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"FIELD INVESTIGATION PLAN FOR POTENTIAL SOURCES OF CONTAMINATION SITE 4, SITE 6, SITE 9, SITE 12, SITE 18 AND SITE 19 NAS CECIL FIELD FL"
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ABB ENVIRONMENTAL SERVICES INC

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FIELD INVESTIGATION PLAN

POTENTIAL SOURCES OF CONTAMINATION (PSC) 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

UNIT IDENTIFICATION CODE: N60200
CONTRACT NO. N62467-89-D-0317/090

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SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA
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FIELD INVESTIGATION PLAN

POTENTIAL SOURCES OF CONTAMINATION (PSC) 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA

Unit Identification Code: N60200

Contract No. N62467-89-D-0317/090

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March 1995

CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, ABB Environmental Services, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/090 are complete and accurate and comply with all requirements of this contract.

Date: March 30, 1995

Name and Title of Certifying Official: Rao Angara
Project Manager

Name and Title of Certifying Official: Allan Stodghill
Project Technical Lead

(DFAR 252.227-7036)

FOREWORD

To meet its mission objectives, the U.S. Navy performs a variety of operations, some requiring the use, handling, storage, or disposal of hazardous materials. Through accidental spills and leaks and conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by today's standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense (DOD) initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at their facilities.

One of these programs is the Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), the Resource Conservation and Recovery Act (RCRA), and the Hazardous and Solid Waste Amendments (HSWA) of 1984. These acts establish the means to assess and clean up hazardous waste sites for both private-sector and Federal facilities. The CERCLA and SARA acts form the basis for what is commonly known as the Superfund program.

Originally, the Navy's part of this program was called the Naval Assessment and Control of Installation Pollutants (NACIP) program. Early reports reflect the NACIP process and terminology. The Navy eventually adopted the program structure and terminology of the standard IR program.

The IR program is conducted in several stages as follows:

- Preliminary Assessment (PA)
- Site Inspection (SI) (formerly the PA and SI steps were called the Initial Assessment Study (IAS) under the NACIP program),
- Remedial Investigation and Feasibility Study (RI/FS), and
- remedial design and remedial action (RD/RA).

The Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) manages and the USEPA and the Florida Department of Environmental Protection (FDEP; formerly Florida Department of Environmental Regulation [FDER]) oversee the Navy environmental program at Naval Air Station (NAS) Cecil Field. All aspects of the program are conducted in compliance with State and Federal regulations, as ensured by the participation of these regulatory agencies.

Questions regarding the CERCLA program at NAS Cecil Field should be addressed to Mr. Alan Shoultz, Code 1875, at (803) 743-0669.

EXECUTIVE SUMMARY

Pursuant to Part V Section G.3 of the Federal Facility Agreement (FFA) for the U.S. Naval Air Station (NAS) Cecil Field, Jacksonville, Florida, Potential Sources of Contamination (PSCs) 4, 6, 9, 12, 18 and 19 will be screened and at the conclusion of the screening the parties of the FFA will make the determination whether further investigation or actions will be required under Comprehensive Environmental Response, Compensation, and Liability Act and/or Resource Conservation and Recovery Act for the PSCs.

The PSCs are identified as follows:

PSC 4, Grease Pits;
PSC 6, Lake Fretwell Rubble Disposal Area;
PSC 9, Recent Grease Pits;
PSC 12, Public Works Rubble Disposal Area;
PSC 18, Ammunition Disposal Area; and
PSC 19, Rowell Creek Rubble Disposal Area.

This Field Investigation Plan summarizes any existing historical information or data for each PSC and proposes field sampling and analysis to provide enough data to support a Preliminary Risk Evaluation (PRE). The PRE will use the investigative results to determine the nature, pathway, and extent of contamination and to identify potential risks to human and ecological receptors.

Based on the results of the PRE, one of the following recommendations will be made for each PSC:

- prepare a No Further Response Action Plan document,
- initiate an immediate removal or interim action, or
- conduct a Remedial Investigation and Feasibility Study.

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
AIMD	Aircraft Intermediate Maintenance Department
bls	below land surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DCB	dichlorobenzene
ECO	electron capture detector
EM	electromagnetic
Envirodyne	Envirodyne Engineers
EOD	explosive ordnance detonation
FID	flame ionization detector
GC	gas chromatograph
GPR	ground penetrating radar survey
HLA	Harding Lawson Associates
Hz	hertz
IAS	Initial Assessment Study
MEK	methyl ethyl ketone
mg/kg	milligrams per kilogram
MIBK	methyl isobutyl ketone
µg/kg	micrograms per kilogram
µg/ℓ	micrograms per liter
NAS	Naval Air Station
PAH	polynuclear aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
POL	petroleum oils and lubricants
PRE	Preliminary Risk Evaluation
PSC	Potential Source of Contamination
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SVOCs	semivolatile organic compounds
TAL	target analyte list
TCA	trichloroethane
TCE	trichloroethene
TCL	target compound list
TD-GC	thermal desorption-gas chromatograph
TD-MS	thermal desorption-mass spectrometry

GLOSSARY (Continued)

TMSS	Technical Memorandum for Supplemental Sampling
TOC	total organic carbon
TRPH	total recoverable petroleum hydrocarbons
TSS	total suspended solids
USEPA	U.S. Environmental Protection Agency
VLF	very low frequency
VOCs	volatile organic compounds

1.0 INTRODUCTION

Pursuant to Part V Section G.3 of the Federal Facility Agreement (FFA) for the U.S. Naval Air Station (NAS) Cecil Field, Jacksonville, Florida, Potential Sources of Contamination (PSCs) 4, 6, 9, 12, 18 and 19 will be screened and at the conclusion of the screening the parties of the FFA will make the determination whether further investigation or actions will be required under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and/or Resource Conservation and Recovery Act (RCRA) for the PSCs.

The PSCs are identified as follows:

PSC 4, Grease Pits;
PSC 6, Lake Fretwell Rubble Disposal Area;
PSC 9, Recent Grease Pits;
PSC 12, Public Works Rubble Disposal Area;
PSC 18, Ammunition Disposal Area; and
PSC 19, Rowell Creek Rubble Disposal Area.

To facilitate the screening of PSCs 4, 6, 9, 12, 18, and 19, the Navy Installation Restoration (IR) program, with concurrence of U.S. Environmental Protection Agency (USEPA) and Florida Department of Environmental Protection (FDEP), has chosen to follow a screening program similar to that adopted for use in the NAS Cecil Field Base Realignment and Closure (BRAC) Phase II grey area investigations. The screening program involves the development and implementation of the Field Investigation Plan. The Field Investigation Plan summarizes any existing historical information or data for each PSC and proposes field sampling and analysis to provide enough data to support a Preliminary Risk Evaluation (PRE). The PRE will use the investigative results to determine the nature, pathway, and extent of contamination and to identify potential risks to human and ecological receptors.

Based on the results of the PRE, one of the following recommendations will be made for each PSC:

- prepare a No Further Response Action Plan (NFRAP) document,
- initiate an immediate removal or interim action, or
- conduct a Remedial Investigation and Feasibility Study (RI/FS).

The field investigations will be conducted in accordance with the approved NAS Cecil Field OUs 3, 4, 5, and 6 RI/FS Workplan and the NAS Cecil Field Project Operations Plan. These documents contain the installation history and background information, geologic and hydrogeologic setting, field sampling procedures, Quality Assurance Project Plans, and Health and Safety Plans. The PSC-specific background information, any existing historical data, and sampling and analysis plans are presented within the Field Investigation Plan.

2.0 SITE 4, GREASE PITS

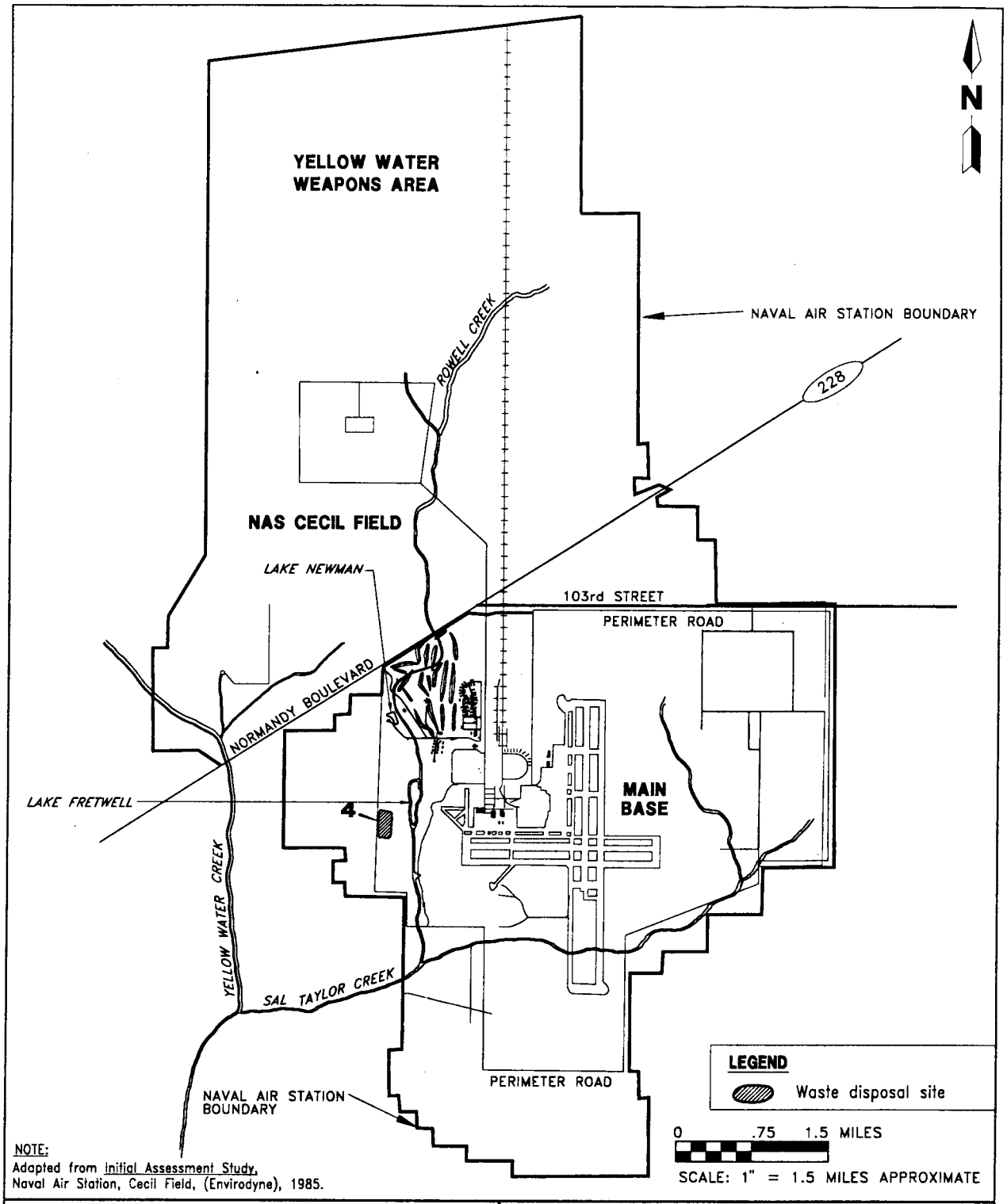
2.1 SITE DESCRIPTION AND HISTORY. PSC 4 is a large, open to partly forested field that has been used for the disposal of waste oil and sludge, kitchen grease, and possibly paint, paint thinners, and solvents. Disposal of these materials occurred from the mid-1950's to the late 1980's, or for a little more than 30 years. Disposal operations consisted of excavating a shallow unlined pit and dumping the waste materials into the pit. The waste was then allowed to either evaporate or percolate into the ground or remain in the pit. When the pit was filled it was covered with soil and a new pit was made. Pit sizes were variable, but each pit is interpreted to be only a few feet deep (3 to 5 feet) and would have a capacity of a few thousand gallons. The locations of these pits are unknown, though areas of activity (areas lacking vegetation) are evident from aerial photographs. These areas parallel Perimeter Road and are located adjacent to the road to approximately 200 feet east of the road. Currently, one pit is evident.

Estimated maximum volumes disposed at the site are 700,000 gallons of waste oil, grease, and solvents and 800,000 gallons of kitchen grease and water. These values were estimated from weekly disposal volumes over a 30-year period and do not reflect actual volumes derived from facility records, which have been searched but not found to contain such information.

PSC 4 is located west of Lake Fretwell and east of Perimeter Road (Figure 2-1). Originally, the site was estimated to be approximately 9 acres in size. The area of investigation, though, has been increased from 9 to approximately 25 acres in size (Figure 2-2). The base coordinate system location of the site is H-7. The site is bordered to the west by Perimeter Road and to the east by woodlands and Lake Fretwell. North and south of the site are open fields and woodlands. The site is partly forested. The western part of the site is open field with scattered areas of pine trees and brush. The eastern part is more densely wooded. The open areas are vegetated with grasses, weeds, and briars. Site 3, identified as an oily waste and solvent disposal pit, is adjacent to and south of PSC 4. PSC 4 is accessible by Perimeter Road.

The land surface at Site 4 is nearly flat, sloping gently eastward toward Lake Fretwell. Eastern parts of the site, near Lake Fretwell, can be marshy. There are no obvious drainage features on the site. If overland water flow occurs at the site it is interpreted that the flow would be toward Lake Fretwell.

2.2 PREVIOUS INVESTIGATIONS. Site 4 was first investigated in 1983 when Geraghty & Miller, Inc., conducted the Hydrogeologic Assessment and Ground-Water Monitoring Plan. During this investigation Site 4 was identified as an area where grease, waste oil, and sludge from the facility's sanitary sewer system and from oil and water separators were disposed into pits. Each pit was believed to have a capacity of a few thousand gallons. Exact locations and sizes of the pits were not assessed, but due to disturbance of the land surface it was believed that the pits were located along Perimeter Road (Figure 2-2).



NOTE:
Adapted from Initial Assessment Study, Naval Air Station, Cecil Field, (Envirodyne), 1985.

FIGURE 2-1
POTENTIAL SOURCE OF CONTAMINATION (PSC) 4 WASTE DISPOSAL SITES, CECIL FIELD AND YELLOW WATER WEAPONS AREA

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

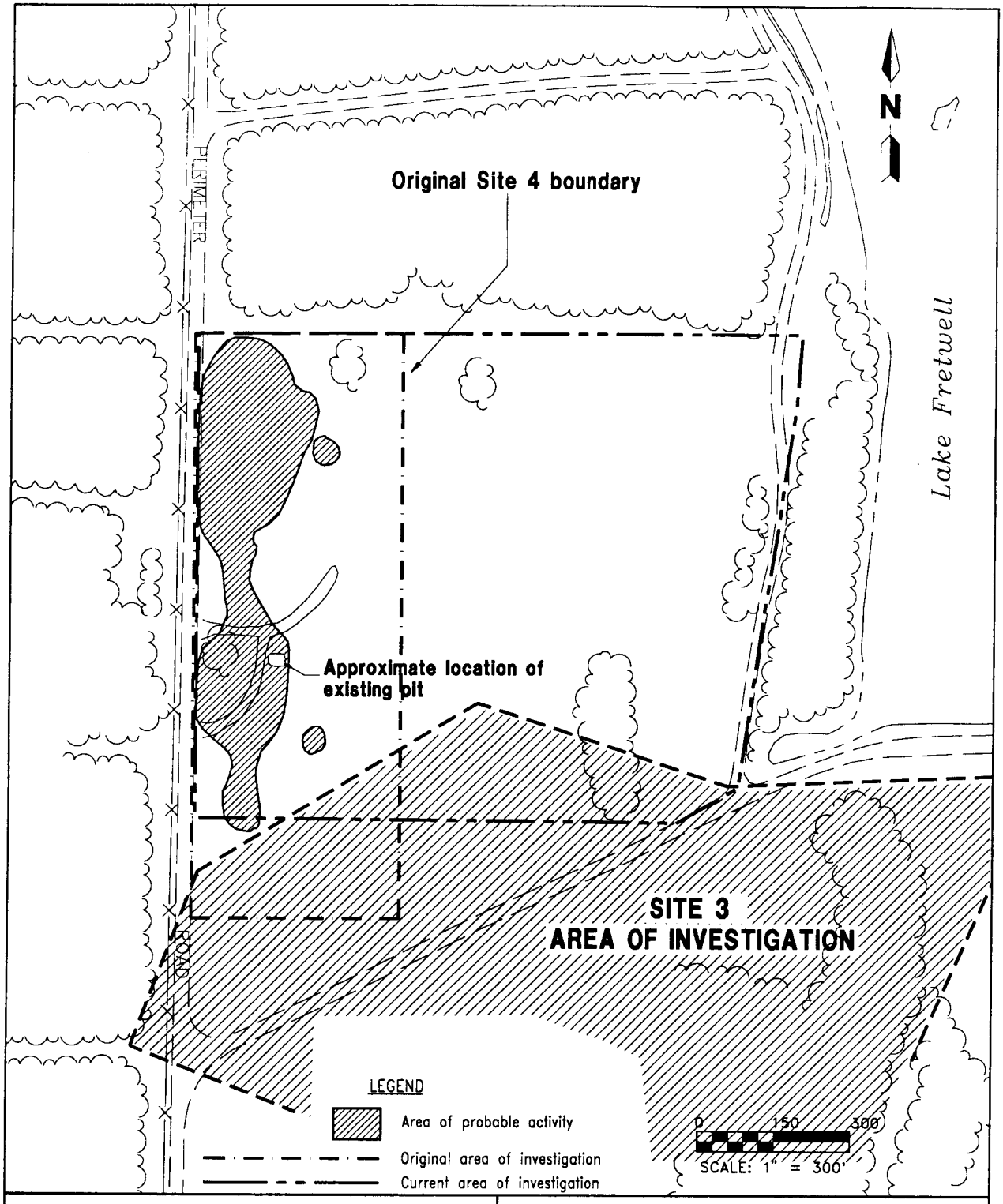

FIGURE 2-2
POTENTIAL SOURCE OF CONTAMINATION (PSC) 4 SITE MAP

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, and 19

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JACKSONVILLE, FLORIDA

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In 1984 Geraghty & Miller, Inc., installed three monitoring wells, each between the original PSC 4 area and Lake Fretwell (Figure 2-3). Groundwater flow of the surficial aquifer was interpreted to flow from west to east; therefore, the wells would be located downgradient of PSC 4. Two wells, S-2 and S-3, were shallow wells, being less than 15 feet in total depth and each having a 5-foot screen. The third well, SA-1, was set in the upper part of the Hawthorn Group, was 115 feet deep, and was apparently an open-hole well from 95 to 115 feet below land surface (bls). The water table was encountered between 2 and 4 feet bls.

Groundwater quality samples were collected from the monitoring wells and analyzed for selected State of Florida primary and secondary drinking-water parameters, volatile organic compounds (VOCs), and acid extractable compounds. Groundwater samples were collected for four consecutive quarters. Analytical results of the first quarter, which are representative of the other data, are given in Appendix A. Except for iron concentrations, results were either below detection limits or below State primary and secondary standards. Based on the groundwater data, it was recommended that monitoring of the site not be continued.

In 1985 Envirodyne Engineers, Inc. (Envirodyne), reported the results of the Initial Assessment Study (IAS). During this study historical data and aerial photographs were reviewed, personnel interviews were conducted, and potential sites were inspected. Based on available data, the estimated maximum amount of liquid waste oils and sludge that could have been disposed at the site was 770,000 gallons. Reportedly, disposed materials included solvents, paint, paint thinners, oils, and fuels. Additionally, a maximum of 800,000 gallons of kitchen grease and water could have been disposed at the site. Sources of the waste materials included the fuel farm, aircraft intermediate maintenance department (AIMD), squadrons, public works, and the facility’s mess halls. The volumes of estimated waste oils and sludge that could have been disposed at the site are given in Table 2-1. The IAS recommended the installation of additional monitoring wells, as well as the collection of groundwater, sediment, and surface water samples.

Additional work at the site was conducted by Harding Lawson Associates (HLA) and reported in the Resource Conservation and Recovery Act (RCRA) Facilities Investigation Report (RFI), 1988.

HLA reported that soil contaminated with diesel fuel and domestic sewage were being disposed at the site during the RFI investigation. A small disposal pit was active during the RFI field work and was located in the central part of the original area of investigation (Figure 2-2).

As part of the RFI, geophysical surveys were conducted at the site. Survey readings were collected from stations located on a 50-foot by 50-foot grid intervals. The grid measured 1,100 feet by 500 feet, with the 0,0 point (reference point) being located in the southwest corner of the site. Magnetometer and very low frequency (VLF) surveys were conducted at the site. The magnetometer survey would detect surface metals contained in other materials or metal buried a few feet bls. The VLF detects variations in soil conductivity and can indicate saturated areas, clay layers, or areas of disturbed soil, such as pits or trenches. No magnetometer anomalies were observed, indicating that metal objects, such as drums, were not disposed at the site. The VLF data indicated soil conductivity readings greater than background in the northern two-thirds of the original area of investigation and possibly in areas east of the survey grid (Figure 2-4).

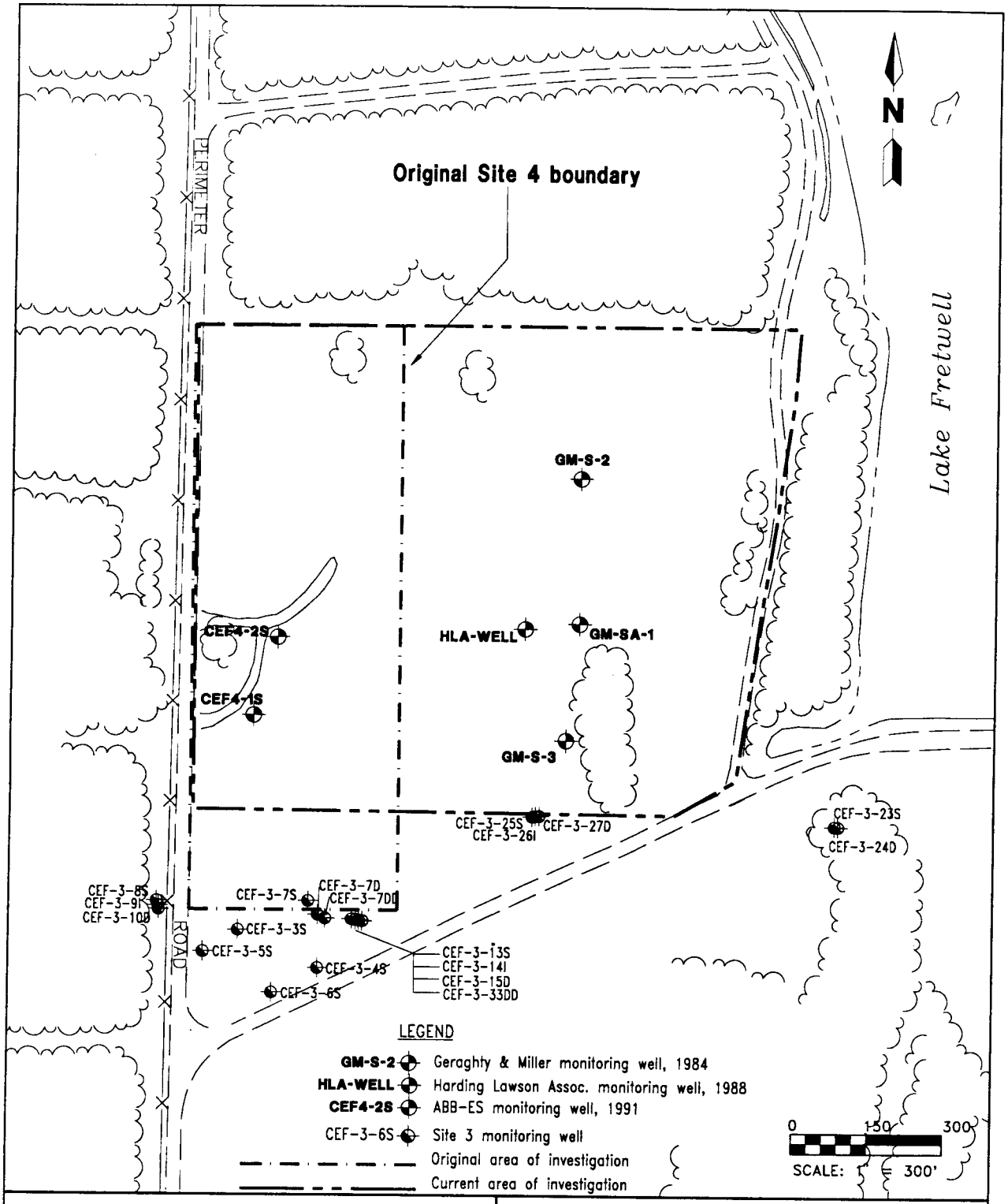

FIGURE 2-3
POTENTIAL SOURCE OF CONTAMINATION (PSC) 4
EXISTING MONITORING WELLS

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Table 2-1
Wastes Potentially Disposed at the Grease Pits, Site 4

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Waste Type	Total Estimated[1] Quantity Disposed (gallons)	Source	Comments
Grease	625,000 to 800,000	Installation messes	Grease mixed with water
Waste paint (enamel, epoxy, polyurethane, lacquer, and acrylic)	8,000	Squadrons, AIMD, and Public Works	--
Spent solvents (Stoddard, MEK, trichloroethene, PD-680, MIBK, toluene, naphtha, and xylene)	180,000	AIMD, squadrons, and Public Works	--
POL wastes	550,000	AIMD, squadron, and fuel farm	--
Paint thinners	35,000	Squadrons, AIMD, and Public Works	--

[1] This represents the total quantity generated during the operational period of the site. Some unknown portion of this total quantity was disposed at the site. This number provides a worst-case assumption (Envirodyne Engineers, 1985).

Notes: PSC = Potential Source of Contamination.
NAS = Naval Air Station.
AIMD = Aircraft Maintenance Department.
MEK = methyl ethyl ketone.
MIBK = methyl isobutyl ketone.
POL = petroleum oils and lubricants.

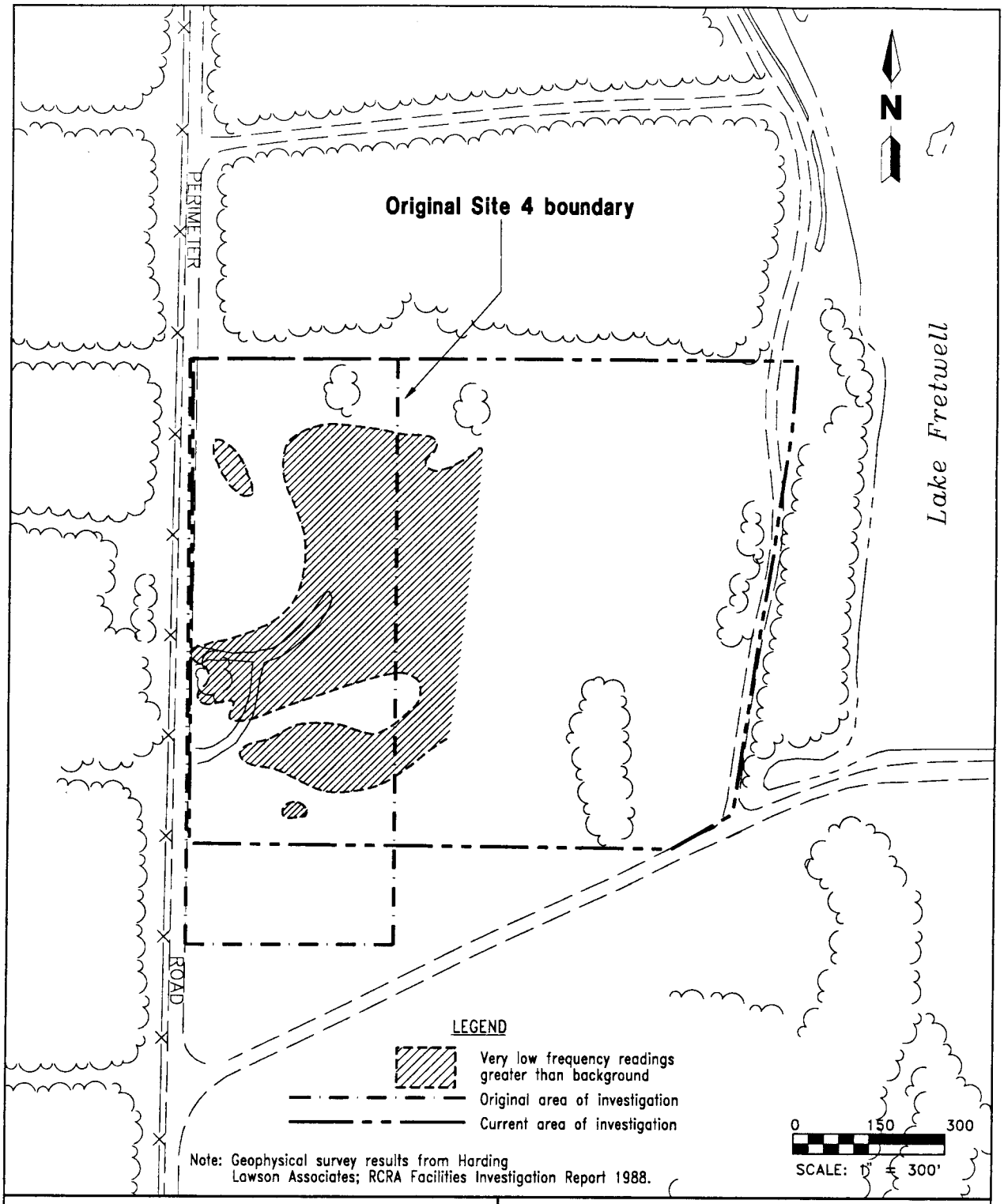

FIGURE 2-4
POTENTIAL SOURCE OF CONTAMINATION (PSC) 4 VERY LOW FREQUENCY (VLF) SURVEY RESULTS FROM THE DRAFT FINAL RCRA FACILITIES INVESTIGATION REPORT, 1988

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FIELD INVESTIGATION PLAN
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NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PSC_4-19.FIP
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During the RFI an additional monitoring well was installed on the east-central side of the site. Groundwater samples were collected from this well and the three existing monitoring wells and one surface water sample was collected near the Lake Fretwell spillway. The samples were analyzed for "modified" priority pollutants and selected heavy metals. Analytical results indicated the presence of bis(2-ethylhexyl)phthalate at a concentration of 14 micrograms per liter (µg/ℓ) in well CEF-4-2 (Geraghty & Miller well SA-1) and 12 µg/ℓ in wells CEF-4-3 (Geraghty & Miller well S-3) and CEF-4-4, (the newly installed well). The RFI recommended that monitoring at PSC 4 be continued, but did not recommend any additional investigative work.

In 1991, ABB Environmental Services, Inc. (ABB-ES), conducted supplemental sampling at the site, reporting the results in the Technical Memorandum for Supplemental Sampling at Operable Units 1, 2, and 7 (TMSS), dated September 1992. Investigative techniques used during the TMSS investigation included a ground penetrating radar (GPR) survey, groundwater headspace screening, piezocone surveying, soil sampling, the installation of two shallow monitoring wells, groundwater sampling, slug testing, and collection of water level data.

The headspace screening samples were analyzed with a gas chromatograph (GC) equipped with an electron capture detector (ECD) and a flame ionization detector (FID). Seven groundwater samples were collected at the water table from locations indicated on Figure 2-5. Six soil samples (Figure 2-5) were collected, three from 0 to 2 feet bls and three from 2 to 4 feet bls. The soil samples were analyzed for U.S. Environmental Protection Agency (USEPA) target analyte list (TAL) inorganics and target compound list (TCL) organics. Groundwater samples from the two new monitoring wells were analyzed for TCL inorganics, TAL organics, and total recoverable petroleum hydrocarbons (TRPH).

The GPR survey was inconclusive and did not delineate any specific pits. The groundwater headspace screening analysis indicated the presence of VOCs, specifically toluene (73 µg/ℓ) and ethylbenzene (22 µg/ℓ). Soil sampling results indicated the presence of VOCs and semivolatile organic compounds (SVOCs). The groundwater sample results indicated low concentrations of SVOCs and TRPH. Actual groundwater and soil TAL and TCL results are given in Appendix B.

Piezocone data indicate that soil at PSC 4 from land surface to 74 feet bls consists of fine-grained sand mixed with varying amounts of silt and clay. Water level data indicate the groundwater flow in the upper part (approximately 15 feet bls) of the surficial aquifer is to the east. The hydraulic conductivity in this same interval was approximately 1.1 feet per day.

Based on the results of the 1991 investigation, which showed the presence of aromatic and chlorinated aliphatic solvents in soil and groundwater, it was recommended that investigative work be continued at PSC 4. The TMSS recommended that a passive soil gas survey be conducted over a sampling grid to be approximately 650 feet by 550 feet, located in the area believed to be the grease pit disposal sites. The results of the soil gas survey would help assess what kinds of additional environmental samples would be required, if any. Suggested sample media included surface soil, subsurface soil, and groundwater samples.

In February 1993, 424 soil gas samplers were installed at PSC 4 by Northeast Research Institute, Inc. These samplers were installed to collect VOCs and SVOCs from the soil gas, map the extent of the detected compounds, and attempt to

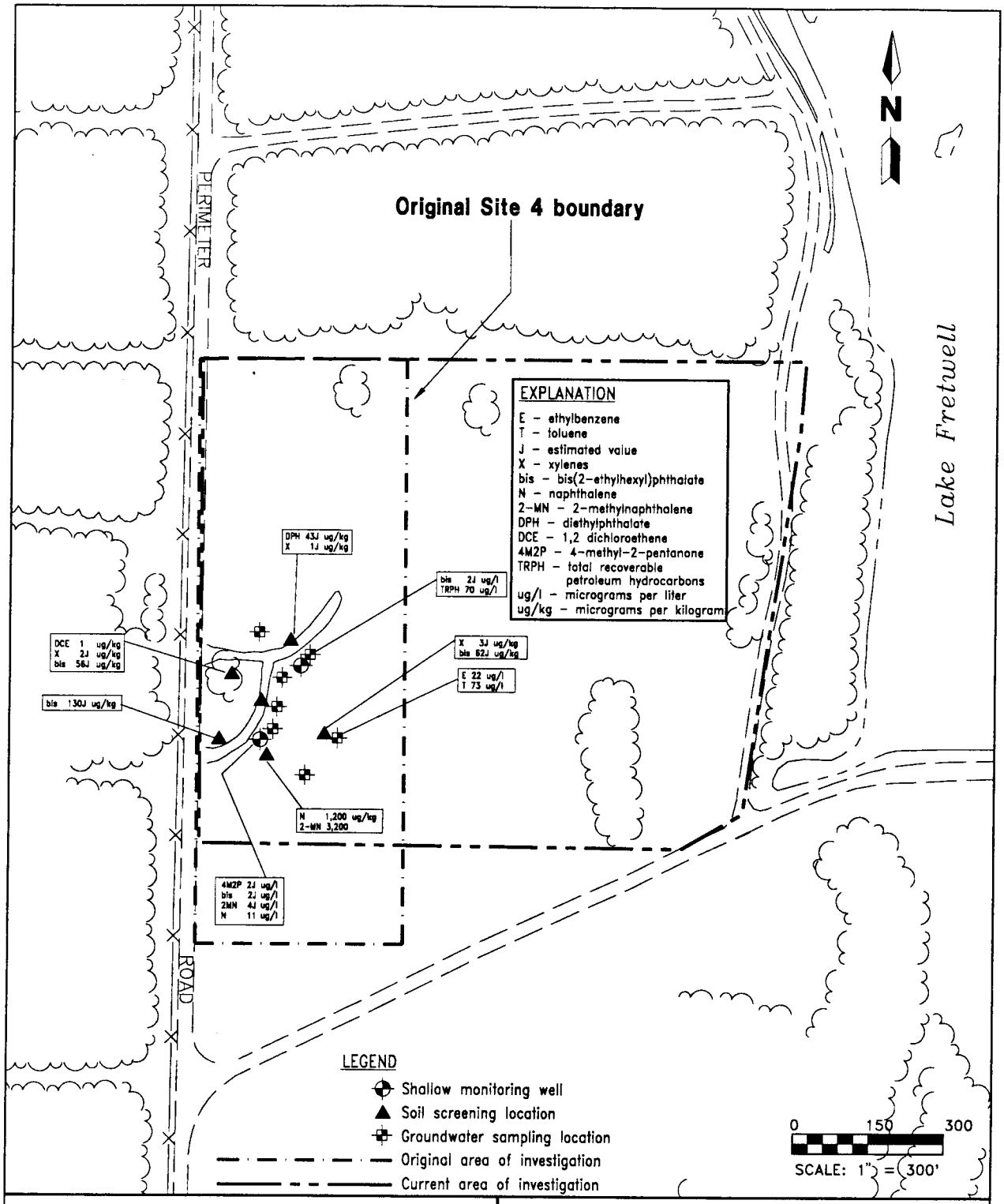

FIGURE 2-5
POTENTIAL SOURCE OF CONTAMINATION (PSC) 4 SAMPLE LOCATIONS AND RESULTS FROM THE 1991 FIELD INVESTIGATION

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
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indicate source areas and plume boundaries. Each soil gas sampler was installed to a depth of 18 inches bls. Samplers were installed at 50-foot centers and sampling density increased to 25-foot centers in areas where contamination was suspected. The sampling grid size was approximately 850 feet by 1,150 feet or approximately 22 acres, with the long axis of the grid oriented west to east.

The soil gas samples were analyzed by thermal desorption-mass spectrometry (TD-MS) and thermal desorption-gas chromatograph and mass spectrometry (TD-GC and MS). Analytical results were reported as ion count values. Ion count values are relative and do not represent actual compound concentrations. Ion counts were plotted as histograms of the distribution of the ion counts and any breaks in the distribution were noted. The soil gas survey report stated that results were generally very low, with few exceptions. Exceptions were those areas where ion counts were equal to or greater than 5,000, which, based on the histograms, was the break between the source populations and migration and background populations (Figure 2-6). Compounds with ion counts equal to or greater than 5,000 included the chlorinated chemicals tetrachloroethene (PCE), trichloroethene (TCE), trichloroethane (TCA), and dichlorobenzene (DCB). Other compounds detected at less than 5,000 ion counts were benzene, toluene, ethylbenzene, xylenes, and chloroform. The report concluded that the isolated distribution of the chlorinated compounds reflected source areas (possibly pits) and, because of the limited areal extent of elevated ion counts, that little or no migration of these compounds had occurred at PSC 4.

A review of aerial photographs did not indicate the location of any specific pits. Some areas of probable activity (areas lacking vegetation) were noted in some photographs. Prominent areas are indicated on Figure 2-2 as areas of probable activity.

2.3 CONCEPTUAL UNDERSTANDING. PSC 4 is a 9-acre area that has been used for about 30 years for waste oil and grease disposal. Waste materials were disposed into shallow, unlined pits, which were covered with soil after discontinued use. The land surface is nearly flat with gentle sloping from west to east. The western part of the site is an open field, vegetated with grasses, weeds, and scattered bushes and pines. Pines and understory plants are more dense in the eastern part of the site, which becomes more marshy in the vicinity of Lake Fretwell.

Soils at Site 4 are generally fine-grained sands mixed with varying amounts of silt and clay. Groundwater flow direction in the surficial aquifer is eastward toward Lake Fretwell. The water table is generally 2 to 4 feet bls. It is interpreted that groundwater from the upper and lower parts of the surficial aquifer discharges to Lake Fretwell.

It is interpreted that the upgradient area of the groundwater in the surficial aquifer is in the western part of PSC 4. It is interpreted that potential contaminants in the groundwater in the western part of the site could first migrate downward then migrate horizontally or eastward. Due to the presence of Lake Fretwell and the fact that the eastern part of the site is hydraulically downgradient of the western part, groundwater vertical flow is interpreted to be upward. Therefore, potential contaminant migration, if any, in the lower part of the surficial aquifer would be upward toward the land surface and Lake Fretwell.

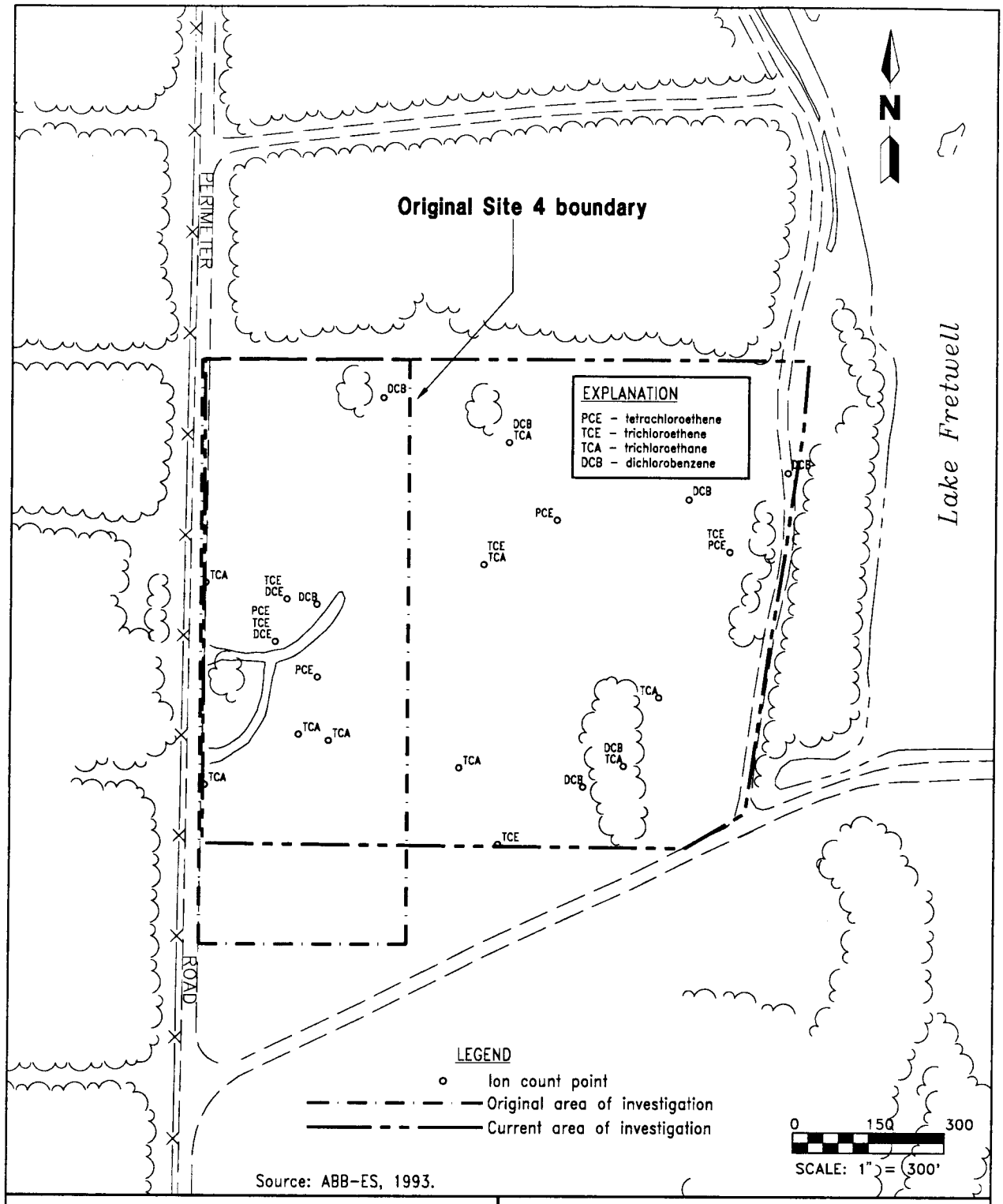

FIGURE 2-6
POTENTIAL SOURCE OF CONTAMINATION (PSC) 4 LOCATIONS OF ION COUNT VALUES EQUAL TO OR GREATER THAN 5,000 (From the 1993 passive soil gas survey)

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 21, 18, AND 19

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Chemical analytical results of soil and groundwater samples indicate that VOCs and SVOCs are present at the site. The presence and migrations of these compounds could potentially affect site surface soil, subsurface soil, and groundwater. Migration of these compounds could also affect Lake Fretwell sediment and surface water now or in the future.

2.4 SAMPLING PROGRAM. A sampling program was developed to provide confirmatory Level IV chemical analyses on which to base a decision for no further action or to initiate remedial investigation and feasibility study activities in support of a Record of Decision. Environmental sample locations were selected to better understand those areas that were probable active sites, to confirm results of the soil gas survey, and to assess the groundwater conditions, both in the upper and lower parts of the surficial aquifer.

2.4.1 Surface Soil Sampling Five surface soil samples will be collected from the site (Figure 2-7). These samples will be collected from areas where activity appeared to have occurred (based on existing data or aerial photographs). Samples will be analyzed for TAL and TCL parameters and TRPH. The rationale for each sample location is as follows.

PSC4-SS1 will be collected in the northwestern part of the site. No samples have been collected previously from this area. Aerial photographs indicate the site was active in the early 1980's.

PSC4-SS2 will be collected in the west-central part of the site near existing well CEF4-2S. This location was an active area and is near a pit in operation during the RFI field work.

PSC4-SS3 will be collected in the vicinity of monitoring well CEF4-1S. Existing data indicate that subsurface soil and groundwater contamination exists at this location.

PSC4-SS4 will be collected in the area approximately 150 to 200 feet north of the existing pit. The passive soil gas survey indicated the presence of solvents in this area.

PSC4-SS5 will be collected at the southern extent of the area of indicated activity. The sample location is in a small area where no data exist between PSC 4 and Site 3.

Surface soil samples have not been proposed for the eastern and the southernmost parts of the PSC 4 area of investigation. Surface soil samples are not proposed in the eastern part because aerial photographs did not indicate areas lacking vegetation (active areas). Additional samples were not proposed for the southern part of the site because the Site 3 area of investigation overlaps much of part of PSC 4. Several Site 3 monitoring wells and field screening soil sample locations are located in this area of overlap. Sample analysis is similar or identical to the analysis proposed for PSC 4 and will be reviewed as part of the PSC 4 contaminant evaluation.

2.4.2 Subsurface Soil Sampling Eight subsurface soil samples will be collected for the current PSC 4 area of investigation. Four samples will be collected from the western part of the site, the area where disposal activity is thought to have

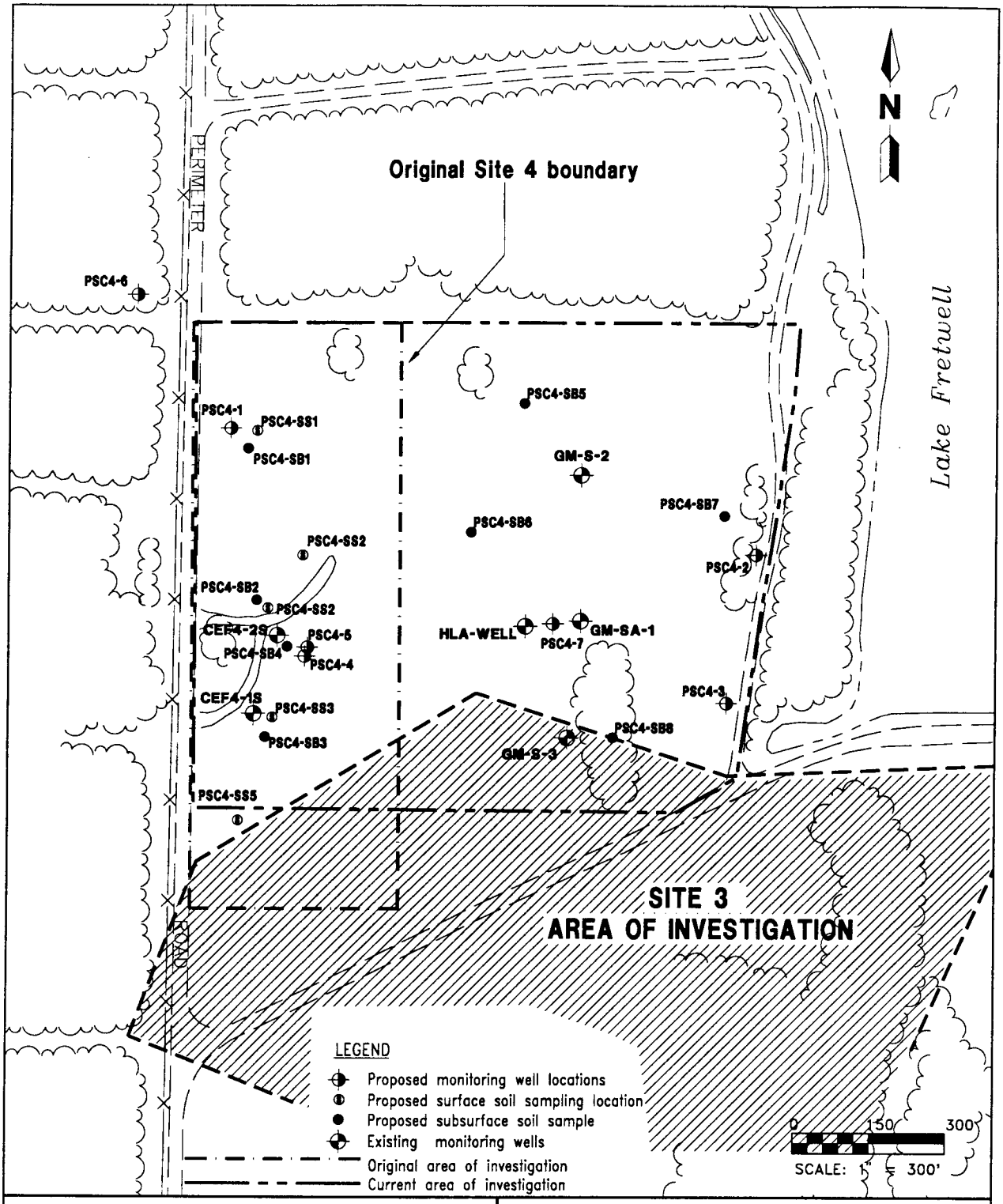

FIGURE 2-7
POTENTIAL SOURCE OF CONTAMINATION (PSC) 4
PROPOSED ENVIRONMENTAL SAMPLE LOCATIONS

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FIELD INVESTIGATION PLAN
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occurred. The remaining four samples will be collected from those soil gas survey locations where two or more chlorinated solvents were detected. The soil gas survey report postulated that these locations represented old pit sites. Each sample will be collected from the 1-foot interval just above the water table. If sample locations are, in fact, located in the pits and disposal material is encountered, the sample will be collected from the 1-foot interval immediately below the pit and native soil interface. Subsurface soil samples will be analyzed for TAL and TCL parameters and TRPH. The rationale for each subsurface soil sample is as follows.

PSC4-SB1 will be collected in the northwestern part of the site. No samples have been collected previously from this area. Interpretation of aerial photographs indicates this area of the site was active in the early 1980's.

PSC4-SB2 will be collected in the west-central part of the site near existing well CEF4-2S. This location was an active area and is near a pit in operation during the RFI field work.

PSC4-SB3 will be collected in the vicinity of monitoring well CEF4-1S. Historic data indicate that subsurface contamination exists at this location and sample analysis should confirm the current presence of these contaminants.

PSC4-SB4 will be collected from the pit that was active during the RFI field work.

PSC4-SB5 through PSC4-SB8 will be collected from the central and eastern parts of the PSC 4 area of investigation where DCB, TCA, TCE, and PCE were indicated by the soil gas survey.

2.4.3 Groundwater Sampling Seven monitoring wells are proposed for installation at PSC 4. All monitoring wells, previously existing and newly installed, will be developed (if necessary), purged, and sampled. Groundwater samples will be analyzed for TAL and TCL parameters and TRPH. The rationale for each proposed monitoring well is as follows.

PSC4-1 will be located in the northwestern part of the site, at the same sample location as PSC4-SS1 and PSC4-SB1. This well will be a shallow well, screened to intersect the water table. This well is intended to monitor an area not previously sampled and is interpreted to have been an active site. This area is also interpreted to be hydraulically upgradient of the eastern part of PSC 4.

PSC4-2 will be located in the east-central part of the area of investigation. Currently, no monitoring wells exist in this area and the soil gas survey indicated potential contamination in the area. The well will be a shallow well that is downgradient of PSC 4 and offset from the line of wells located in the central part of the area of investigation. The well will be set such that the screened interval will intersect the water table. It is interpreted that groundwater from the upper and lower parts of the surficial aquifer at PSC 4 discharge to Lake Fretwell. The vertical head of the lower part of the surficial aquifer will be greater than that of the upper part, thus contaminant migration would be upward in the eastern part of the PSC 4 area of investigation. The screened interval should then be able to intercept contaminant migration from either part of the surficial aquifer.

PSC4-3 will be a shallow well located in the southeastern part of the area of investigation. This well will be a shallow well located downgradient of PSC 4 and just north of the Site 3 area of investigation. The screen interval of this well will be similar to that of PSC4-2. It is interpreted that groundwater from the upper and lower parts of the surficial aquifer at PSC 4 discharge to Lake Fretwell. The vertical head of the lower part of the surficial aquifer will be greater than that of the upper part, thus contaminant migration would be upward in the eastern part of the PSC 4 area of investigation. The screened interval should then be able to intercept contaminant migration from either part of the surficial aquifer. The well will be offset from the line of wells located in the central part of the area of investigation.

PSC4-4 will be a shallow well located in the western part of the site. The well is to be installed just east of the pit that was active during the RFI field work. It is interpreted that this well will be hydraulically downgradient of the pit.

PSC4-5 will be located adjacent to well PSC4-4 and the screen will be set to monitor the deeper part of the surficial aquifer. It is interpreted that the western part of PSC 4 is hydraulically upgradient of the eastern part. It is also interpreted that in this area the vertical head in the upper surficial aquifer will be greater than the vertical head in the lower surficial aquifer. Contaminants, then, could migrate downward in this part of PSC 4.

PSC4-6 will be located northwest of PSC 4 and west of the facility security fence. The well will be a shallow well, screened to intersect the water table. Analytical data for the sample from this well should indicate upgradient groundwater conditions.

PSC4-7 will be an intermediate depth monitoring well located just west of existing well GM-SA-1. The screen will be set approximately 30 to 40 feet bls. Analytical data for the sample from this well should indicate downgradient groundwater conditions at an intermediate depth of the surficial aquifer.

3.0 PSC 6, LAKE FRETWELL RUBBLE DISPOSAL AREA

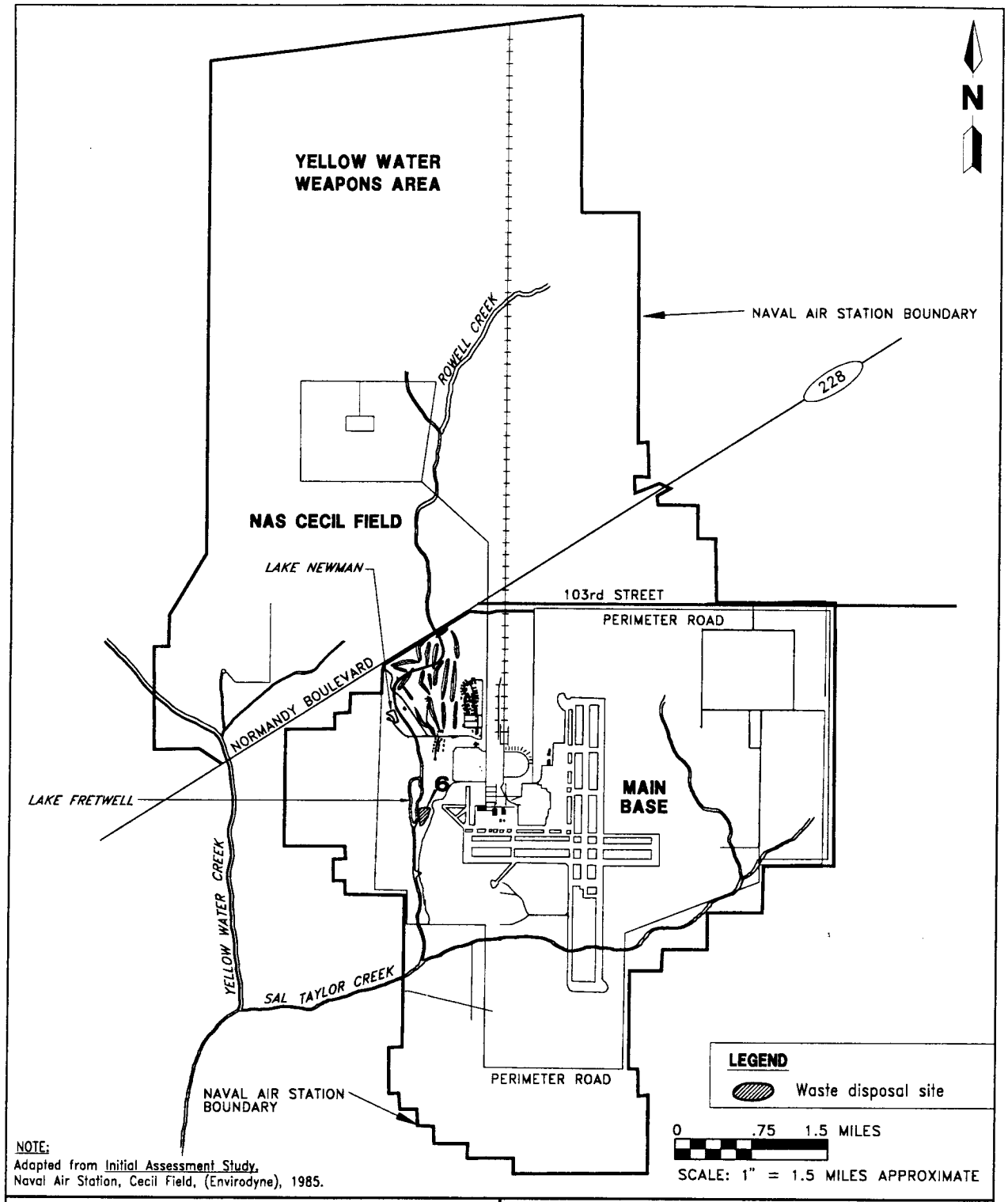
3.1 SITE DESCRIPTION AND HISTORY. PSC 6 was identified as a PSC during the IAS. The site was operated as a rubble disposal site for approximately 30 years, from the mid-1950's until 1984. Review of aerial photographs suggests that site activity was intermittent. Originally, the site was a low-lying marshy area and rubble was used to fill in and build up the area. Reportedly, the NAS Cecil Field Public Works Department hauled and disposed debris at the site by simply dumping the debris onto the land surface. The source of the majority of the waste was construction and building demolition debris. Known wastes disposed at the site include concrete (primarily flightline material), lumber, tree clippings, scrap metal, and similar inert materials. Rubble in the northern half of the site has been covered with soil and a 3- to 5-foot berm has been placed along the northern and western-most perimeters of the site. The rubble in the southern half of the site is uncovered. The volume of materials dumped at this site in unknown. There were no reports or evidence of hazardous wastes being disposed at the site.

PSC 6 is located in the southwestern part of the main base, along the eastern shore of Lake Fretwell (Figure 3-1). The base coordinate system location for the site is H-8. To the north, the site is bounded by a drainage canal, which is oriented slightly southeast to northwest and empties into Lake Fretwell. The canal used to be the old drainage ditch of the wastewater treatment plant. The site is bordered to the east by an unpaved service road and to the south by open to partially wooded land. The site is accessible by service roads, which run along the north and northwestern extent of the site, into the south-central part of the site, and along the southern extent of the site. The general slope of the land is east to west, toward Lake Fretwell. There is no obvious drainage pattern on the site. Western parts of the site are marshy, with seeps and ponded water occurring near the lake's shore. Overland water flow is interpreted to be toward Lake Fretwell. South to southwest of the main part of the site is a small bay, which opens to Lake Fretwell. Some additional concrete rubble is along the south and west borders of the small bay. Other types of debris were not noted in this area. The IAS reports the site to be approximately 1,000 feet long and 150 feet wide or approximately 3.5 acres. The RFI reports the site to be approximately 700 feet long (north to south) and 350 feet wide (west to east) or 5.6 acres.

3.2 PREVIOUS INVESTIGATIONS. Investigation of PSC 6 began in 1985 with the IAS conducted by Envirodyne. The purpose of the IAS was to "identify and assess sites posing a potential threat to human health or the environment due to contamination from past hazardous substance disposal operations" (Envirodyne, 1985). PSCs were identified based on historical records, aerial photographs, field inspections, and personal interviews.

Envirodyne conducted a field inspection at PSC 6, noting the types and extent of materials and the general physical features of the site and surrounding areas. Due to the nature of the materials at PSC 6, the IAS concluded that the site posed no significant source of potential surface or groundwater contamination. No samples were collected from the site during the IAS investigation.

In 1987, HLA conducted an RFI at PSC 6. The RFI included a site inspection and magnetometer and VLF geophysical surveys. Environmental samples were not collected from the site.



NOTE:
Adapted from Initial Assessment Study, Naval Air Station, Cecil Field, (Envirodyne), 1985.

FIGURE 3-1
POTENTIAL SOURCE OF CONTAMINATION (PSC) 6 WASTE DISPOSAL SITES, CECIL FIELD AND YELLOW WATER WEAPONS AREA

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During the RFI site inspection it was noted that the northern 150 feet of the site had been cleared and leveled. Also the vegetation in the eastern part of the site was much more mature than in the western part, indicating that dumping activity in the eastern part did not occur or preceded that of the western part. Vegetation in the eastern part consisted of mature tress and dense understory, whereas the western part consisted of less dense understory trees and bushes and open field. This disparity of growth maturity implies that dumping activity at the site occurred over several decades.

HLA conducted geophysical surveys on a grid 800 feet long and 300 to 400 feet wide (7.3 acres). Data were collected on 100-foot centers. The long axis of the survey was oriented south to north (Figure 3-2). The magnetometer survey indicated metal exists over most of the site. The majority of the metal is in the form of steel reinforcing bars in the concrete debris. Metal was also interpreted to exist beneath land surface in the northern part of the site that had been cleared and leveled. The magnetometer survey did not define the eastern extent of the metal-bearing area. The VLF data indicated only one area where measurements were above background values. This area is small, approximately 60 feet by 60 feet, and is located in the northern extent of the site. It was concluded in the RFI that the area is isolated and has no apparent relation with PSC 6.

On April 21, 1993, ABB-ES collected preliminary screening samples at PSC 6 (Figure 3-3). Five surface soil samples (indicated with the "SS" media designator) and one sediment sample (indicated with the "SD" media designator) were collected from six locations. A duplicate sediment sample was also collected. All of the samples were collected from 0 to 2 feet bls.

The screening samples were submitted to an on-site laboratory for volatile organic analyses using USEPA Methods 8010 (halogenated hydrocarbons) and 8020 (aromatic hydrocarbons) modified to include naphthalene as a parameter. The analyses did not include semivolatile organics or inorganics typically used to evaluate potential sources of contamination. The results of the volatile sampling are summarized below. The complete analytical results are presented in Appendix C.

Location Depth	SS-6-1 (0-2)	SS-6-2 (0-2)	SD-6-3 (0-2)	SD-6-3(D) (0-2)	SS-6-4 (0-2)	SS-6-5 (0-2)	SS-6-6 (0-2)
Compound	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Trichlorofluoromethane	0.003	0.002 U	0.002 U	0.002 U	0.003	0.007	0.003
Toluene	0.002 U	0.002 U	0.002 U	0.009	0.002 U	0.002 U	0.002 U
Ethylbenzene	0.002 U	0.004	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
meta and para-Xylene	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.010	0.002 U

Notes: SS = surface soil sample.
SD = sediment sample.
D = duplicate sample.
0-2 = sampling depth in feet below land surface.
mg/kg = milligrams per kilogram.
U = compound was not detected.

A brief discussion of the volatile organics detected at PSC 6 is provided below. Conclusions regarding the potential extent of the contaminants in soil and sediment cannot be determined with the available data because of the limited number of samples collected.

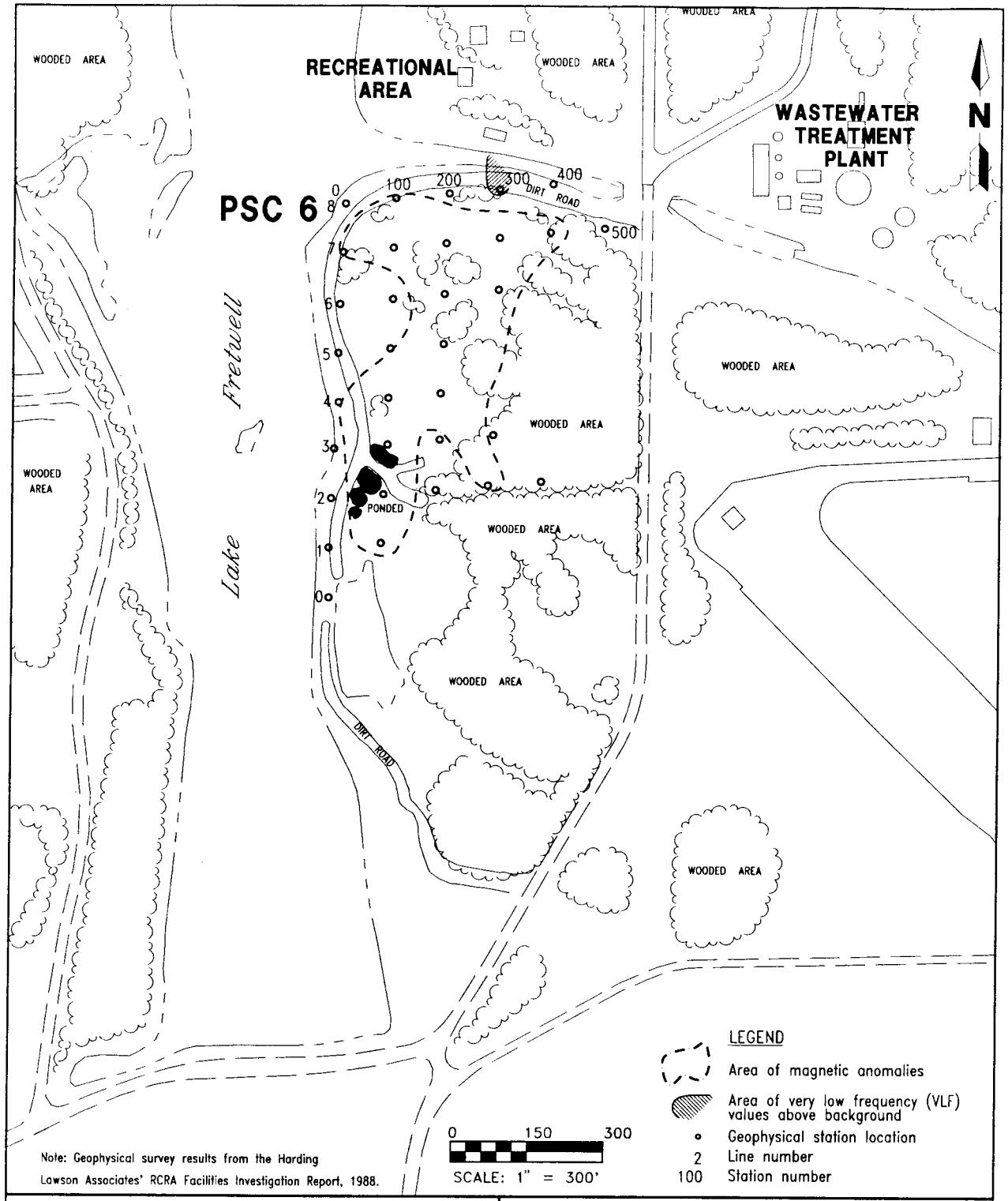

FIGURE 3-2
POTENTIAL SOURCE OF CONTAMINATION (PSC) 6 GEOPHYSICAL SURVEY GRID AND MAGNETOMETER AND VERY LOW FREQUENCY (VLF) RESULTS

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9 ,12, 18, AND 19

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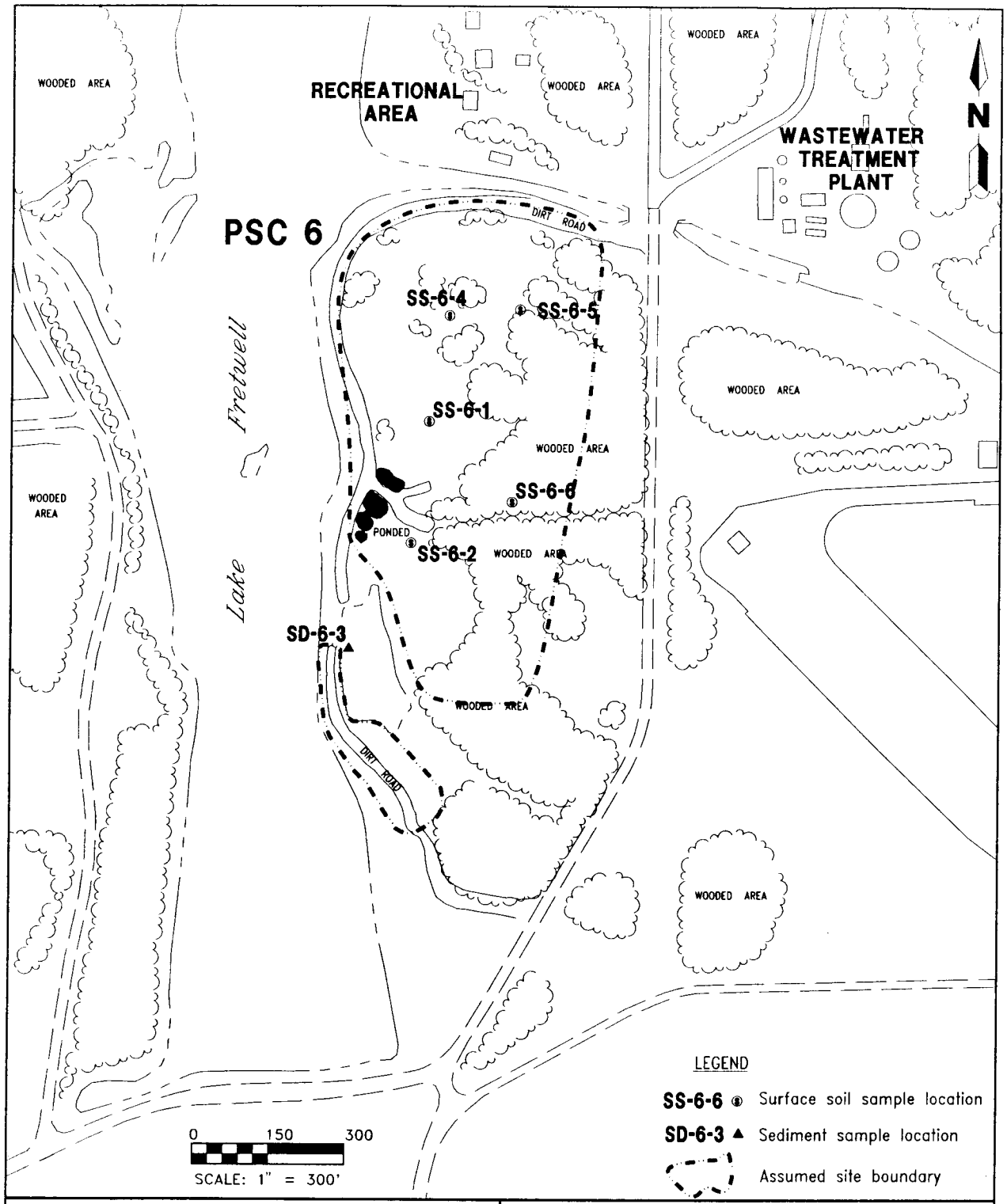

FIGURE 3-3
POTENTIAL SOURCE OF CONTAMINATION (PSC) 6
PRELIMINARY SITE SCREENING SAMPLING LOCATIONS, 1988

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

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Trichlorofluoromethane was detected in soil samples collected in the central and eastern parts of the site. Trichlorofluoromethane, also known as Freon 11, is a volatile organic compound used as a propellent in spray cans, as a blowing agent for polyurethane foams, as a cleaner and solvent, and is used in fire extinguishers and air conditioners. This compound, which is included in the modified USEPA Method 8010, is not on the USEPA's TCL used for CERCLA actions. Trichlororfluoromethane may have anesthetic and cardiotoxic properties in humans when present in air at elevated concentrations (above 5 percent by volume, Ellenhorn and Barceloux, 1988).

The other compounds detected, toluene, ethylbenzene, and xylenes, are hydrocarbons that are often, though not exclusively, related to petroleum products. These compounds were detected in the western part of the site, in areas near Lake Fretwell. The presence of these compounds, at the concentrations reported, may be the result of human activity in the vicinity of PSC 6 (hauling debris, mowing, boating, etc.) or they may possibly be related to disposed materials at the site.

In December 1994, ABB-ES personnel conducted a walkover of the site. The predominant type of debris was concrete. Most of the concrete appeared to be rectangular in shape varying from 2 to 3 feet long and 3 feet wide to 6 to 8 feet long and 5 to 6 feet wide. These slabs were generally a few inches thick and contained steel reinforcement bars. The slabs appear to be old flightline material. Also noted were a few blocks of concrete, some appearing to be old foundation parts; others were standard construction blocks. One 55-gallon drum was seen resting on top of the concrete debris in the southern part of the site. The drum was empty, with one end open. Labeling on the drum was not apparent. In the southern part of the site, water was noticed seeping from the ground and ponding in low areas next to Lake Fretwell or the small bay south of the site. There were no odors or unusual coloration of the water.

In March 1995, ABB-ES personnel conducted another site walkover, exploring the southern extent of the site. Additional concrete rubble was noticed along the southern access road (Figure 3-3). Rubble exists on either side of the road, but the majority of debris occurs on the northern side. The debris appears to be limited to the vicinity of the access road and is separate from the other debris piles. The rubble was composed of concrete culvert and foundation debris. No other type of debris was noted.

A review of aerial photographs from various years was also conducted. The photographs reviewed do not represent continuous years, resulting in gaps during which site activity could have occurred. Site activity was based solely on the absence of vegetation and does not imply disposal of materials. The photographs suggest that site activity occurred intermittently over several decades. Large areas (greater than 100 feet in length) lacking vegetation were noted in photographs from 1960, 1975, 1980, 1982, and 1984. Smaller areas were noted in photographs taken in 1969 and 1970. The site appears to have been inactive during periods that include 1943, 1952, 1972, and 1973.

3.3 CONCEPTUAL UNDERSTANDING. PSC 6 operated for many years as a disposal site of rubble and tree trimmings. Aerial photographs suggest that intermittent activity occurred over a period of at least 25 years, from the 1950's into the 1980's. The majority of the materials disposed at the site is flightline and construction reinforced concrete. Minor amounts of metal parts and construction lumber also exist at the site. Operations consisted of dumping materials onto the ground, though geophysical data suggest that some metal may exist beneath the land surface. One 55-gallon drum was noted in the southern part of the site. Exact volumes of materials disposed at the site are unknown. It is not known if all types of materials disposed at this site have been identified, but there is no information that suggests other materials were deposited at PSC 6. The extent of the debris has not been determined in all parts of the site.

The land is marshy, lying along the eastern shore of Lake Fretwell. Land surface slopes from east to west and to some extent southwest. Overland flow is also expected to be from east to west and southwest. Near the lake, groundwater seeps

from the ground into ponds or drains into the lake. It is assumed, then, that groundwater is near land surface and flow is from east to west, toward the lake.

Analytical data of soil and sediment indicate the presence of very low concentrations (less than 0.010 milligrams per kilogram [mg/kg]) of petroleum-related (aromatic-hydrocarbon) volatile compounds. The aromatic hydrocarbons were detected near the lake.

The presence and migration of any contaminants that may exist in the disposed materials could potentially be released to site surface soil, subsurface soil, and groundwater. If any contaminants are released, they may also be found in sediment and surface water of Lake Fretwell and associated features and tributaries adjacent to and downgradient of the site. Lake Fretwell appears to be hydraulically connected to the site through groundwater and as the lake level fluctuates, the direction of groundwater movement may vary. Any contaminants in groundwater or lake water would migrate accordingly.

3.4 INVESTIGATIVE AND SAMPLING PROGRAM. The objective of the investigative and sampling program is to assess the site for the presence or absence of contaminants potentially associated with the debris disposed at the site. The nature and potential impact these contaminants may have on surface soil, subsurface soil, and groundwater at the site and surface water and sediment adjacent to the site will be assessed. Results of the investigation will be evaluated in the PRE to see if additional investigation is warranted for PSC 6. To meet these objectives, a geophysical survey, monitoring well installation, and sample collection from surface and subsurface soil, groundwater, surface water, and sediment is planned. Sample locations will be biased to identify the presence of contamination.

3.4.1 Surveys Magnetometer and electromagnetic (EM) induction surveys will be conducted in the open and level areas north and west of the debris piles. The geophysical survey should confirm or reject the RFI interpretations that indicate buried materials exist beneath the open field that lies between the rubble and Lake Fretwell. Survey lines will be established in west to east and south to north directions. Survey lines will extend from the debris piles to as close a possible to Lake Fretwell and the drainage canal. Survey lines will be spaced 100 feet apart. In areas where debris boundaries are indicated, supplemental geophysical data will be collected to better define those boundaries. Boundaries or isolated buried objects indicated by the geophysical survey will be marked by stakes.

The areal extent of PSC 6 will be assessed. Those parts of the site where debris exists above ground will be surveyed by a professional land surveyor, certified in the State of Florida. Location stakes from the geophysical survey and other physical features in and around the site will also be surveyed. An accurate site map will be constructed from the land and geophysical surveys.

3.4.2 Surface Soil Sampling Eight surface soil samples will be collected from the site (Figure 3-4). Samples will be collected from 0 to 1 foot below land surface. Five samples will be collected at locations topographically downgradient of the debris pile. One sample will be collected from within the largest debris pile. Surface soil samples will be analyzed for full TAL and TCL parameters. The rationale for each surface soil sample is as follows.

PSC6-SS1 sample will be collected near the northern extent of the debris. This sample will help assess if contaminants are present in the northern part of the site.

PSC6-SS2 will be collected at some feasible location within the debris in an attempt to assess potential contaminants that might emanate from the debris piles.

PSC6-SS3 will be collected near the western edge of the debris piles. This location is topographically downgradient of the debris and is subject to overland flow and potential migration if contaminants are emanating from the debris piles.

PSC6-SS4 will be collected in the western part of the site near the end of the access road that runs west to east across the site. This location is topographically downgradient of the debris piles and subject to overland flow and to seepage from groundwater. Potential contamination is from the debris or groundwater could impact surface soil at this location.

PSC6-SS5 will be collected near the southwest edge of the debris piles. This location is near the location of screening sample PSC6-SS2, where toluene was detected at 0.004 mg/kg. It is also topographically downgradient of the debris piles.

PSC6-SS6 will be collected along the southern extent of the debris piles to help assess whether contaminants exist at the southern extent of the site.

PSC6-SS7 will be collected at some northern extent of the debris located along the southern access road. Data from this area will help assess whether contaminants exist in the area of the southern debris pile.

PSC6-SS8 will be collected from a location between the southern debris pile and Lake Fretwell to help assess site conditions at the southern extent of the site.

3.4.3 Subsurface Soil Sampling If possible, a subsurface soil sample will be collected from each monitoring well location, for a total of five samples. Each sample will be collected from the 1-foot interval just above the water table. One sample will be collected in an area that is hydraulically upgradient of the site. The remaining four will be collected at locations downgradient of the site. Subsurface soil samples will be analyzed for the full TAL and TCL parameters. The rationale for each subsurface soil sample is a follows.

PSC6-SB1 is to be collected from the monitoring well PSC6-1 site, which is interpreted to be upgradient of the debris piles. The PSC6-SB1 sample will help assess upgradient subsurface soil conditions.

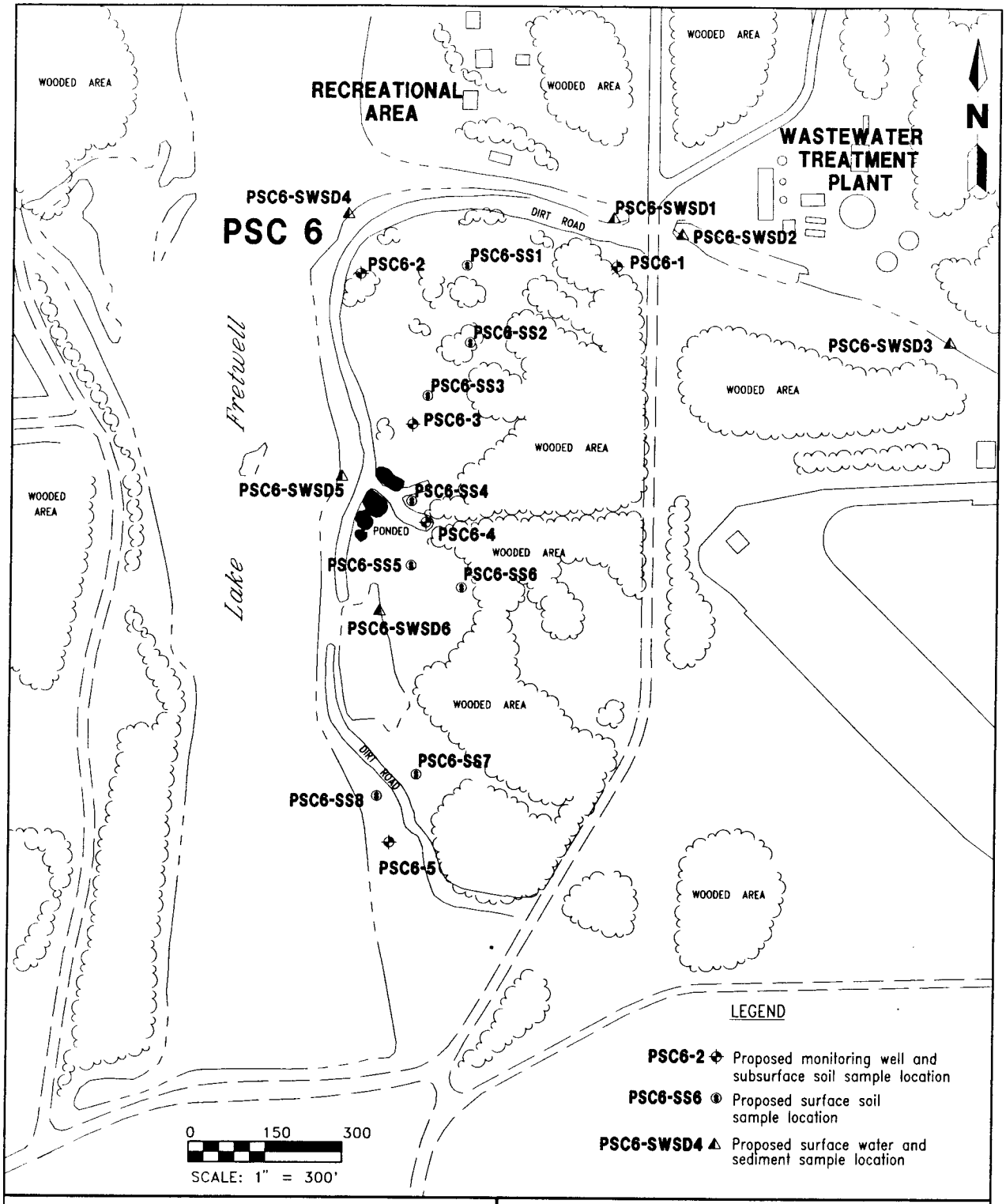

FIGURE 3-4
POTENTIAL SOURCE OF CONTAMINATION (PSC) 6
PROPOSED SAMPLING LOCATIONS

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PSC_4-19.FIP
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PSC6-SB2 will be collected from the PSC6-2 monitoring well site, located downgradient of the northern part of the debris piles.

PSC6-SB3 will be collected from the PSC6-3 monitoring well site, located downgradient of the central part of the debris piles.

PSC6-SB4 will be collected from the PSC6-4 monitoring well site, located downgradient of the south-central part of the debris piles.

PSC6-SB5 will be collected from the PSC6-5 monitoring well site, located between the southern debris pile and Lake Fretwell.

The last four sample locations are between the debris piles and Lake Fretwell. Sample results should indicated whether or not subsurface soil downgradient of the site and near the water table has been impacted by contaminants emanating from the debris piles.

3.4.4 Groundwater Sampling Five shallow monitoring wells will be installed, one upgradient and four downgradient of the site. The monitoring wells will be installed so that the screen interval will intersect the water table. After each well has been developed and purged, groundwater samples will be collected from each well. Groundwater samples will be analyzed for the full TAL and TCL parameters. The rationale for monitoring well locations is as follows.

PSC6-1 will be located in the northeastern part of the site. This area is interpreted to be hydraulically upgradient of the site and should represent background conditions.

PSC6-2 will be located near the northwestern extent of the site, downgradient of the debris piles and adjacent to Lake Fretwell. Analyses of groundwater samples from this location could indicate whether contaminants are migrating toward Lake Fretwell.

PSC6-3 will be located in the west-central part of the site, downgradient of the site. Sample analyses from this location could indicate whether contaminants are migrating from the debris piles.

PSC6-4 will be located in the south-central part of the site. It was noted during the most recent site visit that water was seeping and ponding in areas immediately downgradient of the site. Sample results from this location could indicate whether contaminants are migrating from the debris piles in the southern part of the site.

PSC6-5 will be located in the southwest of the southern access. The location is interpreted to be hydraulically downgradient of the southern debris pile. Sample analysis will help assess groundwater conditions in the vicinity of the southern debris pile.

3.4.5 Surface Water and Sediment Sampling Six surface water and six sediment samples will be collected. Surface water and sediment samples will be analyzed for the full TAL and TCL parameters. Surface water samples will also be analyzed for filtered TAL metals, total suspended solids (TSS), and hardness. Sediment samples will also be analyzed for total organic carbon (TOC). The rationale for the location of each sample site is as follows.

PSC6-SWSD1 will be collected from the drainage canal north of the site. It is proposed that the samples will be collected along the southern bank of the canal, near where the service road crosses the canal. Sample analyses from this location should give some indication of surface water and sediment conditions in the canal and north of the site and whether PSC 6 could receive potential contaminants from sources other than the debris piles.

PSC6-SWSD2 will be collected from the drainage canal north of the site. The sample will be collected immediately east of the service road bridge and downstream of the wastewater treatment plant.

PSC6-SWSD3 will be collected from the drainage canal north of the site and upstream of the wastewater treatment plant. Sample analysis from this location and PSC6-SWSD2 should indicate conditions upstream of the site and upstream and downstream of the wastewater treatment plant.

PSC6-SWSD4 will be collected downgradient of the site, where the canal empties into Lake Fretwell. Sample results from this location could indicate surface water and sediment conditions at a location that may be influenced by the canal, Lake Fretwell, and PSC 6. Samples will be collected from the south bank of the canal or from the lake shoreline.

PSC6-SWSD5 will be collected at the shore of the lake in the vicinity where groundwater seeps from the ground and drains toward the lake.

PSC6-SWSD6 will be collected along the northeast shore of the small embayment, located southwest of the site, where the embayment may receive site runoff or discharge from groundwater.

4.0 SITE 9, RECENT GREASE PITS, NAVAL AIR STATION (NAS) CECIL FIELD

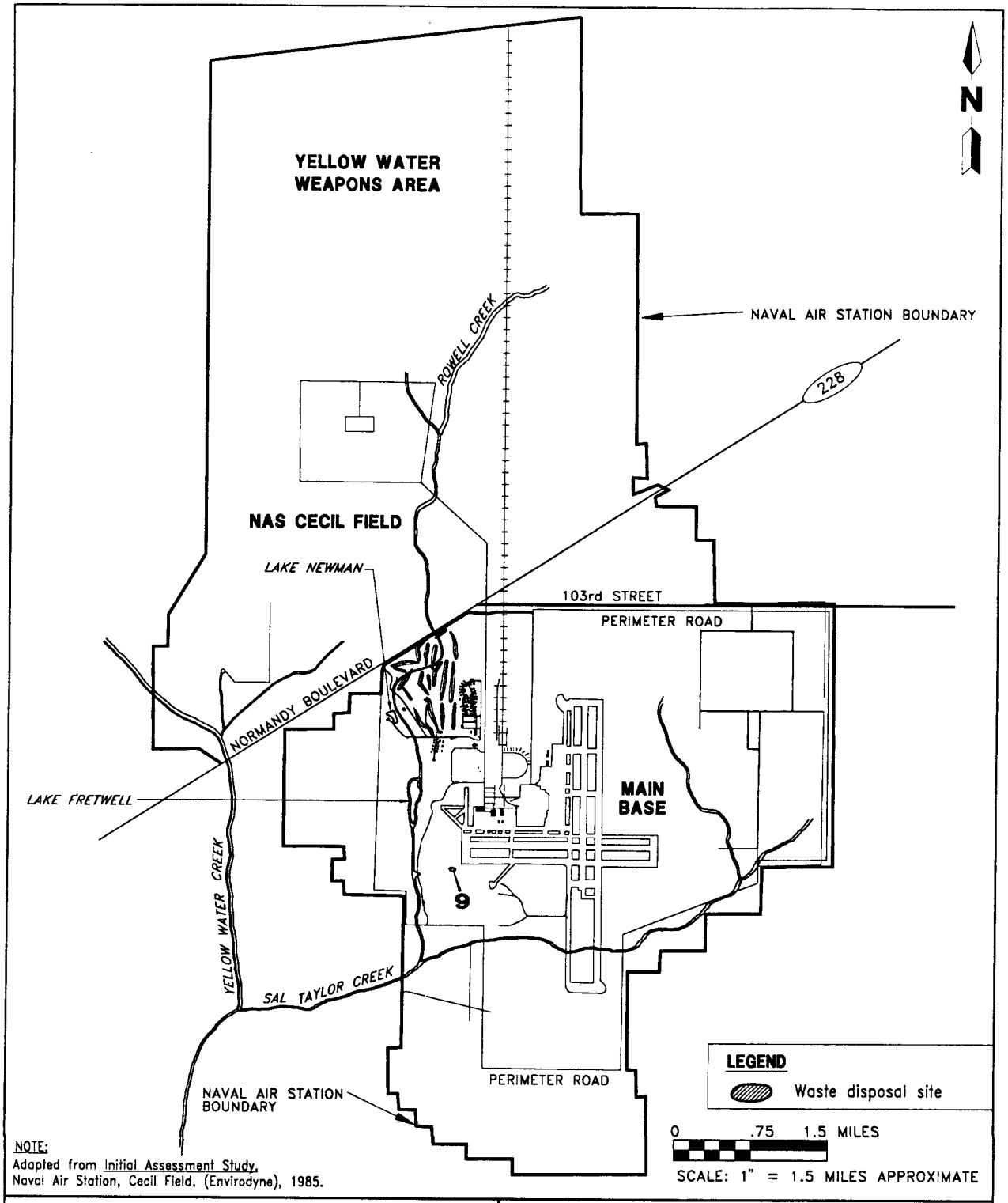
4.1 SITE DESCRIPTION AND HISTORY. Site 9 was identified as a PSC during the IAS conducted by Envirodyne in 1985. Used grease and water from the facility's messes were disposed weekly into one of three shallow pits. Disposal operations consisted of hauling grease and water to the site in 500-gallon capacity trucks and placing the waste into a particular pit. Each pit was used for approximately 4 to 6 months, until it became full, at which time it was covered with soil and a new pit excavated. The site was operated during 1983 and the beginning of 1984. Disposal operations were stopped due to allegedly high clay content in the soil, which prevented the grease from seeping into the ground. Based on installation records, 400 to 500 gallons of grease and water were disposed weekly for 15 months, resulting in an estimated total volume of 24,000 to 30,000 gallons disposed at the site. Previous investigations do not mention any other liquid wastes being disposed at the site.

The site is located in the southwestern part of the main base. PSC 9 is approximately 500 feet southwest of the west and east flightline, approximately 1,400 feet east of Rowell Creek, and approximately 1,400 feet west of the south power check facility (Figure 4-1). The base coordinate system location for the site is I-8. The areal extent of the site was reported to be approximately 100 feet by 200 feet, which is approximately 0.5 acre. Each pit varied in size, but exact dimensions are not known. Each pit reportedly had a 1- to 2-foot earthen berm around it. There were no physical features in 1994 that indicated the locations of the pits. Currently, the grass-covered site is marked by two placards, placed approximately 500 feet apart, one east and one west of the site. North of the site is a small ditch, which drains to the west into Rowell Creek. South of the site is an unpaved service road, which parallels the drainage ditch (Figure 4-2).

4.2 PREVIOUS INVESTIGATIONS. The investigation of PSC 9 began in 1985 with the IAS. During the Envirodyne field inspection, PSC 9 was noted to be located in a depressed area, being approximately 3 feet lower than the service road that forms its southern border. A 5-foot high berm bordered the site on the north side. A definite grease odor was noted during the site inspection. There were no reports of visible soil staining or outlines of specific pits.

Samples were not collected from the site. PSC 9 was evaluated, based on contaminant characteristics of kitchen grease and water, groundwater and surface water migration pathways, and Rowell Creek as the pollutant receptor. PSC 9 was assessed to have no significant source of potential surface water or groundwater contamination, resulting in a recommendation that no confirmation study be conducted at the site.

In 1987 HLA conducted an RFI at PSC 9. The surface features noted in the IAS no longer existed, indicating that the site had been graded. Geophysical surveys were conducted on 100-foot by 50-foot grid intervals, measuring 150 feet by 300 feet. The origin point of the survey (location 0,0) was established in the service road and southwest of the site. The long axis of the survey grid was oriented west to east and paralleled the service road (Figure 4-3). Two surveys, magnetometer and VLF, were conducted at the site. No magnetic anomalies were



NOTE:
Adapted from Initial Assessment Study,
Naval Air Station, Cecil Field, (Envirodyne), 1985.

FIGURE 4-1
POTENTIAL SOURCE OF CONTAMINATION (PSC) 9 WASTE DISPOSAL SITES, CECIL FIELD AND YELLOW WATER WEAPONS AREA

CECIL\PSC-LOCS\KGP-WDW\03-30-95

FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

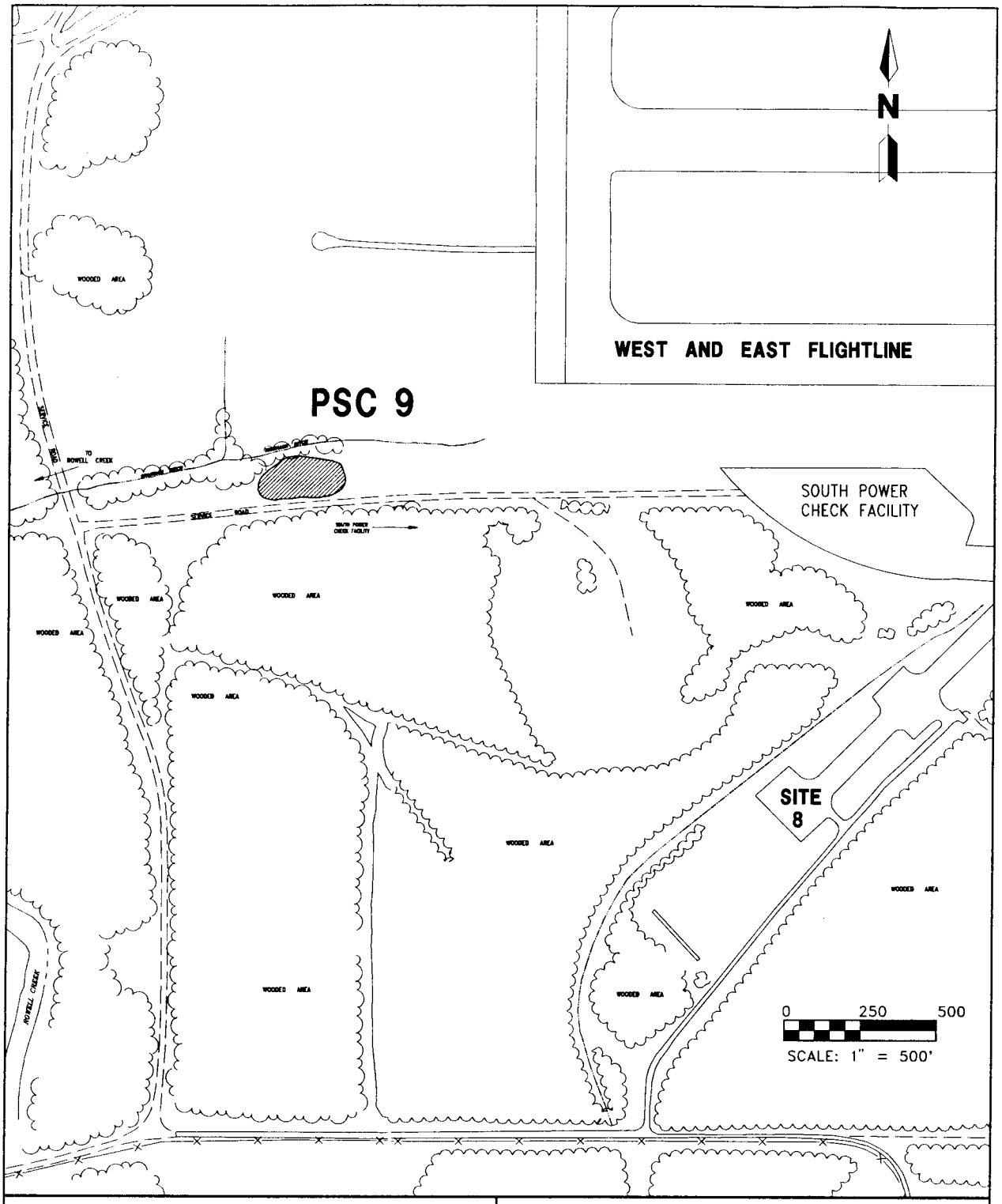


FIGURE 4-2
POTENTIAL SOURCE OF CONTAMINATION (PSC) 9 SITE MAP

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

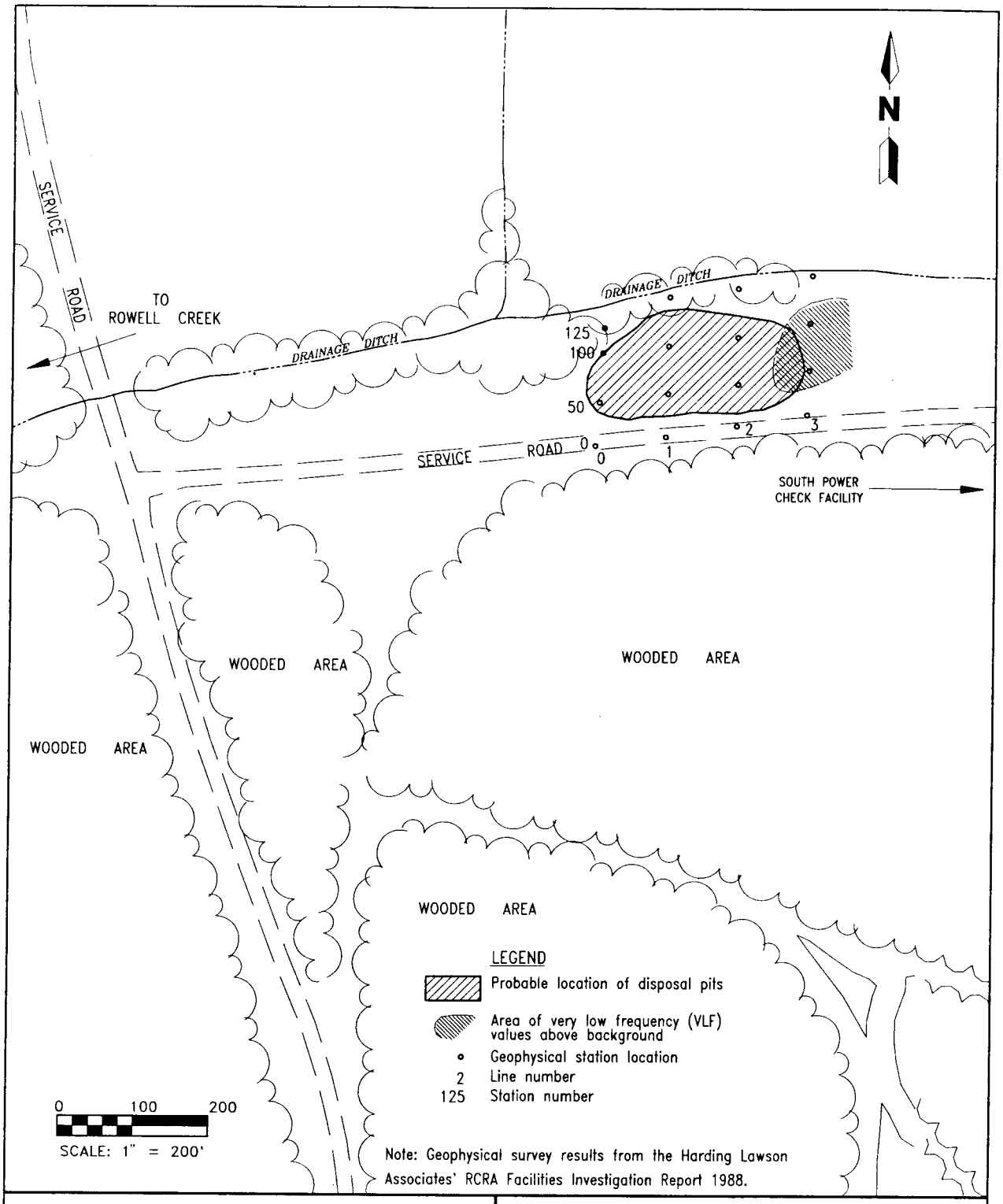

FIGURE 4-3
POTENTIAL SOURCE OF CONTAMINATION (PSC) 9 GEOPHYSICAL GRID AND VERY LOW FREQUENCY (VLF) SURVEY RESULTS

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
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indicated. VLF values in the eastern part of the site are greater than background, indicating that the area may have been disturbed. Aerial photographs indicate that the VLF anomaly is a disturbed area (lacking vegetation) that predates the disposal activity, being first noticeable in the 1960 aerial photograph. No samples were collected during this investigation.

A site visit in December 1994 by ABB-ES personnel confirmed the fact that any surface features from disposal operations no longer exist. The site is relatively flat and slopes northward toward the shallow drainage ditch. It would appear that surface drainage would be to the north toward the drainage ditch and to the west toward Rowell Creek. The site is an open field, covered with grass and weeds. Some bushes and tall grasses exist along the drainage ditch. Surface soil at PSC 9 appears to disturbed and/or transported from another location. It was noted during the site visit that surface soil contain limestone fragments, the color and texture of which appear to be similar to limestones of the Ocala Group.

4.3 CONCEPTUAL UNDERSTANDING. Site 9 operated for 15 months in 1983 and 1984. The site's total area is thought to be approximately 100 feet by 200 feet. The exact size and location of the site is unknown.

Based on the historical information, waste liquids (cooking grease, water, and any cleansers associated with the water) resulting from the installation messes were disposed in three open, shallow, unlined pits. No other types of materials, including hazardous materials, are known to have been disposed in these pits. The estimated maximum volume of waste liquids disposed is 30,000 gallons or a little more than 4,000 cubic feet. The three pits are not believed to be of equal size, but could possibly vary from 1,200 to 2,000 cubic feet in total volume to accommodate the 4,000 cubic feet volume of waste liquids. These pits, then, could be relatively small, each possibly having dimensions similar to 3 feet by 5 feet by 100 feet or 3 feet by 10 feet by 50 feet.

The shallow soils, 0 to 5 feet below land surface, in the PSC 9 area are unconsolidated fine-grained sands with varying amounts of silt and clay. Locally, hardpans may exist within the first few feet of the soil. Disposed materials were allowed to percolate through these soils. Waste materials could enter the vadose zone (the unsaturated water bearing zone above the water table) and the phreatic zone (saturated zone) soils. High clay content in the soil; however, may have prevented percolation of the waste, particularly the grease. By its hydrophobic (affinity to separate from water) nature, the grease would separate from the wastewater and remain above the water. It is assumed that the wastewater would percolate downward or migrate laterally away from the disposal pits.

There are no known existing quantitative or qualitative environmental or hydrological data for this site. Sloping directions of the land surface and a shallow drainage ditch north of the site suggest that groundwater flow in the upper part of the surficial aquifer would be in a northerly direction. It is expected that the grease remained in the disposal pits and the water and any associated cleansers migrated downward or toward the drainage ditch.

4.4 SAMPLING PROGRAM. The objective of the sampling and analysis program is first to locate the disposal trenches and then to sample wastes, soil, and groundwater to evaluate the presence or absence of contamination at the site. Sediment and surface water samples will also be collected from the drainage ditch to assess potential contaminant migration from the site.

4.4.1 Geophysical Survey To approximate the location of the disposal pits, it is recommended that a GPR survey be conducted at Site 9. Survey lines will be established in west to east and south to north directions. Surveys will be conducted in the west to east direction between the site location markers. Surveys conducted in the south to north directions will be run from the service road to as close to the drainage ditch as possible. Initially, survey lines will be spaced 20 feet apart. In areas where pit boundaries or other disturbed soil are indicated, supplemental surveys will conducted and spaced 10 feet apart or

closer. Exact spacing of the supplemental survey lines will be determined in the field by the geophysicist.

Once the pits have been located, soil from the pits will be cored to verify the GPR data. Core samples will be visually inspected by the field geologist or other field team members, as appropriate. Subsurface soil will be visually inspected for the presence of grease, discoloring, staining, or any trait that would indicate the disposal of grease at the site.

4.4.2 Coring Program If the GPR results are inconclusive and the pits cannot be located, then soil cores will be collected to locate the pits or at least to characterize subsurface condition at the site. Cores will be collected on 25 foot centers along transects (lines that traverse the site). Core transects will traverse the site in west to east and south to north directions. Cores will be advanced to 3 to 4 feet below land surface. Soil samples will be visually examined for the presence of grease, discoloring, staining, or any trait that would indicate the disposal of grease at the site. The location and size of the pits will then be approximated from this coring program.

4.4.3 Trenching Program If GPR and soil coring results are inconclusive, exploratory trenches will be dug at the site. Assuming the disposal pits were oriented either north to south or east to west, trenches oriented diagonally to these directions would likely intersect the pits. Suggested trench locations are shown on Figure 4-4. It is estimated that 10 to 15 trenches could be required to locate the disposal pits.

4.4.4 Temporary Piezometers Four temporary piezometers will be installed around the site to assess the groundwater flow direction. Piezometers will be located in areas assumed to be upgradient and in areas assumed to be downgradient. They will be spaced areally to provide appropriate triangulation on which to assess groundwater flow direction.

4.4.5 Surface Soil Sampling Two surface soil samples will be collected from each pit. Samples will be collected from 0 to 1 foot bls. If the pits cannot be identified, surface soil samples will be collected from randomly determined locations. It is anticipated that at least six random samples will be collected. Samples will be analyzed for full TAL inorganic and TCL organic parameters.

4.4.6 Subsurface Soil Sampling A subsurface soil sample will be collected from each pit identified. The sample will be collected from the waste, waste and soil mixture, or, in the absence of identified pits, from the 1-foot interval just above the water table. If the pits cannot be located 5 to 7 random samples will

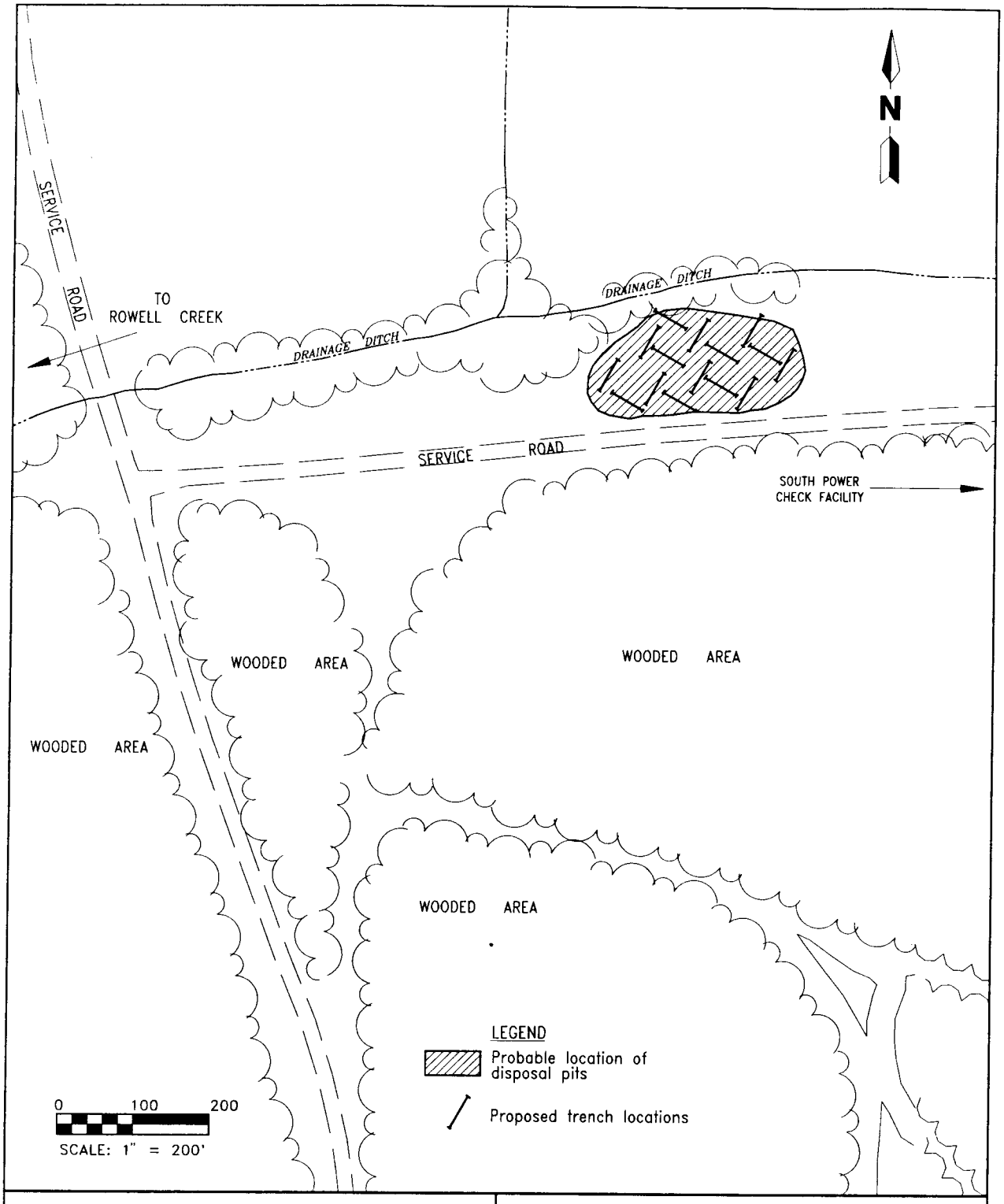

FIGURE 4-4
POTENTIAL SOURCE OF CONTAMINATION (PSC) 9
PROPOSED TRENCH LOCATIONS

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

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JACKSONVILLE, FLORIDA

be collected from the site. Samples will be analyzed the full TAL inorganic and TCL organic parameters.

4.4.7 Groundwater Sampling Two shallow monitoring wells will be installed. One well will be installed in the pit area; the other downgradient, possibly between the pits and the ditch. The monitoring wells will be set so that the screen interval will intersect the water table. Groundwater samples will be collected and analyzed for full TAL inorganics and TCL organic parameters.

4.4.8 Surface Water and Sediment Sampling Three surface water and three sediment samples are proposed. One sample location will be upstream (east) of the site, one will be located in that part of the stream that borders the site, and the last one will be located near and downstream (west) of the site. Surface water samples will be analyzed for full TAL inorganic (filtered and unfiltered) and TCL organic parameters, TSS, and hardness. Sediment samples will be analyzed for full TAL inorganic and TCL organic parameters, and TOC.

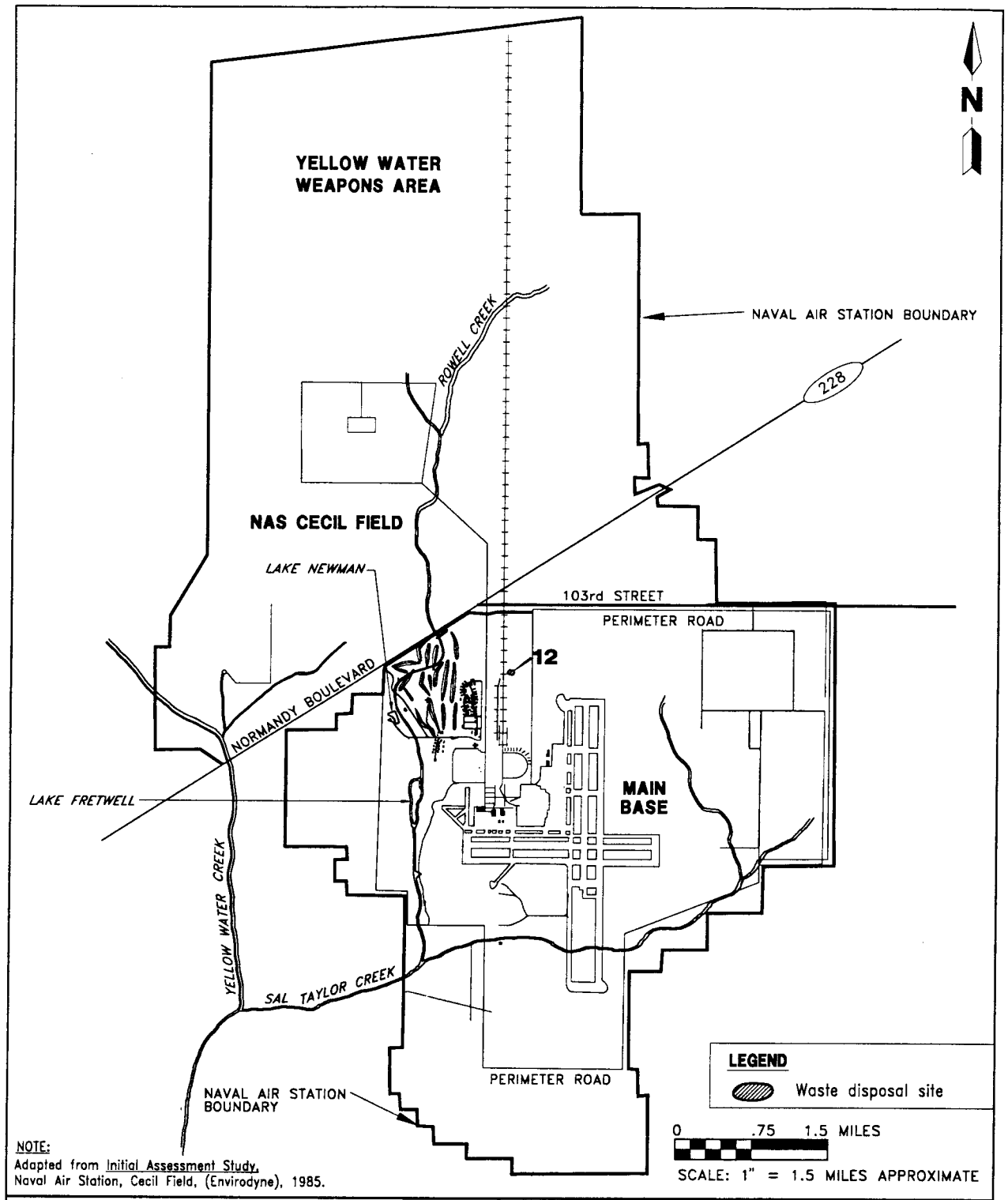
5.0 PSC 12, PUBLIC WORKS RUBBLE DISPOSAL AREA

5.1 SITE DESCRIPTION AND HISTORY. PSC 12 is a rubble disposal area used by public works from the mid to late 1970's to the present. Materials disposed at the site appear to be mostly construction debris. Concrete makes up the majority of the debris and consists of large slabs (3 to 4 feet wide and of varying length), porch stoops, foundation blocks, and small concrete buildings (approximately 6 feet by 6 feet by 8 feet). Some of the concrete debris contains reinforced steel or piping. Other debris at the site includes asphalt, chain-link fence materials, scrap metal, 55-gallon drums or parts of 55-gallons drums containing concrete, and pressure-treated lumber. The IAS reports that rubble has been buried approximately 3 feet below land surface. The rubble piles extend above land surface 4 to 6 feet. Exact volumes of each type of material disposed at the site are unknown. Based on visual observation of piles above ground surface, it is estimated that 4,000 to 10,000 cubic yards are placed in PSC 12.

PSC 12 is located in the central part of the main facility, behind the public works maintenance and storage yard (Figure 5-1). The site is approximately 1,000 feet east of Avenue D and approximately 1,200 feet north of 9th Street. The base coordinate system location is E-9. The site parallels a former railroad spur line. Most of the site lies immediately east of an unpaved service road and utility powerlines. A small part of site lies immediately west of the service road. The site lies between utility power pole UP-RR15 to the north and UP-RR17 to the south. PSC 12 is approximately 450 feet long and 75 to 100 feet wide or approximately 1 acre in size (Figure 5-2). Much of rubble at the site appears to have been deposited in recent years because the site is devoid of any overgrowth. The southernmost part and the part west of the service road are partially covered with soil and are overgrown with weeds and vines. There is also some aircraft wreckage debris located adjacent to the concrete debris piles west of the service road.

The site is located on a broad, nearly level crest. The land surface is relatively flat and gently slopes to the north and northwest. The site appears to be dry with no obvious surface drainage features apparent at the site proper. A small drainage ditch, oriented north and south, is located immediately west of the service road and approximately 30 feet west of the debris piles. The drainage ditch appears to emanate from a culvert and is reported to have once received discharge from a washrack. The exact location of the former washrack and associated piping is currently unknown. Canal B is located approximately 1,000 feet north of the site. The small drainage ditch probably drains into Canal B and Canal B empties into Rowell Creek, north of Lake Fretwell. North of the site is open land, the unpaved service road, and remnants of the railroad spur line. Immediately west and south of the site are unpaved service roads. Woodlands border the site on the east side. Vegetation east and west of the site includes pines, oaks, palmettos, and grasses. In the woods west of the site is a clearing where a 55-gallon drum and five large garbage cans were noted. All of these containers were empty and lying on their sides.

South and southwest of the site is the public works maintenance and storage area. Stored materials include automobiles, small boats, old aircraft skeletons and parts, aluminum parts, wire, and waste oil. Southeast of PSC 12 are old concrete disposal piles. It is not known at this time if these materials are located in upgradient areas and could have any impact on PSC 12.



NOTE:
Adapted from Initial Assessment Study, Naval Air Station, Cecil Field, (Envirodyne), 1985.

FIGURE 5-1
POTENTIAL SOURCE OF CONTAMINATION (PSC) 12 WASTE DISPOSAL SITES, CECIL FIELD AND YELLOW WATER WEAPONS AREA

CECIL\PSC-LOCS\KGP-WDW\03-30-95

FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

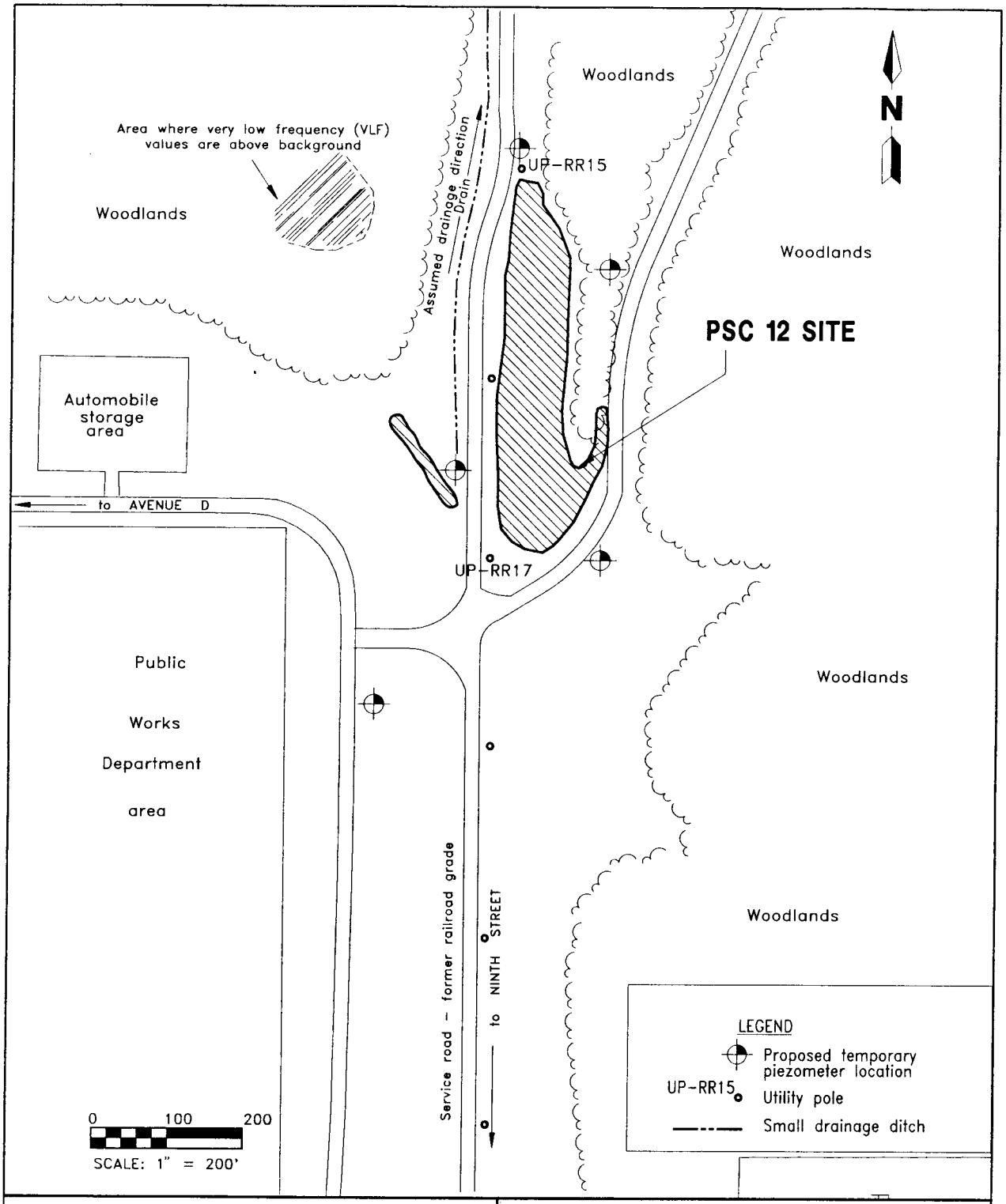


FIGURE 5-2
POTENTIAL SOURCE OF CONTAMINATION (PSC) 12 SITE MAP WITH PROPOSED LOCATIONS OF TEMPORARY PIEZOMETER LOCATIONS

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
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5.2 PREVIOUS INVESTIGATIONS. PSC 12 was initially investigated in 1984 as part of the IAS. During the IAS facility records were reviewed and the site was visually inspected. There were no signs of stressed vegetation and only inert materials were noted. The IAS reported that the source of the materials was the Public Works Department, but did not evaluate the volume of the materials at the site. As the materials were determined to be inert and there were no records or signs of hazardous materials being disposed at the site, no samples were collected (Envirodyne Engineers, Inc., 1985).

Under the RFI program, PSC 12 was revisited by HLA in 1987. During the RFI site visit, it was assessed that PSC 12 extended west of the former railroad grade, but had not been in recent use, being covered with briars and vines. Geophysical surveys were conducted on a 100-foot by 100-foot grid intervals, measuring 100 feet by 400 feet west of the service road and 500 feet by 300 feet east of the service road. Both grids were oriented to the north. Magnetometer data indicated one anomalous area that corresponded to a metal building and some metal debris lying on the ground. The very low frequency (VLF) data indicated one area with values above background levels. The area was in the woods west of the drainage ditch, the service road, and PSC 12 (Figure 5-2) and corresponds with the cleared area where the drum and garbage cans were located. No environmental samples were collected during the RFI and no recommendation for the site was made.

In December 1994, ABB-ES personnel conducted a site visit at PSC 12. The site was visually inspected to assess the types of materials at the site and to note the presence or absence of any stressed vegetation. It was noted that nearly all visible materials at the site were concrete debris. Stressed vegetation was not noted. The presence of debris west of the service road was also not seen. Water was seen to be flowing in the small drainage ditch west of the site. However, the site was dry and no low lying areas, pools or water, or wet spots were noted, even though precipitation during the proceeding 2 months had been unusually high.

Disposal activities were ongoing during the site visit. Two pickup trucks, each with a small load of concrete building blocks, were emptied of their contents. The concrete blocks were disposed at the northern end of the site. No other materials were noted during this disposal activity.

In March 1995, ABB-ES personnel conducted another site walkover to inspect the southwestern area. The debris pile west of the service road appears to be composed of concrete, soil, asphalt, and a minor amount of metal piping. The debris pile is covered with vegetation. The small ditch is located immediately east and adjacent to the debris pile. The small ditch appears to begin at the culvert. Much of the area south of the culvert and ditch had been recently graded; therefore, no surface feature of a former ditch or existing buried drainage structure was evident. There were no visible signs of stressed vegetation in this part of the site.

5.3 CONCEPTUAL UNDERSTANDING. PSC 12 operated as a disposal site for construction and pavement materials from the mid-1970's to the present. Some materials have been buried at the site. The majority of the materials are comprised of concrete. The materials do not appear to adversely affect vegetation or the appearance of the soil.

The land is nearly flat and remains dry, even after an unusually wet autumn. Precipitation is believed to either percolate downward to the water table or runoff to the north or northwest. Overland flow could possibly enter the small drainage ditch west of the site. The presence and migration of potential contaminants could impact site surface soil, subsurface soil, and groundwater. Migration of contaminants could also potentially impact surface water and sediment of the drainage ditch.

5.4 SAMPLING AND ANALYSIS PROGRAM. The site is assumed to be free of contamination. Investigations and sample collections are designed to obtain factual data

regarding the areal extent of the debris and to assess the presence or absence of contaminants associated with the debris.

5.4.1 Records Search Facility records and design plans will be reviewed to assess the location of the former washrack and associated piping. The records search should provide information on the types of activities that occurred at the washrack, including types of waste that may have been generated.

5.4.2 Surveys Magnetometer and electromagnetic induction surveys will be conducted at the site to help delineate the extent of the debris piles. To confirm or deny the presence of debris west of PSC 12, the survey will include part of the woodland west of the small drainage ditch. Debris boundaries will be marked with wooden survey stakes or flags.

The areal extent of PSC 12, as identified during the geophysical survey, will be surveyed by a professional land surveyor, certified in the State of Florida. Location stakes from the geophysical survey and pertinent physical features in and around the site will also be surveyed to more accurately depict the extent of debris and the area in general.

5.4.3 Surface Soil Sampling During the surveying part of the investigation the site will again be visually inspected for stained soil and stressed vegetation. Surface soil samples will be collected in areas where stressed vegetation or soil staining is observed. If stressed vegetation or staining is not observed, five to seven samples will be collected from randomly selected locations. Samples will be analyzed for full TAL inorganic and TCL organic parameters.

5.4.4 Subsurface Soil Sampling Subsurface soil samples will be collected from the 1-foot interval just above the water table. A subsurface soil sample will be collected at each of the surface soil sample locations. Samples will be analyzed for full TAL inorganic and TCL organic parameters.

5.4.5 Groundwater Sampling Five temporary piezometers will be installed at the site to assess flow direction(s) in the surficial aquifer. Piezometers will be located in areas assumed to be upgradient and in areas assumed to be downgradient. They will be spaced areally to provide appropriate triangulation on which to base estimates of groundwater flow (Figure 5-2).

Three shallow monitoring wells will be installed, one upgradient and two downgradient. It is interpreted that the downgradient wells will be located between the debris piles and the small drainage ditch. Each monitoring well will be set so that the screen interval will intersect the water table. After each well has been developed and purged, groundwater samples will be collected from each well. Groundwater samples will be analyzed for TAL and TCL parameters.

5.4.6 Surface Water and Sediment Sampling Three surface water and sediment samples will be collected from the small drainage ditch. One sample location will be upgradient of PSC 12 (or as far upgradient as possible), one location will be across from the site, and the last location will be across from, or downgradient of, the debris piles. Surface water samples will be analyzed for full TAL inorganic (filtered and unfiltered) and TCL organic parameters, TSS, and hardness. Sediment samples will be analyzed for full TAL inorganic and TCL organic parameters, and TOC.

6.0 PSC 18, AMMUNITION DISPOSAL AREA

6.1 SITE DESCRIPTION AND HISTORY. In the IAS, PSC 18 was identified as a PSC as it had been used as a dumping site of ordnance and rubbish collected from a nearby magazine area. Materials were collected from the magazine area, hauled to the site by truck, and dumped from a small, wooden bridge into a creek and along the south bank. Known wastes include ammunition crates, unidentified wooden crates, projectile nose cones, 1-foot-long projectiles, unidentified canisters, furniture, and paint cans. Some materials are submerged. Materials were disposed at the site from the late 1940's through the 1950's. There has been no visible biological stress observed either in the creek or the surrounding forest vegetation.

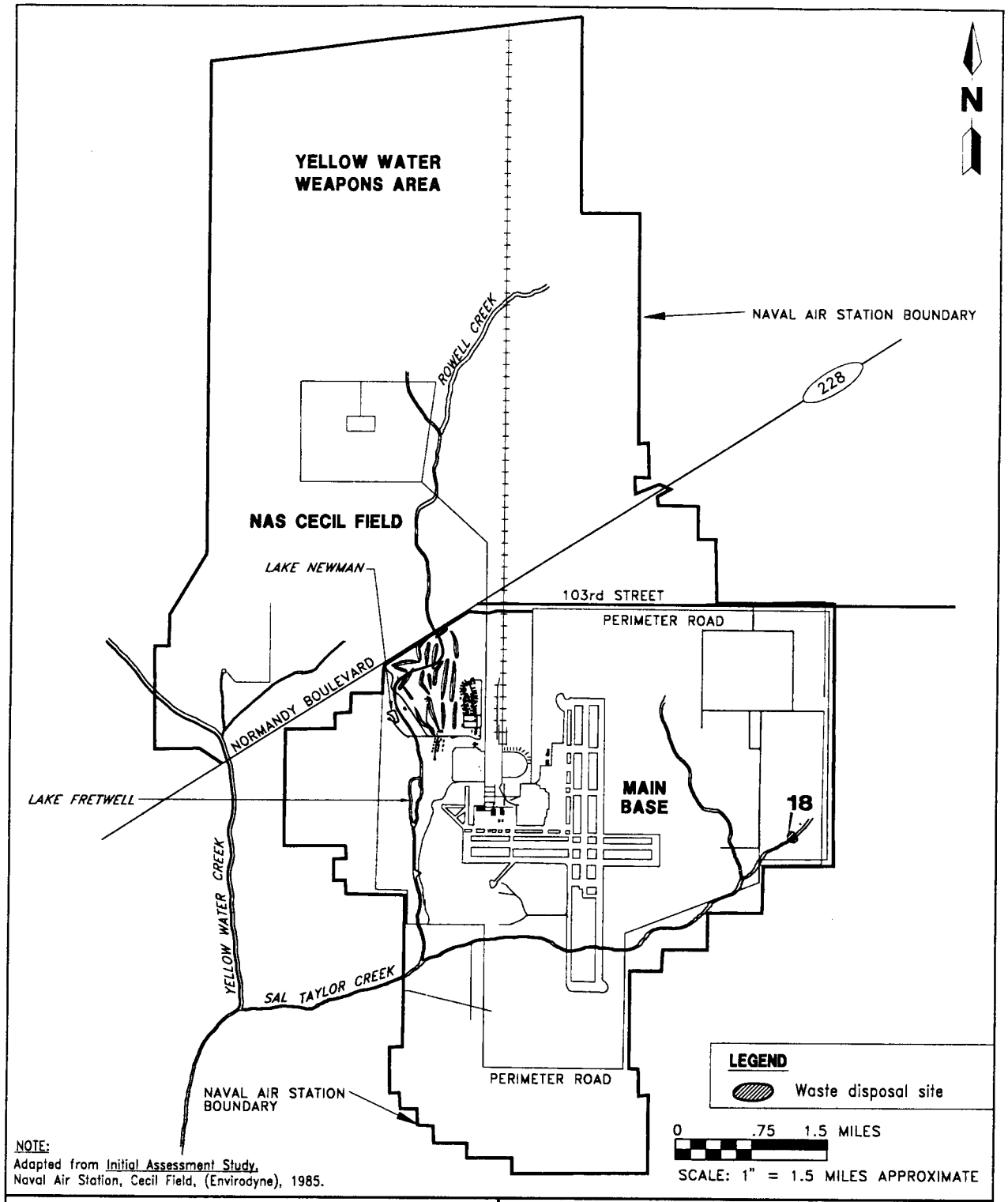
It has been reported that a truck turned over at the bridge, dumping ordnance onto the south bank and into the stream. A collapse feature (a circular depression in the ground), structural damage to the bridge, and scattered debris, all located at the southern end of the bridge, indicate that such an event may have occurred. This event, however, has not been substantiated.

PSC 18 is located in the southeastern part of the main base, at the intersection of an old service road and a small creek that empties into Sal Taylor Creek approximately 2,000 feet southwest of the site (Figure 6-1). Perimeter Road lies approximately 1,600 feet to the east and to the south of the site. The site is surrounded by woodlands, parts of which are swampy. Much of the site area is heavily wooded, being composed of mature pine and hardwood trees and sparse to dense understory and palmettos. The site is composed of a small creek, approximately 10 to 30 feet wide and greater than 5 feet deep, a wooden bridge, an unpaved service road, and the woodlands immediately adjacent to the creek (Figure 6-2). The bridge is in disrepair and no longer functional. The land surface adjacent to the southern end of the bridge is sunken, indicating collapse has occurred either naturally or possibly from a small detonation. The IAS document reported the site to be approximately 30 feet by 100 feet or less than 0.1 acre. The latest ordnance survey, concluded in 1994, covered an area of approximately 100 feet by 200 feet or approximately 0.5 acre. The base coordinate system location for the site is H-15.

6.2 PREVIOUS INVESTIGATIONS. Prior to the IAS site inspection, the site was inspected by explosive ordnance detonation (EOD) personnel to assess potential danger from the ordnance. The EOD survey results concluded that ordnance materials along the creek banks did not present a danger. EOD personnel determined that some ordnance was present in the creek below the water surface. The type and condition of the submerged ordnance was not assessed. Some ordnance was removed from the site.

The site was inspected during the IAS. The debris was restricted to a small area of the creek and along the south creek bank, next to the bridge. The types of waste at the site were noted. Because there were no visible signs of vegetative stress and the debris was inert, no samples were collected during the IAS and the site was not recommended for further study.

The site was also inspected during the RFI, and again no samples were collected from the site. It was determined that two to three crates were observed beneath



NOTE:
Adapted from Initial Assessment Study, Naval Air Station, Cecil Field, (Envirodyne), 1985.

FIGURE 6-1
POTENTIAL SOURCE OF CONTAMINATION (PSC) 18 WASTE DISPOSAL SITES, CECIL FIELD AND YELLOW WATER WEAPONS AREA

CECIL\PSC-LOCS\KGP-WDW\03-30-95

FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

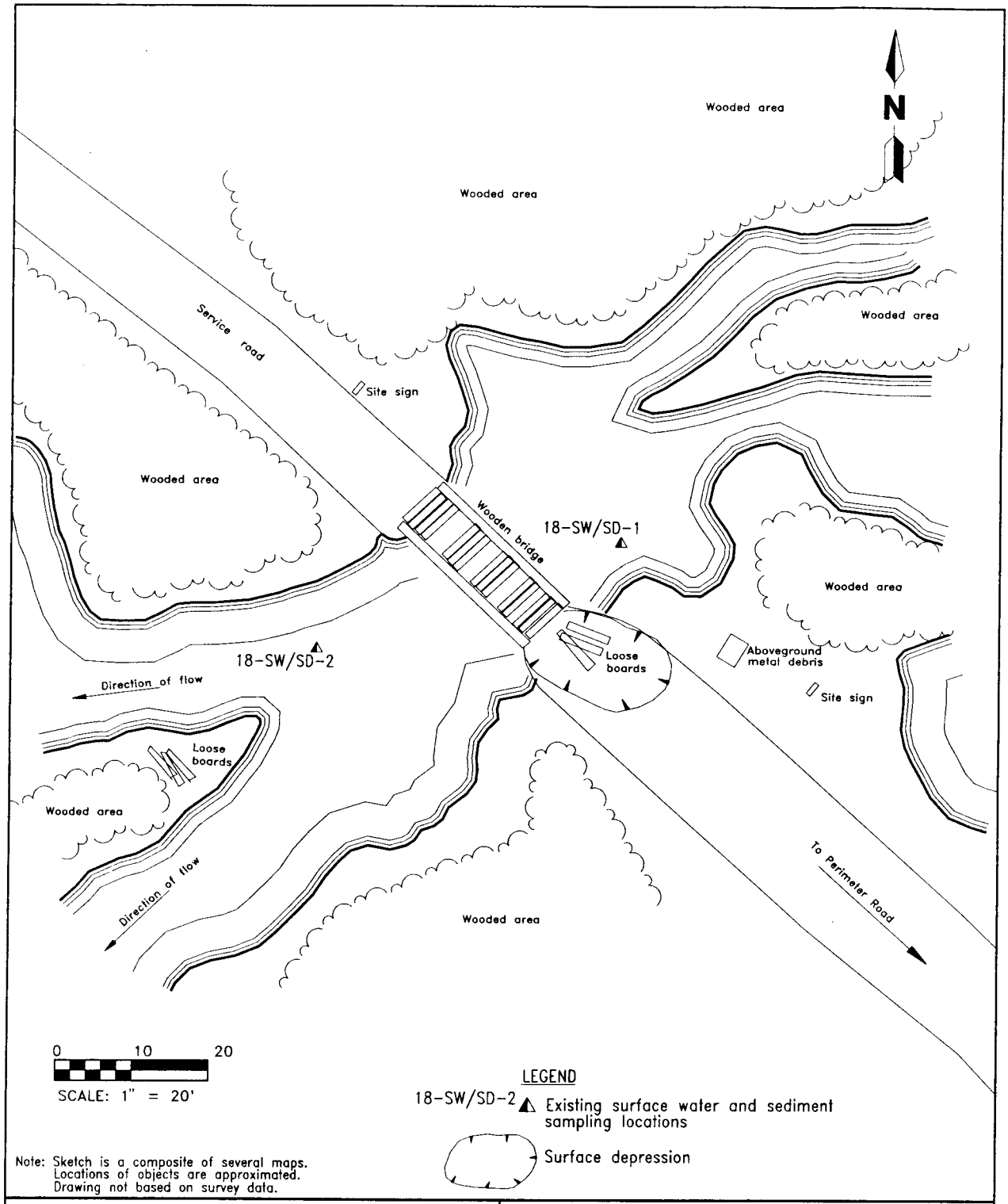


FIGURE 6-2
POTENTIAL SOURCE OF CONTAMINATION (PSC) 18 SITE MAP

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12 18, AND 19

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

the water east of the wooden bridge. Magnetometer and VLF surveys were conducted on 50-foot grid intervals, measuring 100 feet by 50 feet and oriented approximately N45E. Magnetometer data indicated one anomaly, just north of the bridge. The VLF data were at or below background values.

In the summer of 1993, ABB-ES personnel collected surface water and sediment samples from two locations at the site (Figure 6-2). Sample 18-SW/SD-1 was collected from the creek approximately 10 feet east and upstream of the bridge. Sample 18-SW/SD-2 was collected approximately 20 feet west and downstream of the bridge. Surface water and sediment samples were analyzed for the TAL inorganic and TCL organic parameters plus phosphorous, total nitrogen, Kjeldahl nitrogen, TRPH, and TOC. Surface water data did not indicate the presence of organic contaminants. Sediment sample data, however, indicate the presence of semivolatile organic compounds (polynuclear aromatic hydrocarbons [PAHs]) and TRPH at both locations and dinitrotoluene, a chemical associated with ordnance, at location 18-SW/SD-2. Sample results are given in Table 6-1.

In October 1994, EODT Services, Inc., conducted a second magnetometer survey of the site. The survey covered an area of approximately 100 feet by 200 feet. Survey lines were oriented approximately southwest to northeast and southeast to northwest. Magnetometer readings varied from background (approximately 40 hertz [Hz]) to greater than 400 Hz (Figure 6-3). Interpretation of results by EODT Services, Inc., indicated 16 anomalies, which varied from the site's metal placards to pits and trenches to unknown sources. Locations of these anomalies are shown on Figure 6-3. Anomaly descriptions are given in Table 6-2.

6.3 CONCEPTUAL UNDERSTANDING. The site consists of a small stream that flows through mature woodlands that are swampy in some locations. The topography is relatively flat and approximately 2 to 8 feet above the stream bed. The stream varies from a few feet to more than 30 feet in width and water flow is seasonally affected. The creek flows from northeast to southwest and empties into Sal Taylor Creek. Because the creek is relatively small and not deeply incised, only surface runoff and shallow groundwater are interpreted to discharge into the creek. Deeper groundwater flow in the surficial aquifer may not discharge into the creek at this location. Observations of vegetation and creek habitat indicate a lack of stressed conditions. Based on past sampling results, there appears to be a release of ordnance components (dinotrotoluene), TRPH, and PAHs.

6.4 SAMPLING PROGRAM. The objective of the following sampling and analysis program is to confirm and expand upon the results of the earlier investigations. Results of this investigation will be use to determine whether additional investigation and remediation of the site is needed.

Prior to any additional activity at the site, unidentified anomalies must be properly identified. All anomalies identified as ordnance must be removed from the site before any environmental samples are collected. Remaining anomalies must be accurately located, their perimeters delineated, and marked.

Environmental sample locations, types, and numbers are proposed based on the current understanding of the site. The ordnance removal activities and the identification of the unknown anomalies may generate additional data that will

Table 6-1
Surface Water and Sediment Screening Results, PSC 18,
August 16, 1993

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Compound	18-SW/SD-1 Sediment		Units	18-SW/SD-1 Surface Water		Units
Inorganics						
Aluminum	452		mg/kg	530	J	µg/ℓ
Arsenic	1.2	J		ND		
Barium	12.1	J		18.3	J	
Beryllium	0.16	J		ND		
Calcium	1,540	J		5,980	J	
Chromium	ND			ND		
Cyanide	0.45	J		ND		
Copper	5.3	J		ND		
Iron	3,520			6,580		
Lead	7.7	J		ND		
Magnesium	112	J		1,590	J	
Manganese	8.6			72.9		
Potassium	ND			1,690		
Sodium	14.9	J		4,450	J	
Vanadium	0.92	J		ND		
Zinc	10.8			32.8		
Total Organic Carbon	15,000			NA		
Total Recoverable Petroleum Hydrocarbons	120			NA		
Organics						
Acetone	71		µg/kg			
2-butanone	17	J				
Cyclopentasiloxane	18	J				
Pentanone, hydroxyn-	92,000	J				
Benzo(b)fluoranthene	260	J				
Benzo(k)fluoranthene	200	J				
Chrysene	240	J				
Di-n-butylphthalate	760	J				
Fluoranthene	320	J				
Pyrene	420	J				

See notes at end of table.

Table 6-1 (Continued)
Surface Water and Sediment Screening Results, PSC 18, August 16, 1993

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Compound	18-SW/SD-2 Sediment		Units	18-SW/SD-2 Surface Water		Units
Inorganics						
Aluminum	172		mg/kg	487	J	µg/ℓ
Arsenic	0.99	J		ND		
Barium	2.6	J		ND		
Beryllium	0.12	J		ND		
Calcium	175	J		4,100	J	
Chromium	3	J		ND		
Copper	2	J		ND		
Cyanide	0.29	J		ND		
Iron	1,010			5,540	J	
Lead	7.3			ND		
Magnesium	9.5			1,180		
Manganese	4			30.4		
Potassium	ND			2,120		
Sodium	6.1	J		3,960		
Vanadium	0.71			ND		
Zinc	5.1			16.8		
Total Organic Carbon Total Recoverable Petroleum Hydrocarbons	8,810			NA		
	46.9			NA		
Organics						
Acetone	45		µg/kg			
2-Butanone	13					
Benzene, ethylmethyl	540	J				
benzene, trimethyl	750	J				
Pentanone, hydroxy-	53,000	J				
Phenanthrene, dimethyl	550	J				
2,4-Dinotrotoluene	9	J				
Benzo(a)anthracene	170	J				
Benzo(b)fluoranthene	360	J				
Benzo(j)fluoranthene	270	J				
Benzo(k)fluoranthene	230	J				
Chrysene	380	J				
Di-n-butylphthalate	1,600	J				
Fluoranthene	380	J				
N-Nitrosodiphenylamine	220	J				
Pyrene	430	J				

Notes: SW = surface water sample.
SD = sediment sample.
mg/kg = milligrams per kilogram.
J = estimated concentration.
µg/ℓ = micrograms per liter.
ND = not detected.
NA = not analyzed.
µg/kg = micrograms per kilogram.

Note: Adopted from ordnance survey by EDOT Services, Inc., 1994.

Magnetometer Color Key

- 0 – 100 Hertz (Hz)
- 100 – 200 Hz
- 200 – 300 Hz
- 300 – 400 Hz
- 400 – 500 Hz

16 Anomalous magnetic areas

0 10 20

SCALE: 1" = 20'

Note: Sketch is a composite of several maps. Locations of objects are approximated. Drawing not based on survey data.

FIGURE 6-3
POTENTIAL SOURCE OF CONTAMINATION (PSC) 18 MAGNETOMETER RESULTS

FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

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Table 6-2
Interpreted Anomaly Identification, PSC 18

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Anomaly Number	Description
1	Indicates pit, possibly beginning trench
2	Indicates pit
3	Indicates pit
4	Sign
5	Indicates large pit or trench
6	Indicates pit
7	Unknown
8	Indicates pit
9	Explosive crater, surface banding straps, and possible pit
[1]10	Indicates pits or trench
[1]11	Indicates pit or trench and some background benchmark
12	Surface metal
[1]13	Sign
14	Unknown
[1]15	Indicates pit
[1]16	Unknown

[1] Possibly large trench or dump site.

Source: EODT Services, Inc., 1994.

require amending the sampling program to address additional areas and concerns of the site.

6.4.1 Surface Soil Sampling Five surface soil samples will be collected from the site (Figure 6-4). Samples will be collected from 0 to 1 foot bls. Samples will be collected at anomalies that were designated either as pits or as unknowns. Each surface soil sample will be collected in the area of the highest magnetometer reading. Surface soil samples will be analyzed for full TAL inorganic, TCL organic, nitroaromatic parameters, and TRPH. The rationale for each sample location is a follows.

PSC18-SS1 will be collected located at Anomaly 1, located approximately 50 feet northeast of the bridge. Magnetometer results indicated a possible pit at this location. If debris were disposed at this location, contaminants from that debris should be indicated by the sample analysis.

PSC18-SS2 will be collected from Anomaly 2, located in the northwest of the site and just west of the old service road. This location should also be topographically downgradient of Anomaly 3, which is in the service road. Sample analysis should indicate if contaminants are present in this area of the site.

PSC18-SS3 will be collected from Anomaly 11, approximately 30 feet east of the bridge. Magnetometer results indicate a possible trench or pit in this area. Sample analysis will also indicate surface soil conditions in the eastern part of the site.

PSC18-SS4 will be collected from Anomaly 15, a possible pit located approximately 40 feet south of the bridge and west of the service road.

PSC18-SS5 will be collected from Anomaly 16, where the cause of the magnetometer results are unknown. Anomaly 16 is located approximately 60 feet southeast of the bridge and is west of the service road.

Analytical results from the last two samples should indicate if contaminants exist in the two potential pits and indicate surface soil conditions in the southern part of the site.

6.4.2 Subsurface Soil Sampling If possible, a subsurface soil sample will be collected from three locations, each being in an anomaly where the highest magnetometer readings were recorded. Samples will be collected from Anomalies 2, 11, and 15. Each sample will be collected from the 1-foot interval just above the water table. Subsurface soil samples will be analyzed for full TAL inorganic, TCL organic, and nitroaromatic parameters. The rationale for each sample location is a follows.

PSC18-SB1 will be collected from Anomaly 2 and north of the site. Anomalous readings were indicated in the area in both magnetometer surveys conducted at the site. Sample analysis should indicate the presence of contaminants, if any, north of the small creek.

PSC18-SB2 will be collected from Anomaly 11, identified as a possible trench, located in the eastern part of the site. Sample analysis would indicate subsurface conditions in the eastern part of the site and confirm or deny contaminants in the eastern part of the site.

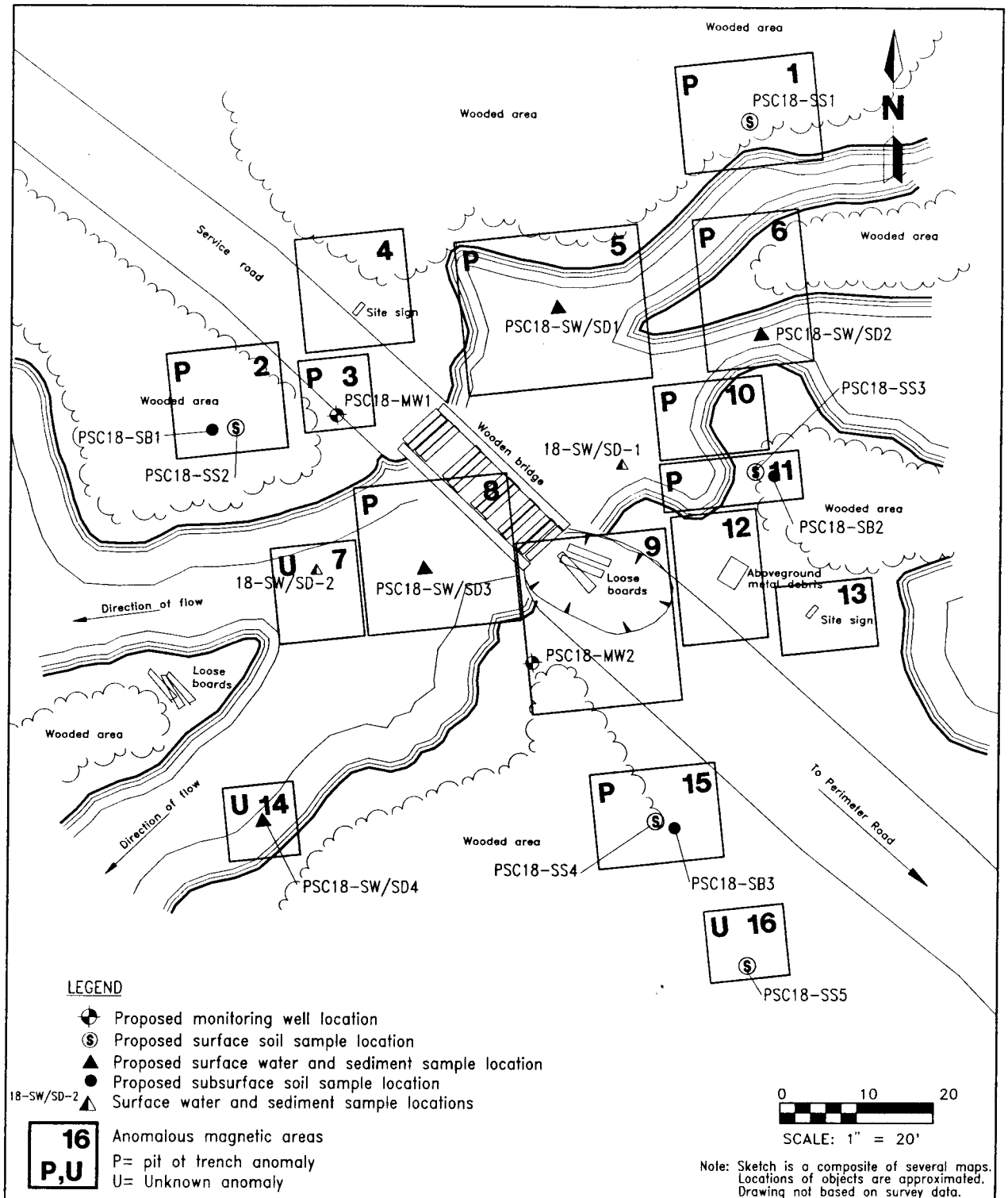

FIGURE 6-4
POTENTIAL SOURCE OF CONTAMINATION (PSC) 18
PROPOSED SAMPLING LOCATIONS

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FIELD INVESTIAGTION PLAN
PSCs 4, 6, 9, 12 18, AND 19

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PSC18-SB3 will be collected from Anomaly 15, which has been identified as a possible pit. Sample analysis should indicate subsurface soil conditions in this potential pit and in the southern part of the site.

6.4.3 Groundwater Sampling Two shallow monitoring wells will be installed near the bridge. Each monitoring well will be set so that the screen interval will intersect the water table. After the wells have been developed and purged, groundwater samples will be collected and analyzed using TAL and TCL parameters. The rationale for each monitoring well location is as follows.

PSC18-MW1 will be located approximately 10 feet north of the bridge and south of Anomaly 3. Anomalous reading were indicated in this area of the site in both magnetometer surveys. Groundwater sample results should indicate if contaminants are present in the groundwater north of the creek.

PSC18-MW2 will be located approximately 10 to 15 feet from the south end of the bridge and west of the service road and collapse feature. This is the area where debris and rubbish were noted and where the truck allegedly turned over.

6.4.4 Surface Water and Sediment Sampling Four surface water and sediment samples will be collected. Surface water and sediment samples will be analyzed for full TAL inorganic, TCL inorganic, and nitroaromatic parameters. The rationale for each sample location is a follows.

PSC18-SW/SD1 will be collected upstream of the bridge from Anomaly 5, a possible pit or trench. This location is also down stream of Anomaly 1. Sample analysis could indicated possible contaminants emanating from locations upstream of the bridge.

PSC18-SW/SD2 sample will be collected upstream of the bridge at Anomaly 6, a possible pit which yielded moderate magnetometer readings. Again, sample results could indicate possible contaminants in this anomalous area and upstream of the bridge.

PSC18-SW/SD3 will be collected from Anomaly 8, located immediately downstream of the bridge. Anomaly 8 is a possible pit and, as such, could have received debris from the disposal activity or the accidental dumping and is adjacent to field screening location 18-SW/SD-2. Sample results will indicate surface water and sediment conditions in an area of likely dumping activity.

PSC18-SW/SD4 will be collected from Anomaly 14, an unknown anomaly, located approximately 45 feet downstream of the bridge and the farthest downstream anomaly at the site. Sample results should indicate if contaminants are present in this downstream part of the site.

7.0 SITE 19, ROWELL CREEK RUBBLE DISPOSAL AREA

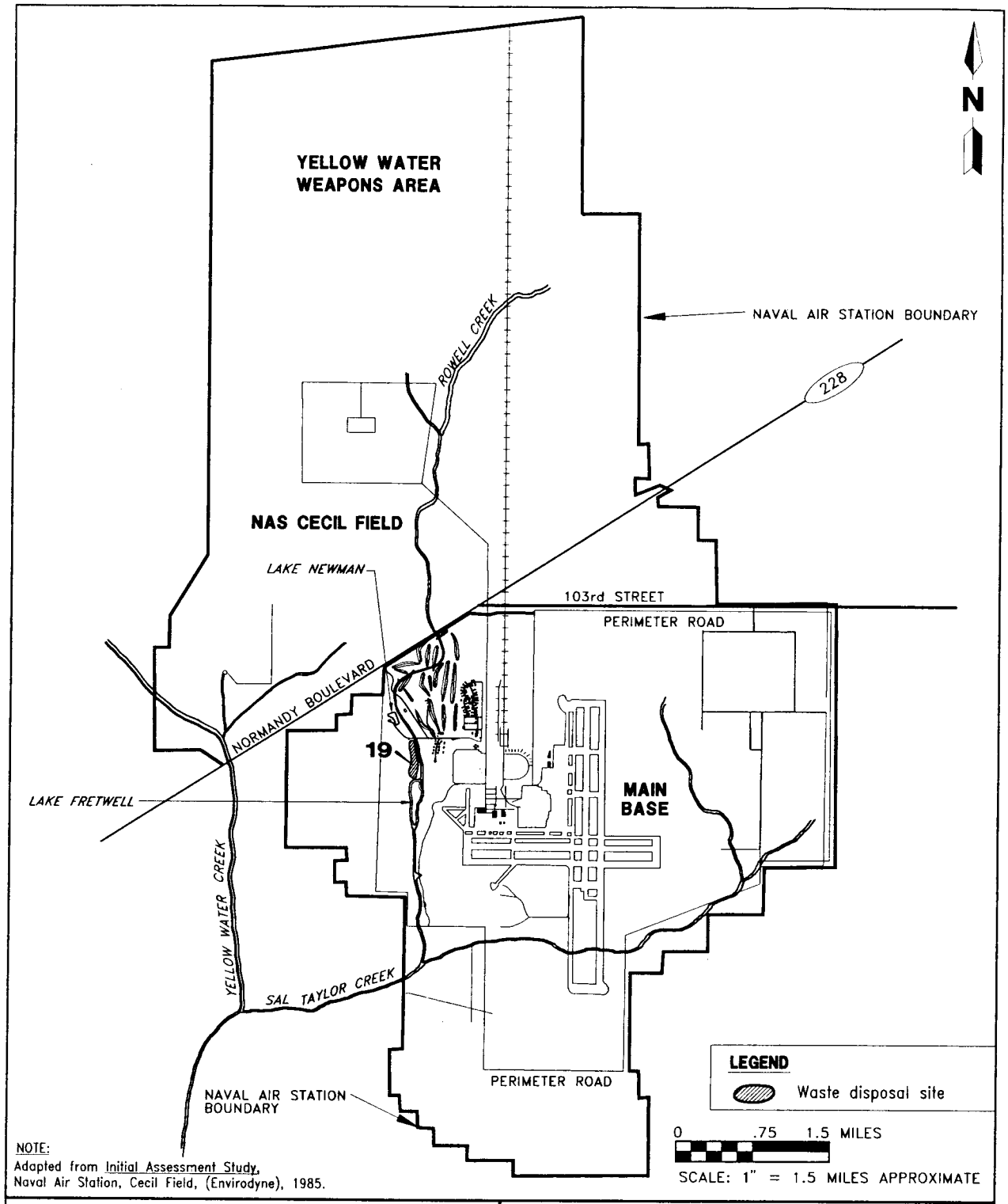
7.1 SITE HISTORY. Site 19 was identified as a possible PSC during the RFI field program of 1987. At the time of the RFI site visit most of the site was inactive. Active dumping was occurring at the southern end of the site, near the junction of Rowell Creek and Lake Fretwell. During a site visit by ABB-ES personnel in December 1994, no active dumping was apparent. The majority of the debris at the site is concrete. The noted debris includes concrete slabs and other concrete construction rubble, concrete structures that appear to be stormwater drainage vaults, asphalt, mattresses, wood, general rubbish, and 1- and 5-gallon plastic containers. The plastic containers appear to be the type that contain either fuel or pesticides. The piles of debris are not continuous or contiguous. Debris appears to have been dumped in the north and north central parts of the site and in the southernmost part of the site. The volume of material dumped at the site is unknown. Debris is visible along the western side of the site. The eastern extent of the debris is not known. It is unknown if any debris has been buried at the site.

PSC 19 is located in the southwestern part of the main facility (Figure 7-1). The site is located south of 6th Street, immediately west of Rowell Creek, and northwest of the northern end of Lake Fretwell (Figure 7-2). Land surface is relatively flat, sloping east and south toward Rowell Creek and Lake Fretwell. At least one small ditch transects the northern part of the site. Dry ditches were also noted in the central and southern parts of the site in December 1994. The site and surrounding areas are forested with mature trees. The understory is sparse in the western part, becoming more dense in the eastern part of the site. An unpaved access road borders the western and southern sides of the site.

The RFI reports the site to be approximately 1,100 feet long and 200 feet wide or approximately 5 acres. Aerial photographs and the more recent site visit indicate that the site is approximately 2,600 feet long and 400 feet to 800 feet wide or approximately 35 acres. This larger area includes areas that may be associated with the site, including those that do not appear to have been used for dumping. The period of dumping activity at the site is unknown.

7.2 PREVIOUS INVESTIGATIONS. Previous investigations have consisted of site visits only. During the RFI site visit, the site location and types of materials were noted, but no samples were collected. The purpose of the ABB-ES site visit was to verify the RFI information and develop a conceptual understanding of site and waste conditions. Based on this understanding a sampling plan was developed for the site. The presence of stressed vegetation was not noted in either site visit.

In the summer of 1993, ABB-ES personnel collected surface water and sediment samples from areas near PSC 19. Samples were collected from Rowell Creek at a location north of PSC 19 (sample GC-SW/SD-2), from two locations east of PSC 19 (RC-SW/SD-1 and RC-SW/SD-2), and from two locations in the northern part of Lake Fretwell (LF-SW/SD-1 and LF-SW/SD-2). Samples were analyzed for TAL and TCL parameters. Sample results are given in Table 7-1. Polychlorinated biphenyls (PCBs) and pesticides were detected in sediment samples collected from Rowell Creek north and east of the site. It is believed that the source of these contaminants is north of PSC 19, as pesticides and PCBs have been detected in



NOTE:
Adapted from Initial Assessment Study, Naval Air Station, Cecil Field, (Envirodyne), 1985.

FIGURE 7-1
POTENTIAL SOURCE OF CONTAMINATION (PSC) 19 WASTE DISPOSAL SITES, CECIL FIELD AND YELLOW WATER WEAPONS AREA

CECIL\PSC-LOCS\KGP-WDW\03-31-95

FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

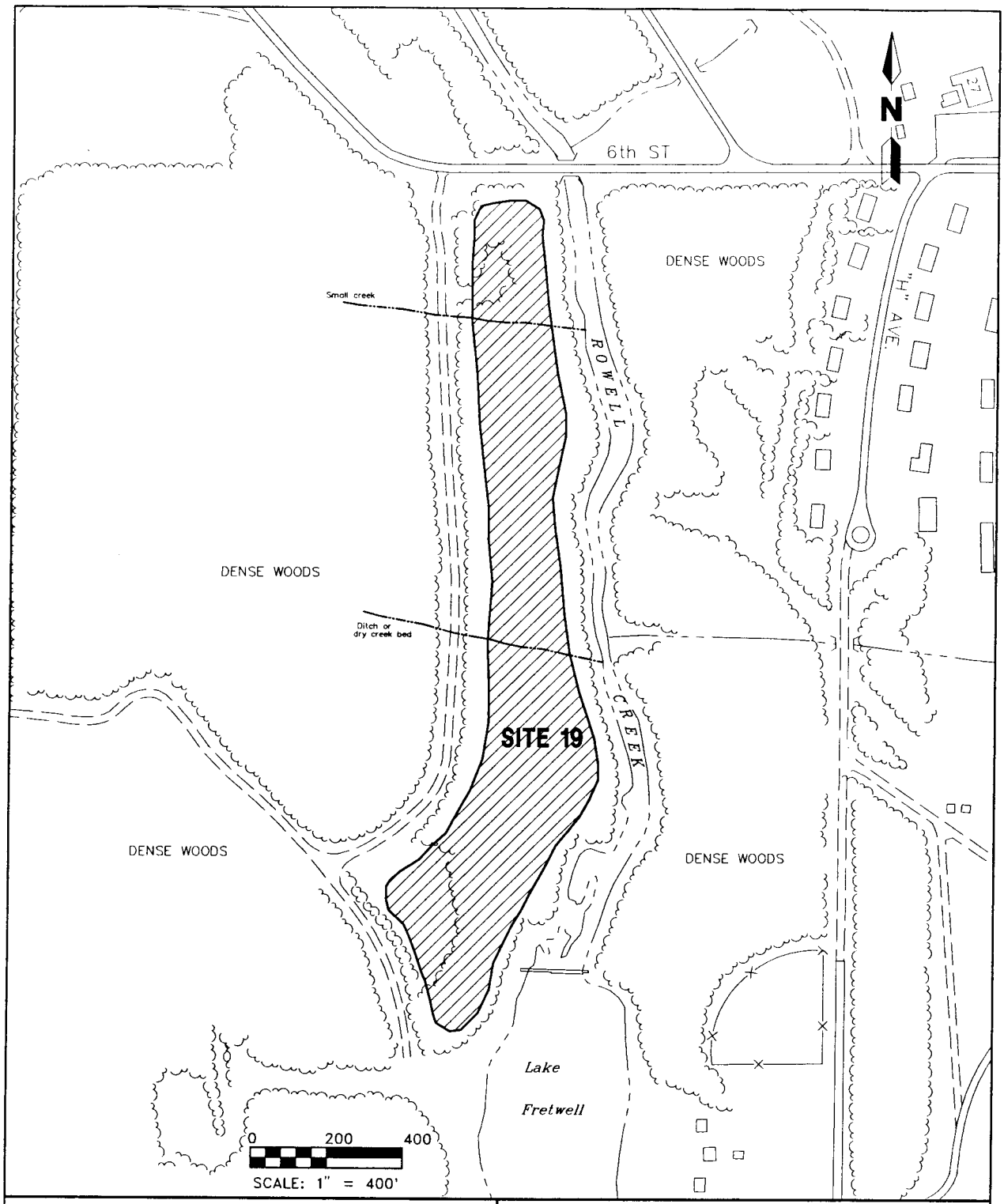


FIGURE 7-2
POTENTIAL SOURCE OF CONTAMINATION (PSC) 19
SITE LOCATION MAP

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FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Table 7-1
Surface Water and Sediment Screening Results, PSC 19
June 1993

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Compound	GC-SW/SD-2 Sediment		Units	GC-SW/SD2 Surface Water		Units
Inorganics						
Aluminum	2,670		mg/kg	ND		µg/ℓ
Arsenic	1.5	J		ND		
Barium	16.7	J		23.4	J	
Beryllium	0.32	J		ND		
Cadmium	1.1	J		ND		
Calcium	1,680	J		13,900		
Chromium	5			ND		
Copper	14.9			ND		
Iron	1,320			953		
Lead	16.9			ND		
Magnesium	237	J		2,810	J	
Manganese	6.1			ND		
Mercury	0.08			ND		
Potassium	ND			866		
Sodium	17.8	J		6,680		
Vanadium	4.8	J		ND		
Zinc	44.7			ND		
Total Organic Carbon	22,600			NA		
Organics						
Aroclor-1254	180		µg/kg			
Aroclor-1260	97					
alpha-chlordane	14					
gamma-chlordane	11					
4,4'-DDD	6.9					
4,4'-DDE	6.4					
4,4'-DDE	6.4					
2-Pentanone, 4-hydroxy	140,000	J				
Phenanthrene, dimethyl	1,100	J				
Di-n-butylphthalate	310	J				

See notes at end of table.

Table 7-1 (Continued)
Surface Water and Sediment Screening Results, PSC 19, June 1993

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Compound	RC-SW/SD-1 Sediment		Units	RC-SW/SD-1 Surface Water		Units
Inorganics						
Aluminum	ND		mg/kg	86.9		µg/ℓ
Barium	ND			25	J	
Cadmium	ND			0.26	J	
Calcium	ND			14,400		
Iron	ND			925		
Lead	ND			3.4		
Magnesium	ND			2,920	J	
Nitrate/Nitrite	ND			20		mg/ℓ
Total Keljdahl Nitrogen	ND			540		
Total Nitrogen	ND			540		
Total Phosphorous	ND			20		
Sodium	ND			7,020		µg/ℓ
Vanadium	ND			3		
Total Organic Carbon	25,200		mg/kg	NA		
Organics						
Acetone	21	J	µg/kg	12		µg/ℓ
Acid volatile sulfides	0.32		µmole/g			
Aroclor-1254	200	µg/kg				
Aroclor-1260	89					
alpha-Chlordane	3.8					
gamma-Chlordane	3	J				

See notes at end of table.

Table 7-1 (Continued)
Surface Water and Sediment Screening Results, PSC 19, June 1993

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Compound	RC-SW/SD-2 Sediment	Units	RC/SW/SD-2 Surface Water		Units
Inorganics					
Aluminum	ND	mg/kg	107	J	µg/ℓ
Barium	ND		25.7	J	
Calcium	ND		14,700		
Iron	ND		996		
Magnesium	ND		2,990	J	
Manganese	ND		7.8	J	
Sodium	ND		7,240		
Total Organic Carbon	62,100	mg/kg	NA		
Organics					
Aroclor-1254	270	µg/kg			
Aroclor-1260	150				
alpha-Chlordane	7.9				
gamma-Chlordane	6.6				
4,4'-DDE	7.5				

See notes at end of table.

Table 7-1 (Continued)
Surface Water and Sediment Screening Results, PSC 19
June 1993

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Compound	RC-SW/SD-2 Sediment		Units	RC/SW/SD-2 Surface Water		Units
Inorganics						
Aluminum	10,600		mg/kg	84.9		µg/ℓ
Arsenic	3.6	J		ND		
Barium	38.3	J		23	J	
Beryllium	0.39	J		0.29	J	
Calcium	2,670	J		13,900		
Chromium	11.3			ND		
Copper	27.6			ND		
Iron	3,270			862	J	
Lead	40.7			ND		
Magnesium	627	J		2,850	J	
Manganese	14.1			ND		
Mercury	0.16			ND		
Total Kjeldahl						
Nitrogen	ND			0.64		mg/ℓ
Total Nitrogen	ND			0.64		
Total Phosphorous	ND			0.03		
Sodium	54.4	J		6,850		
Vanadium	12.2	J		ND		
Zinc	85.2			ND		
Total Organic Carbon	69,700		mg/kg	NA		
Organics						
Aroclor-1254	250		µg/kg			
Aroclor-1260	160					
alpha-Chlordane	4.8					
gamma-Chlordane	4.0					
4,4'-DDE	8.4					
Di-n-butylphthalate	910	J				
2-Pentanone, 4-hydroxy-	190,000	J				

See notes at end of table.

Table 7-1 (Continued)
Surface Water and Sediment Screening Results, PSC 19, June 1993

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Compound	RC-SW/SD-2 Sediment		Units	RC/SW/SD-2 Surface Water		Units
Inorganics						
Aluminum	5,940		mg/kg	112	J	µg/ℓ
Arsenic	1.2	J		ND		
Barium	27.8	J		23.4	J	
Beryllium	0.22	J		0.23	J	
Calcium	2,040	J		13,900		
Chromium	6.3			ND		
Copper	9.4			ND		
Iron	1,720			872		
Lead	0.1			ND		
Magnesium	188	J		ND		
Manganese	7.4			ND		
Sodium	45.2	J		6,940		
Vanadium	7.3	J		ND		
Zinc	22.9			ND		
Total Organic Carbon	52,500		mg/kg	NA		
Organics						
Aroclor-1254	91		µg/kg			
Aroclor-1260	62					
alpha-Chlordane	7.9					
gamma-Chlordane	6.6					
4,4'-DDD	4.1	J				
4,4'-DDE	18	J				
4,4'-DDT	2.2	J				
Benzo(b)fluoranthene	91				J	
Di-n-butylphthalate	660	J				
Pyrene	81	J				
Pentanone, hydroxyme-	37,000	J				
Pentanone,hydroxyme-I	160,000	J				
1-Phenanthrene-carboxyl	650	J				

Notes: SW = surface water sample.
SD = sediment sample.
mg/kg = milligrams per kilogram.
mg/ℓ = milligrams per liter.
µg/kg = micrograms per kilogram.
µg/ℓ = micrograms per liter.
µmole/g = micromole per gram.
NA = not analyzed.
ND = not detected.
J = estimated concentration.

areas north of PSC 19. Sites north of, but near to, PSC 19 were used for the mixing, application, and disposal of pesticides. These sites include the facility golf course and a pesticide disposal site located on the golf course.

7.3 CONCEPTUAL UNDERSTANDING. PSC 19 is a relatively flat, gently sloping area of 35 acres. The site is covered by mature woods. Construction debris, primarily concrete and asphalt, has been disposed in various locations at the site. The materials at the site are thought to be inert and potential contamination from these materials is not anticipated. Rowell Creek borders the east side of the site and Lake Fretwell is southeast of the site. Groundwater flow in the surficial aquifer is anticipated to flow from west to east and southeast. At least one small ditch transects the site. The ditch is shallow, having banks of 1 to 2 feet in height. The water depth in the ditch was observed to be a few inches. Dry ditches also transect the site and probably contain water during wet seasons.

Because the land surface is relatively flat and Rowell Creek and Lake Fretwell border the site in a topographically downgradient direction, it is interpreted that surface runoff and shallow groundwater flow will discharge to Rowell Creek and Lake Fretwell. Surface runoff and possibly shallow groundwater flow may also discharge to the small ditch, especially in the eastern part of the site near Rowell Creek.

7.4 INVESTIGATIVE AND SAMPLING PROGRAM. The site is assumed to be free of contamination. Investigations and sample collections are designed to obtain factual data regarding the areal extent of the debris and to assess the presence or absence of contaminants associated with the debris.

7.4.1 Document and Records Survey Facility documents and records will be searched for any information pertaining to the dumping activities at PSC 19. A records search may reveal the types and volumes of debris, the sources of the debris, and the periods in which the debris was dumped at the site.

7.4.2 Surveys Where possible, magnetometer and electromagnetic induction geophysical surveys will be conducted to better assess the boundaries of the site. The boundaries indicated by the geophysical survey will be marked by stakes.

The areal extent of PSC 19 will be delineated. The extent and location of debris piles will be surveyed by a professional land surveyor, certified in the State of Florida. Location stakes from the geophysical survey and other physical features in and around the site will be surveyed to more accurately depict the extent of debris and the area in general. From the land and geophysical surveys a refined site map will be constructed.

7.4.3 Surface Soil Sampling Five surface soil samples will be collected from the site (Figure 7-3). Samples will be collected from 0 to 1 foot bls. Samples will be analyzed for full TAL inorganic and TCL organic parameters. The rationale for each surface soil sample is as follows.

PSC19-SS1 will be collected in an area topographically upgradient of the site and away from the roads. The proposed location is west of the northwest corner of

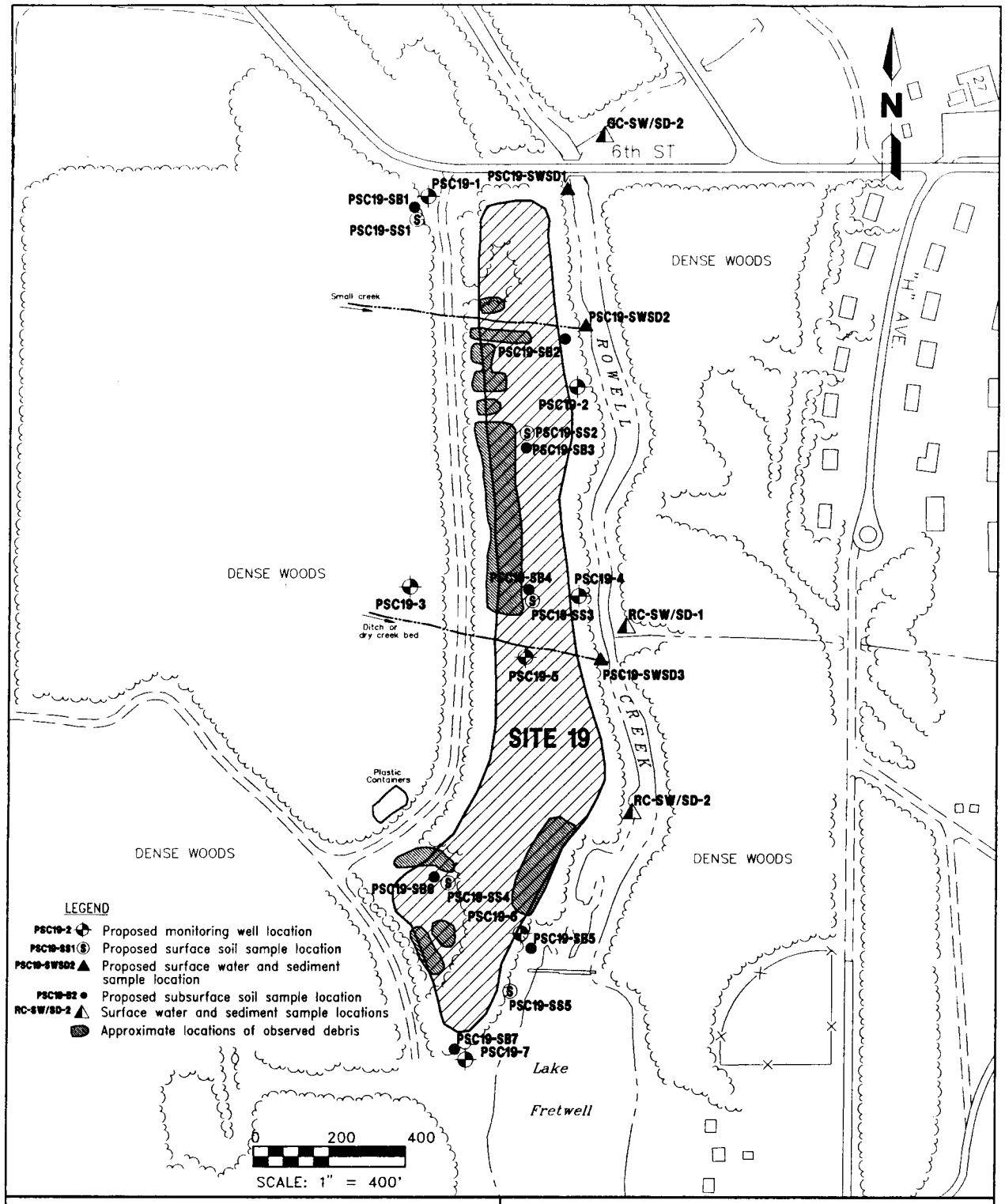

FIGURE 7-3
POTENTIAL SOURCE OF CONTAMINATION (PSC) 19
PROPOSED SAMPLE LOCATIONS AND
LOCATIONS OF OBSERVED DEBRIS

H:\CECIL\PSC19\KGP-WDW\03-30-95

FIELD INVESTIGATION PLAN
PSCs 4, 6, 9, 12, 18, AND 19

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

the site. Results of the sample collected in this area will give some indication of conditions upgradient of the site.

PSC19-SS2 will be collected in the central part of the site to characterize site conditions. If possible, the sample will be collected at or just within the eastern (topographically downgradient) extent of the debris.

PSC19-SS3 will be collected in the central part of the site and south of PSC19-SS3 to characterize site conditions. If possible, the sample will be collected at or just within the eastern (topographically downgradient) extent of the debris.

PSC19-SS4 will be collected in the southwestern part of the site, downgradient of a debris pile. Analytical results should help characterize site conditions in the southern part of the site, an area currently interpreted to be separate from the debris piles in the northern part of the site.

PSC19-SS5 will be collected in the southeastern part of the site, downgradient of most of the site and adjacent to Lake Fretwell. Analytical results should help characterize surface soil conditions between the site and Lake Fretwell.

7.4.4 Subsurface Soil Sampling Seven subsurface soil samples will be collected at the site. Samples will be collected from the 1-foot interval just above the water table. In the eastern part of the site near Rowell Creek, this interval may be the 0 to 1 foot bls interval, effective making them surface soil samples. Samples will be analyzed for full TAL inorganic and TCL organic parameters. The rationale for each subsurface soil sample is as follows.

PSC19-SB1 will be collected at a topographically upgradient location to characterize conditions upgradient of the site.

PSC19-SB2 will be collected in the northeastern part of the site, immediately south of the small ditch. Sample results will help characterize site conditions downgradient of the debris piles in the northern part of the site.

PSC19-SB3 will be collected at or just within the eastern extent of the debris piles, located in the central part of the site. Results from this sample will help characterize site conditions downgradient of the debris piles.

PSC19-SB4 will be collected at or just within the eastern extent of the debris piles, south of PSC19-SB3, and will be located in the central part of the site. Results from this sample will help characterize site conditions downgradient of the debris piles.

PSC19-SB5 will be collected topographically downgradient of debris piles located in the southeastern part of the site. The sample site will be located near the confluence of Rowell Creek and Lake Fretwell. Sample results will help characterize conditions in an area that is downgradient of most of the site and that may be influenced by Rowell Creek.

PSC19-SB6 will be located in the southwestern part of the site, at the same location as surface soil sample PSC19-SS4, to characterize site conditions in the area of the southern debris piles.

PSC19-SB7 will be located at the southernmost area of the site. This location should be topographically and hydrologically downgradient of most, if not all, of the site.

7.4.5 Groundwater Sampling Temporary piezometers will be installed and water levels collected to assess groundwater gradients and flow directions.

Seven shallow monitoring wells are proposed for the site. Each well will be set so that the screen interval will intersect the water table. After all wells are installed and purged, groundwater samples will be collected and analyzed for the full TAL inorganic and TCL organic parameters. The rationale for each groundwater sample location is as follows.

PSC19-1 will be hydrologically upgradient and located northwest of the site. It will represent background groundwater quality.

PSC19-2 will be installed along the eastern extent of the debris and in the upper third of the site. Samples from this well will indicate downgradient conditions in the northern part of the site.

PSC19-3 will be installed upgradient of the site, west of the service road and approximately at the midpoint of the long axis of the site. Samples from this well will characterize upgradient and background conditions in the central part of the site.

PSC19-4 will be located at the eastern extent of the debris and approximately at the midpoint of the long axis of the site. Samples from this well will help characterize downgradient conditions in the central part of the site.

PSC19-5 will be located along the western or west-central extent of the debris and immediately south of a dry ditch, located in the central part of the site. Samples of this well will help characterize site conditions in an area interpreted to be the southern terminus of the debris piles in the northern part of the site.

PSC19-6 will be located along the southeastern extent of the debris, near the confluence of Rowell Creek and Lake Fretwell. This is an area where groundwater may be influenced by the site, Rowell Creek, and Lake Fretwell. The well will be located downgradient of the site, but is interpreted to be upgradient of Lake Fretwell.

PSC19-7 will be located at the southernmost extent of the site and should be hydraulically downgradient of most of the site. Samples from this well should help characterize groundwater from an area downgradient of the southern debris piles.

7.4.6 Surface Water and Sediment Sampling Three surface water and sediment samples are proposed. Collected samples will be analyzed for the full TAL inorganic and TCL organic parameters. Surface water will also analyzed for filtered TAL inorganics, hardness, and TSS and sediment will also be analyzed for TOC. The rationale for each surface water and sediment sample location is as follows.

PSC19-SWSD1 will be collected immediately south of the road and bridge north of the site. Results of these samples may indicate contaminants emanating from upstream sources that could affect site conditions at PSC 19.

PSC19-SWSD2 will be collected from the small ditch in the northern part of the site. The sample will be collected near and upstream of the point where the ditch empties into Rowell Creek. Results from this location may indicate contaminants that may be migrating via the ditch from the northern part of PSC 19 to Rowell Creek.

PSC19-SWSD3 will be collected from Rowell Creek at the eastern end of the dry ditch located in the central part of the site. If the ditch contains water, the samples will be collected from the ditch. Results from this location may indicate contaminants that may be migrating via the ditch from the central part of PSC 19 to Rowell Creek.

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APPENDIX A

GROUNDWATER ANALYTICAL RESULTS

Geraghty & Miller, Inc.

Water-Quality Results
at the Grease Pit Area

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58413

May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: S-2, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.005
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	<0.0002
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.029
Manganese, mg/l	0.007
Zinc, mg/l	0.030
Nitrate, mg/l N	0.002
Hydrogen Sulfide, mg/l	<0.1
Chloride, mg/l	2.5
Fluoride, mg/l	0.045
pH	5.7
Sulfate, mg/l	2.8
Total Dissolved Solids, mg/l	15
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	<2
Gross Beta, pCi/liter	<3
*Total Organic Halide	40 ug/l

*Supplemental report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58414

May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: S-3, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.019
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	0.040
Mercury, mg/l	<0.0002
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.210
Manganese, mg/l	<0.002
Zinc, mg/l	<0.010
Nitrate, mg/l N	0.403
Hydrogen Sulfide, mg/l	<0.1
Chloride, mg/l	5.2
Fluoride, mg/l	0.054
pH	5.8
Sulfate, mg/l	6.3
Total Dissolved Solids, mg/l	23
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	<2
Gross Beta, pCi/liter	<3
*Total Organic Halide	52 ug/l

*Supplemental report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 2 (cont'd.). Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa

Report No.: 84-439

Compound	Sample ID: CAA ID:	Concentration ug/l (ppb)[2] S-1 8401955	S-2 8401956	S-3 8401957
chloromethane				
dichlorodifluoromethane				
vinyl chloride				
chloroethane				
methylene chloride				
trichlorofluoromethane				
1,1-dichloroethene				
1,1-dichloroethane				
trans-1,2-dichloroethene				
chloroform				
1,2-dichloroethane				
1,1,1-trichloroethane				
carbon tetrachloride				
bromodichloromethane				
1,2-dichloropropane				
trans-1,3-dichloropropane				
trichloroethene				
dibromochloromethane				
1,1,2-trichloroethane				
cis-1,3 dichloropropene				
2-chloroethylvinyl ether				
bromoform				
1,1,2,2-tetrachloroethane				
tetrachloroethene				
chlorobenzene				
Detection Limit		0.1	0.1	0.1

[1] U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2] Concentrations less than the detection limit are left blank.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58410

May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: SA-1, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.063
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	0.0002
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.042
Manganese, mg/l	0.003
Zinc, mg/l	<0.010
Nitrate, mg/l N	0.003
Hydrogen Sulfide, mg/l	0.1
Chloride, mg/l	8.3
Fluoride, mg/l	0.268
pH	7.5
Sulfate, mg/l	4.2
Total Dissolved Solids, mg/l	251
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/Liter	<2
Gross Beta, pCi/Liter	<3
*Total Organic Halide	50 ug/l

*Supplemental report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 2. Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa

Report No.: 84-439

Compound	Sample ID: CAA ID:	Concentration ug/l (ppb)[2] SA-1 8401952
chloromethane		
dichlorodifluoromethane		
vinyl chloride		
chloroethane		
methylene chloride		
trichlorofluoromethane		
1,1-dichloroethene		
1,1-dichloroethane		
trans-1,2-dichloroethene		
chloroform		
1,2-dichloroethane		
1,1,1-trichloroethane		
carbon tetrachloride		
bromodichloromethane		
1,2-dichloropropane		
trans-1,3-dichloropropane		
trichloroethene		
dibromochloromethane		
1,1,2-trichloroethane		
cis-1,3 dichloropropene		
2-chloroethylvinyl ether		
bromoform		
1,1,2,2-tetrachloroethane		
tetrachloroethene		
chlorobenzene		
Detection Limit		0.1

[1] U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2] Concentrations less than the detection limit are left blank.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 3. Concentration of Acid Extractables (Method 625[1])

Client: Geraghty and Miller - Tampa Report No.: 84-439

Compound	Sample ID: CAA ID:	Concentration - ug/l (ppb)[2] SA-1 8401952	S-2 8401956	S-3 8401957
ACID COMPOUNDS				
(21A) 2,4,6-trichlorophenol				
(22A) p-chloro-m-cresol				
(24A) 2-chlorophenol				
(31A) 2,4-dichlorophenol				
(34A) 2,4-dimethylphenol				
(57A) 2-nitrophenol				
(58A) 4-nitrophenol				
(59A) 2,4-dinitrophenol				
(60A) 4,6-dinitro-2-methylphenol				
(64A) pentachlorophenol				
(65A) phenol				
Detection Limit		2	2	2

APPENDIX B

SOIL AND GROUNDWATER ANALYTICAL RESULTS

Table B-1
Soil Analytical Summary, Site 4

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Identifier:	BOR4-1-1		BOR4-1-2		BOR4-2-1		BOR4-2-2		BOR4-3-1		BOR4-3-2	
Sample Depth (feet, bls):	0-2'		2-4'		0-2'		2-4'		0-2'		2-4'	
Volatiles (µg/kg)												
Acetone	35	U	10	U	11	U	12	U	11	U	12	U
Benzene	5	U	6	U	5	U	6	U	6	U	6	U
2-Butanone	11	U	12	U	11	U	12	U	11	U	12	U
Carbon Disulfide	5	U	6	U	5	U	6	U	6	U	6	U
Chloroform	5	U	6	U	5	U	6	U	6	U	6	U
1,2-Dichloroethene (total)	5	U	6	U	5	U	6	U	6	U	6	U
Ethylbenzene	5	U	6	U	5	U	6	U	6	U	6	U
2-Hexanone	11	U	12	U	11	U	12	U	11	U	12	U
4-Methyl-2-pentanone	11	U	12	U	11	U	12	U	11	U	12	U
Methylene chloride	9	U	15	U	8	U	15	U	10	U	11	U
Toluene	5	U	6	U	5	U	6	U	6	U	6	U
Trichloroethene	5	U	6	U	5	U	6	U	6	U	6	U
Xylenes (total)	3	J	6	U	5	U	6	U	6	U	6	U
Semivolatiles (µg/kg)												
4-Methylphenol	360	U	380	U	360	U	12,000	U	390	U	400	U
2,4-Dimethylphenol	360	U	380	U	360	U	12,000	U	390	U	400	U
Benzoic acid	1,700	U	1,800	U	1,800	U	56,000	U	1,900	U	1,900	U
Dibenzofuran	360	U	380	U	360	U	12,000	U	390	U	400	U
Fluoranthene	360	U	380	U	360	U	12,000	U	390	U	400	U
Fluorene	360	U	380	U	360	U	12,000	U	390	U	400	U
Naphthalene	360	U	380	U	360	U	1,200	J	390	U	400	U

See notes at end of table.

Table B-1 (Continued)
Soil Analytical Summary, Site 4

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Identifier:	BOR4-1-1		BOR4-1-2		BOR4-2-1		BOR4-2-2		BOR4-3-1		BOR4-3-2	
Sample Depth (feet, bls):	0-2'		2-4'		0-2'		2-4'		0-2'		2-4'	
Semivolatiles (continued)												
Pentachlorophenol	1,700	U	1,800	U	1,800	U	56,000	U	1,900	U	1,900	U
Phenanthrene	360	U	380	U	360	U	12,000	U	390	U	400	U
Phenol	360	U	380	U	360	U	12,000	U	390	U	400	U
Pyrene	360	U	380	U	360	U	12,000	U	390	U	400	U
2-Methylphenol	360	U	380	U	360	U	12,000	U	390	U	400	U
Benzo (g,h,i) perylene	360	U	380	U	360	U	12,000	U	390	U	400	U
2-Methylnaphthalene	360	U	380	U	360	U	3,200	J	390	UJ	400	U
Diethylphthalate	360	U	380	U	360	U	12,000	U	390	U	400	U
Benzo (a) anthracene	360	U	380	U	360	U	12,000	U	390	U	400	U
bis(2-Ethylhexyl)phthalate	62	J	380	U	360	U	12,000	U	390	U	130	J
Di-n-octylphthalate	360	U	380	U	360	U	12,000	U	390	U	400	U
Benzo (b) fluoranthene	360	U	380	U	360	U	12,000	U	390	U	400	U
Benzo (k) fluoranthene	360	U	380	U	360	U	12,000	U	390	U	400	U
Benzo (a) pyrene	360	U	380	U	360	U	12,000	U	390	U	400	U
Indeno (1,2,3-cd) pyrene	360	U	380	U	360	U	12,000	U	390	U	400	U
Pesticides (µg/kg)												
beta-BHC	4.3	U	9.2	U	8.8	U	9.3	U	9.4	U	9.6	U
Aroclor 1260	170	U	180	U	180	U	190	U	190	U	190	U

See notes at end of table.

Table B-1 (Continued)
Soil Analytical Summary, Site 4

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Identifier:	BOR4-1-1		BOR4-1-2		BOR4-2-1		BOR4-2-2		BOR4-3-1		BOR4-3-2	
Sample Depth (feet, bls):	0-2'		2-4'		0-2'		2-4'		0-2'		2-4'	
Inorganics (mg/kg)												
Aluminum	*2,690		*5,140		*2,260		*3,190		*2,180		*2,380	
Antimony	8.74	UJ	9.58	UJ	9.08	UJ	9.08	UJ	9.08	UJ	9.75	UJ
Barium	7.69	U	6.11	U	3.29	U	4.08	U	2.88	U	3.27	U
Beryllium	0.02	U	0.03	U	0.02	U	0.02	U	0.02	U	0.03	U
Cadmium	0.35	U	0.39	U	0.37	U	0.37	U	0.37	U	0.39	U
Calcium	*441	UJ	*253	UJ	*347	UJ	*170	UJ	*217	UJ	*214	UJ
Chromium	3.25	J	8.31	J	1.77	J	4.05	J	1.63	J	3.42	J
Copper	7.19	J	0.34	UJ	0.32	UJ	0.48	J	0.32	UJ	0.35	UJ
Iron	*866	J	*1,000	J	*443	J	*1,354	J	*493	J	*524	J
Lead	5.03	J	2.79	J	2.58	J	4.78	J	0.69	UJ	1.84	J
Magnesium	*106	UJ	*170	UJ	*62.0	UJ	*72.8	UJ	*49.8	UJ	*56.4	UJ
Manganese	3.48	J	2.85	J	4.16	J	2.38	J	1.55	J	1.41	J
Mercury	0.09	UJ	0.11	UJ	0.1	UJ	0.1	UJ	0.08	UJ	0.1	UJ
Nickel	1.53	U	1.67	U	1.58	U	1.58	U	1.58	U	1.7	U
Potassium	*38.6	U	*45.7	U	*40.1	U	*40.1	U	*40.1	U	43	U
Selenium	0.49	UJ	0.36	UJ	0.26	UJ	0.27	UJ	0.27	UJ	0.31	UJ
Thallium	0.31	UJ	0.34	U	0.32	UJ	0.32	U	0.32	UJ	0.34	U
Vanadium	1.63	U	3.56	U	1.21	U	3.28	U	1.59	U	1.86	U
Zinc	*19.6	J	5.76	J	9.23	J	*14.4	J	6.78	J	4.79	J
Total Petroleum Hydrocarbons (mg-/kg)	13		2	U	4.6		4,880		1.8	U	2	U

See notes at end of table.

Table B-1 (Continued)
Soil Analtyical Summary, Site 4

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Identifier:	BOR4-4-1		BOR4-4-1-D		BOR4-4-2		BOR4-5-1		BOR4-5-2		BOR4-6-1		BOR4-6-2	
			Dup of BOR4-4-1											
Sample Depth (feet, bls):	0-2'				2-4'		0-2'		2-4		0-2'		2-4'	
Volatiles (µg/kg)														
Acetone	11	U	12	UJ	12	U	11	U	12	U	11	U	12	U
Benzene	5	U	5	UJ	6	U	5	U	6	U	5	U	6	U
2-Butanone	11	U	11	UJ	12	U	11	U	12	U	11	U	12	U
Carbon Disulfide	5	U	5	UJ	6	U	5	U	6	U	5	U	6	U
Chloroform	5	U	5	UJ	6	U	5	U	6	U	5	U	6	U
1,2-Dichloroethene (total)	5	U	5	UJ	6	U	5	U	6	U	1	J	6	U
Ethyl benzene	5	U	2	J	6	U	5	U	6	U	5	U	6	U
2-Hexanone	11	U	2	J	12	U	11	U	12	U	11	U	12	U
4-Methyl-2-pentanone	11	U	11	UJ	12	U	11	U	12	U	11	U	12	U
Methylene chloride	14	U	29	UJ	12	U	13	U	15	U	10	U	12	U
Toluene	5	U	1	J	6	U	5	U	6	U	5	U	6	U
Trichloroethene	5	U	5	UJ	6	U	5	U	6	U	5	U	6	U
Xylenes (total)	5	U	4	J	6	U	1	J	6	U	2	J	6	U
Semivolatiles (µg/kg)														
4-Methylphenol	360	U	360	U	400	U	360	U	400	U	380	U	390	U
2,4-Dimethylphenol	360	U	360	U	400	U	360	U	400	U	380	U	390	U
Benzoic acid	1,700	U	1,700	U	1,900	U	1,800	U	1,900	U	1,900	U	1,900	U
Dibenzofuran	360	U	360	U	400	U	360	U	400	U	380	U	390	U
Fluoranthene	360	U	360	U	400	U	360	U	400	U	380	U	390	U
Fluorene	360	U	360	U	400	U	360	U	400	U	380	U	390	U

See notes at end of table.

Table B-1 (Continued)
Soil Analtyical Summary, Site 4

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Identifier:	BOR4-4-1		BOR4-4-1-D		BOR4-4-2		BOR4-5-1		BOR4-5-2		BOR4-6-1		BOR4-6-2	
			Dup of BOR4-4-1											
Sample Depth (feet, bls):	0-2'				2-4'		0-2'		2-4		0-2'		2-4'	
Semivolatiles (continued)														
Naphthalene	360	U	360	U	400	U	360	U	400	U	380	U	390	U
Pentachlorophenol	1,700	U	1,700	U	1,900	U	1,800	U	1,900	U	1,900	U	1,900	U
Phenanthrene	360	U	360	U	400	U	360	U	400	U	380	U	390	U
Phenol	360	U	360	U	400	U	360	U	400	U	380	U	390	U
Pyrene	360	U	360	U	400	U	360	U	400	U	380	U	390	U
2-Methylphenol	360	U	360	U	400	U	360	U	400	U	380	U	390	U
Benzo (g,h,i) perylene	360	U	360	U	400	U	360	U	400	U	380	U	390	U
2-Methylnaphthalene	360	UJ	360	UJ	400	UJ	360	UJ	400	UJ	380	UJ	390	U
														J
Diethylphthalate	360	U	360	U	400	U	360	U	43	J	380	U	41	J
Benzo (a) anthracene	360	U	360	U	400	U	360	U	400	U	380	U	390	U
bis(2-Ethylhexyl)phthalate	360	U	360	U	400	U	360	U	400	U	56	J	390	U
Di-n-octylphthalate	360	U	360	U	400	U	360	U	400	U	380	U	390	U
Benzo (b) fluoranthene	360	U	360	U	400	U	360	U	400	U	380	U	390	U
Benzo (k) fluoranthene	360	U	360	U	400	U	360	U	400	U	380	U	390	U
Benzo (a) pyrene	360	U	360	U	400	U	360	U	400	U	380	U	390	U
Indeno (1,2,3-cd) pyrene	360	U	360	U	400	U	360	U	400	U	380	U	390	U
Pesticides (µg/kg)														
beta-BHC	8.7	U	8.7	U	9.6	U	8.8	U	9.6	U	9.3	U	9.4	U
Aroclor 1260	170	U	170	U	190	U	180	U	190	U	190	U	190	U

See notes at end of table.

Table B-1 (Continued)
Soil Analtyical Summary, Site 4

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Identifier:	BOR4-4-1		BOR4-4-1-D Dup of BOR4-4-1		BOR4-4-2		BOR4-5-1		BOR4-5-2		BOR4-6-1		BOR4-6-2	
Sample Depth (feet, bls):	0-2'				2-4'		0-2'		2-4		0-2'		2-4'	
Inorganics (mg/kg)														
Aluminum	*1,920		*1,720		*1,040		*2,910		*5,730		*1,920		*1,470	
Antimony	8.83	UJ	8.76	UJ	9.63	UJ	8.77	UJ	9.92	UJ	8.6	UJ	9.35	UJ
Barium	7.78	U	5.44	U	2.29	U	3.66	U	4.47	U	2.47	U	2.62	U
Beryllium	0.02	U	0.02	U	0.03	U	0.02	U	0.03	U	0.02	U	0.02	U
Cadmium	0.41	U	0.35	U	0.39	U	0.35	U	0.4	U	0.35	U	0.38	U
Calcium	*53,900	J	*25,100	J	*680	UJ	*269	UJ	*223	UJ	*206	UJ	*196	UJ
Chromium	4.91	J	2.03	J	1.24	J	1.59	J	6.64	J	1.14	J	1.78	J
Copper	0.76	J	0.31	UJ	0.34	UJ	0.31	UJ	0.35	UJ	0.31	UJ	0.33	UJ
Iron	*643	J	*460	J	*497	J	*504	J	*624	J	*530	J	*409	J
Lead	2.43	J	2.21	J	0.76	UJ	1.61	J	1.93	J	1.39	UJ	0.94	UJ
Magnesium	*385	UJ	*190	UJ	38.9	UJ	*64.7	UJ	*89.4	UJ	*47.4	UJ	*50.3	UJ
Manganese	*12.46	J	7.65	J	4.48	J	3.48	J	2.16	J	4.37	J	1.86	J
Mercury	0.09	UJ	0.09	UJ	0.11	UJ	0.09	UJ	0.09	UJ	0.08	UJ	0.09	UJ
Nickel	1.54	U	1.53	U	1.68	U	1.53	U	1.73	U	1.5	U	1.71	U
Potassium	*39.0	U	38.9	U	*42.5	U	*55.2	U	*43.8	U	*38.0	U	*41.2	U
Selenium	0.29	UJ	0.53	UJ	0.27	UJ	0.41	UJ	0.28	UJ	0.31	UJ	0.32	UJ
Thallium	0.31	U	0.31	UJ	0.34	U	0.31	U	0.35	U	0.3	U	0.33	U
Vanadium	3.98	U	1.71	U	1.13	U	1.92	U	2.71	U	1.13	U	1.02	U
Zinc	6.33	J	4.03	UJ	2.21	UJ	2.56	UJ	*11.6	J	6.08	J	5.01	J
Total Petroleum Hydrocarbons (mg/kg)	1.8	U	1.8	U	2	U	1.8	U	2.1	U	3.5		1.9	U

* Corrected for significant figures from Technical Memorandum for Supplemental Sampling (TMSS).

Notes: µg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
bls = below land surface.

U = undetected.
J = estimated.
UJ = quantitation estimated.

Table B-2
Groundwater Target Analyte List (TAL) and Target Compound List (TCL) Summary, Site 4

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Identifier:	CEF-4-1S		CEF-4-2S	
Screen Interval (feet, bls):	3-13'		3-13'	
Volatiles (µg/ℓ)				
Acetone	11	U	14	U
Benzene	5	U	5	U
2-Butanone	10	U	10	U
Chloroethane	10	U	10	U
1,1-Dichloroethene	5	U	5	U
1,1-Dichloroethane	5	U	5	U
1,2-Dichloroethene (total)	5	U	5	U
Ethyl benzene	5	U	5	U
4-Methyl-2-pentanone	2	J	10	U
Toluene	5	U	5	U
1,1,1-Trichloroethane	5	U	5	U
1,1,2-Trichloroethane	5	U	5	U
Trichloroethene	5	U	5	U
Xylenes	6	U	5	U
Semivolatiles (µg/ℓ)				
bis(2-Ethylhexyl)phthalate	2	J	2	J
Di-n-butylphthalate	10	U	10	U
2-Methylnaphthalene	4	J	10	U
4-Methylphenol	10	U	10	U
Naphthalene	11		10	U
Phenol	10	U	10	U
Dibenzofuran	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U
2,4-Dimethylphenol	10	U	10	U
2-Methylphenol	10	U	10	U
Benzoic acid	50	U	50	U
Pesticides (µg/ℓ)				
beta-BHC	0.05	U	0.05	U

See notes at end of table.

Table B-2 (Continued)
Groundwater Target Analyte List (TAL) and Target Compound List (TCL) Summary, Site 4

Field Investigation Plan
PSCs 4, 6, 9, 12, 18, and 19
NAS Cecil Field, Jacksonville, Florida

Identifier:	CEF-4-1S		CEF-4-2S	
Screen Interval (feet, bls):	3-13'		3-13'	
Inorganics (µg/ℓ)				
Aluminum	*32,400		*82,800	
Antimony	*40.0	U	*40.0	U
Arsenic	0.76	U	0.83	U
Barium	*43.2	J	65.9	J
Calcium	*5,790		*3,890	U
Chromium	*24.4		*74.1	
Cobalt	5.12	U	5.12	U
Copper	4.65	J	8.95	J
Iron	*4,600		*5,620	
Lead	5.66		19.2	
Magnesium	*1,400	U	*1,580	U
Manganese	*37.0		*22.8	
Mercury	0.16	U	0.33	
Nickel	6.97	U	14.49	U
Potassium	*1,370	U	*1,560	U
Selenium	1.14	U	1.14	UJ
Sodium	*7,970	J	*1,940	UJ
Thallium	1.4	UJ	1.4	UJ
Vanadium	*17.0	U	*33.5	U
Zinc	*11.4	U	*18.8	U
Cyanide	1.8	U	1.8	U
Total Petroleum Hydrocarbons (mg/ℓ)	0.05	U	0.07	

* Corrected for significant figures from Technical Memorandum for Supplemental Sampling (TMSS).

Notes: µg/ℓ = micrograms per liter. U = undetected.
mg/ℓ = milligrams per liter. J = estimated.
bls = below land surface. UJ = quantitation estimated.

APPENDIX C

PRELIMINARY SCREENING ANALYSIS RESULTS FOR PSC 6

ABB Environmental Services, Inc.
2590 Executive Center Circle East
Tallahassee, FL 32301
Attn : Maria Pijnenburg

RE: On-Site Analysis at the NAS Cecil Field Site
Jacksonville, Florida
PACE Project Number: 930121.600

Date Recieved:		4/21/93	4/21/93	4/21/93	4/21/93
Date Analyzed :		4/22/93	4/22/93	4/23/93	4/23/93
Time Analyzed :		22:55	23:37	10:50	12:57
Analyzed By ;		FFE	FFE	FFE	FFE
Sample Number ;		10 700555	10 700556	10 700561	10 700554
Run Number :		ABB422,15	ABB422,16	ABB423,3	ABB423,6
Sample Name :		SS-6-2 (0-2)	SD-6-3 (0-2)	SS-6-6 (0-2)	SS-6-1 (0-2)

FIELD ANALYSIS: LOW LEVEL SOIL

Volatile Organics In Soil-Modified Method 8010

	CAS Number	MDL (mg/kg)	Units				
Dichlorodifluoromethane	75-71-8	0.004	mg/Kg	ND	ND	ND	ND
Chloromethane	74-87-3	0.002	mg/Kg	ND	ND	ND	ND
Vinyl Chloride	75-01-4	0.002	mg/Kg	ND	ND	ND	ND
Bromomethane	74-83-9	0.004	mg/Kg	ND	ND	ND	ND
Chloroethane	75-00-3	0.002	mg/Kg	ND	ND	ND	ND
Trichloroflouromethane	75-69-4	0.002	mg/Kg	ND	ND	0.003(C)	0.003(C)
1,1-Dichloroethylene	75-35-4	0.002	mg/Kg	ND	ND	ND	ND
Methylene Chloride	75-09-2	0.002	mg/Kg	ND	ND	ND	ND
Trans-1,2-Dichloroethylene	156-60-5	0.002	mg/Kg	ND	ND	ND	ND
1,1-Dichloroethane	75-34-3	0.002	mg/Kg	ND	ND	ND	ND
Chloroform	67-66-3	0.002	mg/Kg	ND	ND	ND	ND
1,1,1-Trichloroethane	71-55-6	0.002	mg/Kg	ND	ND	ND	ND
Carbon Tetrachloride	56-23-5	0.002	mg/Kg	ND	ND	ND	ND
1,2-Dichloroethane	107-06-2	0.002	mg/Kg	ND	ND	ND	ND
1,1,2-Trichloroethylene (TCE)	79-01-6	0.002	mg/Kg	ND	ND	ND	ND
1,2-Dichloropropane	78-87-5	0.002	mg/Kg	ND	ND	ND	ND
Dichlorobromomethane	75-27-4	0.002	mg/Kg	ND	ND	ND	ND
2-Chloroethylvinylether	100-75-8	0.002	mg/Kg	ND	ND	ND	ND
Cis-1,3-Dichloropropylene	10061-02-6	0.002	mg/Kg	ND	ND	ND	ND
Trans-1,3-Dichloropropylene	10061-01-5	0.002	mg/Kg	ND	ND	ND	ND
1,1,2-Trichloroethane	79-00-5	0.002	mg/Kg	ND	ND	ND	ND
1,1,2,2-Tetrachloroethylene (PCE)	127-18-4	0.002	mg/Kg	ND	ND	ND	ND
Dibromochloromethane	124-48-1	0.002	mg/Kg	ND	ND	ND	ND
Chlorobenzene	108-90-7	0.002	mg/Kg	ND	ND	ND	ND
Bromoform	75-25-2	0.004	mg/Kg	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	79-34-5	0.004	mg/Kg	ND	ND	ND	ND
1,3-Dichlorobenzene	541-73-1	0.004	mg/Kg	ND	ND	ND	ND
1,4-Dichlorobenzene	106-46-7	0.004	mg/Kg	ND	ND	ND	ND
1,2-Dichlorobenzene	95-50-1	0.004	mg/Kg	ND	ND	ND	ND

MDL - Method Detection Limit
ND - Not Detected
C - Confirmed By Second Column Analysis
(1)-MDL X 5

ABB Environmental Services, Inc.
2590 Executive Center Circle East
Tallahassee, FL 32301
Attn : Maria Pijnenburg

RE: On-Site Analysis at the NAS Cecil Field Site
Jacksonville, Florida
PACE Project Number: 930121.600

Date Recieved:	4/21/93	4/21/93	4/21/93
Date Analyzed :	4/23/93	4/23/93	4/23/93
Time Analyzed :	13:40	14:23	15:12
Analyzed By :	FFE	FFE	FFE
Sample Number :	10 700557	10 700558	10 700559
Run Number :	ABB423,7	ABB423,8	ABB423,9
Sample Name :	SD-6-3 (0-2D)	SS-6-4 (0-2)	SS-6-5 (0-2)

FIELD ANALYSIS: LOW LEVEL SOIL

Volatile Organics in Soil-Modified Method 8010

	CAS Number	MDL (mg/kg)	Units			
Dichlorodifluoromethane	75-71-8	0.004	mg/Kg	ND	ND	ND
Chloromethane	74-87-3	0.002	mg/Kg	ND	ND	ND
Vinyl Chloride	75-01-4	0.002	mg/Kg	ND	ND	ND
Bromomethane	74-83-9	0.004	mg/Kg	ND	ND	ND
Chloroethane	75-00-3	0.002	mg/Kg	ND	ND	ND
Trichloroflouromethane	75-69-4	0.002	mg/Kg	ND	0.003(C)	0.007(C)
1,1-Dichloroethylene	75-35-4	0.002	mg/Kg	ND	ND	ND
Methylene Chloride	75-09-2	0.002	mg/Kg	ND	ND	ND
Trans-1,2-Dichloroethylene	156-60-5	0.002	mg/Kg	ND	ND	ND
1,1-Dichloroethane	75-34-3	0.002	mg/Kg	ND	ND	ND
Chloroform	67-66-3	0.002	mg/Kg	ND	ND	ND
1,1,1-Trichloroethane	71-55-6	0.002	mg/Kg	ND	ND	ND
Carbon Tetrachloride	56-23-5	0.002	mg/Kg	ND	ND	ND
1,2-Dichloroethane	107-06-2	0.002	mg/Kg	ND	ND	ND
1,1,2-Trichloroethylene (TCE)	79-01-6	0.002	mg/Kg	ND	ND	ND
1,2-Dichloropropane	78-87-5	0.002	mg/Kg	ND	ND	ND
Dichlorobromomethane	75-27-4	0.002	mg/Kg	ND	ND	ND
2-Chloroethylvinylether	100-75-8	0.002	mg/Kg	ND	ND	ND
Cis-1,3-Dichloropropylene	10061-02-6	0.002	mg/Kg	ND	ND	ND
Trans-1,3-Dichloropropylene	10061-01-5	0.002	mg/Kg	ND	ND	ND
1,1,2-Trichloroethane	79-00-5	0.002	mg/Kg	ND	ND	ND
1,1,2,2-Tetrachloroethylene (PCE)	127-18-4	0.002	mg/Kg	ND	ND	ND
Dibromochloromethane	124-48-1	0.002	mg/Kg	ND	ND	ND
Chlorobenzene	108-90-7	0.002	mg/Kg	ND	ND	ND
Bromoform	75-25-2	0.004	mg/Kg	ND	ND	ND
1,1,2,2-Tetrachloroethane	79-34-5	0.004	mg/Kg	ND	ND	ND
1,3-Dichlorobenzene	541-73-1	0.004	mg/Kg	ND	ND	ND
1,4-Dichlorobenzene	106-46-7	0.004	mg/Kg	ND	ND	ND
1,2-Dichlorobenzene	95-50-1	0.004	mg/Kg	ND	ND	ND

MDL - Method Detection Limit
ND - Not Detected
C - Confirmed By Second Column Analysis
(1)-MDL X 5

ABB Environmental Services, Inc.
2590 Executive Center Circle East
Tallahassee, FL 32301
Attn : Maria Pijnenburg

RE: On-Site Analysis at the NAS Cecil Field Site
Jacksonville, Florida
PACE Project Number: 930121.600

Date Recieved:		4/21/93	4/21/93	4/21/93	4/21/93
Date Analyzed :		4/29/93	4/30/93	4/30/93	4/29/93
Time Analyzed :		19:12	10:47	13:12	18:36
Analyzed By :		RJS	RJS	RJS	RJS
Sample Number :		10 700555	10 700556	10 700561	10 700554
Run Number :		ABB429C,6	ABB430B,4	ABB430B,8	ABB429C,5
Sample Name :		SS-6-2 (0-2)	SD-6-3 (0-2)	SS-6-6 (0-2)	SS-6-1 (0-2)

FIELD ANALYSIS: LOW LEVEL SOIL: 8020

Volatile Organics In Soil-Modified Method 8010

	CAS Number	MDL (mg/kg)	Units				
Methylene Chloride		0.002	mg/Kg	ND	ND	ND	ND
Benzene		0.002	mg/Kg	ND	ND	ND	ND
Toluene		0.002	mg/Kg	ND	ND	ND	ND
Chlorobenzene		0.002	mg/Kg	ND	ND	ND	ND
Ethyl Benzene		0.002	mg/Kg	0.004	ND	ND	0.003
Total Xylenes		0.006	mg/Kg	ND	ND	ND	ND
1,3-Dichlorobenzene		0.002	mg/Kg	ND	ND	ND	ND
1,4-Dichlorobenzene		0.002	mg/Kg	ND	ND	ND	ND
1,2-Dichlorobenzene		0.002	mg/Kg	ND	ND	ND	ND
Napthalene		0.004	mg/Kg	ND	ND	ND	ND

MDL - Method Detection Limit
ND - Not Detected
C - Confirmed By Second Column Analysis
(1)-MDL X 5

ABB Environmental Services, Inc.
2590 Executive Center Circle East
Tallahassee, FL 32301
Attn : Maria Pijnenburg

RE: On-Site Analysis at the NAS Cecil Field Site
Jacksonville, Florida
PACE Project Number: 930121.600

Date Recieved:	4/21/93	4/21/93	4/21/93
Date Analyzed :	4/30/93	4/30/93	4/30/93
Time Analyzed :	11:23	12:00	13:50
Analyzed By :	RJS	RJS	RJS
Sample Number :	10 700557	10 700558	10 700559
Run Number :	ABB430B,5	ABB430B,6	ABB430B,9
Sample Name :	SD-6-3 (0-2D)	SS-6-4 (0-2)	SS-6-5 (0-2)

FIELD ANALYSIS: LOW LEVEL SOIL: 8020

Volatile Organics in Soil-Modified Method 8010

	CAS Number	MDL (mg/kg)	Units			
Methylene Chloride		0.002	mg/Kg	ND	ND	ND
Benzene		0.002	mg/Kg	ND	ND	ND
Toluene		0.002	mg/Kg	0.009	ND	ND
Chlorobenzene		0.002	mg/Kg	ND	ND	ND
Ethyl Benzene		0.002	mg/Kg	ND	ND	ND
Total Xylenes		0.006	mg/Kg	ND	ND	0.01
1,3-Dichlorobenzene		0.002	mg/Kg	ND	ND	ND
1,4-Dichlorobenzene		0.002	mg/Kg	ND	ND	ND
1,2-Dichlorobenzene		0.002	mg/Kg	ND	ND	ND
Napthalene		0.004	mg/Kg	ND	ND	ND

MDL - Method Detection Limit
ND - Not Detected
C - Confirmed By Second Column Analysis
(1)-MDL X 5