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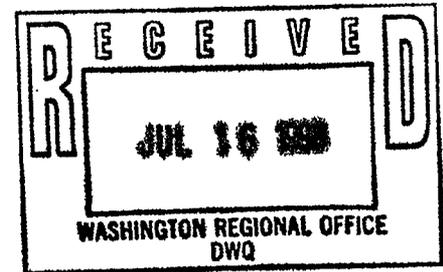
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**ON-SITE ASSESSMENT REPORT  
Hamilton Beach◇Proctor-Silex, Inc.  
Washington, North Carolina**

**Groundwater Incident No. 14338**

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**EXECUTIVE SUMMARY**

The Hamilton Beach◇Proctor-Silex (HB◇PS) facility is located at 234 Springs Road, north of the City of Washington, in Beaufort County, North Carolina. The facility and surrounding land parcel are owned by the City of Washington and have been leased by HB◇PS since 1990 and previously leased by predecessor companies. The facility is involved in the final assembly, packaging, and warehousing of small electric household appliances.

Since 1992, when chemicals were initially detected in groundwater, several phases of environmental investigation have been performed at the site. The most recent of these investigations is the subject of this report, which describes conditions within the limits of the facility property.

Soil and water at the site contain fuel, chlorinated and non-chlorinated volatile organic compounds, and semivolatile organic compounds that are consistent with the storage and use of petroleum products and degreasing solvents. The principal chemicals detected at the site are certain volatile organics. Certain semivolatile organics are detected less frequently, at lower concentrations, and over a smaller area. Based on the site's description and operating history and on the results of the investigations, it is apparent that the chemicals detected in soil and groundwater originated from multiple sources. A potential source of the solvents is the former above-ground storage tank (AST) that contained trichloroethene and, later, 1,1,1-trichloroethane. The specific source of the petroleum constituents is unknown. The nature, volume, and time period of any releases associated with these potential sources is also unknown. Regardless, they have created a "secondary source" within the soil located near the southeast corner of the plant building.

In 1995, an unknown quantity of oil was accidentally released into a drainage ditch along the south property line when a North Carolina Department of Transportation work crew ruptured a former roof drain pipe that transects the source area. HB◇PS reported the incident to the appropriate state agency and responded to the release by excavating all visibly affected soil from the drainage ditch. With the concurrence of the North Carolina Department of

Environment, Health, and Natural Resources and the City of Washington, the excavated soil was subsequently land farmed in an area east of the employee parking lot. Oil was later measured in a monitoring well and free product recovery was initiated. After the volume of product recovered from the well by periodic manual bailing had diminished, HB◇PS, with the concurrence of the North Carolina Department of Environment and Natural Resources, implemented free product recovery using Aggressive Fluid-Vapor Recovery technology on both the well and the former drain pipe. Recovery efforts have removed approximately 50 gallons of product, but results have shown steadily diminishing returns.

Eight domestic water-supply wells have been identified within a 1500-foot radius of the apparent source. However, municipal water service is available in the area as an alternate source of water. In addition, analysis of samples collected from four of the domestic water-supply wells did not detect any volatile organic compounds.

The source area at the site overlies a recharge area for the Castle Hayne aquifer. No wellhead protection areas have been established within 1,500 feet of the site.

A drainage ditch is located along the east side of the active portion of the site and along approximately 600 feet of the site's south side. The ditch ultimately enters Cherry Run approximately 9,500 feet downstream of the site. Several other unnamed tributaries to Cherry Run are also located within 1500 feet of the site.

The principal subsurface structures at the site are utility lines including water lines, gas lines, and storm drains. A segment of the drainage ditch and several drainage canals have also been relocated or abandoned at the site. The plant building foundation is slab construction, precluding the presence of confined spaces. Also, the results of an air monitoring survey did not detect volatile organic compounds near the source area, suggesting that there is little, if any, concern for organic vapor migration at the site.

Land surrounding the facility is primarily agricultural mixed with commercial, industrial, and residential uses.

The hydrogeology of the site is characterized by a shallow groundwater reservoir (Unit A), a surficial confining bed, a semi-confined aquifer (Unit B), and a lower (Yorktown) confining bed. Groundwater in Unit A flows toward, and discharges into, the drainage ditch that borders the active part of the site on the east and south. Groundwater in Unit B flows, in the opposite direction, toward the northwest. Vertical hydraulic gradients indicate that the site overlies a groundwater recharge area, except at locations immediately adjacent to the drainage ditch. The surficial confining bed that separates Unit A from Unit B appears continuous across the site. However several monitoring wells previously installed near the source area have penetrated this barrier. The Yorktown confining bed underlies Unit B and appears to be continuous across the site.

Preliminary soil cleanup levels applicable to the site are the default values of 10 parts per million (ppm) for purgeable (gas) Total Petroleum Hydrocarbons (TPH), 40 ppm for extractable (diesel) TPH, and 250 ppm for Oil and Grease. Chemical-specific "soil-to-groundwater" target concentrations will also likely apply to the site. Preliminary cleanup goals for Class GA (potentially potable) groundwater are the standards established under North Carolina Administrative Code (NCAC) Title 15A, Subchapter 2L, Section .0200 (2L Standards).

Soil in the source area exceeds established cleanup goals for TPH and for several VOCs. Soil exhibiting elevated concentrations is primarily located adjacent to the former solvent AST and encompasses an area approximately 60 feet by 60 feet in size. This area conceivably extends beneath a portion of the plant building. Chemicals detected in soil outside this general area are presumed to represent transport by groundwater and subsequent adsorption onto the soil. Four abandoned underground storage tanks, formerly used to store gasoline, diesel fuel, and used oil, appear to have had only an incidental effect, if any, on chemical distribution at the site.

Groundwater underlying the site exceeds the groundwater standards for certain, predominantly, chlorinated volatile organic compounds. Groundwater also exceeds the standards for certain semivolatile organic compounds; however, the extent of the semivolatile organics is more limited. The volatile organic plume, originating at the source area, is present in both

hydrogeologic Units A and B having migrated through natural or anthropogenic discontinuities in the surficial confining bed. Within Unit A, the plume extends from the source area toward the south and discharges to the drainage ditch as evidenced by the presence of similar volatile organics in the surface water. Within Unit B, the plume extends from the source area toward the northwest. The plume underlies the plant building and the leading edge is located about 700 feet from the source area and 150 feet from Springs Road. A lobe of the plume extends from the source area, against the hydraulic gradient, to the south. Vertical migration of the plume is potentially retarded by the Yorktown confining bed. However, a water sample collected from 10 feet into the bed indicated the presence of VOCs.

A second, smaller VOC plume is located east of the employee parking lot. Chlorinated VOCs similar to those identified in the source area are present in Unit A and, to a lesser degree, in Unit B.

The facility's site priority ranking score is 100/B, which is consistent with a high priority site. The ranking is attributed to the location of private, domestic water supply wells within 1,500 feet of the site. Providing municipal water service to these well users could result in a lowering of the risk classification.

Several activities to fulfill remaining information requirements for a comprehensive site assessment should be implemented. In general, these include assessing the southern extent of the plume originating in the source area; assessing the vertical distribution of chemicals at the site; conducting hydraulic testing; and, evaluating the origin and extent of the plume located east of the employee parking lot.

## 1.0 INTRODUCTION

This document is a On-Site Assessment Report for the manufacturing facility leased by Hamilton Beach Proctor-Silex, Inc. (HBPS) in Washington, North Carolina. It is an interim report of site assessment results available to date. The data presented here will be utilized with the results of future investigation to prepare a Comprehensive Site Assessment Report. The On-Site Assessment Report discusses the current understanding of the site hydrogeology and the distribution of chemicals in soil and water at the facility. The On-Site Assessment Report is limited to a description of conditions within the limits of the facility property; adjacent off-site areas were not included in this phase of the assessment.

### 1.1 Purpose and Scope

The scope of the assessment included the physical and chemical assessment of soil, groundwater, and surface water on the facility property. The purpose of this report is to characterize the cause, significance, and extent of any chemicals in soil and water on the site such that the next phase of investigation can focus on investigating relevant off-site areas and on eliminating any remaining data gaps on-site. The report includes the following major elements:

- Site history and source characterization;
- Results of on-site soil and water investigation; and
- Recommendations for future action.

The information presented in this report describes the site and discusses the chemicals present, their probable routes of migration, and their potential impact on any receptors.

## 1.2 Report Organization

The On-Site Assessment Report is organized into two volumes. Volume 1 includes the report text and supporting figures and tables. Section 1.0 of the report is this introduction. Section 2.0 describes the facility, discusses the history of the site, and summarizes the nature of known releases. Section 3.0 identifies potential receptors and addresses migration pathways. Sections 4.0 and 5.0 present the results of the soil and groundwater investigations, respectively. Section 6.0 includes recommendations and Section 7.0 cites references used in preparing the report. Volume 2 includes supporting data in Appendices A through E.

## **2.0 SITE HISTORY AND SOURCE CHARACTERIZATION**

This section describes the site, discusses its operational history since the mid-1960s, presents data pertaining to materials handling practices, and provides other background information relevant to the assessment. The information presented here is based on records currently available at the facility and on the recollection of several long-time employees.

### **2.1 Site Location**

The HB◇PS facility is located at 234 Springs Road (State Road 1509), north of the City of Washington, in Beaufort County, North Carolina (Figures 2-1 and 2-2). The site is bordered on the north by Springs Road; on the south by State Road 1536 and agricultural fields; on the west by several residential and commercial properties; and on the east by woodland. Primary access to the facility is by Springs Road. The facility also has a truck entrance on State Road 1536.

### **2.2 Site History and Description**

The facility and surrounding land parcel are owned by the City of Washington and have been leased to HB◇PS and predecessor companies since the property was first developed. Until 1990, the plant was operated by Hamilton Beach, Inc. The parent company of Proctor-Silex acquired Hamilton Beach in late 1990 and merged the two companies, forming HB◇PS, which has operated the facility since that date.

According to Beaufort County Land Records, the facility property is an irregularly shaped parcel (5677-61-3599) that occupies 39.45 acres. Approximately 30 acres are occupied by the plant building and surrounding grounds. The remaining acreage, located on the east side of a drainage ditch, is woodland. Before the facility was developed, the property is reported to have been farmland and woods. The facility was initially developed in the 1966 and experienced several periods of expansion in 1968 and 1973. Figure 2-3 is a site map depicting major features at the facility.

The original plant building occupies the east end of the present structure; progressively more recent additions occur to the west. The plant building is a single-story structure encompassing approximately 386,000 square feet. It is constructed from concrete blocks with steel supports on a poured concrete foundation. The foundation is slab-on-grade construction except in the rear, or southern, portion of the plant building where the foundation is constructed as an elevated slab on compacted fill to accommodate the truck-loading docks. Consequently, no confined spaces are present in the foundation design for the accumulation of vapors.

The plant building is primarily a large open room with walls existing between older buildings and more recent additions. All manufacturing and assembly operations are conducted in the eastern portion of the plant, which is the original building. Maintenance facilities and shipping and receiving are located on the south side of the plant; the middle of the plant is used for parts servicing, warranty repairs and shipping; and the western portion of the plant is used for warehousing and shipping finished product. The facility's office areas adjoin the northern portion of the original plant building. The building heating and cooling systems are electric. Supplemental heat, if needed in winter, is available using boilers fired by natural gas. Electrical service, water, and sewer service are provided by the City of Washington.

Areas north and west of the plant building are predominately grass covered. Several small locations are landscaped with shrubs, bushes, and flowers. An asphalt-paved lot for employee parking is located on the east side of the plant building. A small portion of the parking lot, near the southeast corner of the plant building, is occupied by several electrical generators owned by the City of Washington. The generators provide electricity to the manufacturing facility during periods of peak demand. Fuel for the generators is stored in an above-ground storage tank (AST) located immediately north of the generators.

Outside facility activities occur in an area located south of the plant building. Access to this area is restricted by a chain-link wire fence with locked or guarded gates. Various portions of the area are paved with concrete and asphalt, covered with gravel, or vegetated in grass. Trucks and trailers are parked on paved areas along the plant's south wall and also on

unpaved areas located farther south. Several smaller buildings and other structures are currently located south of the plant building. They include a guard house, several storage sheds, and a pump house associated with a 289,000 gallon water storage tank used for fire protection. Also located here are electrical transformers that service the facility, cooling towers, a solid waste dumpster, two 550-gallon capacity ASTs containing gasoline and diesel fuel, a 1000-gallon capacity AST containing Liquid Petroleum (LP) gas, and several closed USTs that are described in Section 2.2.2.

A parcel of land located near the southwest corner of the plant building is used exclusively by the City of Washington. This parcel of land is occupied by a 500,000-gallon capacity, elevated water storage tank and a sewage lift station.

Solid waste generated by the facility consists of general production scraps, office waste, floor sweepings, and packaging waste. The waste is placed in an on-site compacting dumpster and removed regularly by a commercial waste hauler for proper disposal in a Subtitle D landfill in Aulander, North Carolina. Metal and cardboard scrap are collected separately and sent off-site for recycling.

Wastewater, consisting of sanitary waste only, is discharged through the municipal sewer system to the City of Washington Wastewater Treatment Plant (WWTP). The facility does not generate process wastewater.

Stormwater at the site is managed under the facility's stormwater permit. Runoff at the facility is collected through a network of lined and unlined surface channels, drop inlets, and subsurface pipes. It discharges into drainage ditches located along the north, east, and south sides of the facility.

### **2.2.1 Manufacturing Process**

The facility is involved in the final assembly, packaging, and warehousing of small, electric household appliances. Manufacturing processes include plastic injection molding and building electronic subassemblies and electronic motors.

### **2.2.2 Chemical Use, Storage, and Handling**

During the course of normal operations, various types of fuels, solvents, resins, cleaning solutions, paints, thinners, adhesives, and sealers were used, and continue to be used, at the facility. Also, some of the chemicals used and the manner in which they were managed have changed over time consistent with industry and regulatory standards. Current chemical use in terms of type and quantity is generally less than during other times in the facility's operating history. This section summarizes relevant information about present and past chemical usage and management at the facility. The locations of all of the storage areas discussed below are illustrated on Figure 2-3.

Diesel fuel and gasoline are currently stored in two 550-gallon ASTs located within a partially covered, concrete, secondary containment area that adjoins the plant wall near the building's southeast corner. Each AST rests on a metal cradle and is fitted with a metering pump for dispensing the fuels. The two ASTs were installed in September 1986 to replace several USTs that were abandoned. In the past, hydraulic oil and motor oil were also dispensed from 55-gallon drums that were staged in the containment area next to the ASTs.

Prior to the installation of the two ASTs, gasoline was stored in one 1000-gallon steel UST and diesel fuel was stored in two 4000-gallon steel USTs. The USTs, which were registered to Waters Oil Company, are buried south of the plant building in the approximate location shown on Figure 2-3. Several fuel dispensers were also reportedly located in this immediate area. The diesel fuel tanks were installed in May 1973. The installation date of the gasoline UST is unknown. In June 1979, a 1000-gallon used oil tank was installed in the general area of the three fuel USTs and registered to Hamilton Beach. In January 1987, with the

concurrency of the Washington Regional Office (WaRO) of the North Carolina Department of Environment, Health, and Natural Resources, Hamilton Beach abandoned the four USTs in-place in general accordance with American Petroleum Institute Guidelines in effect at that time. The USTs were triple rinsed with water after the product had been removed. The tops were then removed and several holes drilled into each bottom. Each tank was then filled with washed sand. All fill pipes were removed and vent pipes cut off and sealed. Subsequently, the top of the USTs were covered with fill material and poured concrete. Table 2-1 summarizes the information currently known about the four USTs.

Until 1984, an 8,000-gallon AST was located adjacent to the south wall of the plant building. It was used to store No. 6 fuel oil for use in the plant boilers before the conversion was made to natural gas. The tank rested on a cradle without secondary containment.

Although no longer used at the facility, 1,1,1-Trichloroethane (TCA) was previously used to clean metal parts in the 1970s and 1980s. Most recently, the TCA was stored in 500-gallon metal containers located next to the vapor degreaser. Prior to 1986, however, TCA was stored in an AST located on a concrete pad adjacent to the south wall of the plant. A concrete secondary containment dike was added to the pad sometime between the late 1970s and early 1980s. TCA was delivered to the AST by tanker truck. A different degreasing solvent, Trichloroethene (TCE), was reportedly used for parts cleaning and stored in the AST before the conversion to TCA was made.

Isopropyl alcohol (IPA) and naphtha were previously used in small amounts to also clean parts and were stored in a dual-compartment AST that had a total capacity of approximately 2000 gallons. Until its removal in 1996, the tank was located within a covered, secondary containment structure next to the hazardous materials storage shed.

Toluene was previously used during the period when motor cores were varnished at the facility. Lacquer thinner was also used for cleanup in several processes. These chemicals, together with varnish, which is still used at the facility, and miscellaneous other materials were stored in drums in the hazardous materials storage shed. The shed consists of a roof over a

poured concrete slab with a fence around the roof supports. Currently, the shed is used to store empty drums. A 1000-gallon AST next to the shed contains LP gas for fueling the fork lift trucks.

Hazardous waste generation at the facility has been greatly reduced through product substitution measures, waste minimization practices, process changes, and a decrease in manufacturing output. Currently, hazardous waste generated at the facility is limited to a small quantity of varnish. It is transported off-site for proper disposal.

Used oil, although not classified as hazardous, was also generated at the facility. The used oil was generated during maintenance of the plant machinery and fork lift trucks and placed into a 1000-gallon UST prior to proper disposal. After the UST was abandoned, the used oil was collected in 55-gallon drums. When a sufficient volume of used oil had been accumulated, it was removed by a commercial transporter for proper off-site disposal.

Hazardous wastes and, later, used oil were reportedly transported in drums from the plant to the hazardous waste storage shed for temporary storage prior to proper off-site disposal. This shed is constructed of concrete block with a ventilated roof and a bermed floor.

### **2.2.3 Known Releases**

Although evidence from the investigations discussed in the following section suggests that several releases to soil and water have occurred at the facility, detailed information is available in only one case. On January 11, 1995, an unknown quantity of oil was accidentally released into the drainage ditch along the south property line. The release occurred during ditch maintenance when a North Carolina Department of Transportation (NCDOT) work crew ruptured the end of one of two pipes that had been formerly connected to the plant's roof drain system. The 12-inch diameter, concrete pipe, which previously drained to the ditch, had been disconnected from the roof drains. When the pipe was broken, the oil was discharged to the ditch. HB◇PS responded to the release by notifying the North Carolina Department of Environment, Health, and Natural Resources, by recovering oil, and by excavating all visibly

affected soil from the drainage ditch. Oil recovered from the release was properly disposed of off-site. The excavated soil was subsequently placed in a plastic-lined and covered stockpile located within a secure area of the facility until the soil was characterized. Analysis of samples collected from the ditch, adjacent soil, and stockpile indicated the presence of petroleum hydrocarbons and volatile organic compounds (VOCs) including, among others, benzene; 1,1,1-Trichloroethane (TCA); 1,1-Dichloroethane (1,1-DCE); Tetrachloroethene (PCE); Trichloroethene (TCE); and cis-1,2-Dichloroethene (cDCE). Analytical results also indicated that the concentration of toxicity characteristic (TC) constituents was below the regulatory levels established for characteristically hazardous waste. The results are summarized in three letter reports entitled, Sampling and Chemical Analysis-Oil Release Incident, Hamilton Beach◇Proctor-Silex, Inc., Springs Road, Washington, North Carolina (Hamilton Beach◇Proctor-Silex, Inc., 1995), Additional Sampling, Chemical Analysis and Excavation-Oil Release Incident, Hamilton Beach◇Proctor-Silex, Inc. Spring Road, Washington, North Carolina (Hamilton Beach◇Proctor-Silex, Inc., 1995a) and Sampling and Analysis of Soil Stockpile, Washington, North Carolina (Radian Corporation, 1995). Following characterization, HB◇PS, with the concurrence of the North Carolina Department of Environment and Natural Resources and the City of Washington, treated the soil by land application on-site. The excavated soil was tilled into native soil located east of the pavement near the northeast corner of the fenced employee parking area.

During groundwater sampling performed in April 1997, a layer of oil resembling the product noted earlier in the drain pipe was observed in well MW-206. Laboratory analysis indicated that the product exhibited petroleum hydrocarbons in both the diesel and motor oil ranges. Subsequently, in May 1998, after the volume of product recovered from the well by periodic manual bailing had diminished, HB◇PS, with the concurrence of the North Carolina Department of Environment and Natural Resources, initiated free product recovery using Aggressive Fluid-Vapor Recovery (AFVR) technology. The AFVR system was applied to well MW-206 on three occasions for a total of 20 hours. Only six gallons of product were recovered together with 1,419 gallons of groundwater suggesting that the volume of recoverable free product at the site is minimal. The volume of product recovered also diminished over each of the three successive events, decreasing from five gallons of product initially to less than one gallon during the most recent event. The AFVR system was also applied to the drain pipe on two

occasions for a total of 2 hours. Approximately 45 gallons of product were recovered together with 3,075 gallons of groundwater.

## **2.3 Previous Investigations**

The following sections present an overview of previous investigations conducted at the site as they relate to the current assessment.

### **2.3.1 Groundwater Assessment**

In 1992, Engineering Tectonics, P.A., under contract to HB◇PS, performed a voluntary subsurface investigation of the facility. The scope of work included the installation of nine monitoring wells and piezometers (PZ-201S, PZ-201D, MW-202, MW-203, MW-204, MW-205, MW-206, PZ-207, and PZ-208) to characterize soil and groundwater underlying the site. Soil samples, collected during well installation, were analyzed for 36 VOCs. Subsequently, water samples were collected from five monitoring wells and two piezometers and were also analyzed for VOCs.

The results of the assessment were compiled in a document entitled Groundwater Assessment, Hamilton Beach-Proctor Silex, Washington, North Carolina (Engineering Tectonics, P.A., 1993) and reported to the North Carolina Department of Environment, Health, and Natural Resources. The analytical results indicated the presence of six VOCs in the soil. Trichloroethane (TCA) was the principal VOC detected in the soil. Reported TCA concentrations were highest in soil collected from boring MW-206, located near a former above-ground solvent storage tank. The analytical results also identified 16 chlorinated and non-chlorinated VOCs in groundwater. Concentrations were generally highest in the water sample collected from MW-206. Principal VOCs detected included 11-DCA, 1,1-Dichloroethene (11-DCE), TCA, and TCE at concentrations of 89,000; 218,000; 635,000; and 22,300 parts per billion (ppb), respectively.

The groundwater assessment report characterized the shallow geology at the site as interbedded sands and clays. Groundwater was measured at shallow depths and was reported to flow generally eastward with minor components of northeastward flow in the northeastern corner of the site and southeastward flow in the southwestern portion of the property. Subsequent investigation suggests that groundwater may flow in different directions within the various units that comprise the aquifer system at the site.

Based on the analytical results included in the groundwater assessment report, a Notice of Violation (NOV) was issued to HB◇PS by the WaRO on March 15, 1993. Incident Number 14338 was assigned to the site.

### **2.3.2 Groundwater Sampling**

In 1997, water samples were collected from the wells by Radian International LLC (Radian) and analyzed for VOCs. The results are described in the report entitled, Results of Groundwater Sampling: April 1997 for the Hamilton Beach Proctor-Silex Washington, North Carolina Facility (Radian International LLC, 1997) and were reported to the North Carolina Department of Environment, Health, and Natural Resources. The analytical results for the groundwater samples were generally consistent with those reported in 1992. However, as discussed previously, a layer of oil was observed on the water surface in well MW-206.

### **2.3.3 Limited Site Investigation**

In early 1998, Groundwater Management Associates, Inc. (GMA), under contract to HB◇PS and the City of Washington, conducted a limited site investigation. The scope of work included advancing four exploratory borings; installing seven monitoring wells (MW-209 to MW-215); identifying adjacent surface water features and proximal water-supply wells; sampling and analyzing soil, surface water, the monitoring wells, and selected water-supply wells; and, evaluating the hydrogeology of the site

The results of the investigation were summarized in a document entitled, Limited Site Investigation, Hamilton Beach Proctor-Silex Facility, 234 Springs Road, Washington, Beaufort County, NC (Groundwater Management Associates, Inc., 1998) and the results were reported to the North Carolina Department of Environment and Natural Resources. The soil and groundwater analyses confirmed the earlier results and also indicated that the areal distribution of VOCs in groundwater extends northward beneath the plant building and southward to the drainage ditch located adjacent to the south property line. The results also suggested that the vertical distribution of VOCs in groundwater extends to a depth of at least 38 feet. Laboratory analyses also indicated that no VOCs were detected in the samples collected from the water-supply wells.

The investigation also identified two hydrogeologic units within the upper 34 feet of deposits underlying the site. The units are separated by a relatively impermeable clay layer and each unit is characterized by a distinct hydrogeologic regime. The presence of the two units influences groundwater flow and chemical distribution patterns at the site.

#### **2.3.4 Air Monitoring Survey**

In May 1998, Health & Hygiene/ELB, under contract to HB◇PS, sampled ambient air at the facility to confirm that no exposure pathway exists between the VOCs detected in soil and groundwater and the workplace atmosphere. Sampling points were selected based on their locations relative to the source area and to the distribution of VOCs in groundwater. Two air samples were collected near floor level from points located close to the source area. Seven air samples were collected at approximate breathing zone height from other facility locations. All of the samples were analyzed for vinyl chloride and five other VOCs that previous investigations had identified as principal constituents in soil and groundwater. Laboratory results were below the method detection limits for the analytes in all of the air samples, indicating that there is no pathway between the VOCs present in soil and groundwater and the workplace atmosphere. The survey is described in a letter report entitled, Industrial Hygiene Survey Report, Hamilton Beach Proctor Silex, Washington, NC (Health & Hygiene/ELB, 1998).

## **2.4 Source Characterization**

Based on the site's description and operating history and on the results of previous investigations, it is apparent that the chemicals detected in soil and groundwater originated from multiple sources. Current data indicate that soil and water at the site exhibit constituents of both petroleum hydrocarbons and degreasing solvents. A potential source of the solvents is the former AST that contained TCE and, later, TCA. The source of the petroleum constituents is unknown but may be one or more of the various ASTs and USTs that are, or have been, utilized at the site. The nature, volume, and time period of any releases associated with these potential sources is also unknown. Regardless, they have created a "secondary source" within the soil surrounding the former location of the solvent AST. The principal area of affected soil is located adjacent to the south wall of the plant building, near the southeast corner, and in the remainder of this report is referred to as the source area.

## **2.5 Site Priority Ranking and Cleanup Goals**

The WaRO initially assigned the facility a site priority ranking score of 50/E, which is consistent with a low priority site. On December 15, 1997, the WaRo changed the facility's priority ranking score to 100/B, which is consistent with a high priority site. The higher priority ranking was attributed to the location of private, domestic water supply wells within 1,500 feet of the site.

Due to the presence of chemicals in groundwater, the site does not meet the criteria for using the North Carolina Department of Environment and Natural Resources. Site Sensitivity Evaluation (SSE) process to calculate final cleanup levels for Total Petroleum Hydrocarbons (TPH) in the soil. Instead, preliminary soil cleanup levels applicable to the site are the default values of 10 parts per million (ppm) for purgeable (gas) TPH and 40 ppm for extractable (diesel) TPH, and 250 ppm for oil and grease (O&G). However, selecting appropriate cleanup goals (CUG) for soil is complicated by the added presence of non-petroleum constituents. Ultimately, cleanup goals must also address these constituents, suggesting that application of a site-specific leaching model will probably be required.

Preliminary CUG for Class GA (potentially potable) groundwater are the standards established under North Carolina Administrative Code (NCAC) Title 15A, Subchapter 2L, Section .0200 (2L Standards). Numerical 2L standards have currently been established for approximately 100 substances under NCAC. For substances which are not naturally occurring and for which no numerical standard has been established, a narrative standard applies. The narrative 2L Standard prohibits any such substances in detectable concentrations in groundwater.

## **2.6 Site Assessment Overview**

The current site assessment began in March 1998 using an iterative process to first, verify the presence of chemicals in soil and water and then, to determine their distribution. Field activities were performed in several phases so that data collected in an earlier phase could be used to plan subsequent phases of work. Field activities included, but were not limited to, stratigraphy profiling and petroleum hydrocarbon screening using combined cone penetrometer techniques (CPT) and a fuel fluorescence detector (FFD); soil and groundwater sampling utilizing direct push technology (DPT); well installation using DPT methods; lithologic logging; surveying; water-level measurement; and, groundwater sampling of monitoring wells. Table 2-2 is a chronological summary of principal field activities and the rationale for conducting them. Additional details regarding field activities are included in Section 4.0, Soils Investigation and Section 5.0, Groundwater Investigation.

### **3.0 RECEPTOR INFORMATION**

This section discusses water resources in the area, identifies subsurface structures, and describes adjacent land use.

#### **3.1 Water Supply Wells**

Eight domestic water-supply wells were identified within a 1,500-foot radius of the apparent source area for the discharge or release (Groundwater Management Associates, Inc., 1998). The locations of these wells is depicted on Figure 3-1 and available identifying information is summarized in Table 3-1.

#### **3.2 Public Water Supplies**

The facility and surrounding areas are served by the City of Washington municipal water supply system. Therefore, an alternate water supply is available to neighboring residents that currently depend on domestic wells as their source of water. Groundwater is the sole source of water for the municipal water supply system. None of the municipal wells are located within 1,500 feet of the source area for the discharge or release.

#### **3.3 Surface Water**

A drainage ditch is located along the east side of the active portion of the site and along approximately 600 feet of the site's south side. According to the North Carolina Department of Environment and Natural Resources, the ditch is a Class "C" surface water. During precipitation events, the ditch receives both sheet flow from adjoining land areas and channeled flow through several drain pipes and open channels that discharge from various areas of the site. Groundwater also discharges to the ditch and provides baseflow. The ditch ultimately enters Cherry Run approximately 9,500 feet downstream of the site.

Although there are no other streams or surface water features within the boundaries of the site, several unnamed tributaries to Cherry Run are located within 1,500 feet of the site as illustrated on Figure 2-1.

There are no surface water intakes for public water supplies located within 0.5 mile of the site.

### **3.4 Wellhead Protection Areas**

No wellhead protection areas have been established within 1,500 feet of the site.

### **3.5 Deep Aquifers**

The source area for the release or discharge at the site is in a recharge area for the Castle Hayne Aquifer System. Relevant information regarding the geology and hydrology of the system is discussed in Sections 4.0 and 5.0.

### **3.6 Subsurface Structures**

The principal subsurface structures at the site are utility lines including water lines, gas lines, and storm drains. The approximate locations of these utilities are illustrated on Figure 3-2. No design plans or as-built drawings are available to indicate construction details such as the depth of installation or the use of graded bedding material. The figure also illustrates the former locations of the drainage ditch and several drainage canals before they were relocated or abandoned during the development of the site.

No plans showing the location of sanitary sewer lines are available at the facility. Plans showing the location of subsurface electrical or telephone lines are also unavailable; however, field observations made during the site assessment suggest that these lines underlie portions of the site, particularly north of the plant building.

**3.7****Land Use and Adjacent Property Owners**

Land surrounding the facility is primarily agricultural mixed with commercial, industrial, and residential uses. The local airport is located approximately one mile east of the facility. A commercial lender, a propane gas distributor, and a heavy equipment dealer are located along US Route 17, west of the site. Private residences, located along Springs Road, adjoin the site along the north and west. State Road 1536 borders the site on the south. Other neighboring land use is agricultural. A map illustrating the parcels of land located immediately adjacent to the site was prepared from Beaufort County, North Carolina Land Records. Locations of the parcels are illustrated on Figure 3-3, and ownership of the parcels is identified in Table 3-2.

## 4.0 SOILS INVESTIGATION

This section includes an overview of the technical approach implemented during the soils investigation; a discussion of the soils and geologic characteristics of the site; and a summary of chemical distribution in the soil. A summary of field procedures used in the soil investigation is provided in Appendix A.

### 4.1 Overview of Technical Approach

Soil and geologic conditions were initially assessed by using CPT/FFD to profile the soil stratigraphy and to screen for Total Petroleum Hydrocarbon (TPH) distribution in the soil. The CPT was used to develop detailed geologic logs for interpreting the stratigraphy of the underlying deposits and for identifying the occurrence of potential confining beds, in particular. The CPT is a combination of geotechnical and environmental sensors that is hydraulically pushed into the ground. Data are collected in-situ and transmitted electronically to an on-board computer for analysis and display. The CPT probe measures point resistance, sleeve friction, and pore water pressure. From this data, the computer determines a range of soil parameters based on established correlations. Soil type is identified from the ratio of sleeve friction to point resistance, and soil strength is related to point resistance. Similarly, water table depth can be estimated by correlating the instrument depth with the measured hydraulic head, and measurement of excess pore pressure generated by the penetration process can identify low permeability layers. Use of a CPT equipped with a FFD can simultaneously measure TPH concentrations in the soil as the tool is advanced into the ground.

Fourteen CPT/FFD borings, C1 and C5 to C18, were advanced to determine the site stratigraphy to a depth of 52 feet. Background soil sampling locations, C2 through C4, were omitted from CPT/FFD profiling due to access constraints resulting from soft ground. At profiling locations C8, C10, and C16, soil samples were collected from between 43 and 48 feet below land surface to verify the presence of a horizontally continuous, low permeability, clay deposit indicated by high pore water pressure readings. The profiling locations, which included areas to the north, east, and south of the plant building, are illustrated on Figure 4-1. Twenty

CPT/FFD borings (F1 to F20) were also advanced to a depth of 10 feet within the source area to specifically screen the soil for levels of TPH exceeding 100 ppm. These profiling locations are illustrated on Figure 4-2. Subsequently, DPT was utilized to collect soil samples at selected locations for laboratory analysis. Samples were collected from three background locations, C2 to C4, illustrated on Figure 4-1. Samples were also collected from six locations in the source area as illustrated on Figure 4-2. Sampling points in the source area were selected primarily on the basis of the FFD results. Soil samples were analyzed as summarized in Table 4-1.

CPT/FFD boring logs are included in Appendix B. Qualified analytical data are provided in Appendix C and raw analytical data are included in Appendix D. Results of soil sample analysis are discussed later in Section 4.4.

#### **4.2            Regional Geology**

Beaufort County, North Carolina is located in the east-central part of the Coastal Plain Physiographic Province. The region is characterized by relatively flat, low, topography with many wetland features. Surrounding areas are drained by the Pamlico and Pungo Rivers and their tributaries, which are estuarine in the lower reaches. Surface elevation in the county ranges from approximately 70 feet above sea level in the southwestern part of the county to less than five feet above sea level in the eastern part.

The region is underlain by a wedge of sedimentary deposits consisting of sand, silt, clay, limestone, and various combinations of these lithologies. The sediments thicken in a southeasterly direction attaining a maximum thickness of approximately 3,000 feet in the eastern part of the county (Robison, 1977) and a thickness of about 1,000 feet near Washington (Sumsion, 1970). The sediments lie on crystalline metamorphic and igneous bedrock consisting of schist, gneiss, granite, and slate (Brown, 1959). The sediments, which range in age from Cretaceous to Recent, can be classified into a number of stratigraphic units or formations. From oldest to youngest, these stratigraphic units are known to include the Middendorf (formerly Tuscaloosa) Formation; Black Creek Formation; Peedee Formation; Beaufort Formation; Castle Hayne Formation; Yorktown Formation; and, undifferentiated surficial deposits. A wedge of

sediments consisting of basal deposits of Early Cretaceous Age may underlie the Middendorf Formation beneath parts of the region; however, as cited by Brown (1959), the extent of these Early Cretaceous deposits is uncertain. Also, the Pungo River Formation, important for its phosphorite beds, underlies parts of the region east of Washington (DeWiest et al., 1967).

Brown (1959) reports that Early Cretaceous deposits and sediments of the Late Cretaceous Middendorf Formation, unconformably overlie bedrock in the region. The early Cretaceous deposits were identified in cuttings from a well drilled in Greenville. Although their extent is unknown, the deposits comprising this unnamed unit are presumed to be widespread throughout the region. Swain and Brown (1964) report that the formation consists primarily of sand and silt interbedded with green and brown silty clay. The formation is estimated to be between 150 and 200 feet thick near Washington and to dip toward the southeast at about 20 feet per mile.

Where the Early Cretaceous deposits are absent, the bedrock is unconformably overlain by the Middendorf Formation of Late Cretaceous Age. The lithology of the formation is highly variable but, in general, is characterized by interbedded lenses of pinkish to drab-gray micaceous sand and clay (Brown, 1959). The upper 150 feet of the deposits consists principally of lenticular clay. Coarse- to medium-grained sand and gravel occur throughout the formation but are more common below the upper 150 feet of the deposits. Sumsion (1970) describes the formation as grading upward from fine sand and silt to coarser sand interbedded with silt and clay. Brown (1972) estimates that the top of the formation is about 650 feet below sea level near Washington. The strike of the Middendorf Formation is northeast and the dip is estimated at more than 20 feet per mile toward the southeast (Brown, 1959).

Approximately 300 feet of the Late Cretaceous Black Creek Formation unconformably overlies the Middendorf Formation near Washington (Brown, 1972). The formation, which includes the upper Snow Hill member and a lower unnamed member, varies in composition, but generally consists of gray lenticular sand interbedded with dark gray to black micaceous clay. The unnamed member commonly contains lignitized wood fragments and some glauconite, and the Snow Hill member contains thin shell beds and glauconite. In its upper part,

the Black Creek Formation is lithologically similar to, and difficult to distinguish from, the overlying Peedee Formation described below. The top of the formation is about 300 to 350 feet below sea level near Washington (Brown, 1972 and Sumsion, 1970). The strike of the Black Creek Formation is reported to be toward the east-northeast in the subsurface (Brown, 1972). The dip of the formation is difficult to determine due to the nature of the beds but has been estimated to vary from 11 feet per mile (Sumsion, 1970) to 15 feet per mile (Brown, 1959) in adjoining Pitt County.

Approximately 120 feet of the Cretaceous Peedee Formation lies conformably on the Black Creek Formation near Washington (Brown, 1972). The Peedee Formation consists of lenticular beds of dark green or gray, medium- to coarse-grained quartz sand interbedded with thinner layers of clay, dark gray silt, and indurated shell. The top of the formation is about 230 feet below sea level near Washington (Brown, 1972). The strike of the Peedee Formation is toward the northeast and the dip is southeast at about 10 feet per mile (Sumsion, 1970) to 15 feet per mile (Brown, 1959) in adjoining Pitt County.

The Beaufort Formation of Paleocene age unconformably overlies the Peedee Formation. The Beaufort Formation, which is about 35 to 60 feet thick near Washington (Brown, 1959 and 1972), consists primarily of fine glauconitic sand interbedded with thin layers of clay, silt, and marl. Near Washington, the top of the formation is about 125 feet (Sumsion, 1970) to 170 feet (Brown, 1972) below sea level. The dip of the Beaufort Formation is toward the east at about 14 feet per mile in adjoining Pitt County (Sumsion, 1970).

The Castle Hayne Limestone of Eocene age unconformably overlies the Beaufort Formation. The thickness of the Castle Hayne Limestone increases from about 60 feet thick in the western portion of Beaufort County to about 250 feet near its eastern border (Brown, 1959). Near Washington, the formation is between 75 feet (Sumsion, 1970) and 130 feet thick (Brown, 1972). The Castle Hayne Limestone varies in lithology and consolidation. It consists of interlayered gray to white shell limestone, marl, fine- to medium-grained calcareous sand, and clay. The top of the formation is about 35 feet (Brown, 1972) to 50 feet (Sumsion, 1970) below

sea level in the vicinity of Washington. The regional strike of the formation is east-northeast and the dip is toward the southeast at 10 to 30 feet per mile (Brown, 1959).

The Yorktown Formation of Miocene age unconformably overlies the Castle Hayne Limestone. The thickness of the Yorktown Formation is about 30 feet near Washington, but may reach a thickness of 200 feet in eastern parts of Beaufort County (Brown, 1959 and 1972). Brown (1959) describes the lower part of the Yorktown Formation as massive interbedded marine clays. In the upper part, it is composed of light-colored sandy shell beds and marls. Similarity of the upper part of the formation with the overlying younger deposits makes distinguishing between them difficult (Sumsion, 1970). The top of the formation is about 35 feet below sea level in the vicinity of Washington (Brown, 1972). The formation strikes northeastward and dips toward the southeast at less than 25 feet per mile (Brown, 1959).

Undifferentiated surficial deposits of varying origin and age (Pleistocene to Recent) generally blanket the region and unconformably overlie the Yorktown Formation. The surficial deposits consist of sand, sandy clay, clay, and gravel. The unit ranges from a few feet to about 60 feet in aggregate thickness throughout the region (Brown, 1959). Near Washington, the unit is about 35 feet thick (Brown, 1972). The deposits exhibit little stratification other than localized cross-bedding.

#### **4.3 Site Soils and Geology**

This section describes the soils and geology at the facility. Interpretation of subsurface conditions at the site is based on CPT boring logs (Appendix B) developed during the current site assessment and on observations noted and recorded during previous subsurface investigations. Consequently, the discussion is limited to the upper 52 feet of sediments penetrated at the site.

#### **4.3.1 Soils**

Soil at the site has been mapped as Urban land (Kirby, 1995). This classification describes areas where the original soil has been altered by cutting, filling, and grading such that a soil series is not recognized. However, soil observed during the subsurface investigations appears characteristic of the Craven fine sandy loam, Leaf silt loam, and Lenoir loam series, which occur over large areas surrounding the site. The soil at the site consists primarily of complexly interbedded silty to clayey sand, sandy to clayey silt, sandy to silty clay, and clay. The color of the soil is also variable ranging from light- to dark-gray to dusky brown with frequent orange mottling in the subsoil.

#### **4.3.2 Geology**

The subsurface geology of the upper 52 feet of sediments underlying the site is characterized by two stratigraphic units. These units, from lower to upper, are the Yorktown Formation and the overlying undifferentiated surficial deposits. This sequence of stratigraphy is consistent with regional subsurface conditions described in Section 4.2.

The lower 10 to 20 feet of sediments penetrated at the site represent the Yorktown Formation. The top of the formation occurs approximately 30 to 40 feet below land surface and is characterized by a transition zone of silty sand interbedded with clay, grading downward to predominantly clay. The transition zone is, itself, up to 10 feet thick as shown on cross-sections prepared for the site. The locations of cross-sections A-A' to C-C' are depicted on Figure 4-3 and the cross-sections are illustrated on Figures 4-4 to 4-6. Below the transition zone, the formation consists of dark greenish gray clay and silty clay containing gastropod shells and shell fragments. The formation is continuous across the site having been encountered in all of the deeper CPT borings advanced during the current site assessment and also having been noted in a deeper boring drilled during a previous investigation (MW-201D). The lower extent and thickness of the unit are not known.

Undifferentiated surficial deposits form the uppermost stratigraphic unit at the site. The deposits, which extend from land surface to the top of the Yorktown Formation, are about 30 to 40 feet thick as illustrated in cross-sections A-A' (Figure 4-4) to C-C' (Figure 4-6). From land surface to a depth of approximately 15 feet, the surficial deposits consist of complexly interbedded sediments that range in texture from fine sand to clay. Between a depth of approximately 5 and 15 feet below land surface, the finer-grained sediments form a layer, ranging from 3 to 12 feet thick, that appears to be continuous beneath the site. Below this layer, the surficial deposits are characterized by light gray to green, predominantly silty sand interbedded with light to medium gray, fine- to medium-grained sand, and some clay lenses. Below a depth of approximately 22 feet the deposits contain shells and shell fragments. The shell-bearing deposits could represent sediments of Late Miocene age, which are difficult to distinguish from the younger, overlying deposits; consequently, regardless of age, they are included with the surficial deposits in this report.

#### **4.4 Results of Soil Sample Analysis**

Soil samples were collected at several background locations and at the source area and analyzed for the parameters listed in Table 4-1. The results of these analyses are discussed below. Each subsection addresses the results for a specific analytical group and is supplemented by a table summarizing the qualified laboratory results. Maps illustrating the distribution of selected chemicals in the soil are included where appropriate. Data upon which interpretations are made were evaluated based on USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (1994). Qualified analytical data and raw analytical data are included in Appendices C and D, respectively. All results, other than for TCLP analysis, are reported on a dry weight basis.

##### **4.4.1 Total Petroleum Hydrocarbons and Oil & Grease**

Analytical results are included in Table 4-2. Figures 4-7 through 4-9 are maps of the area illustrating the sampling locations and the distribution of purgeable TPH, extractable TPH, and O&G, respectively. In various samples, the petroleum constituents detected in the soil

appeared to be weathered, causing the laboratory to report "unidentified organics" in conjunction with, or instead of, TPH in the standard gasoline or diesel ranges. For several of the purgeable TPH analyses, the laboratory noted the presence of a multi-component hydrocarbon eluting in the established integration range for gasoline which did not correspond to known gasoline patterns. Likewise, for some of the extractable TPH analyses, the laboratory noted the presence of heavy, multi-component hydrocarbons eluting late in the specified integration range for diesel or lube oil, but not matching the profile of any known standard. Consequently, a conservative approach was adopted in evaluating the TPH data. In this report, purgeable TPH represents the sum of gasoline species and other unidentified organics. Similarly, extractable TPH represents the sum of all listed species and other unidentified organics.

The results of assessment sampling indicate that purgeable TPH concentrations exceeded the CUG of 10 mg/Kg in three of 11 samples analyzed; extractable TPH exceeded the CUG of 40 mg/Kg in two of 11 samples analyzed; and, O&G exceeded the CUG of 250 mg/Kg in one of 11 samples analyzed. For extractable TPH, the exceedances were reported in both the surface and subsurface samples. For O&G, the exceedance was reported only in the subsurface sample. Exceedances for both extractable TPH and O&G are limited to the general area of the former fuel oil AST. For purgeable TPH, two of the exceedances were reported in the surface and subsurface samples near the former AST. The third exceedance was reported only in the subsurface sample at a location more distant from the former AST. Therefore, purgeable TPH detected at this sampling point (F21) may represent the advection of dissolved petroleum constituents and adsorption of the constituents to the soil.

#### **4.4.2 Volatile Organic Compounds**

Analytical results are summarized in Table 4-3. Figures 4-10 through 4-15 are maps of the area illustrating the sampling locations and the distribution of six VOCs for which "soil-to-groundwater" CUGs have been established (North Carolina Department of Environment and Natural Resources, 1998). The results of assessment sampling indicate that exceedances of the CUGs for benzene, ethylbenzene, naphthalene, and 11-DCE are limited to soil in the general area of the former solvent AST and the former fuel oil AST. Concentrations of cDCE and

12-DCA that exceed the CUGs are more widely distributed in the soil. Both VOCs were detected near the former locations of the ASTs but also extend at least 40 feet to the west (F11) and south (F17). No exceedances were reported for 11-DCA in any of the 11 samples collected from the source area.

Concentrations of VOCs for which no "soil-to-groundwater" CUGs have been established were compared to proposed "soil-to-groundwater" (S3:G-1) target concentrations tabulated in the draft North Carolina Risk Analysis Framework-Methods for Determining Contaminant Target Concentrations in Soil & Groundwater (North Carolina Department of Environment, Health, and Natural Resources, 1997). Five VOCs were reported in one or more soil samples at concentrations exceeding the proposed S3:G-1 target concentrations. These VOCs included carbon tetrachloride, tetrachloroethene (PCE), TCA, TCE, and vinyl chloride (VC). Exceedances for carbon tetrachloride, PCE, and TCE were reported only in soil samples from location F18; exceedances for TCE were reported in soil samples from locations F17 and F18; and exceedances for VC were reported in soil samples from locations F6, F11, F14, and F18.

#### **4.4.3 Semivolatile Organic Compounds**

Analytical results are summarized in Table 4-4 and sampling locations are illustrated on Figure 4-2. A number of SVOCs were detected, most in samples collected from the area near the former ASTs. However, other than for naphthalene, the concentrations of no SVOC exceeded its established "soil-to-groundwater" CUG. Naphthalene is also a target analyte for VOCs and its occurrence at the site was discussed in the preceding section.

Concentrations of SVOCs for which no "soil-to-groundwater" CUGs have been established were compared to proposed S3:G-1 target concentrations. No SVOCs were reported at concentrations exceeding the proposed S3:G-1 target concentrations.

#### 4.4.4 Metals

Analytical results for three background surface soil samples (C2A, C3A, and C4A) and three background subsurface soil samples (C2B, C3B, and C4B) are summarized in Table 4-5. Sampling locations are illustrated on Figure 4-1. Analytical results for 11 samples collected in the source area are summarized in Table 4-6 and sampling locations are illustrated on Figure 4-2. As expected, a majority of the target analytes were detected in the samples because metals are naturally occurring constituents of soil. Lead is the only metal for which a "soil-to-groundwater" CUG has been established and it was not exceeded in any of the samples.

Concentrations of metals for which no "soil-to-groundwater" CUGs have been established were compared to proposed S3:G-1 target concentrations. Four metals were reported in one or more soil samples at concentrations exceeding the proposed S3:G-1 target concentrations. These metals included iron, chromium, mercury, and arsenic. Exceedances for iron were reported in soil samples from all locations and all depths, including background samples. These results confirm the ubiquitous character of naturally occurring iron in surficial deposits throughout the region.

The proposed S3:G-1 target concentration for chromium was exceeded in subsurface samples collected from locations F6 and F17. However, the concentrations reported for both samples were below the chromium background value calculated as two times the average concentration of the background samples (Office of Solid Waste and Emergency Response, 1989).

The concentration of mercury reported in the subsurface sample from location F6 and the concentration of arsenic reported in the subsurface sample from location F17 were above their respective proposed S3:G-1 target concentrations. The concentrations of both metals were also above their background values. However, neither metal has been detected in groundwater above the established standards. Therefore, a single detection of the metals at elevated concentrations is not considered significant.

#### **4.4.5 Total Organic Carbon and pH**

Three background subsurface soil samples (C2C, C3CB, and C4C) were collected and analyzed for Total Organic Carbon (TOC) and all soil samples were analyzed for pH. These parameters are useful in evaluating various potential remedial alternatives. They are included in this report for information purposes. Analytical results are summarized in Table 4-7 and sampling locations are illustrated on Figures 4-1 and 4-2.

#### **4.4.6 Toxicity Characteristic Constituents**

Sample F18B was collected from that part of the source area that exhibited the highest concentration of chemicals detected in the soil. The sample was analyzed for the TC constituents to compare their concentrations to regulatory levels that classify a waste as characteristically hazardous for toxicity. The results are summarized in Table 4-8 and the sampling location is illustrated on Figure 4-2. Concentrations of all TC constituents were reported below their respective regulatory levels.

## 5.0 GROUNDWATER INVESTIGATION

This section includes an overview of the technical approach implemented during the groundwater investigation; a discussion of regional and site-specific hydrogeologic conditions; and, a summary of chemical distribution in groundwater underlying the site. A summary of field procedures used in the groundwater investigation is provided in Appendix A.

### 5.1 Overview of Technical Approach

Groundwater at the site was assessed through a program of groundwater screening for VOCs; monitoring well installation; water-level measurement; and, water sampling and analysis.

Initially, five surface water samples (W81 to W82) were collected from the ditch that adjoins the facility along the south and east to assess whether groundwater from the facility is discharging to surface water. One sample (W85) was collected at an upstream point to establish the quality of water flowing onto the site and a second sample (W81) was collected at a downstream point to determine the quality of surface water flowing off the site. Three additional surface water samples were collected between the up gradient and down gradient sampling points to assess the approximate location and possible extent of any chemicals in groundwater that may be discharging to the stream. Sample locations are illustrated on Figure 5-1 and a summary of the sample analyses is listed in Table 5-1.

Subsequently, groundwater screening was performed using DPT to collect discrete water samples for immediate analysis of VOCs by field gas chromatograph/mass spectrometer (GC/MS). This screening technique permitted real-time identification of chemicals present in the groundwater and allowed subsequent sampling points to be selected on the basis of previous results. Selected VOCs, typical of the petroleum and solvent constituents that were previously detected in the groundwater, served as indicators of chemical distribution and results were used to select locations for permanent monitoring wells. As depicted on Figure 5-1, screening samples were collected from the CPT stratigraphy profiling locations and from several

other locations (G1 to G3) indicated by the screening results. Two to three vertically separated samples were collected at each location as listed in Table 5-2. Replicate samples (W91 to W93) were collected at three locations and submitted for laboratory analysis to confirm the screening results.

Four well pairs, each consisting of a shallow well and a deeper well, were installed at locations selected based on the results of the groundwater screening. The purpose of the wells (MW-216 to MW-223) is to provide permanent sampling points to characterize groundwater quality and to allow future groundwater monitoring, as necessary. The use of paired wells, installed at different depths, allows assessment of vertical chemical distribution and measurement of vertical hydraulic gradients that can influence chemical migration. Each well was installed by DPT according to 15A NCAC Subchapter 2C Section .0200. Following installation, all wells were developed. Well construction records are included in Appendix E. The eight wells supplemented 16 wells installed previously at the site. (Four of the original nine wells were designated as piezometers; they are referred to as monitoring wells in this report.) The locations of all monitoring wells at the site are illustrated on Figure 5-2 and a summary of well construction information is included as Table 5-3.

The eight new wells and wells MW-201S, -206, and -207 were sampled during this assessment. A summary of the groundwater sample analyses is listed in Table 5-1. Qualified analytical data are provided in Appendix C and raw analytical data are included in Appendix D. Results of groundwater analysis are discussed in Section 5.4.

## **5.2 Regional Hydrogeology**

The stratigraphic units described in Section 4.0 can be grouped into several distinct hydrogeologic units on the basis of their hydrologic properties. The region's principal hydrogeologic units include, from deepest to shallowest, the Cretaceous aquifer system, the Beaufort aquifer, the Tertiary limestone aquifer, the Yorktown confining layer, and the surficial aquifer. This section briefly describes these hydrogeologic units and Table 5-4 correlates the units with the stratigraphic units that comprise them.

The Cretaceous aquifer system includes interbedded sand, silt, and clay deposits in the unnamed Early Cretaceous unit and in the Middendorf, Black Creek, and Peedee Formations of Late Cretaceous age. Sumsion (1970) identified four individual aquifers in the system, each separated by extensive beds of clay. Groundwater in the aquifers is confined and recharge occurs as leakage from overlying units. The aquifer system is more than 700 feet thick near Washington; however, the depth to brackish water is about 200 feet (Robison, 1977). Therefore, near Washington, only the upper aquifer in the system, which occurs in the Peedee Formation, is capable of supplying potable water. Because of the thinness and moderate permeability of the fresh-water zone, individual wells are not anticipated to yield above 100 gallons per minute (Robison, 1977). Groundwater obtained from depths greater than 150 feet is soft and of good quality (Brown, 1959).

The Beaufort aquifer is comprised of glauconitic and argillaceous sands, indurated shell, and impure limestone with the glauconitic sand beds being the most productive deposits (Brown, 1959). Groundwater in the aquifer is confined and recharge occurs as leakage from overlying units. The yield of individual wells completed in the Beaufort aquifer ranges from 15 to 150 gallons per minute. The quality of groundwater in the Beaufort aquifer is soft (Sumsion, 1970).

The Tertiary limestone aquifer is comprised of the Castle Hayne Limestone and associated calcareous sand deposits. Groundwater in the aquifer is confined and recharge occurs as leakage from overlying and underlying units (Brown, 1959). The aquifer ranges from about 50 to 100 feet thick near Washington to about 400 feet thick in eastern part of Beaufort County. The aquifer is highly productive throughout much of the region where it occurs in sufficient thickness. Small diameter wells yield from 5 to 150 gallons per minute; where the aquifer is thickest, large diameter gravel-packed wells yield up to 1000 gallons per minute (Brown, 1959). Groundwater in the aquifer is very hard, exhibits moderate to high levels of dissolved solids, and moderately high pH. The water commonly contains hydrogen sulfide gas and excessive iron (Robison, 1977).

Although thin sand lenses and sand beds associated with the Yorktown Formation can provide water to wells, thick marine clay deposits that predominate the unit form a confining bed underlying the surficial aquifer.

The surficial aquifer is the uppermost hydrogeologic unit in the region. It consists of interbedded sand and clay deposits. Groundwater in the aquifer is unconfined and recharge to the surficial aquifer occurs over broad interfluvial areas throughout the region. The yield of wells completed in the surficial aquifer is between two and ten gallons per minute (Brown, 1959). Groundwater in the surficial aquifer is typically corrosive and contains excessive iron.

### 5.3 Site Hydrogeology

The hydrogeologic units discussed in the preceding section are all represented at the facility. However, because the scope of the site assessment focused primarily on the surficial deposits, units below a depth of 52 feet were not investigated. Also, the necessity to avoid unintentionally connecting separate, isolated units precluded drilling to any significant depth below the bottom of the surficial deposits. Nevertheless, a brief description of the Yorktown hydrogeologic unit and its function as a confining bed underlying the facility precedes the more detailed discussion of the hydrogeologic units within the surficial deposits.

The clay deposits of the Yorktown Formation described in Section 4.3.2 comprise a confining bed overlying the Tertiary limestone aquifer. Due to its high content of clay and silt, the Yorktown confining bed exhibits a lower hydraulic conductivity than either an overlying semi-confined aquifer within the surficial deposits or the underlying Tertiary limestone aquifer. Based on a textural description of the deposits, the hydraulic conductivity of the confining bed is estimated to be low to very low, on the order of  $10^{-3}$  ft/day or less (Brassington, 1988). Consequently, the confining bed retards the flow of groundwater through it and essentially isolates the two aquifers from each other. As illustrated in cross-sections A-A' (Figure 4-4) to C-C' (Figure 4-6), the confining bed is continuous beneath the site with the top of the bed occurring approximately 40 feet below land surface. Because the clay deposits were not completely penetrated during the current or preceding investigations the thickness of the confining

bed at the site is unknown. Available data indicates that it is at least 10 feet thick throughout the site and as much as 20 feet thick at some locations.

On a local scale, three hydrogeologic units have been identified within the surficial deposits. These units include, from upper to lower: a shallow groundwater reservoir, a shallow confining bed, and a semi-confined aquifer.

The uppermost hydrogeologic unit coincides with the complexly interbedded fine sand to clay deposits that comprise the upper five to ten feet of sediments underlying the site. The unit, which is identified as Unit A in this report, is not considered to be an aquifer due to the variable permeability, discontinuous nature, and thin saturated thickness of its component deposits. Rather, the unit's function at the site can be viewed as a groundwater reservoir that supplies base flow to surface water and, potentially, recharge to underlying aquifers. Groundwater within Unit A is expected to occur under water table conditions; although, water within an individual sand layer or lens may be confined. The top of Unit A occurs at the water table which is typically about three to five feet below land surface at the site. The base of Unit A is approximately 10 feet below land surface and coincides with the top of a surficial confining bed that is described below. Therefore, the thickness of Unit A at the site is typically four feet or less.

Fine-grained deposits, consisting of sandy silt to clay, form a shallow confining bed immediately below Unit A. Due to its content of primarily fine-grained deposits, the confining bed separates Unit A from the underlying semi-confined aquifer described below. Based on a textural description of the deposits, the hydraulic conductivity of the shallow confining bed is estimated to be low, on the order of  $10^{-3}$  to  $10^{-2}$  ft/day (Brassington, 1988). The top of the shallow confining bed ranges from about four feet to seven feet below land surface. As a result, the water table may occur within the confining bed at some locations where the top of the bed is most shallow. The bottom of the confining bed is as shallow as seven feet below land surface at some locations and as deep as 16 feet at others. As illustrated in cross-sections A-A' (Figure 4-4) to C-C' (Figure 4-6), the shallow confining bed appears to be continuous across the site but it varies in thickness from about three to ten feet depending on location. Where present within the

shallow confining bed, layers and lenses of more permeable deposits decrease its effective thickness as a barrier to vertical groundwater flow.

Silty to fine sand deposits form a semi-confined aquifer between the overlying shallow confining bed and the underlying Yorktown confining bed. The aquifer is identified as Unit B in this report to distinguish it from the shallow groundwater reservoir that also occurs within the surficial deposits at the site. Groundwater within Unit B occurs under semi-confined conditions; recharge to the aquifer is derived through leakage from the overlying units. Based on a textural description of the deposits, the hydraulic conductivity of the Unit B is estimated to be moderate, in the range of 1 to 6 ft/day, and the effective porosity is estimated to be approximately 20 percent (Brassington, 1988). As illustrated in cross-sections A-A' (Figure 4-4) to C-C' (Figure 4-6), the top of Unit B typically occurs about 12 to 16 feet below land surface at the site, but may be as shallow as eight feet below land surface where the overlying shallow confining bed is thin. The base of Unit B is approximately 30 to 40 feet below land surface and coincides with the top of the Yorktown confining bed. The thickness of Unit B averages about 25 feet, but varies considerably across the site ranging from about 15 feet to 35 feet.

During the current assessment, the water table at the site occurred about three feet below land surface. Table 5-5 summarizes the depth to water and the corresponding water-level elevations measured on May 13, 1998 in selected monitoring wells located throughout the site. Figure 5-3 depicts the configuration of the potentiometric surface in Unit A on May 13, 1998 and incorporates water levels measured in the drainage ditch (Table 5-5). Although localized variations occur, the horizontal hydraulic gradient at the site and, therefore, groundwater flow are generally toward the ditch, located east and south of the facility. Beneath and southwest of the plant building, the hydraulic gradient ranges from 0.002 to 0.004 ft/ft. South and east of the plant building, the gradient increases to about 0.008 ft/ft and, approaching the ditch, steepens to more than 0.02 ft/ft. Figure 5-4 depicts the configuration of the potentiometric surface in Unit B. In general, the horizontal hydraulic gradient and groundwater flow are to the northwest, nearly opposite the direction measured in Unit A. The horizontal hydraulic gradient in Unit B averages 0.003 ft/ft at the site. Using the previously noted values for horizontal hydraulic conductivity, and effective porosity, the average linear groundwater flow velocity in Unit B is estimated to range

from 0.02 to 0.09 feet/day. The range of velocity values is considered representative for the site, but does not take into account the inherent small-scale differences in gradient, porosity, and hydraulic conductivity that occur within the unit.

Water-level elevations measured in four well pairs, each comprised of a well screened in Unit A and a well screened near the bottom of Unit B, indicate the presence of vertical hydraulic gradients between the two units. Measurements at well pair MW-216 and MW-217, and well pair MW-222 and MW-223 indicate downward hydraulic gradients of 0.015 and 0.172 ft/ft, respectively. Conversely, measurements at well pair MW-218 and MW-219, and well pair MW-220 and MW-221 indicate upward hydraulic gradients of 0.026 and 0.035 ft/ft, respectively. These measurements, when evaluated in conjunction with the potentiometric surface maps (Figures 5-3 and 5-4) suggest that much of the site overlies a recharge area for the underlying hydrogeologic units. However, narrow areas immediately adjacent to the drainage ditch are discharge areas for groundwater within Unit A. This conclusion is consistent with the concept that groundwater recharge in the region occurs over the broad areas located between streams.

#### **5.4 Results of Groundwater Sample Analysis**

This section presents the results of groundwater samples analyzed for the parameters listed in Table 5-1. Each subsection addresses the results for a specific analytical group and is supplemented by a table summarizing the qualified laboratory results. Maps and cross-sections illustrating the distribution of selected chemicals in the groundwater are included where appropriate. Data upon which interpretations are made were evaluated based on USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (1994). Qualified analytical data and raw analytical data are included in Appendices C and D, respectively.

##### **5.4.1 Volatile Organic Compounds**

Results of on-site GC/MS screening for VOCs are summarized in Table 5-6. Sampling point locations are illustrated on Figure 5-1. Qualified laboratory results for three

replicate samples collected to assess the quality of the on-site analytical procedures are summarized in Table 5-7 and show good agreement with the on-site screening analyses.

The screening results indicate that fourteen VOCs were detected in groundwater at the site. Six of the VOCs were reported in a single sample or at a trace concentration below the detection limit. Of the remaining eight VOCs, the reported concentrations of six exceeded their respective groundwater standards in at least one sample each. The four most frequently detected VOCs were TCE, cDCE, 11-DCE, and 11-DCA. Figures 5-5 through 5-24 are maps and cross-sections illustrating the approximate areal and vertical extent of these four VOCs. Due to the wide range in concentration of these VOCs across the site, only the contour line representing the inferred limits of the VOCs has been illustrated. Figures 5-25 and 5-26 depict the extent of VOCs exceeding the groundwater standards in Units A and B, respectively. These figures represent the inferred extent of dissolved VOC concentrations exceeding groundwater standards, irrespective of a specific VOC. At locations where the concentrations of more than one VOC exceeded the standards, the VOC exhibiting the greatest exceedance is represented.

As illustrated in the isoconcentration maps and cross-sections, a plume of dissolved VOCs are present in both Units A and B at the site. However, due to the difference in hydraulic gradient between the two units, the migration of the plume is generally in opposite directions.

In Unit A, two apparently separate dissolved VOC plumes were detected. The larger of the two is located at the source area and extends, in a hydraulically downgradient direction, to the drainage ditch that borders the southern edge of the site. Some dispersion to areas not in the direction of general groundwater flow is also evident and the plume is presumed to extend beneath a portion of the plant building. The second plume in Unit A underlies the grass area located east of the employee parking lot. Although the VOCs detected in the plume are comparable to those reported at the source area, their location here does not appear consistent with expected migration pathways from the source area.

The plume originating at the source area and present in Unit A was also detected in Unit B. As illustrated in the isoconcentration maps and cross-sections, the plume extends, in a hydraulically downgradient direction, toward the northwest. The plume underlies the plant building and its leading edge is approximately 700 feet from the source area and 150 feet from Springs Road. The plume also exhibits a small lobe of VOCs extending to the northeast. A second small lobe extends, against the hydraulic gradient in Unit B, from the source area toward the south. The lobe is limited to only two of the four VOCs for which figures have been prepared. The lobe includes TCE and a daughter product, cDCE; but not a second daughter product, 11-DCE, or 11-DCA.

Trace concentrations of cDCE and 11-DCA were detected within Unit B in the area east of the employee parking lot. Both VOCs are compounds that were detected in overlying Unit A and are considered to be part of the separate plume identified within Unit A in this area.

As illustrated in the cross-sections, the VOC plume has migrated from Unit A into Unit B. In the immediate source area, chlorinated VOCs may have migrated in response to density differences between the solvent and groundwater provided sufficient product was present to create and maintain a dense nonaqueous phase. Otherwise, the chlorinated VOCs, non-chlorinated VOCs, and any other chemicals dissolved in groundwater migrate in response to hydraulic gradients within the hydrogeologic units. Chemical transport into Unit B occurred as leakage through the surficial confining layer, or through natural or anthropogenic discontinuities in the layer. Within Unit A, dissolved chemicals, where present, are presumed to occur throughout the entire thickness of the unit. Within Unit B, the chemicals may occur throughout the entire thickness of the unit at some locations, but not at others. Because of its low permeability, the Yorktown confining bed underlying Unit B exhibits the potential to limit further downward migration of the chemicals. However, several VOCs were detected in a groundwater sample collected from approximately 10 feet into the confining bed. TCE, cDCE, and trans-1,2-Dichloroethene (tDCE) were reported in groundwater screening sample C14-51. These VOCs and several others were also detected in its replicate sample, W92. Concentrations of all VOCs were below their groundwater standards except TCE, which was reported at 16  $\mu\text{g/L}$  compared to its standard of 2.8  $\mu\text{g/L}$ .

Groundwater samples were collected from selected monitoring wells and analyzed to verify the groundwater screening results. Qualified analytical results for VOCs are summarized in Table 5-8 and sampling point locations are illustrated on Figure 5-1. VOC distribution in Units A and B, based on the results of monitoring well sampling and analysis, is consistent with the screening results.

#### **5.4.2 Semivolatile Organic Compounds**

Groundwater samples collected from selected monitoring wells were also analyzed for SVOCs to assess the presence of these chemicals in groundwater at the site. Qualified analytical results for SVOCs are summarized in Table 5-9 and sampling point locations are illustrated on Figure 5-1.

Fourteen SVOCs were detected in the sample from well MW-206, which is located within the source area. Numerical groundwater standards have been established for ten of these SVOCs. The concentrations of three of the reported SVOCs, bis(2-Ethylhexyl)phthalate, 2-methylnaphthalene, and naphthalene, exceeded their respective standards of 3, 28, and 21  $\mu\text{g/L}$ . Except for an isolated occurrence of benzoic acid in MW-219 and di-n-butylphthalate in MW-221 at a concentration below its standard of 700  $\mu\text{g/L}$ , no other target SVOCs were detected. These results indicate that the distribution of SVOCs in groundwater is no more extensive than the distribution of VOCs and, based on the partition coefficients and other physiochemical properties of SVOCs, are expected to be significantly more limited in their extent.

Tentatively Identified Compounds (TICs) were characterized for each sample. The TICs are listed with the qualified analytical data and the raw analytical data in Appendices C and D, respectively. Ten TICs were reported in the sample from well MW-206, located in the source area. They included ethylbenzene, several non-specific xylenes, several unknown C3 benzenes, and several unknown alkanes. TICs were also reported in the other wells sampled. In summary, these TICs included an unknown alkane and several unknown organic acids and general unknowns. Trans-1,2-Dichlorocyclohexane was reported in the sample from MW-220 at an estimated concentration of 4  $\mu\text{g/L}$  and ethyl ester acetic acid was reported in six wells at

estimated concentrations ranging from 4 to 20  $\mu\text{g/L}$ . However, neither TIC was reported in the source area well. When considered with respect to standard TIC interpretation processes, these results are deemed to be unremarkable and to bear no significance in assessing the distribution of chemicals at the site. Therefore, assessment and subsequent decision-making will focus on the results of target analytes in characterizing the nature and distribution of chemicals in groundwater at the site.

#### 5.4.3 Metals

Groundwater samples collected from selected monitoring wells were analyzed for metals to assess their presence in groundwater at the site. Based on hydraulic gradients measured at the site, wells MW-201S, -207, and -223 are considered upgradient wells in Unit A. Well MW-201D was originally designated as an upgradient well in Unit B; however, it was deemed inappropriate for sampling due to sediment accumulation in the well casing. Therefore, well MW-220 was substituted as an upgradient well in Unit B. Qualified analytical results for the metals are summarized in Table 5-10 and sampling point locations are illustrated on Figure 5-1.

As expected, a majority of the target analytes were detected in the samples because metals are naturally occurring constituents in groundwater. In samples from wells screened in Unit A (MW-201S, -207, -217, -219, -221, and -223), four metals were reported at concentrations exceeding the groundwater standards at least once. They included iron, manganese, chromium, and lead. Concentrations of iron, manganese, and lead also exceeded the standards in the sample from MW-206, located in the source area. Well MW-206 is screened partly in Unit A and in part of Unit B, but is included with the wells in Unit A for this report.

Concentrations of iron and manganese were reported above the respective groundwater standards of 300  $\mu\text{g/l}$  and 50  $\mu\text{g/L}$  in all samples collected from wells screened in Unit A, including the background wells. However, in samples from the three downgradient wells (MW-217, -219, and -221), iron and manganese concentrations were below their background values, calculated as two times the average concentration of the background samples (EPA, 1989). Both metals are common in groundwater and, regionally, concentrations of iron have

been acknowledged to frequently exceed the standard under natural conditions. In the sample from the source area well, MW-206, the manganese concentration was also reported below its background value but, the iron concentration was reported above its background value. The exceedance of the iron background value does not imply that iron should be of concern in the source area but, rather, it suggests that natural degradation of organic chemicals is occurring in the source area and creating a reducing environment that is solubilizing naturally occurring iron in the soil.

Concentrations of lead were reported above the groundwater standard of 15  $\mu\text{g/l}$  in the samples collected from background well MW-207, source area well MW-206, and well MW-221. Reported concentrations of lead in both wells MW-206 and -221 were below the background value.

Chromium was reported above the groundwater standard of 50  $\mu\text{g/l}$  only in the sample collected from background well MW-207.

In samples from wells screened in Unit B (MW-216, -218, -220, and -222), only iron and manganese were reported at concentrations exceeding their groundwater standards. The concentrations of iron in all samples collected from downgradient wells (MW-216, -218, and -222) were less than the level reported in the background well sample. The concentration of manganese reported in the samples from wells MW-218 and -222 were less than the concentration reported in the background, while the level in the sample from MW-216 was slightly above the concentration reported in the background sample. However, as discussed earlier, its occurrence is attributed to natural conditions in the region.

#### 5.4.4 Field Measurements

The specific conductance, temperature, and pH of the groundwater samples were measured at the time of collection. The results are summarized in 5-11.

#### **5.4.5 Free Product**

Free product was first detected in the source area in April 1997 when a layer of oil more than three feet thick was measured in monitoring well MW-206. After a year of periodic hand bailing followed by several rounds of AFVR, product thickness in May 1998 was measured at about 0.01 foot. However, product accumulation may have been precluded by an elevated water table at the time of measurement. Analysis of a product sample indicated that the oil contains hydrocarbons in both the diesel and motor oil ranges and has a specific gravity of 0.9595 g/cm<sup>3</sup> (Radian International, 1997).

Although oil has not been detected in any monitoring well other than MW-206, it has been reported in a subsurface pipe that was part a former roof drain system for the plant building. The drain pipe transects the source area and is located about 40 feet east of well MW-206. CPT probing performed in the source area with a FFD did not detect levels of TPH in the soil that would be indicative of free product. The FFD results were confirmed by soil sampling and analysis that indicated a limited area of petroleum hydrocarbons at concentrations exceeding CUGs, but not at levels suggesting the presence of free product. Consequently, the extent of free product appears to be limited to an area between well MW-206 and the former drain pipe, and located within 40 feet of the plant building's south wall. Therefore, the former USTs that are buried approximately 40 feet to the west of MW-206 do not appear to be the source of the free product.

#### **5.5 Results of Surface Water Sample Analysis**

This section presents the results of surface samples analyzed for the parameters listed in Table 5-1. Each subsection addresses the results for a specific analytical group and is supplemented by a table summarizing the qualified laboratory results. Data upon which interpretations are made were evaluated based on USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (1994). Qualified analytical data and raw analytical data are included in Appendices C and D, respectively.

### **5.5.1 Volatile Organic Compounds**

Surface water samples were collected from five sampling locations and analyzed to determine whether groundwater is discharging to the drainage ditch and transporting VOCs to surface water. Qualified analytical results for VOCs are summarized in Table 5-12 and sampling point locations are illustrated on Figure 5-1. Sampling point W81 is the downgradient location and higher numbered sampling points are progressively upgradient. However, recent water-level measurement suggests that, at times, water in the segment of the ditch near W85 may be stagnant.

Fifteen VOCs were detected in the samples. None of the VOCs exceeded the surface water quality standards established for Class "C" surface waters. Nevertheless, the results confirm that chemicals, characteristic of both petroleum and solvents, have migrated from the source area and are discharging to the ditch. The greatest number of chemicals, at the highest, concentrations were reported in the downgradient sample. Both the number of chemicals detected and their reported concentrations decreased in the upgradient direction.

### **5.5.2 Semivolatile Organic Compounds**

The five surface water samples were also analyzed to determine whether SVOCs are being discharged to surface water. Qualified analytical results for SVOCs are summarized in Table 5-13 and sampling point locations are illustrated on Figure 5-1.

Only bis(2-Ethylhexyl)phthalate was reported in the upgradient sample. These results indicate that SVOCs have not migrated from the source area to the ditch and support the earlier conclusion that the distribution of SVOCs at the site is significantly more limited than the extent of VOCs.

### **5.5.3 Metals**

Three surface water samples were collected and analyzed to determine whether metals potentially associated with the source area are being discharged to surface water.

Qualified analytical results for VOCs are summarized in Table 5-14 and sampling point locations are illustrated on Figure 5-1. Because soil and groundwater analysis did not identify any metals of concern in the source area, no discharge of metals to the ditch at levels of concern is anticipated. In that regard, the surface water results for metals are unremarkable.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

This section presents conclusions based on currently available data and makes general recommendations for follow-on assessment.

### 6.1 Conclusions

Soil and water at the site contain fuel, chlorinated and non-chlorinated VOCs, and SVOCs that are consistent with the storage and use of petroleum products and degreasing solvents. The principal chemicals detected at the site are volatile organics. Semivolatile organics were detected less frequently, at lower concentrations, and over a smaller area. Metals detected in soil and water at the site represent natural conditions.

The principal source of organic chemicals at the site is located near the southeast corner of the plant building. This area is approximately 60 feet by 60 feet in size and is the current and previous location of multiple drums and tanks. A source of chlorinated VOCs at the site may be a former AST used to store solvents. A source of the fuel and petroleum constituents is unknown. However, the distribution of free product and chemicals in the soil suggests that the four abandoned USTs have had little, if any, effect on site conditions. A separate source of organic chemicals appears to be located between the east side of the employee parking lot and the drainage ditch.

The hydrogeology of the site, in the upper 50 feet, is characterized by a shallow groundwater reservoir (Unit A), a surficial confining bed, a semi-confined aquifer (Unit B), and a lower (Yorktown) confining bed. Groundwater in Unit A flows toward, and discharges into, the drainage ditch that borders the active part of the site on the east and south. Groundwater in Unit B flows, in the opposite direction, toward the northwest. Vertical hydraulic gradients indicate that the site overlies a groundwater recharge area, except at locations immediately adjacent to the drainage ditch. The surficial confining bed that separates Unit A from Unit B appears continuous across the site. However several monitoring wells near the source area have penetrated this barrier. Other discontinuities in the confining bed may also exist due to the installation of

subsurface pipes and USTs. The Yorktown confining bed underlies Unit B and appears to be continuous across the site.

Soil in the source area exceeds established cleanup goals for TPH and for several VOCs. Soil exhibiting elevated concentrations is primarily located adjacent to the former solvent AST and encompasses an area approximately 60 feet by 60 feet in size. This area conceivably extends beneath a portion of the plant building. Chemicals detected in soil outside this general area are presumed to represent transport by groundwater and subsequent adsorption onto the soil. As indicated previously, the four abandoned USTs appear to have had only an incidental effect, if any, on chemical distribution at the site.

Groundwater underlying the site exceeds the groundwater standards for a number of, predominantly, chlorinated VOCs. Groundwater also exceeds the standards for a number of SVOCs; however, the extent of the SVOCs is more limited. The VOC plume, originating at the source area, is present in both hydrogeologic Units A and B having migrated through natural or anthropogenic discontinuities in the surficial confining bed. Within Unit A, the plume extends from the source area toward the south and discharges to the drainage ditch as evidenced by the presence of similar VOCs in the surface water. Within Unit B, the plume extends from the source area toward the northwest. The plume underlies the plant building and the leading edge is located about 700 feet from the source area and 150 feet from Springs Road. A lobe of the plume extends from the source area, against the hydraulic gradient, to the south. Vertical migration of the plume is potentially retarded by the Yorktown confining bed. However, a water sample collected from 10 feet into the bed indicated the presence of VOCs.

The results of an air monitoring survey performed concurrently with the site assessment indicates that there is no completed pathway between the chemicals detected in soil and water and the workplace air in the plant building.

A second, smaller VOC plume east of the employee parking lot. Chlorinated VOCs similar to those identified in the source area are present in Unit A and, to a lesser degree, in Unit B.

Recoverable free product, measured in well MW-206, appears to be limited to an area between well MW-206 and a former drain pipe located about 50 feet to the east. Free product recovery measures conducted at the well and drain pipe have shown steadily diminishing returns.

Although a detailed site model has been developed, several data gaps remain and should be addressed before the assessment can be completed. These data gaps include the following:

- The southern extent of the plume originating in the source area has not been determined. The limits of chemical distribution within Units A and B are unknown beyond the drainage ditch located south of the plant. These areas are off-site and are either under State control or private ownership.
- The vertical extent of the plume originating in the source area is inconclusive. The Yorktown confining bed is continuous across the site and is a potential barrier to the downward migration of chemicals. Nevertheless, groundwater screening data suggest that VOCs have penetrated at least the upper part of the confining bed south of the source area.
- The hydraulic characteristics of the hydrogeologic units at the site have been estimated from lithologic descriptions. However, no quantitative hydraulic analysis has been performed.
- The source of chemicals contributing to the plume located east of the employee parking lot has not been confirmed. Also, the extent of the plume within Unit A has not been determined. The limits of chemical distribution beyond the drainage ditch located east of the plant is unknown. The area east of the ditch is an undeveloped part of the site but may require an easement across private property to gain physical access.

## **6.2 Recommendations**

The general recommendations listed below are intended to address the data gaps identified in the previous section and to fulfill remaining information requirements for a comprehensive site assessment. Implementation of certain recommendations will require off-site access and property owner authorization for well construction.

- DPT groundwater screening and/or monitoring well installation and sampling should be performed in areas south of the drainage ditch to assess the extent of the plume originating in the source area. Assessment should include both hydrogeologic Unit A and Unit B.
- A monitoring well, incorporating a telescoping-casing design, should be installed farther into, or through, the Yorktown confining layer to assess the vertical distribution of chemicals at the site. The well should be located within or near the source area, where VOCs have been detected in the overlying hydrogeologic units.
- Hydraulic testing should be performed to quantify the hydraulic conductivity of the principal hydrogeologic units. Methods may include "hydrocone" testing at selected locations and depths; bail-down testing in selected wells; and/or, controlled pumping tests.
- Additional soil and groundwater testing should be performed to evaluate the origin and extent of the plume located east of the employee parking lot site. Surface and subsurface grab samples should be collected from the overlying soil and analyzed for VOCs and SVOCs. DPT groundwater screening and/or monitoring well installation and sampling should be performed in the general area, particularly east of the drainage ditch.

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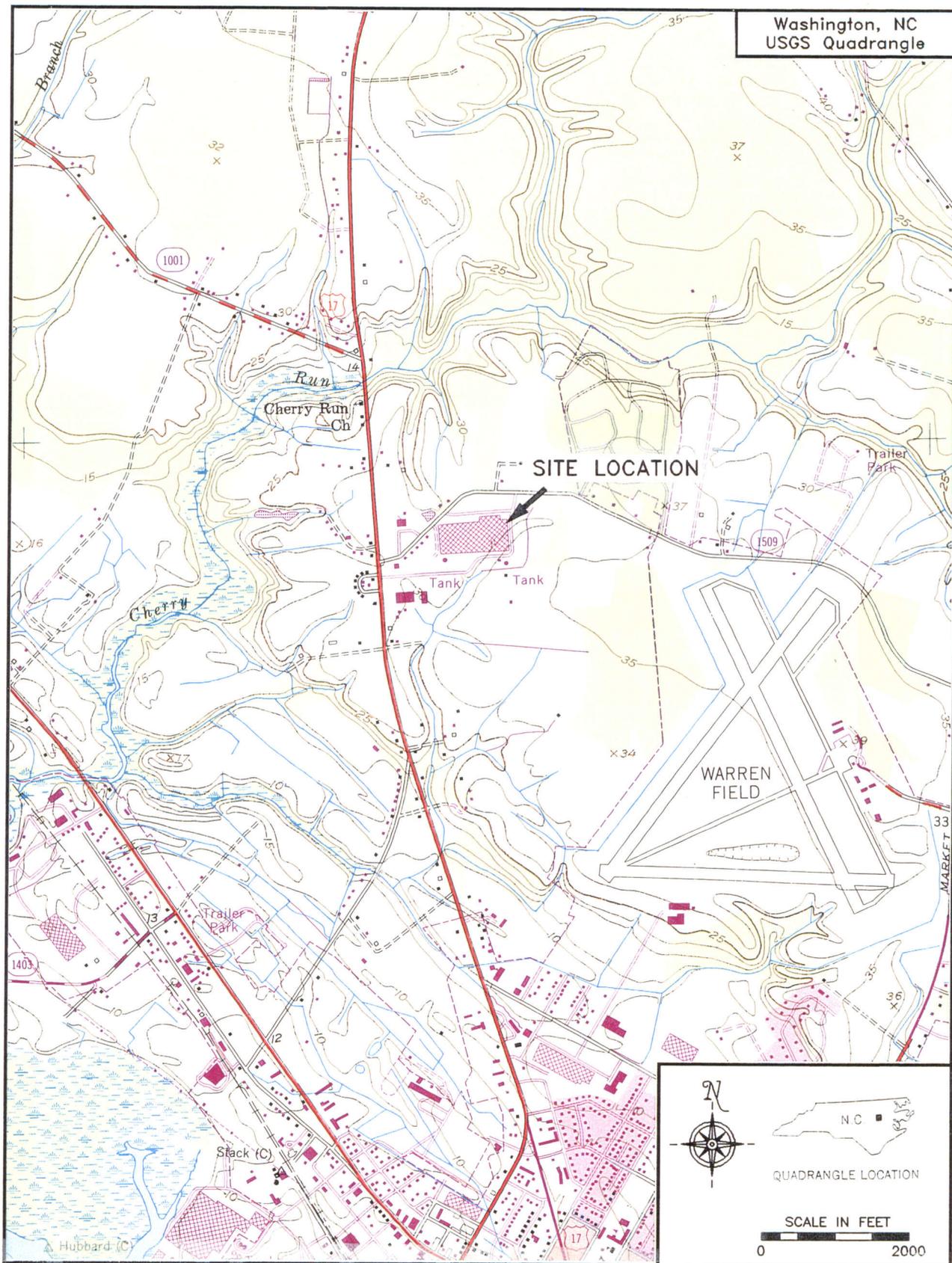
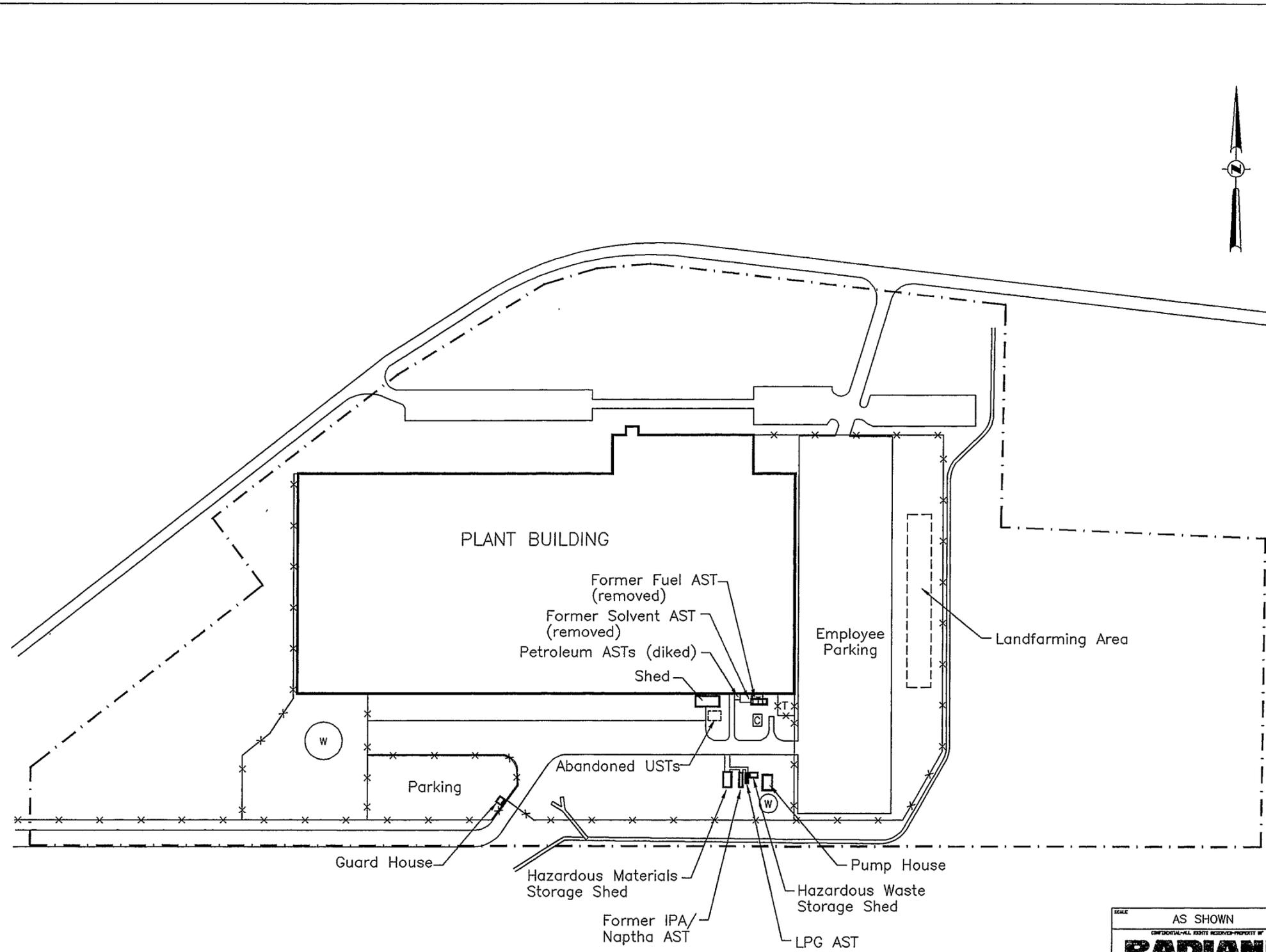


Figure 2-1. Topographic Map  
Hamilton Beach & Proctor-Silex, Inc.



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- LEGEND**
- Building
  - Road and/or Parking Area
  - Property Line
  - Fenceline
  - Ditch
  - Water Tank
  - Cooling Tower
  - Transformers
  - AST Aboveground Storage Tank
  - UST Underground Storage Tank



SCALE IN FEET

SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 2-3. Site Map		
	<small>CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF</small>	DRAWN BY	TSH	DATE	28MAY98		Hamilton Beach & Proctor-Silex Inc.		
	<b>RADIANT</b> <b>INTERNATIONAL</b>	CHECKED BY	BPG	DATE	19JUN98		CONTRACT NO.	DRAWING NO.	REV.
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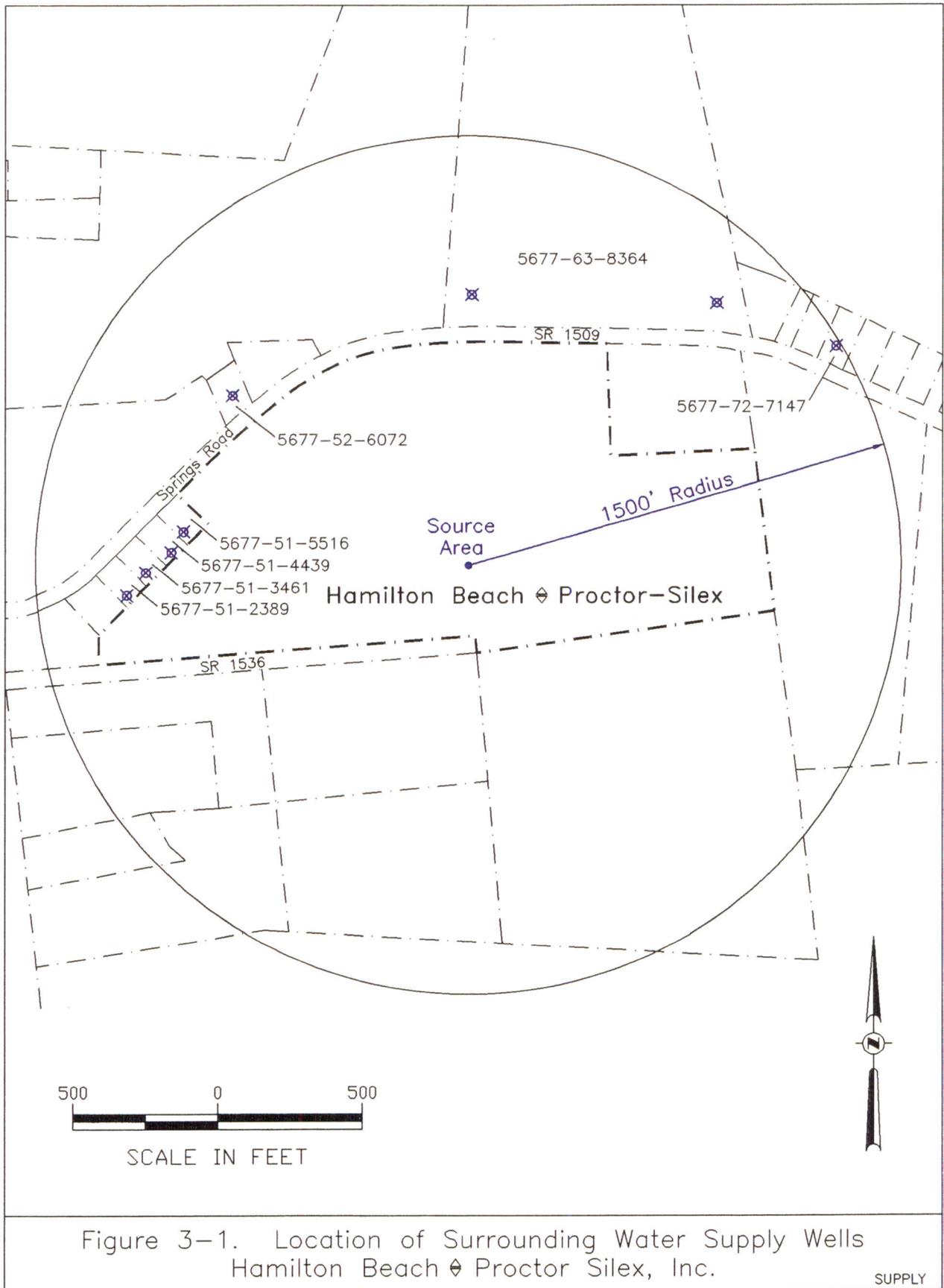
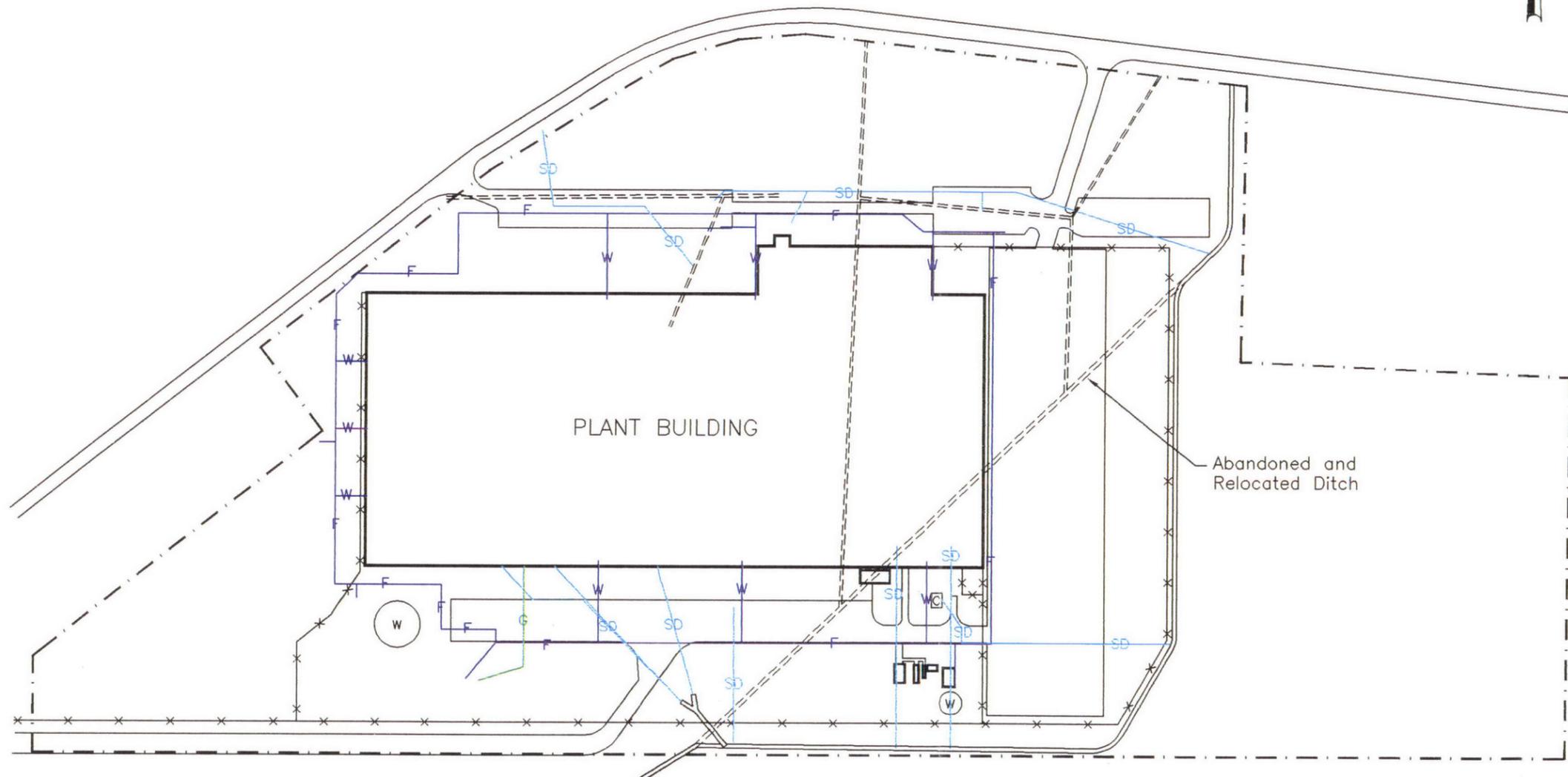


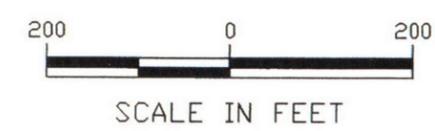
Figure 3-1. Location of Surrounding Water Supply Wells  
Hamilton Beach ♦ Proctor Silex, Inc.

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- LEGEND**
- Building
  - Road and/or Parking Area
  - Property Line
  - Fenceline
  - Ditch
  - Ditch - Abandoned or Relocated
  - W Water Tank
  - CT Cooling Tower
  - F- Fire Line
  - G- Gas Line
  - W- Water Line
  - SD- Storm Drain

**NOTE:**  
All utility locations were derived from plans provided by Hamilton Beach Proctor-Silex and are approximate.



<small>SCALE</small>	AS SHOWN	<small>DESIGNED BY</small>	JN	<small>DATE</small>	27MAY98	<small>DRAWING TITLE</small>
	<small>CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF</small>	<small>MADE BY</small>	TSH	<small>DATE</small>	28MAY98	Figure 3-2. Subsurface Utilities Hamilton Beach & Proctor-Silex Inc.
	<b>RADIAN</b> <b>INTERNATIONAL</b>	<small>CHECKED BY</small>	BPG	<small>DATE</small>	19JUN98	
	<small>CONTRACT NO.</small>	<small>APPROVED BY</small>		<small>DATE</small>		<small>CONTRACT NO.</small>
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						UTILITY
						<small>REV.</small>
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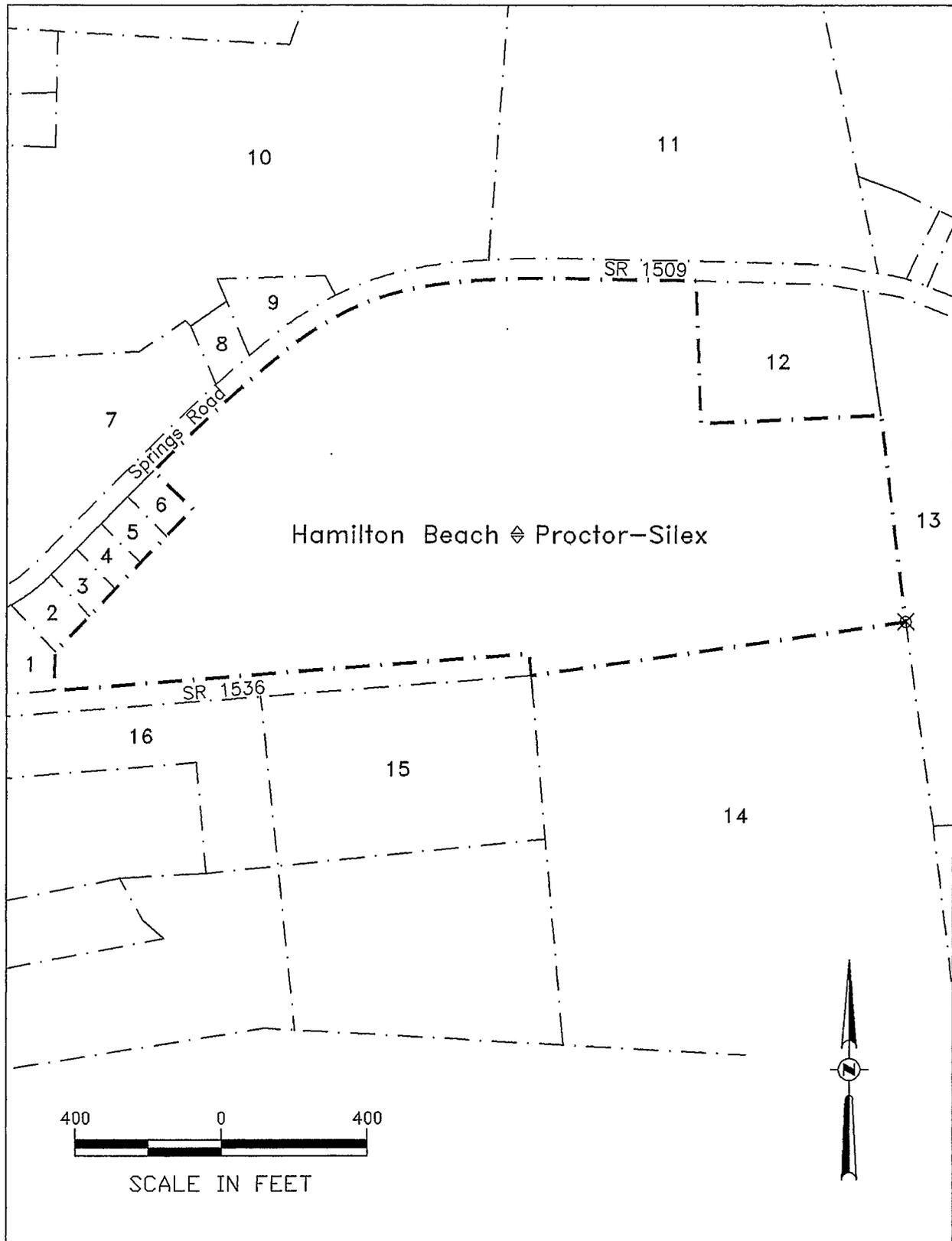


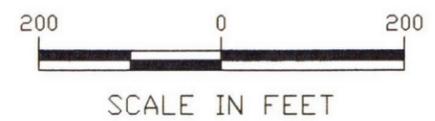
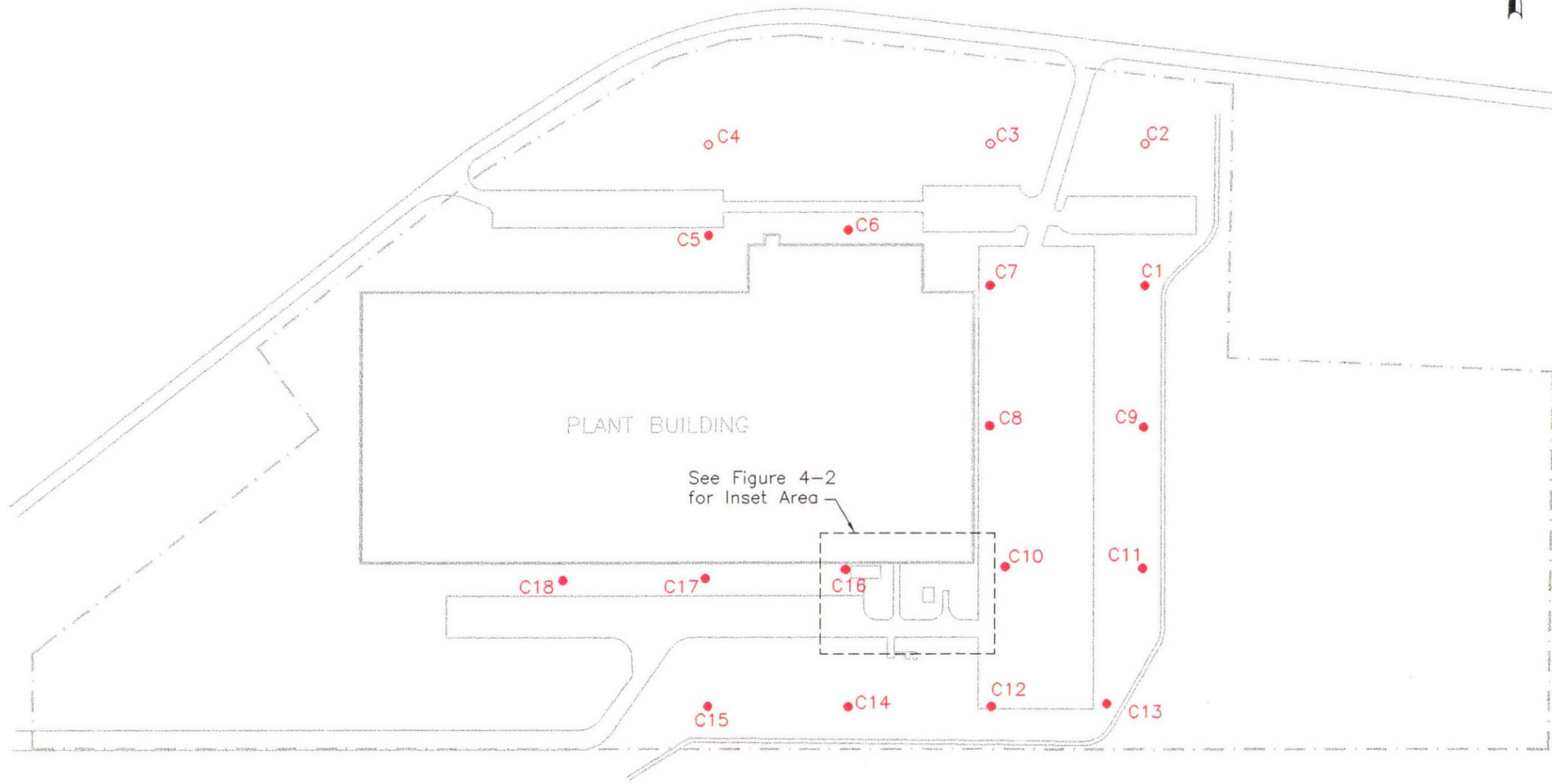
Figure 3-3. Adjacent Property Map  
Hamilton Beach & Proctor Silex, Inc.

ADJ-PRO



**LEGEND**

- CPT/FFD Profiling
- DPT Soil Sampling



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 4-1. Profiling and Soil Sampling Locations Hamilton Beach & Proctor Silex, Inc
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		CHECKED BY	BPG	DATE	19JUN98	CONTRACT NO.	650138.0501
		APPROVED BY		DATE		DRAWING NO.	C-CPT
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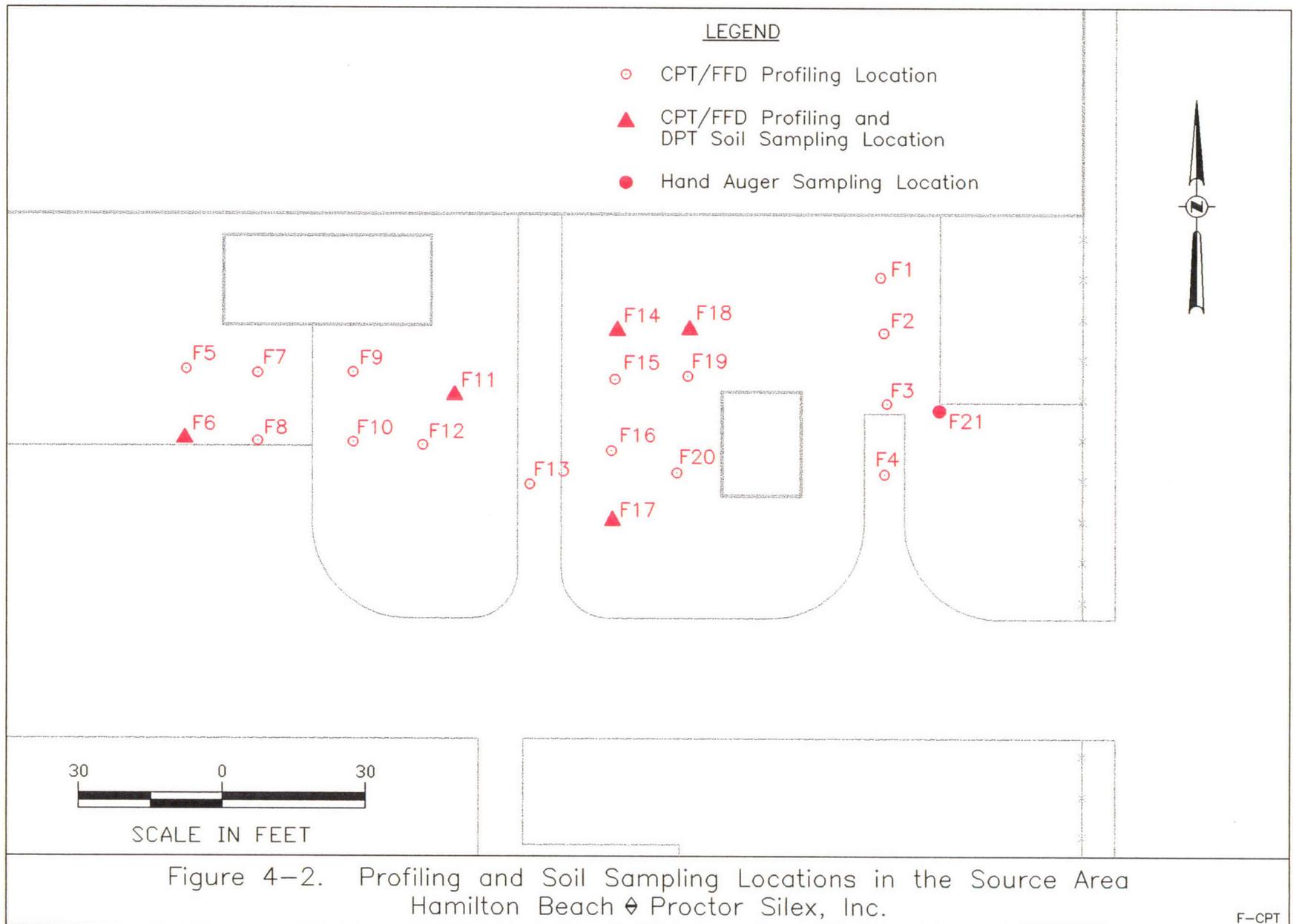
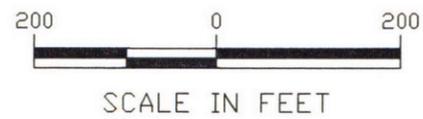
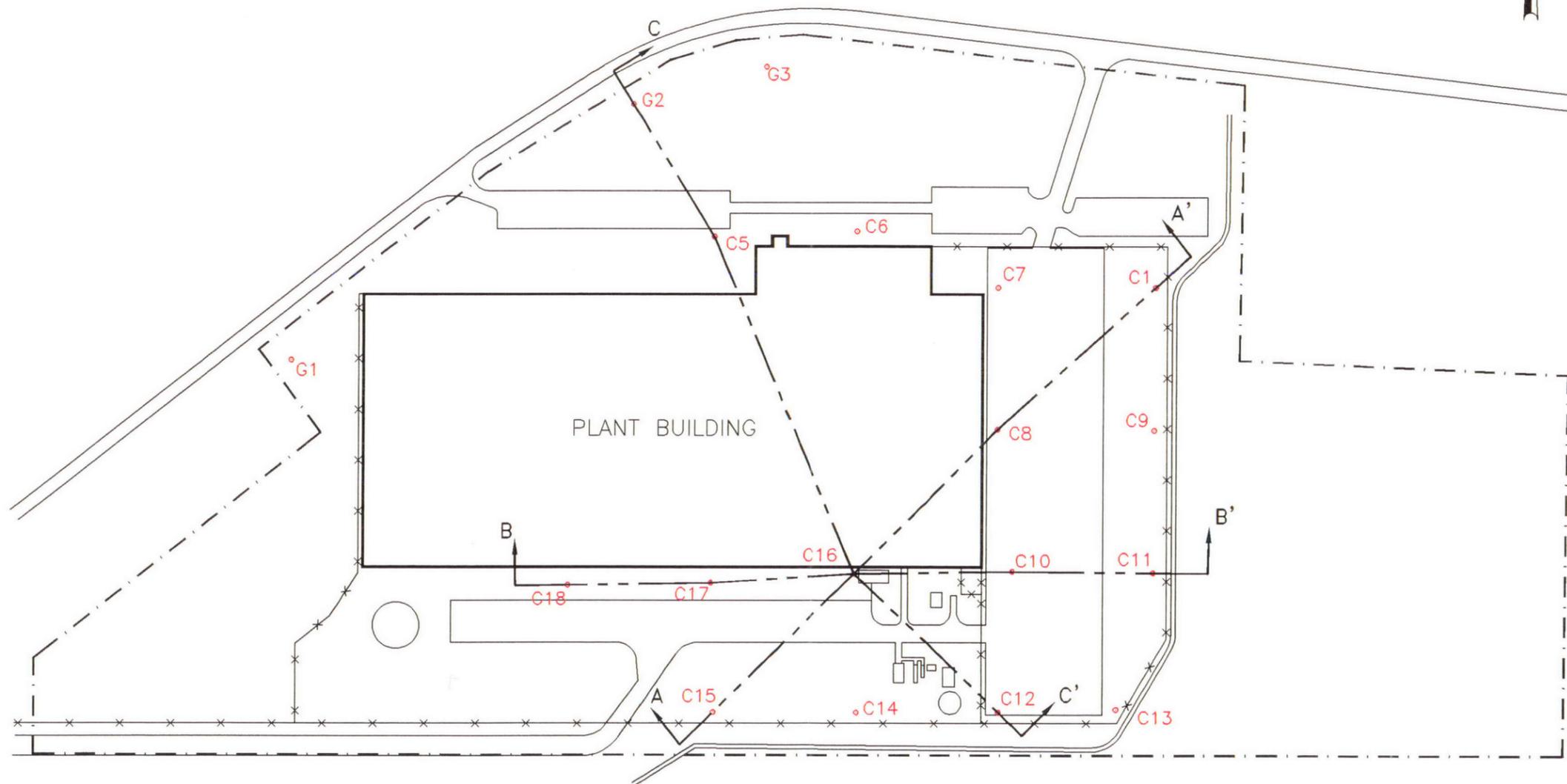


Figure 4-2. Profiling and Soil Sampling Locations in the Source Area Hamilton Beach Proctor Silex, Inc.

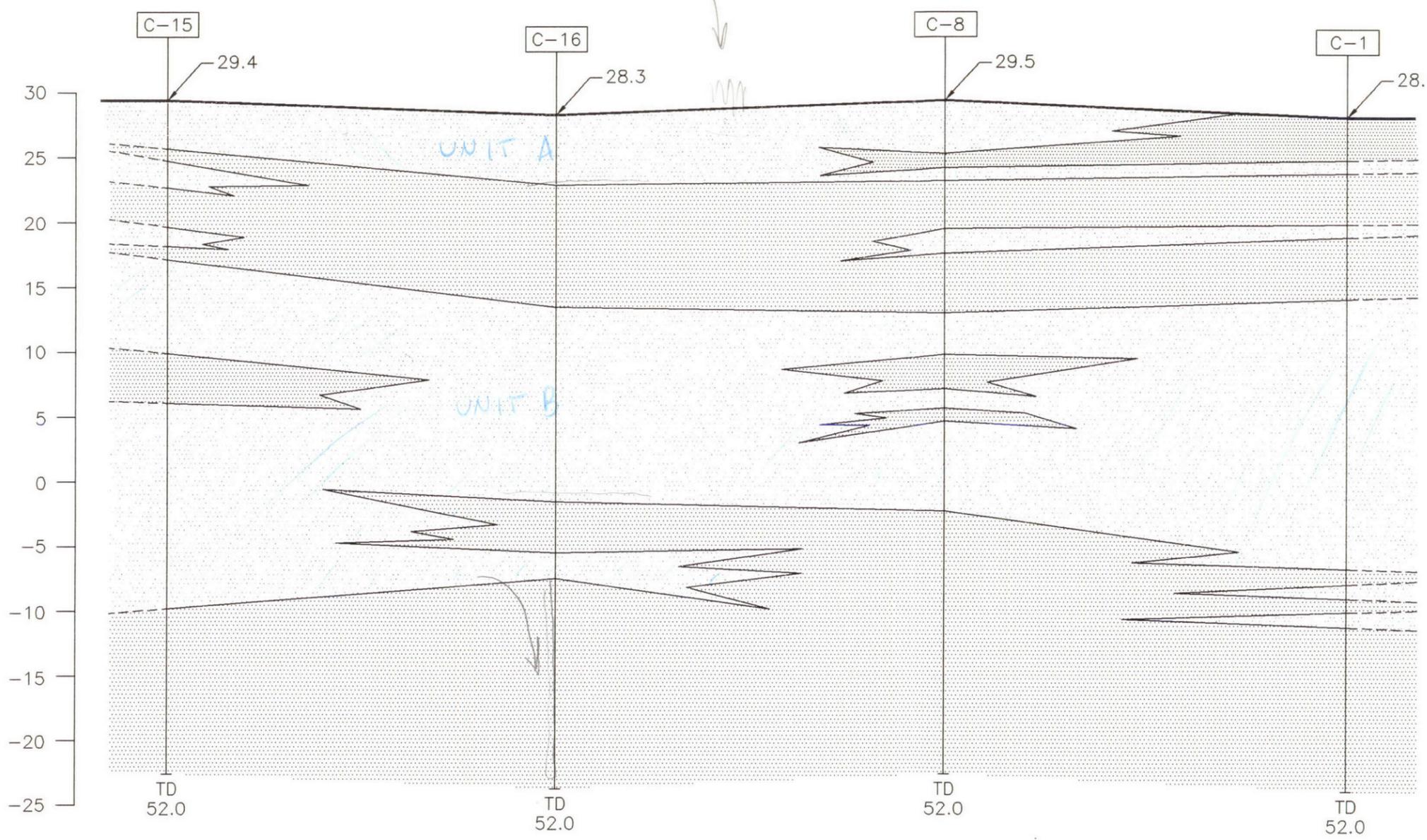
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	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	DATE	Figure 4-3.
	<b>RADIAN</b> ™	TSH	23MAR98	Cross Section Locations
	<b>INTERNATIONAL</b>	CHECKED BY		Hamilton Beach & Proctor-Silex Inc.
	REVISION TABLE FILE: HBPS\X-SECT-16 JUN98-1130	APPROVED BY		OLD DRAWING FILE
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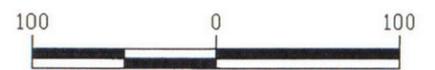
SOUTHWEST  
A

NORTHEAST  
A'



LEGEND

- C-1 Location Number
- 28.1 — Ground Surface Elevation
- TD 52.0 Total Depth of Boring
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



HORIZONTAL SCALE



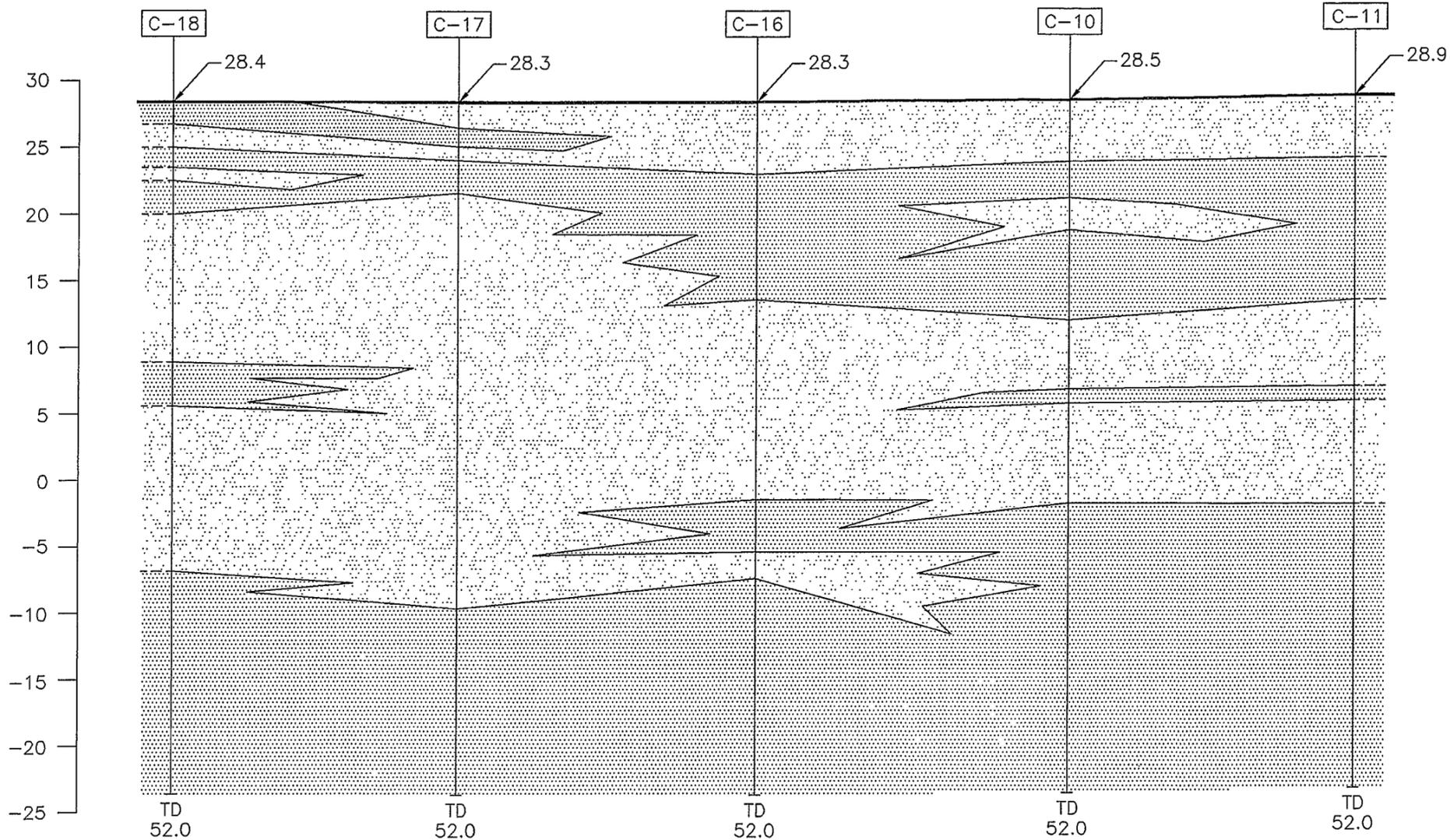
VERTICAL SCALE

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SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 4-4.		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		Geologic Cross-Section A-A'		
	<b>RADIAN</b> <sup>TM</sup>	CHECKED BY	BPG	DATE	19JUN98		Hamilton Beach & Proctor-Silex Inc.		
	INTERNATIONAL	APPROVED BY		DATE			CONTRACT NO.	DRAWING NO.	REV.
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WEST  
B

EAST  
B'

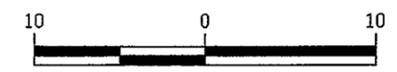


**LEGEND**

- C-1 Location Number
- 28.1  
┌──────────┴──────────┘ Ground Surface Elevation
- ┆ TD  
52.0 Total Depth of Boring
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



HORIZONTAL SCALE



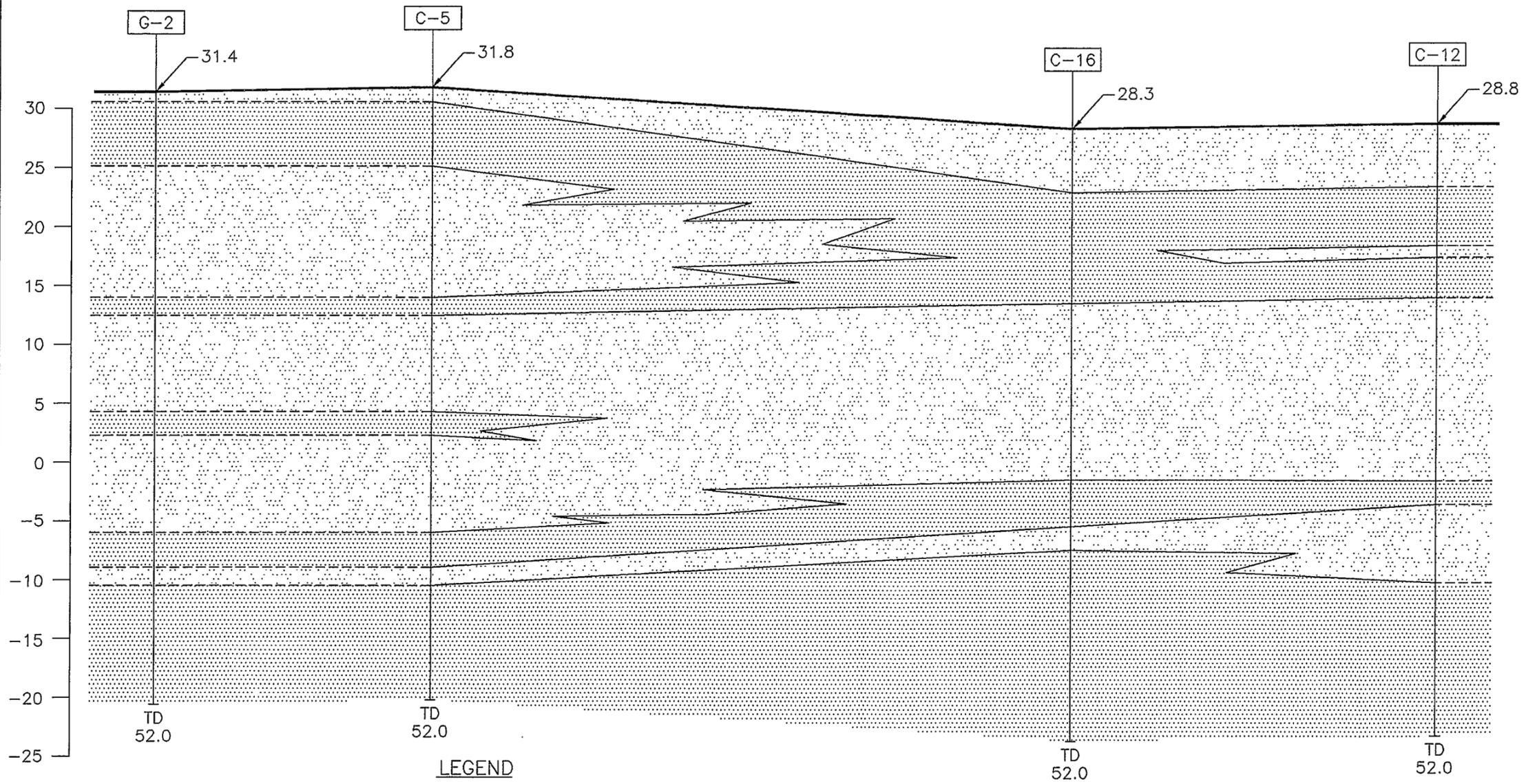
VERTICAL SCALE

SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 4-5. Geologic Cross-Section B-B' Hamilton Beach & Proctor-Silex Inc.		
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		CHECKED BY	BPG	DATE	19JUN98				
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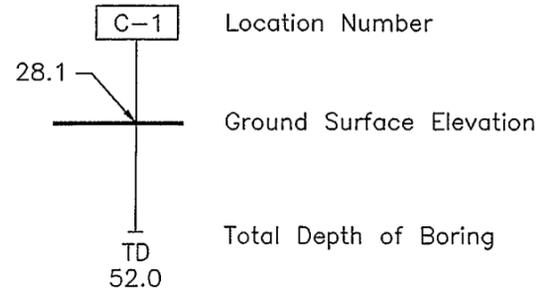
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NORTHWEST  
C

SOUTHEAST  
C'



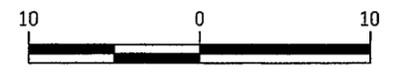
LEGEND



-  Higher permeability deposits including Sand, Fine Sand, and Silty Sand
-  Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



HORIZONTAL SCALE



VERTICAL SCALE

SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 4-6. Geologic Cross-Section C-C' Hamilton Beach & Proctor-Silix Inc.		
	<small>CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF</small>	DRAWN BY	TSH	DATE	28MAY98				
	<b>RADIAN</b> INTERNATIONAL	CHECKED BY	BPG	DATE	19JUN98				
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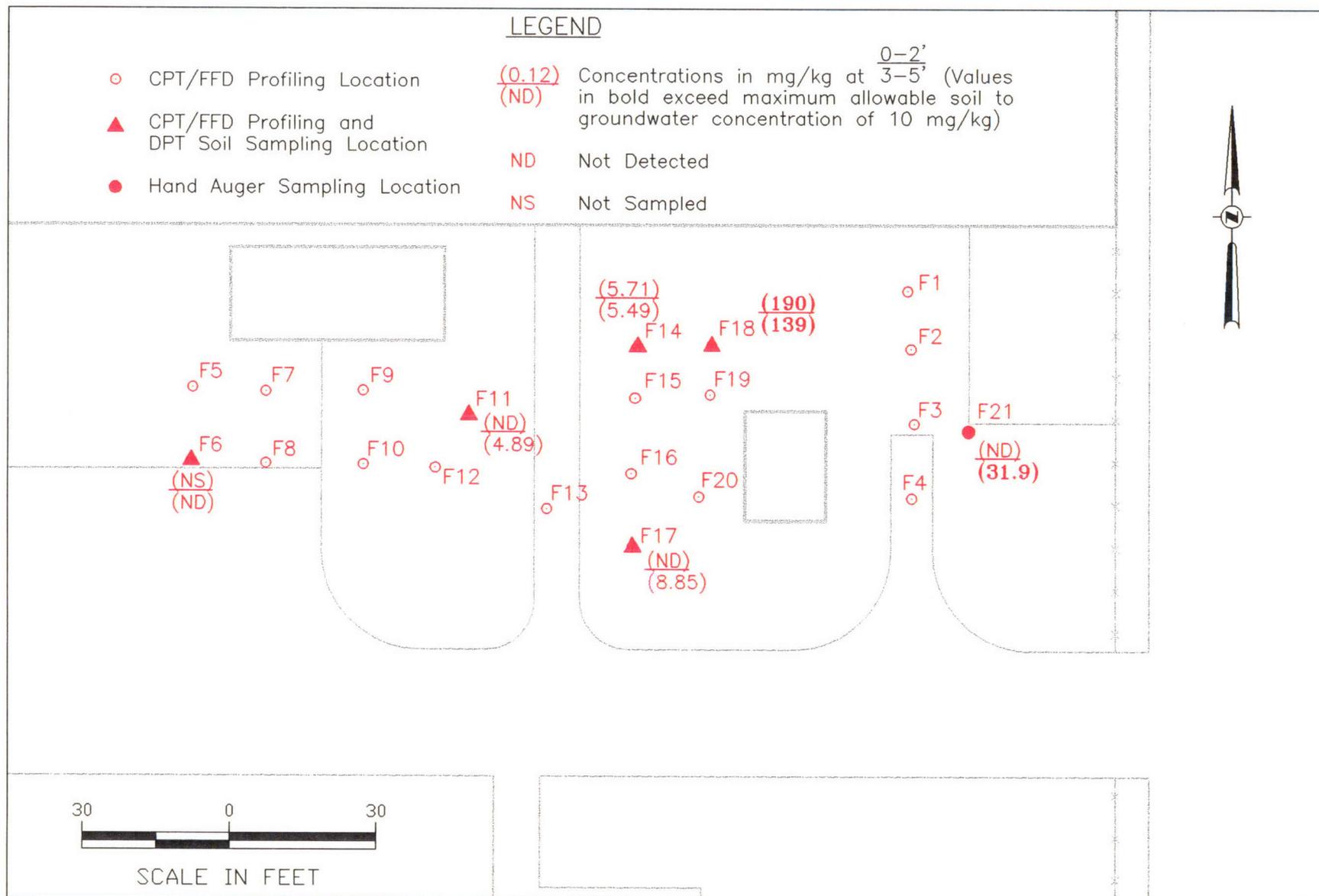


Figure 4-7. Distribution of Purgeable Total Petroleum Hydrocarbons in Source Area Soil Hamilton Beach ◊ Proctor Silex, Inc.

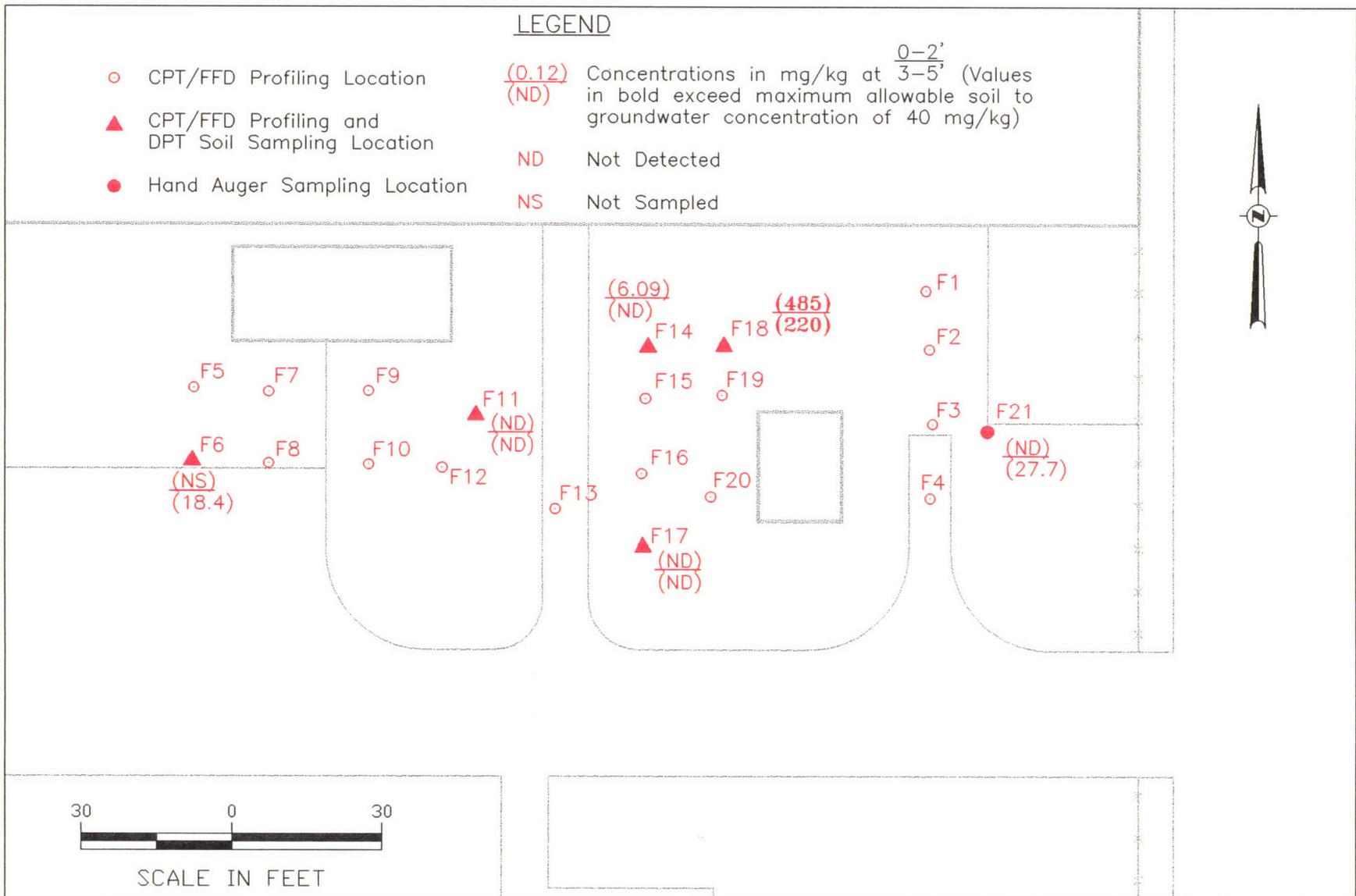


Figure 4-8. Distribution of Extractable Total Petroleum Hydrocarbons in Source Area Soil Hamilton Beach ◊ Proctor Silex, Inc.

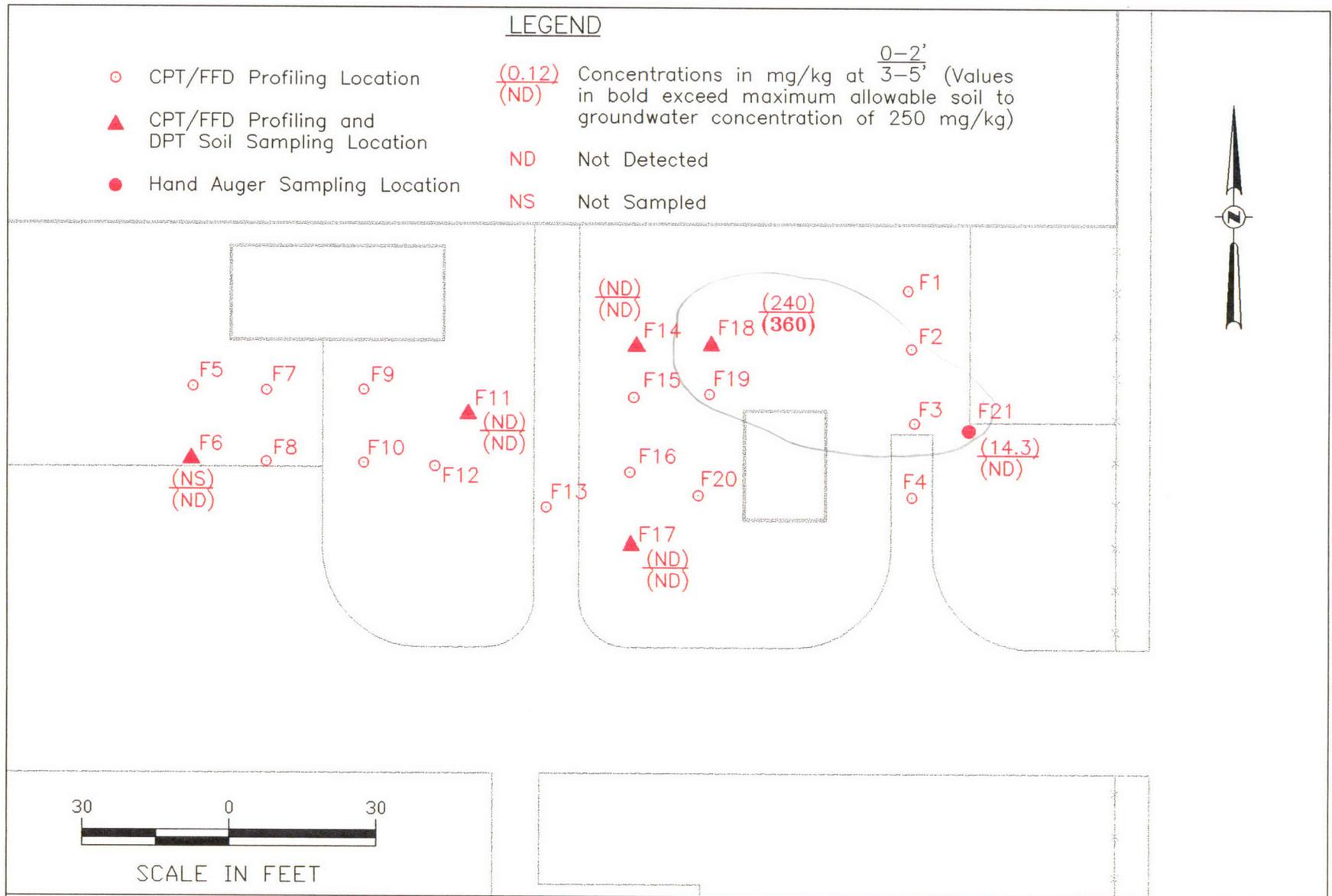


Figure 4-9. Distribution of Oil and Grease in Source Area Soil Hamilton Beach ♦ Proctor Silex, Inc.

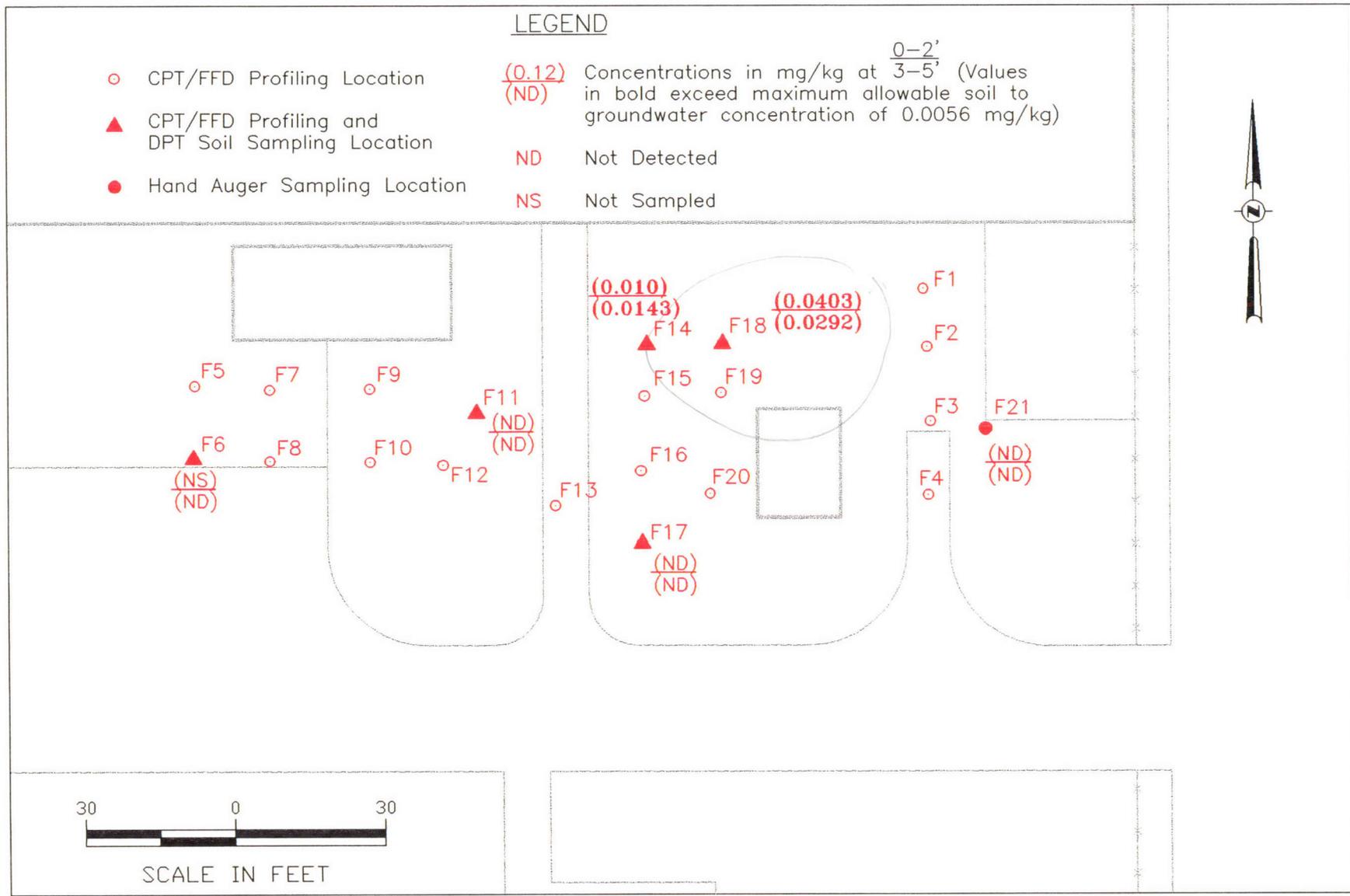
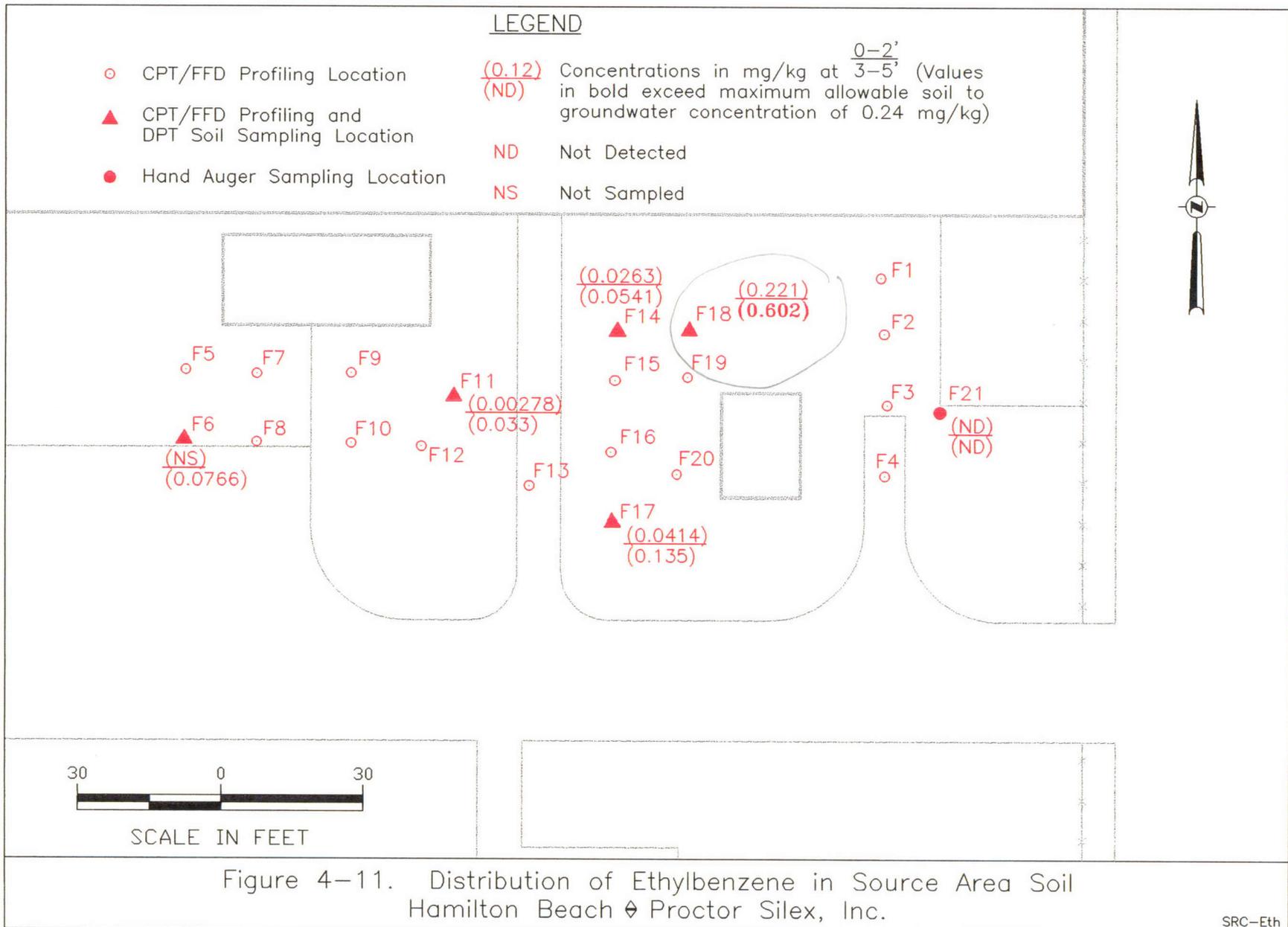


Figure 4-10. Distribution of Benzene in Source Area Soil  
Hamilton Beach ♦ Proctor Silex, Inc.



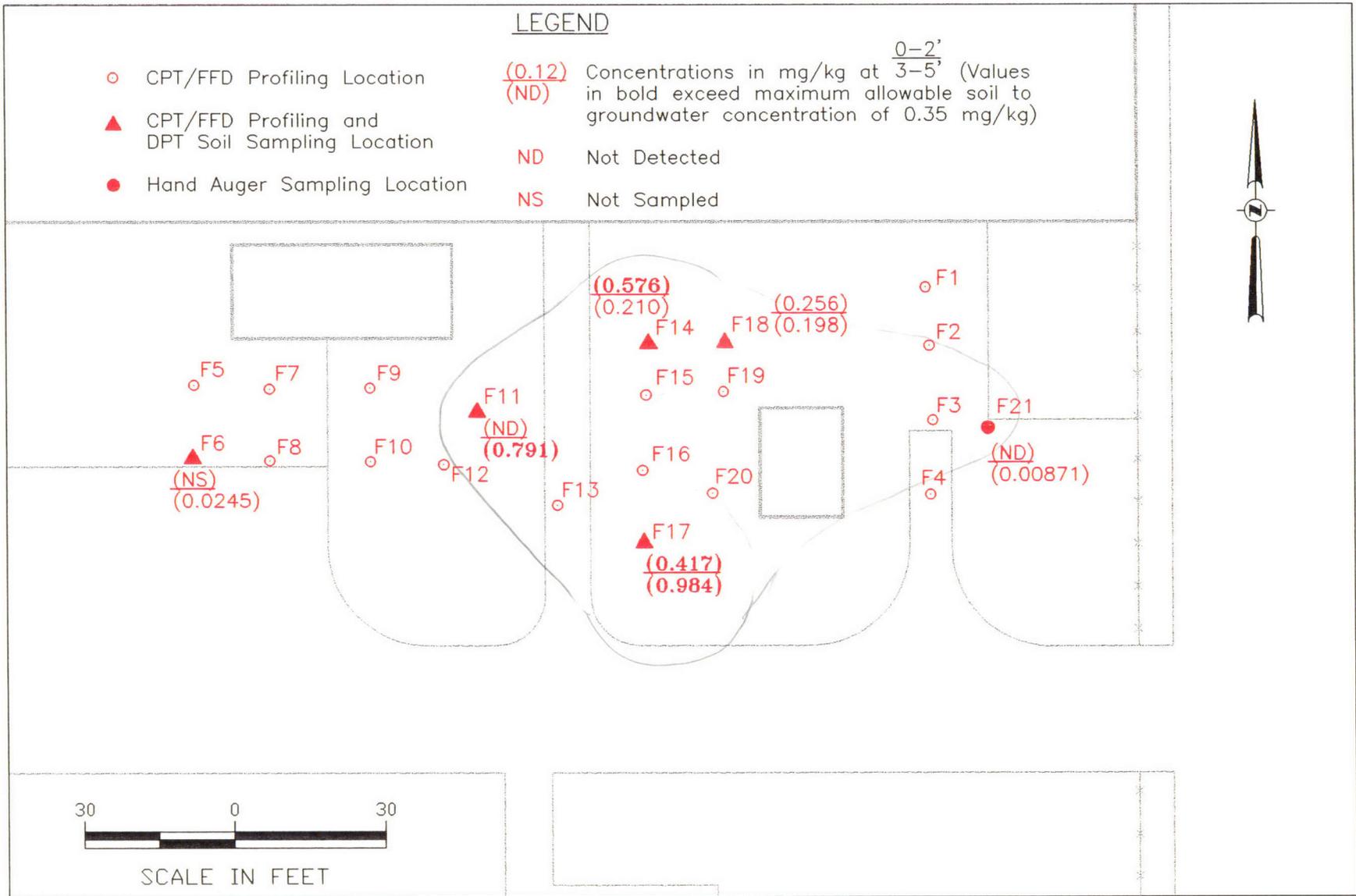


Figure 4-12. Distribution of cis-1,2-Dichloroethene in Source Area Soil Hamilton Beach & Proctor Silex, Inc.

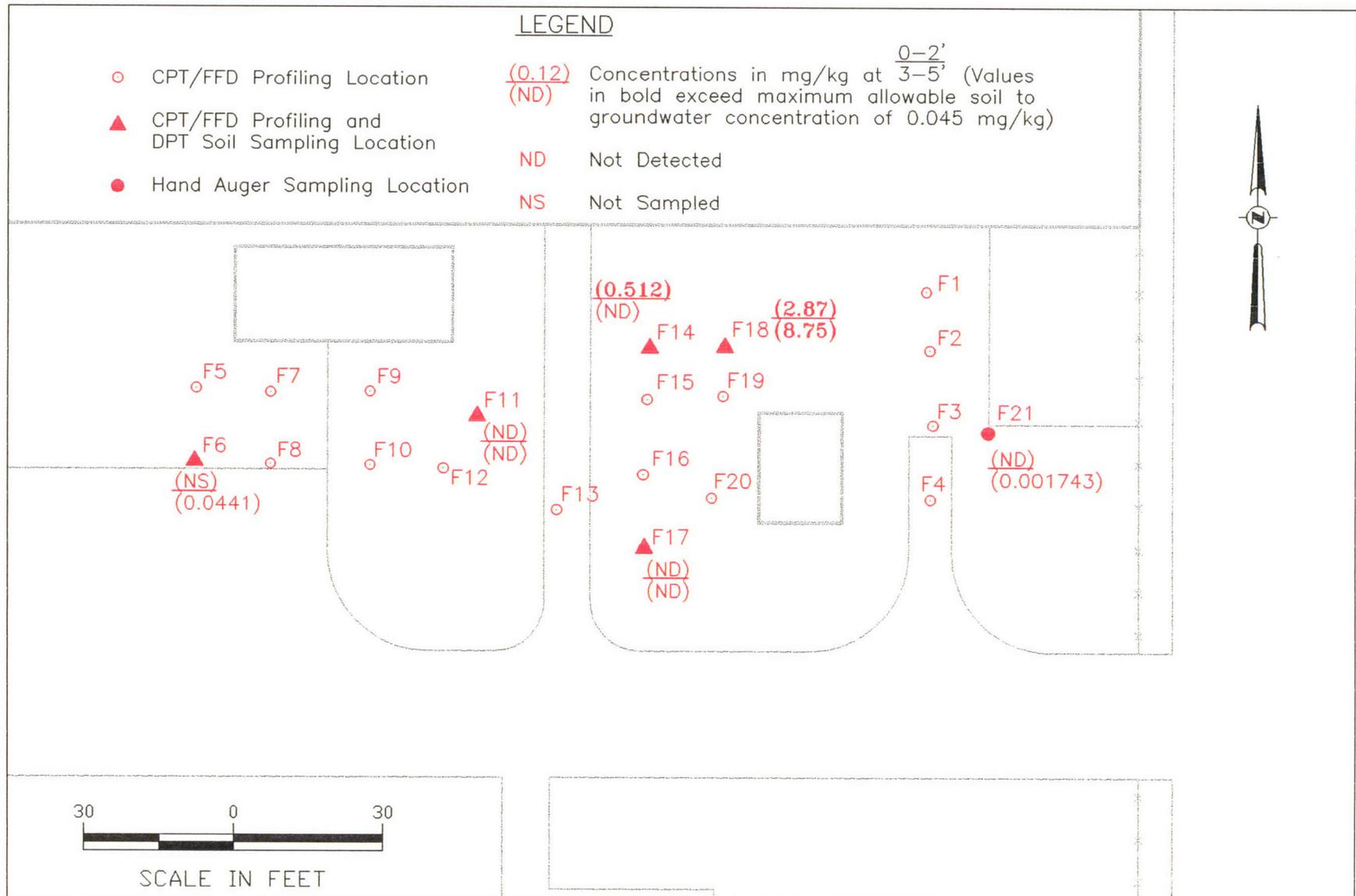


Figure 4-13. Distribution of 1,1-Dichloroethene in Source Area Soil Hamilton Beach ◊ Proctor Silex, Inc.

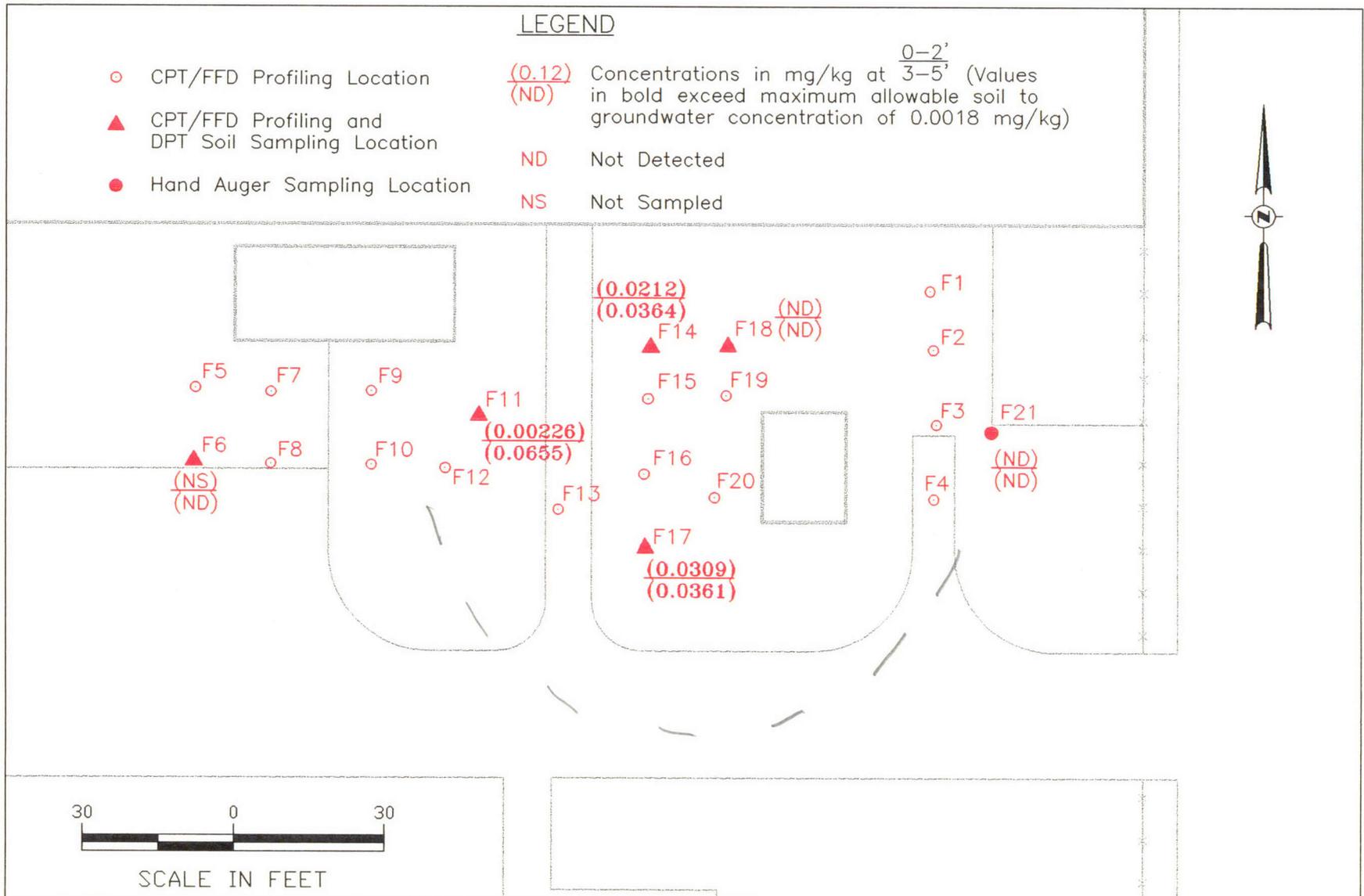


Figure 4-14. Distribution of 1,2-Dichloroethane in Source Area Soil Hamilton Beach ♦ Proctor Silex, Inc.

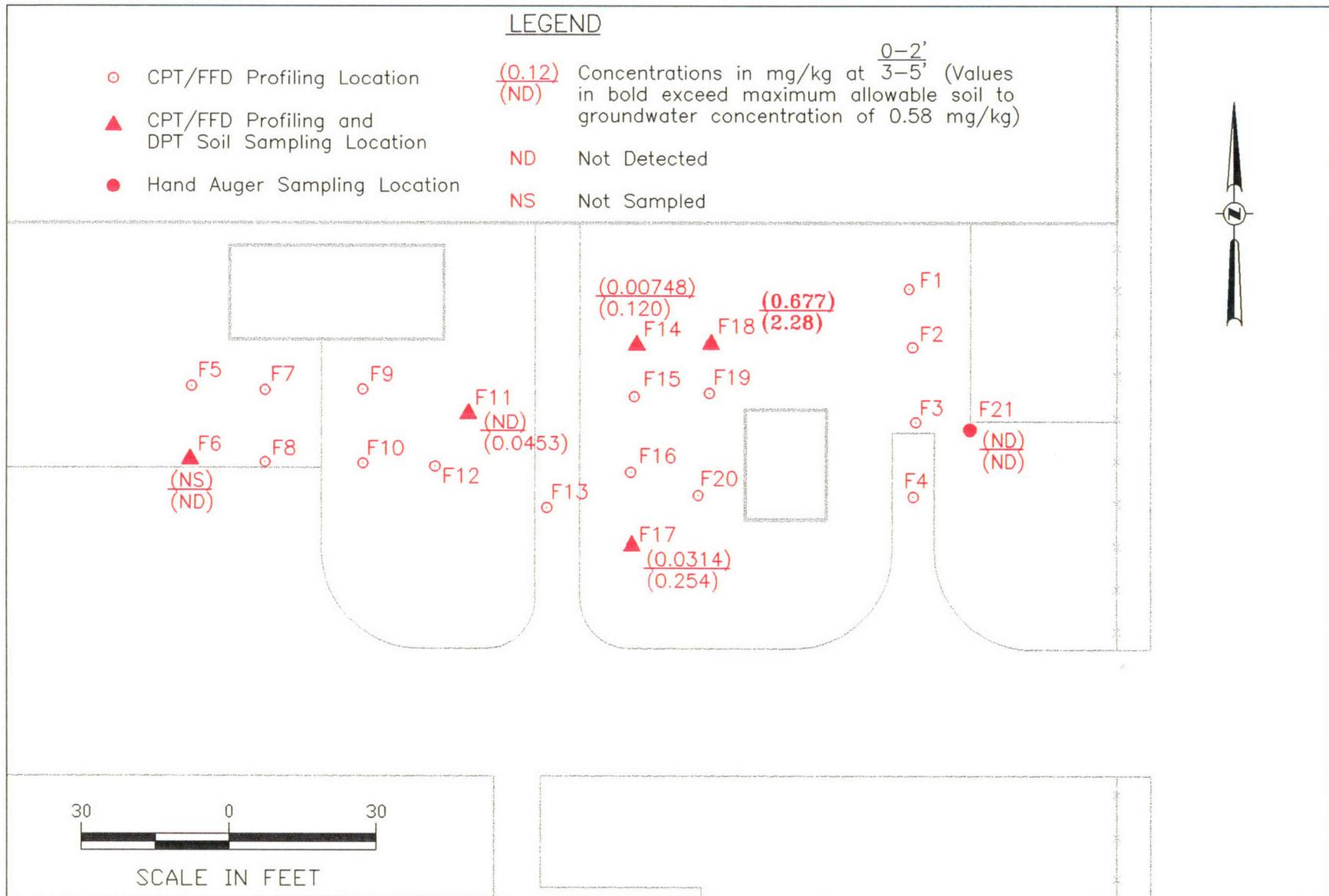
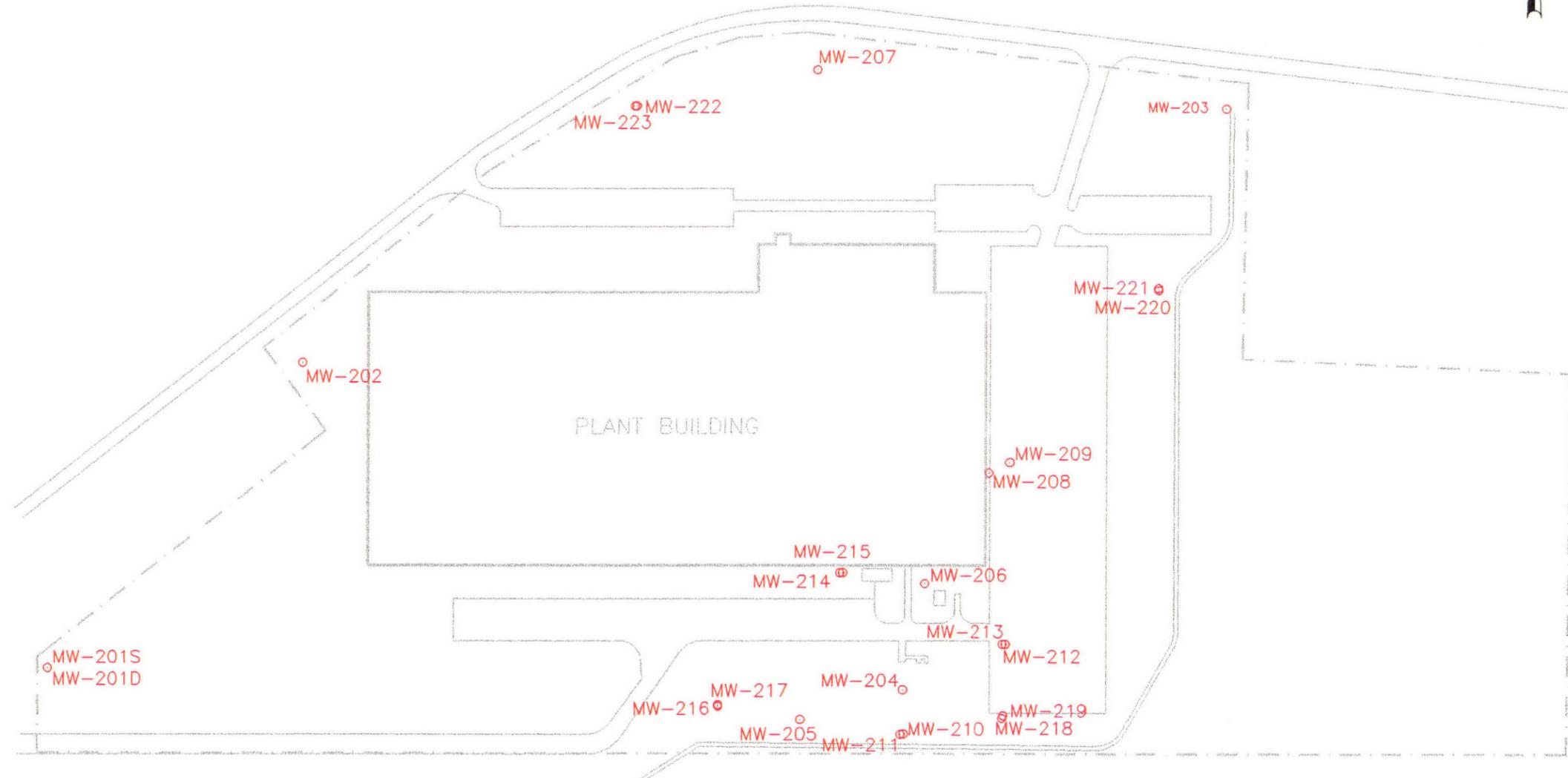


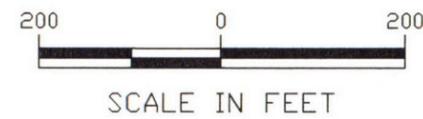
Figure 4-15. Distribution of Naphthalene in Source Area Soil  
Hamilton Beach ♦ Proctor Silex, Inc.





LEGEND

○ Monitoring Well



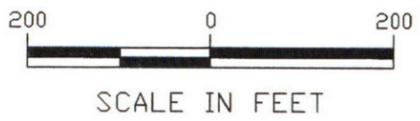
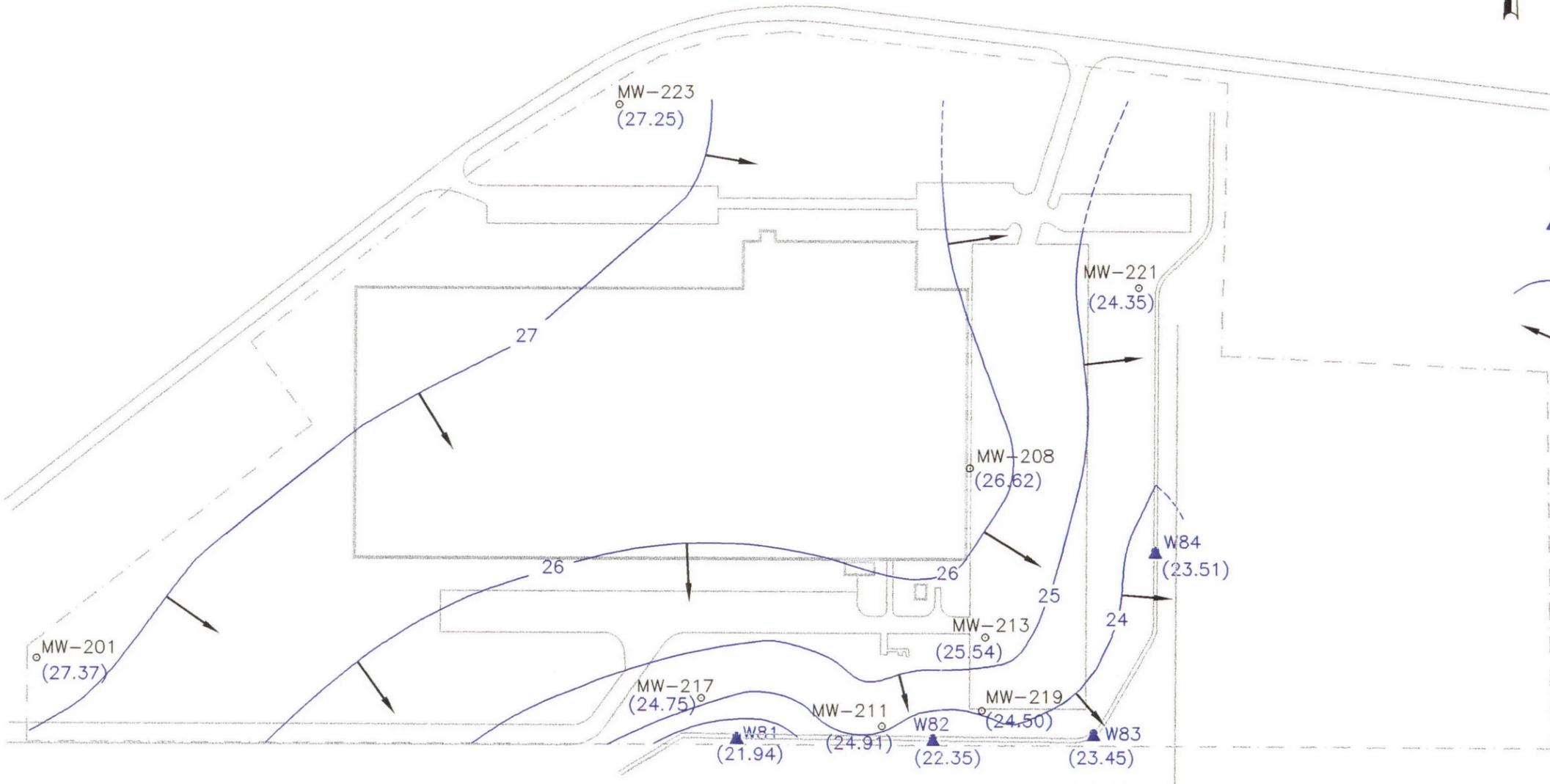
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SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98	Figure 5-2. Location of Monitoring Wells		
	<b>RADIAN</b> INTERNATIONAL	CHECKED BY	BPG	DATE	19JUN98	Hamilton Beach & Proctor Silex, Inc		
	<small>REPRODUCED FROM THE ORIGINAL DRAWING</small>	APPROVED BY		DATE		CONTRACT NO.	DRAWING NO.	REV.
						650138.0501	MONITOR	0



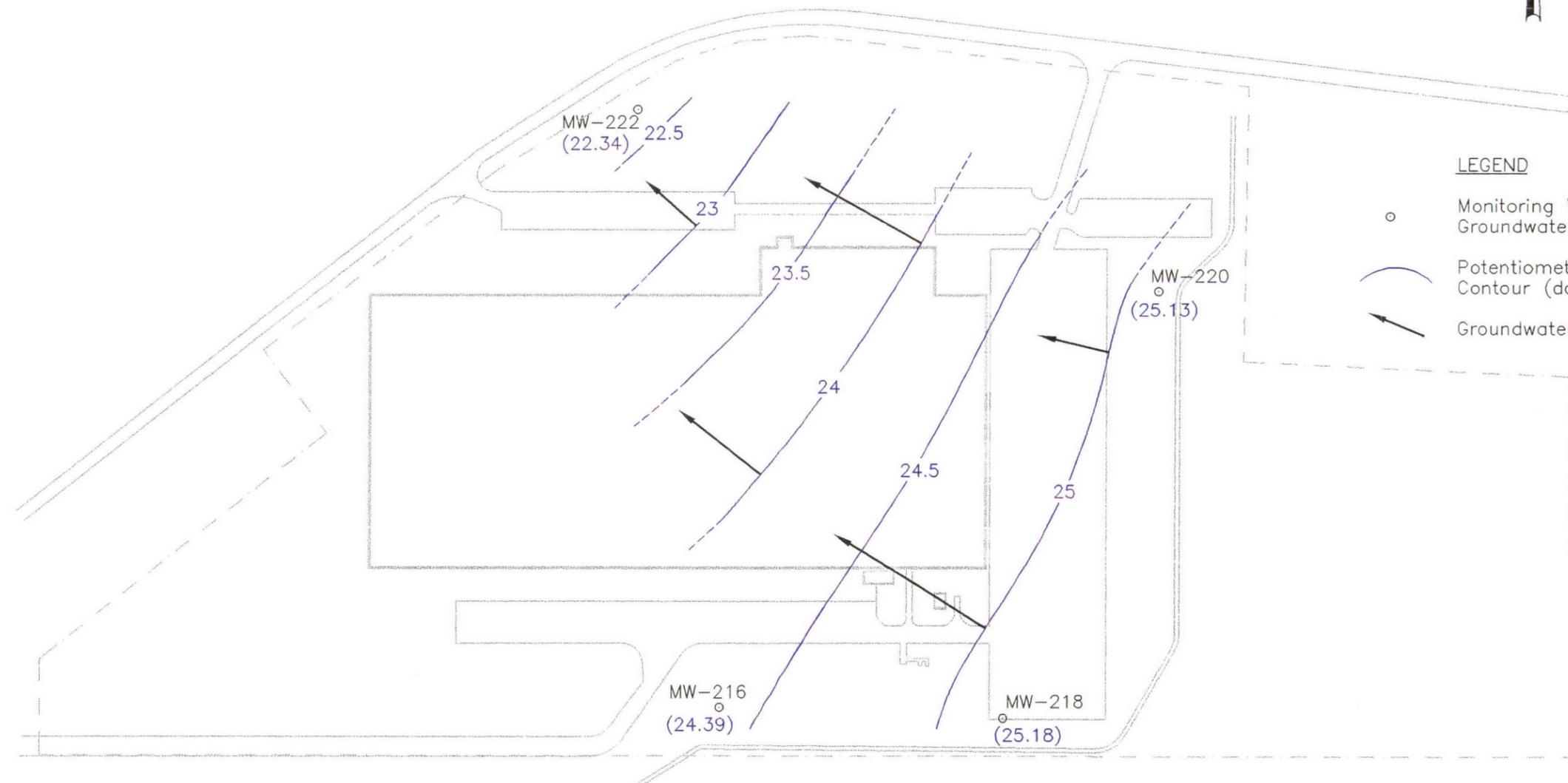
**LEGEND**

- Monitoring Well with Groundwater Elevation (MSL)
- ▲ Surface Water Measuring Point with Water Elevation
- Potentiometric Surface Contour (dashed where inferred)
- Groundwater Flow Direction



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-3. Potentiometric Surface Map, Unit A, May 1998		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		Hamilton Beach & Proctor-Silex Inc.		
	<b>RADIAN INTERNATIONAL</b>	CHECKED BY	BPG	DATE	19JUN98		CONTRACT NO.	DRAWING NO.	REV.
	ISSUES: 000001, 000002, 000003	APPROVED BY		DATE			650138.0501	SHALLOW	0

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**LEGEND**

- Monitoring Well with Groundwater Elevation (MSL)
- Potentiometric Surface Contour (dashed where inferred)
- Groundwater Flow Direction



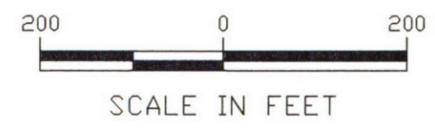
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SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-4. Potentiometric Surface Map, Unit B, May 1998 Hamilton Beach & Proctor-Silex Inc.		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98	CONTRACT NO.	650138.0501	REVISION NO.	DEEP
	<b>RADIAN</b> INTERNATIONAL	CHECKED BY	BPG	DATE	19JUN98	REV.			0
	12300 VILLAGE BLVD., NEW ORLEANS, LA 70115	APPROVED BY		DATE					



**LEGEND**

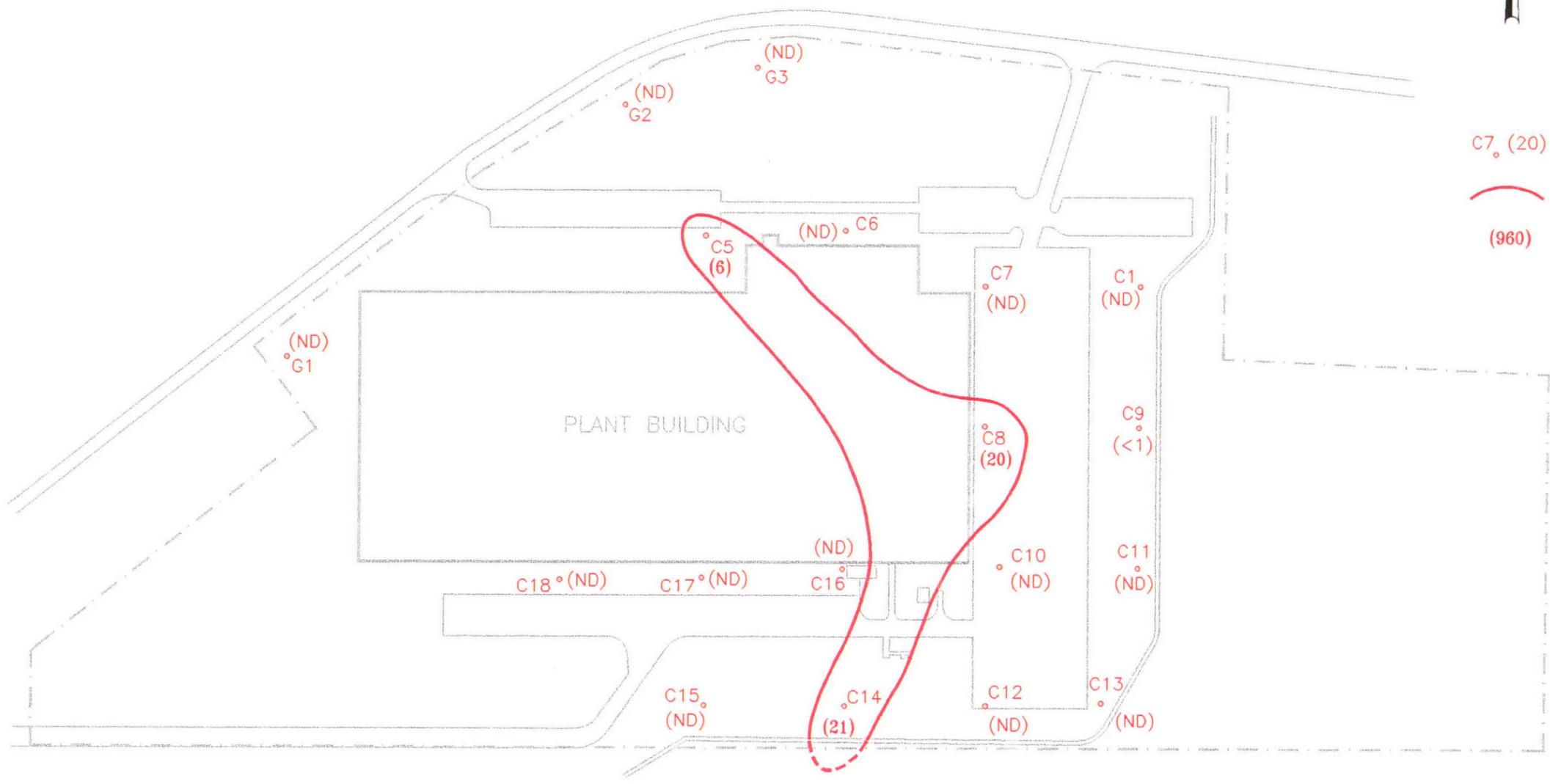
- C7 (20) Sampling Location and Reported Concentration in (ug/L)
- (960) Inferred Areal Limit of Chemical
- 960** Bold Values Exceed 2L Groundwater Standard



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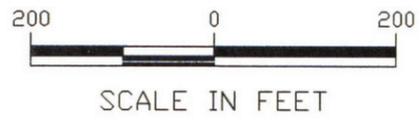
SCALE	AS SHOWN	REVISION BY	JN	DATE	27MAY98	DRAWING TITLE		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98	Figure 5-5. Approximate Areal Extent of Trichloroethene in Unit A		
	<b>RADIAN INTERNATIONAL</b>	CHECKED BY	BPG	DATE	19JUN98	Hamilton Beach & Proctor-Sillex Inc.		
	<small>REVISIONS SHALL FOLLOW THE DRAWING TITLE</small>	APPROVED BY		DATE		CONTRACT NO.	DRAWING NO.	REV.
						650138.0501	TCE-UP	0

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LEGEND

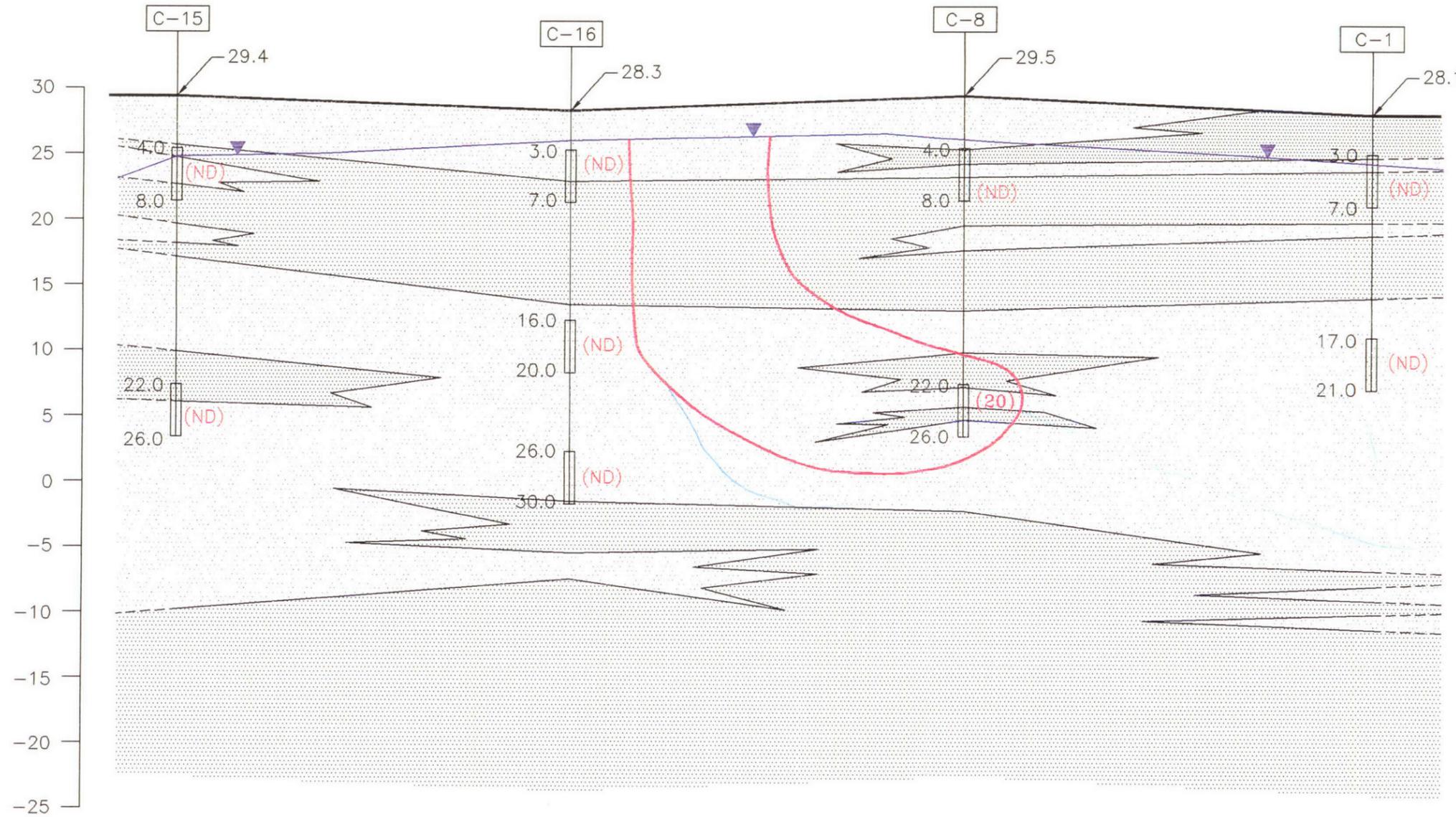
- C7 (20) Sampling Location and Reported Concentration in (ug/L)
- Inferred Areal Limit of Chemical
- (960)** Bold Values Exceed 2L Groundwater Standard



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-6. Approximate Areal Extent of Trichloroethene in Unit B		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		Hamilton Beach & Proctor-Silex Inc.		
	<b>RADIAN INTERNATIONAL</b>	CHECKED BY	BPG	DATE	19JUN98		CONTRACT NO.	DRAWING NO.	REV.
	SEARCH SINGLE FILE, WITH OTHERS 07/98	APPROVED BY		DATE			650138.0501	TCE-DP	0

SOUTHWEST  
A

NORTHEAST  
A'



LEGEND

- C-1 Location Number
- Ground Surface Elevation
- Top of Screen Depth
- Bottom of Screen Depth
- Water Level Elevation
- Inferred vertical extent of chemical
- (960)** Reported concentration in ug/L, bold values exceed 2L groundwater standard
- (ND)** Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



HORIZONTAL SCALE



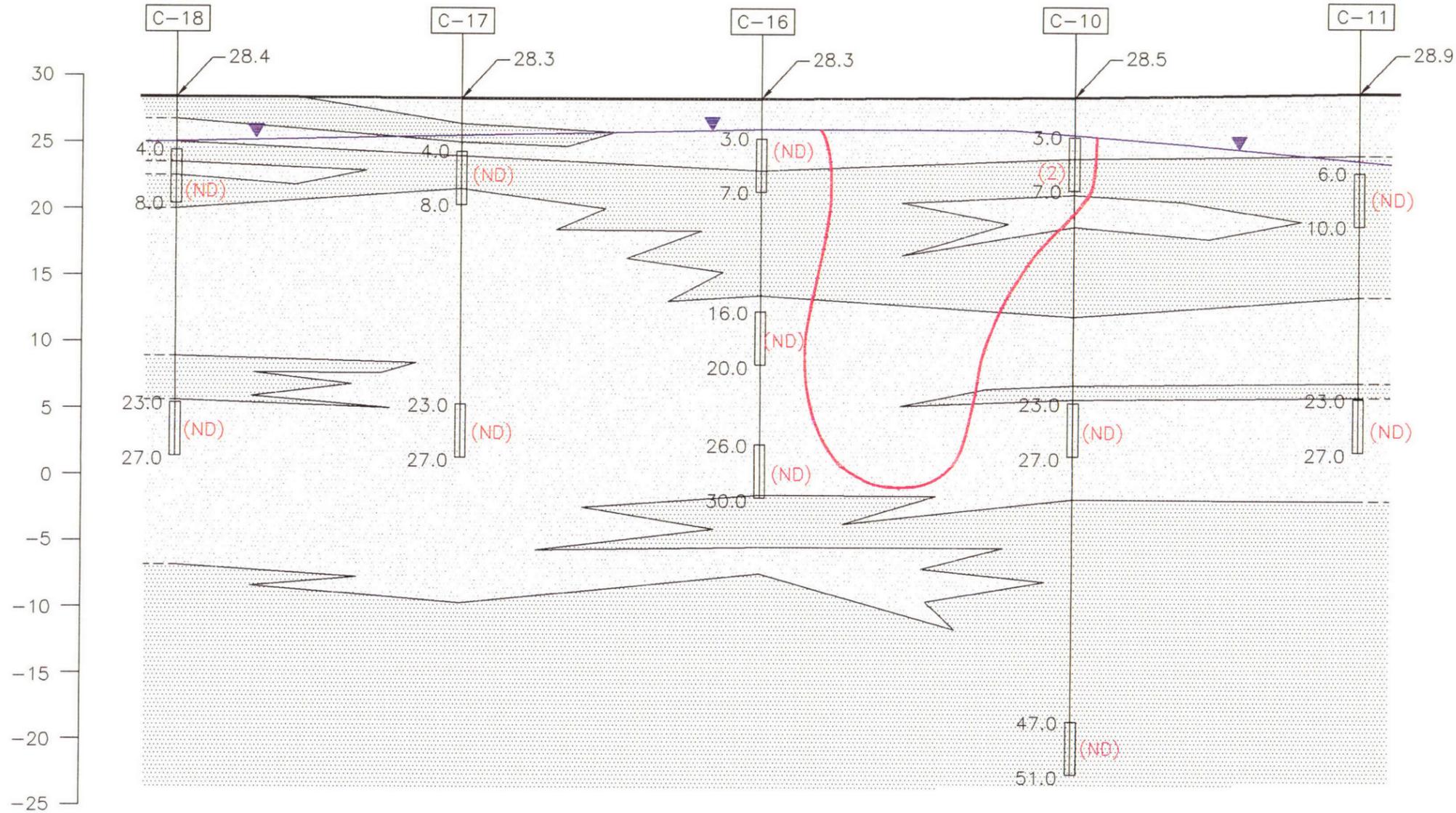
VERTICAL SCALE

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SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-7.
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		Approximate Vertical Extent of Trichloroethene, A-A'
	<b>RADIANT INTERNATIONAL</b>	DESIGNED BY	BPG	DATE	19JUN98		Hamilton Beach & Proctor-Sillex Inc.
	<small>REGISTERED TRADE NAME, WASHINGTON STATE</small>	APPROVED BY		DATE		CONTRACT NO.	650138.0501
						DRAWING NO.	TCE-A-A
						REV.	0

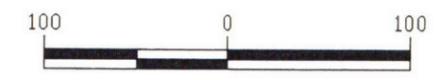
WEST  
B

EAST  
B'

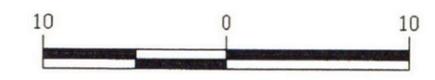


LEGEND

- C-1 Location Number
- Ground Surface Elevation
- Top of Screen Depth
- Bottom of Screen Depth
- Water Level Elevation
- Inferred vertical extent of chemical
- (960)** Reported concentration in ug/L, bold values exceed 2L groundwater standard
- (ND) Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



HORIZONTAL SCALE



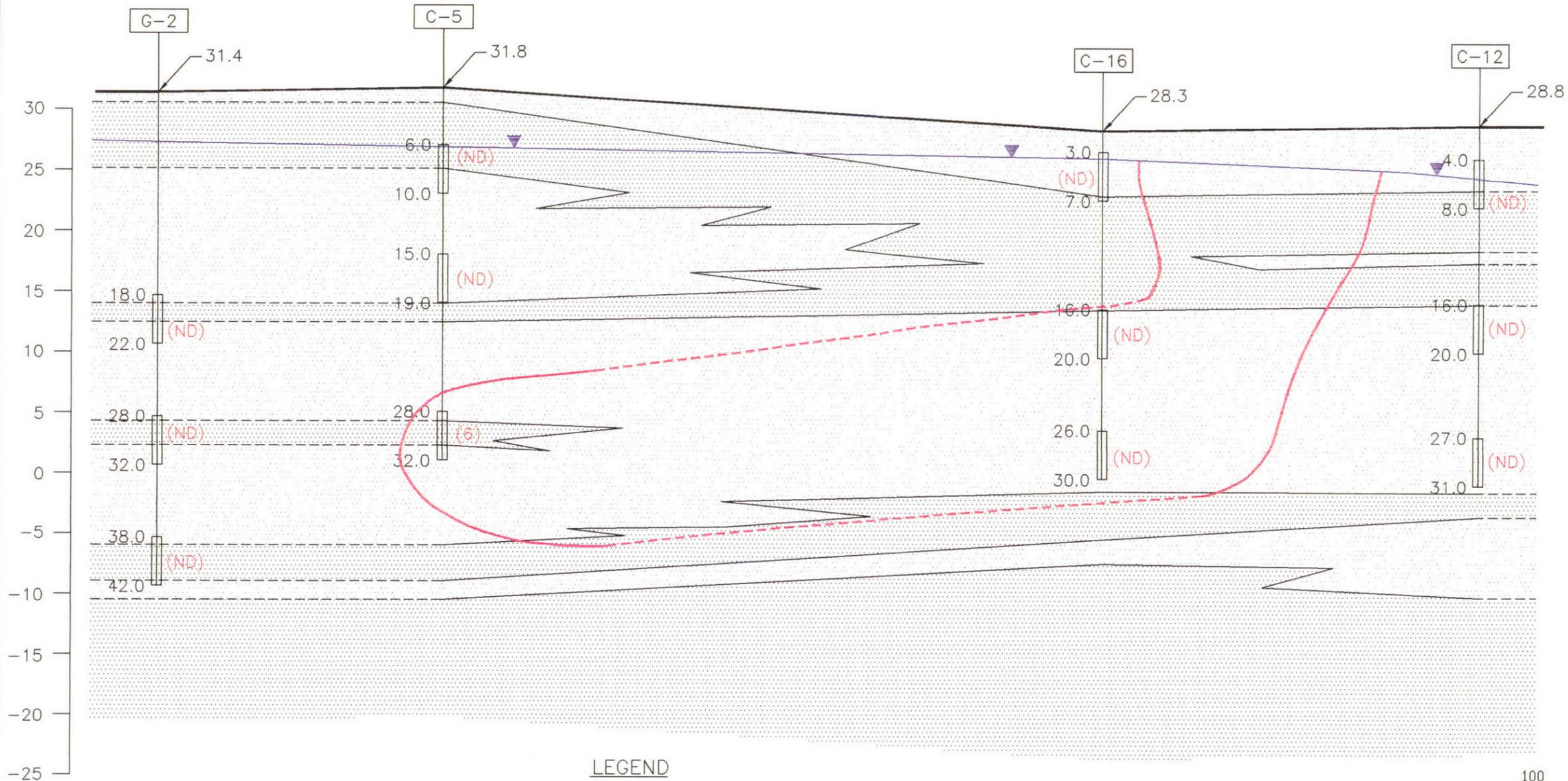
VERTICAL SCALE

SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-8. Approximate Vertical Extent of Trichloroethene, B-B'		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		Hamilton Beach & Proctor-Silex, Inc.		
	<b>RADIANT</b> INTERNATIONAL	CHECKED BY	BPG	DATE	19JUN98		CONTRACT NO.	DRAWING NO.	REV.
	REVISION TABLE PAGE 0001 OF 01/00	APPROVED BY		DATE			650138.0501	TCE-B-B	0

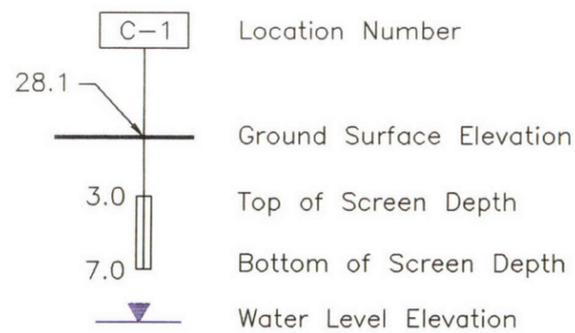
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NORTHWEST  
C

SOUTHEAST  
C'

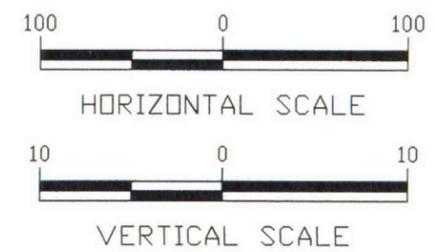


LEGEND



- Inferred vertical extent of chemical
- Dashed indicates extent offset from section shown
- (960)** Reported concentration in ug/L, bold values exceed 2L groundwater standard
- (ND)** Not Detected

- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



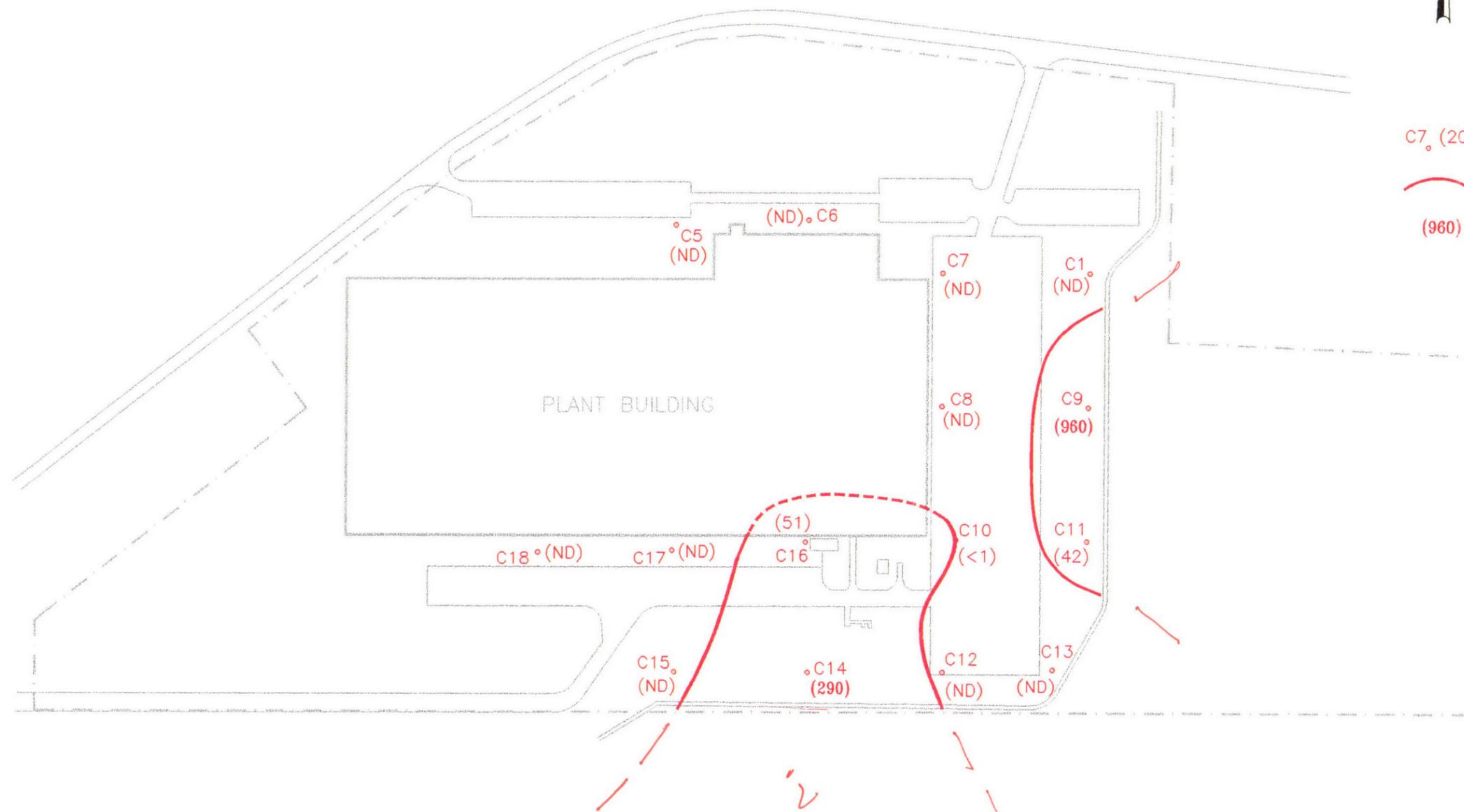
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SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-9.
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		Approximate Vertical Extent of Trichloroethene, C-C'
	<b>RADIAN</b> INTERNATIONAL	CHECKED BY	BPG	DATE	19JUN98		Hamilton Beach & Proctor-Silex Inc.
	<small>ISSUES TRIMBLE FILE, BUSH CEILING 0790</small>	APPROVED BY		DATE		CONTRACT NO.	650138.0501
						DRAWING NO.	TCE-C-C
						REV.	0

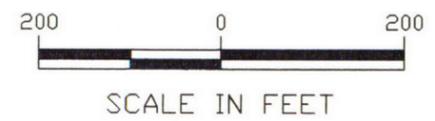


LEGEND

- C7 (20) Sampling Location and Reported Concentration in (ug/L)
- Inferred Areal Limit of Chemical
- (960) Bold Values Exceed 2L Groundwater Standard



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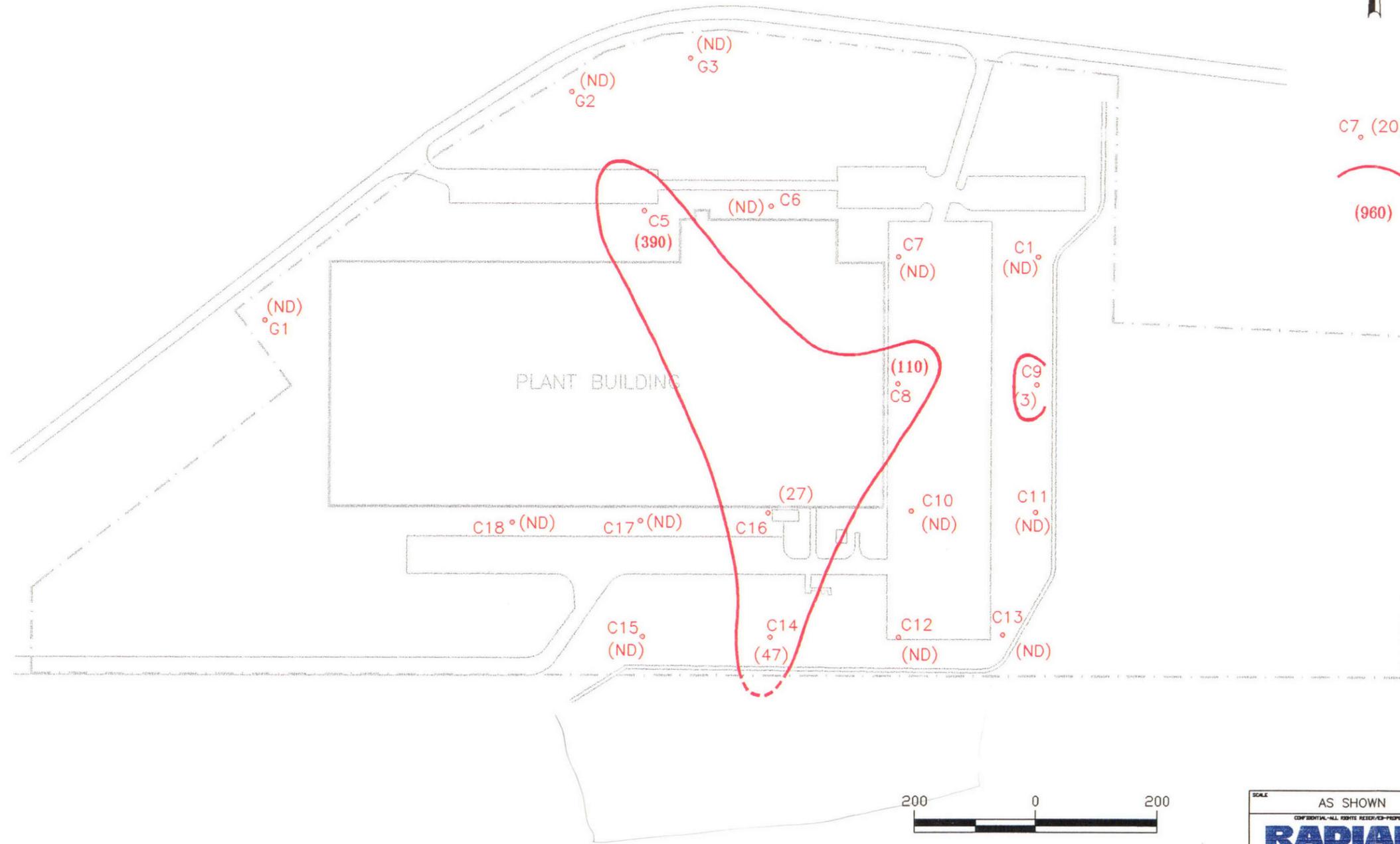
SCALE	AS SHOWN	REVISION BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-10. Approximate Areal Extent of cis-1,2-Dichloroethene in Unit A Hamilton Beach & Proctor-Silex, Inc.		
		DRAWN BY	TSH	DATE	28MAY98				
		CHECKED BY	BPG	DATE	19JUN98				
		APPROVED BY		DATE					
						CONTRACT NO.	650138.0501	DRAWING NO.	CIS-UP
						REV.			0

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LEGEND

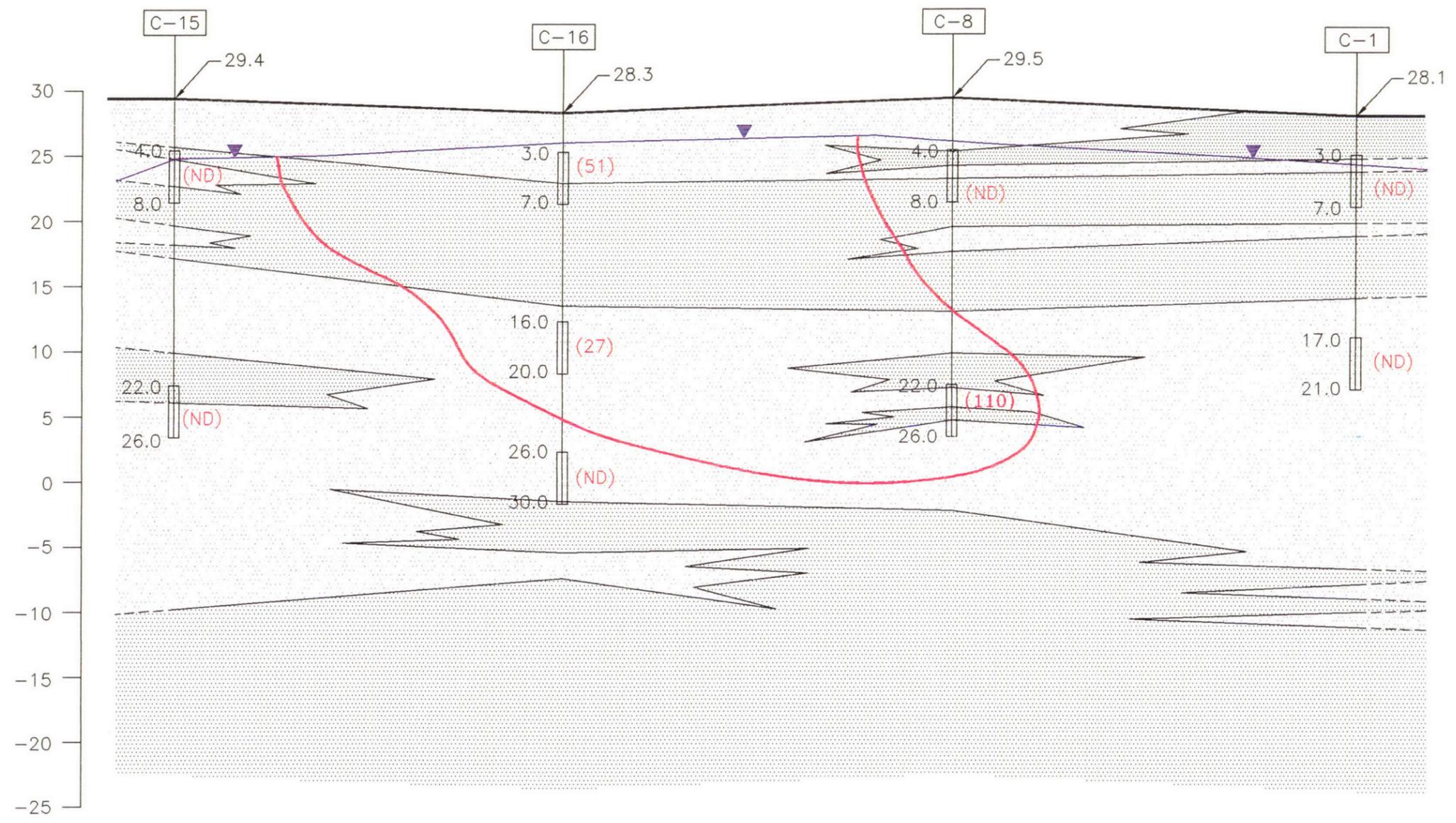
- C7 (20) Sampling Location and Reported Concentration in (ug/L)
- (960) Inferred Areal Limit of Chemical
- (960)** Bold Values Exceed 2L Groundwater Standard



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-11. Approximate Areal Extent of cis-1,2-Dichloroethene in the Unit B
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		Hamilton Beach & Proctor-Silex Inc.
	<b>RADIAN</b> INTERNATIONAL	CHECKED BY	BPG	DATE	19JUN98	CONTRACT NO.	650138.0501
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						REV.	0

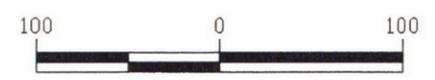
SOUTHWEST  
A

NORTHEAST  
A'

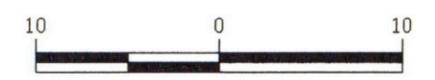


LEGEND

- C-1 Location Number
- 28.1 Ground Surface Elevation
- 3.0 Top of Screen Depth
- 7.0 Bottom of Screen Depth
- Water Level Elevation
- Inferred vertical extent of chemical
- (960)** Reported concentration in ug/L, bold values exceed 2L groundwater standard
- (ND)** Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



HORIZONTAL SCALE



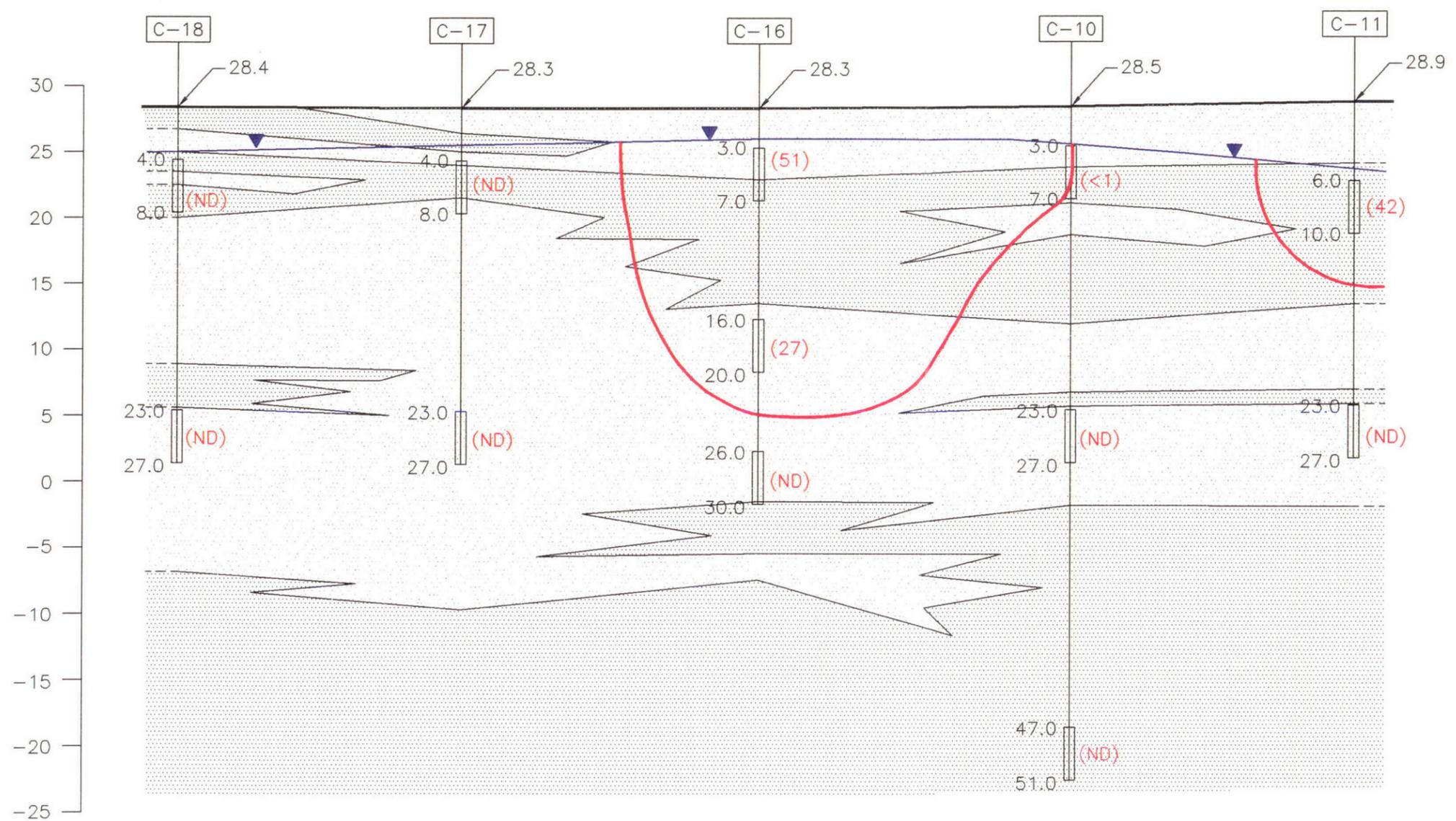
VERTICAL SCALE

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SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-12. Approximate Vertical Extent of cis-1,2-Dichloroethene, A-A'		
		DRAWN BY	TSH	DATE	28MAY98	Hamilton Beach & Proctor-Sillex, Inc.			
		CHECKED BY	BPG	DATE	19JUN98	CONTRACT NO.	DRAWING NO.	REV.	
		APPROVED BY		DATE		650138.0501	CIS-A-A	0	

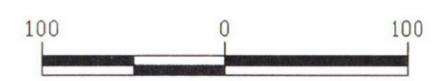
WEST  
B

EAST  
B'

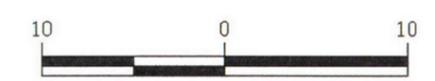


LEGEND

- C-1 Location Number
- Ground Surface Elevation
- Top of Screen Depth
- Bottom of Screen Depth
- Water Level Elevation
- Inferred vertical extent of chemical
- (960)** Reported concentration in ug/L, bold values exceed 2L groundwater standard
- (ND)** Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



HORIZONTAL SCALE



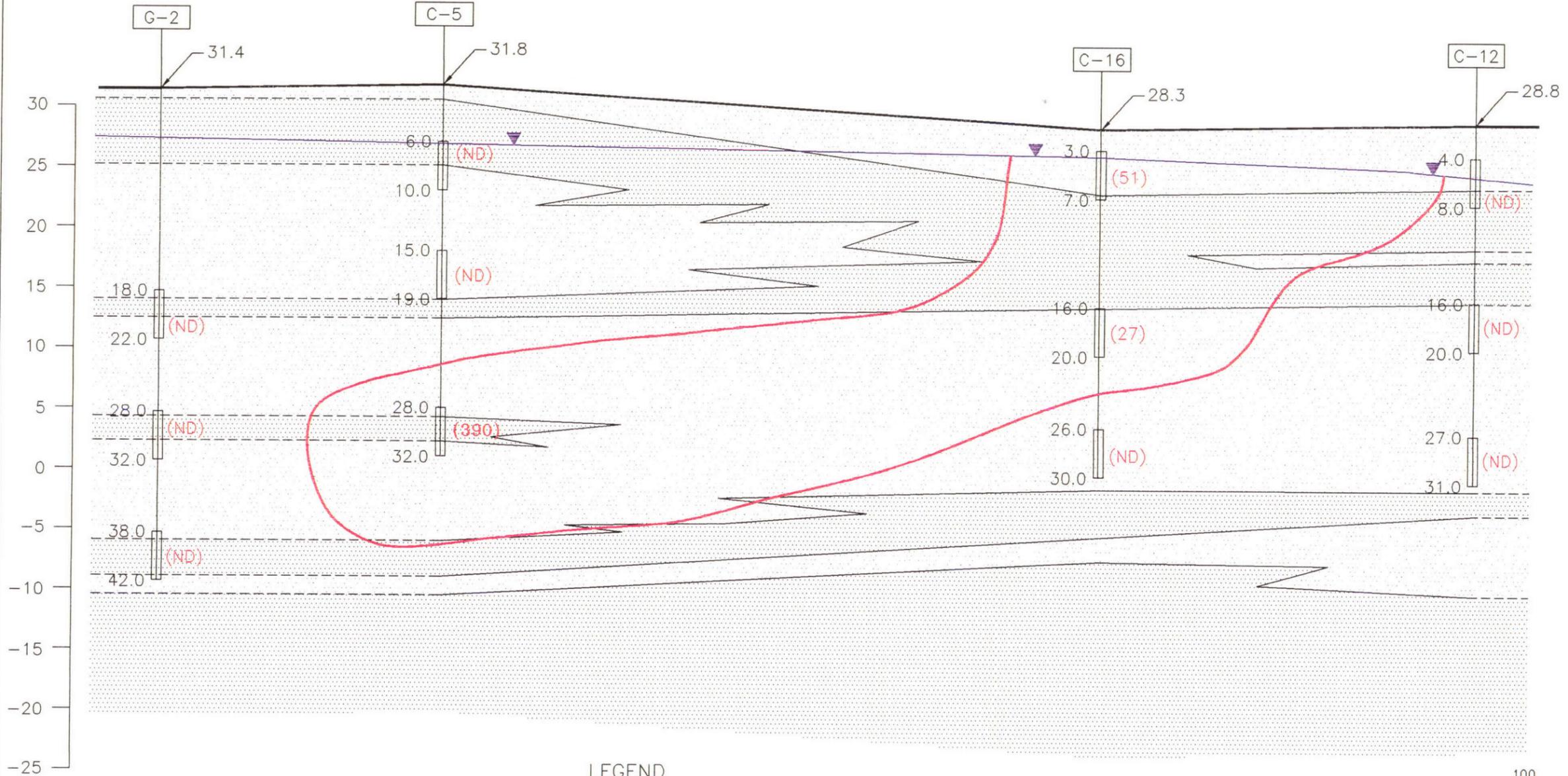
VERTICAL SCALE

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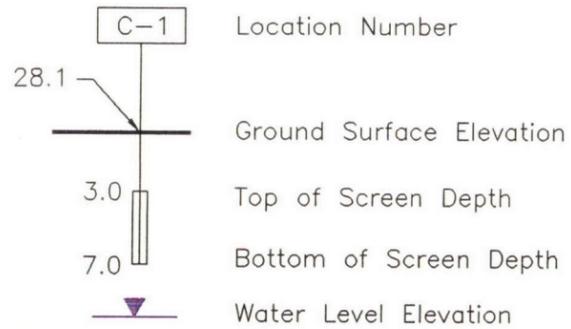
SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-13. Approximate Vertical Extent of cis-1,2-Dichloroethene, B-B'		
		DRAWN BY	TSH	DATE	28MAY98		Hamilton Beach & Proctor-Silex Inc.		
		CHECKED BY	BPG	DATE	19JUN98		CONTRACT NO.	DRAWING NO.	REV.
		APPROVED BY		DATE			650138.0501	CIS-B-B	0

NORTHWEST  
C

SOUTHEAST  
C'



LEGEND



- Inferred vertical extent of chemical
- (960)** Reported concentration in ug/L, bold values exceed 2L groundwater standard
- (ND) Not Detected

- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



HORIZONTAL SCALE



VERTICAL SCALE

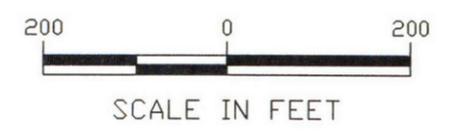
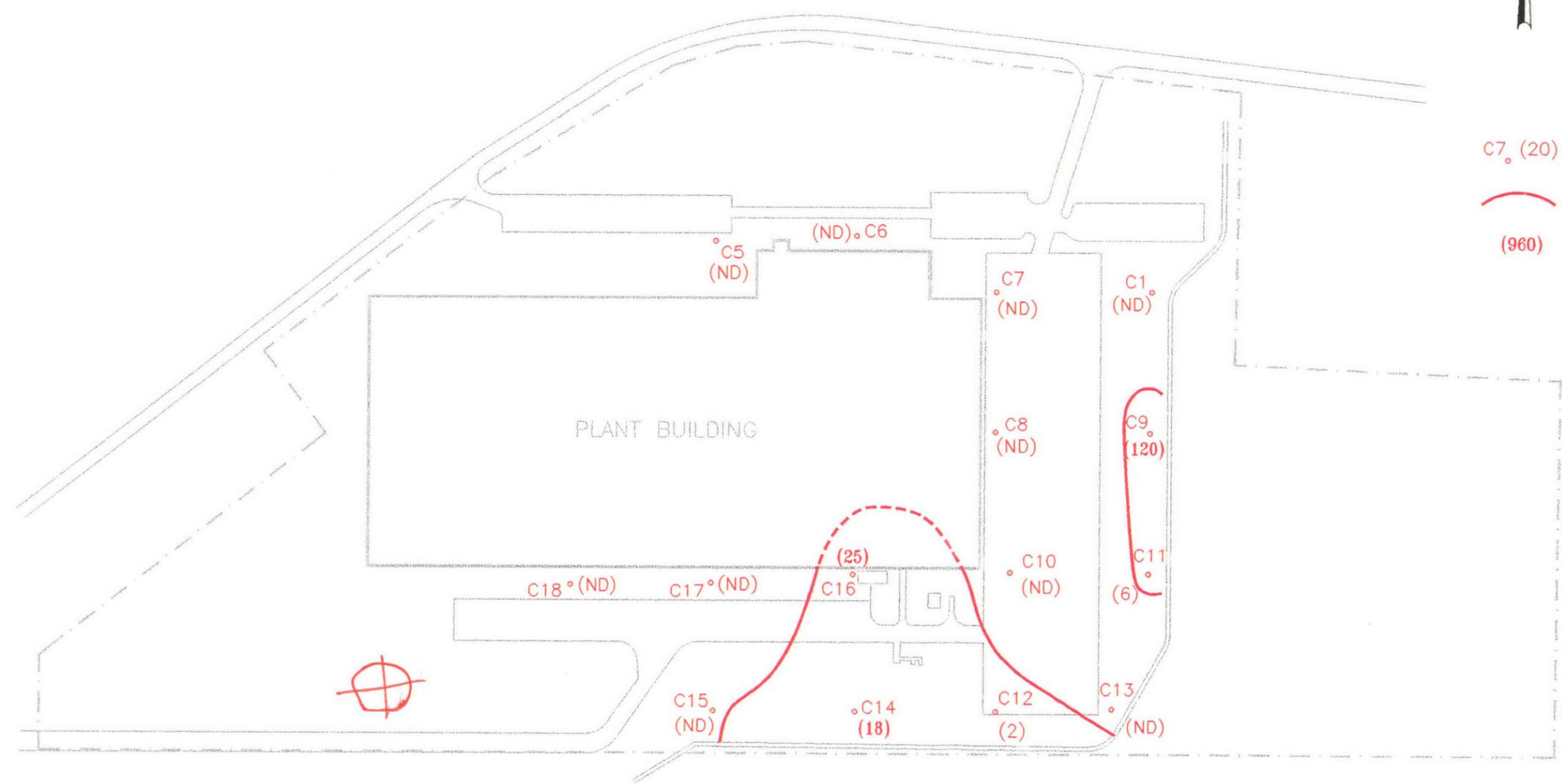
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SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-14.
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		Approximate Vertical Extent of
	<b>RADIAN</b>	ORDERED BY	BPG	DATE	19JUN98		cis-1,2-Dichloroethene, C-C'
	INTERNATIONAL	APPROVED BY		DATE			Hamilton Beach & Proctor-Sillex Inc.
	<small>ESTD 1968</small>					CONTRACT NO.	650138.0501
						DRAWING NO.	CIS-C-C
						REV.	0



**LEGEND**

- C7 (20)** Sampling Location and Reported Concentration in (ug/L)
-  Inferred Areal Limit of Chemical
- (960)** Bold Values Exceed 2L Groundwater Standard



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	FIGURE TITLE	Figure 5-15. Approximate Areal Extent of 1,1-Dichloroethene in Unit A
		DRAWN BY	TSH	DATE	28MAY98		Hamilton Beach & Proctor-Silex Inc.
		CHECKED BY	BPG	DATE	19JUN98	CONTRACT NO.	650138.0501
		APPROVED BY		DATE		DRAWING NO.	DCE-UP
						REV.	0

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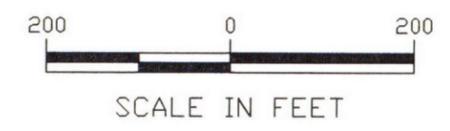
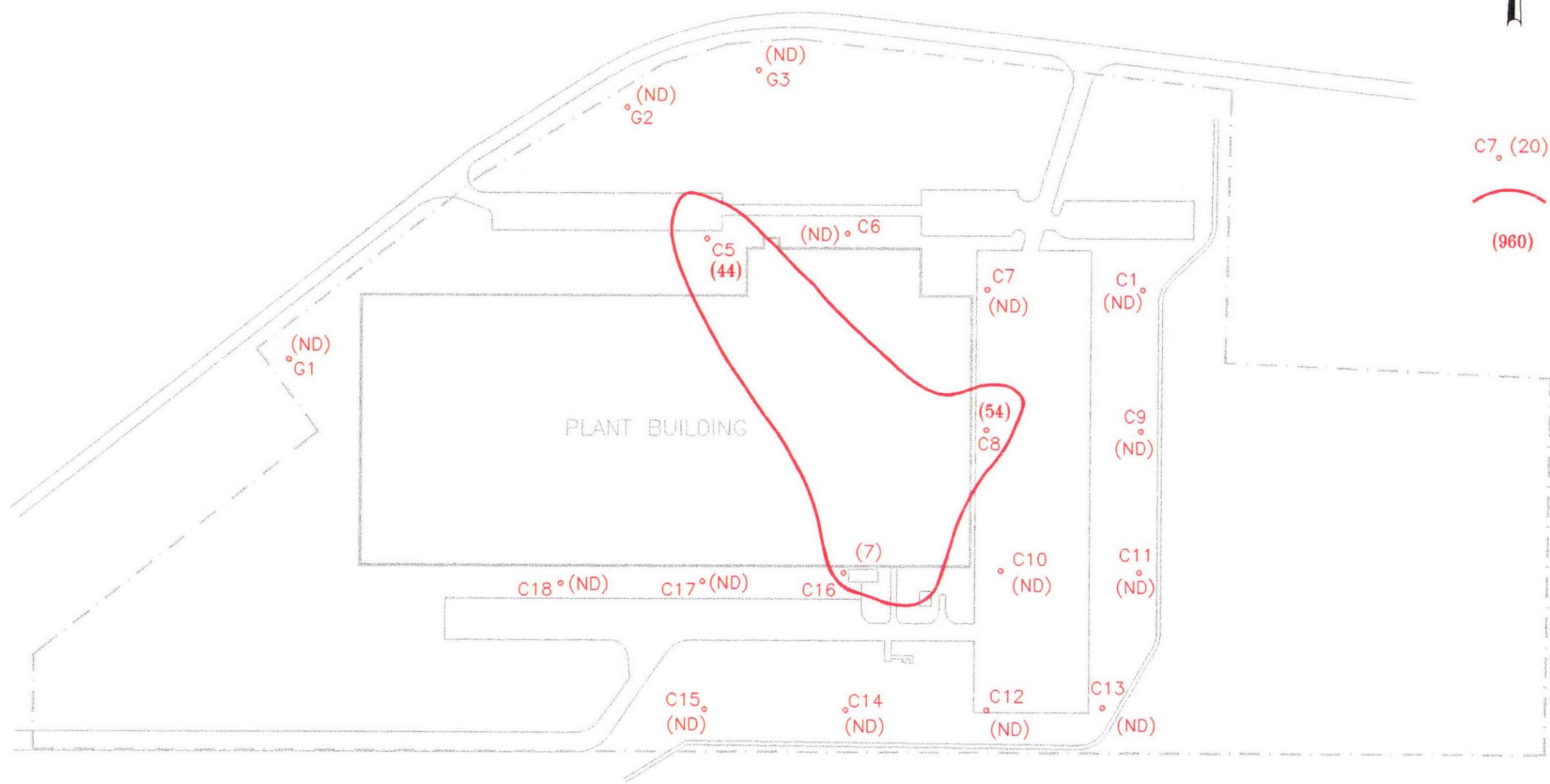


**LEGEND**

C7 (20) Sampling Location and Reported Concentration in (ug/L)

(960) Inferred Areal Limit of Chemical

Bold Values Exceed 2L Groundwater Standard

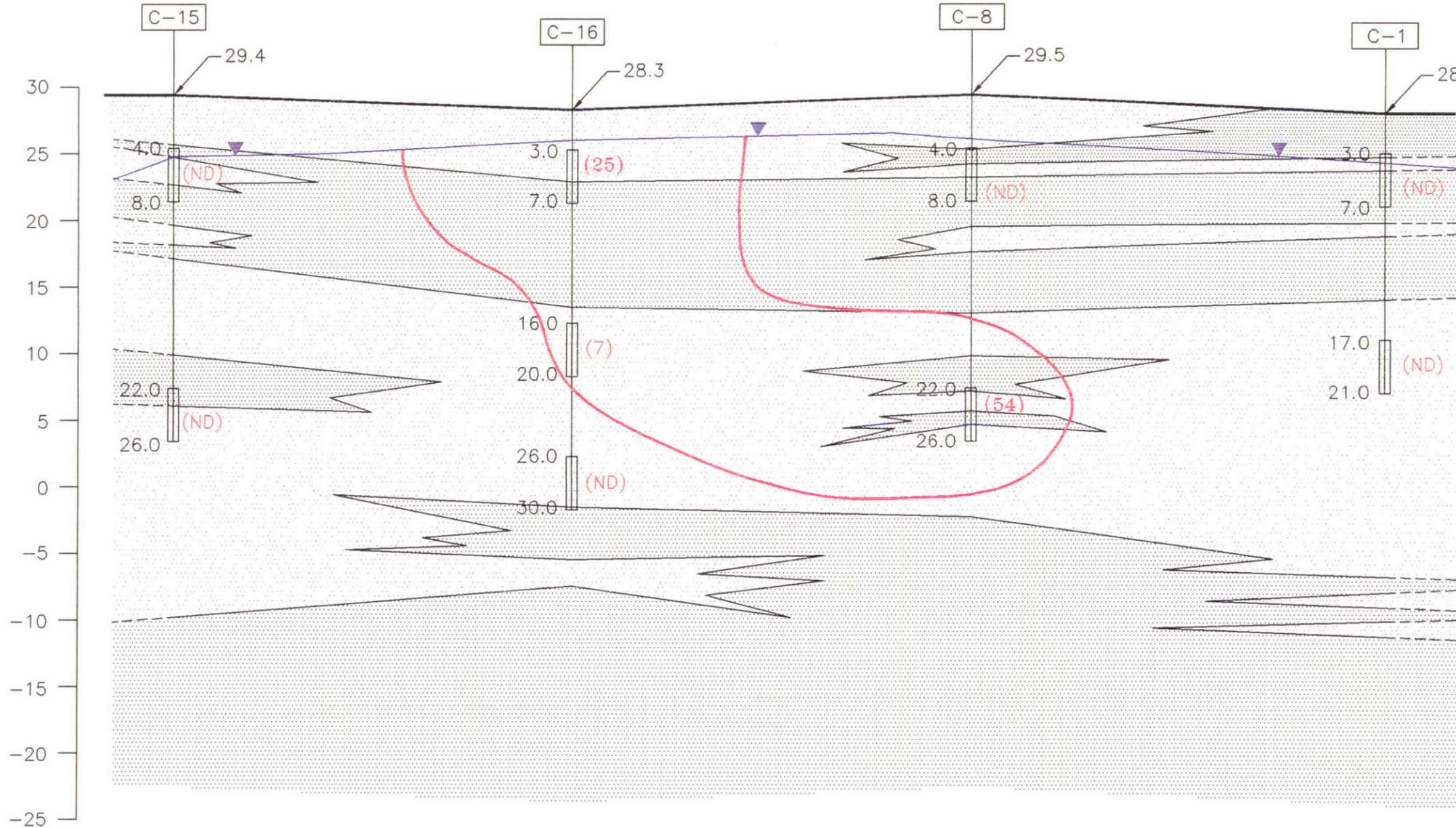


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SCALE	AS SHOWN	REVIEWED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-16. Approximate Areal Extent of 1,1-Dichloroethene in Unit B
		DRAWN BY	TSH	DATE	28MAY98		Hamilton Beach Proctor-Silex Inc.
		CHECKED BY	BPG	DATE	19JUN98		
		APPROVED BY		DATE		CONTRACT NO.	650138.0501
						DRAWING NO.	DCE-DP
						REV.	0

SOUTHWEST  
A

NORTHEAST  
A'

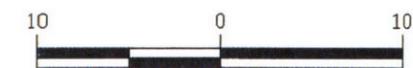


LEGEND

- C-1 Location Number
- Ground Surface Elevation
- 3.0 Top of Screen Depth
- 7.0 Bottom of Screen Depth
- Water Level Elevation
- Inferred vertical extent of chemical
- (960)** Reported concentration in ug/L, bold values exceed 2L groundwater standard
- (ND)** Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



HORIZONTAL SCALE



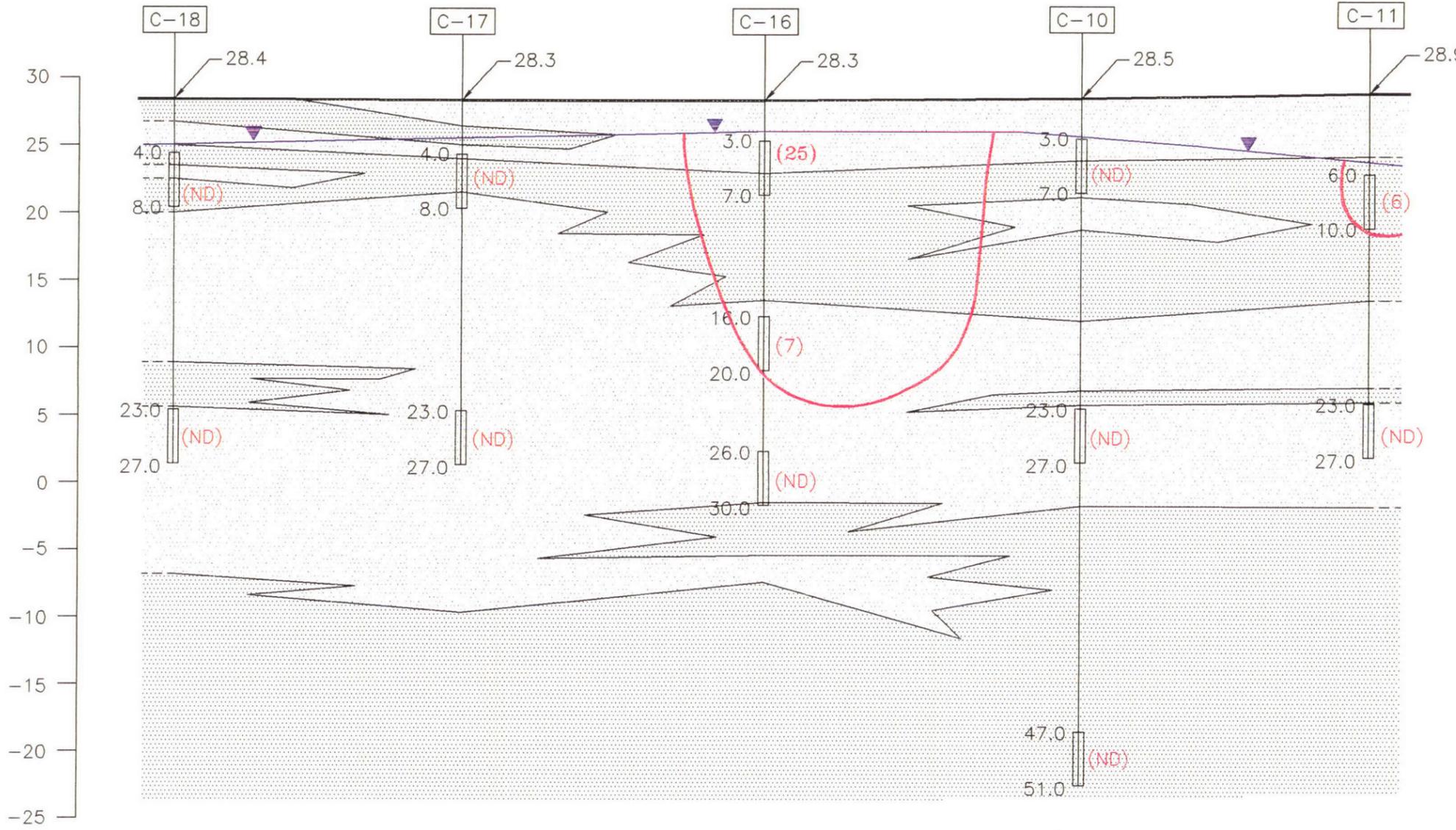
VERTICAL SCALE

SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-17.
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		Approximate Vertical Extent of 1,1-Dichloroethene, A-A'
	<b>RADIAN INTERNATIONAL</b>	CHECKED BY	BPG	DATE	19JUN98		Hamilton Beach & Proctor-Sixes Inc.
	<small>EXCEEDS FEDERAL AND STATE REGULATIONS</small>	APPROVED BY		DATE		CONTRACT NO.	DRAWING NO.
						650138.0501	DCE-A-A
							REV.
							0

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WEST  
B

EAST  
B'



**LEGEND**

- C-1 Location Number
- Ground Surface Elevation
- Top of Screen Depth
- Bottom of Screen Depth
- Water Level Elevation
- Inferred vertical extent of chemical
- (960)** Reported concentration in ug/L, bold values exceed 2L groundwater standard
- (ND)** Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



HORIZONTAL SCALE



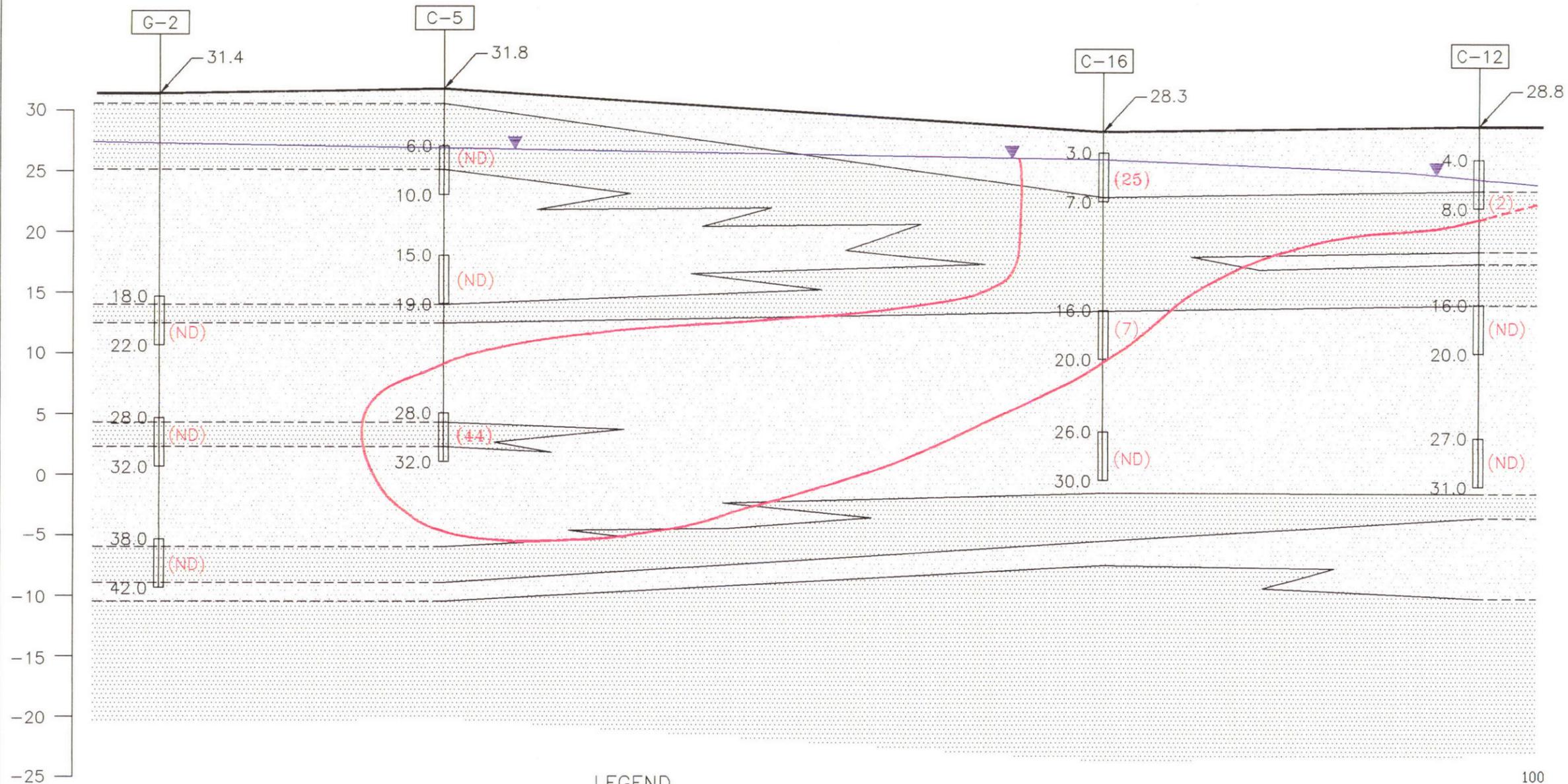
VERTICAL SCALE

SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-18. Approximate Vertical Extent of 1,1-Dichloroethene, B-B' Hamilton Beach & Proctor-Silex, Inc.		
		DRAWN BY	TSH	DATE	28MAY98		CONTRACT NO.	DRAWING NO.	REV.
		CHECKED BY	BPG	DATE	19JUN98		650138.0501	DCE-B-B	0
		APPROVED BY		DATE					

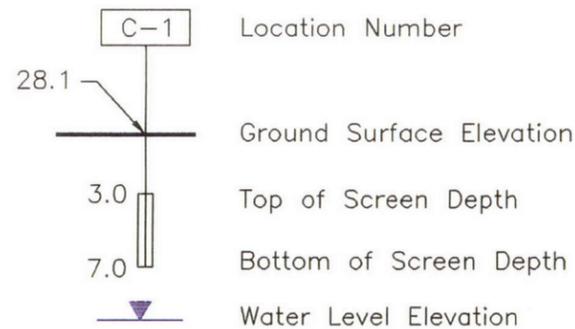


NORTHWEST  
C

SOUTHEAST  
C'

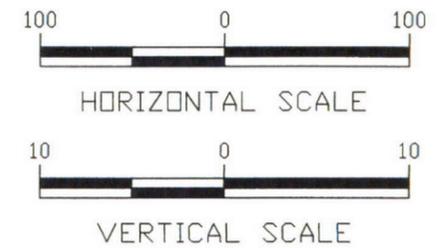


LEGEND



- (960) Reported concentration in ug/L, bold values exceed 2L groundwater standard
- (ND) Not Detected

- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



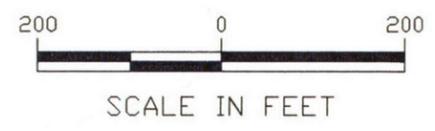
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SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-19.
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		Approximate Vertical Extent
	<b>RADIAN</b>	CHECKED BY	BPG	DATE	19JUN98		of 1,1-Dichloroethene, C-C'
	<b>INTERNATIONAL</b>	APPROVED BY		DATE			Hamilton Beach & Proctor-Silex, Inc.
	EXCEEDS TOLERANCE PER ANSI GRAPHIC STANDARDS					CONTRACT NO.	650138.0501
						DRAWING NO.	DCE-C-C
						REV.	0



**LEGEND**

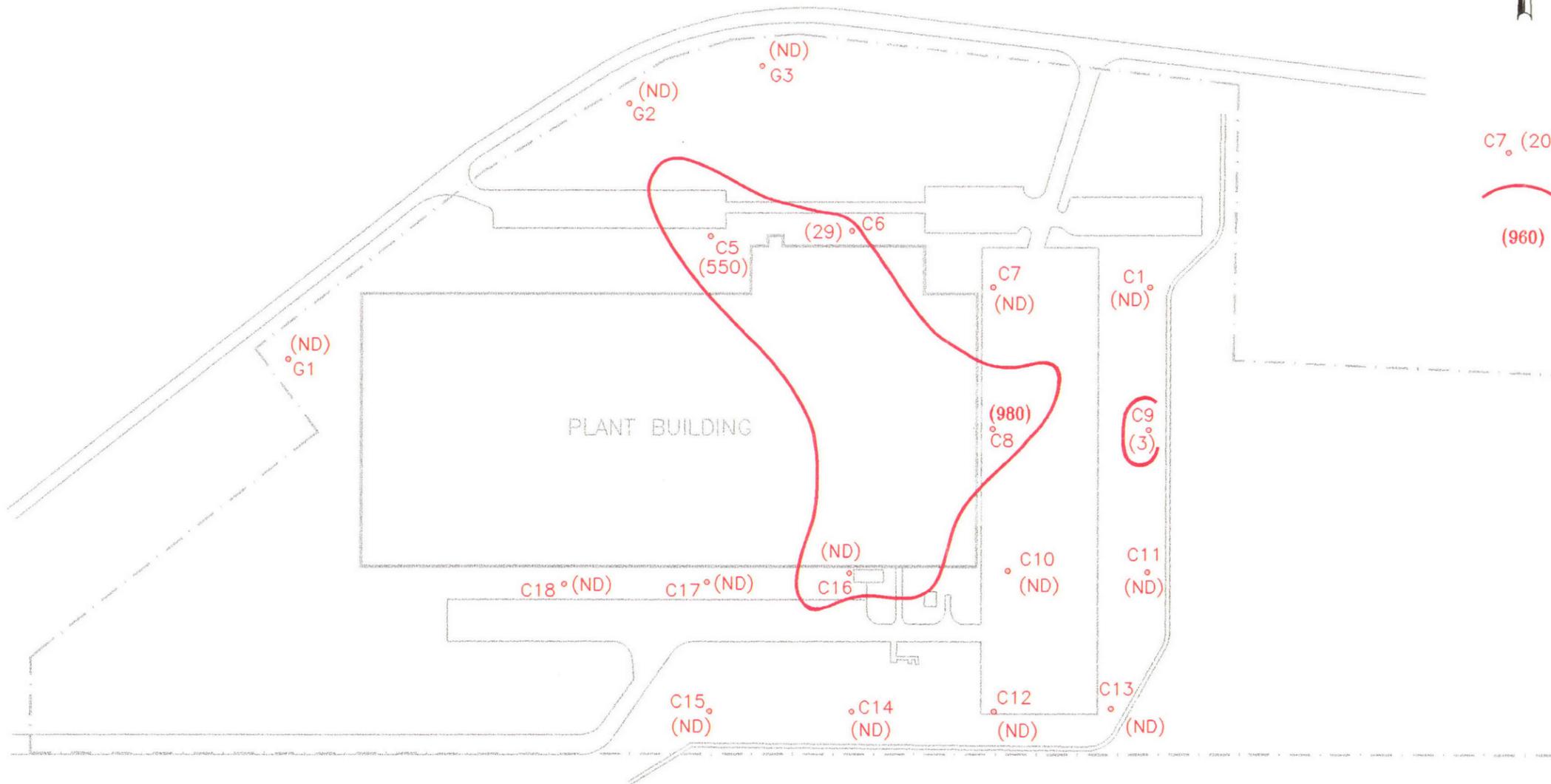
- C7 (20) Sampling Location and Reported Concentration in (ug/L)
- (960) Inferred Areal Limit of Chemical
- (960)** Bold Values Exceed 2L Groundwater Standard



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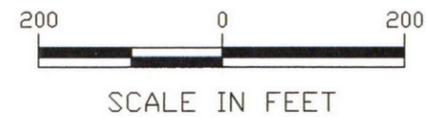
SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE Figure 5-20. Approximate Areal Extent of 1,1-Dichloroethane in Unit A Hamilton Beach & Proctor-Silex Inc.			
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98				
	<b>RADIAN</b> INTERNATIONAL	CHECKED BY	BPG	DATE	19JUN98				
	RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709	APPROVED BY		DATE					
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**LEGEND**

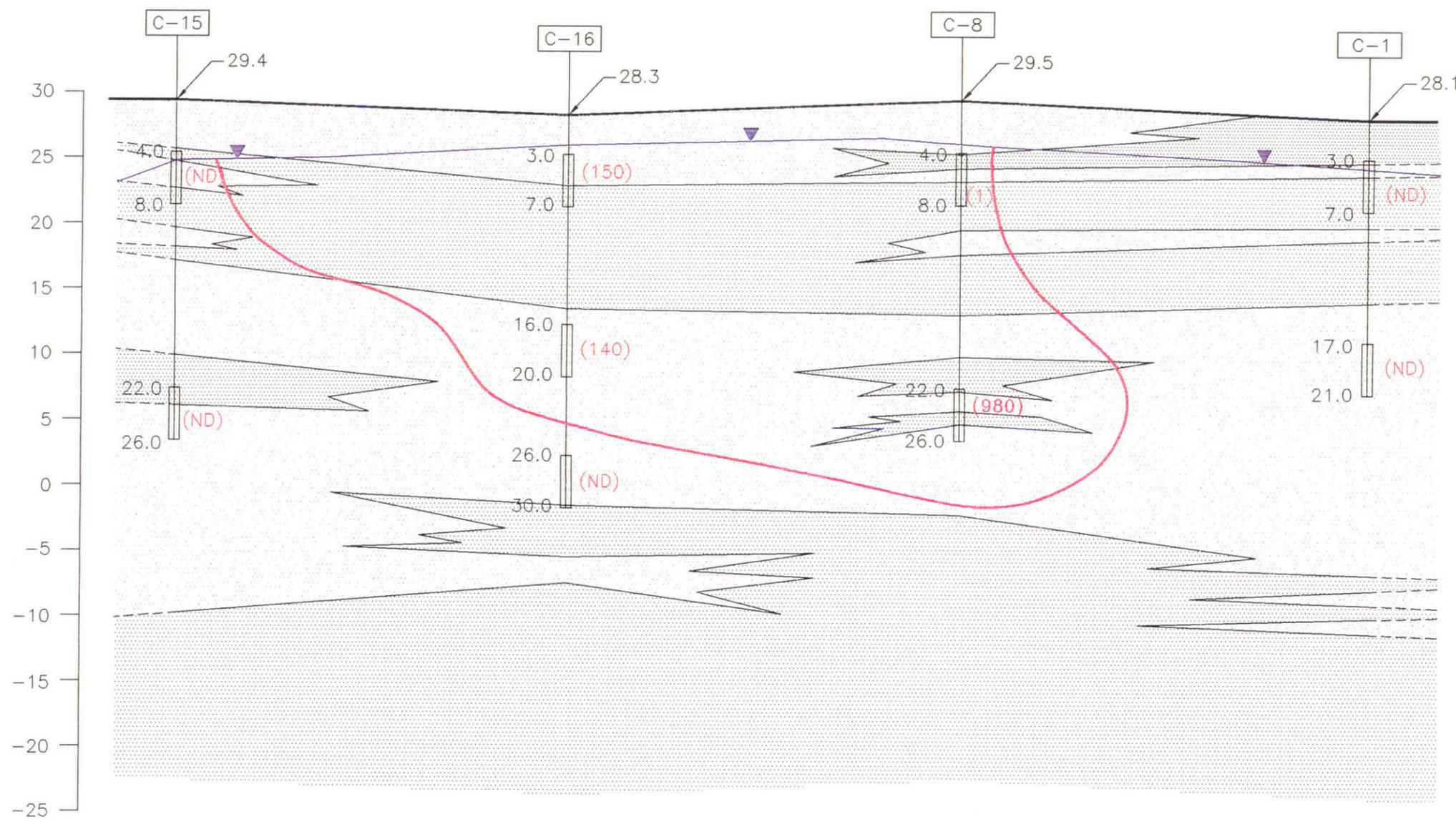
- C7 (20)** Sampling Location and Reported Concentration in (ug/L)
- (960)** Inferred Areal Limit of Chemical
- (960)** Bold Values Exceed 2L Groundwater Standard



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE Figure 5-21. Approximate Areal Extent of 1,1-Dichloroethane in Unit B Hamilton Beach & Proctor-Sillex Inc.	
	CONFIDENTIAL - ALL RIGHTS RESERVED - PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		
	<b>RADIAN INTERNATIONAL</b>	CHECKED BY	BPG	DATE	19JUN98		
	REGARD SHALL THE USE THEREOF	APPROVED BY		DATE			
		CONTRACT NO.	650138.0501	DRAWING NO.	DCA-DP	REV.	0

SOUTHWEST  
A

NORTHEAST  
A'



LEGEND

- C-1 Location Number
- Ground Surface Elevation
- Top of Screen Depth
- Bottom of Screen Depth
- Water Level Elevation
- Inferred vertical extent of chemical
- (960)** Reported concentration in ug/L, bold values exceed 2L groundwater standard
- (ND)** Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



HORIZONTAL SCALE



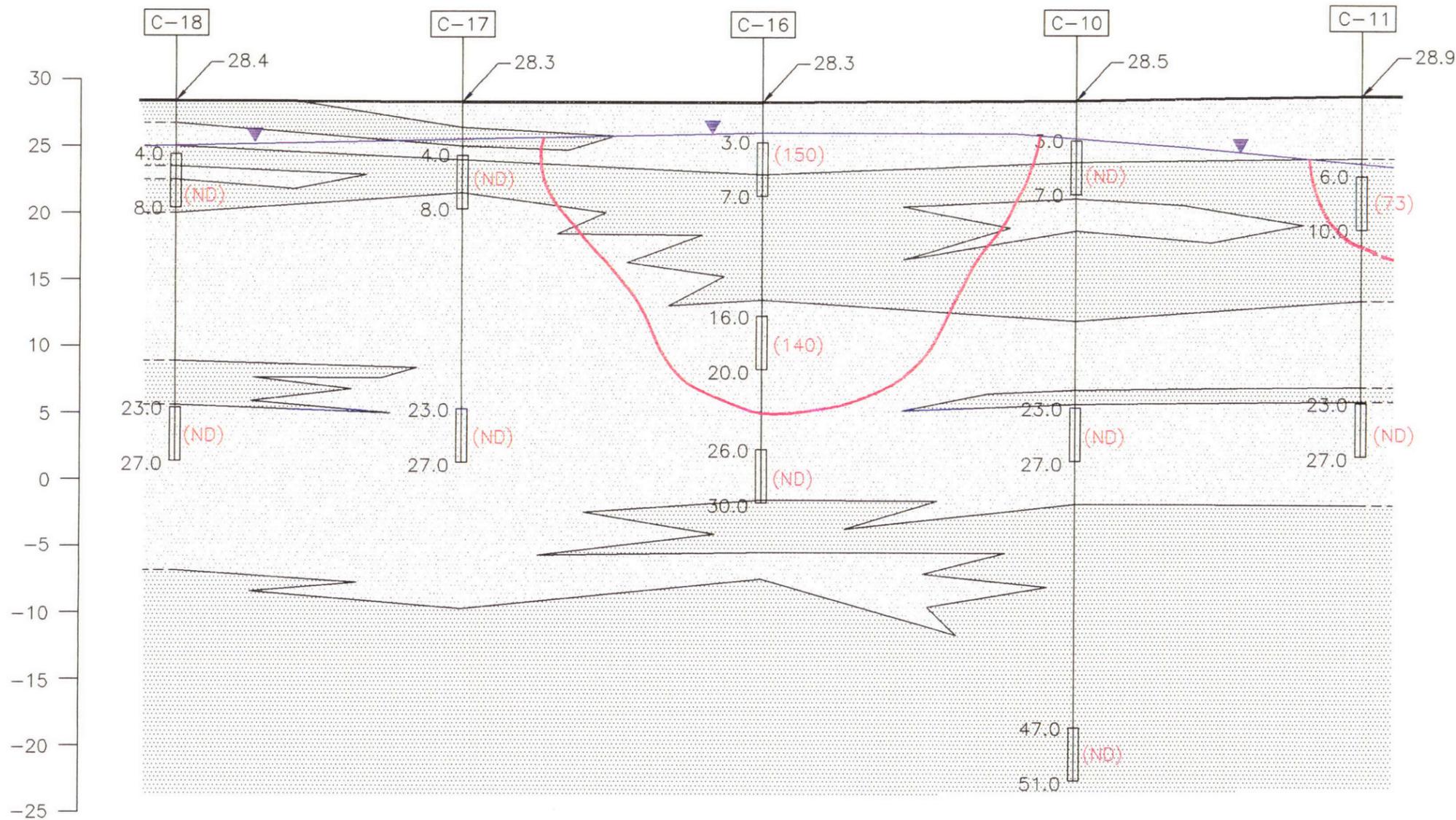
VERTICAL SCALE

D:\HBBS\WASHINGTON\JCA-A-A\27MAY98-1455

SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-22. Approximate Vertical Extent of 1,1-Dichloroethane, A-A'		
		DRAWN BY	TSH	DATE	28MAY98	Hamilton Beach & Proctor-Silex Inc.			
		CHECKED BY	BPG	DATE	19JUN98	CONTRACT NO.	650138.0501	DRAWING NO.	DCA-A-A
		APPROVED BY		DATE		REV.			0

WEST  
B

EAST  
B'



LEGEND

- C-1 Location Number
- Ground Surface Elevation
- Top of Screen Depth
- Bottom of Screen Depth
- Water Level Elevation
- Inferred vertical extent of chemical
- (960)** Reported concentration in ug/L, bold values exceed 2L groundwater standard
- (ND)** Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, and Clay



HORIZONTAL SCALE

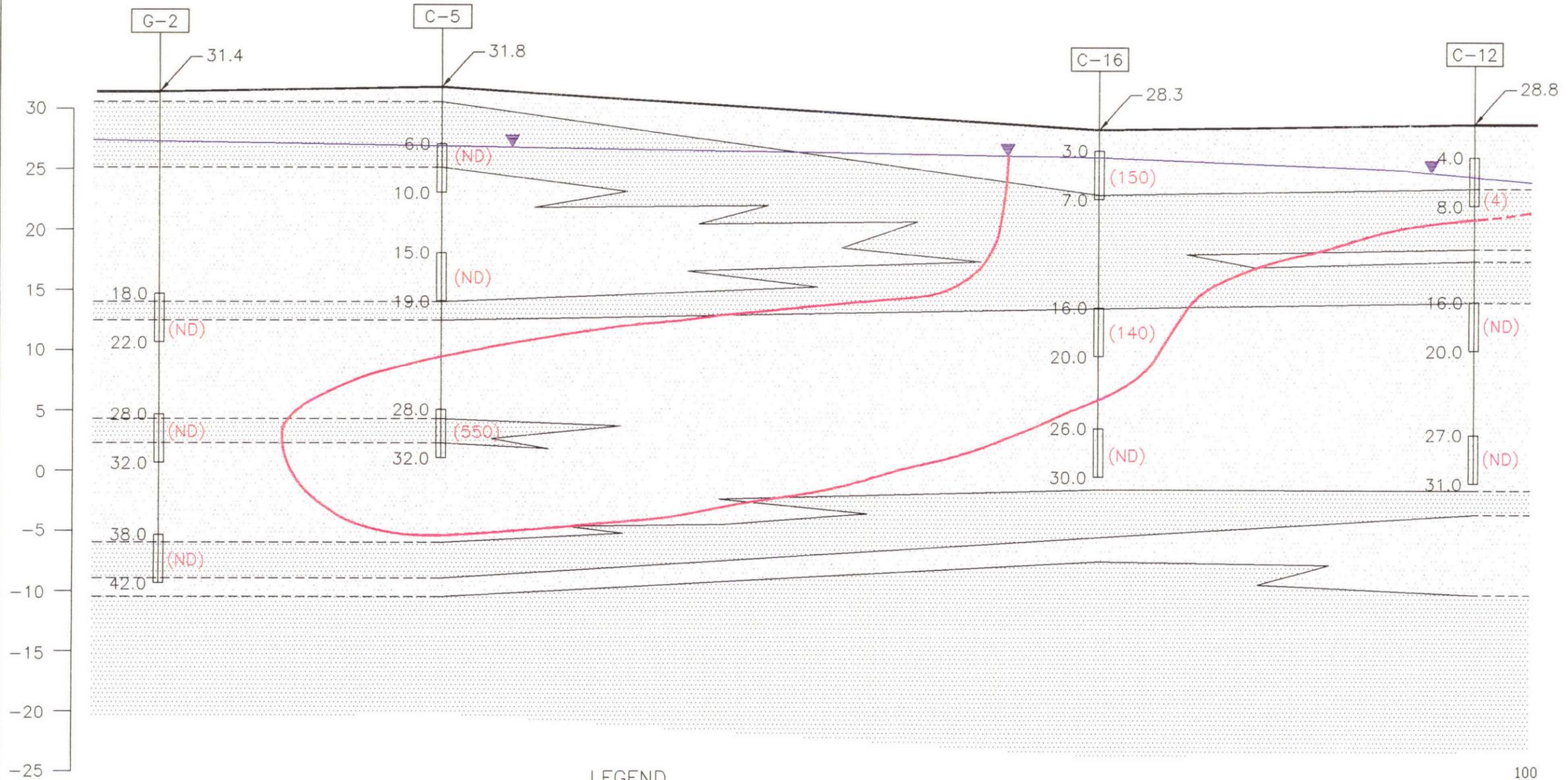


VERTICAL SCALE

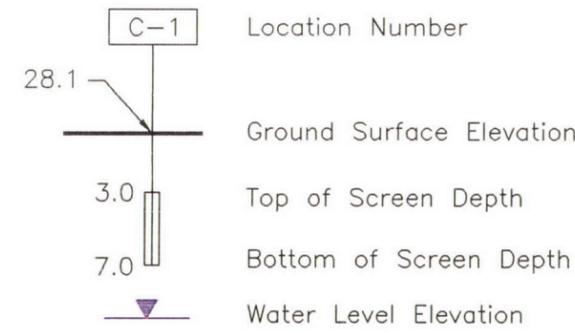
SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-23.
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		Approximate Vertical Extent
	<b>RADIANT</b>	CHECKED BY	BPG	DATE	19JUN98		of 1,1-Dichloroethane, B-B'
	<b>INTERNATIONAL</b>	APPROVED BY		DATE			Hamilton Beach & Proctor-Silex Inc.
	<small>EXTEND TIME: 100, 1000, 10000, 100000, 1000000</small>					CONTRACT NO.	650138.0501
						DRAWING NO.	DCA-B-B
						REV.	0

NORTHWEST  
C

SOUTHEAST  
C'

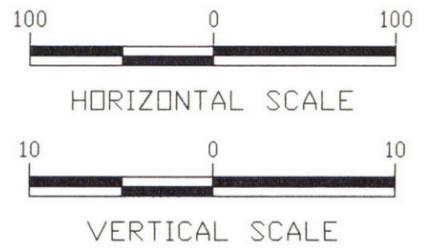


LEGEND



- Inferred vertical extent of chemical
- (960)** Reported concentration in ug/L, bold values exceed 2L groundwater standard
- (ND) Not Detected

- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay



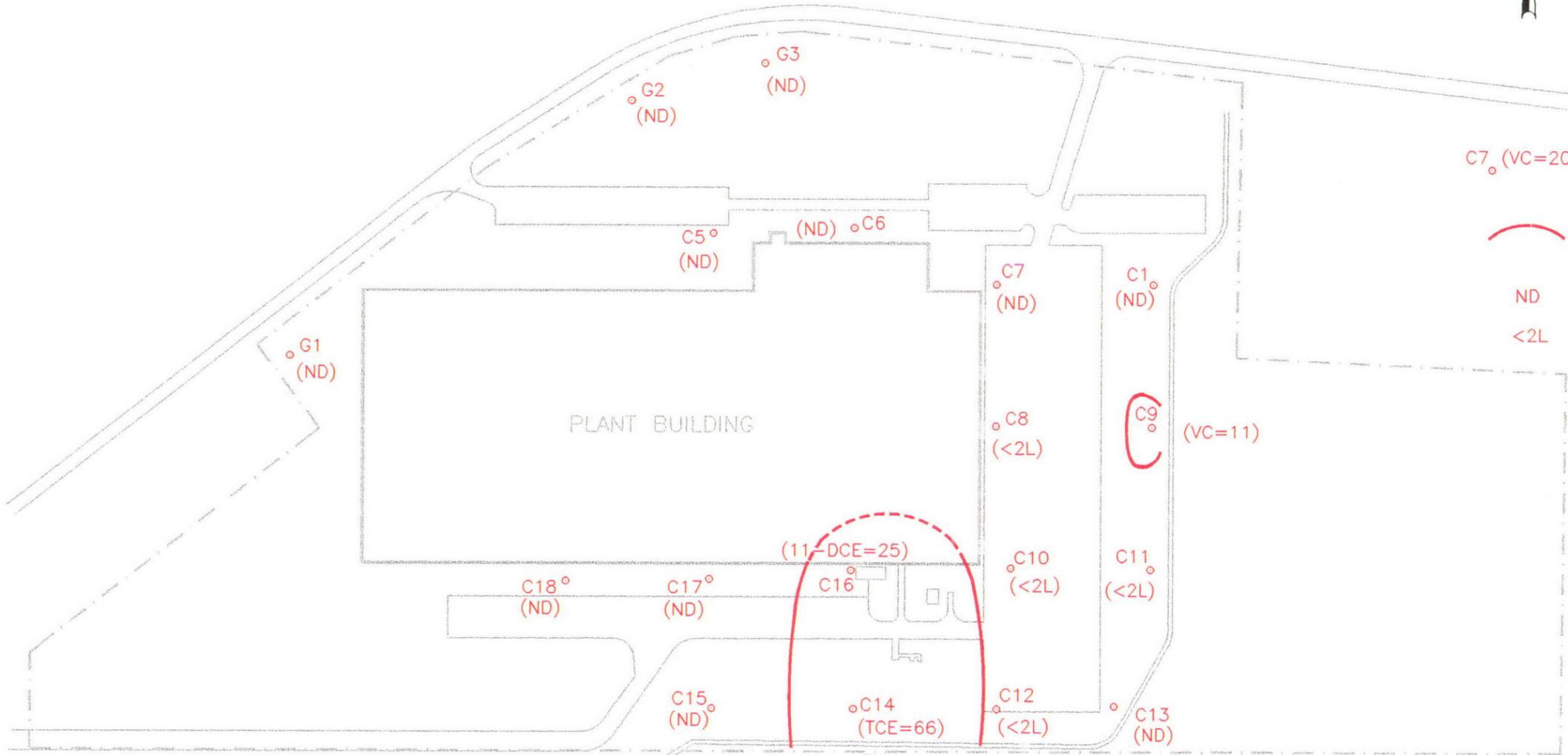
D:\HBPS\WASHINGTON\DC-C-C\27MAY98-1455

SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE Figure 5-24. Approximate Vertical Extent of 1,1-Dichloroethane, C-C' Hamilton Beach & Proctor-Silex, Inc.	
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28MAY98		
	<b>RADIAN</b> INTERNATIONAL	CHECKED BY	BPG	DATE	19JUN98		
	RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709	APPROVED BY		DATE			
		CONTRACT NO.	650138.0501	DRAWING NO.	DCA-C-C	REV.	0



**LEGEND**

- C7 (VC=20) Sampling Location, Chemical, and Reported Concentration in ug/L
-  Inferred Areal Limit of Chemical Concentrations exceeding 2L Groundwater Standard
- ND Not Detected
- <2L Less Than Groundwater Standard
- 11-DCE=1,1-Dichloroethene
- TCE=Trichloroethene
- VC=Vinyl Chloride



DN:\HBPS\WASHINGTON\COM-2L-S\27MAY98-1455

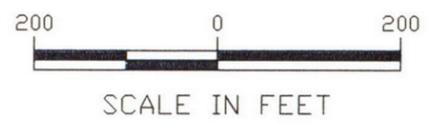
SCALE	AS SHOWN	DRAWN BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-25. Extent of Chemicals Exceeding 2L Standard in Unit A		
		CHECKED BY	TSH	DATE	28MAY98		Hamilton Beach & Proctor-Silex Inc.		
		APPROVED BY	BPG	DATE	19JUN98	CONTRACT NO.	650138.0501	DRAWING NO.	COM-2L-S
						REV.			0



**LEGEND**

- C7 (VC=20) Sampling Location, Chemical, and Reported Concentration in ug/L
-  Inferred Areal Limit of Chemical Concentrations exceeding 2L Groundwater Standard
- ND Not Detected
- <2L Less Than Groundwater Standard
- 12-DCA=1,2-Dichloroethane
- TCE=Trichloroethene
- VC=Vinyl Chloride

D:\HBPS\WASHINGTON\CDM-2L-D\27MAY98-1455



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	27MAY98	DRAWING TITLE	Figure 5-26. Extent of Chemicals Exceeding 2L Standard in Unit B		
		DRAWN BY	TSH	DATE	28MAY98		Hamilton Beach & Proctor-Silex Inc.		
		CHECKED BY	BPG	DATE	19JUN98	CONTRACT NO.	650138.0501	DRAWING NO.	COM-2L-D
		APPROVED BY		DATE		REV.			0

**TABLES**

**Table 2-1**

**Summary Table of Underground Storage Tanks  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

<b>Tank ID</b>	<b>Owner</b>	<b>Capacity (gallons)</b>	<b>Product</b>	<b>Date Installed</b>	<b>Date Closed</b>
0-002948	Waters Oil Company	4,000	Diesel Fuel	3/73	1/87
0-002948	Waters Oil Company	4,000	Diesel Fuel	3/73	1/87
0-002855	Waters Oil Company	1,000	Gasoline	NA	1/87
0-023693	Hamilton Beach	1,000	Used Oil	6/79	1/87

No evidence of product release was documented in the available records.  
NA = Not Available.

**Table 2-2**

**Chronological Summary of Site Assessment Field Activities  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

<b>Date</b>	<b>Task</b>	<b>Purpose</b>
3/98	Establish and survey surface water sampling points.	Provide future water-level measuring points.
	Collect surface water samples W81 through W85 from the drainage ditch. Analyze samples for VOCs, SVOCs, and metals.	Assess water quality of the ditch and evaluate whether groundwater discharge is occurring.
	Establish and survey grid for future cone penetrometer investigation. Locate underground utilities.	Determine stratigraphic profiling locations and access constraints.
4/98	Use CPT to advance probes C1, and C5 through C18.	Characterize subsurface stratigraphy and measure pore pressure.
	Use CPT equipped with a fuel fluorescence detector to advance probes F1 through F20.	Characterize subsurface stratigraphy and assess distribution of free product and petroleum constituents in source area soil.
	Use DPT to collect groundwater samples from various depths at probe locations C1, C5 through C18, and G1 through G3. Analyze samples for VOCs using an on-site GC/MS.	Determine the nature and extent of VOCs in groundwater underlying the site.
	Use DPT to collect background soil samples from various depths at probe locations C2, C3, and C4. Analyze selected samples for metals and TOC.	Determine background concentrations for metals and TOC in soil.
	Use DPT to collect soil samples from various depths at probe locations F6, F11, F14, F17, and F18. Analyze samples for purgeable and extractable TPH, Oil & Grease, VOCs, SVOCs, and metals.	Determine the nature and extent of solvent- and petroleum-related constituents in the source area.
5/98	Use DPT to install monitoring wells MW-216 through MW-223 as well pairs. Survey well locations and elevations	Establish perimeter monitoring points for water quality and water-level monitoring.
	Measure water levels in selected monitoring wells and at surface water sampling points in the drainage ditch.	Estimate groundwater flow directions and gradients.
	Collect groundwater samples from monitoring wells MW-201S, MW-206, MW-207, and wells MW-216 through MW-223. Analyze samples for VOCs, SVOCs, and metals.	Confirm the nature and extent of solvent- and petroleum-related constituents in groundwater. Determine background concentrations of metals.
	Use hand auger to collect soil samples from various depths at location F21.	Determine the nature and extent of solvent- and petroleum-related constituents at the perimeter of the source area.

Table 3-1

**Surrounding Water Supply Wells\***  
**Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Well No. <sup>b</sup>	Owner	Address	Phone No.	Use	Well Depth (feet bgs)	Casing Depth (feet bgs)	Screen Interval (feet bgs)	Distance From Source Area
5677-51-2394	James Hodges	74 Springs Road Washington, N.C.	(919) 946-5095	WS	110	NA	NA	1,250 ft.
5677-51-3451	Larry & Carolyn Walker	94 Springs Road Washington, N.C.	(919) 946-8962	WS	165	NA	NA	1,200 ft.
5677-51-4439	Charlene G. Simpkins	112 Springs Road Washington, N.C.	NA	Unused	NA	NA	NA	1,100 ft.
5677-51-5516	Wayne and Barbara Osgood	130 Springs Road Washington, N.C.	(919) 975-6494	Unused	NA	NA	NA	1,050 ft.
5677-52-6072	James & Hilda Watters	215 Springs Road Washington, N.C.	(919) 946-4395	WS	NA	NA	NA	1,050 ft.
5677-63-8364 (2 Wells)	Kermit & Grace Arnold	363 Springs Road Washington, N.C.	(919) 946-6811	WS	150+	NA	NA	950/1,200 ft.
5677-72-7147	Charlie Corey	601 Springs Road Washington, N.C.	(919) 946-2643	WS	100+	NA	NA	1,500 ft.

\*Source: Groundwater Management Associates, Inc. (1998)

<sup>b</sup>Index to Figure 3-1.

bgs = below ground surface

WS = water supply

NA = not available

Table 3-2

**Adjacent Property Ownership<sup>a</sup>**  
**Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Map Index <sup>b</sup>	Street Address	Owner	Mailing Address	Telephone Number
1	1710 Carolina Ave. Washington, N.C.	East Carolina Farm Credit ACA	P.O. Box 1786 Greenville, N.C. 27835	(919) 946-4116
2	Springs Road Washington, N.C.	Seth C. & Louise Boyd	P.O. Box 469 Kisco, N.Y. 10549	NA
3	74 Springs Road Washington, N.C.	James H. & Joyce Hodges	P.O. Box 382 Washington, N.C. 27889	(919) 946-5095
4	94 Springs Road Washington, N.C.	Larry R. & Carolyn L. Walker	94 Springs Road Washington, N.C. 27889	(919) 946-8962
5	112 Springs Road Washington, N.C.	Charlene G. Simpkins	112 Springs Road Washington, N.C. 27889	NA
6	130 Springs Road Washington, N.C.	Barbara Webb	Rt. 6 Box 76 A Washington, N.C. 27889	NA
7	53 Springs Road Washington, N.C.	Wolf Summit Coal Co.	c/o Gregory Poole Equipment Co. P.O. Box 469 Raleigh, N.C. 27602	(919) 946-1081
8	215 Springs Road Washington, N.C.	James & Hilda Watters	215 Springs Road Washington, N.C. 27889	(919) 946-4395
9	Springs Road Washington, N.C.	Down East Properties, Inc.	930 West 15 <sup>th</sup> Street Washington, N.C. 27889	NA
10	2125 Hwy 17 North Washington, N.C.	Joseph D. & Nancy Arnold	2125 Hwy 17 North Washington, N.C. 27889	NA
11	363 Springs Road Washington, N.C.	Kermit V. & Grace Arnold	2898 Hwy 17 North Washington, N.C. 27889	(919) 946-6811

**Table 3-2 (Continued)**

<b>Map Index<sup>b</sup></b>	<b>Street Address</b>	<b>Owner</b>	<b>Mailing Address</b>	<b>Telephone Number</b>
12	Springs Road Washington, N.C.	The Thad & Ada Taylor Trust	c/o Raymond M. Taylor, Trustee 3073 Granville Drive Raleigh, N.C. 27609	(919) 787-1931
13	Springs Road Washington, N.C.	William L. Fox & Carolyn Jean Wilson	P.O. Box 822 Washington, N.C. 27889	NA
14	SR 1536	William L. Fox & Carolyn Jean Wilson	P.O. Box 822 Washington, N.C. 27889	NA
15	SR 1536	Charles L. & Julia S. Rogers	214 River Road Washington, N.C. 27889	(919) 946-7909
16	1851 Carolina Avenue Washington, N.C.	D. S. Swain Gas Company	1851 Carolina Avenue Washington, N.C. 27889	(919) 946-5178

<sup>a</sup>Owner and property information obtained from Beaufort County, North Carolina, tax records.

<sup>b</sup>Index to Figure 3-3.

NA = Not Available.

Table 4-1

Soil Sampling and Analysis Matrix  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina

Sample ID	Purgeable TPH (Method 5030/M8015)	Extractable TPH (Method 3550/M8015)	Oil & Grease (Method E413.2)	VOCs (Method 8260B)	SVOCs (Method 8270B)	Metals (Method 6010B)	Mercury (Method 7471A)	TOC	pH
C2A						√	√		√
C2B						√	√		√
C2C								√	√
C3A						√	√		√
C3B						√	√		√
C3C								√	√
C4A						√	√		√
C4B						√	√		√
C4C								√	√
F6A	√	√	√	√	√	√	√		√
F11A	√	√	√	√	√	√	√		√
F11B	√	√	√	√	√	√	√		√
F14A	√	√	√	√	√	√	√		√
F14B	√	√	√	√	√	√	√		√
F17A	√	√	√	√	√	√	√		√
F17B	√	√	√	√	√	√	√		√
F18A	√	√	√	√	√	√	√		√
F18B*	√	√	√	√	√	√	√		√
F21A	√	√	√	√	√	√	√		√
F21B	√	√	√	√	√	√	√		√

\* F18B was also analyzed for toxicity characteristic (TC) constituents by the toxicity characteristic leaching procedure.

SVOCs = Semivolatile Organic Compounds

TOC = Total Organic Carbon

VOCs = Volatile Organic Compounds

Table 4-2

**Summary of Qualified Soil Analytical Results:  
Purgeable TPH by Method 5030/M8015, Extractable TPH by Method 3550/M8015,  
and Oil and Grease by Method E413.2  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	Sample Interval (ft. below surface)	Date of Sampling	Purgeable TPH <sup>1</sup> (mg/kg)	Date of Analysis (Purgeable TPH)	Extractable TPH <sup>2</sup> (mg/kg)	Date of Analysis (Extractable TPH)	Oil and Grease (mg/kg)	Date of Analysis (Oil and Grease)
F6A	3-5	4/15/98	ND (1.56) U	4/23/98	18.4 DA	4/23/98	ND (1.37)	4/20/98
F11A	0-2	4/15/98	ND (1.45) U	4/22/98	ND (9.14) U	4/23/98	ND (1.37)	4/20/98
F11B	3-5	4/15/98	4.89 X	4/22/98	ND (5.41) U	4/23/98	ND (1.37)	4/20/98
F14A	0-2	4/15/98	5.71 X	4/22/98	6.09 J	4/23/98	ND (1.37)	4/20/98
F14B	3-5	4/15/98	5.49 X	4/22/98	ND (8.56) U	4/23/98	ND (1.37)	4/20/98
F17A	0-2	4/15/98	ND (1.84) U	4/22/98	ND (7.81) U	4/23/98	ND (1.37)	4/20/98
F17B	3-5	4/15/98	8.85 X	4/22/98	ND (6.85) U	4/23/98	ND (1.37)	4/20/98
F18A	0-2	4/15/98	190 X	4/24/98	485 J	4/26/98	240	4/20/98
F18B	3-5	4/15/98	139 X	4/24/98	220	4/26/98	368	4/20/98
F21A	0-2	5/12/98	ND (1.48) U	5/18/98	ND (2.47) U	5/27/98	14.3	5/15/98
F21B	3-5	5/12/98	31.9 X	5/18/98	27.7	5/27/98	ND (8.88)	5/15/98

<sup>1</sup>Purgeable TPH value represents sum of gasoline species and other unidentified organics.

<sup>2</sup>Extractable TPH value represents sum of diesel species and other unidentified organics.

ND ( ) = Not detected at specified detection limit.

A = Presence of hydrocarbon mix eluting in the lube oil range. The pattern does not match that of lube oil.

D = Presence of hydrocarbon mix eluting in the diesel range. The pattern does not match that of diesel.

J = Estimated Quantity.

U = Not present at associated level; blank contamination is present.

X = Presence of hydrocarbon mix eluting in the gasoline range. The pattern does not match that of gasoline.

Samples F6A through F18B were collected using a macro-core open-tube sampler advanced by DPT.

Samples F21A and F21B were collected using a hand auger.

Table 4-3

**Summary of Qualified Soil Analytical Results:  
Volatile Organic Compounds by Method 8260B  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	F6A	F11A	F11B	F14A	F14B	F17A
Sample Interval (ft. below surface)	3-5	0-2	3-5	0-2	3-5	0-2
Date of Sampling	4/15/98	4/15/98	4/15/98	4/15/98	4/15/98	4/15/98
Date of Analysis*	4/24/98	4/24/98	4/24/98	4/24/98	4/24/98	4/24/98
Analyte (mg/kg)						
Acetone	ND (0.0554) U	ND (0.0310) U	ND (0.0528) U	0.091	0.160 J	ND (0.0431) U
Benzene	ND (0.00160) U	ND (0.00164) U	ND (0.00407) U	0.010	0.0143 J	ND (0.00183) U
2-Butanone (MEK)	0.0151	ND (0.00593) U	0.0488	0.033	0.239 J	0.0524
n-Butylbenzene	ND (0.00136)	ND (0.0019)	0.00292	0.00424	0.00906 J	0.00314
sec-Butylbenzene	ND (0.00212)	ND (0.00185)	ND (0.00190)	0.00133 J	0.00220 J	0.00100 J
Carbon disulfide	ND (0.00505)	0.00104 J	ND (0.00455) U	ND (0.00432) U	ND (0.00484)	0.00121 J
Carbon tetrachloride	ND (0.00231)	ND (0.00202)	ND (0.00208)	ND (0.00198)	ND (0.00222)	ND (0.00193)
Chloroethane	0.0487	0.0246	0.0465	0.0609	0.0141 J	0.0106 J
3-Chloropropene	ND (0.00309)	ND (0.00269)	ND (0.00278)	0.00618	ND (0.00296) UJ	0.00332
1,1-Dichloroethane	0.228	0.156	0.877	0.907	0.460	0.430
1,2-Dichloroethane	ND (0.00429)	0.00226	0.0655	0.0212	0.0564 J	0.0309
1,1-Dichloroethene	0.0441	ND (0.00417)	ND (0.431) U	0.512 J	ND (0.466) U	ND (0.401) U
cis-1,2-Dichloroethene	0.0245	ND (0.0023)	0.791	0.576	0.210 J	0.417

Table 4-3 (Continued)

Sample ID	F6A	F11A	F11B	F14A	F14B	F17A
trans-1,2-Dichloroethene	0.0013 J	0.00451	0.0143	0.00743	0.00630 J	0.00604
Ethylbenzene	0.0766	0.00278	0.033	0.0263	0.0541 J	0.0414 J
2-Hexanone	0.000638 J	ND (0.00289)	0.00128 J	0.00171 J	0.00663 J	ND (0.00277)
Isopropylbenzene	ND (0.00274)	0.00138 J	0.00367	0.00316	0.00580 J	0.00358
p-Isopropyltoluene	ND (0.00142)	ND (0.00124)	0.00236	0.00448	0.00598 J	0.00231
Methyl t-butyl ether	0.00377	ND (0.00205)	0.00293	0.00134	0.0205 J	ND (0.00197)
4-Methyl-2-pentanone (MIBK)	0.00143 J	ND (0.00278)	0.00112	0.00312	0.00525	0.00173 J
Napthalene	ND (0.00323)	ND (0.00301)	0.0453	0.00748	0.120 J	0.0314
n-Propylbenzene	ND (0.00381)	ND (0.00167)	0.0197	0.0219	0.0439 J	0.0249
Styrene	ND (0.00244)	ND (0.00213)	ND (0.00220)	ND (0.00209)	0.00118 J	ND (0.00204)
Tetrachloroethene	0.00159 J	ND (0.00160)	0.000812 J	0.00165	0.00324 J	0.00109 J
Tetrahydrofuran	ND (0.00411)	ND (0.00358) U	ND (0.00369) U	ND (0.00351) U	ND (0.00393) UJ	ND (0.00343) U
Toluene	0.0450	0.00903	0.0573	0.0893 J	0.159 J	0.0335 J
1,1,1-Trichloroethane	0.0599	ND (0.00145)	ND (0.544) U	ND (1.47) U	ND (1.14) U	0.121
1,1,2-Trichloroethane	ND (0.00188)	ND (0.00164)	0.0103	0.00347	0.0128 J	0.00835
Trichloroethene	ND (0.00658)	ND (0.00247)	ND (0.269) U	ND (0.245) U	ND (0.276) U	1.06
Trichlorofluoromethane	ND (0.00430)	ND (0.00375)	ND (0.00387)	ND (0.00368)	ND (0.00412) UJ	ND (0.00360)
1,2,4-Trimethylbenzene	ND (0.00333)	ND (0.00358)	0.119	0.0892	0.236 J	0.110
1,3,5-Trimethylbenzene	ND (0.00368) U	ND (0.00219)	0.0327	0.0320	0.0638 J	0.0303
Vinyl chloride	0.00536	0.00167 J	ND (0.375)	0.125	0.052 J	ND (0.349)

Table 4-3 (Continued)

Sample ID	F6A	F11A	F11B	F14A	F14B	F17A
m&p-Xylene	0.104	0.00337	0.0872	0.0686	0.154 J	0.105
o-Xylene	0.0297	0.00571	0.0831	0.0519	0.134 J	0.0918

\*Samples were analyzed over multiple dates. Latest date is shown.

Target analytes not listed were not detected.

ND ( ) = Not detected at specified detection limit.

J = Estimated value.

U = Not present at associated level; blank contamination is present.

UJ = Not detected and the detection limit is estimated.

Samples F6A through F18B were collected using a macro-core open-tube sampler advanced by DPT.

Samples F21A and F21B were collected using a hand auger.

Table 4-3 (Continued)

Sample ID	F17B	F18A	F18B	F21A	F21B
Sample Interval (ft. below surface)	3-5	0-2	3-5	0-2	3-5
Date of Sampling	4/15/98	4/15/98	4/15/98	5/12/98	5/12/98
Date of Analysis	4/24/98	4/24/98	4/24/98	5/21/98	5/21/98
<b>Analyte (mg/kg)</b>					
Acetone	ND (0.0612) U	0.0904 J	ND (0.0396) UJ	ND (0.00294) UJ	ND (0.00982) UJ
Benzene	ND (0.00332) U	0.0403 J	0.0292 J	ND (0.000544)	ND (0.000601)
2-Butanone (MEK)	0.138	0.0616 J	0.0567 J	ND (0.00301) UJ	ND (0.00333) UJ
n-Butylbenzene	0.0163	0.208 J	0.145 J	ND (0.00112)	0.00183
sec-Butylbenzene	0.00417	0.103 J	0.0416 J	ND (0.00174)	ND (0.00192)
Carbon disulfide	0.00148 J	0.00183 J	0.00181 J	R	R
Carbon tetrachloride	ND (0.00214)	0.0140 J	0.0335 J	ND (0.00190)	ND (0.00210)
Chloroethane	0.00764	0.0184 J	0.0261 J	ND (0.00197)	ND (0.00218)
3-Chloropropene	ND (0.00286)	ND (0.00261) UJ	0.0135 J	ND (0.00254)	ND (0.00280)
1,1-Dichloroethane	1.03	1.74	3.09	ND (0.00314)	0.00527
1,2-Dichloroethane	0.0361	ND (0.00190) UJ	ND (0.00196) UJ	ND (0.00184)	ND (0.00204)
1,1-Dichloroethene	ND (0.451)	2.87	8.75	ND (0.00393)	0.00174 J
cis-1,2-Dichloroethene	0.984	0.256 J	0.198 J	ND (0.00217)	0.00871
trans-1,2-Dichloroethene	0.0108	0.00354 J	0.0033 J	ND (0.00356)	ND (0.00393)
Ethylbenzene	0.135	0.221 J	0.602 J	ND (0.00225)	ND (0.00248)
2-Hexanone	0.00342	0.0196 J	0.0147	ND (0.00272)	ND (0.00301)

Table 4-3 (Continued)

Sample ID	F17B	F18A	F18B	F21A	F21B
Isopropylbenzene	0.0133	0.145 J	0.0878 J	ND (0.00225)	ND (0.00248)
p-Isopropyltoluene	0.00980	0.141 J	0.0594 J	ND (0.00117)	0.00112 J
Methyl t-butyl ether	0.00123 J	0.00364 J	0.00225 J	ND (0.00194)	ND (0.00214)
4-Methyl-2-pentanone (MIBK)	0.00199 J	ND (0.00270) UJ	ND (0.00278) UJ	ND (0.00262)	ND (0.00289)
Napthalene	0.254 J	0.677 J	2.28	ND (0.00284)	ND (0.00314) U
n-Propylbenzene	0.096 J	0.432 J	0.899 J	ND (0.00158)	ND (0.00174)
Styrene	0.00248	0.0102 J	0.0225 J	ND (0.00200)	ND (0.00222)
Tetrachloroethene	0.00249	0.0446 J	0.0314 J	ND (0.00151)	ND (0.00167)
Tetrahydrofuran	0.00972	ND (0.00347) UJ	ND (0.00358) UJ	ND (0.00337) UJ	ND (0.00373) UJ
Toluene	0.108	0.402 J	0.604 J	ND (0.00199)	ND (0.00220)
1,1,1-Trichloroethane	ND (0.616) U	ND (12.6) U	54.4	ND (0.00137)	0.00408
1,1,2-Trichloroethane	0.0108	ND (0.00159) UJ	ND (0.00164) UJ	ND (0.00154)	ND (0.00170)
Trichloroethene	3.24	ND (2.80) U	6.58	0.000369 J	0.039
Trichlorofluoromethane	0.0130 J	0.00604 J	0.00386 J	ND (0.00353)	ND (0.00391)
1,2,4-Trimethylbenzene	0.237 J	3.06	5.29	ND (0.00337)	ND (0.00373)
1,3,5-Trimethylbenzene	0.128	ND (1.08) U	ND (1.53) U	ND (0.00206)	ND (0.00228)
Vinyl chloride	ND (0.392)	0.0888 J	0.0530 J	ND (0.00342)	ND (0.00378)

Table 4-3 (Continued)

Sample ID	F17B	F18A	F18B	F21A	F21B
m&p-Xylene	0.369	1.65 J	2.04	ND (0.00315)	ND (0.00348)
o-Xylene	0.142	1.01	1.63	ND (0.00115)	ND (0.00127)

\*Samples were analyzed over multiple dates. Latest date is shown.

Target analytes not listed were not detected.

ND ( ) = Not detected at specified detection limit.

J = Estimated value.

R = Unusable data; laboratory specification not met.

U = Not present at associated level; blank contamination is present.

UJ = Not detected and the detection limit is estimated.

Samples F6A through F18B were collected using a macro-core open-tube sampler advanced by DPT.

Samples F21A and F21B were collected using a hand auger.

Table 4-4

**Summary of Qualified Soil Analytical Results:  
Semivolatile Organic Compounds by Method 8270B  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	F6A	F11A	F11B	F14A	F14B	F17A
Sample Interval (ft. below surface)	3-5	0-2	3-5	0-2	3-5	0-2
Date of Sampling	4/15/98	4/15/98	4/15/98	4/15/98	4/15/98	4/15/98
Date of Analysis	4/28/98	4/22/98	4/22/98	4/22/98	4/22/98	4/22/98
<b>Analyte (mg/kg)</b>						
Acenaphthene	ND (0.0170)	ND (0.0148)	ND (0.0152)	ND (0.0146)	ND (0.0165)	ND (0.0142)
Benzoic acid	0.676 J	R	R	R	0.149 J	R
Dibenzofuran	ND (0.0115)	ND (0.0101)	ND (0.0103)	ND (0.00990)	ND (0.0112)	ND (0.00959)
bis(2-Ethylhexyl)phthalate	4.08	1.79	ND (0.0516)	ND (0.0495)	ND (0.0782) U	ND (0.0480)
Fluoranthene	ND (0.0170)	ND (0.0149)	ND (0.0153)	ND (0.0146)	ND (0.0165)	ND (0.0142)
Fluorene	ND (0.0160)	ND (0.0140)	ND (0.0144)	ND (0.0138)	ND (0.0156)	ND (0.0134)
2-Methylnaphthalene	ND (0.0169)	ND (0.0148)	ND (0.0152)	ND (0.0146)	0.0654	ND (0.0141)
4-Methylphenol/3-Methylphenol	0.608 J	ND (0.0195)	ND (0.0201)	0.067 J	ND (0.0217)	ND (0.0186)
Naphthalene	ND (0.0211)	ND (0.0184)	ND (0.0189)	ND (0.0181)	0.0846	ND (0.0176)
Phenanthrene	ND (0.0288)	ND (0.0251)	ND (0.0258)	ND (0.0248)	0.0210 J	ND (0.0240)
Pyrene	ND (0.0234)	ND (0.0204)	ND (0.0210)	ND (0.0201)	ND (0.0227)	ND (0.0195)

Table 4-4 (Continued)

Sample ID	F17B	F18A	F18B	F21A	F21B
Sample Interval (ft. below surface)	3-5	0-2	3-5	0-2	3-5
Date of Sampling	4/15/98	4/15/98	4/15/98	5/12/98	5/12/98
Date of Analysis	4/22/98	4/22/98	4/22/98	5/18/98	5/18/98
<b>Analyte (mg/kg)</b>					
Acenaphthene	ND (0.0159)	0.111	ND (0.0148)	ND (0.0140)	ND (0.0156)
Benzoic acid	R	R	R	ND (1.43)	ND (1.58)
Dibenzofuran	ND (0.0108)	0.0918	0.0489	ND (0.00950)	ND (0.0106)
bis(2-Ethylhexyl)phthalate	ND (0.0540)	5.52	2.15	ND (0.0475)	ND (0.0528)
Fluoranthene	ND (0.0160)	0.0259	ND (0.0148)	ND (0.0141)	ND (0.0156)
Fluorene	ND (0.150)	0.357	0.133	ND (0.0132)	ND (0.0147)
2-Methylnaphthalene	0.0482	2.26	0.759	ND (0.0140)	ND (0.0155)
4-Methylphenol/3-Methylphenol	ND (0.0210)	ND (0.0192)	ND (0.0195)	ND (0.0185)	ND (0.0205)
Naphthalene	0.0610	0.950	0.390	ND (0.0174)	ND (0.0515)
Phenanthrene	ND (0.0270)	0.778	0.322	ND (0.0238)	ND (0.0264)
Pyrene	ND (0.0219)	0.160	0.0538	ND (0.0193)	ND (0.0214)

Target analytes not listed were not detected.

ND ( ) = Not detected at specified detection limit.

J = Estimated value.

R = Unusable data; laboratory specification not met.

U = Not present above the associated level; blank contamination is present.

Sample F6A through F18B were collected using a macro-core open-tube sampler advanced by DPT.

Samples F21A and F21B were collected using a hand auger.

Table 4-5

**Summary of Qualified Soil Analytical Results:  
Background Metals by Methods 6010B and 7471A (Mercury)  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	C2A	C2B	C3A	C3B	C4A	C4B
Sample Interval (ft. below surface)	0-2	3-5	0-2	3-5	0-2	3-5
Date of Sampling	4/13/98	4/13/98	4/13/98	4/13/98	4/13/98	4/13/98
Date of Analysis*	5/28/98	5/1/98	5/1/98	5/1/98	5/1/98	5/1/98
<b>Analyte (mg/kg)</b>						
Aluminum	10,500	25,800	6,380	17,700	5,420	9,790
Antimony	ND (0.475) U	ND (0.517)	ND (0.503)	ND (0.416)	ND (0.389)	ND (0.493)
Arsenic	1.38	1.45	2.02	1.49	0.986	2.23
Barium	28.4	48.6	22.4	34.3	11.8	20.8
Beryllium	0.356	0.582	ND (0.226) U	ND (0.317) U	ND (0.303) U	0.459
Cadmium	ND (0.0284)	0.595	0.155	0.345	ND (0.0638) U	0.321
Calcium	175	126	1,010	654	450	189
Chromium	9.60	30.6	6.94	18.4	5.51	10.8
Cobalt	0.619	2.16	0.434	0.837	0.293	0.444
Copper	0.730	3.22	0.907	1.75	0.401	0.853
Iron	2,310	16,700	3,700	9,540	2,300	8,870
Lead	10.2	13.8	10.5	10.9	5.90	8.05
Magnesium	358	708	254	542	194	245

Table 4-5 (Continued)

Sample ID	C2A	C2B	C3A	C3B	C4A	C4B
Manganese	18.7	15.4	12.7	10.6	7.93	5.61
Mercury	0.0288	0.0171	0.0172	ND (0.00599)	0.00464	ND ( 0.00693)
Molybdenum	ND (0.218) U	ND (0.132)	ND (0.124) U	ND (0.207) U	ND (0.121) U	ND (0.105) U
Nickel	1.34	3.49	1.03	2.16	0.793	1.06
Potassium	ND (317) U	996	ND (177) U	563	ND (159) U	ND (344) U
Selenium	ND (0.350) U	ND (0.313)	ND (0.305)	ND (0.252)	ND (0.235)	ND (0.298)
Silver	ND (0.0341)	ND (0.127)	ND (0.124)	ND (0.102)	ND (0.0957)	ND (0.121)
Sodium	ND (38.3) U	ND (36.2) U	ND (29.1)	ND (56.9) U	ND (22.5)	ND (28.5)
Thallium	ND (0.432)	ND (0.492)	ND (0.479)	ND (0.395)	ND (0.370)	ND (0.469)
Vanadium	13.5	37.0	10.5	24.9	7.88	14.7
Zinc	4.79	18.1	6.51	8.69	2.70	5.81

\*Mercury analyzed on 4/30/98

ND ( ) = Not detected at specified detection limit.

U = Not present at associated level; blank contamination is present.

Samples collected using a macro-core open-tube sampler advanced by DPT.

Table 4-6

**Summary of Qualified Soil Analytical Results:  
Metals by Methods 6010B and 7471A (Mercury)  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	F6A	F11A	F11B	F14A	F14B	F17A
Sample Interval (ft. below surface)	3-5	0-2	3-5	0-2	3-5	0-2
Date of Sampling	4/15/98	4/15/98	4/15/98	4/15/98	4/15/98	4/15/98
Date of Analysis*	5/2/98	5/1/98	5/1/98	5/1/98	5/1/98	5/1/98
Analyte (mg/kg)						
Aluminum	38,400	12,000	11,700	15,100 J	8,360	11,700
Antimony	ND (0.407)	ND (0.396)	ND (0.497)	ND (0.369)	ND (0.566)	ND (0.491)
Arsenic	1.80	2.44	ND (1.06) U	ND (0.503) U	1.88	1.44
Barium	96.7	37.3	17.6	22.5	14.2	26.5
Beryllium	0.566	ND (0.295) U	ND (0.213) U	ND (0.235) U	ND (0.298) U	ND (0.213) U
Cadmium	0.322	0.186	ND (0.134) U	0.160	0.190	0.265
Calcium	605	1,110	294	450	151	951
Chromium	30.9	11.7	12.0	14.1 J	11.7	10.6
Cobalt	2.06	0.393	0.350	0.572	0.349	ND (0.144) U
Copper	4.67	4.76	2.75	2.07	2.03	1.67
Iron	7,270	4,050	5,190	4,880 J	5,360	7,220
Lead	36.8	16.9	9.84	9.52	8.91	9.11
Magnesium	1,030	306	363	453	313	267
Manganese	15.2	8.41	8.05	12.2	6.94	4.78

**Table 4-6 (Continued)**

Sample ID	F6A	F11A	F11B	F14A	F14B	F17A
Mercury	0.0970	0.0259	ND (0.00614)	0.0237	ND (0.00740)	ND (0.00526)
Molybdenum	ND (0.324) U	ND (0.285) U	ND (0.171) U	ND (0.0937) U	ND (0.346) U	ND (0.173) U
Nickel	7.10	1.65	1.06	1.74	0.970	0.764
Potassium	899	ND (329) U	ND (353) U	442	ND (494) U	ND (288) U
Selenium	0.376	ND (0.318) U	ND (0.301)	ND (0.224)	ND (0.337)	ND (0.297)
Silver	ND (0.100)	ND (0.0975)	ND (0.122)	ND (0.0909)	ND (0.137)	ND (0.121)
Sodium	ND (62.2) U	ND (104) U	ND (34.5) U	ND (69.1) U	ND (32.2)	ND (143) U
Thallium	ND (0.387)	ND (0.376)	ND (0.473)	ND (0.315)	ND (0.529)	0.467
Vanadium	31.7	12.8	17.3	15.4 J	15.1	18.9
Zinc	17.4	8.26	5.29	7.29	4.96	3.63

\*Mercury analyzed on 4/30/98 and 5/19/98.

ND ( ) = Not detected at specified detection limit.

U = Not present at associated level; blank contamination is present.

Samples F6A through F18B were collected using a macro-core open-tube sampler advanced by DPT.

Samples F21A and F21B were collected using a hand auger.

Table 4-6 (Continued)

Sample ID	F17B	F18A	F18B	F21A	F21B
Sample Interval (ft. below surface)	3-5	0-2	3-5	0-2	3-5
Date of Sampling	4/15/98	4/15/98	4/15/98	5/12/98	5/12/98
Date of Analysis*	5/1/98	5/1/98	5/1/98	5/15/98	5/15/98
Analyte (mg/kg)					
Aluminum	19,100	15,500	9,600	19,900	19,900
Antimony	ND (0.494)	ND (0.437)	ND (0.445)	ND (0.504) UJ	ND (0.525)
Arsenic	30.6	1.29	2.83	2.66	0.913
Barium	37.7	27.9	12.8	46.0	21.0
Beryllium	0.550	ND (0.186) U	ND (0.302) U	0.256	0.346
Cadmium	1.05	0.179	0.452	0.281	0.269
Calcium	270	590	111	4,270	393
Chromium	33.5	13.6	15.2	16.6	22.0
Cobalt	0.785	0.506	0.418	0.839	0.973
Copper	5.79	2.09	2.55	3.93	1.79
Iron	30,700	4,710	14,400	7,520	8,390
Lead	14.4	9.74	7.90	ND (11.9) U	ND (8.98) U
Magnesium	849	400	401	695	698
Manganese	10.3	15.4	12.2	11.3	13.7
Mercury	0.00844	0.0152	ND (0.00691)	ND (0.00537) UJ	ND (0.00487) UJ
Molybdenum	1.42	ND (0.113) U	ND (0.575) U	3.73	ND (0.311) U
Nickel	2.34	1.60	1.17	2.74	2.63

**Table 4-6 (Continued)**

Sample ID	F17B	F18A	F18B	F21A	F21B
Potassium	1,180	ND (368) U	595	452	816
Selenium	ND (0.299)	ND (0.265)	ND (0.269)	ND (0.305)	ND (0.356) U
Silver	ND (0.122)	ND (0.108)	ND (0.110)	ND (0.124)	ND (0.129)
Sodium	ND (89.3) U	238	ND (102) U	181	ND (30.4)
Thallium	ND (0.470)	ND (0.416)	ND (0.423)	ND (0.479)	ND (0.500)
Vanadium	70.1	18.6	19.9	25.1 J	29.3
Zinc	12.9	6.12	7.64	14.9	11.3

\*Mercury analyzed on 4/30/98 and 5/18/98.

ND ( ) = Not detected at specified detection limit.

U = Not present at associated level; blank contamination is present.

Samples F6A through F18B were collected using a macro-core open-tube sampler advanced by DPT.

Samples F21A and F21B were collected using a hand auger.

**Table 4-7**

**Summary of Qualified Soil Analytical Results:  
pH by Method 9045C and Total Organic Carbon  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

<b>Sample ID</b>	<b>Date of Sampling</b>	<b>pH</b>	<b>Date of Analysis (pH)</b>	<b>TOC (mg/Kg)</b>	<b>Date of Analysis (TOC)</b>
C2A	4/13/98	4.84	4/29/98	NA	NA
C2B	4/13/98	4.49	4/29/98	NA	NA
C2C	4/13/98	5.34	4/29/98	972	4/24/98
C3A	4/13/98	6.05	4/29/98	NA	NA
C3B	4/13/98	4.71	4/29/98	NA	NA
C3C	4/13/98	4.87	4/29/98	983	4/24/98
C4A	4/13/98	5.83	4/29/98	NA	NA
C4B	4/13/98	4.52	4/29/98	NA	NA
C4C	4/13/98	5.43	4/29/98	3,880	4/24/98
F6A	4/15/98	5.00	4/29/98	NA	NA
F11A	4/15/98	5.81	4/29/98	NA	NA
F11B	4/15/98	4.70	4/29/98	NA	NA
F14A	4/15/98	4.59	4/29/98	NA	NA
F14B	4/15/98	3.76	4/29/98	NA	NA
F17A	4/15/98	4.97	4/29/98	NA	NA
F17B	4/15/98	4.31	4/29/98	NA	NA
F18A	4/15/98	4.73	4/29/98	NA	NA
F18B	4/15/98	3.55	4/29/98	NA	NA
F21A	5/12/98	6.70	5/21/98	NA	NA
F21B	5/12/98	6.24	5/21/98	NA	NA

NA = Not Analyzed.

TOC = Total Organic Carbon.

All samples were collected using a macro-core open-tube sampler advanced by DPT except F21A and F21B, which were collected using a hand auger.

**Table 4-8**

**Summary of Qualified Soil Analytical Results:  
Toxicity Characteristic Leaching Procedure by Method 1311  
Soil Sample F18B  
Hamilton Beach ♦ Proctor-Silex, Washington, North Carolina**

Analyte	Concentration	Regulatory Level
<b>TCLP Volatile Organics (µg/L) by Method 8260B</b>		
Benzene	ND (1.57)	500
Carbon tetrachloride	ND (3.36)	500
Chlorobenzene	ND (1.94)	100,000
Chloroform	ND (1.85)	6,000
1,2-Dichloroethane	ND (2.32)	500
1,1-Dichloroethene	94.0	700
2-Butanone (MEK)	ND (14.6)	200,000
Tetrachloroethene	1.98 J	700
Trichloroethene	120	500
Vinyl chloride	ND (2.56)	200
<b>TCLP Semivolatiles (µg/L) by Method 8270C</b>		
1,4-Dichlorobenzene	ND (1.67)	7,500
2,4-Dinitrotobenzene	ND (1.60)	130
Hexachlorobenzene	ND (1.47)	130
Hexachlorobutadiene	ND (2.34)	500
Hexachloroethane	ND (1.15)	3,000
4-Methylphenol/3-Methylphenol	ND (0.814)	200,000
2-Methylphenol	ND (0.764)	200,000
Nitrobenzene	ND (2.14)	2,000
Pentachlorophenol	ND (23.9)	100,000
Pyridine	ND (3.01)	5,000
2,4,5-Trichlorophenol	ND (3.37)	400,000
2,4,6-Trichlorophenol	ND (1.31)	2,000

**Table 4-8 (Continued)**

Analyte	Concentration	Regulatory Level
<b>TCLP Pesticides (<math>\mu\text{g/L}</math>) by Method 8081A</b>		
gamma-BHC	0.162	400
Chlorodane	ND (0.110)	30
Endrin	ND (0.0721)	20
Heptachlor	ND (0.0250)	8
Heptachlor epoxide	ND (0.0144)	8
Methoxychlor	ND (0.360)	10,000
Toxaphene	ND (0.793)	500
<b>TCLP Herbicides (<math>\mu\text{g/L}</math>) by Method 8151A</b>		
2,4-D	ND (0.980)	10,000
2,4,5-TP (Silvex)	ND (0.265)	1,000
<b>TCLP Metals (mg/L) by Method 6010B or 7470A*</b>		
Arsenic	ND (0.00608) U	5
Barium	2.45 J	100
Cadmium	ND (0.00127)	1
Chromium	0.00271	5
Lead	0.0122	5
Mercury*	ND (0.000057)	0.2
Selenium	ND (0.00955)	1
Silver	ND (0.000630)	5

ND ( ) = Not detected at specified detection limit.

J = Estimated value.

U = Not present at associated level; blank contamination is present.

Sample F18B was collected using a macro-core open-tube sampler advanced by DPT.

**Table 5-1**

**Water Sampling and Analysis Matrix  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

<b>Sample ID</b>	<b>VOCs (Method 8260B)</b>	<b>SVOCs (Method 8270B)</b>	<b>Metals (Method 6010B)</b>	<b>Mercury (Method 7471A)</b>
W81 through W85	√	√	√	√
W91 to W93*	√			
MW-201S			√	√
MW-206	√	√	√	√
MW-207			√	√
MW-216 through MW-223	√	√	√	√

\*Represents confirmatory samples for groundwater screening samples C5-30, C14-51, and C16-81, respectively.

**Table 5-2**

**Groundwater Screening Sample Locations and Depths  
Hamilton Beach◇Proctor Silex, Washington, North Carolina**

Sample ID	Screen Interval (ft bgs)
C1-4	3 - 7
C1-19	17 - 21
C5-8	6 - 10
C5-17	15 - 19
C5-30*	28 - 32
C6-8	6 - 10
C6-20	24 - 28
C7-5	3 - 7
C7-24	22 - 26
C8-5	4 - 8
C8-24	22 - 26
C9-4	6 - 10
C9-25	23 - 27
C10-4	3 - 7
C10-25	23 - 27
C10-49	47 - 51
C11-4	6 - 10
C11-25	23 - 27
C12-4	4 - 8
C12-18	16 - 20
C12-29	27 - 31
C13-3	6 - 10

Sample ID	Screen Interval (ft bgs)
C13-24	22 - 26
C14-5	4 - 8
C14-23	21 - 25
C14-51 <sup>b</sup>	49 - 53
C15-5	4 - 8
C15-24	22 - 26
C16-4	3 - 7
C16-18 <sup>c</sup>	16 - 20
C16-28	26 - 30
C17-4	4 - 8
C17-25	23 - 27
C18-5	4 - 8
C18-25	23 - 27
G1-20	18 - 22
G1-30	28 - 32
G1-40	38 - 42
G2-20	18 - 22
G2-30	28 - 32
G2-40	38 - 42
G3-20	18 - 22
G3-30	28 - 32
G3-40	38 - 42

bgs = below ground surface

\*Replicate of Sample W91

<sup>b</sup>Replicate of Sample W92

<sup>c</sup>Replicate of Sample W93

**Table 5-3**

**Monitoring Well Construction Data  
Hamilton Beach ◇ Proctor-Silex, Washington, North Carolina**

<b>Well No.</b>	<b>Installation Date</b>	<b>Top of Casing Elevation (ft. above MSL)</b>	<b>Total Depth (ft. bgs)</b>	<b>Screen Interval (ft. bgs)</b>	<b>Filter Pack (ft. bgs)</b>	<b>Bentonite Seal (ft. bgs)</b>	<b>Grout Seal (ft. bgs)</b>
MW-201S	9/10/92	29.74	9.9	7.9 - 9.9	5 - 9.9	2.9 - 5	0 - 2.9
MW-201D	9/10/92	29.71	45	43 - 45	14 - 45	2.9 - 14	0 - 2.9
MW-202	9/10/92	34.98	14	4 - 14	3.5 - 14	2 - 3.5	0 - 2
MW-203	9/11/92	32.16	15	5 - 15	4 - 15	2 - 4	0 - 2
MW-204	9/11/92	32.65	15	5 - 15	4 - 15	2 - 4	0 - 2
MW-205	9/11/92	31.75	15	5 - 15	4 - 15	1.3 - 4	0 - 1.3
MW-206	9/11/92	28.79	13.6	3.6 - 13.6	3.1 - 13.6	0.7 - 3.1	0 - 0.7
MW-207	11/4/92	33.78	10.4	5.4 - 10.4	4.2 - 10.4	1.2 - 4.2	0 - 1.2
MW-208	11/4/92	32.11	9.7	4.7 - 9.7	4 - 9.7	1.2 - 4	0 - 1.2
MW-209	1/14/98	32.93	26.4	16.4 - 26.4	14 - 26.4	13 - 14	0 - 13
MW-210	1/14/98	32.49	20	12 - 20	11 - 20	9.3 - 11	0 - 9.3
MW-211	1/14/98	31.75	7.5	3 - 7.5	2.5 - 7.5	1.5 - 2.5	0 - 1.5
MW-212	1/14/98	28.45	20	12 - 20	11 - 20	10 - 11	0 - 10
MW-213	1/14/98	28.44	7.5	3 - 7.5	2.5 - 7.5	1.5 - 2.5	0 - 1.5
MW-214	1/16/98	27.93	21	14.5 - 21	13.5 - 21	12.5 - 13.5	0 - 12.5
MW-215	1/16/98	28.06	10	8.5 - 10	8 - 10	7 - 8	0 - 7
MW-216	5/5/98	32.82	35	26 - 35	25 - 35	24 - 25	0 - 24
MW-217	5/5/98	32.75	10	4 - 10	3 - 10	2 - 3	0 - 2
MW-218	5/6/98	31.55	37	28 - 37	27 - 37	26 - 27	0 - 26
MW-219	5/5/98	31.83	10	4 - 10	3 - 10	2 - 3	0 - 2
MW-220	5/5/98	31.50	34	25 - 34	24 - 34	23 - 24	0 - 23
MW-221	5/5/98	31.39	10	4 - 10	3 - 10	2 - 3	0 - 2
MW-222	5/6/98	35.11	40	31 - 40	30 - 40	29 - 30	0 - 29
MW-223	5/6/98	35.15	10	4 - 10	3 - 10	2 - 3	0 - 2

Monitoring wells 201 through 208 installed by Engineering Tectonics, P.A.  
 Monitoring wells 209 through 215 installed by Groundwater Management Associates, Inc.  
 Monitoring wells 216 through 223 installed by Radian Mobile Field Services.

MSL = Mean Sea Level  
 bgs = below ground surface

Table 5-4

**Relationship Between Stratigraphic Units and Hydrogeologic Units  
Hamilton Beach◇Proctor Silex, Washington, North Carolina**

Period	Epoch	Stratigraphic Unit	Hydrogeologic Unit	General Description
Quaternary	Holocene	Undifferentiated Surficial Deposits	Surficial Aquifer	Deposits consisting of sand, clay, and marl form the uppermost aquifer in the region. Groundwater occurs under water-table conditions.
	Pleistocene			
Tertiary	Miocene	Yorktown Formation	Yorktown Confining Bed	Massive clay deposits overlying sand lenses and shell beds form a confining bed that separates the surficial aquifer from the underlying limestone aquifer.
	Eocene	Castle Hayne Limestone	Tertiary Limestone Aquifer	Shell limestone and calcareous sand deposits constitute the principal aquifer in Beaufort County. Groundwater occurs under confined conditions.
	Paleocene	Beaufort Formation	Beaufort Aquifer	Glauconitic sands, argillaceous sands, and impure limestones constitute a fresh-water aquifer in Beaufort County. Groundwater occurs under confined conditions.
Cretaceous	Late Cretaceous	Peedee Formation	Cretaceous Aquifer System	Deposits of complexly interbedded sand, silt, and clay constitute an aquifer system. Individual aquifers typically are separated by extensive beds of clay. Groundwater occurs under confined conditions. Only the Peedee Formation contains fresh water in western Beaufort County.
		Black Creek Formation		
		Middendorf Formation		
	Early Cretaceous	Unnamed Cretaceous Deposits		

**Table 5-5**

**Ground Water Elevations: May 13, 1998  
Hamilton Beach ♦ Proctor-Silex, Washington, North Carolina**

<b>Well</b>	<b>Measuring Point Elevation (ft. above MSL)</b>	<b>Depth to Water (ft. below MP)</b>	<b>Water-Level Elevation (ft. above MSL)</b>
MW-201S	29.74	2.37	27.37
MW-206	28.79	3.35	25.44
MW-207	33.78	3.70	30.08
MW-208	32.11	5.49	26.62
MW-209	32.93	7.82	25.11
MW-210	32.49	7.39	25.10
MW-211	31.75	6.84	24.91
MW-212	28.45	2.80	25.65
MW-213	28.44	2.90	25.54
MW-214	27.93	2.98	24.95
MW-215	28.06	3.09	24.97
MW-216	32.82	8.43	24.39
MW-217	32.75	8.00	24.75
MW-218	31.55	6.37	25.18
MW-219	31.83	7.33	24.50
MW-220	31.50	6.37	25.13
MW-221	31.39	7.04	24.35
MW-222	35.11	12.77	22.34
MW-223	35.15	7.90	27.25

**Surface Water Elevations: May 13, 1998  
Hamilton Beach ♦ Proctor-Silex, Washington, North Carolina**

<b>Measuring Point</b>	<b>Measuring Point Elevation (ft. above MSL)</b>	<b>Depth to Water (ft. below MP)</b>	<b>Water-Level Elevation (ft. above MSL)</b>
W81	22.73	0.79	21.94
W82	23.16	0.81	22.35
W83	23.99	0.54	23.45
W84	23.99	0.48	23.51
W85	24.25	0.85	23.40

MSL = Mean Sea Level  
MP = Measuring Point

**Table 5-6**

**Summary of Groundwater Screening Results:  
Volatile Organic Compounds by Method 8260A  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

<b>Sample ID</b>	<b>C1-4</b>	<b>C1-19</b>	<b>C5-8</b>	<b>C5-17</b>	<b>C5-30</b>	<b>C6-8</b>	<b>C6-26</b>	<b>C7-5</b>	<b>C7-24</b>
Sample Interval (ft. below surface)	3-7	17-21	6-10	15-19	28-32	6-10	24-28	3-7	22-26
Date of Sampling	4/13/98	4/13/98	4/13/98	4/13/98	4/13/98	4/13/98	4/13/98	4/14/98	4/14/98
<b>Analyte (µg/L)</b>									
n-Butylbenzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
Chloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
1,1-Dichloroethane	ND (1)	ND (1)	ND (1)	ND (1)	550	ND (1)	29	ND (1)	ND (1)
1,2-Dichloroethane	ND (1)	ND (1)	ND (1)	ND (1)	12	ND (1)	ND (1)	ND (1)	ND (1)
1,1-Dichloroethene	ND (1)	ND (1)	ND (1)	ND (1)	44	ND (1)	ND (1)	ND (1)	ND (1)
cis-1,2-Dichloroethene	ND (1)	ND (1)	ND (1)	ND (1)	390	ND (1)	ND (1)	ND (1)	ND (1)
trans-1,2-Dichloroethene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
Ethylbenzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
Methylene chloride	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
Toluene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
1,1,1-Trichloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
Trichloroethene	ND (1)	ND (1)	ND (1)	ND (1)	6 J	ND (1)	ND (1)	ND (1)	ND (1)
Vinyl chloride	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
m&p-Xylene	ND (2)	ND (2)	ND (2)	ND (2)	ND (20)	ND (2)	ND (2)	ND (2)	ND (2)

Table 5-6 (Continued)

Sample ID	C8-5	C8-24	C9-4	C9-25	C10-4	C10-25	C10-49	C11-4	C11-25
Sample Interval (ft. below surface)	4-8	22-26	6-10	23-27	3-7	23-27	47-51	6-10	23-27
Date of Sampling	4/14/98	4/14/98	4/13/98	4/13/98	4/15/98	4/15/98	4/15/98	4/13/98	4/13/98
<b>Analyte (µg/L)</b>									
n-Butylbenzene	ND (1)	ND (10)	ND (10)	ND (1)					
Chloroethane	ND (1)	ND (10)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)	18	ND (1)
1,1-Dichloroethane	1	980	390	3	ND (1)	ND (1)	ND (1)	73	ND (1)
1,2-Dichloroethane	ND (1)	30	13	ND (1)					
1,1-Dichloroethene	ND (1)	54	120	ND (1)	ND (1)	ND (1)	ND (1)	6	ND (1)
cis-1,2-Dichloroethene	ND (1)	110	960	3	T	ND (1)	ND (1)	42	ND (1)
trans-1,2-Dichloroethene	ND (1)	ND (10)	7 J	ND (1)	ND (1)	ND (1)	ND (1)	1	ND (1)
Ethylbenzene	ND (1)	ND (10)	ND (10)	ND (1)					
Methylene chloride	ND (1)	ND (10)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)	3	ND (1)
Toluene	ND (1)	ND (10)	ND (10)	ND (1)	ND (1)	ND (1)	1	ND (1)	ND (1)
1,1,1-Trichloroethane	ND (1)	ND (10)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)	4	ND (1)
Trichloroethene	ND (1)	20	480	T	2	ND (1)	ND (1)	ND (1)	ND (1)
Vinyl chloride	ND (1)	ND (10)	11	ND (1)					
m&p-Xylene	ND (2)	ND (20)	ND (20)	ND (2)					

Table 5-6 (Continued)

Sample ID	C12-4	C12-18	C12-29	C13-3	C13-24	C14-5	C14-23	C14-51	C15-5
Sample Interval (ft. below surface)	4-8	16-20	27-31	6-10	22-26	4-8	22-26	49-53	4-8
Date of Sampling	4/13/98	4/13/98	4/13/98	4/13/98	4/13/98	4/14/98	4/14/98	4/14/98	4/14/98
<b>Analyte (µg/L)</b>									
n-Butylbenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Chloroethane	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
1,1-Dichloroethane	4	ND (1)	ND (1)	ND (1)	ND (1)	87	ND (1)	15	ND (1)
1,2-Dichloroethane	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
1,1-Dichloroethene	2	ND (1)	ND (1)	ND (1)	ND (1)	18	ND (1)	ND (1)	ND (1)
cis-1,2-Dichloroethene	ND (1)	290	47	25	ND (1)				
trans-1,2-Dichloroethene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Ethylbenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Methylene chloride	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Toluene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
1,1,1-Trichloroethane	6	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Trichloroethene	ND (1)	66	21	16	ND (1)				
Vinyl chloride	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
m&p-Xylene	ND (2)	ND (20)	ND (2)	ND (2)	ND (2)				

Table 5-6 (Continued)

Sample ID	C15-24	C16-4	C16-18	C16-28	C17-4	C17-25	C18-5	C18-25	G1-20
Sample Interval (ft. below surface)	22-26	3-7	16-20	26-30	4-8	23-27	4-8	23-27	18-22
Date of Sampling	4/14/98	4/15/98	4/15/98	4/15/98	4/14/98	4/14/98	4/13/98	4/13/98	4/14/98
Analyte (µg/L)									
n-Butylbenzene	T	ND (10)	ND (10)	ND (10)	ND (1)				
Chloroethane	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
1,1-Dichloroethane	ND (1)	150	140	ND (10)	ND (1)				
1,2-Dichloroethane	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
1,1-Dichloroethene	ND (1)	25	7 J	ND (10)	ND (1)				
cis-1,2-Dichloroethene	ND (1)	51	27	ND (10)	ND (1)				
trans-1,2-Dichloroethene	ND (1)	5 J	ND (1)	ND (10)	ND (1)				
Ethylbenzene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)	T
Methylene chloride	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
Toluene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
1,1,1-Trichloroethane	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
Trichloroethene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
Vinyl chloride	ND (1)	ND (10)	44	ND (10)	ND (1)				
m&p-Xylene	ND (2)	ND (20)	ND (20)	ND (20)	ND (2)	ND (2)	ND (2)	ND (2)	T

Table 5-6 (Continued)

Sample ID	G1-30	G1-40	G2-20	G2-30	G2-40	G3-20	G3-30	G3-40	
Sample Interval (ft. below surface)	28-32	38-42	18-22	28-32	38-42	18-22	28-32	38-42	
Date of Sampling	4/14/98	4/14/98	4/14/98	4/14/98	4/14/98	4/14/98	4/14/98	4/14/98	
<b>Analyte (<math>\mu\text{g}/\text{kg}</math>)</b>									
n-Butylbenzene	ND (1)								
Chloroethane	ND (1)								
1,1-Dichloroethane	ND (1)								
1,2-Dichloroethane	ND (1)								
1,1-Dichloroethene	ND (1)								
cis-1,2-Dichloroethene	ND (1)								
trans-1,2-Dichloroethene	ND (1)								
Ethylbenzene	ND (1)								
Methylene chloride	ND (1)								
Toluene	ND (1)	ND (1)	ND (1)	T	ND (1)	ND (1)	ND (1)	ND (1)	
1,1,1-Trichloroethane	ND (1)								
Trichloroethene	ND (1)								
Vinyl chloride	ND (1)								
m&p-Xylene	ND (2)								

Target analytes not listed were not detected.

ND ( ) = Not detected at specified detection limit.

J = Estimated value.

T = Unquantified trace level between zero and the detection limit.

All samples were collected using a Tubing Check-Valve System within a screen point sampler or within a temporary well (C1-4, C13-3, and C14-5) advanced by DPT.

**Table 5-7**

**Summary of Replicate Sample Results  
Volatile Organic Compounds by Method 8260B  
Hamilton Beach ♦ Proctor-Silex, Washington, North Carolina**

Sample ID*	W91	W92	W93
Date of Sampling	4/13/98	4/14/98	4/15/98
<b>Analyte (µg/L)</b>			
Benzene	ND (0.0375)	0.190	0.371
Carbon disulfide	1.20 J	ND (0.0547)	0.720 J
Chloroethane	0.717	ND (0.0441)	0.724
1,1-Dichloroethane	572 J	ND (0.0576) UJ	101 J
1,2-Dichloroethane	16.4	ND (0.0348) UJ	ND (0.0348)
1,1-Dichloroethene	46.9	0.153 J	7.00
cis-1,2-Dichloroethene	393 J	19.4 J	17.6
trans-1,2-Dichloroethene	1.40	0.367 J	1.02
Ethylbenzene	0.134	0.680 J	0.0779 J
Methylene Chloride	0.830	ND (0.137) UJ	ND (0.137)
Toluene	1.37	1.18 J	0.965
Trichloroethene	3.84	13.5 J	0.280
Vinyl Chloride	2.92	ND (0.0639) UJ	21.8
m&p-Xylene	ND (0.115)	0.659 J	0.546
o-Xylene	ND (0.0414)	0.297 J	ND (0.0414)

\* Represents confirmatory samples for groundwater screening samples C5-30, C14-51, and C16-18, respectively.

Target analytes not listed were not detected.

ND = Not detected at (detection limit).

J = Estimated value

UJ = Not detected and detection limit is estimated.

All samples were collected using a Tubing Check-Valve System within a screen point sampler advanced by DPT.

Table 5-8

**Summary of Qualified Groundwater Analytical Results:  
Volatile Organic Compounds by Method 8260B  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	MW-206	MW-216	MW-217	MW-218	MW-219	MW-220	MW-221	MW-222	MW-223
Date of Sampling	5/12/98	5/12/98	5/12/98	5/12/98	5/12/98	5/12/98	5/12/98	5/12/98	5/12/98
Analyte (µg/L)									
1,1-Dichloroethane	22,500	ND (0.0576)	ND (0.0576)	ND (0.0576)	3.37	ND (0.0576)	ND (0.0576)	ND (0.0576)	ND (0.0576)
1,1-Dichloroethene	78,200	ND (0.0715)	ND (0.0715)	ND (0.0715)	1.64	ND (0.0715)	ND (0.0715)	0.0908 J	ND (0.0715)
cis-1,2-Dichloroethene	4,680	ND (0.0383)	ND (0.0383)	ND (0.0383)	0.135	ND (0.0383)	ND (0.0383)	ND (0.0383)	ND (0.0383)
Ethylbenzene	ND (928)	ND (0.0928)	0.0933	ND (0.0928)	ND (0.0928)	ND (0.0928)	ND (0.0928)	ND (0.0928)	ND (0.0928)
Toluene	ND (522)	0.171	0.521	ND (0.0522)	ND (0.0522)	ND (0.0522)	ND (0.0522)	0.156 J	ND (0.0522)
1,1,1-Trichloroethane	276,000	ND (0.0658)	ND (0.0658)	ND (0.0658)	4.39	ND (0.0658)	ND (0.0658)	ND (0.0658)	ND (0.0658)
Trichloroethene	15,700	ND (0.0892)	ND (0.0892)	ND (0.171) U	0.250	ND (0.212) U	ND (0.474) U	ND (0.0892)	ND (0.0892)
m&p-Xylene	ND (1150)	ND (0.115)	0.284	ND (0.115)	ND (0.115)	ND (0.115)	ND (0.115)	ND (0.115)	ND (0.115)

Target analytes not listed were not detected.

ND ( ) = Not detected at specified detection limit.

J = Estimated value.

U = Not present at associated level; blank contamination is present.

UJ = Not detected and the detection limit is estimated.

Samples from MW-217 to MW-223 were collected using an inertial foot-valve pump; the sample from MW-206 was collected using a bailer.

Table 5-9

**Summary of Qualified Groundwater Analytical Results:  
Semivolatile Organic Compounds by Method 8270B  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	MW-206	MW-216	MW-217	MW-218	MW-219	MW-220	MW-221	MW-222	MW-223
Date of Sampling	5/12/98	5/13/98	5/13/98	5/12/98	5/12/98	5/12/98	5/12/98	5/12/98	5/12/98
Analyte (µg/L)									
Acenaphthene	3.89 J	ND (0.386)	ND (0.386)	ND (0.386)	ND (0.401)	ND (0.386)	ND (0.401)	ND (0.386)	ND (0.409)
Benzoic acid	ND (32.5) UJ	ND (32.5) UJ	ND (32.5) UJ	ND (32.5) UJ	6.97 J	ND (32.5) UJ	ND (33.8) UJ	ND (32.5) UJ	ND (34.5) UJ
Butylbenzylphthalate	2.03 J	ND (0.206)	ND (0.206)	ND (0.206)	ND (0.214)	ND (0.206)	ND (0.214)	ND (0.206)	ND (0.218)
Dibenzofuran	3.95 J	ND (0.350)	ND (0.350)	ND (0.350)	ND (0.363)	ND (0.350)	ND (0.363)	ND (0.350)	ND (0.370)
Di-n-butylphthalate	0.462 J	ND (0.199)	ND (0.199)	ND (0.199)	ND (0.207)	ND (0.199)	1.07	ND (0.199)	ND (0.211)
bis(2-Ethylhexyl)phthalate	17.2 J	ND (4.20)	ND (4.20)	ND (4.20)	ND (4.36)	ND (4.20)	ND (4.36)	ND (4.20)	ND (4.45)
Fluorene	7.88 J	ND (0.350)	ND (0.350)	ND (0.350)	ND (0.364)	ND (0.350)	ND (0.364)	ND (0.350)	ND (0.371)
2-Methylnaphthalene	129 J	ND (0.279)	ND (0.279)	ND (0.279)	ND (0.289)	ND (0.279)	ND (0.289)	ND (0.279)	ND (0.295)
2-Methylphenol	3.50	ND (0.446)	ND (0.446)	ND (0.446)	ND (0.463)	ND (0.446)	ND (0.463)	ND (0.446)	ND (0.472)
4-Methylphenol/ 3-Methylphenol	29.9 J	ND (0.581)	ND (0.581)	ND (0.581)	ND (0.604)	ND (0.581)	ND (0.604)	ND (0.581)	ND (0.616)
Naphthalene	519	ND (0.424)	ND (0.424)	ND (0.424)	ND (0.441)	ND (0.424)	ND (0.441)	ND (0.424)	ND (0.450)
Phenanthrene	9.52 J	ND (0.480)	ND (0.480)	ND (0.480)	ND (0.499)	ND (0.480)	ND (0.499)	ND (0.480)	ND (0.509)

Table 5-9 (Continued)

Sample ID	MW-206	MW-216	MW-217	MW-218	MW-219	MW-220	MW-221	MW-222	MW-223
Date of Sampling	5/12/98	5/13/98	5/13/98	5/12/98	5/12/98	5/12/98	5/12/98	5/12/98	5/12/98
Analyte (µg/L)									
Phenol	28.6	ND (0.209)	ND (0.209)	ND (0.209)	ND (7.70) U	ND (0.209)	ND (0.217)	ND (0.209)	ND (0.222)
Pyrene	0.716 J	ND (0.302)	ND (0.302)	ND (0.302)	ND (0.314)	ND (0.302)	ND (0.314)	ND (0.302)	ND (0.320)
2,4,5-Trichlorophenol	5.36	ND (0.338)	ND (0.338)	ND (0.338)	ND (0.351)	ND (0.338)	ND (0.351)	ND (0.338)	ND (0.358)

Target analytes not listed were not detected.

ND ( ) = Not detected at specified detection limit.

J = Estimated value.

U = Not present above the associated level; blank contamination is present.

UJ = Not detected and the detection limit is estimated.

Samples MW-216 through MW-223 were collected with a peristaltic pump, sample MW-206 was collected with a disposable bailer.

Table 5-10

**Summary of Qualified Groundwater Analytical Results:  
Metals by Methods 6010B and 7470A (Mercury)  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

<b>Sample ID</b>	<b>MW-201S</b>	<b>MW-206</b>	<b>MW-207</b>	<b>MW-216</b>	<b>MW-217</b>	<b>MW-218</b>
Date of Sampling	5/13/98	5/12/98	5/12/98	5/12/98	5/13/98	5/12/98
Date of Analysis	5/15/98	5/15/98	5/15/98	5/15/98	5/15/98	5/15/98
<b>Analyte (mg/L)</b>						
Aluminum	1.34	50.3	50.7	0.124	0.734	ND (0.0232) U
Antimony	ND (0.00776) U	ND (0.00141)	ND (0.00176) U	ND (0.00279) U	ND (0.00141)	ND (0.00141)
Arsenic	ND (0.00599) U	ND (0.00802) U	0.0460	ND (0.00327)	ND (0.00327)	ND (0.00327)
Barium	0.872	0.445	0.751	0.0462	0.0901	0.0395
Beryllium	ND (0.00400) U	0.00500	0.0117	ND (0.000500) U	ND (0.000840) U	ND (0.000460) U
Cadmium	ND (0.000260)	ND (0.000290) U	ND (0.000260)	ND (0.000260)	ND (0.000260)	ND (0.000260)
Calcium	16.5	79.9 J	8.94	87.9	7.71	85.6
Chromium	0.00235	ND (0.000400)	0.0848	ND (0.000620) U	0.00184	ND (0.000400)
Cobalt	0.0139	0.0105	0.0524	ND (0.000770) U	0.00599	ND (0.000500)
Copper	0.00160	0.0106	0.0729	0.000950	0.0740	0.000630
Iron	6.35	85.3 J	56.7	2.28	1.43	3.35
Lead	ND (0.00427) U	0.0376	0.126	ND (0.00128)	ND (0.00128)	ND (0.00128)
Magnesium	11.0	11.3	6.18	3.94	2.44	2.18
Manganese	0.412	0.456 J	0.370	0.224	0.453	0.0867
Mercury	ND (0.000057)	ND (0.000057)	0.000430	ND (0.000057)	ND (0.000057)	ND (0.000057)

Table 5-10 (Continued)

Sample ID	MW-201S	MW-206	MW-207	MW-216	MW-217	MW-218
Molybdenum	ND (0.00112) U	0.0311	ND (0.00100)	ND (0.00111) U	ND (0.00100)	0.00238
Nickel	0.0194	0.0187	0.0887	ND (0.00395) U	0.0387	ND (0.00174) U
Potassium	ND (3.40) U	6.18	5.31	ND (2.23) U	ND (2.16) U	ND (1.77) U
Selenium	ND (0.00144)	0.00320	ND (0.00144)	ND (0.00144)	ND (0.00144)	ND (0.00144)
Silver	ND (0.000630)	ND (0.000630)	ND (0.000630)	ND (0.000630)	ND (0.000630)	0.00101
Sodium	156	131 J	11.1	9.46	13.3	9.19
Thallium	ND (0.00387)	ND (0.00387)	ND (0.00387)	ND (0.00387)	ND (0.00387)	ND (0.00387)
Vanadium	0.00119	0.00426	0.164	ND (0.000720)	ND (0.000720)	0.000780
Zinc	ND (0.0563) U	0.155 J	0.293	ND (0.00791) U	ND (0.0390) U	ND (0.0217) U

ND ( ) = Not detected at specified detection limit.

U = Not present at associated level;; blank contamination is present.

J = Estimated value.

Table 5-10 (Continued)

Sample ID	MW-219	MW-220	MW-221	MW-222	MW-223
Date of Sampling	5/12/98	5/12/98	5/12/98	5/12/98	5/12/98
Date of Analysis	5/15/98	5/15/98	5/15/98	5/15/98	5/15/98
<b>Analyte (mg/L)</b>					
Aluminum	2.26	4.47	26.2	ND (0.0344) U	3.07
Antimony	ND (0.00237) U	ND (0.00197) U	ND (0.00141)	ND (0.00141)	ND (0.00393) U
Arsenic	ND (0.00327)	ND (0.00327)	ND (0.00406) U	ND (0.00327)	ND (0.00848) U
Barium	0.0464	0.0810	0.132	0.0410	0.129
Beryllium	ND (0.000510) U	ND (0.00193) U	ND (0.00160) U	ND (0.000560) U	ND (0.00166) U
Cadmium	ND (0.000260)	ND (0.000260)	ND (0.000260)	ND (0.000260)	ND (0.000260)
Calcium	56.9	24.0	ND (2.66 ) U	75.3	ND (3.94) U
Chromium	0.0184	0.0113	0.0460	ND (0.000400)	0.00551
Cobalt	ND (0.000610) U	0.00379	0.00420	ND (0.000500)	0.00579
Copper	0.00465	0.0230	0.0567	ND (0.000420)	0.00416
Iron	1.67	13.3	6.43	2.46	4.61
Lead	ND (0.00187) U	ND (0.00545)	0.0463	ND (0.00128)	ND (0.00398) U
Magnesium	1.01	1.33	0.918	1.81	1.31
Manganese	0.0368	0.187	0.137	0.101	0.134
Mercury	ND (0.000057)	ND (0.00057)	0.000260	ND (0.000057)	ND (0.000057)
Molybdenum	0.00451	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)
Nickel	0.00554	0.0108	0.0213	ND (0.00148) U	0.00886
Potassium	8.45	ND (1.55) U	ND (1.75) U	ND (1.69) U	ND (1.70) U

Table 5-10 (Continued)

Sample ID	MW-219	MW-220	MW-221	MW-222	MW-223
Selenium	ND (0.00144)	ND (0.00144)	ND (0.00144)	0.00242	ND (0.00144)
Silver	ND (0.000630)	ND (0.000630)	ND (0.000630)	ND (0.000630)	ND (0.000630)
Sodium	17.8	8.23	7.42	11.4	9.28
Thallium	ND (0.00387)	ND (0.00387)	ND (0.00387)	ND (0.00387)	ND (0.00387)
Vanadium	0.0150	0.00988	0.0225	ND (0.000720)	0.00552
Zinc	ND (0.00922) U	ND (0.0298) U	ND (0.0266) U	ND (0.00317) U	ND (0.0248) U

ND ( ) = Not detected at specified detection limit.

U = Not present at associated level; blank contamination is present.

**Table 5-11**

**Field Measurements  
Hamilton Beach ◇ Proctor-Silex, Washington, North Carolina**

<b>Well</b>	<b>Purged Volume<sup>1</sup> (Gallons)</b>	<b>Temperature (°C)</b>	<b>Specific Conductance (µS)</b>	<b>pH</b>
MW-201S	1.0	16.0	900	5.4
MW-207	2.5 (dry)	17.0	50	5.5
MW-216	1.0	17.0	405	7.1
MW-217	0.2	17.0	130	5.7
MW-218	1.0	19.0	425	7.2
MW-219	0.2	19.5	1,100	11.4
MW-220	1.0	17.0	120	7.1
MW-221	0.3	17.5	60	6.2
MW-222	1.0	18.0	370	7.5
MW-223	0.4	17.0	80	5.5

<sup>1</sup>Volume is at least three times the well volume unless well was purged dry.

Table 5-12

**Summary of Qualified Surface Water Analytical Results:  
Volatile Organic Compounds by Method 8260B  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	W81	W82	W83	W84	W85
Date of Sampling	3/16/98	3/16/98	3/16/98	3/16/98	3/16/98
Analyte (µg/L)					
Acetonitrile	R	R	21.0 J	R	R
Bromoform	ND (0.117)	ND (2.66) UJ	0.653 J	ND (0.133) UJ	ND (0.133) UJ
Chloroethane	13.5	ND (3.44)	ND (0.172)	ND (0.172)	ND (0.172)
Chloroform	0.249	ND (1.85)	ND (0.0927)	ND (0.0927)	ND (0.0927)
1,1-Dichloroethane	30.7	ND (1.13)	ND (0.0566)	ND (0.0566)	ND (0.0566)
1,1-Dichloroethene	32.9	36.4	0.219	ND (0.145)	ND (0.145)
cis-1,2-Dichloroethene	115	22.7	0.0827 J	0.213	ND (0.152)
trans-1,2-Dichloroethene	2.00	ND (4.42)	ND (0.221)	ND (0.221)	ND (0.221)
Ethylbenzene	0.222	ND (4.12)	ND (0.206)	ND (0.206)	ND (0.206)
4-Methyl-2-pentanone (MIBK)	2.73	ND (5.88)	ND (0.294)	ND (0.294)	ND (0.294)
Tetrachloroethene	11.9	ND (3.68)	ND (0.184)	ND (0.184)	ND (0.184)
Toluene	0.728	ND (1.95)	ND (0.0973)	ND (0.0973)	ND (0.0973)
1,1,1-Trichloroethane	170	157	0.601	ND (0.168)	ND (0.168)
Trichloroethene	219	40.5	ND (0.181)	ND (0.181)	ND (0.181)
Vinyl chloride	4.63	ND (2.56)	ND (0.128)	ND (0.128)	ND (0.128)
m&p-Xylene	0.403	ND (4.60)	ND (0.230)	ND (0.230)	ND (0.230)
o-Xylene	0.151	ND (2.52)	ND (0.126)	ND (0.126)	ND (0.126)

Target analytes not listed were not detected.

ND ( ) = Not detected at specified detection limit.

J = Estimated value.

R = Unusable data; laboratory specification not met.

Samples were collected by dipping containers partially below the water surface.

Table 5-13

**Summary of Qualified Surface Water Analytical Results:  
Semivolatile Organic Compounds by Method 8270B  
Hamilton Beach ◇ Proctor-Silex, Washington, North Carolina**

Sample ID	W81	W82	W83	W84	W85
Date of Sampling	3/16/98	3/16/98	3/16/98	3/16/98	3/16/98
Analyte ( $\mu$ E)					
bis(2-Ethylhexyl)phthalate	ND (4.88)	ND (5.28)	ND (5.12)	ND (4.88)	1.27 J

Target analytes not listed were not detected.

ND ( ) = Not detected at specified detection limit.

J = Estimated value.

Samples were collected by dipping containers partially below the water surface.

Table 5-14

**Summary of Qualified Surface Water Analytical Results:  
Metals by Methods 6010B and 7471A (Mercury)  
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	W81	W82	W83	W84	W85
Date of Sampling	3/16/98	3/16/98	NS	NS	3/16/98
<b>Analyte (mg/L)</b>					
Aluminum	0.670	0.562	NS	NS	1.47
Antimony	ND (0.00266) U	ND (0.00266) U	NS	NS	ND (0.00266) U
Arsenic	ND (0.00173) U	ND (0.00173) U	NS	NS	ND (0.00173) U
Barium	0.116	0.127	NS	NS	0.0699
Beryllium	ND (0.000988) U	ND (0.000988) U	NS	NS	ND (0.000988) U
Cadmium	ND (0.000362)	ND (0.000362)	NS	NS	ND (0.000362)
Calcium	14.8	11.7	NS	NS	13.8
Chromium	ND (0.000610)	ND (0.000610)	NS	NS	ND (0.000820)
Cobalt	ND (0.000979) U	ND (0.000979) U	NS	NS	ND (0.000979) U
Copper	0.00618	ND (0.00235) U	NS	NS	ND (0.000930) U
Iron	0.579	0.508	NS	NS	1.26
Lead	ND (0.00201) U	ND (0.00256) U	NS	NS	ND (0.00365) U
Magnesium	3.47	3.46	NS	NS	2.10
Manganese	0.0181	0.0171	NS	NS	0.0340
Mercury	ND (0.00057)	ND (0.00057)	NS	NS	ND (0.00057)
Molybdenum	0.150	0.166	NS	NS	ND (0.000770) U

Table 5-14 (Continued)

Sample ID	W81	W82	W83	W84	W85
Nickel	ND (0.00110) U	ND (0.00126) U	NS	NS	ND (0.00927) U
Potassium	4.35	4.58	NS	NS	2.64
Selenium	ND (0.00165) U	ND (0.00149) U	NS	NS	ND (0.00149) U
Silver	ND (0.000626)	ND (0.000626)	NS	NS	ND (0.000626)
Sodium	50.5	43.1	NS	NS	4.52
Thallium	ND (0.00274)	ND (0.00274)	NS	NS	ND (0.00274)
Vanadium	ND (0.000707) U	ND (0.000707) U	NS	NS	ND (0.00282) U
Zinc	0.0289	0.0148	NS	NS	0.0112

ND ( ) = Not detected at specified detection limit.

NS = Not sampled.

U = Not present at associated level; blank contamination is present.

Samples were collected by dipping containers partially below the water surface.