

**Black and Decker (U.S.), Inc.**

**Environmental Investigation Report  
Black and Decker, Incorporated  
Hampstead, Maryland Facility**





ENVIRONMENTAL INVESTIGATION REPORT  
BLACK AND DECKER, INCORPORATED  
HAMPSTEAD, MARYLAND FACILITY

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## EXECUTIVE SUMMARY

Black and Decker, Inc. (Black & Decker) retained Roy F. Weston, Inc. (WESTON) to conduct an environmental investigation of Black & Decker's Hampstead, Maryland facility. The study was initiated as a result of the detection of chlorinated hydrocarbons in the groundwater at the plant site.

WESTON's objectives in the investigation were to:

- Identify sources or potential sources of groundwater contamination on-site.
- Delineate the nature and extent of potential contamination on-site.
- Characterize possible routes of chlorinated hydrocarbon migration.
- Develop recommendations based on the available data.

### POTENTIAL SOURCE AREA CHARACTERIZATION

Using a variety of nonintrusive and intrusive investigation techniques, the Phase I Source Area identification program efficiently achieved the objective of identifying which of the potential source areas could represent significant current sources of groundwater contaminants. Follow-up sampling was conducted on selected areas during Phase II to further define suspected source areas.

#### Storage Tank Areas (Zone A)

Of the three storage tank areas, the aboveground storage tank area does not appear to be a current source area. Soils in the other two areas, underground Tank Farms 1 and 2, appear to contain localized "hot spots" of both total petroleum hydrocarbons (TPH) and volatile organic compounds (VOCs). The VOCs are present mainly in soils with elevated TPH concentrations.

##### Tank Farm 1

Soils in the tank farm area contain TPH, toluene, ethyl benzene, and xylene in limited horizons. A comparison of the nearby groundwater quality and the Toxicity Characteristic Leaching Procedure (TCLP) leachate concentrations against proposed draft Federal drinking water standards indicates that these compounds are present below levels that have or would significantly impact groundwater quality.

## Tank Farm 2

Soils in this tank farm area contain primarily TPH, PCE, and TCE in limited horizons. A comparison of the nearby groundwater quality and the TCLP leachate concentrations against Federal drinking water standards indicates that these compounds may be present at sufficiently high concentrations to impact groundwater quality. Although the potential future groundwater impacts were not quantified (i.e., using leachate generation rates, lateral groundwater flow rates, and transport characteristics), the available data indicate that soil remediation is appropriate for Tank Farm 2.

### Other Potential Source Areas

The evaluation of other potential source areas generally indicates that, although previous source inputs cannot be precluded, the following areas are not current sources of PCE and TCE to the groundwater:

- Fill site near seep area (Zone B).
- Potential heat treating residues disposal areas (Zone C).
- Product (tool) disposal area (Zone D).
- Corner of Buildings 5 and 6 (Zone E).
- Past potential burn area (Zone F).
- Lagoon area (Zone G).

The overall groundwater flow and VOC distribution characterization indicate that Tank Farm 2 may not have been the only, nor the principal, source of PCE and TCE in the groundwater. More likely, historical use of solvents at the Hampstead facility may have contributed to the current quality of groundwater on-site. The current distribution of TCE and PCE probably reflects the migration of a plume or plumes of these contaminants from a source or sources, no longer existing, along pathways of preferred shallow and deep groundwater flow.

### GROUNDWATER CONTAMINANT/MIGRATION CHARACTERIZATION

The investigation has confirmed that the principal direction of groundwater movement is to the south-southwest. An additional component of flow to the east has been identified in the north-eastern edge of the facility. Groundwater migration pathways in the bedrock are expected to be preferentially oriented along fracture zones and schistosity planes. Shallow groundwater flow

appears to be perpendicular to the hydraulic gradient, which corresponds generally with surface topography. Preferred flow pathways within the saprolite may partially reflect trends in the underlying bedrock.

Characterization of the VOC distribution in the groundwater indicates that essentially separate plumes of TCE and PCE exist on the eastern half and western half of the facility, respectively. The TCE plume appears to extend south from an origin near the aboveground storage tank area. Eastern components of flow in this area suggest that a small portion of the groundwater that contains TCE may be migrating toward Route 30. The PCE plume, with highest concentrations at production well 7, encompasses the western half of the facility. Evidence suggests that groundwater containing PCE is generally moving toward the southwest.

## RECOMMENDATIONS

### Tank Farm Soils

Based on field and soil-water partition data for Tank Farm 2 and the concentration of groundwater contaminants in RFW-8, remediation of the Tank Farm 2 soils is recommended to minimize the future migration of contaminants to the groundwater.

### Groundwater

Based on the distribution of PCE and TCE in the groundwater on-site and groundwater flow directions, a groundwater remediation plan is recommended. The proposed plan incorporates the pumping of several recovery wells to create a hydraulic barrier to contaminated groundwater flow along the northeast and southwest property boundaries. The remedial plan is designed to recover contaminated groundwater on-site and prevent migration of contaminants off-site and to result in eventual restoration of the aquifer.



## SECTION 1

### INTRODUCTION

Black and Decker, Inc. (Black & Decker) retained Roy F. Weston, Inc. (WESTON) in 1987 to conduct an environmental investigation of Black & Decker's Hampstead, Maryland facility. The study was initiated as a result of the detection of chlorinated hydrocarbons in the groundwater at the plant site.

WESTON's objectives in the investigation were to:

- Identify sources or potential sources of groundwater contamination on-site.
- Delineate the nature and extent of potential contamination on-site.
- Characterize possible routes of chlorinated hydrocarbon migration.
- Develop recommendations based on the available data.

WESTON's investigation at the plant was approached in two phases. The first phase, conducted in November and December 1987, utilized soil-gas sampling, geophysical surveying, test pit excavations, soil borings, lagoon water and sediment sampling, and groundwater sampling in an effort to identify sources or potential sources of the constituents found in the groundwater. Data collected during this phase were evaluated and the resultant conclusions were incorporated in the design of the second phase.

Phase II of the investigation, conducted in June, July and December 1988, involved supplemental monitor well installation, additional soil borings, and groundwater and soil sampling and analysis. These activities aided in further definition of the extent of contamination of the on-site soil and groundwater, characterized routes of migration and provided preliminary data to be considered in developing remedial alternatives.

This report provides a comprehensive description of both Phase I and Phase II field activities, discusses the results of the data analysis, and includes recommendations for further action at the Black & Decker site.



## SECTION 2

### BACKGROUND

#### 2.1 SITE DESCRIPTION

The Black & Decker facility is located in Hampstead, Maryland in northeastern Carroll County, approximately 35 miles north of Baltimore (Figure 2-1). The plant is situated on 150 acres of Black & Decker property in a predominantly rural setting. The population center of Hampstead is approximately 0.8 mile north of the plant along Hanover Road, State Route 30.

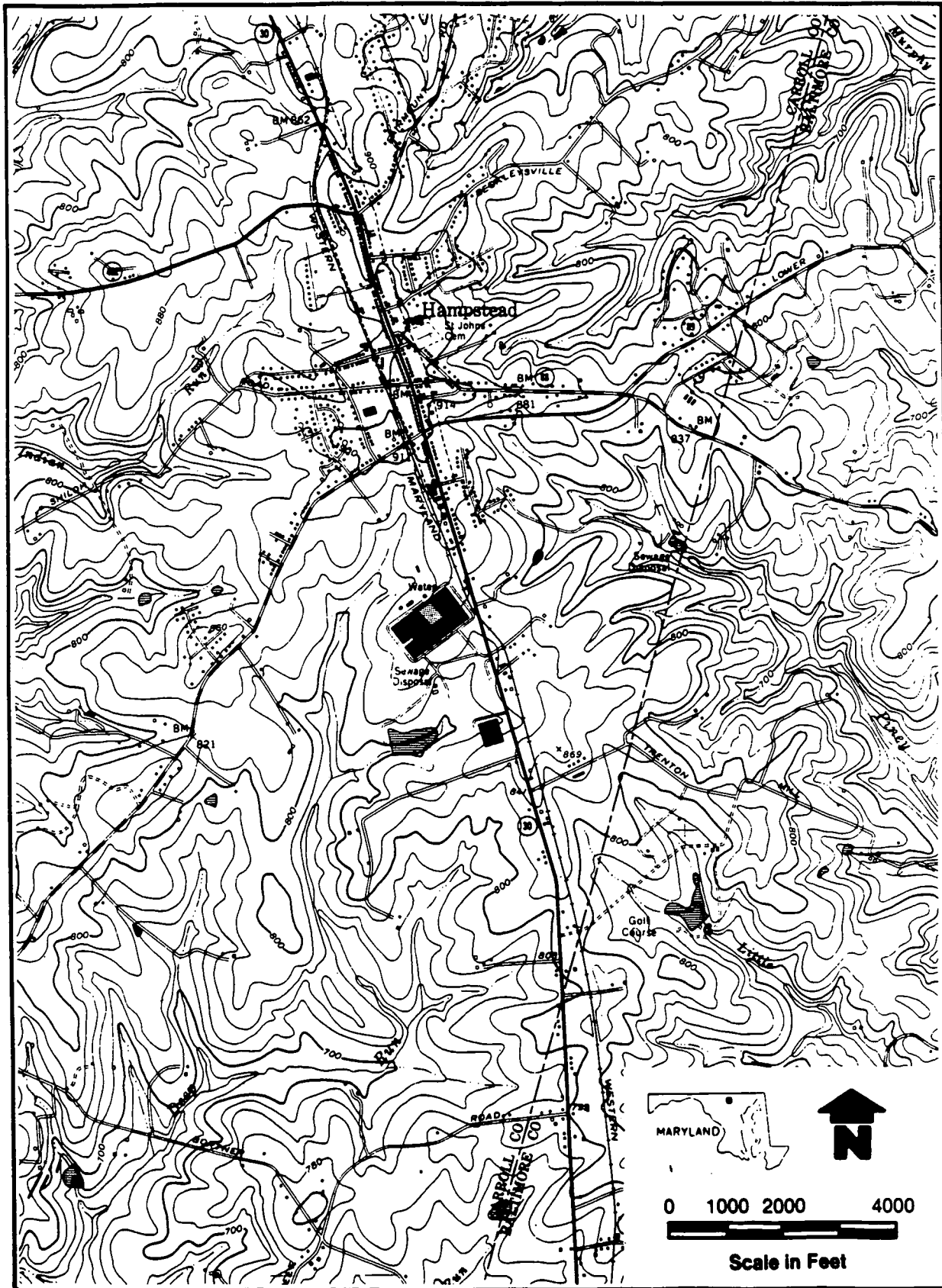
As shown in Figure 2-2, centrally located on the plant site is a large building, which serves as the center of operations. On the northwest side of this building are several single story buildings, which are used for the maintenance of plant operations. Five water supply wells line the northwest boundary of the site. A gravel road provides access to the wooded area surrounding the well houses. This road continues along the western boundary and connects with a paved road, leading to the wastewater treatment facility and lagoons on the south end of the property.

#### 2.2 SITE ACTIVITIES

The original Black & Decker facility on the property was built in 1952 for the manufacture of power hand tools. There have been additions to the main building and construction of several ancillary buildings on-site since 1952. The main building is actually a composite of several buildings constructed in phases during the plant's operation. Various areas within the composite building have been designated Buildings 1 through 6.

Beginning in 1983, the focus of plant activities was gradually changed from manufacturing to distribution. The transformation was officially completed in July 1987; currently, the Hampstead facility serves as Black & Decker's principal distribution center on the East Coast. Subordinate activities still conducted on-site include manufacturing gears from powdered metal, heat treatment of the gears, and cleaning and treatment of power tool accessories for rust prevention.

Based on the recollections of current employees, several areas on the property were believed to be used for disposal of debris and off-specification tool products during the history of manufacturing operations. These materials were believed to be relatively inert. In addition, the manufacturing processes utilized numerous solvents and oils, which were stored in on-site above-ground and belowground tanks. The use of these materials has largely been discontinued with the change in emphasis at the



**FIGURE 2-1 TOPOGRAPHIC MAP OF BLACK & DECKER PLANT, HAMPSTEAD, MD AND VICINITY**

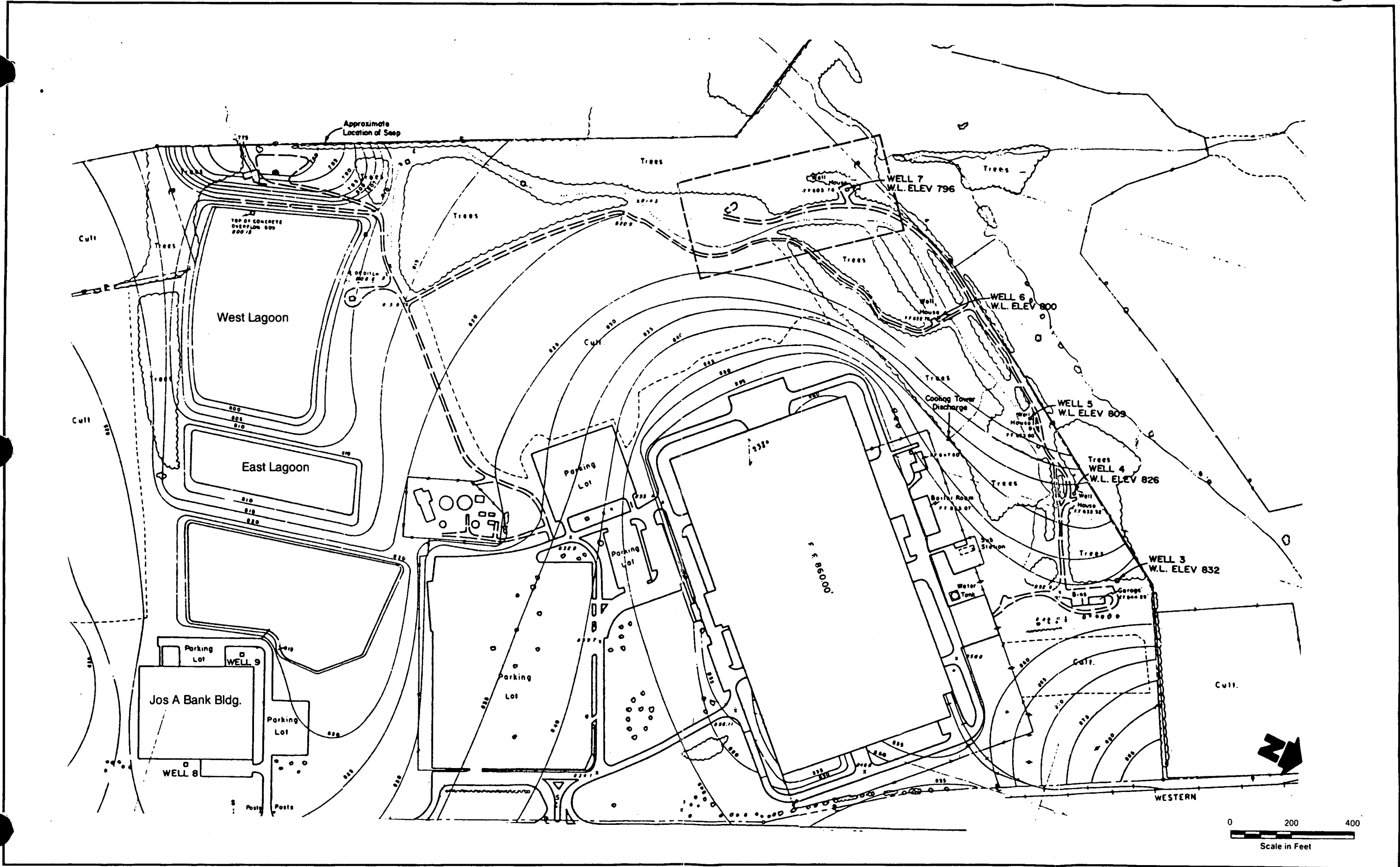


FIGURE 2-2 SITE MAP OF BLACK & DECKER FACILITY, HAMPSTEAD, MD



facility from manufacturing to distribution. All of the underground storage tanks have since been excavated, cleaned, and filled with sand.

Since 1978, the two lagoons on-site have been used by the facility for wastewater treatment. The smaller East Lagoon is used as a holding pond for the boiler blow-down water and for the effluent of the biotreatment plant. This water is, in turn, treated in the chemical treatment plant and discharged to the larger West Lagoon or "process lake." A portion of the water from the West Lagoon is recycled for use as noncontact cooling water and the excess discharged to a small stream west of the site via a NPDES permitted outfall.

In April 1984, as part of an effort to determine the impact of a gasoline spill at the Hampstead Exxon Service Station, water samples of supply wells at the Hampstead Black & Decker facility were analyzed by Carroll County officials for volatile organic compounds (VOCs). As a result of the detection of chlorinated hydrocarbons in the samples (particularly trichloroethene and tetrachloroethene), an environmental investigation was initiated by Black & Decker in conjunction with the then Maryland Department of Health and Mental Hygiene. Initial activity involved a preliminary characterization of the potential sources of the chlorinated hydrocarbons, which may have been related to past activities at the plant site. Since beginning the study, Black & Decker has provided for groundwater remediation through the use of an air stripping unit to remove moderate concentrations of VOCs from groundwater at the plant site.

## **2.3 ENVIRONMENTAL SETTING**

### **2.3.1 Physiography**

The plant site lies within the eastern division of the Piedmont physiographic province, which is characterized by moderate relief, gentle slopes, and rounded hills (Meyer, 1958). The climate in the Hampstead area is considered humid temperate; the average rainfall is 44 inches, and the average annual temperature is 53°F (Duigon, 1981).

As shown in Figure 2-1, the Black & Decker plant is situated on a N35°E trending ridge, which is an extension of a topographic high to the north on which the town of Hampstead lies. One hundred feet of relief (a 2° to 4° slope) separates the main building from a small stream, which follows the western perimeter of the plant site and drains south to Deep Run.

As shown in Figure 2-1, on the southeastern portion of the facility, the land surface slopes gently toward the lagoons. Storm drainage in this area is directed toward these lagoons and regionally toward Deep Run. In a small portion of the facility adjacent to the main building along the eastern

perimeter of the site, the land surface slopes gradually to the east-northeast. Surface drainage in this area is directed east toward Piney Run.

### 2.3.2 Geology

As in most of eastern Carroll County, an indeterminate thickness of the albite-chlorite schist facies of the Wissahickon Formation underlies the Black & Decker property. This facies consists principally of tightly folded albite schist or phyllite interbedded with layers of chlorite and or muscovite schist. Cream to yellow, vitreous, micaceous quartzite veins are frequently injected along the planes of foliation.

Thin quartzite beds (<5 feet thick) are interbedded with the phyllite near the base of the formation. As is common in the Piedmont, the Wissahickon bedrock underlying the property has been highly deformed and fractured. Zones of intense fracturing may have surface expression as valleys or draws, or as other linear topographic features. Meyer (1958) reports that the strike of schistosity on the plant grounds ranges from N35°E to N46°E.

Chemical weathering has produced a 25- to 80-foot thickness of weathered schist or saprolite overlying the crystalline bedrock on-site. The saprolite grades from a micaceous, clayey reddish-brown silt at shallow depths to a medium soft, greyish-brown, slightly weathered schist/phyllite near the interface with competent bedrock. Residual quartz veins are encountered throughout the saprolite.

### 2.3.3 Hydrogeology

In the Hampstead area, groundwater occurs chiefly in the tension joints, fractures, and shear zones in the Wissahickon Schist, in the pore spaces of the overlying saprolite, and in fractured quartz veins. Recharge to the bedrock fractures is principally from the downward percolation of water stored in the saprolite (Meyer, 1958). Groundwater flow in the bedrock may follow preferred directions as dictated by the strike of schist foliation or principal direction of jointing. Shallow groundwater flow is generally perpendicular to the hydraulic gradient, which corresponds generally with surface topography. Preferred flow pathways within the saprolite may partially reflect trends in the underlying bedrock.

The large areal extent and moderately good water-bearing properties have made the albite-chlorite facies an important aquifer in Carroll County. A high percentage of domestic and farm water wells and several municipal and industrial supply wells tap fractures in this unit at an average depth of 100 feet. The yields of these wells average approximately 16 gpm with an average specific capacity of 1.5 gpm per foot of drawdown (Meyer, 1958).

The supply wells at Black & Decker exceed the reported area averages for the bedrock aquifer. Well records for August 1988 indicate an average yield of 32 gpm and a range of specific capacities from 0.8 to 2.8 gpm per foot of drawdown for the five wells used by the plant. Step-drawdown tests conducted by the Maryland Geological Survey in 1954 on Black & Decker supply well 3 yielded an average coefficient of transmissivity and a storage coefficient for the bedrock aquifer as 5,000 gpd per foot and 0.03, respectively. A decrease in pumping levels with increased pumping rate during the test indicates that bedrock permeability decreases with depth (Meyer, 1958).

**SECTION 3****PHASE I INVESTIGATION**

Seven areas at the Hampstead facility that could be possible sources of groundwater and/or soil contamination were identified based on discussions with Black & Decker employees and previous investigations. These areas, Zones A through G, were investigated in Phase I, and are illustrated in Figure 3-1.

The field investigations and analytic results specific to each zone are described in Subsections 3.1 through 3.7. The validity of all chemical analyses in this section were confirmed in accordance with the WESTON quality assurance and quality control program, as described in Appendix C of the Work Plan. Summary tables of the analytical results, as presented in the following subsections, list only the compounds that were detected in samples of the particular zone. Units of mg/kg and mg/L in the summary tables correspond to parts per million (ppm) in the text. Units of ug/L and ug/kg correspond to parts per billion (ppb). Units of ng/L correspond to parts per trillion (ppt). A complete tabulation of the results, which lists all compounds tested in each analysis, is provided in Appendix A.

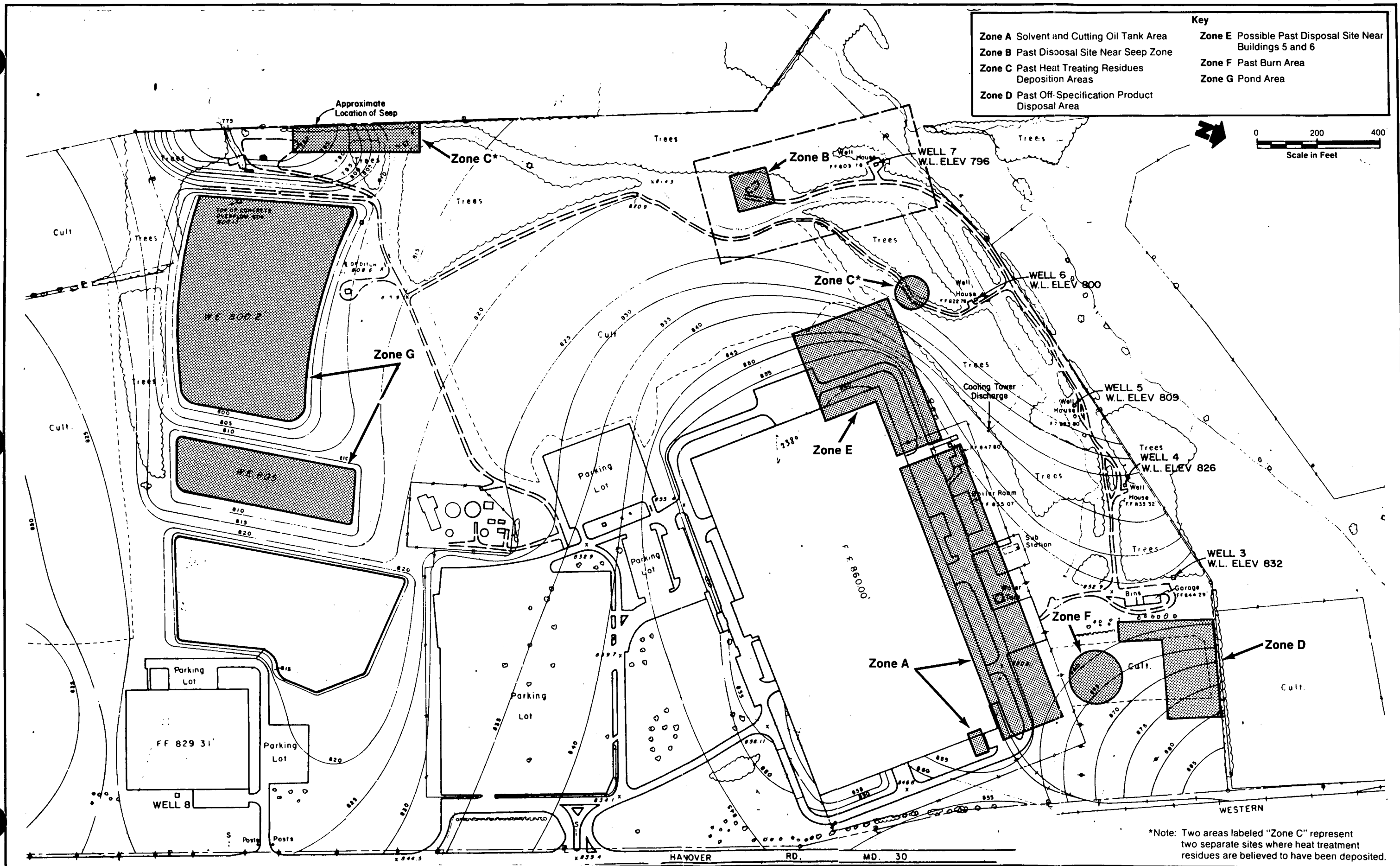
The conclusions drawn from the Phase I investigation and their use in developing the Phase II investigation are discussed in Subsection 3.8.

**3.1 ZONE A - STORAGE TANK AREA****3.1.1 Field Activity**

Three areas in this zone were identified as locations of tanks, that previously contained solvents and cutting oils. Potential soil and groundwater contamination could have occurred as a result of inadvertent spills or possible leakage.

Tank Farm 1 consisted of 13 underground tanks, which were located immediately adjacent to the rear of the main building. The oils and solvents that were contained in the tanks are listed in Table 3-1. Tank Farm 2 consisted of five underground tanks located immediately adjacent to the east side of the main building. The tanks contained various oils used in the manufacturing processes at Black & Decker, in addition to waste oils, as listed in Table 3-1. The aboveground storage tank area consisted of two 5,000-gallon aboveground tanks containing UCAR™ chemicals and trichloroethylene.

The underground tanks at the tank farms have since been excavated, cleaned, and backfilled with sand. The old TCE storage



**Key**

Zone A Solvent and Cutting Oil Tank Area	Zone E Possible Past Disposal Site Near Buildings 5 and 6
Zone B Past Disposal Site Near Seep Zone	Zone F Past Burn Area
Zone C Past Heat Treating Residues Deposition Areas	Zone G Pond Area
Zone D Past Off-Specification Product Disposal Area	

\*Note: Two areas labeled "Zone C" represent two separate sites where heat treatment residues are believed to have been deposited.

**FIGURE 3-1 PHASE I AREAS OF INVESTIGATION, BLACK & DECKER, HAMPSTEAD, MD**

Table 3-1

Tank Farm 1 and 2 Inventory

Tank No.	Contents	Capacity	Comments	
Tank Farm 1	1-1	Toluol	1,000g	
	1-2	Acetone	1,000g	
	1-3	Acetone	1,000g	
	1-4	(Mineral spirits) Cleaning Fluid	1,000g	
	1-5	(Mineral spirits) Cleaning Fluid	1,000g	
	1-6	Empty	1,000g	Previously contained xylene and acetone
	1-7	Kerosene	1,000g	
	1-8	Solvesso 150 aromatic solvent	1,000g	
	1-9	Solvesso 100 aromatic solvent	1,000g	
	1-10	Alcohol	1,000g	
	1-11	Rust Velo	5,000g	
	1-12	Titanine clear acrylic	6,000g	
	1-13	Clear Valspar	1,000g	
Tank Farm 2	2-1	Reclaimed oil	2,000g	
	2-2	Ordnance oil	1,500g	
	2-3	Quench oil	2,000g	
	2-4	Cutting oil	8,000g	
	2-5	Lubricating oil	6,000g	

tank has been removed from the aboveground tank area. Additional aboveground tanks, including a new diked TCE storage tank and tanks for methanol and liquid nitrogen, are now present in this area.

Soil-gas analysis and soil borings were the investigative techniques used to evaluate the Tank Farm Zone for the presence of VOCs and petroleum hydrocarbons (TPH).

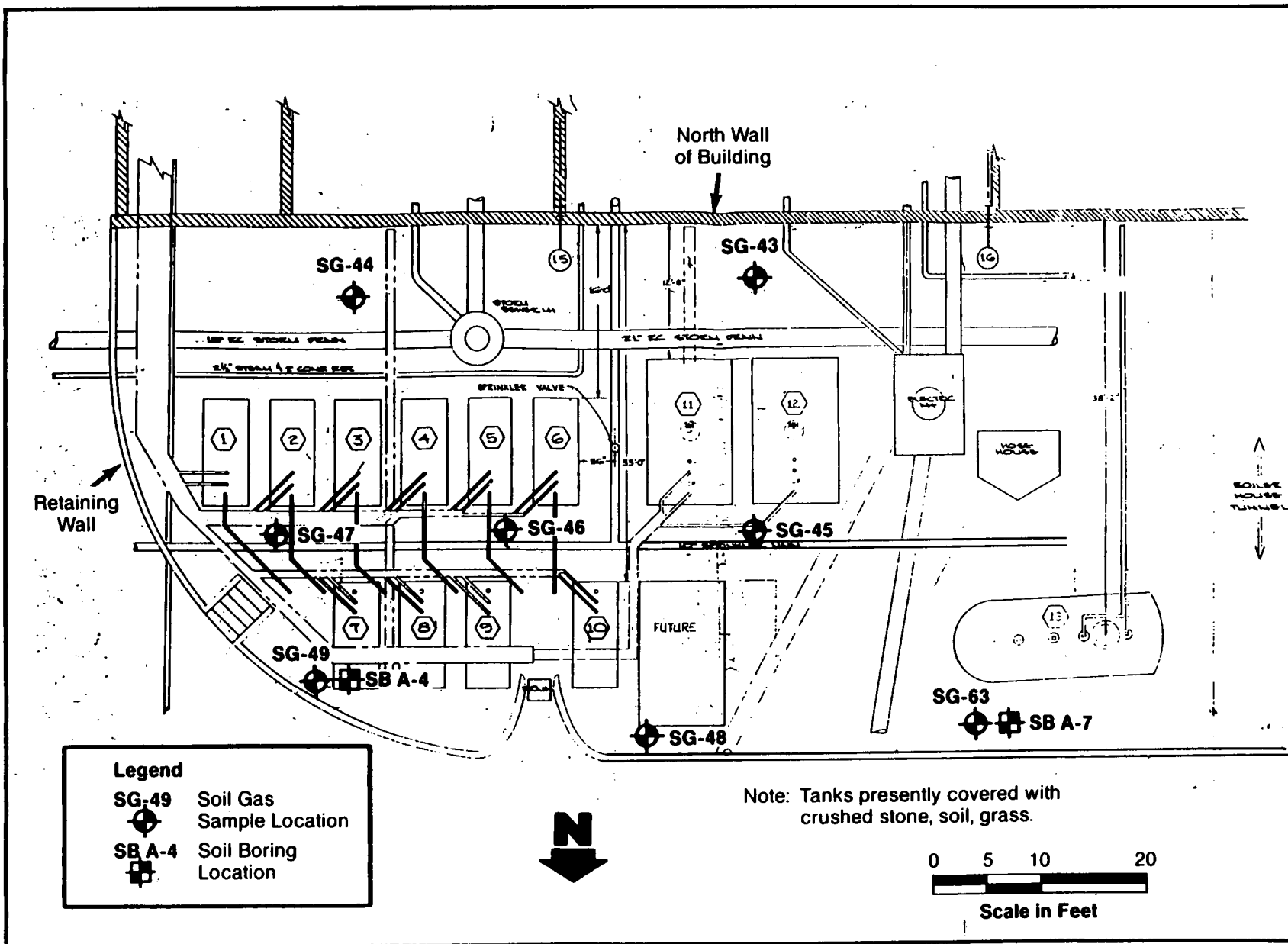
#### Soil-Gas Analysis

In Zone A, 19 soil-gas samples were collected and analyzed on-site for trichlorethene (TCE) and tetrachloroethene (PCE) using the procedure described in Appendix B. Figure 3-2 depicts the locations of the eight sampling points in Tank Farm 1; Figure 3-3 depicts the locations of the three sampling points in Tank Farm 2; Figure 3-4 depicts the locations of the eight sampling points in the aboveground tank storage area. Sample locations were concentrated around distribution pipes and the underground and aboveground tanks identified on the Black & Decker site plans.

#### Soil Borings

Soil borings were performed in five locations in Zone A. These locations were selected on the basis of the soil-gas results (see Subsection 3.1.2). The locations of the borings for the three tank farm areas are shown in Figures 3-2 through 3-4. Each boring was advanced with a truck-mounted hollow-stem auger drill rig. Auger refusal was encountered at 10 feet in boring SB-A-2. The other borings were completed to a depth of 16 feet. As the borings were advanced, the boreholes were screened with a Century organic vapor analyzer (OVA) for indications of VOCs.

Continuous samples of soils were taken with a split spoon using Standard Penetration Test techniques (ASTM D-1586). Visual descriptions of the soil, including color, texture, and moisture content, were made during sampling. Soil from each 2-foot interval was collected with a stainless steel trowel and contained in two 250-ml laboratory-cleaned jars. Aluminum foil was placed over the mouth of the jar designated for TPH analysis and the jar lid was fitted over the foil. At the conclusion of the boring, within 5 hours of sample collection, the headspace of the jar designated for TPH analysis was screened by inserting the OVA probe through the foil after the jar lid had been removed. The screening was conducted at room temperature, between 75° and 80°F. The sample with the highest OVA reading was submitted for petroleum hydrocarbon analysis. The companion sample from that interval was submitted for VOC analysis. Two sample intervals were analyzed from SB-A-9 since both intervals had comparably high OVA readings. A duplicate



**FIGURE 3-2 LOCATION OF PHASE I SAMPLING POINTS, TANK FARM 1, BLACK & DECKER, HAMPSTEAD, MD**



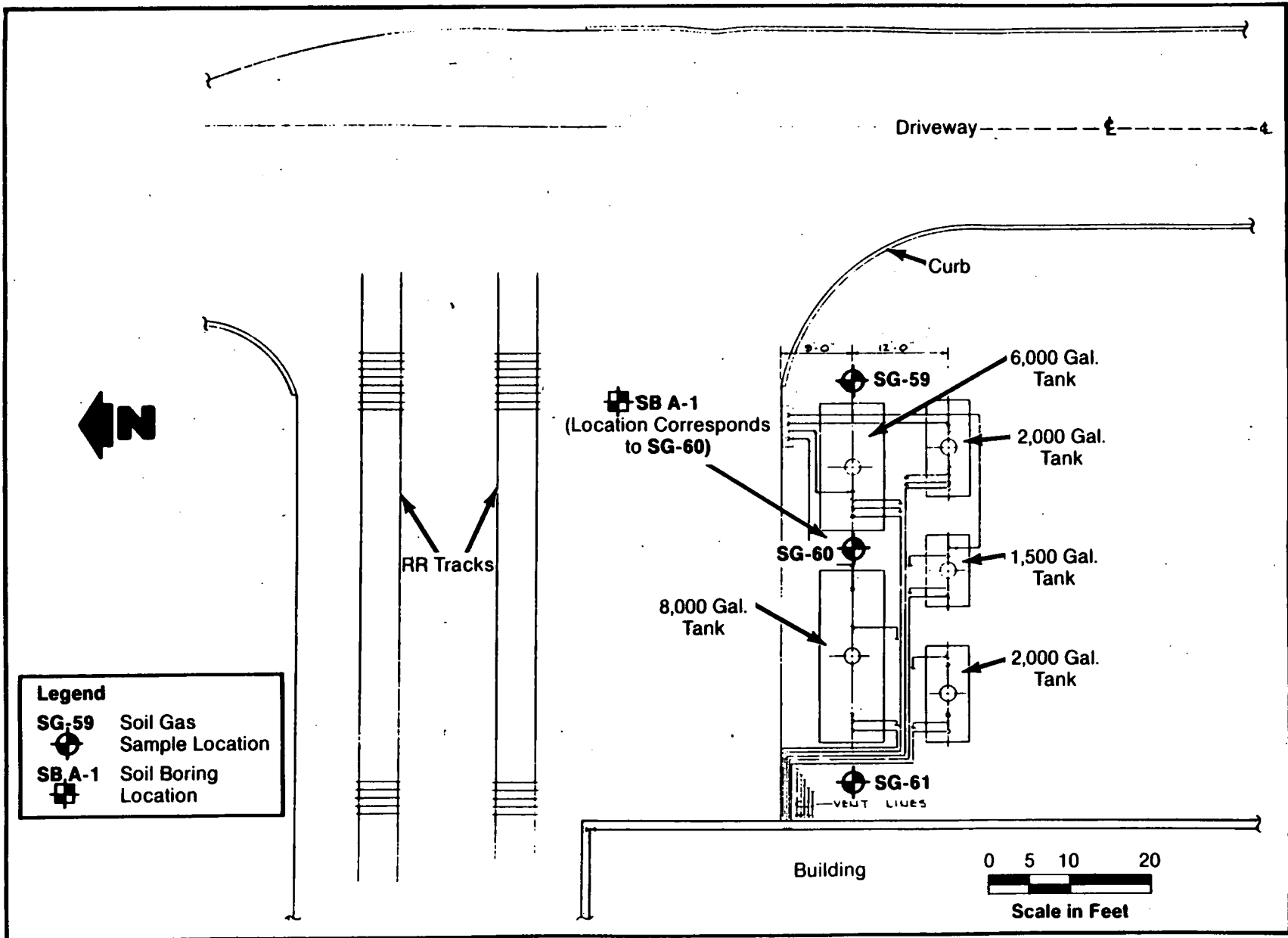


FIGURE 3-3 LOCATION OF PHASE I SAMPLING POINTS, TANK FARM 2, BLACK & DECKER, HAMPSTEAD, MD

3-7

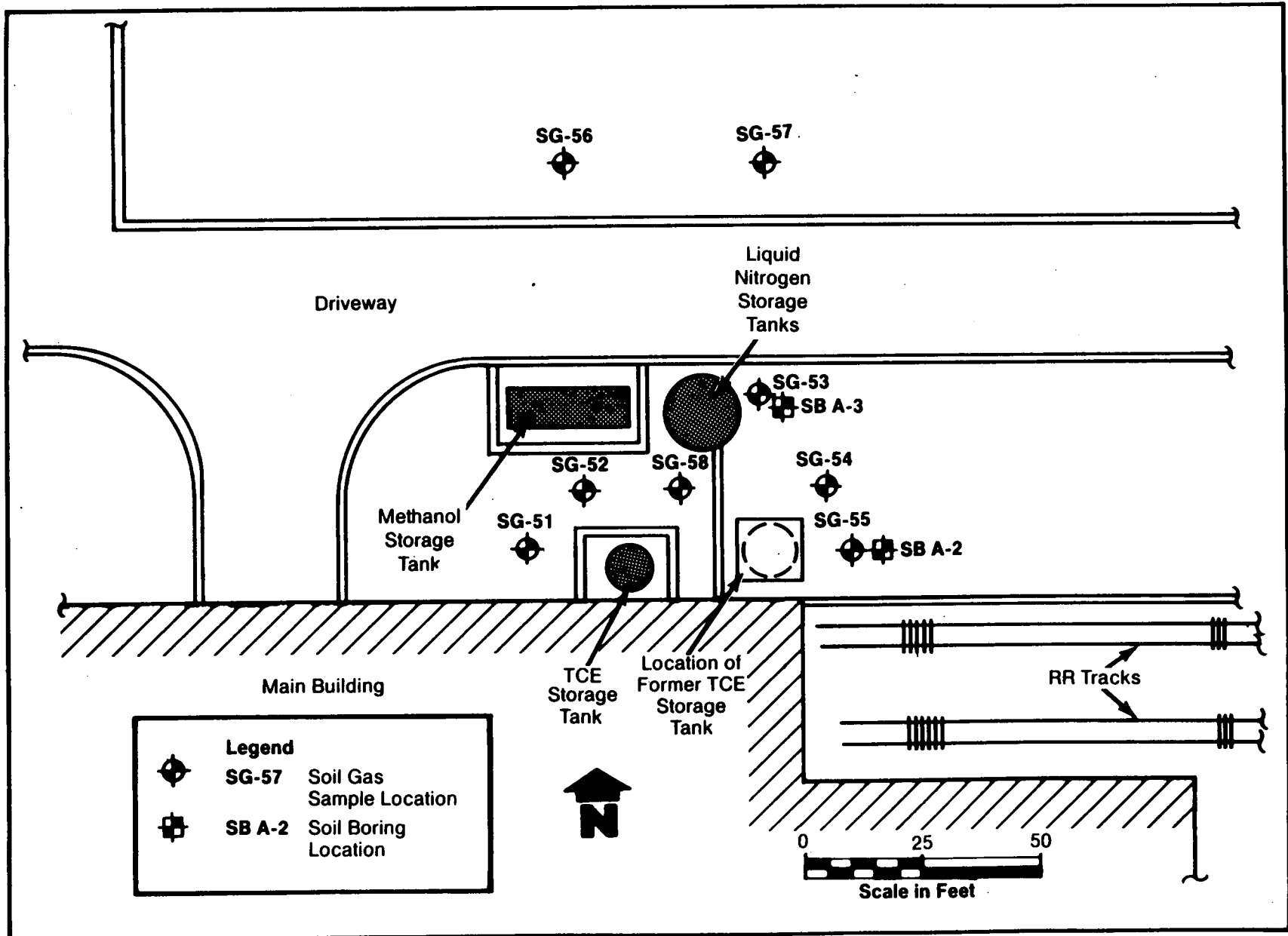


FIGURE 3-4 LOCATION OF PHASE I SAMPLING POINTS, ABOVE GROUND TANK STORAGE TANK AREA, BLACK & DECKER, HAMPSTEAD, MD

sample was collected at SB-A-4 for VOC analysis. A field blank was collected of HPLC water, which had been poured over a decontaminated split spoon in the field. The field blank was submitted for TPH and VOC analysis.

Sample spoons and trowels were cleaned with Alconox and water, with a potable water rinse followed by a deionized water rinse, after each sampled interval. The back of the rig, augers, and spoons were steam cleaned between borings.

Latex gloves were worn for sampling and changed between sample intervals. At the conclusion of drilling, these shallow boreholes were backfilled with cuttings.

### 3.1.2 Analytical Results

#### Soil-Gas

The results of the soil-gas analysis for TCE and PCE are presented in Table 3-2 and Figures 3-5, 3-6, and 3-7. The detection limits for TCE and PCE were 0.06 pptr and 0.08 pptr, respectively. J values represent quantities that were noted as present but at concentrations below the quantification limit.

In general, both PCE and TCE were detected at very low levels in the soil-gas. PCE was typically found at levels less than 1.0 pptr. Concentrations at this level and lower were insignificant, especially since both TCE and PCE were detected in one air blank (11-21-87) at approximately 0.5 pptr. Relative to the rest of the samples, higher concentrations (several hundred parts per trillion) of TCE were detected in samples SG-60, SG-55, and SG-53 from Tank Farm 2 and the aboveground storage tank area. The locations of soil borings SB-A-1, SB-A-2, and SB-A-3 completed in Zone A correspond to these three soil-gas sampling locations.

#### Soil Borings

Soils sampled in the tank zones were generally described as brown silty loam to silt to clayey silt. Quartzite fragments were frequently found distributed through the finer-grained sediment. Fill was encountered above some of the underground tanks. Complete boring logs are included in Appendix C.

The summaries of the VOC and TPH analyses for the soils sampled in Zone A are presented in Table 3-3, and Figures 3-5, 3-6, and 3-7. The results of the VOC analysis show that significant levels of TCE and PCE were found in the soil at 6 to 8 feet in SB-A-1, 2.4 ppm and 380 ppm, respectively; lesser concentrations of other volatiles were also detected in this sample. Significant levels of PCE, ethyl benzene, and total xylenes were found in the soil at 4 to 6 feet in SB-A-4. In addition, 4-methyl-2-pentanone was detected at 110 ppb in the 12- to 14-foot interval of SB-A-4. Several volatile organics were noted

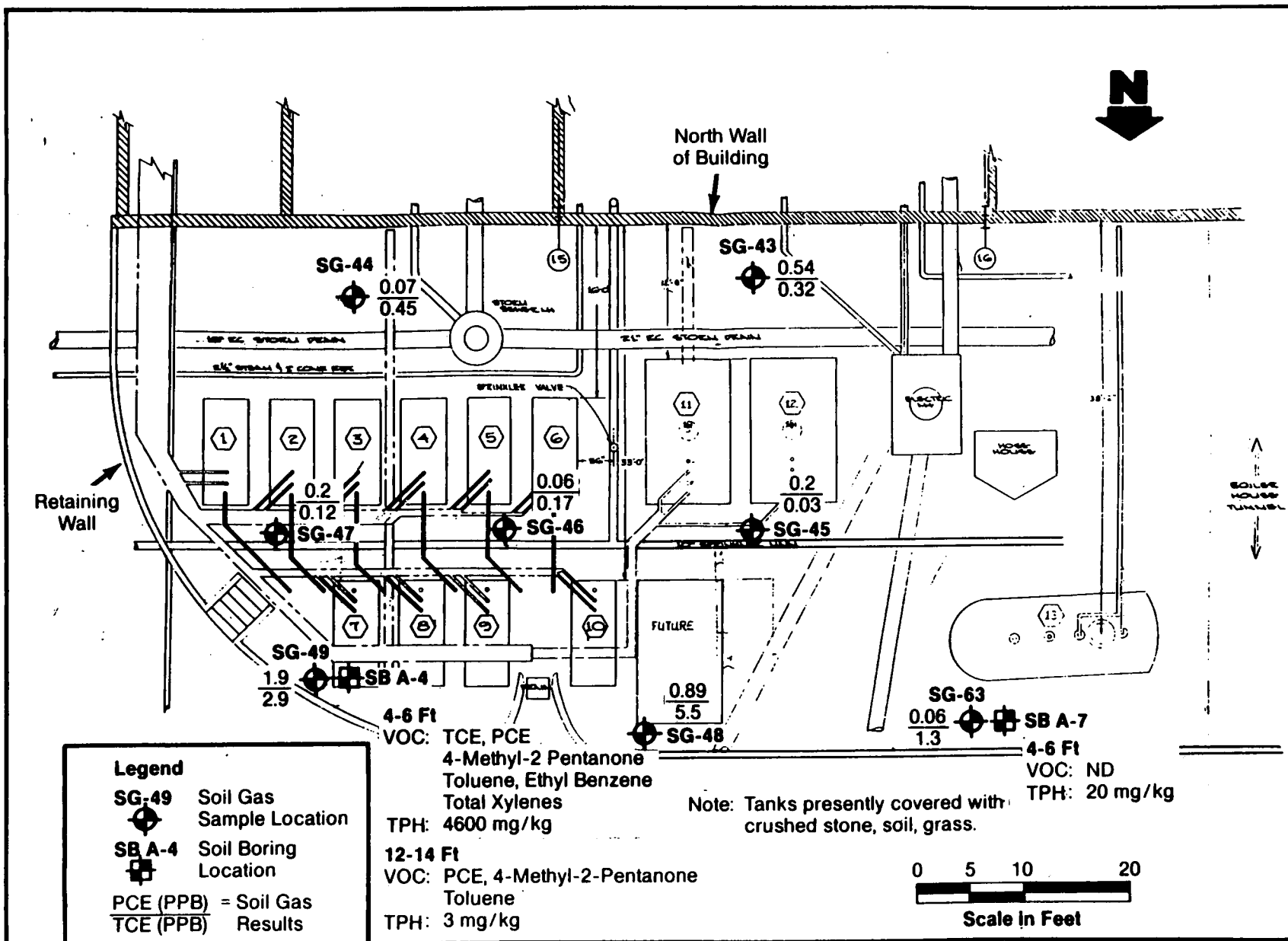
Table 3-2

## Results of Soil Gas Analysis: Zone A

Sample ID	Bulb #	Run #, Inj. Port.	TCE (ng/mL)	PCE (ng/mL)
43	6	88B	0.32	0.54
44	5	91B	0.45	0.07J
45	1	92B	0.03J	0.20
46	4	65A	0.17	0.06J
47	6	66A	0.12	0.20
48	3	93B, 94B	5.5	0.89
49	2	68A, 69A	2.9	1.9
50	5	67A	0.27	0.03J
51	2	49A, 50A	8.4	ND
52	4	48A	8.2	ND
53	5	28A, 52B	150	0.12
54	3	20A, 23A	5.5	0.02J
55	2	24A	240	1.4
56	5	51A	3.6	ND
57	2	30A, 54B	12	0.01J
58	4	29A, 57B	10	0.48
59	6	79B, 80B	16	22
60	3	54A	120	42
61	1	77B, 78B	1.0	9.5
62	1	100B	0.17	0.05J
63	1	96B	1.3	0.06J
60 Repl. (11-21)	2		125	45
60 Repl. (11-22)	5		89	44
Air Blank (11-20)		53A 76B	0.03J 0.03J	0.14 ND
Inside Air Blank (11-21)		73A 87B	ND 0.50	ND 0.58
Air Blank (11-22)		93A 127B	0.05 0.08	0.01J 0.02J
Bulb Blank	6		ND	0.01J

J - Detected at concentration below detection limits  
 ND - Not detected

3-10



**FIGURE 3-5 RESULTS, TANK FARM 1 SOIL GAS AND SOIL SAMPLE ANALYSIS  
 BLACK & DECKER, HAMPSTEAD, MD**

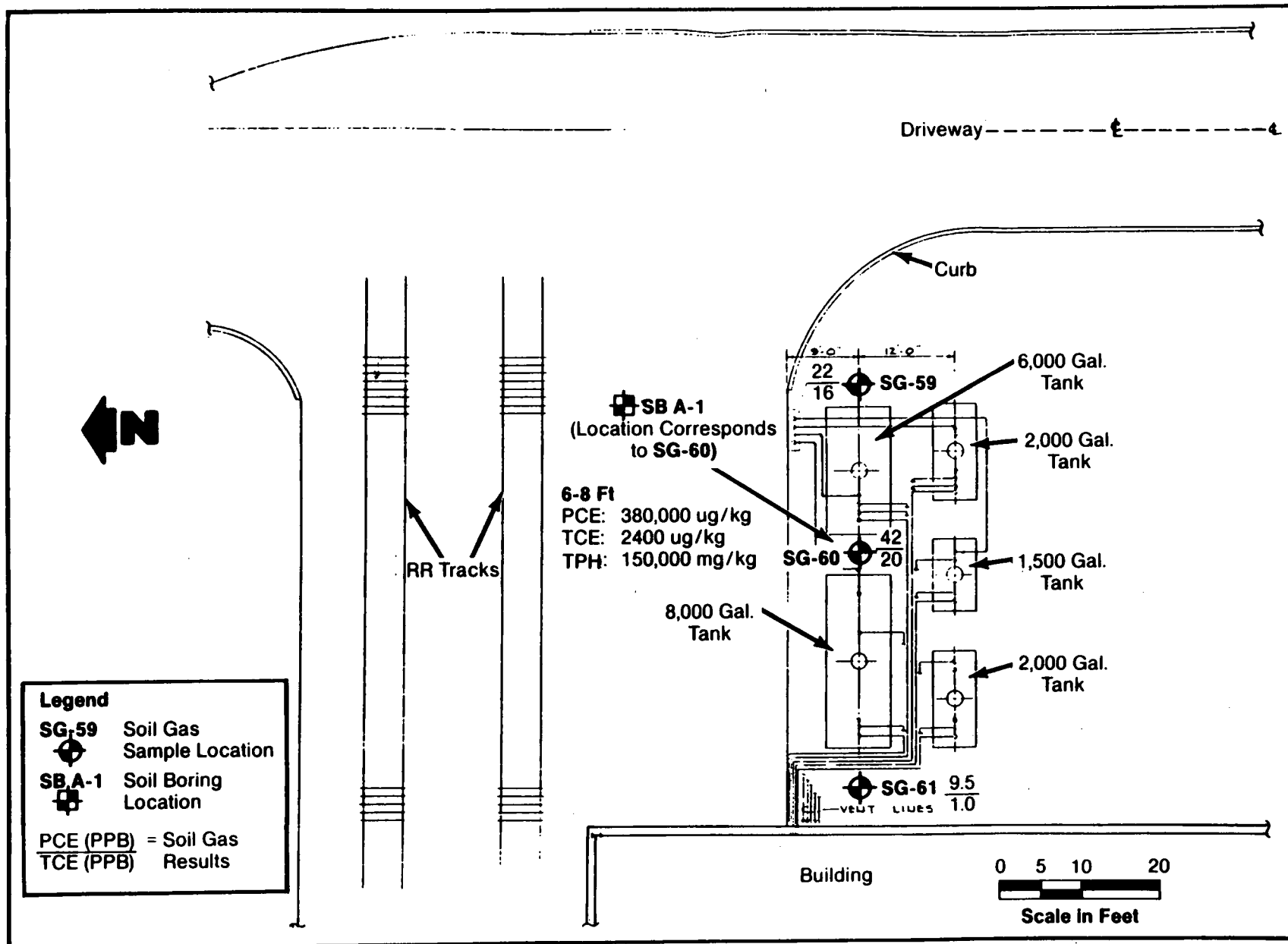
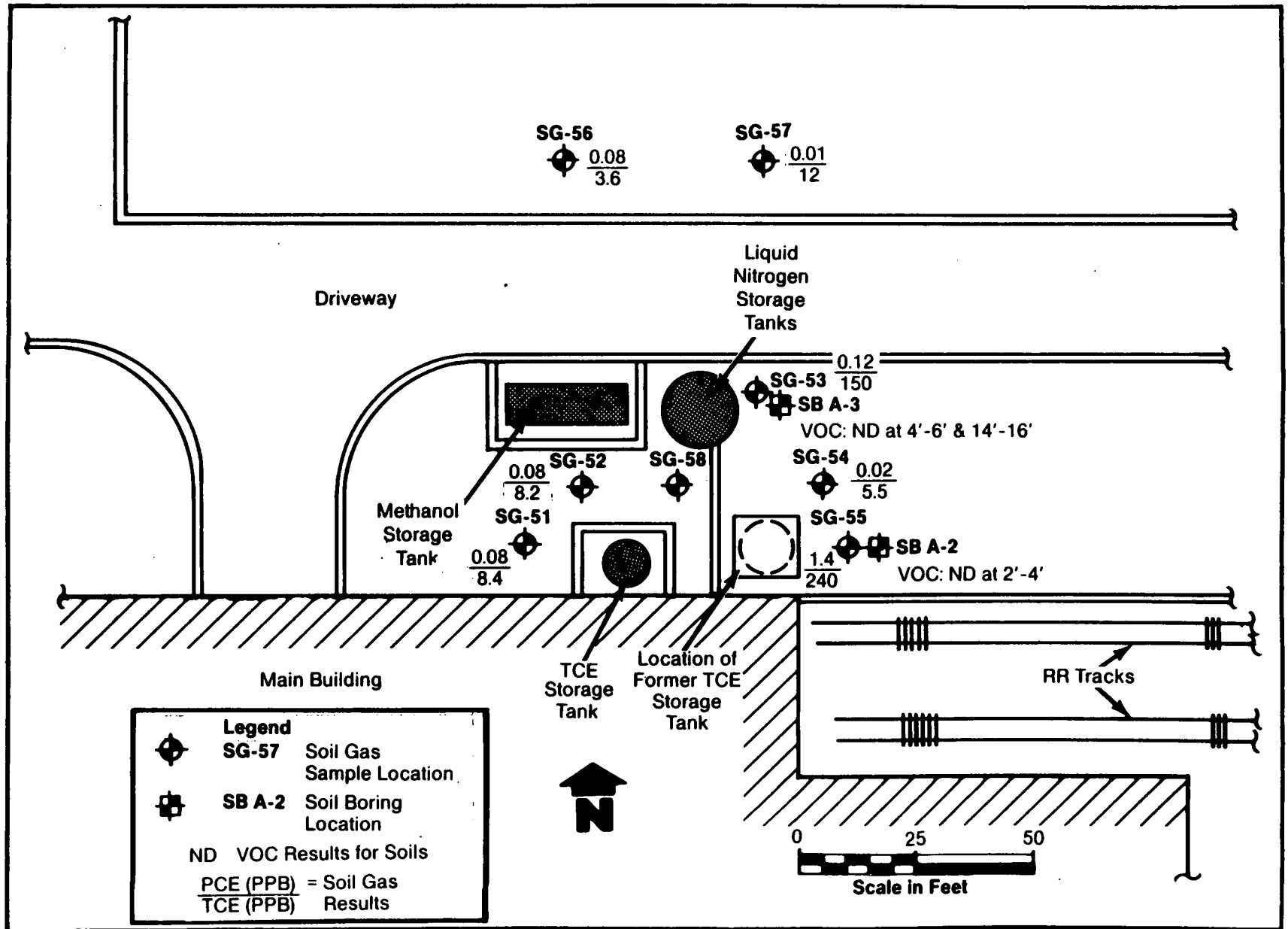


FIGURE 3-6 RESULTS, TANK FARM 2 SOIL GAS AND SOIL SAMPLE ANALYSIS  
 BLACK & DECKER, HAMPSTEAD, MD



**FIGURE 3-7 RESULTS, ABOVE GROUND TANK STORAGE AREA, SOIL GAS AND SOIL SAMPLE ANALYSIS, BLACK & DECKER, HAMPSTEAD, MD**

Table 3-3

Zone A: Soil Analysis

Results of TPH Analysis

Sample Number	Sample Depth (ft)	TPH Concentration
SB-A1	6-8	150000 mg/kg
SB-A2	2-4	3 mg/kg
SB-A3	14-16	2 mg/kg
SB-A4	4-6	4600 mg/kg
SB-A4	12-14	3 mg/kg
SB-A7	4-6	20 mg/kg
Field Blank		0.2u mg/l

u - not detected

Results of VOC Analysis

Detected Compound	SB-A1 ug/kg	SB-A2 ug/kg	SB-A3 ug/kg	SB-A4 ug/kg	SB-A4 ug/kg	SB-A7 ug/kg	FIELD BLANK ug/l	TRIP BLANK ug/l
Methylene Chloride	130 B	26 B	21 B	120 B	39 B	20 B	6 B	6 B
Acetone	190 B	15 B	17 B	200 B	410 B	26 B	2 B	2 JB
1,1-Dichloroethene	8 J							
Trans-1,2-Dichloroethene	13 J							
Chloroform				2 J			6	5
2-Butanone	26 JB		6 JB	29 JB	12 JB	11 JB		
Carbon Tetrachloride	39 J							
Trichloroethene	2400			9 J				
1,1,2-Trichloroethane	220							
4-Methyl-2-pentanone				55 J	110			
Tetrachloroethene	380000			850	2 J	4 J		
Toluene	88 B	2 JB	2 JB	46 B	2 JB	2 JB		
Ethylbenzene				510				
Total Xylenes				1600				
Sample Depth (ft)	6-8	2-4	14-16	4-6	12-14	4-6		

B - Detected in laboratory blanks

J - Detected at concentration below detection limits



as present in the soil but below laboratory quantification limits in SB-A-2, SB-A-3, and SB-A-7. Concentrations of methylene chloride, acetone, chloroform, toluene, and 2-butanone found in the samples were low and not considered significant since these compounds were also detected in laboratory blanks.

The results of the TPH analysis show that 150,000 ppm and 4,600 ppm of petroleum hydrocarbons were detected in soil samples from SB-A-1 and SB-A-4, respectively. Low concentrations were detected in SB-A-2, SB-A-3, and SB-A-7.

These results indicated that the aboveground tank area in Zone A is not currently a source of groundwater contaminants. However, underground Tank Farms 1 and 2 appeared to contain localized "hot spots" of both TPH and VOCs. VOCs were only present at significant levels in samples that contained very high petroleum hydrocarbon levels. This may be due to a partitioning phenomenon where the VOCs appeared to be preferentially residing in the oil phase rather than the aqueous or gas phase. The hydrocarbons were retained in the soil pores by surface tension forces and high viscosity. This scenario could have accounted for the historical migration of any VOCs not associated with high TPH and retention of VOCs in soils characterized by TPH/VOC hot spots.

In general, the Zone A results indicated that further characterization of the soils in Tank Farms 1 and 2 in Phase II was warranted.

### **3.2 ZONE B - FILL SITE NEAR SEEP AREA**

#### **3.2.1 Field Activity**

This area in the western portion of the property was identified as a potential site of plant refuse disposal early in the plant's history. Zone B is located in a low-lying area adjacent to groundwater seeps. Groundwater data collected by others reportedly suggested that the area may be the source of PCE and TCE identified in nearby production well 7. However, previous testing did not indicate contamination in the groundwater seeps. Fill areas within Zone B had been previously identified by geophysical surveys, but had not been evaluated further for the presence of wastes or soils containing organic chemical constituents.

For the WESTON Phase I investigation, test pits were excavated in the previously identified fill areas to visually characterize the material and sample for VOC and EP toxicity metals analysis. At the request of the Maryland Department of the Environment (MDE), water samples were collected from six existing monitor wells and analyzed for VOCs in order to determine the effect pumping of well 7 had on PCE and TCE concentrations in the local groundwater.

### Backhoe Test Excavations

Eight trenches were excavated with a backhoe around the fill areas in locations shown in Figure 3-8. Test pits TPB-1, TPB-1B, TPB-3, and TPB-5 were excavated within suspected boundaries of the fill material. TPB-4 and TPB-6 were located hydraulically upgradient of the boundaries, and TPB-2 and TPB-7 were located hydraulically downgradient of the boundaries. Excavations were made to the base of the fill, or to a depth where groundwater was encountered if no fill was present. Visual descriptions of the soils and any encountered fill were made at each excavation. Monitoring of the soils sampled by the backhoe bucket was conducted using a HNu Model 101 portable gas analyzer with a 10.2-eV probe.

Four samples of test pit soils were collected and analyzed for VOCs and EP toxicity metals. Elevated HNu readings recorded in TPB-2 and TPB-4 determined the sampling interval in those test pits. Samples were taken from the base of the fill in TPB-3 and TPB-5 because no elevated readings occurred. A duplicate sample from TPB-3 and a field blank were submitted for VOC analysis.

Samples were collected from the backhoe bucket with stainless steel trowels. The field blank consisted of HPLC water, which had been poured in the decontaminated backhoe bucket. The bucket and rear of the backhoe were steam-cleaned between excavations. Test pits were carefully backfilled at the completion of sampling.

### Groundwater Sampling

Groundwater samples were collected from the six monitor wells selected by MDE in Zone B, as shown in Figure 3-8. Prior to sampling with a Teflon bailer, the wells were purged of three well volumes using a Johnson Keck pump Model SP-81. The conductivity, temperature, and pH of the purge water were monitored during sampling using a YSI conductivity meter and an analytical pH meter Model 107. All samples, including a duplicate sample from monitor well P-3, a field blank, and a trip blank, were analyzed for VOCs. The field blank consisted of HPLC water, which had been poured into a decontaminated bailer in the field.

The bailers and pump were scrubbed with an Alconox and water solution, rinsed with potable water, and then rinsed with de-ionized water before each well was sampled. A fresh pair of latex gloves was worn during sampling at each well.

The elevations of the top of the outer steel casing of the 26 existing on-site monitor wells and the finished floor elevations of the production well houses were surveyed with respect to the finished floor elevation of the main building by a Maryland licensed surveyor to within  $\pm 1$  foot of horizontal distance

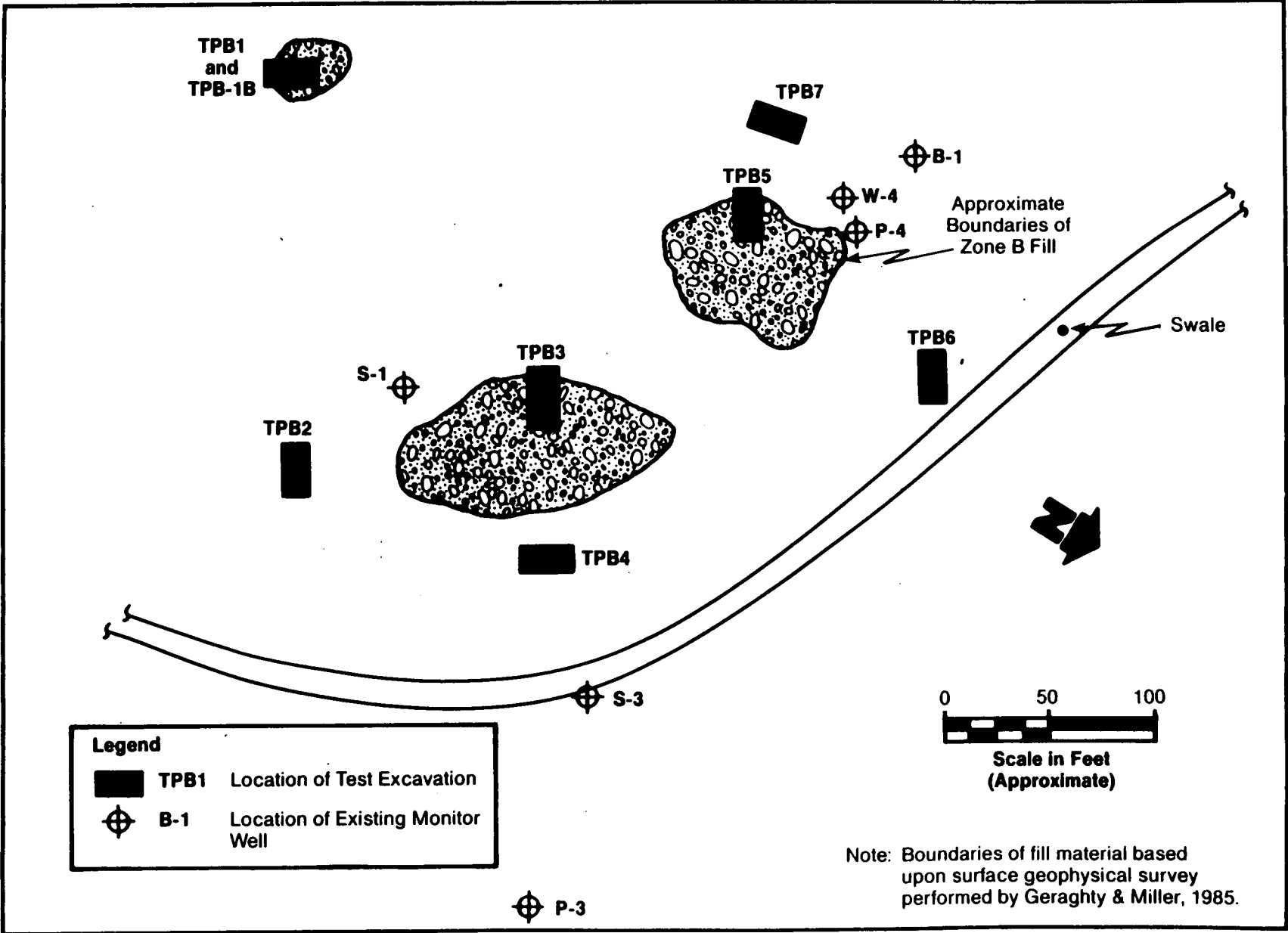


FIGURE 3-8 LOCATIONS OF ZONE B TEST PITS AND MONITOR WELLS, BLACK & DECKER, HAMPSTEAD, MD

and  $\pm 0.01$  foot of elevation. The elevations of the innermost casings of all monitor wells were determined by subtracting the thickness of the locking cap and distance between the top of the inner and outer casings from the surveyed elevation (Table 3-4).

### 3.2.2 Analytical Results

#### Soil Samples from Test Pits

The soil uncovered in excavation of pits in Zone B were typically a yellowish brown to red brown to brown, silty loam, silt, or silty clay. Fill, consisting of burnt wood, bricks, and scrap metal was found from 5 to 8 feet in TPB-3. Similar fill was found from 1 to 5 feet in TPB-5. Field HNu readings several units above background were noted only at 10.5 feet in TPB-2 and at 2.5 feet in TPB-4. Complete descriptions of each test pit are included in Appendix C.

The results of the VOC analyses (Table 3-5) indicate that no concentrations of volatiles above quantification limits were found in any of the test pit soil samples, except for low levels of constituents, which were also found in the laboratory blanks.

The results of the EP toxicity metals scan showed that selenium was detected at 116 ppb in the leachate from sample TPB4-1. This concentration is well below the hazardous waste standard established by the Code of Maryland (COMAR) 10.51. The maximum concentration allowable for selenium under COMAR 10.51 is 1.0 ppm. No other metals were detected in extracts from this sample or other samples from the Zone B test pits.

The results for Zone B indicated that the fill areas are not a current source of groundwater contamination. It was determined that no further source characterization was warranted in Zone B.

#### Groundwater Samples

VOC analyses for the groundwater sampled from six of the monitor wells in Zone B are included in Table 3-5. These results were consistent with previous results. Samples from all six wells in this area showed PCE concentrations in excess of 100 ppb. PCE concentrations in monitor wells B-1 and W-4 exceeded 1 ppm. Lesser concentrations, the majority below detection limits, of TCE, 1,1,2-TCA, and trans-1,2-DCE were found in individual samples. Low levels of methylene chloride, acetone, toluene, and 1,1,1-TCA were also found in these samples, but these compounds were detected in field and laboratory blanks and the results are not considered significant.

Table 3-4

Zone B: Well Elevation Survey

Well No.	Elevation TOC (ft above MSL)	Distance between TOC and TIC (ft)	Elevation TIC (ft above MSL)
B1	815.57	0.02	815.55
B2	807.70	0.02	807.68
B3	803.04	0.02	803.02
T1	816.75	0.02	816.73
S1	813.90	0.19	813.71
S2	814.22	1.02	813.20
S3	822.42	0.30	822.12
S4	802.37	0.24	802.13
S5	804.02	1.05	802.97
S6	833.61	0.60	833.01
P1	813.72	0.19	813.53
P3	823.75	0.14	823.61
P4	816.56	0.11	816.45
P5	817.16	0.20	816.96
P6	812.90	0.18	812.72
P8	812.48	0.41	812.07
W1	813.90	0.18	813.72
W3	820.13	0.38	819.75
W4	815.24	0.18	815.06
W5	815.61	0.21	815.40
W6	820.55	0.15	820.40

TOC - top of outermost casing  
TIC - top of innermost casing  
MSL - mean sea level

Table 3-5

## Zone B: Soil and Groundwater VOC Analysis

## Results of VOC Analysis: Soil Samples

Compound Detected	TPB2-1 ug/kg	TPB3-1 ug/kg	TPB4-1 ug/kg	TPB5-1 ug/kg	Field Blank ug/l	Trip Blank ug/l
Methylene Chloride	16 B	22 B	27 B	28 B	4 JB	4 JB
Acetone	12 B	7 JB	4 JB	5 JB	4 JB	5 JB
2-Butanone	8 JB				3 JB	24 JB
Toluene	3 JB	6 JB	3 JB	15 B	2 JB	3 JB
Carbon Disulfide				2 J		
Chloroform					7	7

## Results of VOC Analysis: Groundwater Samples

Compound Detected	S-1 ug/l	S-3 ug/l	P-3 ug/l	P-3 DUP ug/l	P-4 ug/l	W-4 ug/l	B-1 ug/l	TB ug/l	FB ug/l
Methylene Chloride	3 JB	6 B	7 JB	5 JB	83 B	3 JB	89 B	3 JB	6 B
Acetone			2 JB	2 JB	59 JB		70 JB	1 JB	2 JB
1,1,1-Trichloroethane		1 JB		1 JB					
Trans-1,2-Dichloroethene	4 J	27	13	12		7			6
Chloroform								5	
2-Butanone								18	
Trichloroethene	2 J	8	5 J	5		16	38 J		
Tetrachloroethene	140	280	130	140	650	1600	1700		
1,1,2-Trichloroethane						8			
Toluene	1 JB		1 JB	1 JB	12 JB	1 JB	10 JB	2 JB	

B - Detected in laboratory blanks

J - Detected at concentration below detection limits

### **3.3 ZONE C - POTENTIAL HEAT TREATING RESIDUES DISPOSAL AREA**

#### **3.3.1 Field Activity**

Zone C consists of two areas where material may have been deposited from heat-treating furnaces that previously operated at the facility. The northern area, closest to the plant building, could have received residues from the furnaces. The southern area, near the ponds, could have received furnace fragments, brick, and other debris from the furnaces. The presence of residues or debris and chemical constituents that could be associated with them was not previously investigated. Test pit excavations and sediment sampling were used to investigate this zone for possible soil contamination. The parameters tested included VOCs, based on the constituents present in the groundwater, and EP toxicity metals and cyanide, based on constituents typically associated with heat treatment.

#### **Backhoe Test Excavations**

Four test excavations (two per area) were completed and sampled following the procedures defined for excavations in Zone B (Subsection 3.2.1). The locations of the excavations are shown in Figure 3-9. Visual descriptions were made of the soils and fill. Samples were collected from the base of the fill in TPC-1, TPC-2, and TPC-3. No fill was uncovered in TPC-4, and therefore, the sample and duplicate were taken at the base of the excavation. The five samples and field blanks were analyzed for cyanide and EP toxicity metals. A trip blank was submitted for VOC analysis.

#### **Sediment Sampling**

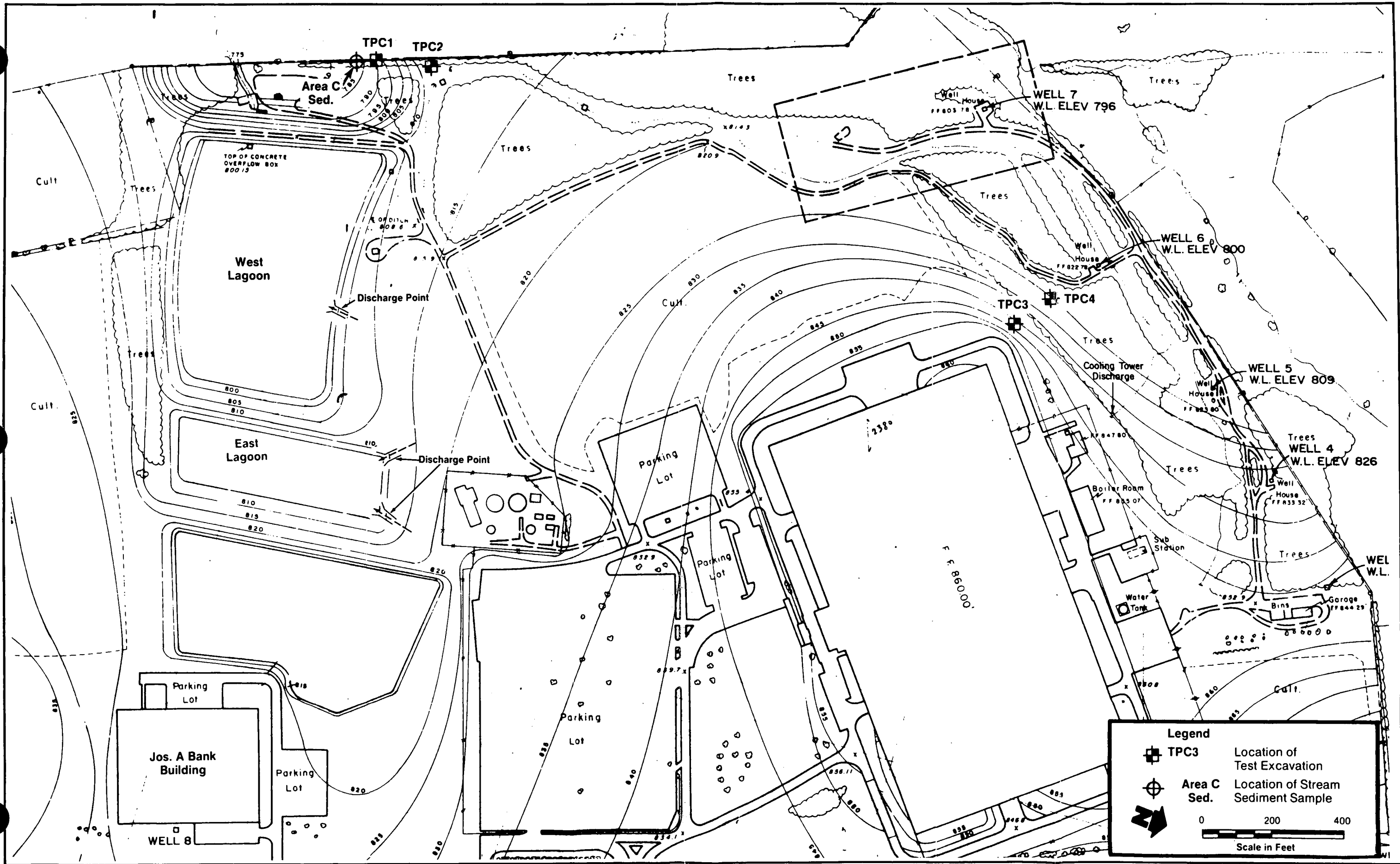
One stream sediment sample was collected with a stainless steel trowel from a location downgradient of TPC-1, as shown in Figure 3-9. The sample was analyzed for VOCs, EP toxicity metals, and cyanide.

#### **3.3.2 Analytical Results**

##### **Soil Samples from Test Pits**

Soils encountered in test pits were generally described as reddish-brown to yellowish-brown, and grading from clay to silt to sandy loam. Fill and debris, including concrete, metal pipe and scraps, fabric, sheet plastic, and a tree stump, were uncovered in TPC-1 and TPC-2 from 1 to 4.25 feet and 1 to 11 feet, respectively. A layer of white material was encountered at the surface in TPC-3. No fill was found in TPC-4. Complete test excavation logs are included in Appendix C.

The EP toxicity metals results indicated that only selenium at 121 ppb was detected in the extract from the TPC-1 sample.



**FIGURE 3-9 LOCATIONS OF ZONE C TEST PITS AND SEDIMENT SAMPLE, BLACK & DECKER, HAMPSTEAD, MD**



This concentration is below the hazardous waste level established in COMAR 10.51. No EP toxicity metals were detected in the other samples. In addition, the cyanide results indicated that cyanide was not present in any of the test pit soil samples.

The results for Zone C indicated that the fill areas are not a current source of groundwater contamination. It was determined that no further source characterization was warranted in Zone C.

#### Sediment Sampling

The VOC analysis for the stream sediment sample is presented in Table 3-6. PCE was detected in the sample at 14 ppb; TCE was present at a concentration just below the quantification limit. Low levels of methylene chloride, acetone, and toluene were also detected in these samples, but as these compounds were also detected in laboratory blanks, the results are not considered significant.

The results of the cyanide and EP toxicity metals analyses for the sediment sample were negative.

These results indicated that the stream sediment does not represent a significant repository of groundwater contaminants.

### 3.4 ZONE D - POTENTIAL PRODUCT DISPOSAL AREA

#### 3.4.1 Field Activity

This area was identified by Black & Decker as a potential site of buried off-specification products. The boundaries of the fill area, and the potential presence of chemical constituents were not previously investigated. A geophysical survey was conducted to define the boundaries of buried debris. Test excavations were completed in areas defined by the survey, and the soils were sampled for VOC and EP toxicity metals analysis.

#### Geophysical Survey

One of the objectives of the geophysical investigation was to locate the debris burial sites in Zone D. Site reconnaissance revealed that the trenches were probably oriented north-south, based on soil surface depressions. Visual estimates of the length of the trenches could not be made, but the width of the trenches was estimated to be approximately 5 feet (two backhoe bucket widths).

A detailed discussion of the field procedures and data reduction procedures of the geophysical investigation is included in Appendix D.

Table 3-6

Results of VOC Analysis: Zone C Sediment

Compound Detected	Area C sed ug/kg	Field Blank ug/l	Trip Blank ug/l
Methylene Chloride	21 B	4 JB	4 JB
Acetone	5 JB	4 JB	5 JB
Chloroform			7
Trichloroethene	7 J		
Tetrachloroethene	14		
Toluene	3 JB	7 B	3 JB
2-Butanone		3 J	24

B - Detected in laboratory blanks

J - Detected at concentration below detection limits

### Magnetics

The proton precession magnetometer was used to identify areas containing relatively large concentrations of buried ferrous metal. Interpreted sources of the ferrous metals were the trench contents in Zone D. Figure 3-10 presents the area of magnetic coverage for the geophysical survey at the Black & Decker facility.

The magnetic survey was designed based on the suspected orientations and dimensions of the trenches in Zone D. The magnetic survey was divided into two parts.

The first part was designed to locate the east-west boundaries (the short axis) of the trenches located in the northern portion of the site. Magnetic measurements were taken at 10-foot intervals along four east-west-oriented lines spaced 20 feet apart. The second part of the survey was designed to locate the north-south boundaries (the long axis) of the trenches in Zone D. Magnetic measurements were taken at 20-foot intervals along north-south-oriented lines spaced 20 feet apart.

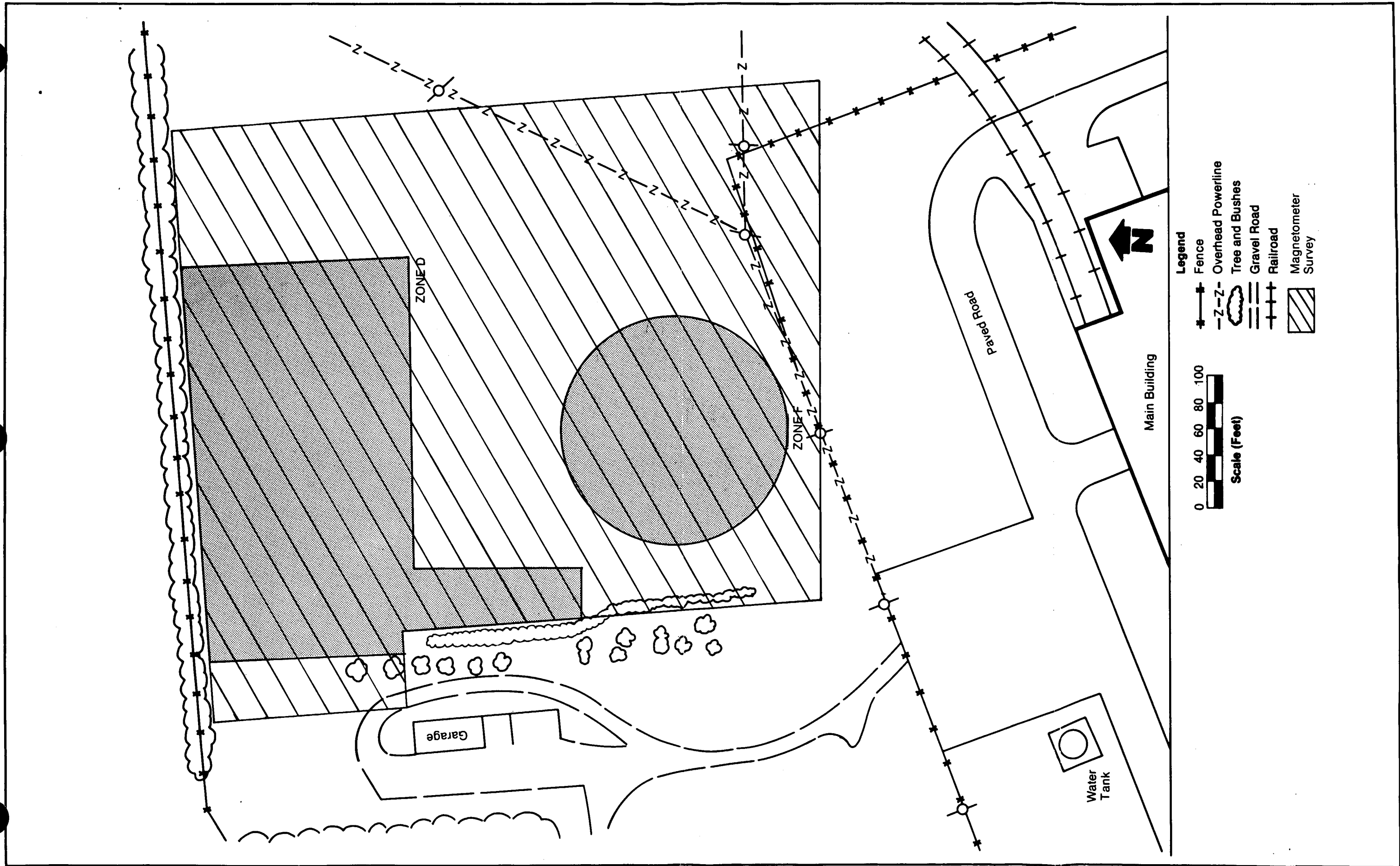
### Electromagnetics

The EM-31D terrain conductivity meter was used to identify areas having anomalous electrical conductivities. Metal debris associated with burial activities could be possible sources of anomalous conductivities. Figure 3-11 shows the electromagnetic coverage for the geophysical survey conducted at the Black & Decker facility.

The electromagnetic survey was designed based on the results of the magnetic survey. The EM survey encompassed both Zone D and Zone F. It was found that areas of increasing magnetic intensities were clustered in the northwest and southwest portions of the surveyed area. Therefore, the electromagnetic survey focused on the central and western portions of the area defined by the 20-foot magnetic survey grid. Electromagnetic measurements were taken at 20-foot intervals along north-south-oriented lines spaced 20 feet apart.

### Backhoe Test Excavations

After interpretation of the geophysical survey data, the locations of test excavations were selected in suspected fill areas. Four trenches were excavated at Zone D in the locations depicted in Figure 3-12. The procedures for completing and sampling the excavations were the same as defined for Zone B (Subsection 3.2.1). Visual descriptions were made of the soils and fill in all pits. Soil samples from TPD-1 and TPD-4 were collected from within the fill area, since it was not possible to trench below the fill. Soil samples from TPD-2 and



**FIGURE 3-10 ZONE D & F, MAGNETOMETER SURVEY, BLACK & DECKER, HAMPSTEAD, MD**

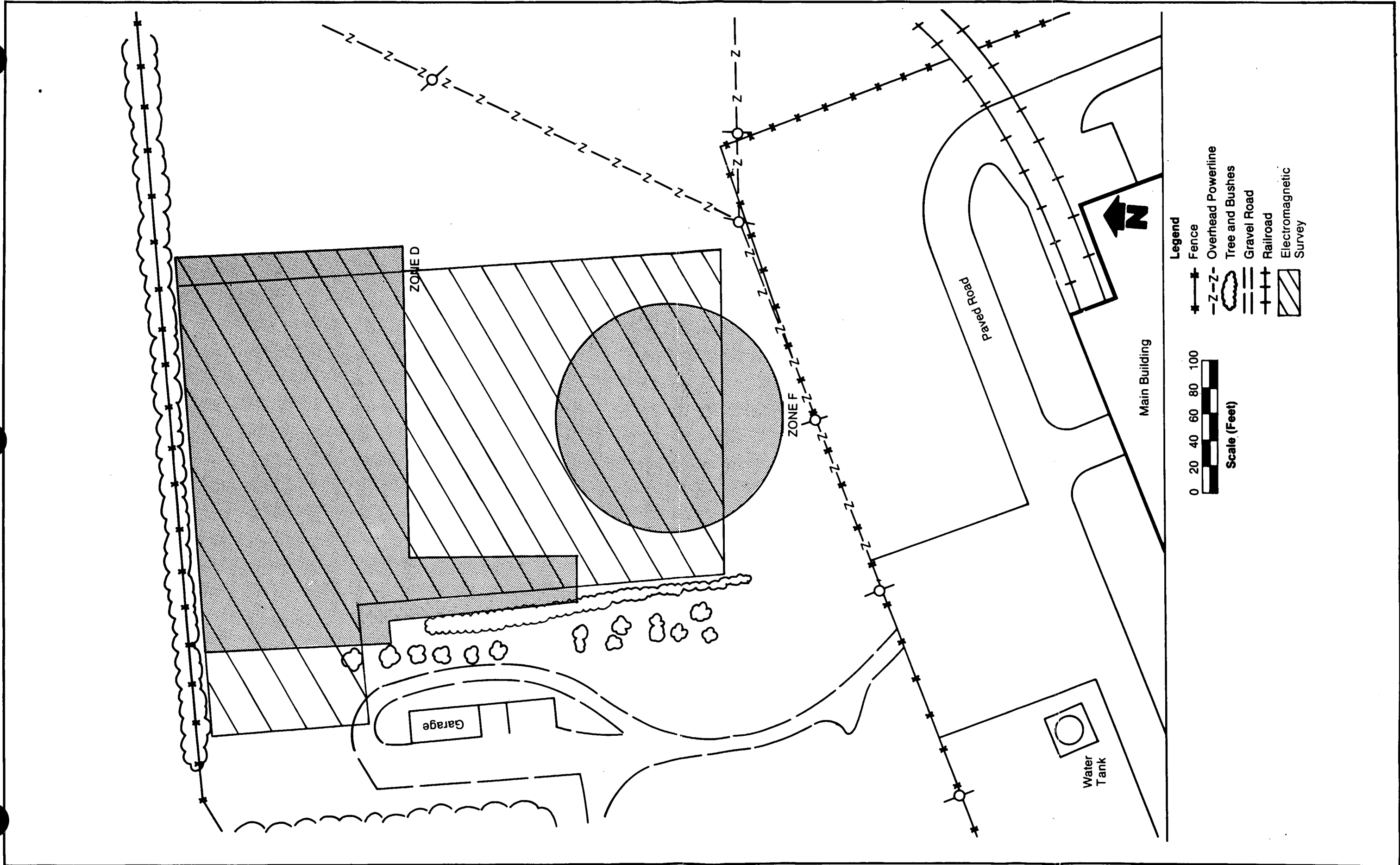


FIGURE 3-11 ZONE D & F, ELECTROMAGNETIC SURVEY, BLACK & DECKER, HAMPSTEAD, MD

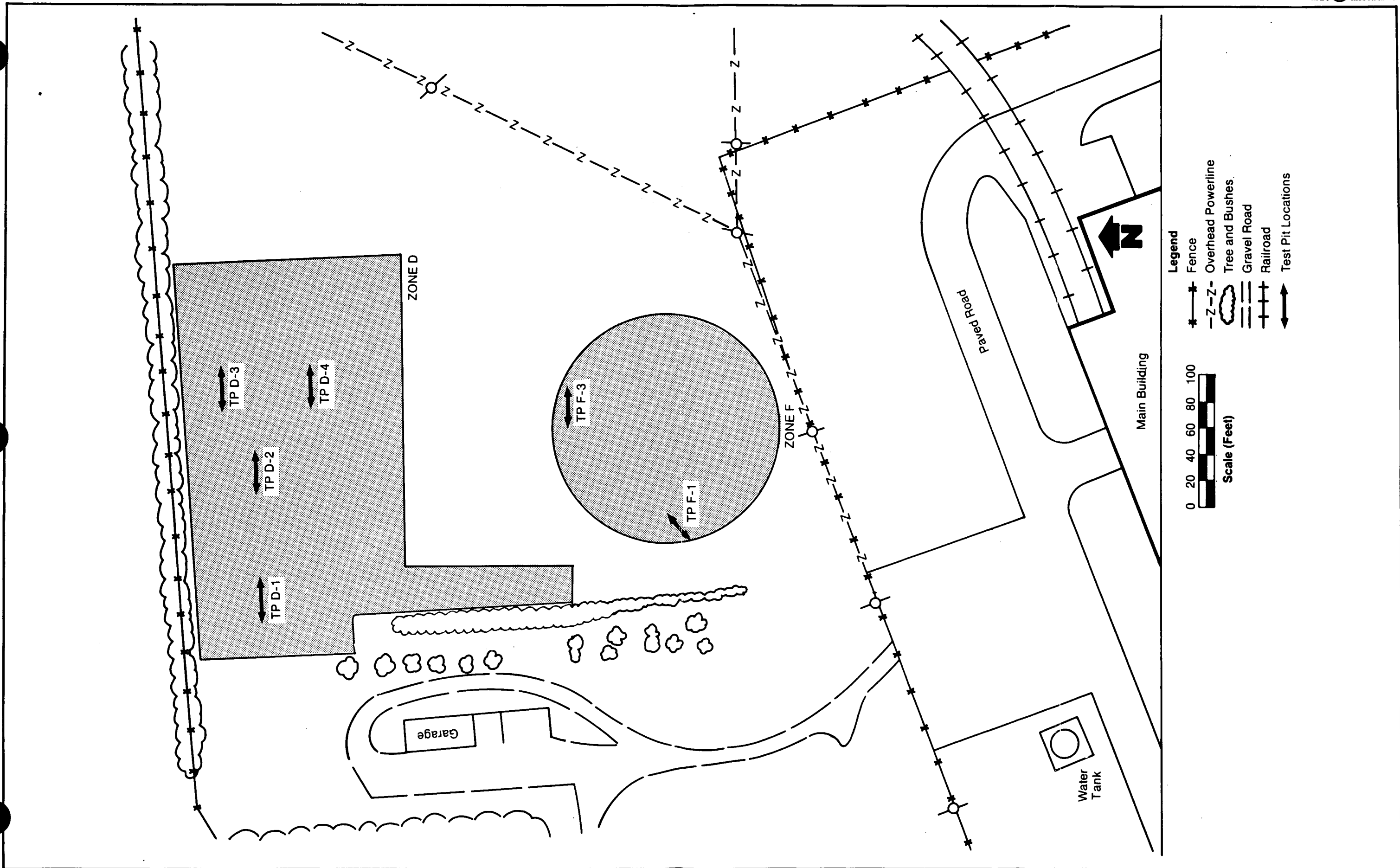


FIGURE 3-12 ZONE D & F, TEST PIT LOCATIONS, BLACK & DECKER, HAMPSTEAD, MD

TPD-3 were collected at the base of the fill. A duplicate sample was collected at TPD-3. Based on the presence of buried off-specification tool products, all samples were analyzed for EP toxicity metals. Although HNu readings were low, samples from TPD-2 and TPD-3 and a trip blank were also analyzed for VOCs to check for the presence of the organic constituents found in the groundwater.

### 3.4.2 Analytical Results

#### Geophysical Survey

##### Magnetics

The full set of data recorded for the magnetic survey is presented in Appendix D. The results of the magnetic survey interpretation are presented in Figure 3-13.

Integration of the east-west magnetic survey and the north-south magnetic survey resulted in the definition of seven magnetic anomalies in Zone D, as identified in Figure 3-13. The criteria used to identify the anomalies are reviewed in Appendix D.

The location of these anomalies was used to select the five test pit locations in Zone D.

##### Electromagnetics

The electromagnetic (EM-31) survey data are presented in Appendix D. The results of the EM-31 survey interpretation are presented in Figure 3-14.

Three electromagnetic anomalies were identified using the in-phase component of the electromagnetic field (see Appendix D). Generally, the locations of the in-phase anomalies were in agreement with the magnetometer anomalies. Two of the magnetic anomalies were not confirmed by the electromagnetic survey. This is probably because the source of the magnetic anomaly was not a relatively strong conductor.

##### Soils Samples from Test Pits

Soils encountered in Zone D test pits were described as yellow-brown to red-brown silt to silt loam. Fill and debris were encountered in all four excavations. This included scrap metal, wood, plastic, construction debris, and power tool parts. The test excavation logs are included in Appendix C.

The VOC analysis for the soil samples from TPD-2 and TPD-3 showed only the presence of toluene in levels below the quantification limits, 1 ppb and 2 ppb, respectively (Table 3-7)

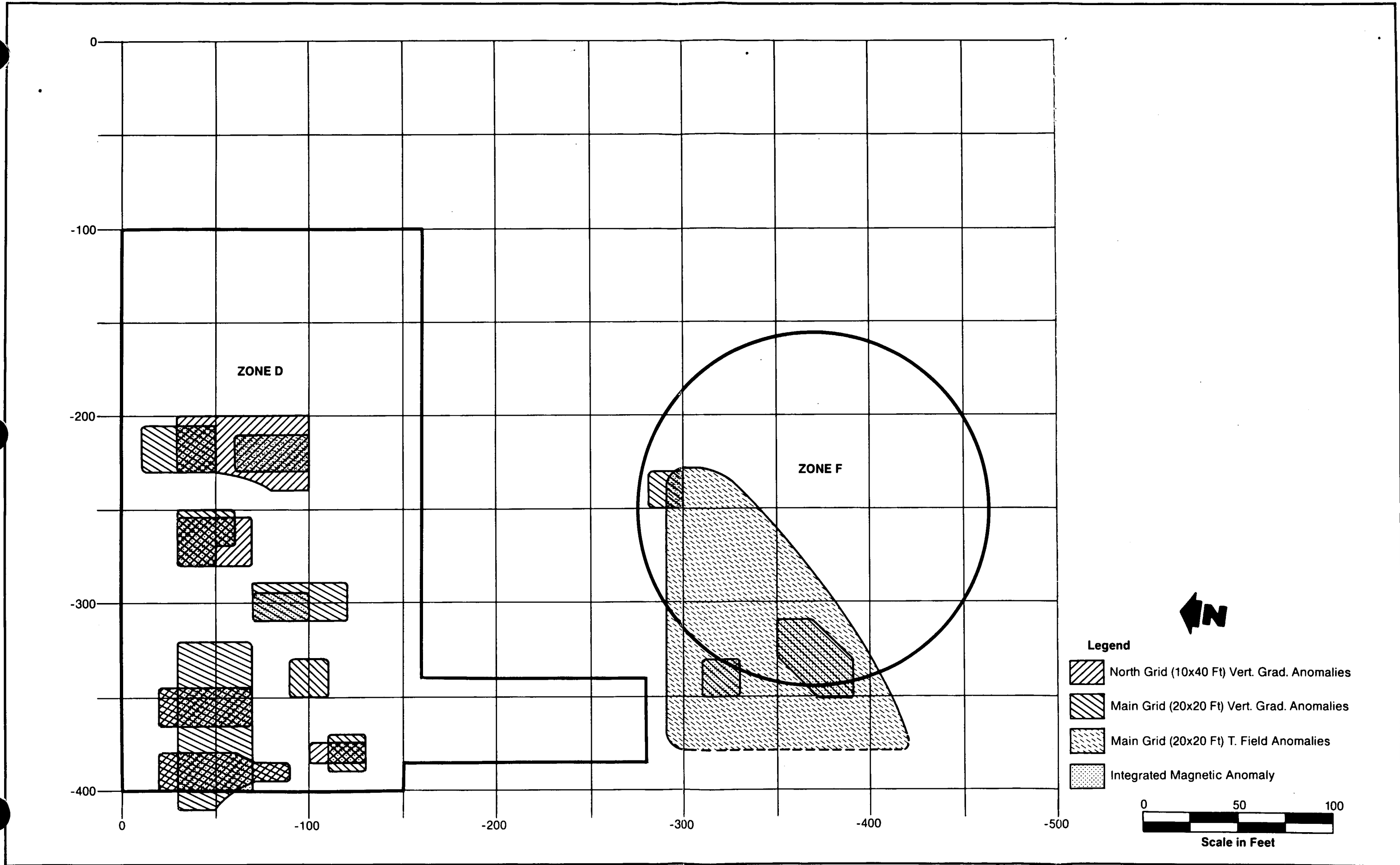
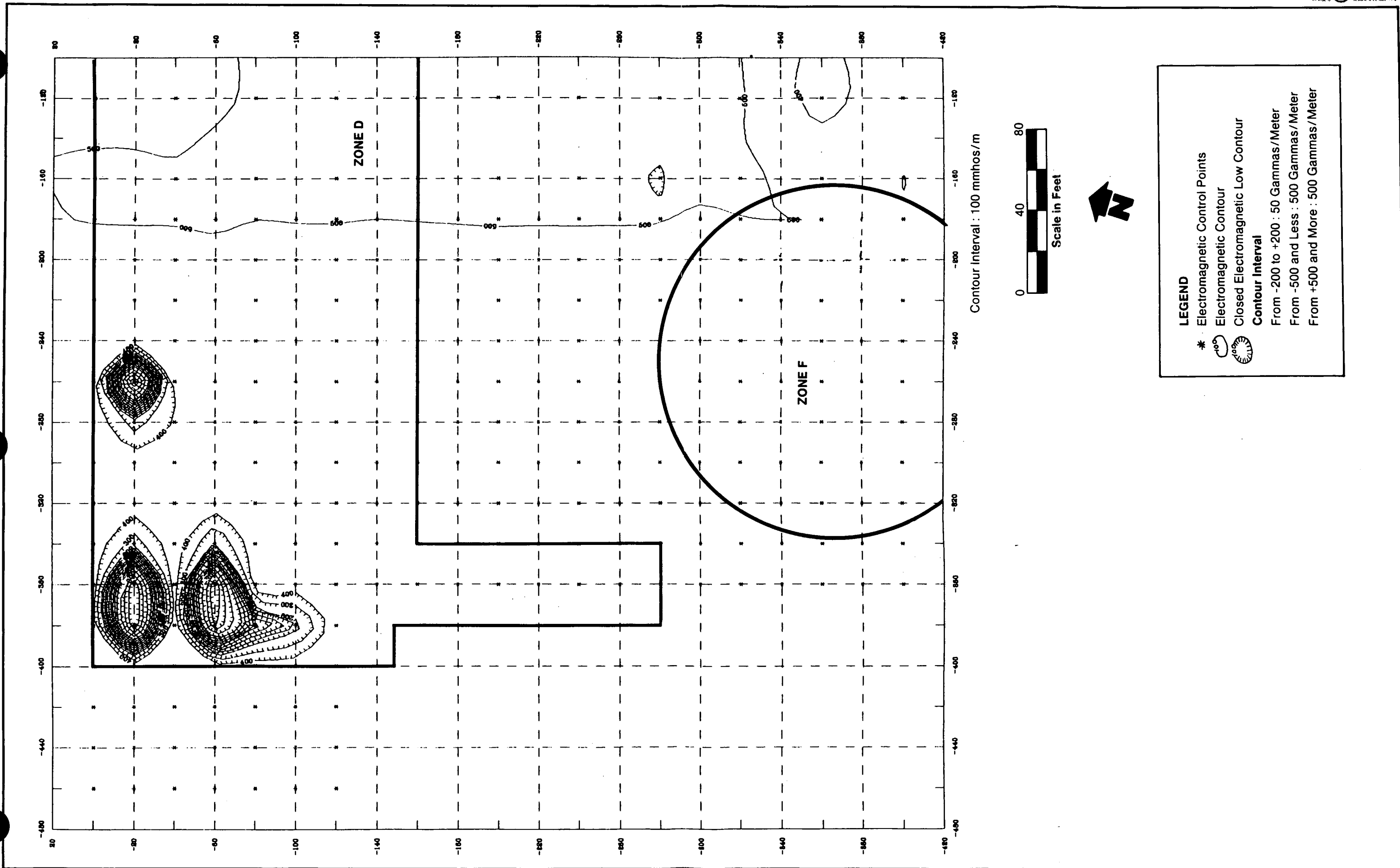


FIGURE 3-13 ZONE D & F, MAGNETIC ANOMALY MAP, BLACK & DECKER, HAMPSTEAD, MD





**FIGURE 3-14 ZONE D & F, ELECTROMAGNETIC ANOMALY MAP, BLACK & DECKER, HAMPSTEAD, MD**

Table 3-7

Results of VOC Analysis: Zone D Soil Samples

Compound Detected	TPD2-1 ug/kg	TPD3-1 ug/kg	Field Blank ug/l	Trip Blank ug/l
Methylene Chloride	13 B	22 B	4 JB	4 JB
Acetone	2 JB	7 JB	4 JB	5 JB
Toluene	1 JB	2 JB	2 JB	3 JB
Chloroform			7	7

B - Detected in laboratory blanks

J - Detected at concentration below detection limits

Methylene chloride and acetone were detected at low levels in the samples, but were also found in the laboratory blanks.

The EP toxicity metals results indicated that in the soil sample for TPD-3, selenium was detected at 264 ppb, a concentration below COMAR 10.51 standards. No other metals were detected in leachate from this or the three other Zone D soil samples.

These results generally indicated that the Zone D off-specification product burial area does not currently represent a repository of groundwater contaminants.

### **3.5 ZONE E - SITE NEAR CORNER OF BUILDINGS 5 AND 6**

#### **3.5.1 Field Activity**

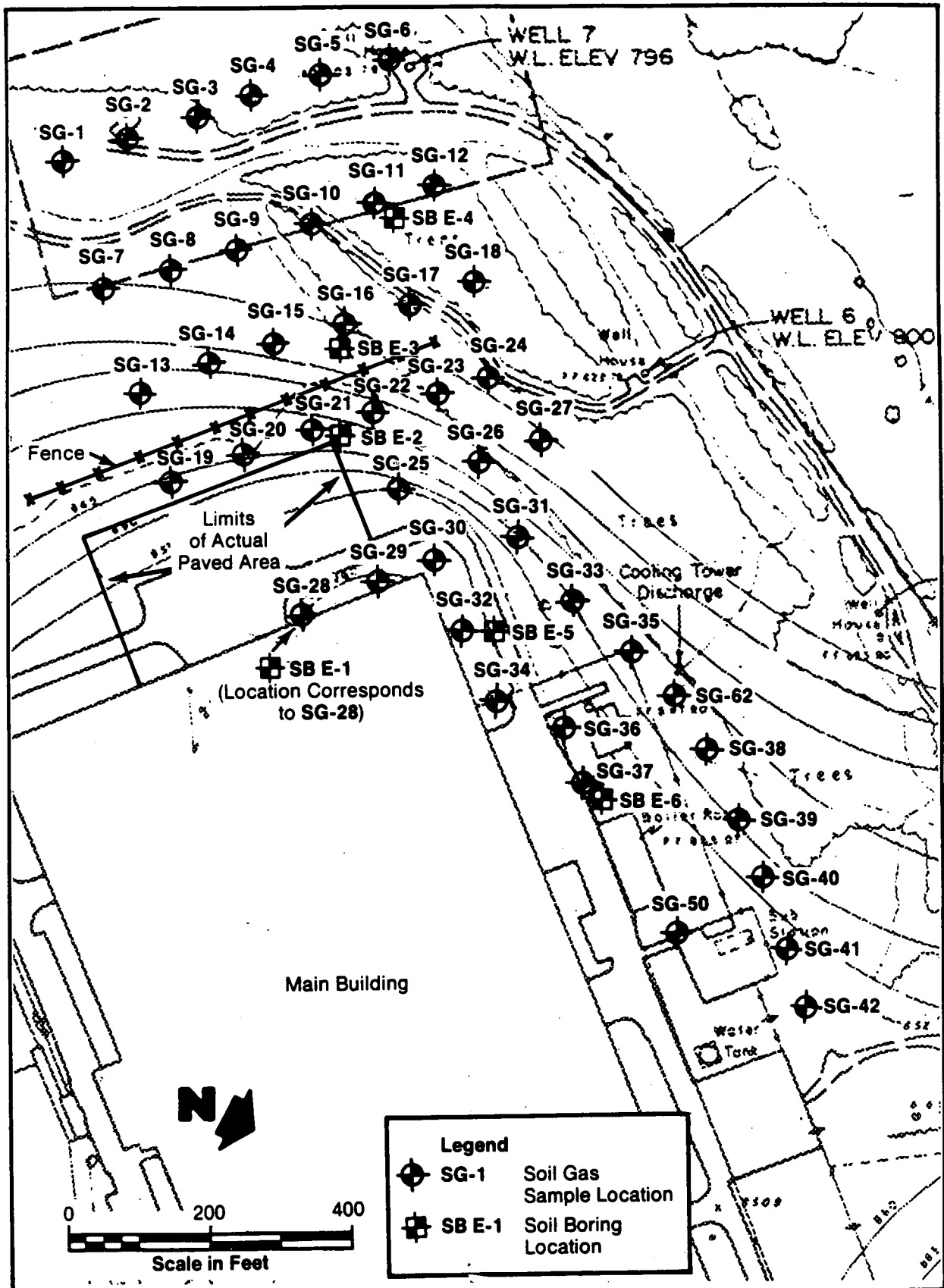
This area was filled and regraded prior to the Building 5 and 6 expansion of the main plant and again prior to construction of a small storage building to the southwest of Building 5/6. It was believed that this area could potentially have been used to deposit heat-treating residues. The zone was investigated to assess the potential for buried fill and constituents found in the groundwater. Soil-gas analysis and soil borings were the investigative techniques used to evaluate this zone.

#### **Soil-Gas Analysis**

In Zone E, 44 soil-gas samples were collected and analyzed for TCE and PCE using the procedure described in Appendix B. Figure 3-15 depicts the location of the sampling points; the sampling area was extended south and west of Zone E at the request of MDE, to allow for the evaluation of potential migration of VOCs toward well 7 and Zone B.

#### **Soil Borings**

Soil borings were performed in seven locations distributed throughout the Zone E area. Since the soil-gas analysis, in general, indicated that the concentration of volatiles in the soil was low, the locations were selected in an effort to evaluate the soils in Zone E for possible contamination with cyanide. The boring locations are shown in Figure 3-15. The procedures for drilling the borings and sampling were the same as those outlined for Zone A (Subsection 3.1.1). Borings were drilled and sampled to a depth of 16 feet, with the exception of SB-E-6, which was drilled to a depth of 10 feet. Visual descriptions were made of each sampled interval. One sample from each boring, selected by headspace screening with the OVA, was submitted for VOC and cyanide analyses. Field blanks were collected and analyzed for VOCs and cyanide. A trip blank was submitted for VOC analysis.



**FIGURE 3-15 LOCATION OF PHASE I SAMPLING POINTS, ZONE E, BLACK & DECKER, HAMPSTEAD, MD**

### 3.5.2 Analytical Results

#### Soil-Gas Analysis

The results of the broad soil-gas sampling and analysis program for TCE and PCE off the east corner of the main building are presented in Table 3-8. In general, both TCE and PCE were detected at low levels in the soil-gas, typically below 1 pptr. Two "relatively" high PCE concentrations of 13 pptr and 160 pptr were detected in SG-21 and SG-24, respectively. Soil boring SB-E-2 was placed at the SG-21 location, and a Phase II monitor well was proposed for the SG-24 location.

#### Soil Borings

Similar to Zone A soils, the soils in the six soil borings at Zone E were described as yellowish-brown to reddish-brown silt loam to silt. Occasional clayey layers and quartzose fragments were also encountered. Boring lithologic logs are included in Appendix C.

The soil sample analysis results for VOCs were largely negative (Table 3-9). PCE was detected in only one sample at an estimated concentration of 1 ppb (below quantification limits) in SB-E-1 at the 4- to 6-foot sample interval. Other than methylene chloride, acetone, toluene, and 2-butanone, which were detected in the blanks, no other VOCs were detected in any of the samples from soil borings in Zone E. The results of the cyanide analysis were also negative.

These results generally indicated that the Zone E, Building 5/6 presumed construction fill area does not contain waste materials and does not contain significant levels of groundwater contaminants.

### 3.6 ZONE F - PAST POTENTIAL BURN AREA

#### 3.6.1 Field Activity

This area may have been used in part to disable off-specification products, plastic parts, and other materials prior to their disposal. The location of the potential burn area was not clearly defined, but was thought to coincide with a slight surface depression to the east of Zone D. A geophysical survey was conducted to define the boundaries of any potential buried fill. Test excavations were completed in areas defined by the geophysical anomalies.

#### Geophysical Survey

The objective of the geophysical investigation in Zone F was to delineate the burn area. A detailed discussion of the field procedures and data reduction procedures of the geophysical investigation is included in Appendix D.

Table 3-8

## Results of Soil Gas Analysis: Zone E

Sample ID	Bulb #	Run #, Inj. Port.	TCE (ng/mL)	PCE (ng/mL)
1	4	142B	ND	0.04J
2	6	138B	0.04J	0.57
3	1	114A	ND	0.02J
4	5	134B	0.45	0.40
5	2	135B	0.32	0.35
6	3	136B	0.08	0.04J
7	2	129B	0.40	0.09
8	3	105A, 130B	0.07	0.04J
9	5	131B	1.1	2.3
10	4	108A	0.03J	0.71
11	6	107A	0.03J	1.5
12	1	133B	0.06	0.02J
13	3	122B	0.04J	0.02J
14	2	123B	0.33	0.07J
15	5	98A, 99A, 100	1.3	1.1
16	4	104A	0.02J	1.8
17	1	124B, 125B	ND	0.07J
18	6	126B	0.02J	1.0
19	4	84A	0.06	0.03J
20	2	85A, 86A	0.42	0.16
21	6	87A	0.07	13
22	1	82A	ND	0.12
23	3	108B, 104B	0.11	0.31
24	6	107B	0.15	160
25	1	97A, 88A	0.02J	0.02J
26	5	110B	0.16	2.2
27	4	78A, 80A	0.01J	1.8
28	6	96A	0.02J	0.72
29	4	121B	0.03J	0.01J
30	3	120B	0.08	0.07J
31	5	77A	0.08	0.09
32	2	94A	0.40	0.10
33	3	76A	0.10	0.07
34	1, 6	89A	0.03J	0.14
35	2	102B	0.45	0.66
36	6	71A	0.34	0.19
37	4	70A	0.07	0.04J
38	2	72A	0.75	0.25
39	3	97B	0.15	0.09
40	5	98B	0.09	0.01J
41	6	75A	0.03J	0.07J
42	4	101B	0.03J	0.27

J - Detected at concentration below detection limits

Table 3-9

## Results of VOC Analysis: Zone E Soil Samples

Detected Compound	SB-E1 ug/kg	SB-E2 ug/kg	SB-E3 ug/kg	SB-E4 ug/kg	SB-E5 ug/kg	SB-E5 ug/kg	SB-E6 ug/kg	FIELD BLANK ug/l	TRIP BLANK ug/l
Methylene Chloride	19 B	29 B	25 B	21 B	15 B	21 B	17 B	6 B	6 B
Acetone	34 B	29 B	36 B	9 JB	25 B	46 B	23 B	2 JB	2 JB
Chloroform								6	5
2-Butanone			5 JB		5 JB	6 JB	7 JB		
Tetrachloroethene	1 J								
Toluene	2 JB	5 JB	2 JB	2 JB	2 JB	2 JB	2 JB		
Sample Depth (ft)	4-6	4-6	6-7	10-11	4-6	8-10	14-16		

B - Detected in laboratory blanks

J - Detected at concentration below detection limits

### Magnetometer

The magnetometer was used to identify areas that could have contained relatively large concentrations of buried ferrous metals, based on the possibility that ferrous metals could have been present in near-surface soils or in buried fill within the product burn area. Figure 3-10 presents the area of magnetic coverage for the geophysical survey at the Black & Decker facility.

The survey was designed to encompass a 5-acre area of investigation, which included Zone D to the north. Magnetic measurements in Zone F were taken at 20-foot intervals along north-south-oriented lines spaced 20 feet apart.

### Electromagnetics

The EM-31D terrain conductivity meter was used to identify areas having anomalous electrical conductivities. Metal debris associated with burning activities could be possible sources of anomalous conductivities. Figure 3-11 presents the electromagnetic coverage for the geophysical survey conducted at the Black & Decker facility.

The design of the electromagnetic survey was based on the magnetic survey results. The EM survey encompassed both Zone D and Zone F. The details of the EM survey grid are discussed in Subsection 3.4.1.

### Test Excavations

Two trenches were excavated in areas identified as weak anomalies by the geophysical survey, as shown in Figure 3-12. The test pits were completed and sampled in accordance with the procedures outlined for Zone B (Subsection 3.1.1). TPF-1 and TPF-3 were terminated at a depth of 8 feet and 4 feet, respectively, where a vein of quartzite was encountered. Visual descriptions of the soils were made for each pit. One sample from the base of each excavation and a field blank were collected and submitted for VOC and TPH analyses. A duplicate was collected from TPF-1 and analyzed for VOCs.

## 3.6.2 Analytical Results

### Geophysical Survey

Magnetic and electromagnetic surveys were conducted to determine if near-surface or buried metallic residues were present in this potential past off-specification product burning area.



### Magnetics

The magnetic survey identified three relatively weak anomalies in Zone F. The location of these anomalies is presented in Figure 3-13. These anomalies potentially resulted from relatively small concentrations of buried ferrous materials.

### Electromagnetics

The electromagnetic survey did not identify any areas in Zone F that had relatively high concentrations of buried conductive materials.

### Soil Samples from Test Pits

Soils encountered in the two Zone F test pits were a brown silt loam. Quartzite and other weathered rock fragments were abundant and caused refusal at 4 feet in TPF-3 and at 8 feet in TPF-1. The test excavation logs are included in Appendix C.

The results of the VOC and TPH analyses are summarized in Table 3-10. Total xylenes were detected at 6 ppb in the soil sample taken from TPF-1. Methylene chloride, acetone, and toluene were detected in laboratory blanks, as well as at low levels in both soil samples. TPH were detected at relatively low levels, less than 15 ppm, in the soils.

These results did not confirm the reported possible use of this area for burning off-specification tool products, and indicated that Zone F does not contain waste materials or significant levels of contaminants detected in on-site groundwater.

## **3.7 ZONE G - LAGOON AREAS**

### **3.7.1 Field Activity**

The East Lagoon has served as a surge-detention basin for wastewater, and the West Lagoon served as a receiving pond for treated wastewater and noncontact cooling water. Based on these uses, the potential presence of chemical constituents in the water and bottom sediment was investigated. The sediment and water samples were analyzed for VOCs, EP toxicity metals, priority pollutant metals, and nitrates.

### Sediment Sampling

Eight sediment samples were collected from the bottom of the two ponds using a Ponar dredge. The locations of the sediment samples, as shown in Figure 3-16, were selected from areas in the lagoons that would most likely contain the highest levels of chemical constituents, such as near the treated sewage and wastewater discharge points. A duplicate sample was taken at location EL-1. Visual descriptions were made of each sample as

Table 3-10

Results of Petroleum Hydrocarbon and VOC Analysis  
Zone F Soil Samples

Results of TPH Analysis

Sample Number	TPH Concentration
TPF1-1	9.0 mg/kg
TPF1-1DUP	12.0 mg/kg
TPF3-1	14.0 mg/kg

Results of VOC Analysis

Detected Compound	TPF1-1 ug/kg	TPF3-1 ug/kg	Field Blank ug/l	Trip Blank ug/l
Methylene Chloride	25 B	21 B	3 JB	3 JB
Acetone	19	9 J	2 J	
Chloroform				7
Toluene	2 J	2 J	1 J	2 J
Total Xylenes	6			
2-Butanone			7	25

B - Detected in laboratory blanks

J - Detected at concentration below detection limits

collected. The sediments were analyzed for VOCs, EP toxicity metals, and nitrates.

#### Surface-Water Sampling

Three water samples, two from the East Lagoon and one from the West Lagoon, were collected 1 foot beneath the water surface with a Kemmerer sampler. A duplicate sample was collected at EL-1. One sample each was collected from a pipe that extends out from the westernmost slope of the West Lagoon, and from the pipe that extends out from the eastern slope of the West Lagoon. Both samples were collected directly into laboratory-prepared bottles. These pipes are thought to collect water from drainage zones designed to prevent hydrostatic pressure buildup at the toe of the slopes between lagoons. These locations are shown in Figure 3-16.

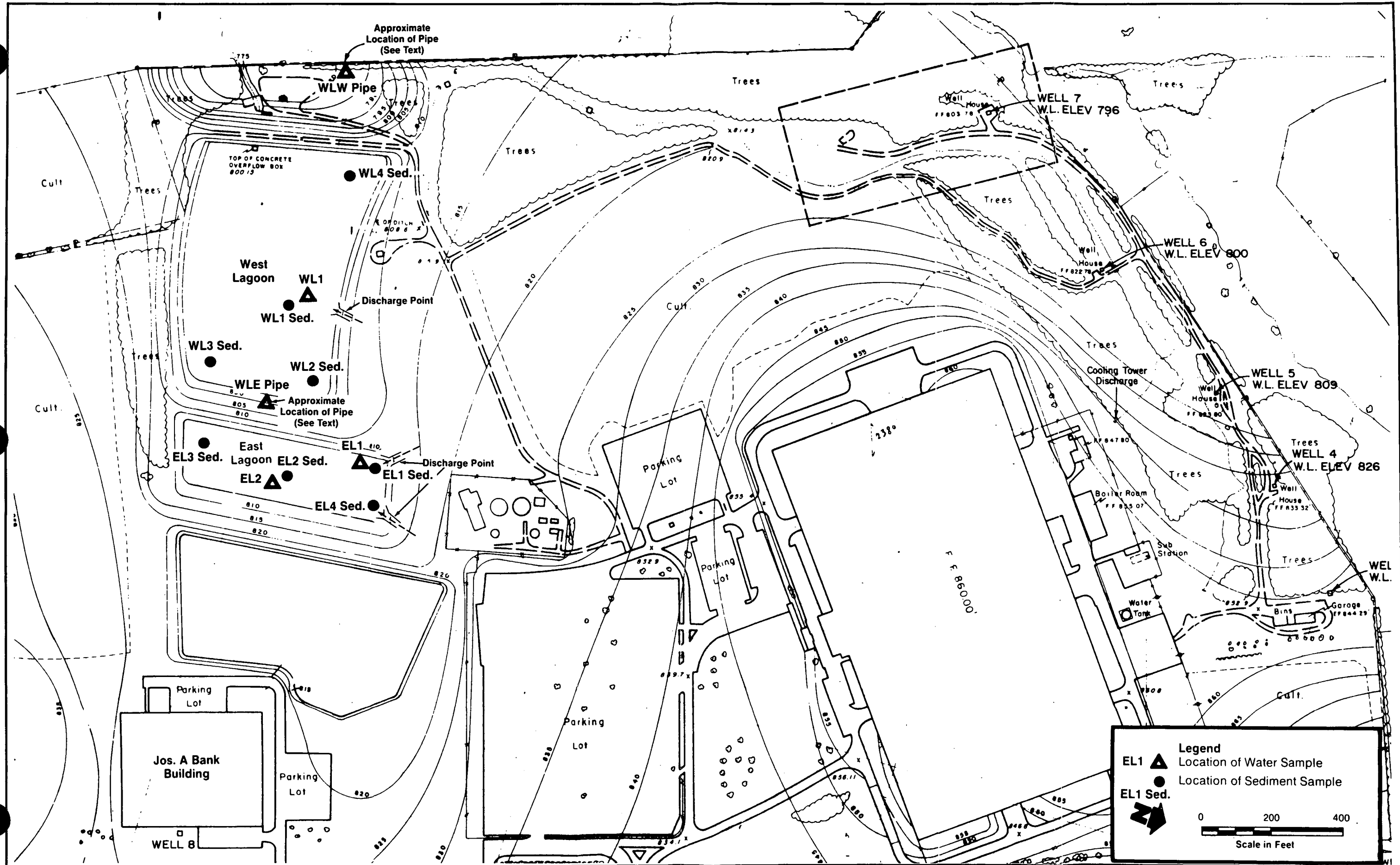
The water samples and field blank were analyzed for VOCs and metals; pH, temperature, and conductivity were recorded for each sample at the time of collection. A trip blank was submitted for VOC analysis.

#### 3.7.2 Analytical Results

The summary results of the VOC, EP toxicity metals, metals, and nitrate analyses are presented in Tables 3-11, 3-12, and 3-13. The distribution of TCE and PCE in the lagoon sediment and water samples is shown in Figure 3-17.

#### Sediment Samples

As shown in Table 3-11, trans-1,2-dichloroethene (trans-1,2-DCE), TCE, PCE, toluene, ethyl benzene, total xylenes, vinyl chloride, and carbon disulfide were detected in sediment samples from the East Lagoon. Trans-1,1-DCE, TCE, PCE, toluene, ethyl benzene, and total xylenes were detected at relatively higher concentrations near or above 1 ppm each in the EL-1 sample, which was collected near a wastewater discharge point in the northwest corner of the lagoon. The other three samples in the East Lagoon contained these constituents at estimated concentrations below the detection limits. Sediment sample WL-4 from the northwest corner of the West Lagoon was the only West Lagoon sample that contained detectable levels of TCE at 110 ppb. Low concentrations of trans-1,2-DCE and carbon disulfide were present in the other West Lagoon sediment samples. The significance of concentrations of methylene chloride, acetone, chloroform, and low concentrations of toluene and 2-butanone detected in all of the lagoon sediment samples is questionable as these compounds were also detected in blanks.



**FIGURE 3-16 LOCATION OF PHASE I SAMPLING POINTS, ZONE G, BLACK & DECKER, HAMPSTEAD, MD**

Table 3-11

## Results of VOC Analysis: Zone G Surface Water and Sediment Samples

## Results of VOC Analysis: Surface Water Samples

Compound Detected	EL-1 ug/l	EL-2 ug/l	WL-1 ug/l	WLE PIPE ug/l	WLW PIPE ug/l	BLANK ug/l	BLANK ug/l
Methylene Chloride	9 B	11 B	9 B	8 B	8 B	7	7
Acetone	20	12	2 J		9 J	6 J	3 J
Trans-1,2-Dichloroethene	16			5	2 J		
Chloroform	12	5	8	9		6	6
Trichloroethene			12	480	3 J		
Tetrachloroethene				9	16		
Toluene	1 J	1 J					
1,1,1-Trichloroethane				1 J			
Bromodichloromethane			1 J	1 J			

## Results of VOC Analysis: Sediment Samples

Compound Detected	EL1-SED ug/kg	EL2-SED ug/kg	EL3-SED ug/kg	EL4-SED ug/kg	WL1-SED ug/kg	WL2-SED ug/kg	WL3-SED ug/kg	WL4-SED ug/kg
Chloromethane							5 J	
Methylene Chloride	290 B	14 B	130 B	170 B	25 B	28 B	16 B	130 B
Acetone	1100 B	35 B	360 B	590 B	71 B	200 B	47 B	300 B
Trans-1,2-Dichloroethene	2000	4 J	14 J	15 J		14 J	2 J	
Chloroform			11 J	16 J				
2-Butanone		12 J	85 J	170	26 J	74	20	
Trichloroethene	100 J							110
Tetrachloroethene	45 J							
Toluene	8300	6 J	32 J	61 J	6 J	6 J	7 J	23 J
Ethylbenzene	900		29 J	27 J				
Total Xylenes	3100							
Carbon Disulfide	150 J		39 J	74 J	5 J	8 J		

B - Detected in laboratory blanks

J - Detected at concentration below detection limits

Table 3-12

Results of Nitrate and EP-Toxicity Analysis  
 Zone G: Sediment and Surface Water Samples

Results of Nitrate Analysis  
 Surface Water Samples

Sample Number	Nitrate Concentration
EL-1	2.5 mg/l
EL-2	1.6 mg/l
WL-1	0.65 mg/l
WLE-PIPE	1.4 mg/l
WLW-PIPE	1.3 mg/l

Results of Nitrate and EP-Toxicity Analysis  
 Sediment Samples

Sample Number	Nitrate Concentration	EP Leachate Barium*
EL1 SED		1490 ug/l
EL2 SED		
EL3 SED		
EL4 SED		
WL1 SED	0.41 mg/kg	2380 ug/l
WL2 SED		1180 ug/l
WL3 SED	0.19 mg/kg	1560 ug/l
WL4 SED		9190 ug/l
Field Blank		

\* Other EP-Toxicity Results Negative

Table 3-13

## Results of Metals Analysis: Zone G Surface Water Samples

Metal	EL-1 ug/l	EL-1DUP ug/l	EL-2 ug/l	WL-1 ug/l	PIPE ug/l	PIPE ug/l	FB ug/l
Antimony	73.1						
Arsenic	8.9	1.7	1.8	1.4	0.5	0.6	
Beryllium	3.6	1.3	1.1	1.5	0.5	0.5	0.5
Cadium	41.2						
Chromium	1600	16.2	31.5	17.1			
Copper	4320	113	117	208	45.1	30.0	29.6
Lead	6880	63.6	126	62	4.0	3.2	3.5
Mercury	4.7	2.1	1.8	0.59			
Nickel	1470	164	697	40.6		8.6	
Selenium			0.9				
Zinc	5500	262	260	342	219	75.8	83.3

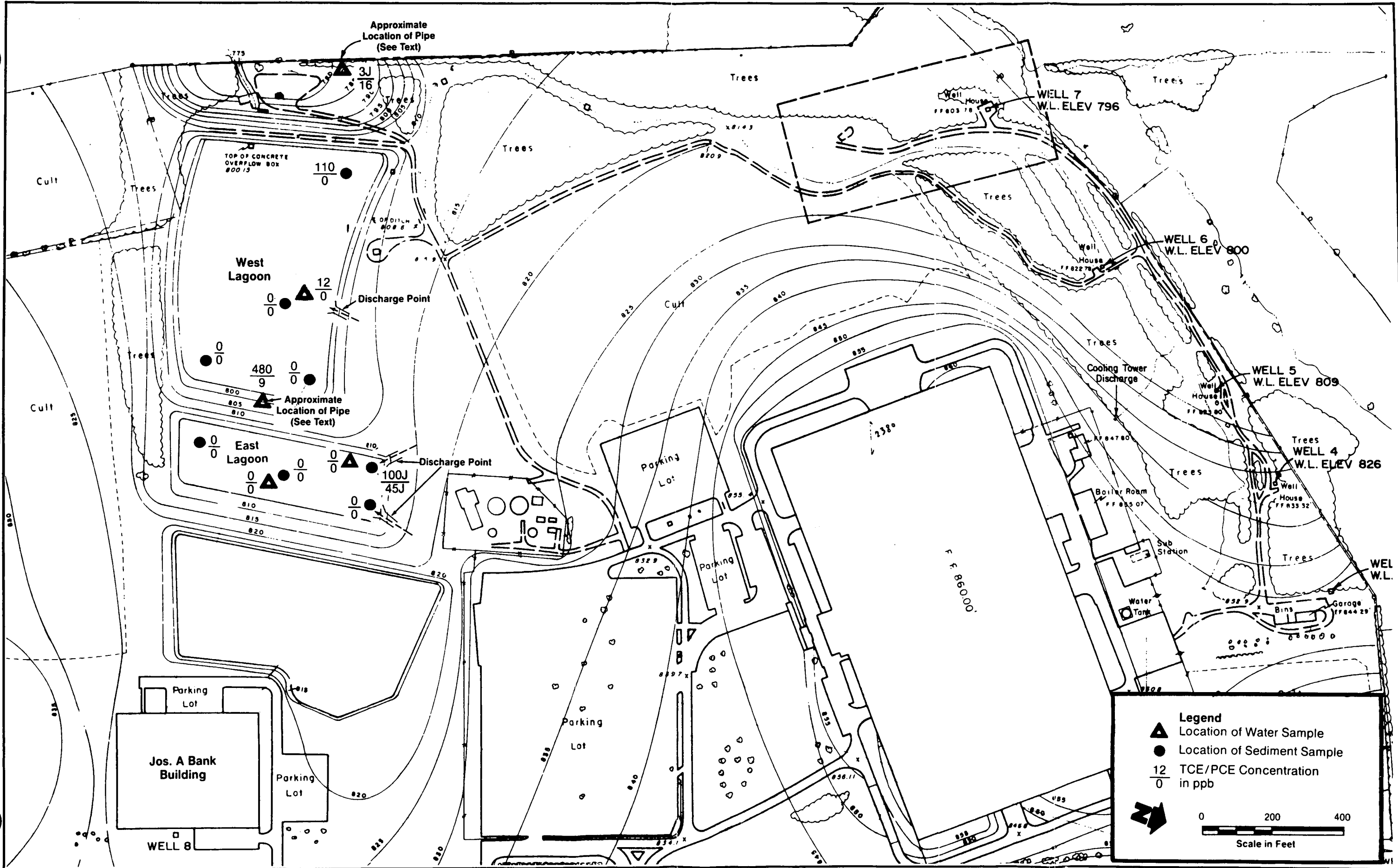


FIGURE 3-17 RESULTS, ZONE G, LAGOON SURFACE WATER AND SEDIMENT SAMPLE ANALYSIS



As shown in Table 3-12, the EP toxicity metals analysis results for the lagoons found only barium in detectable concentrations. Less than 2 ppm of barium was detected in the leachate from sediment sample EL-1 from the East Lagoon, and less than 10 ppm was detected in extracts of all West Lagoon sediment samples. These concentrations are well below the COMAR 10.51 maximum EP toxicity concentration of 100 ppm established for barium. No other metals were detected in leachates from the other lagoon sediment samples.

The results of the nitrate analysis, shown in Table 3-12, show a maximum concentration of nitrates of 0.41 ppm in WL-1 SED.

These results generally indicated that contaminants are present in the sediments of the wastewater lagoons at levels commensurate with their use. As expected, the highest levels of volatile organics were found near the inlet to the East Lagoon, which had been used to collect wastewater prior to treatment and discharge to the West Lagoon. The predominant constituents detected were not PCE and TCE, however. The moderate concentrations of other VOCs observed in a limited area do not suggest that the lagoons are a source of groundwater contaminants. Other site data, such as surface-water and groundwater results, should also be considered in evaluating this area.

#### Surface-Water Samples

As shown in Table 3-11 and Figure 3-17, water samples in the East Lagoon contained considerably less VOCs than the sediments. Only trans-1,2-DCE was detected in sample EL-1 at 16 ppb. A low concentration of TCE (12 ppb) was detected in the water sample from the West Lagoon. These results indicated that the VOCs currently observed in the sediments are not present at significant levels in the water that is in direct contact with the sediments, which is consistent with soil/water partition behavior for these organic compounds.

TCE was detected at 480 ppb in the water from the toe of slope drain on the east end of the West Lagoon. In addition, water was sampled from a pipe believed to drain the toe of the west slope of the West Lagoon, which is a discharge point into the small stream crossing Black & Decker property, west of the lagoons. In this sample, TCE was reported at an estimated concentration below the quantification limit, and PCE was detected at 16 ppb. Trace amounts of trans-1,2-DCE, bromodichloromethane, and 1,1,1-TCA were also detected in the various lagoon water samples. Low concentrations of methylene chloride, acetone, and toluene detected in the samples were not considered significant because they were also detected in the blanks.

The results of the nitrate analyses, shown in Table 3-12, show a maximum concentration of nitrates of 2.5 ppm in EL-1. These concentrations are typically not considered significant for wastewater discharge or water supply.

The metals analysis for lagoon water samples are presented in Table 3-13. The water sample at the inlet to the East Lagoon (EL-1) had significant concentrations of cadmium, chromium, copper, lead, mercury, and zinc. Metals concentrations in sample EL-2, taken some distance from the inlet, were an order of magnitude or more lower, possibly reflecting both quiescent conditions and equalization of wastewater influent variations. These concentrations of metals are typical of wastewater prior to treatment at the plant. Lower concentrations of metals were found in sample WL-1 from the West Lagoon, which receives the treated effluent. The results for samples from the WLE pipe and WLW pipe from the toe of slope drains were very low, indicating that the migration of metals from the lagoon waters has not occurred.

The lagoon sediment sample results indicated that the sediments do not represent a current source of groundwater contaminants. The toe of slope samples, however, indicated that the lagoons may have represented a source in past operation. The significance of this contribution was addressed in the Phase II groundwater program by locating monitor wells in the lagoon area.

### 3.8 CONCLUSIONS

Using a variety of nonintrusive and intrusive investigation techniques, the Phase I source area identification program efficiently achieved the objective of identifying which of the potential source areas actually represent current sources of groundwater contaminants. The conclusions reached regarding each potential source and any recommendations for the Phase II groundwater program are summarized in the paragraphs that follow.

#### Zone A - Storage Tank Areas

Of the three storage tank areas, the aboveground storage tank area does not appear to be a current source area. Soils in the other two areas, underground Tank Farms 1 and 2, appear to contain localized "hot spots" of both TPH and VOCs. The VOCs were present mainly in soils with elevated TPH concentrations.

Based on these results, additional soil borings and shallow monitor wells were proposed for these two tank farms in order to achieve the following objectives:

- Define the extent of VOC (especially PCE and TCE) and petroleum hydrocarbon contamination.
- Determine if VOCs and TPH had migrated from soils into the shallow groundwater in Zone A.

- Evaluate the possibility that the tank farms served as a source for chlorinated hydrocarbons detected in Zone B and in the Black & Decker production wells.

#### Zone B - Fill Site Near Seep Area

The test pit program confirmed that several areas in this zone contain fill. The fill observed included primarily burnt wood, bricks, and scrap metal. Soil test results confirmed the visual observation that no wastes or other repositories of groundwater contaminants are currently present in this area. Since groundwater analysis results in this area continued to show that it is adjacent to the area of highest PCE concentrations, the possibility that the fill area served as a past source, which migrated out of the unsaturated zone soils, cannot be precluded. However, based on current conditions, no further source identification/characterization was recommended.

#### Zone C - Potential Heat-Treating Residues Disposal Areas

The test pit program identified debris fill in the southern Zone C area, but it did not appear to include heat-treating residues. Observations made in the test pits in the area west of the main building indicated that residue was only present at the ground surface in a small area. Soils tested in these pits and the sediment sampled adjacent to the southern Zone C area did not exhibit significant concentrations of metals or cyanides. Collectively, the data indicated that Zone C is not a current source of groundwater contaminants, and no further study was recommended.

#### Zone D - Product Disposal Area

Geophysical surveys and test pit excavations confirmed that off-specification tool products were buried in Zone D. The fill contained scrap metal, wood, refuse, plastic, construction debris, and power tool parts. However, analysis of the underlying soils indicated that the fill was not a source of groundwater contaminants. No further study was recommended.

#### Zone E - Corner of Buildings 5 and 6

Soil-gas analysis and soil boring sampling/analysis was conducted in this area to investigate the possibility that heat-treating residues were buried in the area that was filled prior to construction of the Building 5 and 6 additions to the main facility building.

The soil-gas analysis generally detected very low concentrations of TCE and PCE in the vadose zone. The soil boring sample analysis indicated that no significant levels of VOCs or cyanides are present. There were no indications that buried

wastes are present. For Phase II, a shallow and deep well pair was proposed for the area between Zone E and well 7 to monitor the possible migration of PCE and TCE in the groundwater. No further evaluation of soils was considered necessary.

#### Zone F - Past Potential Burn Area

The geophysical surveys indicated only minor anomalies in Zone F. The test pits uncovered no evidence of buried fill or past burning activities. The test pit sample analyses indicated that Zone F does not contain waste materials or significant levels of groundwater contaminants. No further study of this area was recommended.

#### Zone G - Lagoon Areas

The lagoon sediment sample results indicated that several VOCs are present in the East Lagoon inlet area in the 1 to 10 ppm range. PCE and TCE were generally present at much lower levels ranging from none detected to 0.1 ppm. PCE levels in the toe of slope drain samples indicated, however, that the lagoons could have represented a source in past operation. In order to assess the significance of this contribution, a shallow monitor well was proposed for the south side of the lagoons as part of the Phase II groundwater investigation.

#### Overall Facility Source Assessment

In general, the results suggested that no large source currently exists in the areas where the highest concentrations of contaminants have been observed in the groundwater. Scattered "hot spots" were identified in the Zone A Tank Farms 1 and 2, and there were indications that higher PCE residuals may have been associated with the Zone G lagoons in the past. These areas were explored further in Phase II, which also focused on the broader objectives of determining PCE and TCE distributions in the groundwater and evaluating site hydrogeology.

## SECTION 4

## PHASE II INVESTIGATION

The Phase II investigation was designed to address three objectives:

- Further characterization of the extent of VOCs and petroleum hydrocarbons (TPH) detected in Phase I soil samples from the Zone A underground storage tank areas.
- The evaluation of the local hydrogeology to identify probable pathways of migration.
- Assessment of the groundwater quality on the plant site.

Phase IIa incorporated the analysis of soil and groundwater samples from borings and shallow monitor wells to evaluate the two underground tank farm areas. Additional monitor wells were installed to the depth of the bedrock/saprolite interface and into the bedrock aquifer to characterize groundwater quality and flow conditions across Black & Decker's property. Phase IIb was proposed after reviewing the results of Phase IIa. Closely spaced borings were installed and sampled in both tank farm areas to evaluate the volume and distribution of soil contaminants. Toxicity Characteristic Leaching Procedure (TCLP) testing was proposed for selected soil samples to provide an indication of constituent mobility in the soils. Four monitor wells were added to evaluate groundwater quality in the north-east corner of the facility.

Details of the Phase II Tank Farm investigation are described in Subsection 4.1. The groundwater investigation is presented in Subsection 4.2. The conclusions are presented in Subsection 4.3.

#### 4.1 TANK FARM SOILS

##### 4.1.1 Phase IIa

###### Field Activity

Nine soil borings, five in Tank Farm 1 and four in Tank Farm 2, were performed using a truck-mounted hollow stem auger. Boring locations, shown in Figures 4-1 and 4-2, were chosen to evaluate soil quality throughout both tank farm areas. Samples from the borings were collected at approximately 5-foot intervals with a 2-foot split-spoon using Standard Penetration Test techniques (ASTM D-1586). Sampling was continued until saturated

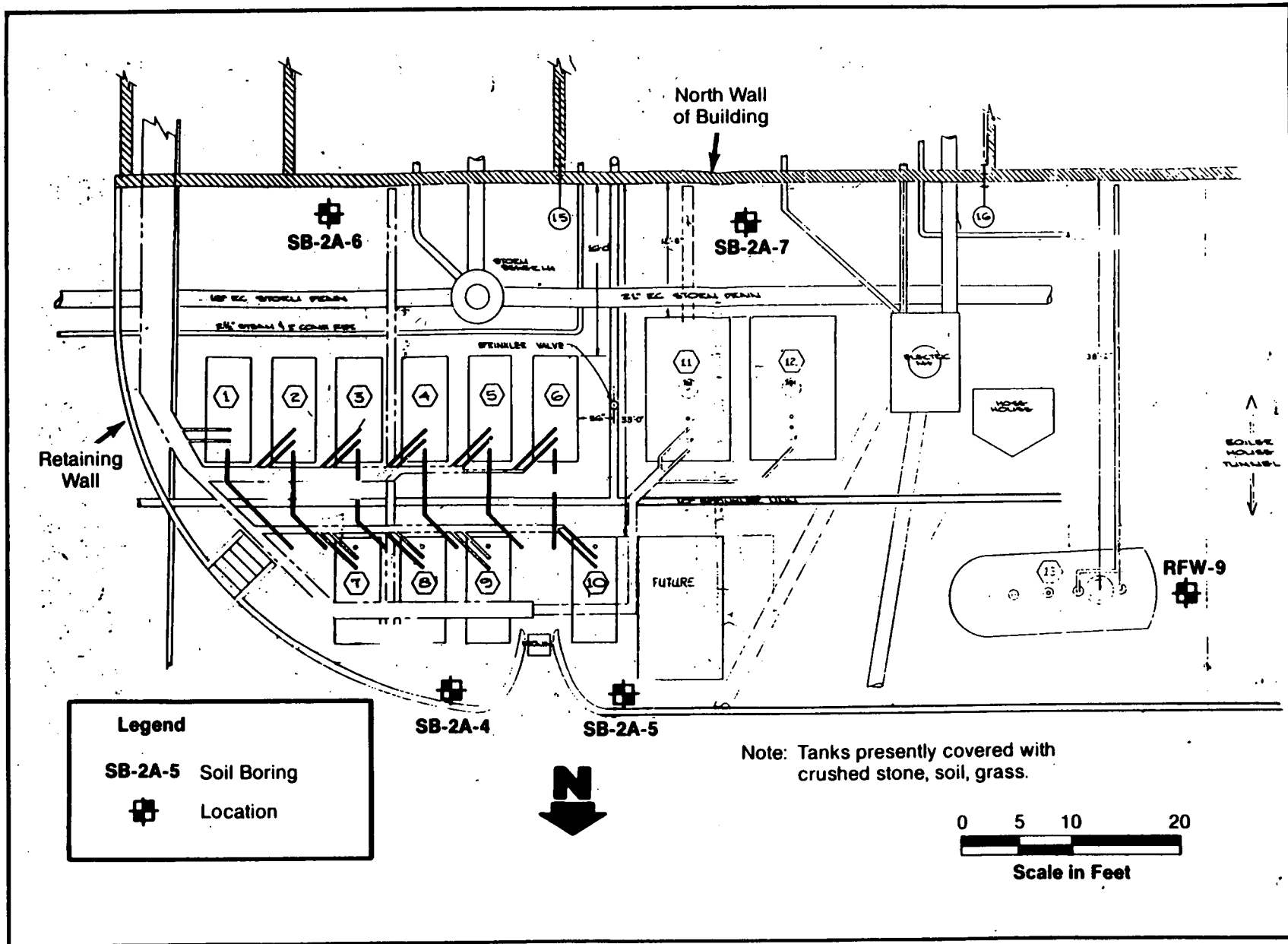


FIGURE 4-1 LOCATION OF PHASE IIa SOIL BORINGS, TANK FARM 1

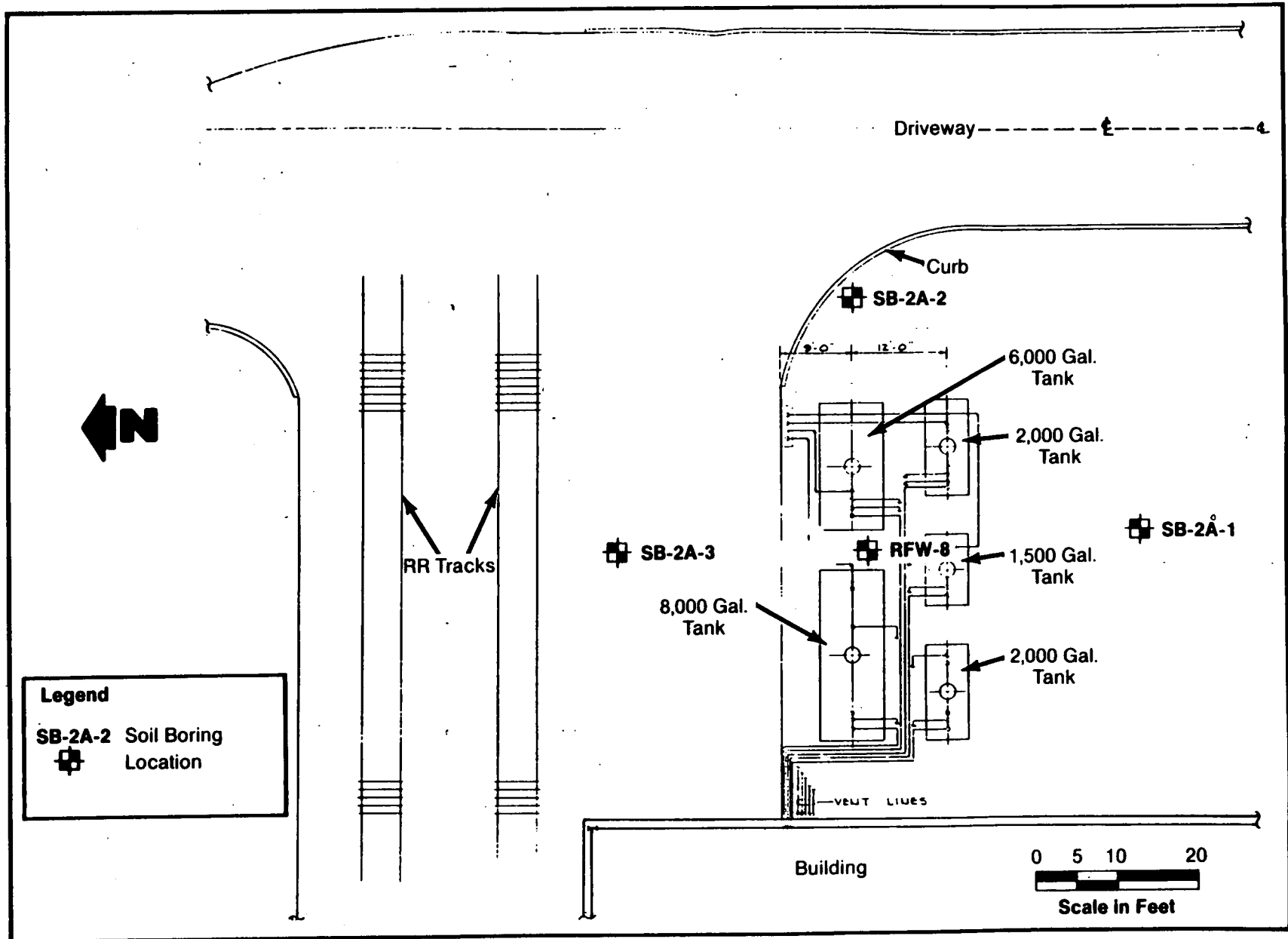


FIGURE 4-2 LOCATION OF PHASE IIa SOIL BORINGS, TANK FARM 2

conditions were encountered. Borings were generally completed to depths of 30 to 45 feet. As the borings were advanced, the boreholes and split spoons were screened with an HNu for detection of VOCs. Visual descriptions of soil color, texture, and moisture content were made during sampling.

Two samples at each 5-foot interval were collected and contained in 125-ml laboratory-cleaned jars. One sample was designated for VOC analysis; the other was designated for field headspace screening and TPH analysis. At the time of sampling, the TPH sample jar was sealed with aluminum foil and with a plastic cap. These jars were then left for a minimum of 3 hours at ambient temperatures ranging from 85° to 95°F. At the conclusion of the day, the headspace of the TPH sample jar from each interval was screened by puncturing the foil with the 10.2-eV probe of a HNu Model 101.

The VOC sample from the same interval as the TPH sample with the highest headspace reading was selected from each borehole and submitted for VOC analysis. An additional VOC sample from both RFW-9 and SB-2A-7 were also submitted for VOC analysis. Samples from all intervals were analyzed for TPH. For quality control, a duplicate sample was collected at SB-2A-4 for TPH analysis and at SB-2A-7 for VOC analysis. A field blank and a trip blank were also analyzed for VOCs and TPH.

Split spoons were scrubbed with Alconox and water with a potable water rinse followed by a deionized water rinse after each sample. The back of the rig, augers, and spoons were steam-cleaned before each boring. Latex gloves were worn and changed between each sampling interval. At the conclusion of drilling, boreholes were grouted to the surface with a Portland cement/bentonite mixture, except for RFW-8 and RFW-9, which were completed as monitor wells. Cuttings from SB-2A-6 and SB-2A-4 were contained in 55-gallon drums because HNu readings from these boreholes exceeded 25 units. The soils from the other boreholes were disposed of on-site by Black & Decker employees.

### Results

A complete tabulation of results, which lists all compounds tested for each analysis, and all blank, spike, and duplicate results is provided in Appendix E. The validity of all chemical analyses in this section was confirmed in accordance with the WESTON quality assurance and quality control programs, as described in Appendix C of the Work Plan.

Five soil borings were completed in Tank Farm 1 and four in Tank Farm 2 to the depth of groundwater saturation. The soils encountered in the borings were similar to those encountered in the Phase I investigation, and were generally described as a yellowish-brown to reddish-brown clayey silt. Quartzite and schistose rock fragments were present throughout the borings. Complete lithologic descriptions of the samples are presented in Appendix F.



The results of the TPH analysis of the soils at Tank Farms 1 and 2 are presented in Figures 4-3 and 4-4 with the VOC analysis. Phase I analysis results are included with the Phase II results to provide a cumulative summary of the soil sample results. In the diagrams, each boring is schematically represented, showing the sample intervals and the corresponding detected concentrations of TPH. The relative locations of the borings are shown in an inset map.

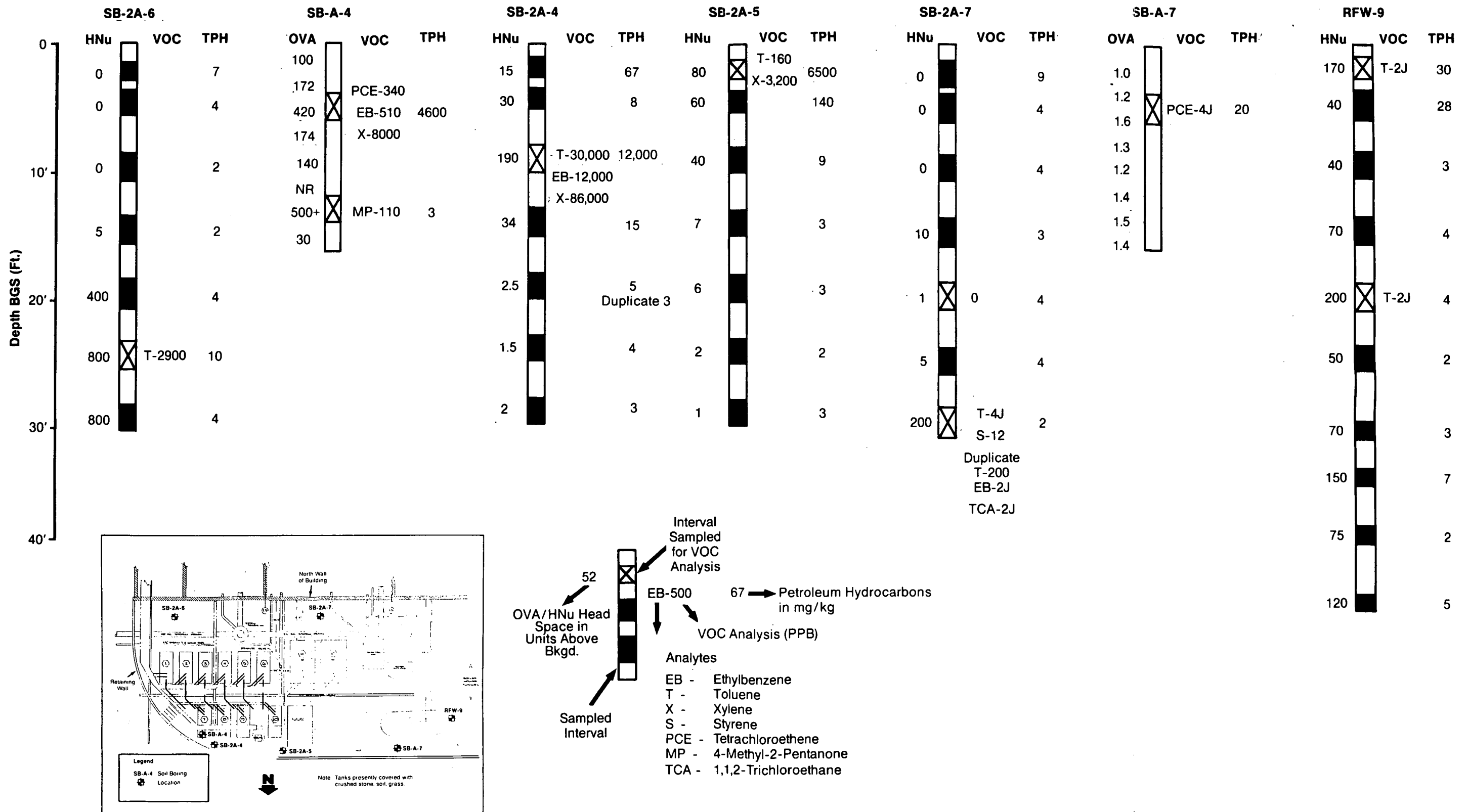
The results for Tank Farm 1 shown in Figure 4-3 indicate that TPH are present in concentrations above 100 ppm in three of the seven borings completed in this area. These elevated levels were found in the soils at one or two intervals from 0 to 20 feet below ground surface (bgs) from borings SB-A-4, SB-2A-4, SB-2A-5, and SB-A-7.

In Tank Farm 2, Figure 4-4, concentrations of TPH in SB-2A-1, SB-2A-2, and SB-2A-3 were below 100 ppm throughout the borings. In SB-A-1 and RFW-8, which are located together, elevated concentrations in excess of 100 ppm were found between 0 and 15 feet bgs.

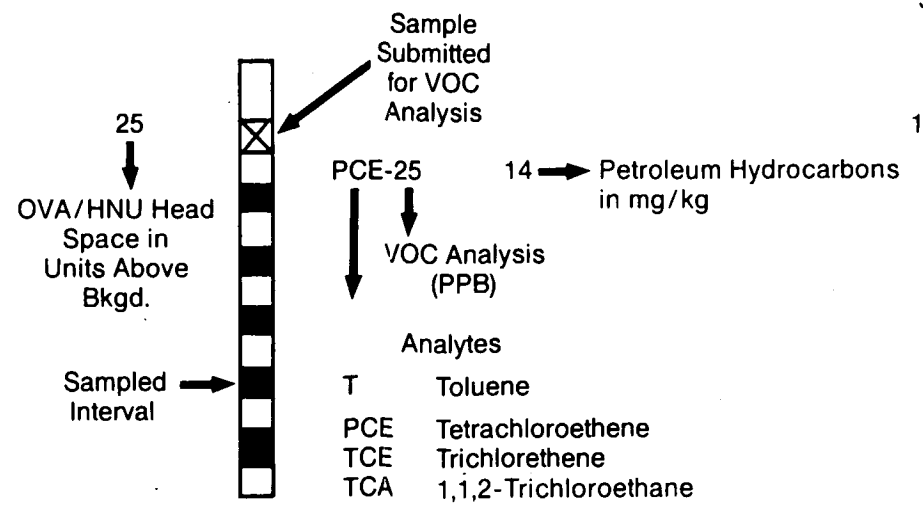
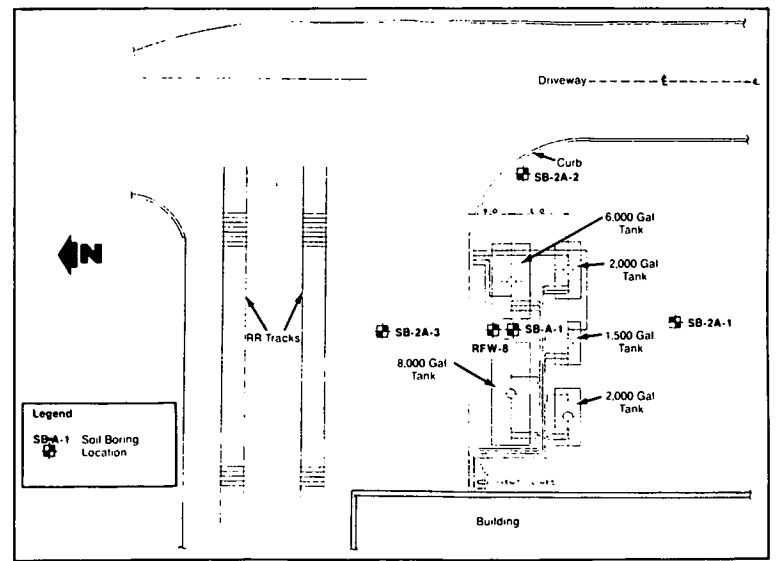
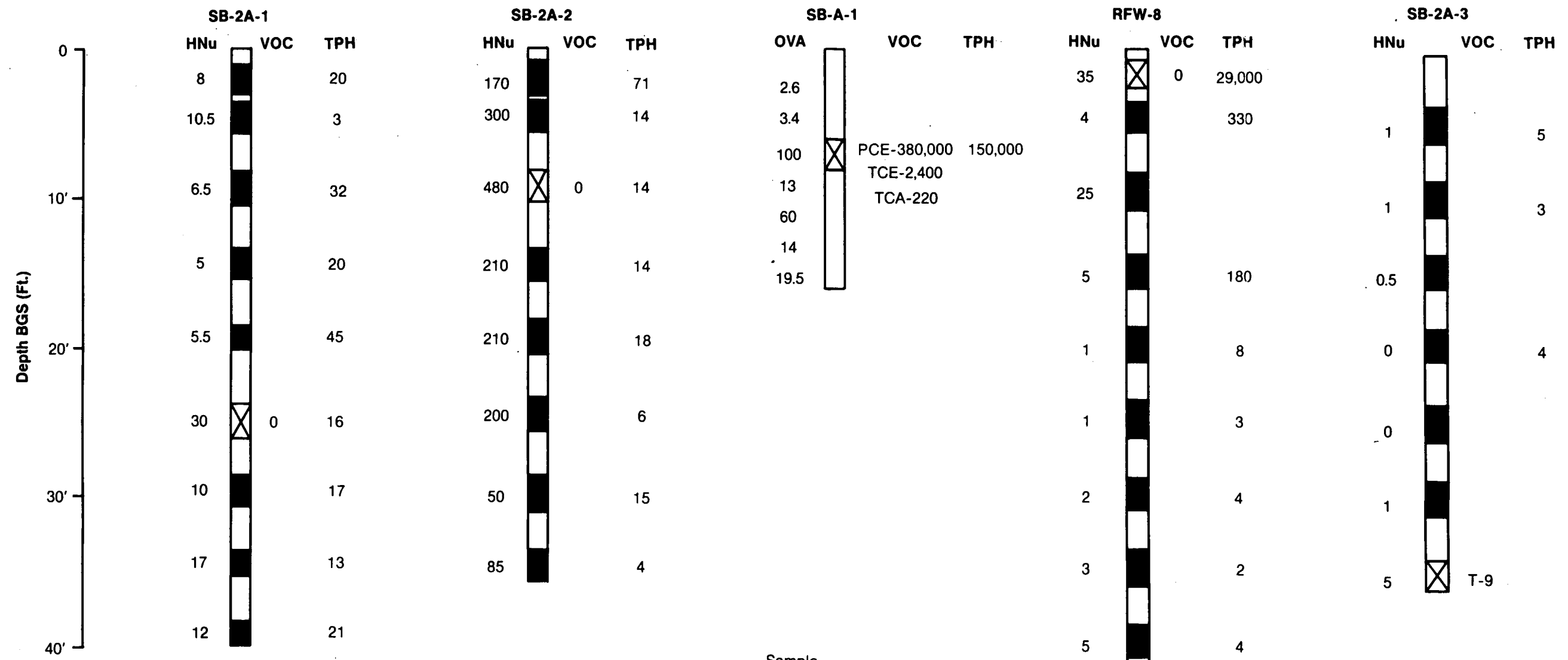
The general pattern of TPH concentrations in the soils at the two tank farms is predictable. The elevated concentrations of TPH, in excess of 100 ppm, are localized and appear to be limited to the upper 15 feet of a few boreholes closest to the tanks. Concentrations ranging from 10 ppm to 100 ppm are detected in several more boreholes, but are typically limited to the upper 30 feet of soil. Low TPH concentrations are detected in all boreholes below 30 feet. Typical background levels of TPH at industrial sites have been observed at 10 ppm to 100 ppm. Background concentrations of 10 ppm and less are commonly encountered on nonindustrial sites. The complete TPH analysis results are presented in Appendix E.

The results of the VOC analysis for Tank Farm 1 and 2 soils are presented with the TPH results in Figures 4-3 and 4-4. Again, Phase I analysis results are included with the Phase II results. In each diagram, the boreholes are schematically represented showing the interval sampled for VOC analysis. The principal analyte detected and the corresponding concentration are listed to the right of the interval. HNu or OVA field headspace readings for each interval are listed on the left.

VOCs were detected in all boreholes from Tank Farm 1, in concentrations ranging from below quantification limits to over 100 ppm. One or more of the compounds, toluene, ethyl benzene, and xylene were detected in concentrations above 1 ppm in soil samples from SB-2A-6, SB-A-4, SB-2A-4, and SB-2A-5, all of which were located right around the underground storage tanks. PCE was detected at 340 ppb in SB-A-4, and its presence below the quantification limit was noted in SB-A-7. Low concentrations of



**FIGURE 4-3 PHASE I AND IIa SOIL BORINGS, RESULTS OF TPH AND VOC ANALYSIS, TANK FARM 1**



**FIGURE 4-4 PHASE I AND IIa SOIL BORINGS, RESULTS OF TPH AND VOC ANALYSIS, TANK FARM 2**

the volatiles, toluene, styrene, and ethyl benzene were detected in SB-2A-7 and RFW-9, which are located several feet south of the underground tanks. In SB-2A-6 and SB-2A-7, HNu headspace readings, and, in particular, HNu readings at the borehole, were higher with increasing moisture content in the sediments. The VOC concentrations above 1 ppm generally correlated to TPH concentrations of above 100 ppm. Exceptions to this correlation are samples taken near or into the water table in SB-2A-6 and SB-2A-7, which may have been influenced by groundwater contamination. The correlation of the VOC concentrations with HNu readings appears to be less reliable, possibly due to solvation effects.

In Tank Farm 2 borings, shown in Figure 4-4, the Phase II VOC analysis was generally negative. SB-2A-3 was the exception; toluene was detected at 9 ppb in the sample at 34 feet. HNu headspace readings were considerably lower than those for Tank Farm 1 borings, with the exception of SB-2A-2, although in this boring there was no corresponding detection of VOCs in the sample analyzed. During the Phase I investigation, concentrations of PCE, TCE, and 1,1,2-TCA totalling several ppm were detected in SB-A-1 in the same interval that 150,000 ppm TPH was detected. These VOC compounds were not detected in RFW-8, which was placed directly adjacent to SB-A-1 or in any soils from the other Tank Farm 2 borings. This unexpected result could be due to the RFW-8 sample being collected near the surface. With the exception of this result, it appears that the VOCs in the soils of Tank Farm 2 are also associated with TPH.

The complete VOC analysis results are presented in Appendix E.

#### 4.1.2 Phase IIb

The results from the Phase IIa soil analyses suggested the need for supplemental data collection to accurately define the contaminated soil profile within the tank farms. Field screening with an HNu had been conducted in part to estimate VOC concentrations in the soils, instead of having to analyze each sample for VOCs in the laboratory. Due to the poor correlation of the HNu readings to the concentration of volatiles in the soils, and the relatively small size of the areas of concern, closely spaced, continuously sampled borings were proposed for both tank farms as part of the Phase IIb investigation. To further determine the impact of the soil contaminants on the groundwater, representative samples from the borings were proposed to be analyzed for VOCs using TCLP procedures.

#### Field Activity

Eighteen soil borings, 8 in Tank Farm 1 and 10 in Tank Farm 2, were performed using an all-terrain-vehicle-mounted hollow stem auger. Boring locations, shown in Figures 4-5 and 4-6, roughly form a grid covering the tank farm areas. It was necessary to

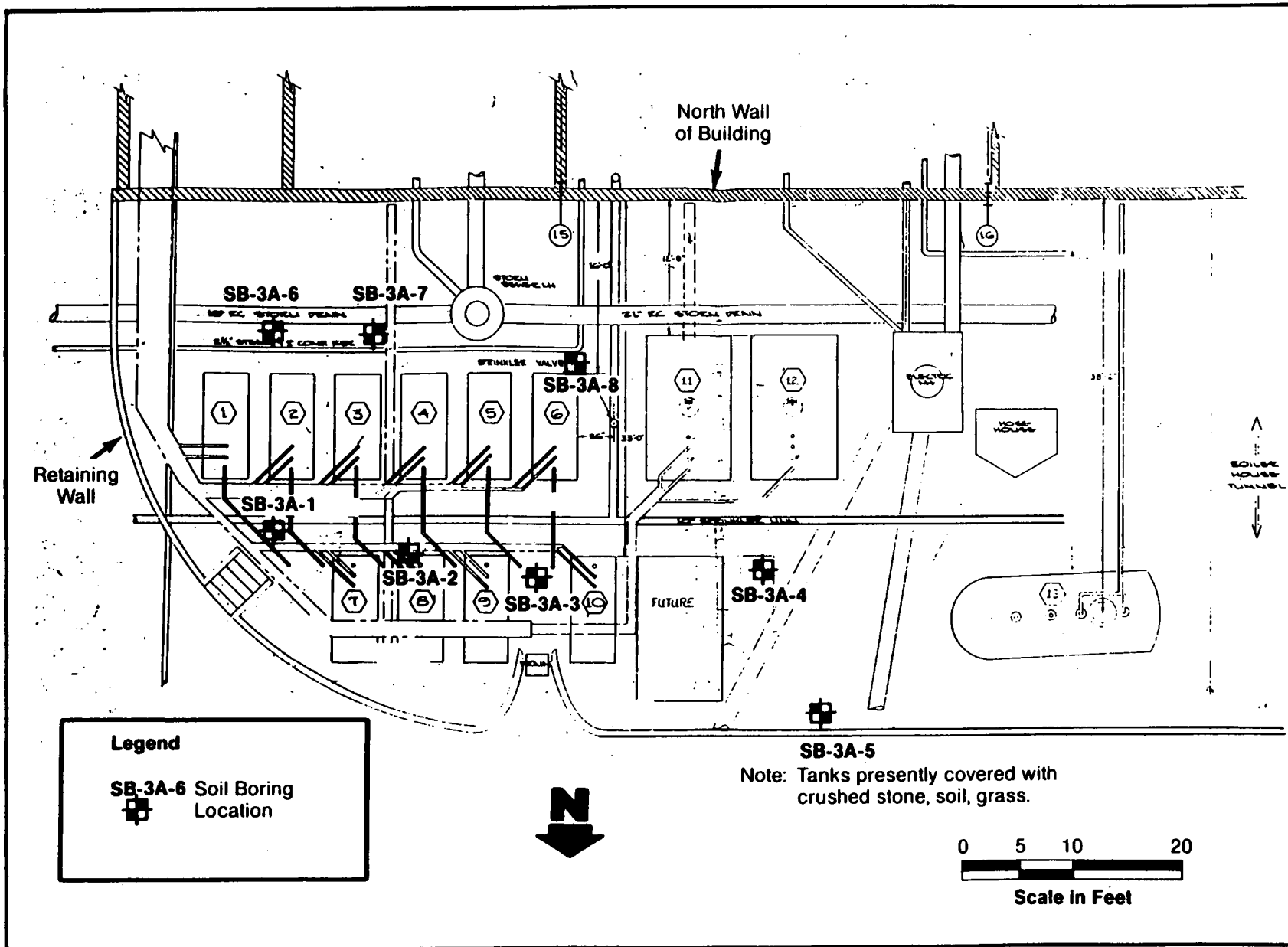


FIGURE 4-5 LOCATION OF PHASE IIb SOIL BORINGS, TANK FARM 1

4-10

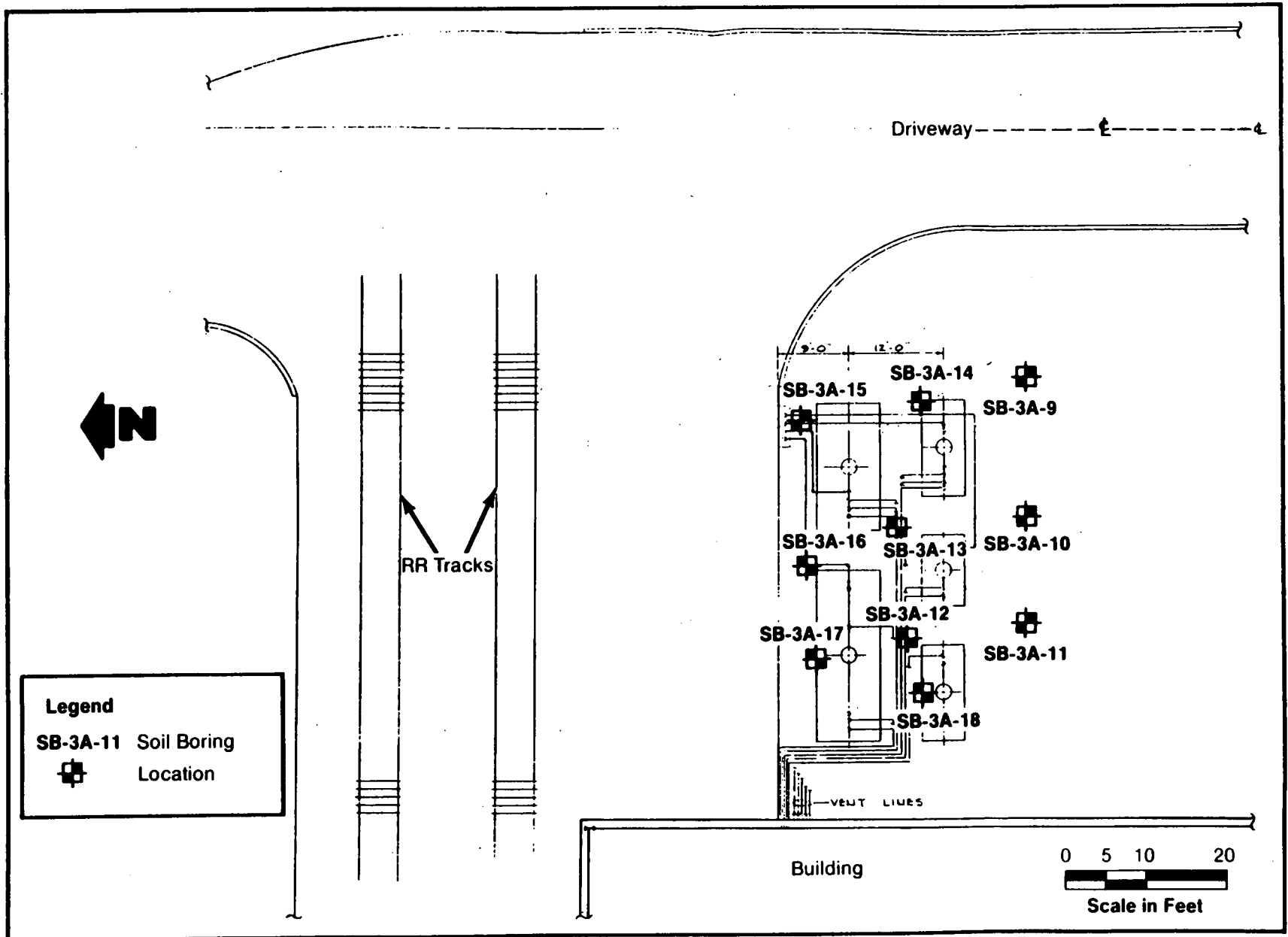


FIGURE 4-6 LOCATION OF PHASE IIb SOIL BORINGS, TANK FARM 2

adjust the proposed locations to avoid underground utility lines. The placement of the borings and depth of sampling in each boring were selected to define the horizontal and vertical limits of local soil contamination as indicated by the Phase IIa investigation. A field laboratory was set up on-site for rapid turnaround sample analysis, in order that field decisions could be made to extend the grids to the limits of soil contamination. The field laboratory consisted of an infrared spectrophotometer (IR) for total petroleum hydrocarbon analysis (TPH), a gas chromatograph electron capture detector (GCECD) for detecting chlorinated hydrocarbons (CH), and a gas chromatograph photoionization detector (GCPID) for benzene, xylene, ethyl benzene, and toluene (BXET) detection.

Soil samples were collected at 2-foot intervals with a split spoon using Standard Penetration Test techniques (ASTM D-1586). As the boreholes were advanced, the boreholes and split spoons were screened with a Model 101 HNu with a 10.2-eV probe. In each borehole, continuous sampling was concluded at 16 feet bgs, with a final sample taken from 18 to 20 feet bgs; a depth suggested by the Phase IIa results to represent the limit of contamination. In borehole SB-3A-6, an additional sample was taken at the 25- to 27-foot bgs interval because of relatively high HNu readings at the 18- to 20-foot interval. In borehole SB-3A-7, additional samples were taken at 20- to 22-foot and 25- to 27-foot intervals because of high HNu readings at the 18- to 20-foot interval. Visual descriptions of soil color, texture, and moisture content were made during sampling.

Two samples at each 2-foot interval were collected and contained in 125-ml laboratory clean jars. One sample was designated for VOC analysis, the other was designated for TPH analysis. All TPH samples were submitted immediately for analysis in the field laboratory set up in the wastewater treatment facility. The VOC samples were stored at temperatures below 30°F (-1°C). When the TPH analysis was completed, the results were used to determine which samples would be analyzed for CH (PCE, TCE, and 1,1,1-TCA) and BXET. Samples were selectively analyzed to define the upper and lower limits of the volatile contaminants in a particular borehole. Samples identified as high or moderately high in TPH were considered most likely to contain volatiles, as indicated by the Phase IIa results. In most cases, one or two samples were initially selected for analysis, and additional samples from the same borehole were selected after reviewing the analytical results. For quality control, duplicate samples were submitted for TPH and VOC analysis of every twentieth sample.

At the completion of the VOC analysis, four samples (two from each tank farm area) were selected for analysis using TCLP procedures to provide an indication of constituent mobility in soils. Samples from borings SB-3A-2 and SB-3A-12 at 10 to 12

feet bgs were selected as representative of samples having the highest level of contamination for each tank farm. Samples from SB-3A-3 at 8 to 10 feet bgs and SB-3A-18 at 4 to 6 feet bgs were selected as representative of samples exhibiting average levels of contamination.

For drilling and sampling, standard decontamination procedures were followed. After each sampling event, split spoons were scrubbed with Alconox and water, followed by a potable water rinse and a deionized water rinse. The back of the rig, augers, and spoons were steam-cleaned before each boring. Latex gloves were worn and changed between each sampling interval. At the conclusion of drilling, the boreholes were backfilled with cuttings, except for SB-3A-6 and SB-3A-7, which were grouted to the surface with a Portland cement/bentonite mixture because they had been sampled to the top of the water table. The remaining cuttings were contained in 55-gallon drums.

### Results

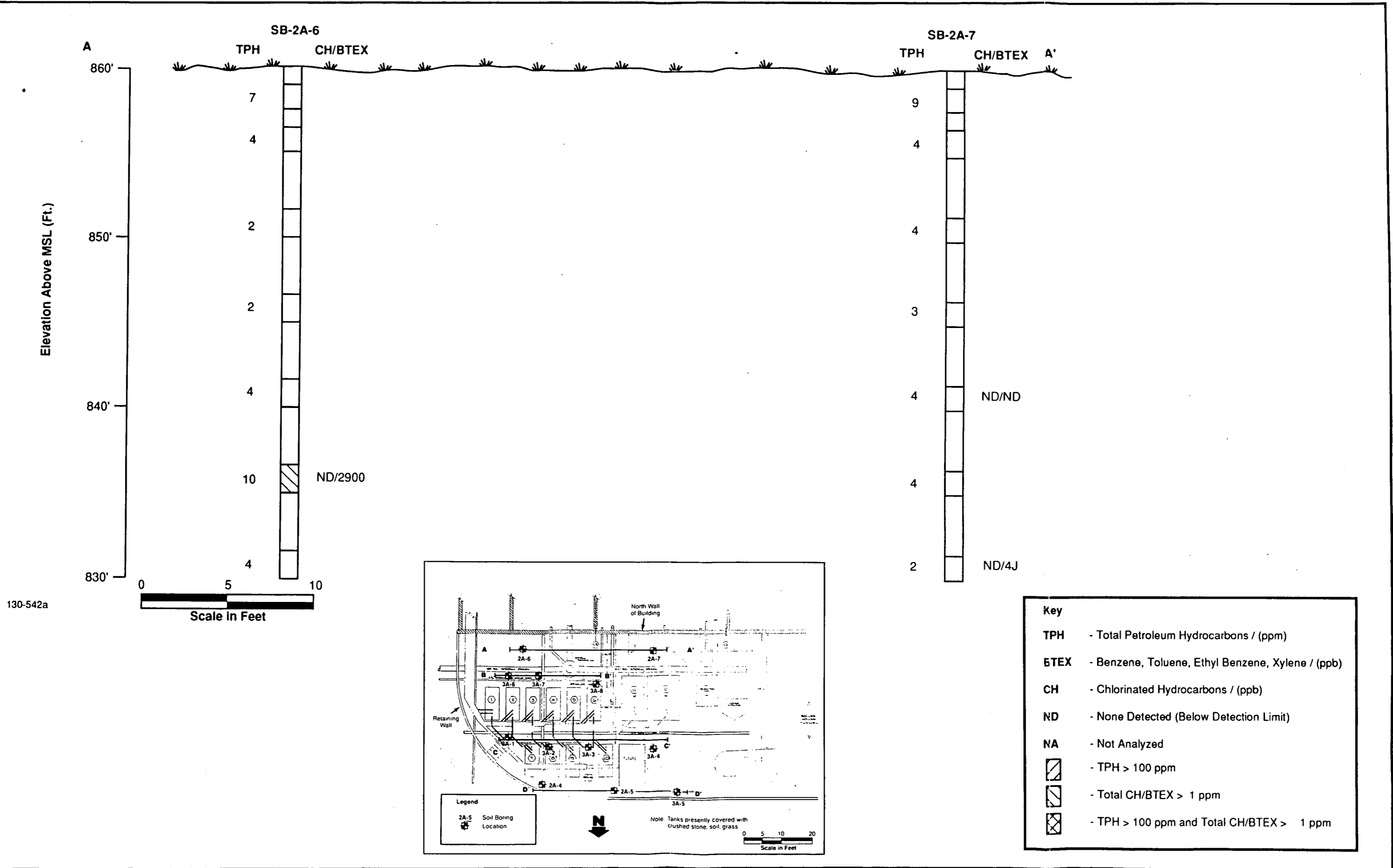
A complete tabulation of results, which lists all compounds tested for each analysis and all blank, spike, and duplicate results, is provided in Appendix G. The validity of all chemical analyses in this section was confirmed in accordance with the WESTON quality assurance and quality control programs as described in Appendix C of the Work Plan.

Eight soil borings were completed in Tank Farm 1 and 10 in Tank Farm 2. Soils encountered in the borings were similar to those encountered in previous borings in these areas. Soils were described generally as yellowish-brown to reddish-brown clayey silt above 845 feet (MSL) in Tank Farm 1 and above 847 feet (MSL) in Tank Farm 2. Highly weathered schist was described below these elevations. The clayey silt probably represents fill collected from another part of the property placed in and around the Tank Farms during their installation and subsequent excavation. Complete lithologic descriptions of samples are presented in Appendix H.

The results of the TPH and VOC analyses of the soils at Tank Farm 1 are summarized in cross-sections (Figures 4-7 through 4-10). Several Phase IIa borings are included to provide a complete overview of the available analytical data. In each diagram the borings are schematically represented, showing the sample intervals and the corresponding concentrations of TPH and CH. The locations of the borings are shown in the inset maps. The complete analysis for each compound is listed in Table 4-1.

The results for Tank Farm 1 indicate that the levels and types of contamination are as indicated in the Phase IIa borings. Most soil samples had TPH concentrations of less than 100 ppm.





**FIGURE 4-7 PHASE II SOIL BORINGS, RESULTS OF TPH AND VOC ANALYSIS CROSS SECTION A-A', TANK FARM 1**