Fonofos, Pebulate, Molinate, Cycloate, etc. Fish from the bypass canal should also be analyzed for the chlorinated pesticides such as DDD, DDE, DDT, alpha-BHC, toxaphene, etc.

Stauffer was in operation next to Six Mile Creek for about 15 years before construction of the bypass canal began in 1966. The on-site ponds are thought to be remnants of Six Mile Creek that were cut off by construction of the bypass canal. These pond sediments contain high levels of pesticides and metals and may be indicative of contamination in Six Mile Creek before construction of the canal. We do not know where the contaminated sediments from Six Mile Creek were deposited when the canal was constructed. We also do not know the extent of sediment contamination from Stauffer in the canal following its completion in 1973.

d. When sampling ambient air, wind direction is important in determining background sample locations. Although the wind was calm when EPA contractor NUS Corporation collected air samples February 2-4, 1988, they located their background air samples upwind of the site. These background air samples were on the *west* side of the site, not on the *east* side as erroneously stated in the draft public health assessment. The text has been corrected.

e. We have expanded the Background section to explain the distinction between the ATSDR public health assessment and the EPA baseline risk assessment.

ATSDR public health assessments are based on environmental characterization information, community health concerns, and health outcome data. Because of the nature of these databases, public health assessments use quantitative as well as qualitative data, focusing on medical public health and toxicologic perspectives associated with exposure to a site. The public health assessment specifically addresses community health concerns (e.g. sensitive populations, possible disease outcomes) and evaluates relevant, community-specific health outcome data. Combined with environmental data, information obtained from these two data sources are used to determine the public health implications of the site guiding the initiation of follow-up health activities when indicated.

A risk assessment is defined as a qualitative and quantitative process conducted by EPA to characterize the nature and magnitude of risks to public health from exposure to hazardous substances, pollutants, or contaminants released from specific sites. Risk assessments include the following components: hazard identification, dose-response assessment, exposure assessment, and risk characterization. Statistical and biologic models are used in quantitative and chemical-oriented risk assessments to calculate numeric estimates of risk to health by using data from human epidemiologic investigations (when available) and animal toxicology studies. The product of quantitative risk assessment is a numeric estimate of the public health consequences of exposure to an agent. In preparing a risk assessment for a site, EPA also attempts to include all adverse health effects, characterizing the risk to sensitive populations when the information is available. EPA risk assessments are used in risk management decisions to establish cleanup levels; to set permit levels for discharge, storage, or transport of hazardous waste; and to determine allowable levels of contamination.

f. It is ATSDR policy to use the maximum detected value whenever possible in calculating an exposure dose. Although this may be inconsistent with EPA guidance, it insures the public health threat is not underestimated.

g. We have modified the Environmental Contamination and Other Hazards section to clarify how background concentrations are used, how comparison values are calculated, and how comparison values are prioritized.

h. We have expanded the Environmental Contamination and Other Hazards section to clarify the distinction between the standard comparison values used in the tables and the Minimal Risk Levels emphasized in the text.

i. We have revised the toxicological evaluation of the closely related pesticides DDT and DDD to be more consistent. We have also added the missing reference.

j. The purpose of a public health assessment is to assess impacts on public health from past exposures, as well as current and future exposures. This is one important difference between the ATSDR public health assessment and the EPA baseline risk assessment. Therefore it is important to know the drinking water source for Stauffer employees between 1951 and 1986 in order to assess their health risk from past exposures.

k. The location of the surface soil samples SS-01 through SS-06 in Figures 6 and 7 differ since they are associated with different sampling events. Unfortunately the EPA contractor, NUS Corporation, used the same numbering scheme for both its 1987 sampling event (NUS 1988a) and its 1988 sampling event (NUS 1988b). We have added this fact to the discussion of the on-site surface soil.

l. ATSDR does not routinely include detection limits in public health assessments for two reasons. First, these assessments integrate data from different studies, conducted at different times, using different laboratories and analytical methodologies. Therefore, there may be more than one detection limit for each contaminant. Second, detection limits are not critical to the public health assessment since we only consider the maximum concentration detected in assessing the public health threat. The detection limit is only important when the contaminant is below the detection limits and the detection limit is greater than the standard comparison value.

m. We did not evaluate the public health risk from exposure to di-n-octylphthalate, methyl isobutyl ketone, vanadium, or nickel since ATSDR did not have standard comparison values when we first drafted this public health assessment in December 1992. Although EPA RfDs exist for these contaminants, the concentrations at Stauffer do not warrant a reevaluation of the data.