

37IHSSF2022



DocumentID NONCD0001814

Site Name HAMILTON BEACH/PROCTOR SILEX

DocumentType Remedial Action Plan (RAP)

RptSegment 1

DocDate 7/28/1999

DocRcvd 2/20/2007

Box SF2022

AccessLevel PUBLIC

Division WASTE MANAGEMENT

Section SUPERFUND

Program IHS (IHS)

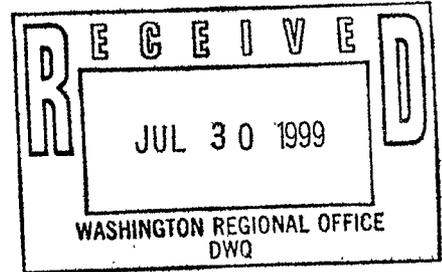
DocCat FACILITY

Radian Engineering Inc.

(Shipping) 1600 Perimeter Park Drive
Morrisville, NC 27560
(Mailing) P.O. Box 13000
Research Triangle Park, NC 27709
(919) 461-1100
FAX # (919) 461-1415

July 28, 1999

Mr. Keith Starner
Department of Environment and Natural Resources
934 Washington Square Mall
Washington, North Carolina 27889



**RE: Groundwater Incident No. 14338
Hamilton Beach◇Proctor-Silex, Inc.
Washington, North Carolina**

Dear Mr. Starner:

In compliance with the schedule agreed to by Hamilton Beach◇Proctor-Silex, Inc., and the Division of Water Quality, we are submitting one copy of a Preliminary Corrective Action Plan (PCAP) for the referenced site. Pending approval of bench-scale and pilot-scale testing as proposed in this PCAP, we will complete these tests and submit an addendum to this PCAP. The addendum will consist of a schedule and detailed plans and specifications for full-scale remediation.

Appendix C of this PCAP includes Applications for Permit to Construct and/or Use A Well(s) for Injection for the pilot-scale testing of two proposed remedial technologies. Upon receipt of a signature from the property owner, the City of Washington, these applications will be submitted to the NCDENR Underground Injection Control Program (UIC)

If you have any questions, please contact Mario Kuhar at (804) 527-7222.

Sincerely,

RADIAN ENGINEERING, INC.

James Narkunas
Sr. Staff Scientist

JN:la.Cover_Ltr.doc

Enclosure

cc: Mario Kuhar - Hamilton Beach◇Proctor-Silex, Inc.
Brad A. De Vore - Womble Carlyle Sandridge & Rice
Project File

DIVISION OF ENVIRONMENTAL MANAGEMENT
Certification for the Submittal of a Corrective Action Plan
Under 15A NCAC 2L .0106(c)

Responsible Party: Hamilton Beach/Proctor-Silex, Inc. Attn: Mario Kuhar
Address: 4421 Waterfront Drive
City: Glen Allen State: VA Zip Code: 23060

Site Name: Hamilton Beach/Proctor-Silex, Inc.
Address: 234 Springs Road
City: Washington County: Beaufort Zip Code: 27889

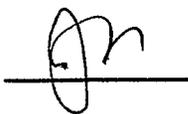
Groundwater Section Incident Number: 14338

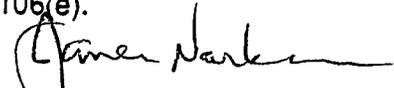
I, James Narkunas, a Professional Engineer/Licensed Geologist (circle one) for Radian Engineering, Inc. (firm or company of employment), do hereby certify that the information indicated below is enclosed as part of the required Corrective Action Plan (CAP) and that to the best of my knowledge the data, site assessments, engineering plans and other associated materials are correct and accurate.

(Each item must be initialed by hand by the certifying licensed professional).

1. JN A listing of the names and addresses of those individuals required to be notified to meet the notification requirements of 15A NCAC 2L .0114(a) is enclosed. Copies of letters ~~and certified mail receipts~~ are also enclosed.
2. JN A Professional Engineer or Licensed Geologist has prepared, reviewed, and certified all applicable parts of the CAP in accordance with 15A NCAC 2L .0103(e).
3. JN A site assessment is attached or on file at the appropriate Regional Office which provides the information required by 15A NCAC 2L .0106(g).
4. JN A description of the proposed corrective action and supporting justification is enclosed.
5. N/A Specific plans and engineering details are enclosed and propose the use of the best available technology for the restoration of groundwater quality to the levels of the groundwater standards prescribed in 15A NCAC 2L .0202.
6. N/A A schedule for the implementation and operation of the CAP is enclosed.

(OVER)

7.  A monitoring plan is enclosed which has the capacity to evaluate the effectiveness of the remedial activity and the movement of the contaminant plume, and which meets the requirements of 15A NCAC 2L .0110.
8.  The activity which resulted in the contamination incident is not permitted by the State as defined in 15A NCAC 2L .0106(e).


(Please Affix Seal and Signature)

NOTE: Any modifications made to this form may result in the return of your submittal.

S.0 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 was a Comprehensive Site Assessment that was completed in January 1999.

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 organic compounds (VOCs), including trichloroethene and 1,1,1-trichloroethane. Certain semivolatile organic compounds (SVOCs) are detected less frequently, at lower concentrations, and over a smaller area. These principal chemicals are no longer in use at the facility. 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. There are no known, on-going, primary sources of trichloroethene or 1,1,1-trichloroethane at the site. The specific source of the petroleum constituents is unknown. The specific nature, volume, and time period of any releases associated with these 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.

Concentrations of chemicals detected in soil and groundwater are compared to proposed cleanup goals (CUGs). These CUGs may not be final cleanup goals for this project and may be revised for, among other reasons, the site being designated as a Brownfields site. For groundwater, the proposed CUGs are based on 2L Standards, interim maximum allowable concentrations (IMACs), and proposed IMACs. For soil, CUGs are based on agency guidance values for Total Petroleum Hydrocarbons (TPH) and allowable soil contaminant concentrations that are determined by comparing chemical concentrations in leachate generated from the soil to the groundwater CUGs. Upon completion of corrective action, a synthetic precipitation leaching procedure (SPLP) will be performed on confirmatory soil samples. The allowable soil contaminant concentration will be that concentration of a chemical in the soil that produces a leachate at a concentration that does not exceed the groundwater CUG for that chemical.

Soil in the source area exceeds proposed CUGs for TPH, and is suspected to exceed the proposed CUGs for several VOCs and SVOCs. Soil exhibiting exceedance is primarily located adjacent to the former solvent AST and encompasses an area approximately 90 feet by 150 feet in size. This area is known to extend 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 CUGs for certain, predominantly; chlorinated VOCs. Groundwater also exceeds the CUGs for certain SVOCs; however, the extent of the semivolatile organics is limited to the upper hydrogeologic unit (Unit A) in the immediate source area. A dissolved VOC plume, originating at the source area, is present in both hydrogeologic Unit A and an underlying hydrogeologic unit (Unit B) having migrated downward through natural or anthropogenic discontinuities in a surficial confining bed. Within Unit A, the plume extends from the source area toward the south and discharges to a drainage ditch as evidenced by the presence of similar volatile organics, at significantly lower concentrations, in the surface water. A lobe of the plume extends to the area east of the employee parking lot. The existence of this lobe may be due to preferential chemical migration through a former, now buried, drainage ditch. 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 approximately 150 feet from Springs Road. A lobe of the plume extends from the source area, against the hydraulic gradient, to the south. The position of the lobe may be influenced by two former roof drains that extend from the plant building to the ditch in this general area. No analytes were detected at concentrations that exceed their CUGs in samples from off-site monitoring points. Vertical migration of the plume is retarded by the Yorktown confining bed. No VOCs were detected in a sample collected from beneath the confining bed underlying the source area.

Based on the assessment results, active remediation in the source area and within the surrounding plume is recommended. Due to site constraints and the nature of the contamination, ~~(in-situ remediation technology is proposed for this site)~~ These proposed technologies include ~~chemical oxidation for shallow groundwater and soils~~ in the source area, and ~~zero-valence iron injection with a carbon source such as guar, molasses, or Hydrogen~~ ~~Release Compound (HRC)~~ for the remaining portion of the dissolved VOC plume. Successful full-scale implementation of any of these in-situ applications requires bench and pilot-scale testing to formulate and optimize design parameters.

1.0 INTRODUCTION

As directed by the North Carolina Department of Environment and Natural Resources (DENR) Washington Regional Office (WaRO), this document was completed as a Preliminary Corrective Action Plan (PCAP) for the manufacturing facility leased by Hamilton Beach Proctor-Silex, Inc. (HB◇PS) on Washington, North Carolina. The PCAP provides a conceptual description of the remedial actions proposed for the soil and groundwater contamination at this facility. The proposed remediation approach is based on the results of a comprehensive site assessment (CSA) conducted at the site. These results are described in the Comprehensive Site Assessment Report (Radian, 1999).

The PCAP provides the WaRO information selected from the Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater, Volume I, Sources Other Than Underground Storage Tanks (1998) to the extent possible without benefit of bench- and pilot-scale testing. Section 1.0 of the plan is this introduction. Section 2.0 discusses plan objectives in the context of cleanup goals for soil and groundwater and proposes a schedule for implementing the plan. Section 3.0 identifies potential receptors. Section 4.0 includes an evaluation of potential corrective action alternatives and recommendations for preferred remedies. Section 5.0 describes the proposed corrective action and Section 6.0 discusses applicable permits. Section 7.0 is a list of references. Supporting data is provided in Appendices A through G.

1.1 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 1-1 through 1-3). 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.

1.2 Purpose of the Corrective Action Plan

The purpose of this PCAP is to respond to the requirements imposed by the WaRO and to remediate soil and groundwater contamination at this site to the proposed cleanup levels. This PCAP describes the conceptual remediation approach proposed for the site including a description of the bench and pilot-scale tests for the proposed in-situ remediation technologies. Detailed plans, specifications, and schedules for implementation of the full-scale remediation will be submitted as an addendum to this PCAP after the NCDENR WaRO has approved the PCAP and after design information is developed upon completion of bench and pilot-scale testing.

1.3 Source Characterization, Summary of Remedial Actions, and Previous Reports

This section describes the source area, summarizes remedial actions conducted to date, and references reports previously submitted to the North Carolina Department of Environment and Natural Resources (DENR) or its predecessor agency, the North Carolina Department of Environment, Health, and Natural Resources (DEHNR).

1.3.1 Source Characterization

Based on the site's description and operating history and on the results of the CSA and earlier investigations, it is apparent that the chemicals detected in soil and groundwater originated from multiple sources. Current data indicate that soil and groundwater at the site exhibit constituents of both petroleum hydrocarbons and degreasing solvents. The source of the petroleum constituents is unknown but may be one or more of the various ASTs and underground storage tanks (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 PCAP is referred to as the source area.

1.3.2 Remedial Actions

Remedial actions that have been conducted at the site relate to a release that occurred on January 11, 1995. On that date, 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, oil released to the ditch. HB◇PS responded to the release by notifying the DEHNR, 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 (11-DCA); 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 DEHNR 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 DENR, 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.

1.3.3 Previous Investigations and Reports

This section briefly describes the series of investigations conducted at the site and references previously submitted reports including the CSA report.

Groundwater Assessment

In 1992, Engineering Tectonics, P.A., under contract to HB◇PS, performed a subsurface investigation of the facility. The scope of work included the installation of nine monitoring wells and piezometers to characterize soil and groundwater underlying the site.

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). The report characterized the hydrogeology at the site and presented the analytical results for the soil and groundwater samples. Analytical results indicated the presence of six VOCs in the soil. The analytical results also identified 16 chlorinated and non-chlorinated VOCs in groundwater. Based on the analytical results included in the groundwater assessment report, a NOV was issued to HB◇PS by the WaRO on March 15, 1993. Incident Number 14338 was assigned to the site.

Assessment of Non-Discharge Wastewater Disposal Alternatives

In 1995, Radian evaluated the feasibility of different discharge options for managing groundwater from a pumping test and from a groundwater extraction system. The results of this evaluation are described in the report entitled, Environmental Feasibility Assessment of Non-Discharge Wastewater Disposal Alternatives, Washington, North Carolina Facility (Radian Corporation, 1995). Due to poor drainage characteristics of the on-site soil, neither spray irrigation, nor a subsurface disposal system was deemed an environmentally feasible alternative to surface discharge of the wastewater. Because municipal officials cited a policy of not accepting groundwater discharge into the sanitary sewer system, surface discharge under a NPDES permit is the only viable option for disposing of wastewater from a groundwater extraction system at this site.

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). The analytical results for the groundwater samples were generally consistent with those reported in 1992. However, a layer of oil was noted on the water surface in well MW-206.

Limited Site Investigation

In early 1998, Groundwater Management Associates, Inc. (GMA), under contract to HB \diamond 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). The report described the hydrogeology of the site noting the occurrence of several geologic units that are characterized by distinct hydrogeologic regimes. The soil and groundwater analyses confirmed the earlier results and further delineated the distribution of VOCs in groundwater. Laboratory analyses also indicated that no VOCs were detected in the samples collected from the water-supply wells.

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. 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).

On-Site Assessment and Comprehensive Site Assessment

The CSA 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. From March to July 1998, the assessment focused on site conditions within the limits of the facility property. The scope of work included 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. Results of the on-site assessment were provided in an On-site Assessment Report (Radian, 1998). The report presented a detailed

site model; however, several data gaps were also identified and recommended for further investigation.

The CSA continued in September 1998 and included soil and groundwater sampling utilizing direct push technology (DPT); well installation using DPT, hollow-stem auger, and mud rotary drilling methods; lithologic logging; surveying; water-level measurement; hydraulic testing; and, groundwater sampling of monitoring wells. A Comprehensive Site Assessment Report (Radian, 1999) was submitted to the WaRO on January 26, 1999 and was approved by DENR on February 26, 1999. A copy of the report was also submitted to the City of Washington to satisfy notification requirements. A separate notification report summarizing the results of the investigation was sent to the Beaufort County Health Director. A copy of the notification report is provided in Appendix A. The CSA, which incorporated the data from the on-site assessment, presented the following 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 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.

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

During the CSA, concentrations of chemicals and metals detected in soil and groundwater were compared to Site Evaluation Screening Levels (SESLs), which serve as conservative benchmarks for determining relative site conditions, assessing whether follow-on action is warranted, and for screening potential corrective action technologies. For groundwater, the SESLs are based on 2L Standards, interim maximum allowable concentrations (IMACs), proposed IMACs, or Method Estimated Quantitation Limits (EQLs). For soil, SESLs are based on default guidance values for Total Petroleum Hydrocarbons (TPH), established "soil-to-groundwater" maximum soil contaminant concentrations, S3:G-1 target concentrations cited in the draft Risk Analysis Framework, or "soil-to-groundwater" maximum soil contaminant concentrations calculated using the transport model cited in agency guidance.

Soil in the source area exceeds site evaluation screening levels (SESLs) for TPH and for a number of VOCs. Soil exhibiting elevated concentrations is primarily located adjacent to the former solvent AST and encompasses an area at least 60 feet by 60 feet (recently approximated at 90 feet by 150 feet) in size. This area 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 USTs appear to have had only an incidental effect, if any, on chemical distribution at the site.

Groundwater underlying the site exceeds the SESLs for a number of, predominantly, chlorinated VOCs. Groundwater also exceeds the SESLs for a several SVOCs; however, the extent of these SVOCs is limited to Unit A in the immediate source area. The VOC plume originates at the source area and 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. A narrow lobe of the

plume extends northeastward beyond the employee parking lot. 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. No chemical comprising the plume was detected above its SESL at off-site monitoring locations. Vertical migration of the plume is retarded by the Yorktown confining bed.

The results of an air monitoring survey performed concurrently with the site assessment indicates that there is no contribution of the contaminants detected in soil and groundwater to the workplace atmosphere.

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

Selected figures from the CSA Report, illustrating conditions at the facility, are reproduced in the PCAP as Figures 1-4 through 1-52. Selected tabulated data from the CSA Report are also reproduced in the PCAP as Tables 1-1 through 1-22.

Water-Supply Well Sampling

In April 1999, Radian International sampled seven domestic water-supply wells located north of the site along Springs Road. The samples were analyzed for VOCs and SVOCs. The results are summarized in a document entitled, Results of Water-Supply Well Sampling, Hamilton Beach (Proctor-Silex, Inc., Washington, North Carolina) (Radian International, 1999). Laboratory analyses indicated that no VOCs or SVOCs were detected in the samples.

2.0 CORRECTIVE ACTION PLAN OBJECTIVES

This section discusses the PCAP's objectives pertaining to soil and groundwater at the site.

2.1 Remediation Goals

The two remediation goals established for this PCAP are as follows:

- Treatment of soils contaminated by TPH, VOCs, and SVOCs in excess of the proposed cleanup goals to eliminate the potential for further groundwater contamination at the site; and
- Treatment of groundwater contaminated by VOCs and SVOCs to eliminate the potential for off-site migration of contaminants above the proposed cleanup goals.

2.2 Cleanup Goals (CUGs)

Cleanup goals for specific chemicals detected in soil and groundwater are discussed below.

2.2.1 Soil

The CUGs for contaminated soils at the site include appropriate chemical concentrations that will be protective of human health and that will not result in an exceedance of the groundwater quality standards or interim standards established in North Carolina Administrative Code (NCAC) Title 15A, Subchapter 2L, Section .0200 (2L Standards).

The WaRO assigned a Site Priority Ranking of Category B to the site. The high priority ranking is attributed to the location of private, domestic water supply wells within 1,500 feet of the site. Since this Site Priority Ranking was assigned, HBØPS has completed steps to convert several of these users to the City of Washington's municipal water supply system.

Due to the Category B ranking, the site does not meet the criteria for using the NCDENR's Site Sensitivity Evaluation (SSE) process to calculate final cleanup levels for TPH-contaminated soil. Instead, soil cleanup goals applicable to the site are the default values of 10 parts per million (ppm) for purgeable (gas) TPH, 40 ppm for extractable (diesel) TPH, and 250 ppm for oil & grease (NCDENR, 1998). Table 2-1 lists the proposed cleanup goals for TPH:

In addition to CUGs for TPH, CUGs have been set for other contaminants including VOCs and SVOCs. Tables 2-2 and 2-3 list the contaminants, associated CUGs, and the basis for determination of the CUG. The contaminants included in these tables have previously shown evidence of exceeding the CUGs at the site. These CUGs are derived from "soil-to-groundwater" leaching potential determined by the synthetic precipitation leaching procedure (SPLP). The SPLP is a conservative batch leaching procedure used for evaluating the potential of chemicals to migrate from soil to groundwater. The CUGs for the soil are actually CUGs for the soil leachate as the concentration of chemicals in the leachate from these soils will be compared against the groundwater CUGs for each of the contaminants tabulated.

≤ MSCC's

2.2.2 Groundwater

The CUGs for groundwater are based on the North Carolina Administrative Code (NCAC) Title 15A, Subchapter 2L, Section .0200 (2L Standards), interim maximum allowable concentrations (IMACs), and proposed IMACs. Tables 2-4 and 2-5 list the contaminants, associated CUGs, and basis for determining the CUG. The contaminants included in these tables have previously shown evidence of exceeding the groundwater CUGs at the site.

No recoverable amounts of free product are currently present at the site.

2.3 Corrective Action Plan Implementation Schedule

Upon approval of the PCAP and assuming that subsurface injection of the proposed technologies has already been approved, bench-scale and pilot-scale testing can be completed in approximately eight months. Full scale design for the CAP addendum could then

be completed in an additional five weeks. Based on pilot-test results, full-scale remediation of the site could range from 6 to 36 months.

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

Originally, 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 are depicted on Figure 3-1 and available identifying information is summarized in Table 3-1. A subsequent inventory of the area indicated that only seven wells were used as a source of potable water as shown on Figure 3-2. Several of these users are in the process of being connected to the City of Washington's municipal water supply system.

3.2 Public Water Supplies

The facility and surrounding areas are served by the City of Washington municipal water supply system. 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 1-1.

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 Aquifer

The site overlies the Tertiary limestone (Castle Hayne) aquifer, which is a semi-confined "deep" aquifer that is used regionally as a source of water supply. Although some wells in the region withdraw water from the overlying surficial aquifer and from the underlying Cretaceous aquifer system, the majority of large capacity wells are completed in the Tertiary limestone aquifer. Because it is capable of yielding large quantities of water throughout much of the region, the Tertiary limestone aquifer is the most important in Capacity Use Area #1 (Division of Water Resources [DWR], 1998). Capacity Use Area #1 (CUA #1), which includes Beaufort County, was originally established in 1968 to control potentially adverse effects associated with aquifer dewatering at a phosphate mine near Aurora, North Carolina. Within CUA #1, permits are required to withdraw water at rates that equal or exceed 100,000 gallons per day. Currently, approximately 75 percent of permitted groundwater withdrawal is associated with the phosphate mine. Most other high volume groundwater users are industries and municipalities that utilize groundwater for public supply (DWR, 1998).

Water-level monitoring in the Tertiary limestone aquifer indicates the formation of a cone of depression centered around the phosphate mine near Aurora, North Carolina with a radius of influence extending approximately 50 miles from the center of pumping. Because of

the high yield of the Tertiary limestone aquifer, withdrawals by other groundwater users typically develop smaller cones of depression around the production wells (DWR, 1998).

A recent Capacity Use Area #1 Program Annual Report (DWR, 1998) concludes, *"that overall use of water in CUA #1 is within sustainable levels. No short term or localized negative impacts have been identified in CUA #1, primarily because growth in the number of users and increases development in the Coastal Plain have been offset by decreased withdrawals related to phosphate mining, and because the of the high yield of the Castle Hayne aquifer throughout CUA #1"*.

3.6 Subsurface Structures

The principal subsurface structures on the site are utilities that include water lines, gas lines, and storm drains. In addition, a municipal water line is located on the north side of Springs Road and a municipal sanitary sewer line is located at the rear of the facility along SR 1536. The approximate locations of these utilities are illustrated on Figure 3-3. 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 sewer line is located along Springs Road; residences in this area are connected to individual septic tanks and leach fields.

Plans showing the location of subsurface electrical or telephone lines are 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 3-4, and ownership of the parcels is identified in Table 3-2.

4.0 EVALUATION OF CORRECTIVE ACTION ALTERNATIVES

4.1 Objectives

As discussed under remediation goals in Section 2 of this plan, the corrective actions intend to:

- Remediate soils in the source area to a level that will preclude the leaching of contaminants from the soils into the groundwater; and
- Remediate concentrations of dissolved VOCs and SVOCs in Units A and B to eliminate the potential for off-site migration of contaminants at levels above the proposed CUGs.

4.2 Identification and Screening of Corrective Action Technologies

The CSA Report identified and screened corrective action technologies applicable to the contaminants and site conditions. These technologies were screened on the basis of their ease of implementation, level of effectiveness, and relative cost. The screening results identified several promising technologies in each general response category that merited more thorough evaluation. Tables 4-1 and 4-2, excerpted from the CSA Report, summarize the technologies that were deemed to be among the most promising with regard to the physical and chemical conditions present at the site.

4.3 Evaluation of the Promising Technologies

In preparing the PCAP, the promising technologies summarized in Tables 4-1 and 4-2 have been further evaluated. Sections 4.3.1 and 4.3.2 discuss the response actions and associated technologies that have been rejected as viable options upon further evaluation. Section 4.3.1 addresses the soil remediation technologies while section 4.3.2 addresses the groundwater remediation technologies. The remaining promising technologies are discussed in Section 4.4.

4.3.1 Soil

The unsaturated zone soil is contaminated with TPH and VOCs in an area approximated at 90 feet by 150 feet in size to a depth of approximately 5 feet below ground surface. This soil must be remediated to prevent the further leaching of these contaminants to the groundwater. This section evaluates the promising technologies for soil remediation in several response categories.

Institutional Controls

Institutional controls include deed restrictions, land use restrictions, and fencing. These controls cannot be used alone as a solution because none of these controls reduce contamination. However, each of these controls may be used in conjunction with an active corrective action technology to reduce exposure and possibly add flexibility to the technology selection process.

Containment

Containment includes the use of a concrete or asphalt cap to eliminate or reduce exposure to the contaminants. A surface cap is also useful to prevent infiltration and further mobilization of contaminants in the unsaturated zone. However, these technologies would not meet the PCAP objective of reducing existing contamination levels. In addition, concrete and asphalt already cover much of the source area. Therefore, capping has been eliminated as an option for soil remediation.

Excavation

Removal of a large portion of the contaminated soils via excavation is technically and financially infeasible. Much of the contaminated soil is located under the plant building. The contaminated soil near the plant building is also covered by concrete that supports structures including ASTs, transformers, and a cooling tower. Only a very insignificant portion of the

contaminated soils could be removed via excavation. Therefore, the removal of contaminated soils via excavation has been eliminated as an option for soil remediation.

Ex-situ Treatment

Ex-situ treatment by thermal desorption or rotary kiln incineration will remediate contaminated soils that have been excavated. Since the contaminated soils can not be removed, these soils can not be treated ex-situ. Therefore, ex-situ treatment has been eliminated as an option for soil remediation.

Disposal

Disposal of soils at an off-site RCRA landfill is an option for soils that have been excavated. Since the contaminated soils cannot be removed, disposal is not a viable option. In addition, disposal does not eliminate future liability associated with the contaminated soils. Therefore, disposal has been eliminated as an option for soil remediation.

4.3.2 Groundwater

Groundwater in Units A and B exceeds the CUGs for numerous VOCs and several SVOCs. The VOC plume originates at the source area and is present in both hydrogeologic Units A and B. The extent of SVOC contamination is limited to Unit A in the immediate source area. This groundwater contamination must be remediated to levels such that CUGs are attained at the property line. This section evaluates the promising technologies for soil remediation in several response categories.

Institutional Controls

Institutional controls include groundwater monitoring, surface water monitoring, deed restrictions, groundwater use restrictions, and fencing. These controls cannot be used alone as a solution because none of these controls will reduce contamination. However, each of these

controls may be used in conjunction with an active corrective action technology to reduce exposure and possibly add flexibility to the technology selection process.

Containment

Containment of contaminants in groundwater by hydraulic controls, a wall or barrier, or a funnel and gate would limit the migration of the contaminants and perhaps redirect the contaminant flow. However, these technologies would be ineffective at meeting the PCAP objective of reducing contamination levels to the point at which the potential for off-site contaminant migration above the CUGs no longer exists. In addition, the depth of the contamination, which is as much as 40 feet below ground surface (bgs), makes it both economically challenging and extremely difficult to successfully implement a containment scenario. Therefore, containment has been eliminated as an option for groundwater remediation.

Extraction

Extraction typically involves using a French drain or vertical wells to physically remove contaminated groundwater from the subsurface. It is among the most widely used groundwater remedial technologies and is frequently referred to as pump and treat. Pump and treat systems function by removing contaminated groundwater from the aquifer and enhancing the flushing of contaminated portions of the aquifer. Therefore, proper well placement is vital to optimum system operation. Recovery wells should be installed in the areas of greatest contamination; along the plume axis; and, in areas of the least mobile contaminants to, collectively, maximize mass removal, reduce the pumping of clean water, and minimize contaminant travel time. In addition, prior completion of source removal is critical to achieving groundwater restoration using pump and treat.

Despite their popularity, the effectiveness of pump and treat systems in achieving aquifer restoration has come into increasing question. Experience has shown that pump and treat is most likely to achieve groundwater restoration in permeable, homogeneous aquifers contaminated with mobile, dissolved contaminants. Under less than these ideal conditions,

groundwater restoration is likely to be infeasible and hydraulic containment of the contaminants is a more realistic goal. At the site, the low permeability of Unit A is inadequate for the effective use of drains or recovery wells. The potential yield of the unit is very low and would result in only minimal contaminant mass removal. Water production is anticipated to be higher in Unit B. However, a significant area of the contaminant plume in Unit A and particularly in Unit B underlies the plant building and other permanent facility structures. Consequently, recovery wells cannot be installed in the necessary locations to ensure acceptable performance. Therefore, extraction using drains or wells has been eliminated as a viable option for groundwater remediation at the site.

Multiphase extraction combines pump and treat with the application of a high vacuum to enhance water production from low permeability formations and to simultaneously extract groundwater and volatile organic vapor. Multiphase extraction systems utilize recovery wells equipped with single or dual pumps to recover contaminated groundwater, to deepen and broaden the associated cone of depression, and to remove volatile organic vapors from the de-watered aquifer matrix. To successfully apply multiphase extraction, a site must be relatively free of stratification and the contaminants present must be volatile. At the site, many of the contaminants are volatile; however, a lesser number are not and would not be treated by multiphase extraction. In addition, Unit B is a confined aquifer that is not amenable to multiphase extraction because de-watering and, hence, vapor extraction is not possible. Finally, because a significant area of the plume in both Units A and B underlie permanent facility structures, multiphase extraction wells cannot be installed in the necessary locations to ensure acceptable performance. Therefore, multiphase extraction has been eliminated as a viable option for groundwater remediation at the site.

Air sparging is a variation of extraction that physically removes volatile contaminants that are dissolved in groundwater and sorbed to the aquifer matrix. It involves the injection of air into the aquifer and results in the transfer of the volatile contaminants to the vapor phase. The air is then vented naturally to the surface or through a soil vapor extraction (SVE) system. To successfully apply air sparging, a site must be characterized by at least moderate permeability and be free of stratification. In addition, the contaminants present must be

volatile. At the site, many of the contaminants are volatile; however, a lesser number are not and would only be marginally treated by air sparging. In addition, the low permeability of Unit A would limit the rate of air injection and, consequently, the rate of mass transfer of contaminants to the vapor phase. Finally, Unit B is a confined aquifer that is not amenable to air sparging because the injected air cannot escape to the atmosphere through the confining layer. Therefore, air sparging has been eliminated as a viable option for groundwater remediation at the site. Phytoremediation, specifically phytoextraction, is another variation of extraction that uses plant transpiration to remove contaminated groundwater from the subsurface. The process works best with phreatophytes, which transpire large amounts of water.

Phytoextraction is applicable only to shallow groundwater contamination in natural areas where plant growth is possible. It also cannot be used in areas where high contaminant concentrations would threaten plant survival. Therefore, for many of the same reasons discussed above, phytoextraction has been eliminated as a viable option for groundwater remediation at the site. However, it may be applicable in a limited scope as a "polishing" tool after active groundwater restoration has been completed.

Ex-situ Treatment

Ex-situ treatment by carbon desorption or air stripping will remediate contaminated groundwater that has been extracted. However, because the contaminated groundwater will not be extracted, ex-situ treatment is not applicable and has been eliminated as an option for groundwater remediation.

Disposal

Discharge to the publicly-owned treatment works (POTW), via an NPDES permit, or by reinjection are typical disposal options for groundwater that has been extracted and treated. However, because the contaminated groundwater will not be extracted, disposal is not applicable and has been eliminated as an option.

4.4 Evaluation of Remediation Alternatives

Following evaluation and elimination of the options described in the sections above, the remediation alternatives remaining for both soil and groundwater fall within the in-situ remediation response category.

4.4.1 Soil Remediation Alternatives

Two promising in-situ soil remediation alternatives were evaluated. Both chemical oxidation and the biological treatment of the contaminated soils initially appeared to be viable options. Both of these technologies treat contaminants in-situ; therefore, they produce no waste streams that require permitting, treatment, or disposal. Both technologies can also be applied to the portion of the source area that constrains access by other technologies.

Biological Treatment

The biological treatment of TPH, VOC, and SVOC contaminated soils would involve the injection of a stimulant to enhance the population of existing microorganisms in an aerobic or anaerobic environment. In turn, these microorganisms would degrade the contaminants present by utilizing the carbon as a food source. However, this form of treatment would not be effective due to the high levels of contamination that would be toxic to the microorganisms. In addition, it is extremely difficult to inject and distribute the microbiological stimulant into the unsaturated zone.

Chemical Oxidation

Chemical oxidation involves the injection of hydrogen peroxide, ferrous iron, and acetic acid (Fenton's Reagent) into the unsaturated zone to create oxidation-reduction reactions leading to the degradation of organic constituents. The shallow soil contamination lends itself to this type of treatment, and chemical oxidation would effectively treat the TPH, VOCs, and SVOCs present in the soil. This technology can remediate organic contaminants within a short

time period, is suitable to developed sites without disruption to site operations, and eliminates long-term O&M that is associated with other remediation technologies. The application of this technology would require a permit for injection.

Of the two technologies described above, chemical oxidation would more effectively allow for the treatment of all contaminants in the unsaturated zone. In addition, chemical oxidation will require less time for remediation and can be implemented with greater ease. Prior to full-scale implementation, chemical oxidation will require bench- and pilot-scale testing at the site. Pending test results, this technology will be utilized for full-scale corrective action at the site.

4.4.2 Groundwater Remediation Alternatives

Several promising in-situ groundwater remediation alternatives were evaluated. Initially, a co-metabolic process; natural attenuation; oxygen enhancement with oxygen release compound (ORC); chemical oxidation; and zero-valence iron injection with a carbon source such as guar, molasses, or hydrogen release compound (HRC) all seemed to be viable options for the treatment of the groundwater. All of these technologies treat contaminants in-situ; therefore, they produce no waste streams that require permitting, treatment, or disposal.

Cometabolism

A co-metabolic process would involve the injection of a dilute solution of primary substrate (e.g., toluene, methane) that would support the breakdown of targeted organic compounds. Cometabolism is an enhanced bioremediation process that involves the injection of air, the primary substrate, and possibly nutrients into the subsurface through injection wells. This process stimulates the growth of microorganisms that produce enzymes that degrade primarily TCE. There is inconclusive evidence that this process degrades a wide range of chlorinated aromatic hydrocarbons (CAHs). Unlike several of the other in-situ groundwater remediation technologies discussed in this section, construction of an injection system for a co-metabolic process would require the installation of permanent subsurface piping and subsequent

operation and maintenance of the system. In addition, the application of this technology would require a permit for injection.

Natural Attenuation

Natural attenuation may be applicable, but only after an active remediation process has reduced source contamination at the site. The use of natural attenuation would require extensive groundwater monitoring and modeling to demonstrate effectiveness. Very low capital and O&M costs would be realized with the implementation of this option.

Oxygen Enhancement

Oxygen enhancement with ORC involves the injection of ORC to promote aerobic degradation of petroleum derived contaminants and lower order CAHs. ORC is a patented formulation of magnesium peroxide, MgO, which when moist releases oxygen slowly. ORC will not harm an aquifer. Biofouling is inhibited by localized elevated pH. Iron fouling is avoided, by the long, gentle release of dissolved oxygen, which is dispersed widely. The hydrated product is harmless Milk of Magnesia, magnesium hydroxide (Mg(OH)₂), which converts to solid form. ORC is useful as a slow release source of oxygen in the remediation of any compound that is aerobically degradable. This technology is suitable to developed sites without disruption to site operations and eliminates long-term O&M associated with other remediation technologies. The application of this technology would require a permit for injection. Although, many of the contaminants at the site are aerobically degradable, the primary contaminants are higher order CAHs that are resistant to rapid aerobic degradation.

Chemical Oxidation

Chemical oxidation involves the injection of hydrogen peroxide, ferrous iron, and acetic acid (Fenton's Reagent) into the saturated zone to create oxidation-reduction reactions leading to the degradation of organic constituents. Chemical oxidation would effectively treat the petroleum hydrocarbons, VOCs, and SVOCs present in the groundwater. This technology

can remediate organic contaminants within a short period, is suitable to developed sites without disruption to site operations, and eliminates long-term O&M that is associated with conventional remediation technologies. The application of this technology would require a permit for injection.

Zero-Valence Iron with a Carbon Source

The injection of zero-valence iron (Fe^0) with a carbon source such as guar, molasses, or HRC can be used to enhance the degradation of chlorinated organic compounds in groundwater. This mixture will promote both a chemical and biological dechlorination of the contaminants present. The injection of Fe^0 in the form of iron filings mixed into guar, which serves as a carrier and carbon source, promotes the dechlorination of the VOCs and SVOCs present in the groundwater. Through a chemical reaction, the Fe^0 reduces many chlorinated aromatic hydrocarbons (CAHs) to nontoxic products such as ethene and chloride ions. The guar carries the iron filings during the injection process and serves as a carbon source for anaerobic bacteria present in the subsurface soil and groundwater. The growth of these anaerobic bacteria will enhance the reductive dechlorination of the contaminants present. In addition, molasses and HRC may both serve as effective carbon sources for anaerobes necessary to promote reductive dechlorination. Based on the results of pilot-scale testing, the mixture would be injected as a treatment wall or as a spot treatment in a grid arrangement. These technologies can remediate organic contaminants within a short period, are suitable to developed sites without disruption to site operations, and eliminate long-term O&M that is associated with conventional remediation technologies. The application of these technologies would require a permit for injection.

Eventually the remedy for this site will be selected and designed based upon the results of bench and pilot-scale testing. ~~The technologies that will be pilot tested include~~ ~~chemical oxidation and zero-valence iron with a carbon source~~ Due to the ease of implementation, low O&M costs, short treatment time, and contaminant treatment ability, these technologies were selected for bench and pilot-scale testing. Pending successful testing results, these technologies will be utilized for full-scale corrective action at the site.

5.0 PROPOSED CORRECTIVE ACTION

Based on the corrective action alternatives evaluation as described in Section 4, the selected remediation technologies include:

- ~~Chemical oxidation for unsaturated soil in the source area;~~
- ~~Chemical oxidation for groundwater in the source area in Unit A; and~~
- ~~Zero-valence iron with a carbon source for the dissolved groundwater plume in Unit B and the dissolved plume outside of the source area in Unit A.~~

The following sections describe the bench and pilot-scale testing to be completed associated with these technologies as well as the conceptual full-scale implementation approach for remediation.

5.1

Soil Remediation

Chemical oxidation in the patented form of the CleanOX[®] Process has been selected as the remediation technology for cleanup of the contaminated soils. Mantech Environmental Corporation (Mantech) is the licensed distributor of the CleanOX[®] Process. Chemical oxidation involves the injection of hydrogen peroxide, ferrous iron, and acetic acid (Fenton's Reagent) into the unsaturated zone to create oxidation-reduction reactions leading to the degradation of organic constituents. The extent of contamination measures approximately 90 feet by 150 feet and is approximately 5 feet deep (see Figure 5-1). Thus, a conservative estimate of volume to be treated is approximately 2500 cubic yards. Bench- and pilot-scale testing will be performed to validate the applicability of the technology for treatment of the contaminants at this site and to gather design data necessary for the full-scale application.

5.1.1 Bench- and Pilot-Scale Testing

Bench-scale Testing

Bench-scale testing will be performed to determine the reactivity of the media to be treated and the appropriate dosage rate for reducing contaminant concentrations. These bench-test results, in combination with site geologic and hydrogeologic characteristics, provide the basis for estimating the reagent dosage rate during the pilot-test. The pilot-test provides the design parameters necessary to develop a full-scale remediation program using the CleanOX[®] Process.

Soil samples will be collected near location F-18 (see Figure 5-1). One sample will be shipped to Mantech Environmental Corporation for application of the reagent. A second sample will be shipped to Radian Analytical Services (RAS) for baseline analysis of the principle contaminants. Mantech will split the sample provided into a sample to be treated and another to be used as a control sample. After applying CleanOX[®] reagents to the treated samples and recording measured parameters and observations, ManTech will containerize both the untreated and treated sample for shipment to RAS for post treatment analyses. A report of the results will be prepared after receiving the analytical results. Based on the results of the bench-test, a work plan for performing the pilot-test will be developed. The work plan will include information regarding the results of the bench-test as they relate to the field application, a description of application well installation specifications, and a description of the procedures to be used in conducting the pilot-test.

Pilot-scale Testing

The pilot test will consist of applying two-cycles of CleanOX[®] reagents to the unsaturated zone soils. The unsaturated zone pilot-test will be conducted during the same mobilization as the groundwater pilot test for chemical oxidation. These pilot tests will be conducted at least 50 feet apart. Four direct-push application points to a depth of 5 feet bgs will be utilized to inject the reagents. The pilot-test application will begin at a low flow rate of

diluted oxidizer solution to start the oxidizing reactions at a very slow rate. During the course of the pilot-test, the flow rate and oxidizer concentration will be gradually increased to optimum levels as determined during the bench-scale test. In addition, vapor points will be monitored to record subsurface pressure increases, if any, and contaminant volatilization, which is not typically detected. PVC vent points screened from the water table to the surface within the treatment area will be utilized to minimize pressure increases during the process.

Baseline soil samples will be collected and analyzed to measure the VOC concentrations in the contaminated soils. Upon receipt of baseline soil data, Mantech will mobilize to the site to apply the CleanOX[®] reagents. Parameters such as depth to water, dissolved oxygen, pH, conductivity, temperature, and oxidation-reduction potential (ORP) will be recorded during the reagent application process to gauge the progress of reactions in the treatment area.

Following the completion of the treatment application, Radian will collect post-treatment soil samples for laboratory analysis from the same locations. Soil samples will be collected as near to the baseline sample collection locations as possible and at the same depth intervals to minimize differences due to the natural soil heterogeneity.

A technical report will be prepared that describes the results of the bench- and pilot-scale tests. It will include the observations recorded during the pilot application, and the conclusions and recommendations from review of the analytical results from the monitoring program. Information regarding the radius of influence from the application wells and the reactivity of site media to the reagents will be presented. The post-treatment results will also be compared with the baseline monitoring results to illustrate the effectiveness of the CleanOX[®] technology in reducing contaminant concentrations in saturated soil and groundwater within the treatment area. Lastly, the report will include the recommendations for implementing full-scale application of the CleanOX[®] Process for the contaminated soil in the source area.

5.1.2 Full-Scale Implementation

The full-scale design of a CleanOX[®] injection system including specific plans and engineering details will be completed upon the successful conclusion of bench and pilot-scale testing. The results of these tests will affect the placement of injection and monitoring points, the oxidizer solution concentration, the volumetric flow rate, and the operating pressure. The radius of influence will also be determined during the pilot-test.

Given the shallow nature of the contamination, geopröbe well points will be installed to facilitate saturation of the soil for treatment using CleanOX[®]. It is estimated that approximately 100 well points will be installed and two or three cycles of reagent application will be required to treat the unsaturated soil in the source area. ~~Additionally, to prevent the potential vertical migration of contamination during drilling, treatment of the source area will be performed before application wells are installed at greater depth within hydrogeologic unit-B₃.~~

The effectiveness of each application technology will be evaluated by collecting and analyzing soil samples before and after each cycle of treatment. The soil samples will be analyzed for VOCs, SVOCs, and TPH. Baseline samples will be taken at varying depth and locations throughout the contaminated zone. Following the completion of each treatment application, Radian will collect post-treatment soil samples for laboratory analysis from the same locations as the pre-application baseline samples. Soil samples will be collected as near to the baseline sample collection locations as possible and at the same depth intervals to minimize differences due to the natural soil heterogeneity. The results of these sampling events will be reported after the completion of each treatment cycle.

During the course of the full-scale implementation, the flow rate and oxidizer concentration will be gradually increased to optimum levels as determined during the bench- and pilot-scale tests. In addition, vapor points will be monitored to record subsurface pressure increases, if any, and contaminant volatilization, which is not typically detected. PVC vent points screened from the water table to the surface within the treatment area will be utilized to minimize pressure increases during the process.

Other operating parameters will be measured to provide an indication of how well the CleanOX[®] Process is proceeding in the field. Specific conductance is an indication that the catalyst is dispersed in the aquifer as needed. ORP is a good indicator for judging whether the reactions are completed and to approximate the radial extent of the process during field applications. Parameters such as sulfates, iron, and pH will be measured initially to provide baseline concentrations since the process will effect these parameters in the treatment area.

5.1.3 Limitations and Concerns

The CleanOX[®] Process introduces a strong oxidizing agent into the application area. Any chemical, organic or inorganic, can be affected to some degree by the process, if it is amenable to oxidation. High concentrations of TOC can indicate that another source of carbon, other than the known contaminants, is present and will compete with the other contaminants for oxidation by the hydroxyl radicals. A high TOC concentration (percentage levels) in soil may be expected to reduce the efficiency of the CleanOX[®] Process. As seen in Table 1-6, TOC levels are not sufficiently high to warrant serious concerns about reduced efficiency during the treatment process.

In-situ chemical oxidation can cause subsurface pressure to increase due to the steam, water vapor, and carbon dioxide generated during the process. However, the application methods employed using the CleanOX[®] Process are specifically designed to avoid the excessive build-up of subsurface pressure. Controlling the reaction rate and the subsurface vapor pressure are two ways that the CleanOX[®] Process accomplishes this. The rate of reaction (and the temperature excursions from the exothermic reactions) can be controlled by maintaining control of the mass flux of oxidizer applied to the treatment area. Mass flux control is maintained by controlling the oxidizer solution concentration and the volumetric flow rate of oxidizer to the application points.

The first step in safely applying in-situ chemical oxidation at any site is observing the oxidation reactions during bench-scale testing. This provides both quantitative and qualitative information regarding any time delay of reactions that may occur during the field

application, foaming that may occur, and the peak temperatures that may be expected. This information is then used during pilot-scale testing to develop the site-specific formula for oxidizer concentration and application flow rate. During pilot-scale testing and full-scale implementation, each application is started with a slow flow rate of diluted oxidizer solution to begin the oxidizing reactions at a very slow rate. During the course of the application, the flow rate and oxidizer concentration are gradually increased to optimum levels.

Use of subsurface vent points is another method for controlling subsurface pressure. Pressure increases can be minimized by placing vent points consisting of PVC well points screened from the water table to the surface within the treatment area. These vapor points can be monitored to record subsurface pressure increases, if any, and contaminant volatilization, which is not typically detected.

The Cleanox® Technology has been successfully and safely applied in 22 states since 1993. In addition, there are outstanding proposals for performing bench testing or field-scale projects utilizing the Cleanox® Technology in 20 other states.

5.1.4 Operation and Maintenance

The injection process and subsequent treatment of the contaminated soil in the source area is expected to be completed in less than 16 weeks. No operation and maintenance will be required.

5.1.5 Post-Remediation Sampling/Monitoring

Upon remediating the contaminated soils, confirmatory samples will be collected and analyzed to demonstrate that the CUGs have been met. CUGs are discussed in Section 2.2. Soil samples collected will be prepared and analyzed for purgeable TPH by method 5030/8015m, extractable TPH by method 3550/8015m, and oil and grease by method 9071.

In addition, confirmatory soil samples will be collected and analyzed for target VOCs and SVOCs following the SPLP as described in Appendix B. The leachate generated from these soils will be compared against the groundwater CUGs for each of the target analytes listed in Tables 2-2 and 2-3. The SPLP was selected because of its ability to estimate the potential release of contaminants from soil. The SPLP is more appropriate for assessing the mobility of organics in soil at the source area than the Toxicity Characteristic Leaching Procedure (TCLP) because the TCLP was developed to simulate landfill leachate that is not found at a typical industrial site. The SPLP extraction fluid is not buffered and contains no chelates or strong complexing/ion pair forming agents that enhance dissolution and leaching. It also has an initial pH that is lower than TCLP and more comparable to local precipitation and a final extraction pH that is controlled by the soil's neutralizing capacity. The SPLP will provide a conservative leaching estimate for evaluating the potential mobility of the chemicals in the source area soil.

The cleanup objective for soil will be satisfied if the median leachate concentration of each target analyte is below its respective groundwater CUG. This condition will be met if 75 percent of the confirmatory samples collected to demonstrate remediation attainment are equal or below the analyte's CUG and no single sample concentration exceeds the CUG by more than ten times. This statistical approach has been adopted by the Pennsylvania Department of Environmental Protection (PADEP) and is administered under PADEP's Land Recycling Program. This approach is commonly referred to as the "75%/10X" rule.

In applying this statistical approach, the number of confirmatory soil samples required is based on the volume of initially contaminated soil as follows:

- For soil volumes equal to or less than 125 cubic yards, at least eight sample points.
- For soil volumes up to 3,000 cubic yards, at least 12 sample points.
- For each additional volume of up to 3,000 cubic yards, an additional 12 sample points.

Since the estimated volume of contaminated soil is 2,500 cubic yards, the source area at this site will require 12 sample points as seen in Figure 5-2.

5.2 Groundwater Remediation

Chemical oxidation in the patented form of the CleanOX[®] Process has been selected as the remediation technology for remediation of the contaminated groundwater in the source area in Unit A. In addition, zero-valence iron with a carbon source such as guar, molasses, or HRC will be used to treat the dissolved contaminant plume in Unit B and outside of the source area in Unit A. The injection of Fe⁰ in the form of iron filings mixed with guar, which serves as a carrier and carbon source, promotes the destruction of the VOCs present in the groundwater. The Fe⁰ reduces many chlorinated aromatic hydrocarbons (CAHs) to nontoxic products such as ethene and chloride ions. The guar carries the iron filings during the injection process and serves as a carbon source for anaerobic bacteria present in the subsurface soil and groundwater. The growth of these anaerobic bacteria will enhance the reductive dechlorination of the contaminants present. In addition, molasses and HRC may both serve as effective supplemental carbon sources for anaerobes necessary to promote reductive dechlorination.

The extent of contamination in Unit A encompasses approximately 2.7 acres as illustrated in Figure 5-3, and the contaminant plume in Unit B encompasses approximately 5.3 acres as illustrated in Figure 5-4. The contaminated portion of Unit A is approximately 5 feet thick with a porosity of 15%. The contaminated portion of Unit B is approximately 20 feet thick with a porosity of 20%. Thus, conservative estimates of the volumes of groundwater to be treated in Units A and B are 0.67 and 6.86 million gallons, respectively. Bench- and pilot-scale testing will be conducted to validate the applicability of these technologies for treatment of the contaminants at this site and to gather design data necessary for the full-scale application.

5.2.1 Chemical Oxidation

Bench-Scale Testing

Bench-scale testing will be performed to determine the reactivity of the media to be treated and the appropriate dosage rate for reducing contaminant concentrations. These test results, in combination with site geologic and hydrogeologic characteristics, provide the basis for estimating the reagent dosage rate during the pilot test.

Bench-scale testing of the CleanOX[®] Process will involve collecting soil and groundwater samples in Units A and B. Groundwater samples will be collected from well MW-228 in Unit A and well MW-227 (see Figure 5-1) in Unit B. In addition, soil samples will be collected from both hydrogeologic units near both of these wells. Soil and water samples will be shipped to Mantech Environmental Corporation for application of the reagent and to RAS for baseline analysis of the principal contaminants. In addition, groundwater samples will be collected and shipped to RAS and analyzed for alkalinity, iron, and total dissolved solids. Mantech will split the samples provided into a sample to be treated and another to be used as a control sample.

After applying CleanOX[®] reagents to the treated samples and recording measured parameters and observations, ManTech will containerize both the untreated and treated sample for shipment to RAS for post treatment analyses. A report of the results will be prepared after receiving the analytical results. Based on the results of the bench-scale test, a work plan for performing the pilot-scale test will be developed. The work plan will include information regarding the results of the bench-test as they relate to the field application, a description of application well installation specifications, and a description of the procedures to be used in conducting the pilot-scale test.

Pilot-Scale Testing

The pilot-scale test will consist of applying CleanOX[®] reagents through two-inch diameter stainless-steel wells in Unit A. The wells will be installed to a depth of approximately 8 feet bgs with the well screen placed from 3 to 8 feet bgs to provide treatment of the upper saturated zone. A two-cycle reagent application will be utilized to produce a greater reduction in contaminant concentrations. The second cycle serves to degrade contaminant mass that has been desorbed during the first treatment cycle. This two-cycle approach will provide data needed to obtain a better understanding of reagent volume requirements that are needed for effective full-scale treatment of the site.

A combination of existing wells and newly installed piezometers will be used to measure the effectiveness of the treatment during the pilot application. Monitoring well MW-228 will be used for monitoring during the field application. The application wells installed within Unit A will be located approximately eight feet from MW-228, with two, two-inch diameter PVC piezometers installed at 13 and 18 feet from the application wells to measure the radius of influence during treatment.

For the pilot-scale test, baseline groundwater samples will be collected from the newly installed application wells, piezometers, and existing monitoring well MW-228. These samples will be analyzed to measure the contaminant concentrations. Upon receipt of baseline groundwater data, Mantech will mobilize to the site to apply the CleanOX[®] reagents.

During the course of the pilot-test, the flow rate and oxidizer concentration will be gradually increased to optimum levels as determined during the bench-scale test. In addition, vapor points will be monitored to record subsurface pressure increases, if any, and contaminant volatilization, which is not typically detected. PVC vent points screened from the water table to the surface within the treatment area will be utilized to minimize pressure increases during the process. In addition, parameters such as depth to water, dissolved oxygen, pH, conductivity, temperature, and oxidation-reduction potential (ORP) will be recorded during the reagent application process to gauge the progress of reactions in the treatment area. Following the

completion of the treatment application, Radian will collect post-treatment groundwater samples for laboratory analysis from the same sampling locations.

A technical report will be prepared that describes the results of the bench and pilot-scale test. It will include the observations recorded during the pilot application, and the conclusions and recommendations from review of the analytical results from the monitoring program. Information regarding the radius of influence from the application wells and the reactivity of site media to the reagents will be presented. The post-treatment results will also be compared with the baseline monitoring results to illustrate the effectiveness of the CleanOX[®] technology in reducing VOC concentrations in saturated soil and groundwater within the treatment area. Lastly, the report will include the recommendations for implementing full-scale application of the CleanOX[®] Process for the contaminated soils at the site.

Full-Scale Implementation

The full-scale design of the proposed groundwater remediation injection technologies including specific plans and engineering details will be completed upon the successful conclusion of bench- and pilot-scale testing. The results of these tests will affect the placement of injection and monitoring points, the solution concentrations, the volumetric flow rate, and the operating pressures. The radius of influence will also be determined during the pilot-scale test. Without the results of bench and pilot-scale testing, only conceptual full-scale solutions are described in the following paragraphs.

The treatment horizon using chemical oxidation will consist of the highly contaminated zone in Unit A. This horizon encompasses an area of approximately 30,000 square feet (see Figure 5-5). Given the shallow nature of the contamination, geoprobe well points will be installed to facilitate injection of the reagent into the aquifer matrix and groundwater. It is estimated that approximately 130 well points will be installed and two or three cycles of reagent application will be required to treat this saturated zone. Once again, to prevent the potential vertical migration of contamination during drilling, treatment of this area will be performed before application wells are installed at greater depth within hydrogeologic unit B.

The effectiveness of this application will be evaluated by collecting and analyzing groundwater samples before and after each cycle of treatment. The groundwater samples will be analyzed for VOCs and SVOCs. Baseline samples will be taken at varying locations throughout the contaminated zone. Following the completion of each treatment application, Radian will collect post-treatment soil samples for laboratory analysis from the same locations. The results of these sampling events will be reported after the completion of each treatment cycle.

During the course of the full-scale application, the flow rate and oxidizer concentration will be gradually increased to optimum levels as determined during the bench-scale test. In addition, vapor points will be monitored to record subsurface pressure increases, if any, and contaminant volatilization, which is not typically detected. PVC vent points screened from the water table to the surface within the treatment area will be utilized to minimize pressure increases during the process. Other parameters will be measured to provide an indication of how well the CleanOX[®] Process is proceeding in the field. Specific conductance is an indication that the catalyst is dispersed in the aquifer as needed. ORP is a good indicator for judging whether the reactions are completed and to approximate the radial extent of the process during field applications. Parameters such as sulfates, iron, and pH will be measured initially to provide baseline concentrations since the process will effect these parameters in the treatment area.

5.2.2 Zero-Valent Iron with a Carbon Source

Bench-Scale Testing

Bench-scale testing will be performed to determine the reactivity of the media to be treated and the appropriate dosage rate for reducing contaminant concentrations. These bench-test results, in combination with site geologic and hydrogeologic characteristics, provide the basis for estimating the reagent dosage rate during the pilot-test.

The objectives of this bench-scale test will be two-fold:

- Determine if indigenous microorganisms are facilitating reductive dechlorination as expected, and
- Identify which amendments can be added to enhance the extent of bioremediation along with the injection of zero-valence iron.

Both objectives will be evaluated using aquifer matrix and groundwater collected at the site and treated in serum bottles used as reaction vessels maintained under strict anaerobic conditions. For the first objective, contaminant levels will be measured at the beginning and end of a specified incubation period to determine whether the analyte concentrations have dropped significantly. For the second objective, the aforementioned tests will be undertaken with each of the four following amendments.

- Guar (guar flour, a polymer containing D-mannose and D-galactose in a 2:1 ratio) mixed with finely ground iron filings;
- Guar;
- Molasses (sucrose carbohydrate source); and
- HRC.

The purpose of these amendments is to ensure that anaerobic conditions favorable for reductive dechlorination exist and to provide an alternate carbon and energy source to enhance the metabolic activity of dechlorinating microorganisms. The former is obtained through the increased activity of facultative anaerobic bacteria present in the subsurface soil and groundwater. These bacteria will consume the amendment carbon source and remove any residual dissolved oxygen. In so doing they will render the subsurface soil anaerobic. The degradation of contaminants occurs through a direct chemical reaction with the zero-valent iron. In addition, a biological process will take place when anaerobic bacteria present in the subsurface use the carbon and energy provided by the amendments to perform reductive dechlorination of the solvents. Anaerobic microorganisms metabolize the carbon source and produce hydrogen. The resulting hydrogen is utilized by reductive dehalogenators to

dechlorinate the CAHs. The chlorinated hydrocarbon is used as an electron acceptor, and a chlorine atom is removed and replaced with a hydrogen atom.

Samples of aquifer matrix and groundwater will be taken in both Unit A and Unit B. Serum bottles (300 mL) will be used as reaction vessels for the samples. Samples will be filled with 50 to 75 g of contaminated aquifer matrix and filled with groundwater mixed with the desired amendment and nutrients to a total volume of 150 mL. This will leave approximately 150 mL of headspace and allow for the conversion of carbon sources to methane and/or carbon dioxide, a natural event during anaerobic growth. The serum bottles will be incubated at ambient room temperature.

Analyte levels will be measured initially and then after a period of four weeks. It is not uncommon for these types of treatability investigations to take a period of six months or more because anaerobic microorganisms are slow growing. However, we believe that we will see a rapid response attributable to the zero-valent iron and carbon sources.

A second set of samples will be included for analysis should the extent of dechlorination be limited in the samples analyzed after 4 weeks. This will allow for a longer incubation time for solvent dechlorination to be observed. The decision as to how long to continue incubating these samples will be based on the findings from the four week testing event. At the conclusion of the bench-scale test, a report will be drafted that summarizes the findings and makes recommendations regarding pilot-scale testing.

Pilot-Scale Testing

The pilot-scale test will consist of injecting an iron slurry through three injection points in Unit A and placing a permeable iron wall perpendicular to the plume flow direction in Unit B. A slurry of powdered zero-valent iron and a carbon source carrier will be placed into the subsurface. In Unit A, the slurry will be injected from approximately 5 feet to 10 feet bgs at the locations shown in Figure 5-5. In Unit B, this slurry will be placed beginning at approximately 15 feet to 35 feet bgs vertically across Unit B at the locations shown in Figure 5-6. Radian's in

house designed Bio-Pumping system will be the vehicle used to apply the slurry. This pumping system will produce 3,300 psi at 55 gpm peak efficiency. The system is controlled by an operator that matches volume and pressure to the formation to most effectively place the slurry.

A direct push technology (DPT) rig pushing a 2.125-inch drill rod will be utilized to inject the slurry. The rig will push the rod to the top of the hydrogeologic units as the slurry is being mixed. When the rod is located at the top of a unit the injection head will be fitted to the top of the drill rod and connected to the slurry pump. Injection will begin through the injection nozzle placed above the drive point on the down-hole end of the drill rod. The nozzle is configured with three slots on 120 degree centers that inject slurry in a "Y" pattern into the formation. The slurry will be continually injected at the rod is driven through the unit until the rod reaches the confining layer below. The DPT rod will be pulled out of the formation, and the rig will be offset to the next injection location where the injection process will be repeated. Each leg of the "Y" will be pressured approximately 5 to 10 feet into the formation. In Unit B, six injection points on 8 feet centers will be placed as seen in Figure 5-6.

Newly constructed 1-inch diameter monitoring wells will be utilized to measure the effectiveness of the treatment during the pilot application. Nine monitoring wells will be used in both hydrogeologic units. Three wells will be placed upgradient of the injection points, three downgradient of the injection points, and three adjacent to the injection points in both Units A and B. These wells will be sampled before, during, and after the pilot test. Samples will be analyzed for VOCs, SVOCs, CO₂, Ethane, and Methane. In addition, parameters such as dissolved oxygen, pH, conductivity, temperature, and oxidation-reduction potential (ORP) will be recorded during the application process to gauge the progress of reactions in the treatment area. The on-site activities associated with the pilot-scale test will be conducted for a period of approximately eight weeks.

A technical report will be prepared that describes the results of the bench and pilot-scale test. It will include the observations recorded during the pilot application, and the conclusions and recommendations from review of the analytical results from the monitoring program. Information regarding the radius of influence from the application wells and the

reactivity of site media to the reagents will be presented. The post-treatment results will also be compared with the baseline monitoring results to illustrate the effectiveness of the technology in reducing VOC concentrations in saturated soil and groundwater within the treatment area. Lastly, the report will include the recommendations and estimated cost for implementing full-scale application of the process.

Full-Scale Implementation

The full-scale design of the proposed groundwater remediation injection technologies including specific plans and engineering details will be completed upon the successful conclusion of bench- and pilot-scale testing. The results of these tests will affect the placement of injection and monitoring points, the solution concentrations, the volumetric flow rate, and the operating pressures. The radius of influence will also be determined during the pilot-scale test. Without the results of bench and pilot-scale testing, only conceptual full-scale solutions are described in the following paragraphs.

Upon completion of chemical oxidation at the site, zero-valent iron with a carbon source will be used to treat the remaining dissolved plume in Units A and B (see Figures 5-5 and 5-6). Multiple injection wells will be drilled on-site to facilitate the injection of an iron powder and carbon source slurry into the formation. A bio pump will be utilized to inject the slurry into the formation with the designed radius of influence. A sufficient amount of zero-valent iron and a carbon source will be injected to promote in-situ treatment of the contaminants for between 4 and 12 months.

The effectiveness of this application will be evaluated by collecting and analyzing soil samples before, during, and after the treatment process. Groundwater samples will be taken throughout the dissolved plume and analyzed for VOCs and SVOCs. The same locations will be utilized for sampling before, during and after the treatment process. The results of these sampling events will be tracked during the treatment process.

5.2.3 Limitations and Concerns

Chemical Oxidation

The CleanOX[®] Process introduces a strong oxidizing agent into the application area. Any chemical, organic or inorganic, can be affected to some degree by the process, if it is amenable to oxidation. High concentrations of TOC (>400 ppm) in groundwater can indicate that another source of carbon, other than the known contaminants, is present and will compete with the other contaminants for oxidation by the hydroxyl radicals. A high TOC concentration may be expected to reduce the efficiency of the CleanOX[®] Process. It is not expected that TOC levels in the groundwater at this site are high enough to warrant serious concerns about reduced efficiency during the treatment process. However, TOC levels in groundwater will be verified during bench testing of this technology.

In-situ chemical oxidation can cause subsurface pressure to increase due to the steam, water vapor, and carbon dioxide generated during the process. However, the application methods employed using the CleanOX[®] Process are specifically designed to avoid the excessive build-up of subsurface pressure. Controlling the reaction rate and the subsurface vapor pressure are two ways that the CleanOX[®] Process accomplishes this. The rate of reaction (and the temperature excursions from the exothermic reactions) can be controlled by maintaining control of the mass flux of oxidizer applied to the treatment area. Mass flux control is maintained by controlling the oxidizer solution concentration and the volumetric flow rate of oxidizer to the application points.

O₂?

How?

The first step in safely applying in-situ chemical oxidation at any site is observing the oxidation reactions during bench-scale testing. This provides both quantitative and qualitative information regarding any time delay of reactions that may occur during the field application, foaming that may occur, and the peak temperatures that may be expected. This information is then used during pilot-scale testing to develop the site-specific formula for oxidizer concentration and application flow rate. During pilot-scale testing and full-scale implementation, each application is started with a slow flow rate of diluted oxidizer solution to

begin the oxidizing reactions at a very slow rate. During the course of the application, the flow rate and oxidizer concentration are gradually increased to optimum levels.

Use of subsurface vent points is another method for controlling subsurface pressure. Pressure increases can be minimized by placing vent points consisting of PVC well points screened from the water table to the surface within the treatment area. These vapor points can be monitored to record subsurface pressure increases, if any, and contaminant volatilization, which is not typically detected.

The Cleanox® Technology has been successfully and safely applied in 22 states since 1993. In addition, there are outstanding proposals for performing bench testing or field-scale projects utilizing the Cleanox® Technology in 20 other states.

Zero-Valent Iron with a Carbon Source

The biggest limiting factor associated with the successful implementation of this technology is lack of contact between the slurry and the contaminants. However, through bench- and pilot-scale testing, adequate slurry volumes and injection pressures will be determined so that the slurry will be properly distributed throughout the formation. Another reaction limiting factor associated with this form of treatment involves the presence of high alkalinity in the groundwater. High hardness in the groundwater (>1800 ppm) could result in precipitation of hardness constituents on the iron in the slurry. This scaling would decrease the effectiveness of the treatment process by covering the iron particles, thus limiting the contact between the iron and the contaminants. However, the alkalinity levels in the groundwater on-site with a high recorded value of 252 ppm are substantially lower than the level at which concern with scaling would arise.

Sulfates present in the soil in significant concentrations (>30 ppm) can promote the formation of iron sulfate upon injection of the slurry. In turn, this iron sulfate can promote the growth of sulfate reducing bacteria as the compound is broken down for a food source. A heavy growth of these bacteria can lead to a plugging of the formation. However, the average

sulfate level in the groundwater at approximately 13 ppm is lower than the level at which concern with this problem would arise.

5.2.4 Operation and Maintenance

The injection process and subsequent treatment of the groundwater is expected to be completed in less than 16 weeks. No operation and maintenance will be required.

5.2.5 Post-Remediation Sampling/Monitoring

Upon completion of active remediation, confirmatory samples will be collected and analyzed to demonstrate that the CUGs have been met. CUGs are discussed in Section 2.2. Groundwater samples collected will be prepared and analyzed for target VOCs and SVOCs utilizing methods 8260 and 8270, respectively. A trip blank and an equipment blank will also be analyzed for QA/QC purposes.

Nine existing wells will be sampled on a quarterly basis during post-remediation sampling/monitoring. "No further action" at the site will be required after results from four consecutive quarters demonstrate no contamination above the CUGs. The proposed wells and the rationale for their selection are tabulated below:

<u>Well Number</u>	<u>Rationale</u>
220	Hydrogeologic Unit B northeast of a minor lobe in the plume.
222	Hydrogeologic Unit B downgradient of the plume axis.
224	Hydrogeologic Unit B south of the site drainage ditch.
225	Hydrogeologic Unit A south of the site drainage ditch.
226	Limestone Aquifer underlying the source area.
227	Hydrogeologic Unit B underlying the source area.
228	Hydrogeologic Unit A underlying the source area.
230	Hydrogeologic Unit A east of the site drainage ditch.
233	Hydrogeologic Unit B along the property line on the northwest corner of the facility.

Data received from the laboratory will be evaluated in general accordance with USEPA functional guidelines for organic data review. A report summarizing the qualified analytical results will be prepared and submitted following each sampling episode.

6.0

PERMITS

Attached as Appendix C is the Application for Permit to Construct and/or Use a Well(s) for Injection, Class 5I Wells for the proposed injection technologies. This application is a preliminary application to be submitted to the Underground Injection Control Program (UIC) of the North Carolina Department of Environment and Natural Resources for the pilot-scale injections of the proposed injection technologies. Some of the specific data requirements have been approximated or annotated as "TBD" (to be determined). These data gaps will be filled upon completion of a bench-scale test. It is our understanding that the role of the UIC is to permit the injection and the role of the NCDENR is to approve the proposed remedial technologies.

7.0 REFERENCES

- Division of Water Resources, NC Department of Environment and Natural Resources. Capacity Use Area #1 Program Annual Report, February 1998.
- Engineering Tectonics, P.A. Groundwater Assessment, Hamilton Beach-Proctor Silex, Washington, North Carolina. 1993.
- Groundwater Management Associates, Inc. Limited Site Investigation, Hamilton Beach/Proctor-Silex Facility, 234 Springs, Washington, Beaufort County, North Carolina. 1998.
- Hamilton Beach-Proctor-Silex, Inc. Sampling and Chemical Analysis-Oil Release Incident, Hamilton Beach-Proctor-Silex, Inc., Washington, North Carolina. 1995a.
- Hamilton Beach-Proctor-Silex, Inc. Additional Sampling, Chemical Analysis and Excavation-Oil Release Incident, Hamilton Beach/Proctor-Silex, Inc., Washington, North Carolina. 1995b.
- Health & Hygiene/ELB. Industrial Hygiene Survey Report, Hamilton Beach Proctor Silex, Washington. June 1998.
- Mantech Environmental Corporation. Discussions, letters, email, and memos. April, May, June 1999.
- North Carolina Department of Environment & Natural Resources, Division of Water Quality. Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater, Volume I, Sources Other Than Underground Storage Tanks. 1998.
- North Carolina Department of Environment, Health, and Natural Resources. North Carolina Risk Analysis Framework (Draft), December 1996.
- Pennsylvania Department of Environmental Protection. Land Recycling Technical Guidance Manual. December 1997.
- Radian International, LLC. Results of Groundwater Sampling: April 1997 for the Hamilton Beach◇Proctor-Silex, Washington, North Carolina Facility. May 1997.
- Radian International, LLC. On-Site Assessment Report, Hamilton Beach◇Proctor-Silex, Inc., Washington, North Carolina. July 1998.
- Radian Mobile Field Services. Discussions, letters, emails, and memos. April, May, June 1999.

**PRELIMINARY
CORRECTIVE ACTION PLAN
Hamilton Beach◇Proctor-Silex, Inc.
Washington, North Carolina**

**Groundwater Incident No. 14338
Site Priority Ranking B**

Prepared for:
Hamilton Beach◇Proctor-Silex, Inc.
4421 Waterfront Drive
Glen Allen, Virginia 23060

Prepared by:
Radian Engineering, Inc.
P.O. Box 13000
Research Triangle Park, North Carolina 27709

July 1999

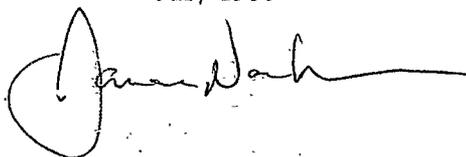
A handwritten signature in black ink, appearing to read "James D. ...", is written over a faint, illegible stamp or watermark.

TABLE OF CONTENTS

	<u>Page</u>
LIST OF FIGURES	iv
LIST OF TABLES	viii
S.0 EXECUTIVE SUMMARY	S-1
1.0 INTRODUCTION	1-1
1.1 Site Location	1-1
1.2 Purpose of the Corrective Action Plan.....	1-2
1.3 Source Characterization, Summary of Remedial Actions, and Previous Reports	1-2
1.3.1 Source Characterization	1-2
1.3.2 Remedial Actions.....	1-3
1.3.3 Previous Investigations and Reports.....	1-4
2.0 CORRECTIVE ACTION PLAN OBJECTIVES	2-1
2.1 Remediation Goals.....	2-1
2.2 Cleanup Goals (CUGs)	2-1
2.2.1 Soil	2-1
2.2.2 Groundwater	2-2
2.3 Corrective Action Plan Implementation Schedule.....	2-2
3.0 RECEPTOR INFORMATION	3-1
3.1 Water Supply Wells	3-1
3.2 Public Water Supplies.....	3-1
3.3 Surface Water.....	3-1
3.4 Wellhead Protection Areas	3-2
3.5 Deep Aquifer.....	3-2
3.6 Subsurface Structures.....	3-3
3.7 Land Use and Adjacent Property Owners.....	3-3
4.0 EVALUATION OF CORRECTIVE ACTION ALTERNATIVES	4-1
4.1 Objectives	4-1
4.2 Identification and Screening of Corrective Action Technologies.....	4-1
4.3 Evaluation of the Promising Technologies	4-1
4.3.1 Soil	4-2
4.3.2 Groundwater	4-3

TABLE OF CONTENTS (Cont.)

	Page
4.4 Evaluation of Remediation Alternatives.....	4-7
4.4.1 Soil Remediation Alternatives.....	4-7
4.4.2 Groundwater Remediation Alternatives.....	4-8
5.0 PROPOSED CORRECTIVE ACTION.....	5-1
5.1 Soil Remediation.....	5-1
5.1.1 Bench- and Pilot-Scale Testing.....	5-2
5.1.2 Full-Scale Implementation.....	5-4
5.1.3 Limitations and Concerns.....	5-5
5.1.4 Operation and Maintenance.....	5-6
5.1.5 Post-Remediation Sampling/Monitoring.....	5-6
5.2 Groundwater Remediation.....	5-8
5.2.1 Chemical Oxidation.....	5-9
5.2.2 Zero-Valent Iron with a Carbon Source.....	5-12
5.2.3 Limitations and Concerns.....	5-17
5.2.4 Operation and Maintenance.....	5-19
5.2.5 Post-Remediation Sampling/Monitoring.....	5-19
6.0 PERMITS.....	6-1
7.0 REFERENCES.....	7-1

APPENDIX A	NOTIFICATION LETTER
APPENDIX B	SYNTHETIC PRECIPITATION LEACHING PROCEDURE
APPENDIX C	APPLICATION FOR PERMIT TO CONSTRUCT AND/OR USE A WELL(S) FOR INJECTION, CLASS 5I WELLS

LIST OF FIGURES

Figure

- 1-1 Topographic Map, Hamilton Beach◇Proctor-Silex, Inc.
- 1-2 Location Map, Hamilton Beach◇Proctor-Silex, Inc.
- 1-3 Site Map, Hamilton Beach◇Proctor-Silex, Inc.
- 1-4 Profiling and Soil Sampling Locations, Hamilton Beach◇Proctor-Silex, Inc.
- 1-5 Profiling and Soil Sampling Locations in the Source Area, Hamilton Beach◇Proctor-Silex, Inc.
- 1-6 Cross Section Locations, Hamilton Beach◇Proctor-Silex, Inc.
- 1-7 Geologic Cross-Section A-A', Hamilton Beach◇Proctor-Silex, Inc.
- 1-8 Geologic Cross-Section B-B', Hamilton Beach◇Proctor-Silex, Inc.
- 1-9 Geologic Cross-Section C-C', Hamilton Beach◇Proctor-Silex, Inc.
- 1-10 Approximate Distribution of Purgeable TPH in Source Area Soil, Hamilton Beach◇Proctor-Silex, Inc.
- 1-11 Approximate Distribution of Purgeable TPH in Source Area Soil, Hamilton Beach◇Proctor-Silex, Inc.
- 1-12 Approximate Distribution of Oil and Grease in Source Area Soil, Hamilton Beach◇Proctor-Silex, Inc.
- 1-13 Approximate Distribution of Benzene in Source Area Soil, Hamilton Beach◇Proctor-Silex, Inc.
- 1-14 Approximate Distribution of Ethylbenzene in Source Area Soil, Hamilton Beach◇Proctor-Silex, Inc.
- 1-15 Approximate Distribution of cis-1,2-Dichloroethene in Source Area Soil, Hamilton Beach◇Proctor-Silex, Inc.
- 1-16 Approximate Distribution of 1,1-Dichloroethene in Source Area Soil, Hamilton Beach◇Proctor-Silex, Inc.
- 1-17 Approximate Distribution of 1,2-Dichloroethane in Source Area Soil, Hamilton Beach◇Proctor-Silex, Inc.

LIST OF FIGURES (Cont.)

Figure

- 1-18 Approximate Distribution of Naphthalene in Source Area Soil, Hamilton Beach◇Proctor-Silex, Inc.
- 1-19 Water Sampling Locations, Hamilton Beach◇Proctor-Silex, Inc.
- 1-20 Location of Monitoring Wells, Hamilton Beach◇Proctor-Silex, Inc.
- 1-21 Potentiometric Surface Map, Unit A, May 1998, Hamilton Beach◇Proctor-Silex, Inc.
- 1-22 Potentiometric Surface Map, Unit B, May 1998, Hamilton Beach◇Proctor-Silex, Inc.
- 1-23 Potentiometric Surface Map, Unit A, November 1998, Hamilton Beach◇Proctor-Silex, Inc.
- 1-24 Potentiometric Surface Map, Unit B, November 1998, Hamilton Beach◇Proctor-Silex, Inc.
- 1-25 Cross Section Locations, Hamilton Beach◇Proctor-Silex, Inc.
- 1-26 Approximate Distribution of 1,1,1-Trichloroethane in Unit A, Hamilton Beach◇Proctor-Silex, Inc.
- 1-27 Approximate Distribution of 1,1,1-Trichloroethane in Unit B, Hamilton Beach◇Proctor-Silex, Inc.
- 1-28 Approximate Distribution of 1,1,1-Trichloroethane, D-D', Hamilton Beach◇Proctor-Silex, Inc.
- 1-29 Approximate Distribution of 1,1,1-Trichloroethane, E-E', Hamilton Beach◇Proctor-Silex, Inc.
- 1-30 Approximate Distribution of 1,1-Dichloroethane in Unit A, Hamilton Beach◇Proctor-Silex, Inc.
- 1-31 Approximate Distribution of 1,1-Dichloroethane in Unit B, Hamilton Beach◇Proctor-Silex, Inc.
- 1-32 Approximate Distribution of 1,1-Dichloroethane, D-D' , Hamilton Beach◇Proctor-Silex, Inc.
- 1-33 Approximate Distribution of 1,1-Dichloroethane, E-E', Hamilton Beach◇Proctor-Silex, Inc.

LIST OF FIGURES (Cont.)

Figure

- 1-34 Approximate Distribution of Trichloroethene in Unit A, Hamilton Beach◇Proctor-Silex, Inc.
- 1-35 Approximate Distribution of Trichloroethene in Unit B, Hamilton Beach◇Proctor-Silex, Inc.
- 1-36 Approximate Distribution of Trichloroethene, D-D', Hamilton Beach◇Proctor-Silex, Inc.
- 1-37 Approximate Distribution of Trichloroethene, E-E', Hamilton Beach◇Proctor-Silex, Inc.
- 1-38 Approximate Distribution of cis-1,2-Dichloroethene in Unit A, Hamilton Beach◇Proctor-Silex, Inc.
- 1-39 Approximate Distribution of cis-1,2-Dichloroethene in Unit B, Hamilton Beach◇Proctor-Silex, Inc.
- 1-40 Approximate Distribution of cis-1,2-Dichloroethene, D-D', Hamilton Beach◇Proctor-Silex, Inc.
- 1-41 Approximate Distribution of cis-1,2-Dichloroethene, E-E', Hamilton Beach◇Proctor-Silex, Inc.
- 1-42 Approximate Distribution of 1,1-Dichloroethene in Unit A, Hamilton Beach◇Proctor-Silex, Inc.
- 1-43 Approximate Distribution of 1,1-Dichloroethene in Unit B, Hamilton Beach◇Proctor-Silex, Inc.
- 1-44 Approximate Distribution of 1,1-Dichloroethene, D-D', Hamilton Beach◇Proctor-Silex, Inc.
- 1-45 Approximate Distribution of 1,1-Dichloroethene, E-E', Hamilton Beach◇Proctor-Silex, Inc.
- 1-46 Approximate Distribution of 1,2-Dichloroethane in Unit A, Hamilton Beach◇Proctor-Silex, Inc.
- 1-47 Approximate Distribution of 1,2-Dichloroethane in Unit B, Hamilton Beach◇Proctor-Silex, Inc.
- 1-48 Approximate Distribution of 1,2-Dichloroethane, D-D', Hamilton Beach◇Proctor-Silex, Inc.

LIST OF FIGURES (Cont.)

Figure

- 1-49 Approximate Distribution of 1,2-Dichloroethane, E-E', Hamilton Beach◇Proctor-Silex, Inc.
- 1-50 Approximate Distribution of Vinyl Chloride in Unit A, Hamilton Beach◇Proctor-Silex, Inc.
- 1-51 Approximate Distribution of Vinyl Chloride in Unit B, Hamilton Beach◇Proctor-Silex, Inc.
- 3-1 Location of Surrounding Water Supply Wells, Hamilton Beach◇Proctor-Silex, Inc.
- 3-2 Water-Supply Well Locations, Hamilton Beach◇Proctor-Silex, Inc.
- 3-3 Subsurface Utilities, Hamilton Beach◇Proctor-Silex, Inc.
- 3-4 Adjacent Property Map, Hamilton Beach◇Proctor-Silex, Inc.
- 5-1 Approximate Distribution of Contaminated Soils, Hamilton Beach◇Proctor-Silex, Inc.
- 5-2 Post-Remediation Confirmatory Soil Sampling Locations, Hamilton Beach◇Proctor-Silex, Inc.
- 5-3 Unit A, Groundwater Contaminant Distribution, Hamilton Beach◇Proctor-Silex, Inc.
- 5-4 Unit B, Groundwater Contaminant Distribution, Hamilton Beach◇Proctor-Silex, Inc.
- 5-5 Unit A, Groundwater Remediation Scenario, Hamilton Beach◇Proctor-Silex, Inc.
- 5-6 Unit B, Groundwater Remediation Scenario, Hamilton Beach◇Proctor-Silex, Inc.

LIST OF TABLES

Table

- 1-1 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
- 1-2 Summary of Qualified Soil Analytical Results: Volatile Organic Compounds by Method 8260B, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-3 Summary of Qualified Soil Analytical Results: Semivolatile Organic Compounds by Method 8270C, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-4 Summary of Qualified Soil Analytical Results: Background Metals by Methods 6010B and 7471A (Mercury), Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-5 Summary of Qualified Soil Analytical Results: Metals by Methods 6010B and 7471A (Mercury), Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-6 Summary of Qualified Soil Analytical Results: pH by Method 9045C and Total Organic Carbon, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-7 Summary of Qualified Soil Analytical Results: Toxicity Characteristic Leaching Procedure by Method 1311 Soil Sample F18B, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-8 Groundwater Elevations: May 13, 1998, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-9 Groundwater Elevations: November 16, 1998, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-10 Summary of Groundwater Screening Results: Volatile Organic Compounds by Method 8260A and 8260B (G4 through G12), Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-11 Summary of Replicate Sample Results, Volatile Organic Compounds by Method 8260B, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-12 Summary of Qualified Groundwater Analytical Results: May 1998, Volatile Organic Compounds by Method 8260B, Hamilton Beach◇Proctor-Silex, Washington, North Carolina

LIST OF TABLES (Cont.)

Table

- 1-13 Summary of Qualified Groundwater Analytical Results: November 1998, Volatile Organic Compounds by Method 8260B, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-14 Summary of Qualified Groundwater Analytical Results: May 1998, Semivolatile Organic Compounds by Method 8270C, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-15 Summary of Qualified Groundwater Analytical Results: November 1998, Semivolatile Organic Compounds by Method 8270C, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-16 Summary of Qualified Groundwater Analytical Results: May 1998, Metals by Methods 6010B and 7470A (Mercury), Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-17 Groundwater Chemistry: November 1998, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-18 Field Measurements: May 1998, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-19 Field Measurements: November 1998, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-20 Summary of Qualified Surface Water Analytical Results: May 1998, Volatile Organic Compounds by Method 8260B, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-21 Summary of Qualified Surface Water Analytical Results: May 1998, Semivolatile Organic Compounds by Method 8270B, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 1-22 Summary of Qualified Surface Water Analytical Results: May 1998, Metals by Methods 6010B and 7471A (Mercury), Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 2-1 Proposed Cleanup Goals (CUGs) for Soil, Total Petroleum Hydrocarbons, Hamilton Beach◇Proctor-Silex, Washington, North Carolina

LIST OF TABLES (Cont.)

Table

- 2-2 Proposed Leachate Concentration Cleanup Goals (CUGs) for Soil Generated through the Synthetic Precipitation Leaching Procedure (SPLP), Volatile Organic Compounds, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 2-3 Proposed Leachate Concentration Cleanup Goals (CUGs) for Soil Generated through the Synthetic Precipitation Leaching Procedure (SPLP), Semivolatile Organic Compounds, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 2-4 Proposed Cleanup Goals (CUGs) for Groundwater, Volatile Organic Compounds, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 2-5 Proposed Cleanup Goals (CUGs) for Groundwater, Semivolatile Organic Compounds, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 3-1 Surrounding Water Supply Wells, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 3-2 Adjacent Property Ownership, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 4-1 Promising Corrective Action Technologies for Soil, Hamilton Beach◇Proctor-Silex, Washington, North Carolina
- 4-2 Promising Technologies for Groundwater, Hamilton Beach◇Proctor-Silex, Washington, North Carolina

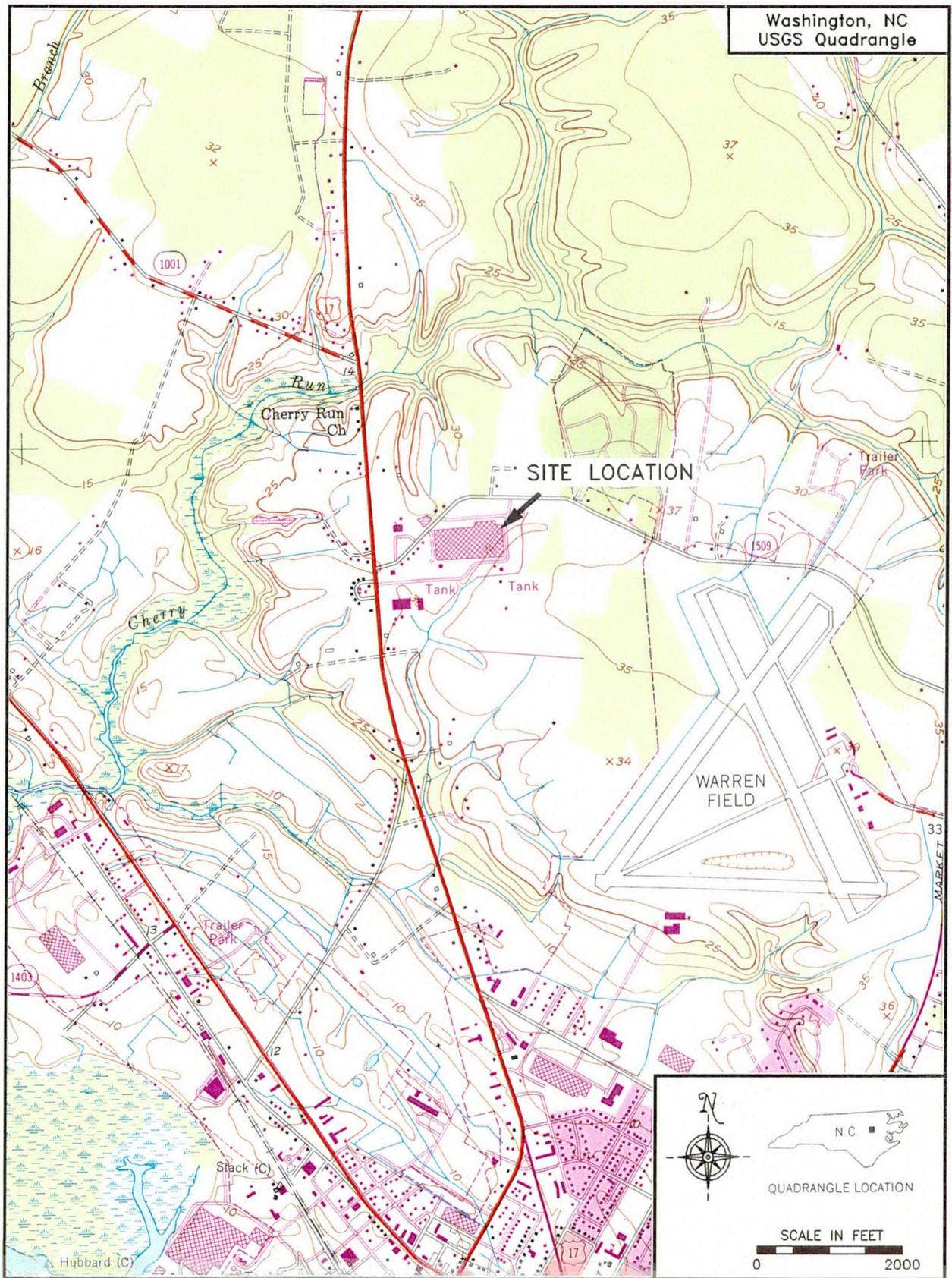
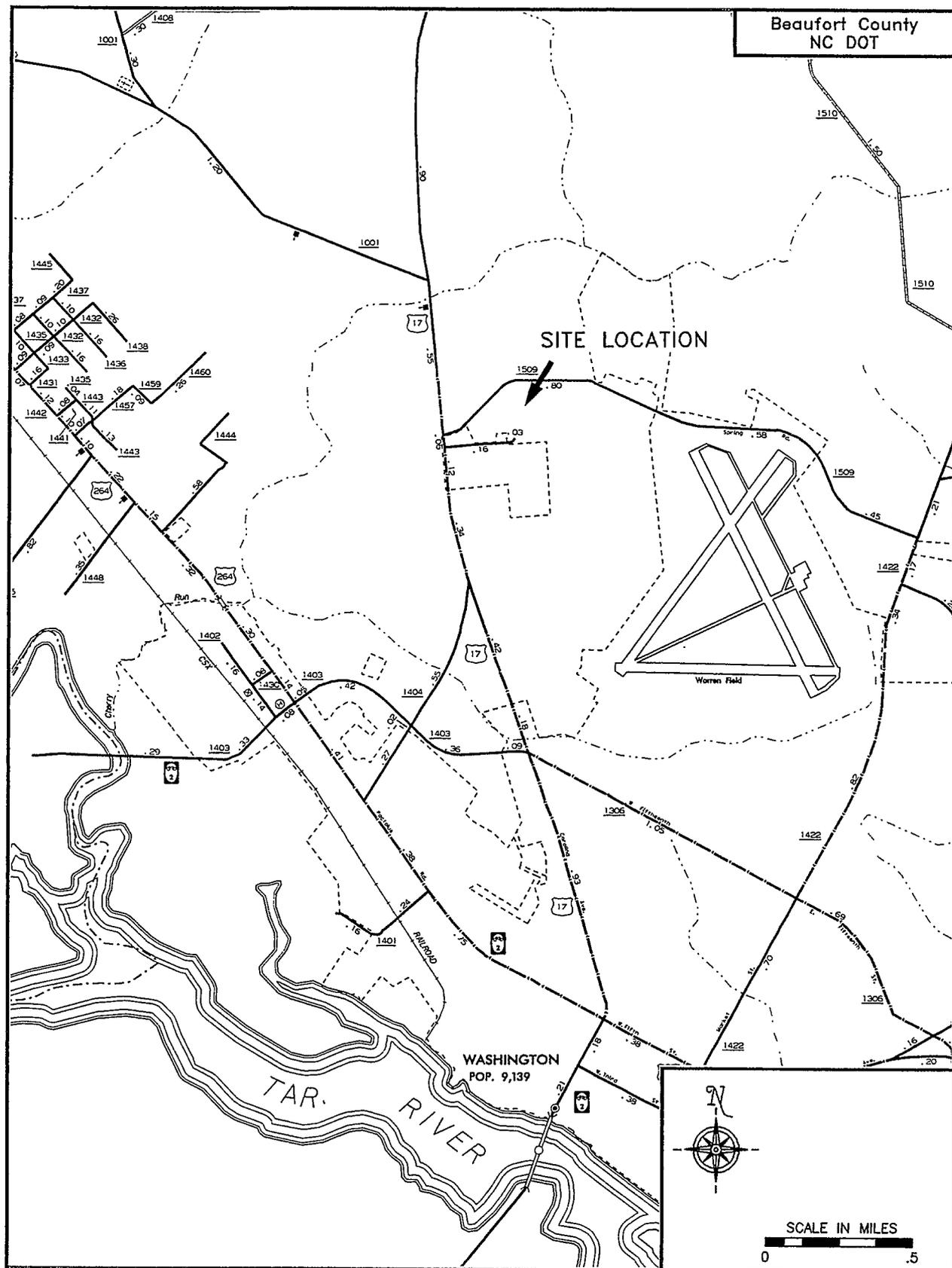


Figure 1-1. Topographic Map
Hamilton Beach ◊ Proctor-Silex, Inc.

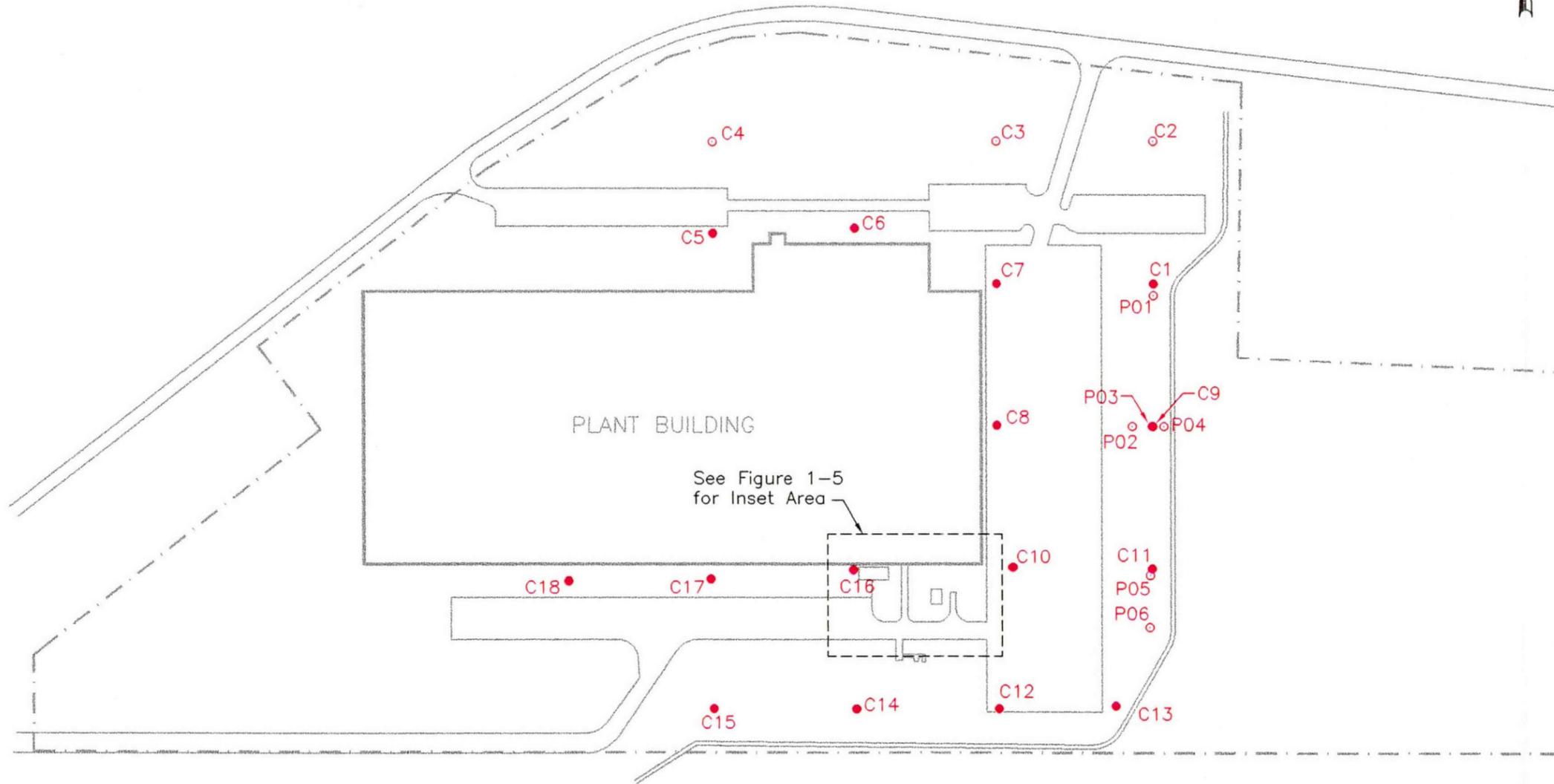


**Figure 1-2. Location Map
Hamilton Beach Proctor-Silex, Inc.**



LEGEND

- CPT/FFD Profiling
- DPT Soil Sampling



PLANT BUILDING

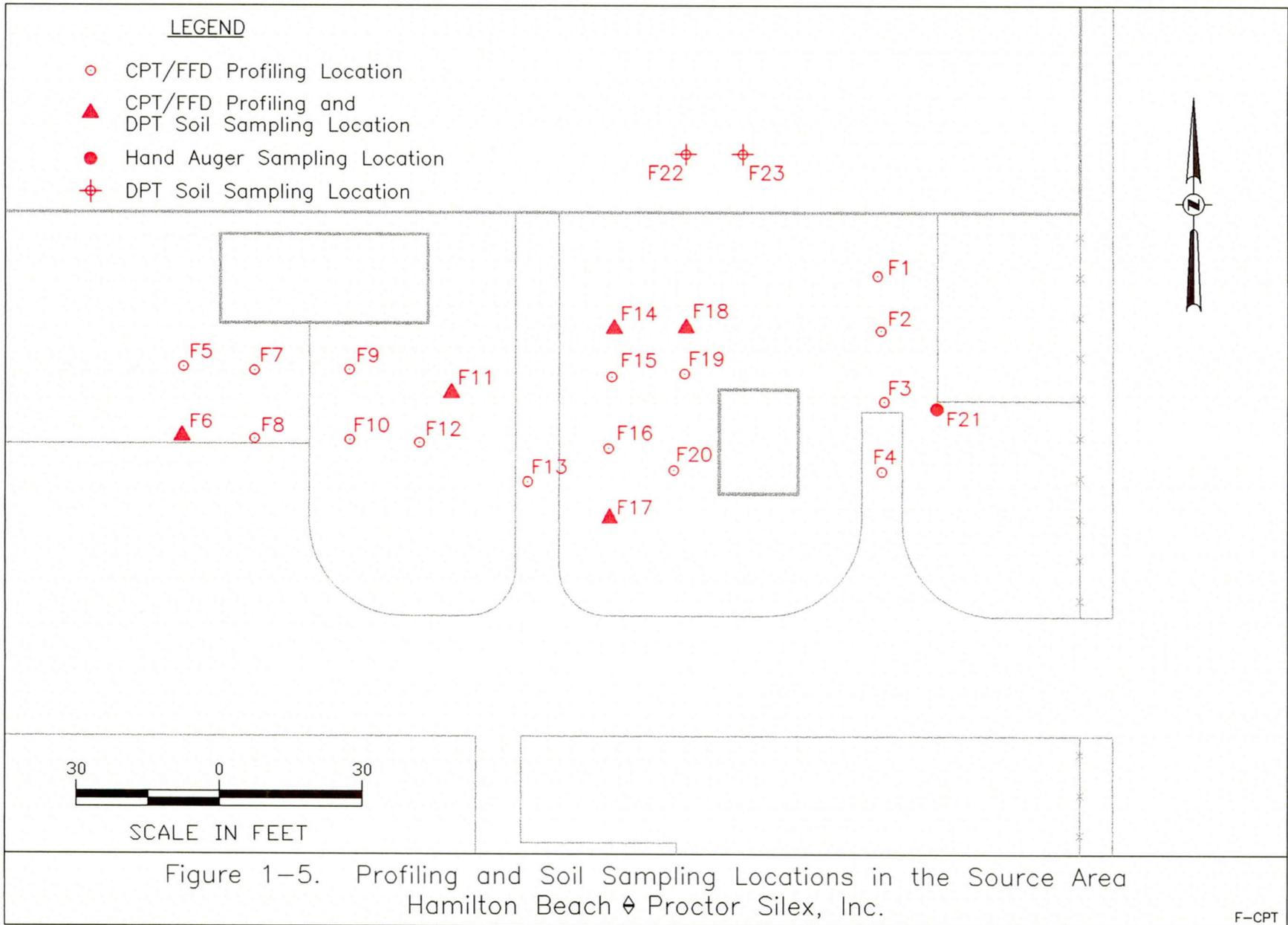
See Figure 1-5
for Inset Area



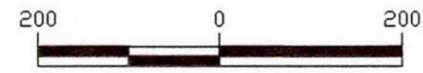
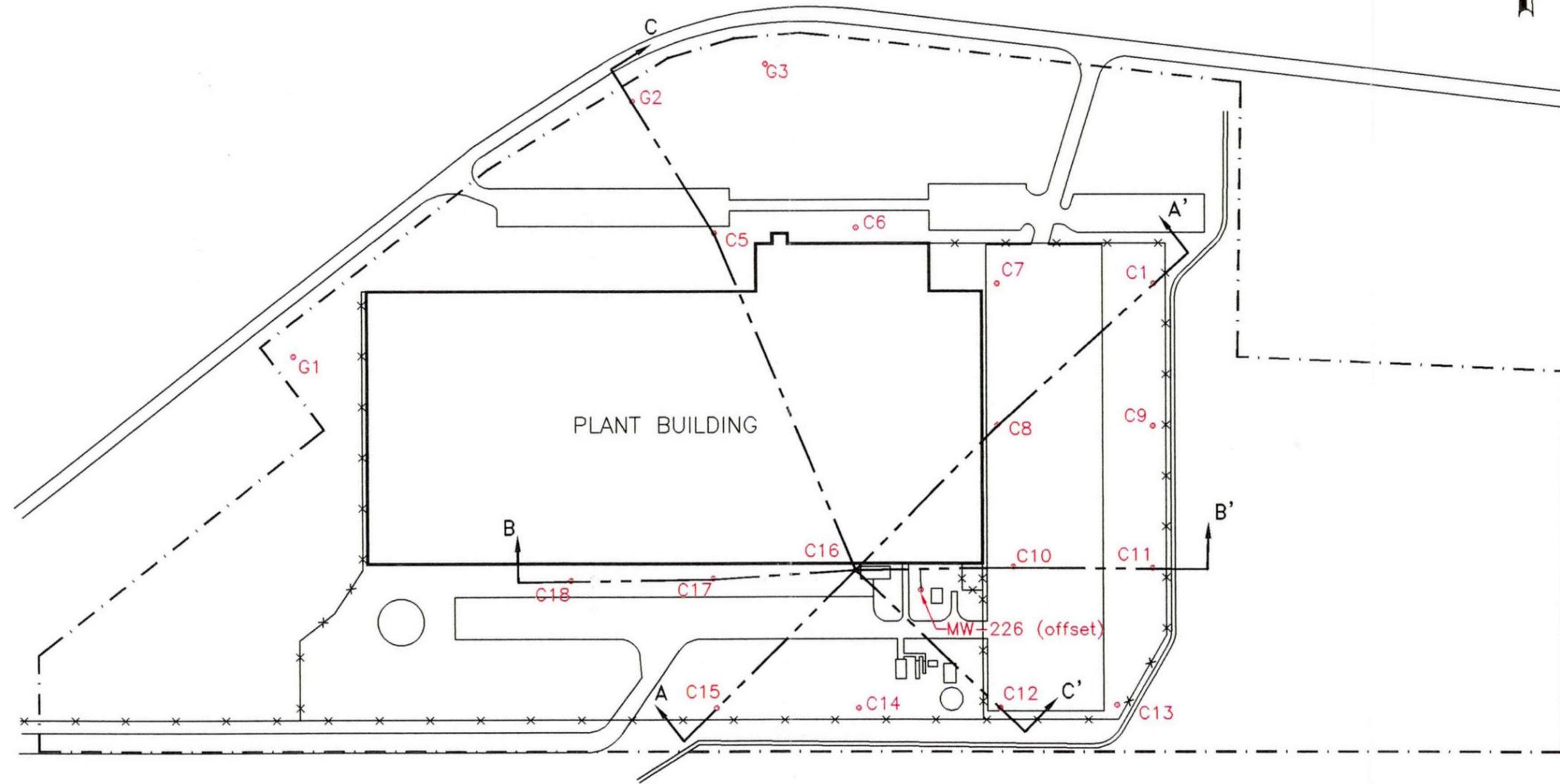
SCALE IN FEET

SCALE	AS SHOWN	DESIGNED BY	JN	DATE	14DEC98	DRAWING TITLE	Figure 1-4. Profiling and Soil Sampling Locations Hamilton Beach & Proctor Silex, Inc				
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	14DEC98						
	 RADIANT INTERNATIONAL	CHECKED BY	BPG	DATE	08JAN99						
	A DAVIS & MOORE GROUP COMPANY	APPROVED BY		DATE							
	REVISION NUMBER: 001, 002, 003, 004, 005					CONTRACT NO.	650138.0501	DRAWING NO.	C-CPT	REV.	0

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

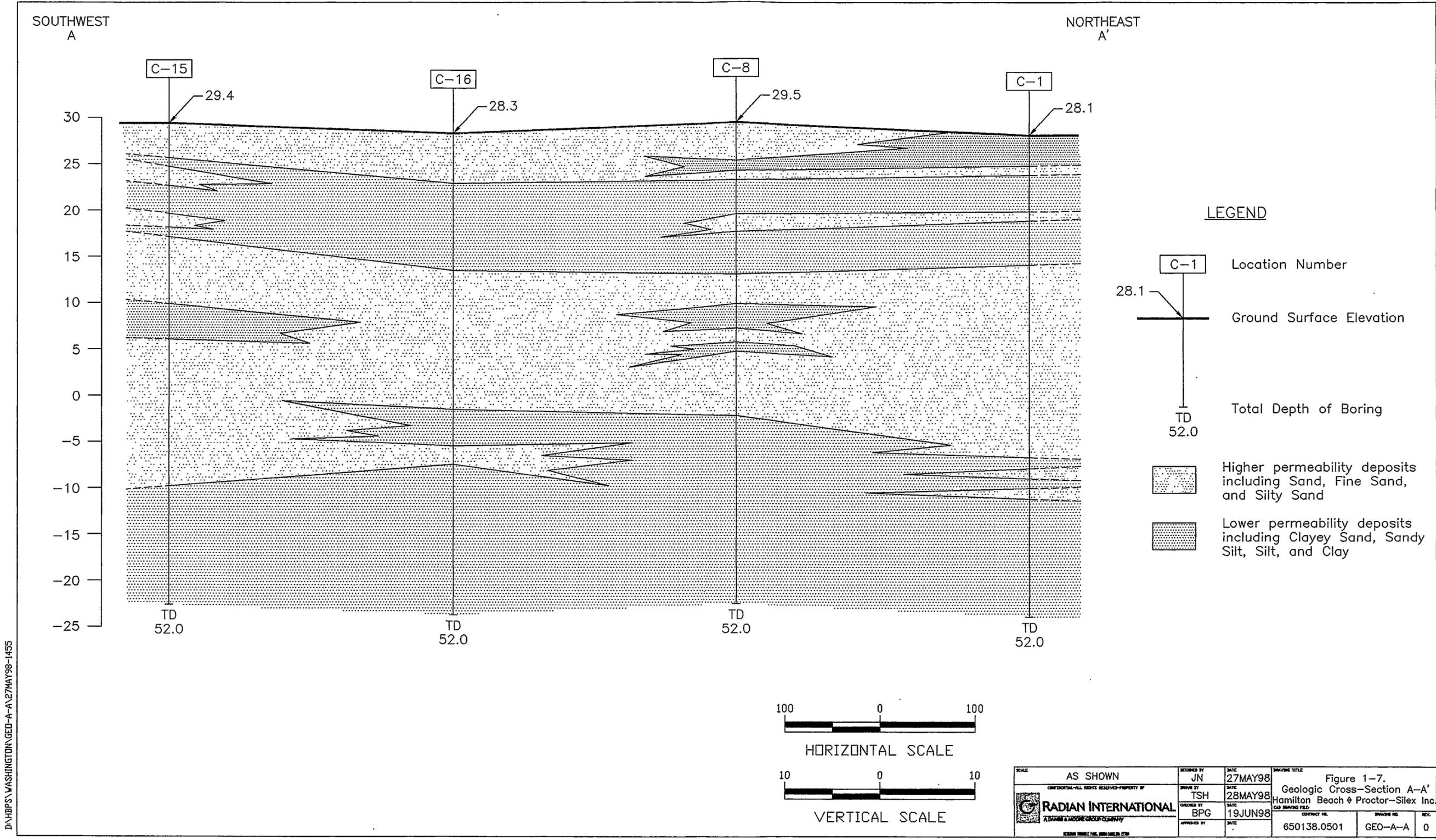


D:\HBPS\X-SECT-16 JUN98-1130



SCALE IN FEET

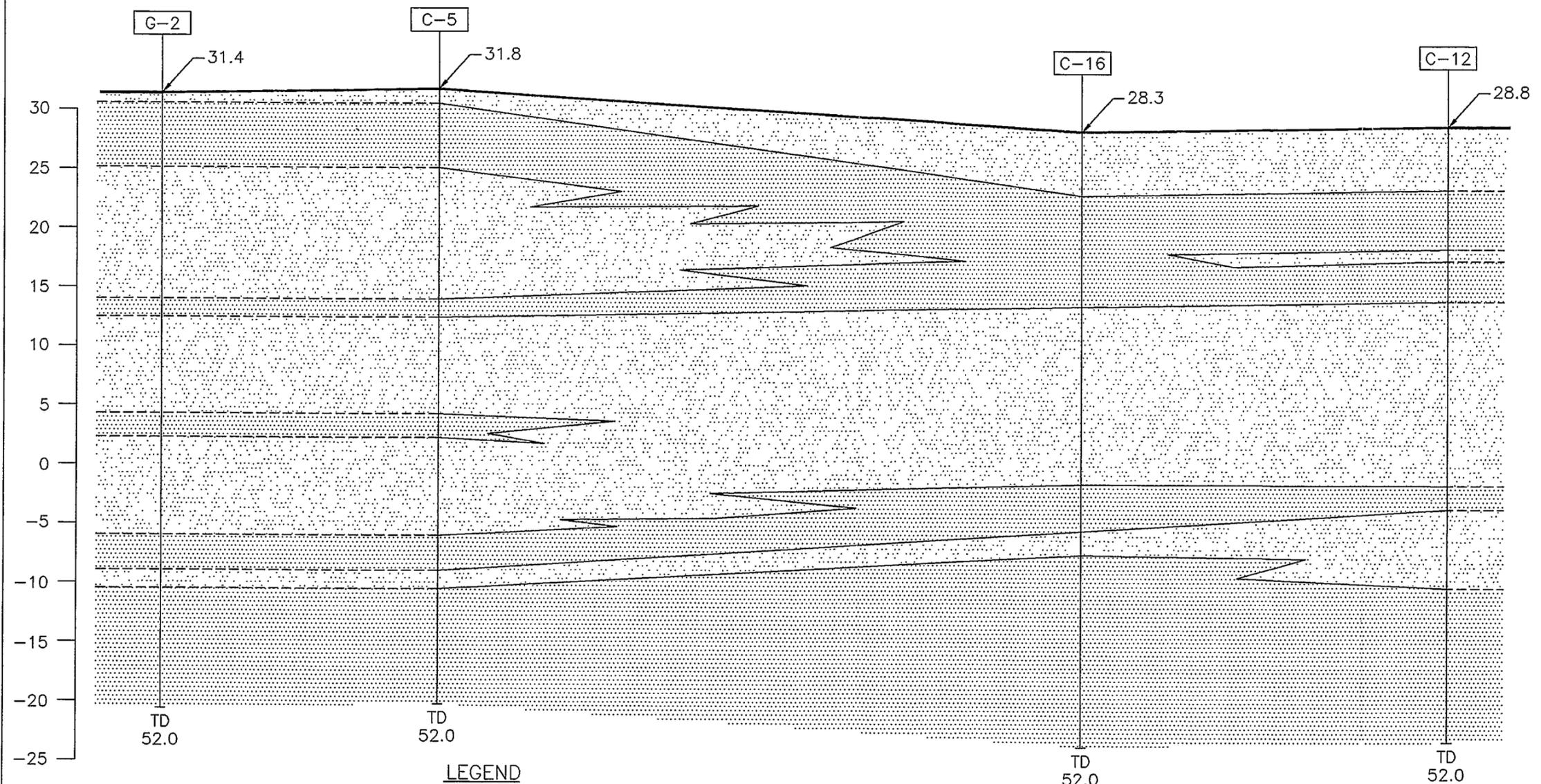
SCALE	AS SHOWN	DESIGNED BY	JN	DATE	14DEC98	DRAWING TITLE	Figure 1-6. Cross Section Locations Hamilton Beach & Proctor-Sillex Inc. CAR BRAVING FIELD		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	14DEC98				
	 RADIANT INTERNATIONAL	CHECKED BY	BPG	DATE	08JAN99				
	A DANBROS & MOORE GROUP COMPANY	APPROVED BY		DATE		CONTRACT NO.	650138.0601	DRAWING NO.	X-SECT
	ISSUES TABLE FILE: 001-001A.DWG							REV.	0



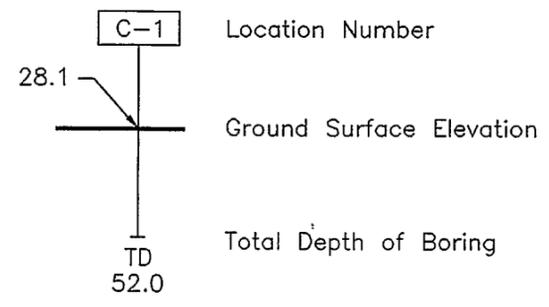
D:\HBPS\WASHINGTON\GEO-A-A-27MAY98-1455

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

 RADIAN INTERNATIONAL <small>A CH2M HILL COMPANY</small>	SCALE	AS SHOWN	REVIEWED BY	JN	DATE	27MAY98	DRAWING TITLE Figure 1-9. Geologic Cross-Section C-C' Hamilton Beach & Proctor-Sillex Inc. <small>CAD DRAWING FILED</small>			
		CONFIDENTIAL-ALL RIGHTS RESERVED-FURNISHED BY	DRAWN BY	TSH	DATE	28MAY98				
			ORDERED BY	BPG	DATE	19JUN98				
			APPROVED BY		DATE					
					CONTRACT NO.	650138.0501	DRAWING NO.	GEO-C-C	REV.	0

DA-HPBS WASHINGTON GEO-C-C-27MAY98-1455

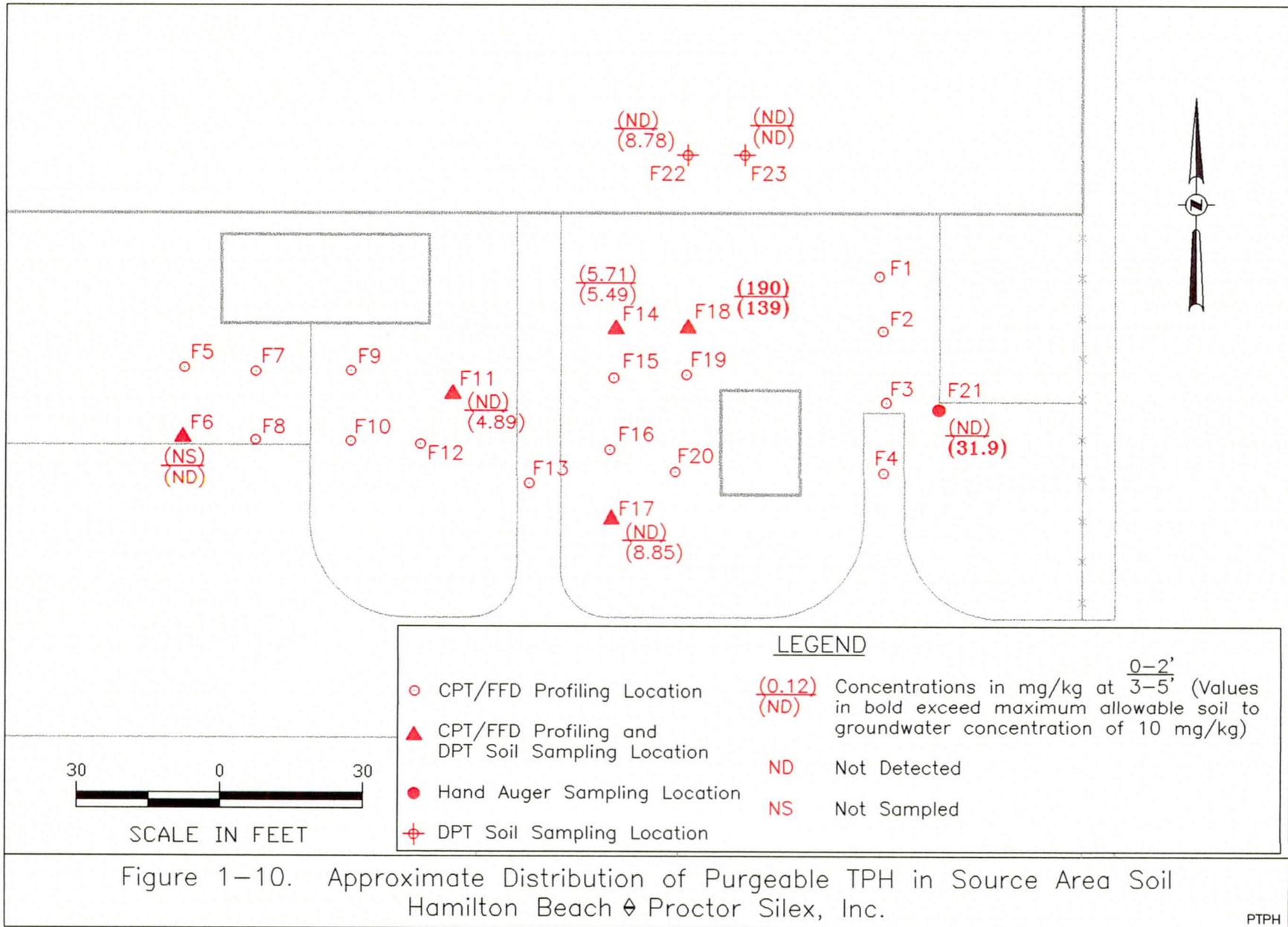
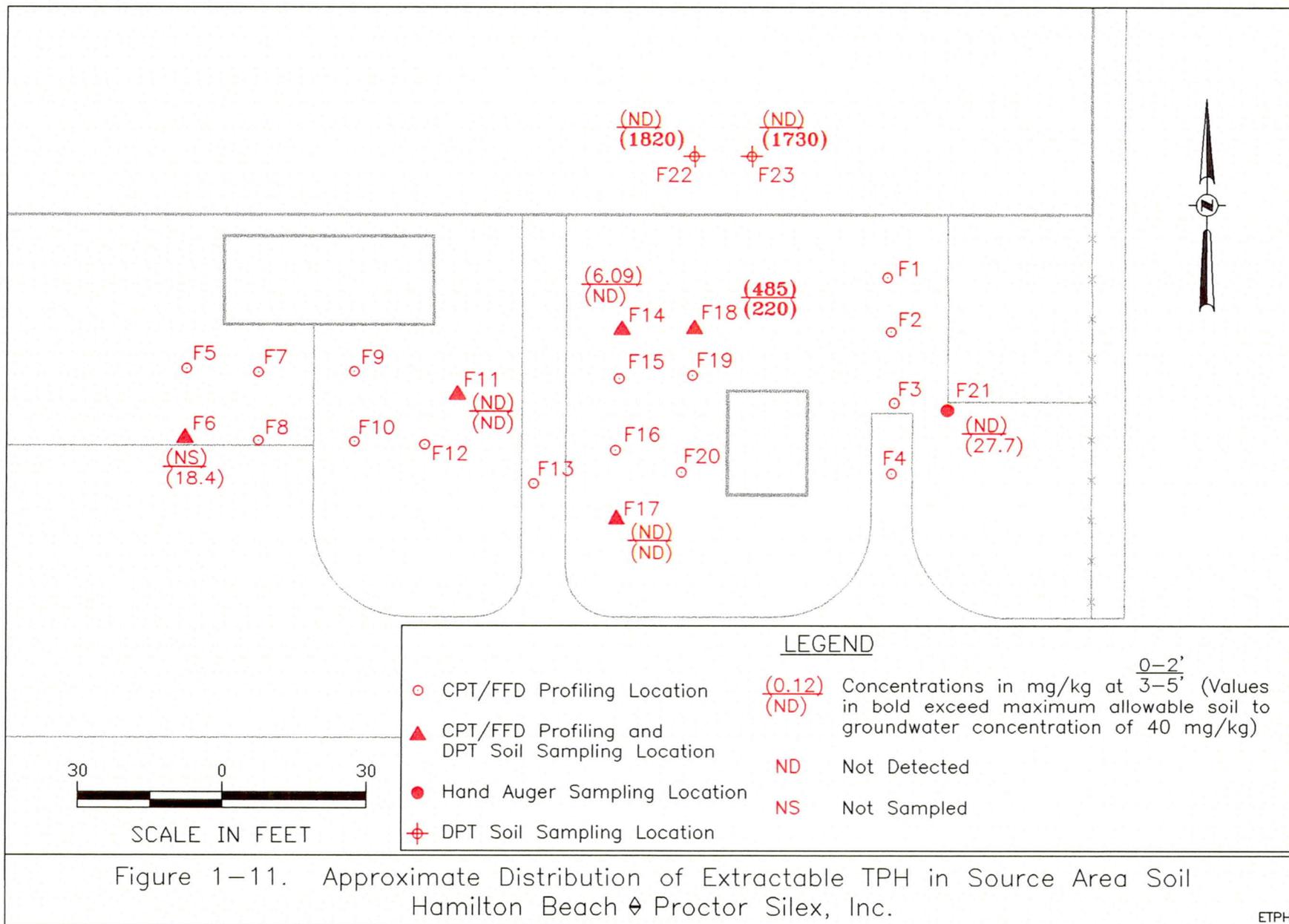


Figure 1-10. Approximate Distribution of Purgeable TPH in Source Area Soil
Hamilton Beach & Proctor Silex, Inc.



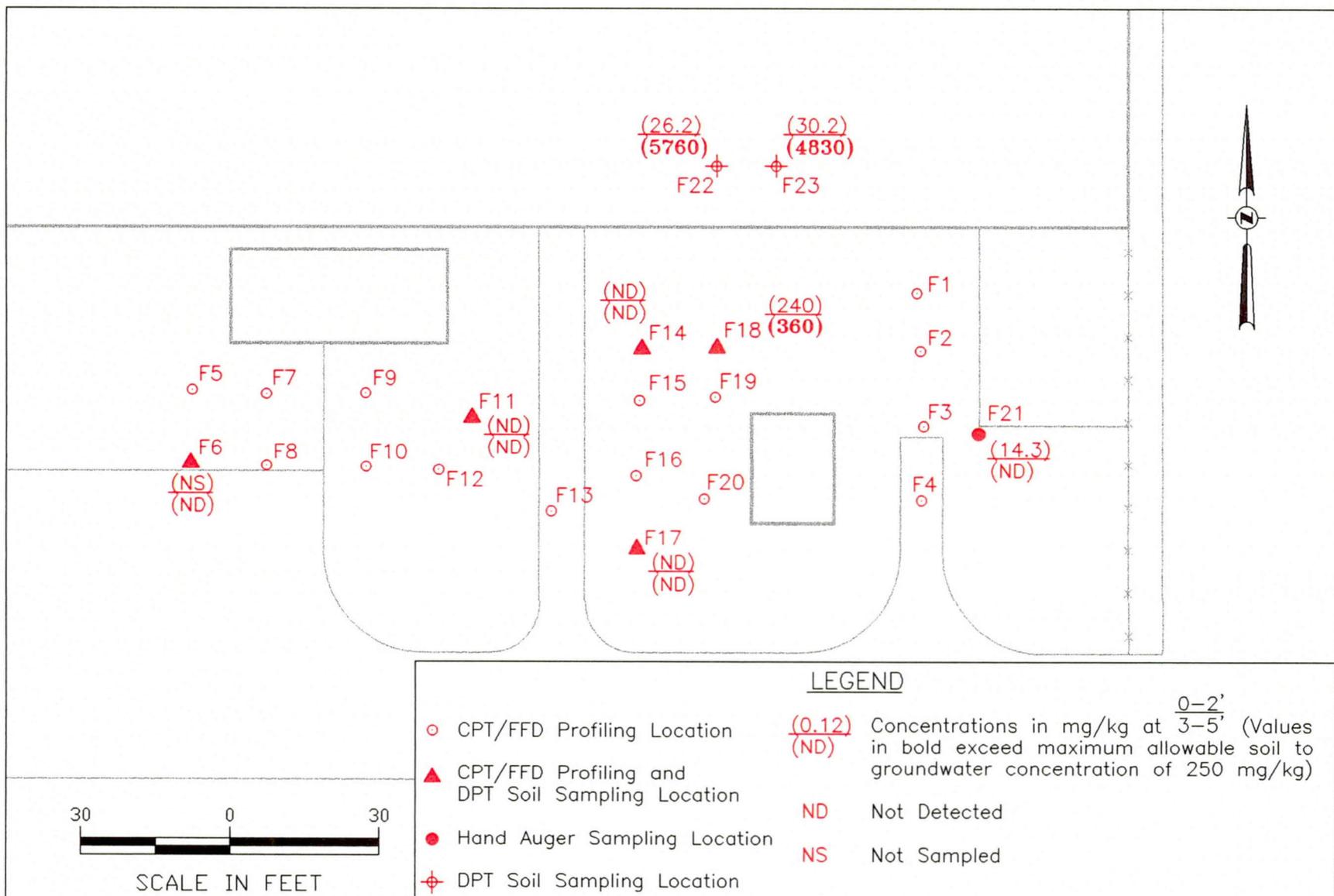


Figure 1-12. Approximate Distribution of Oil and Grease in Source Area Soil Hamilton Beach & Proctor Silex, Inc.

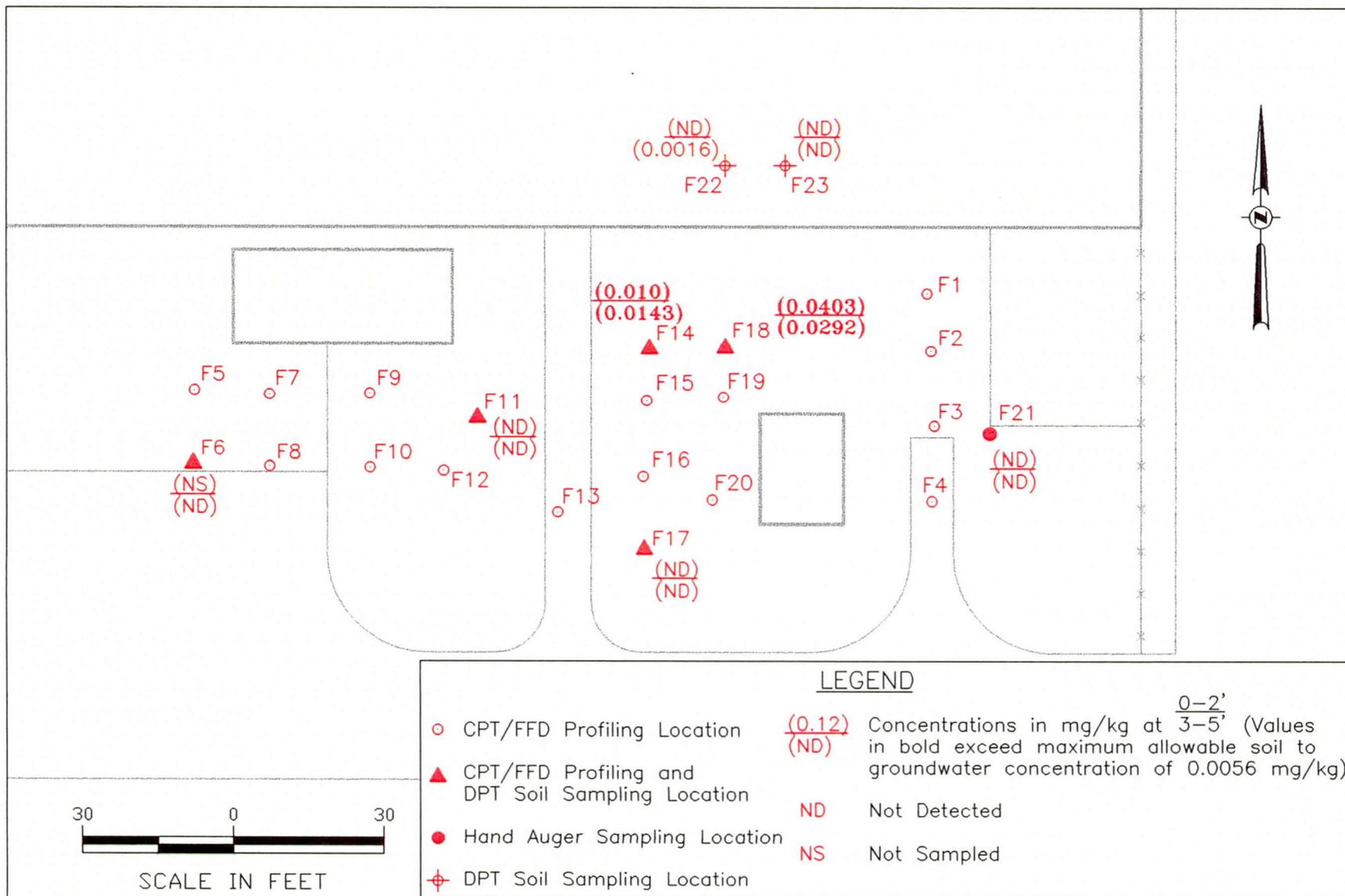


Figure 1-13. Approximate Distribution of Benzene in Source Area Soil
Hamilton Beach ⊕ Proctor Silex, Inc.

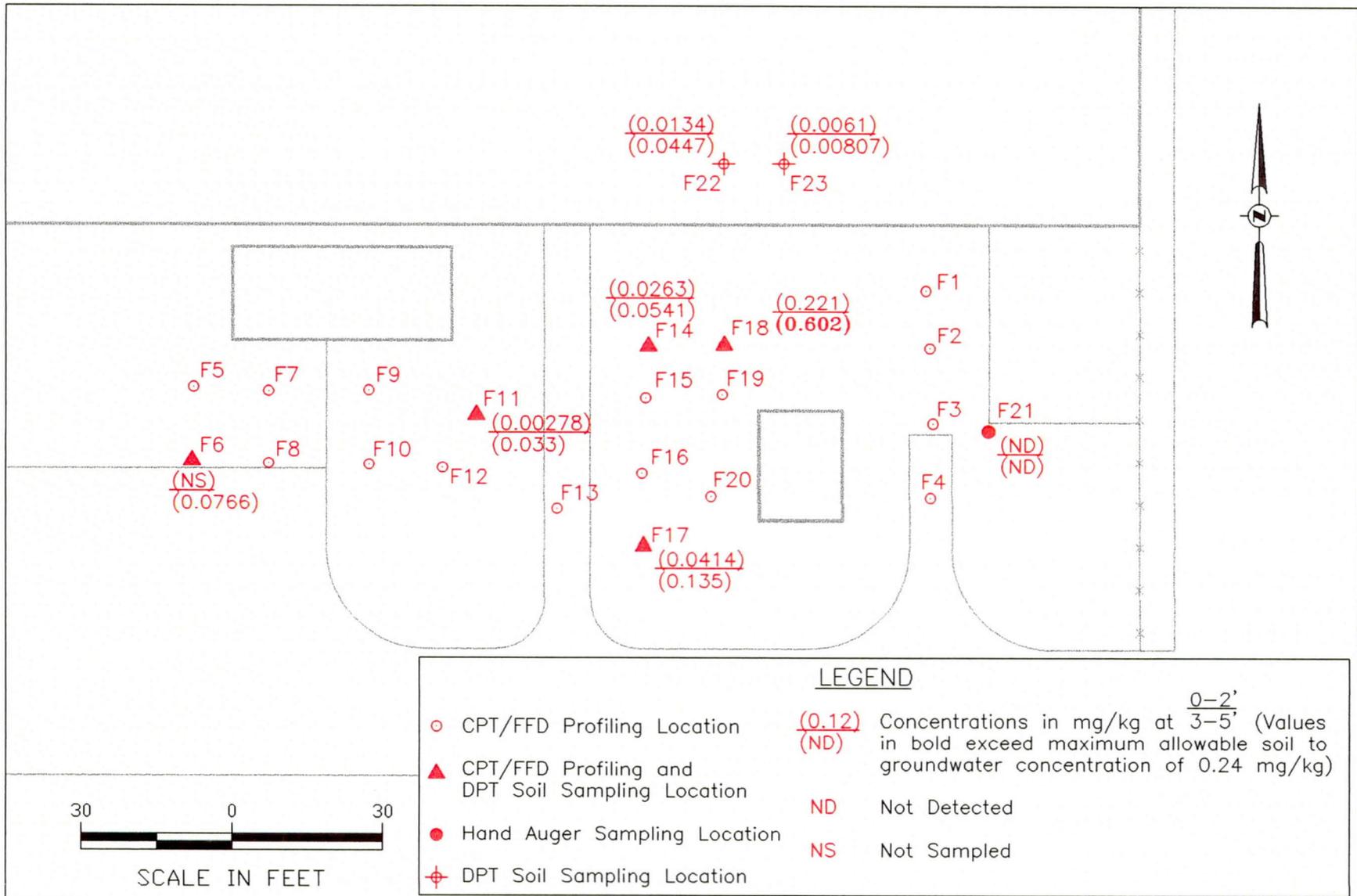
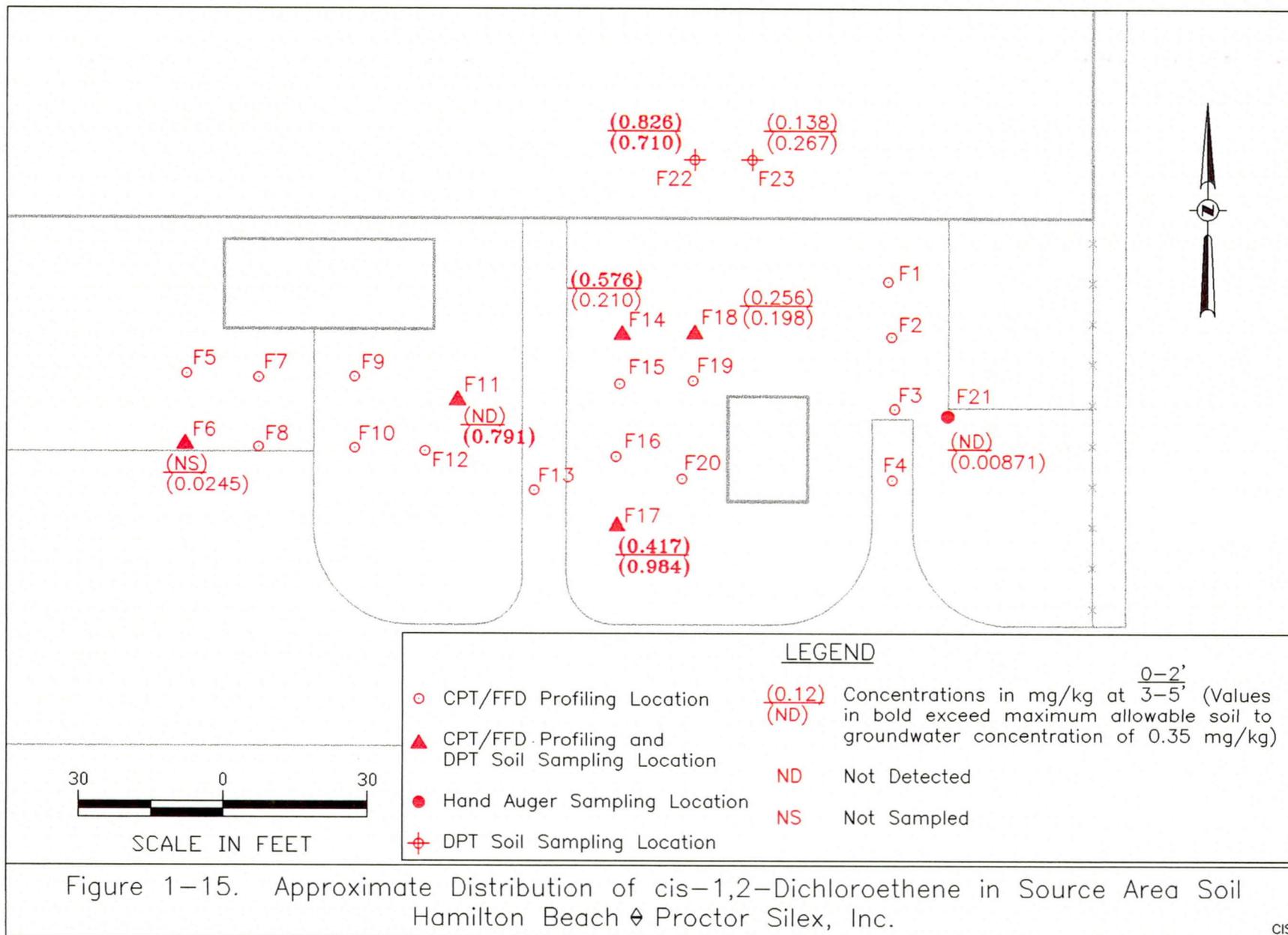
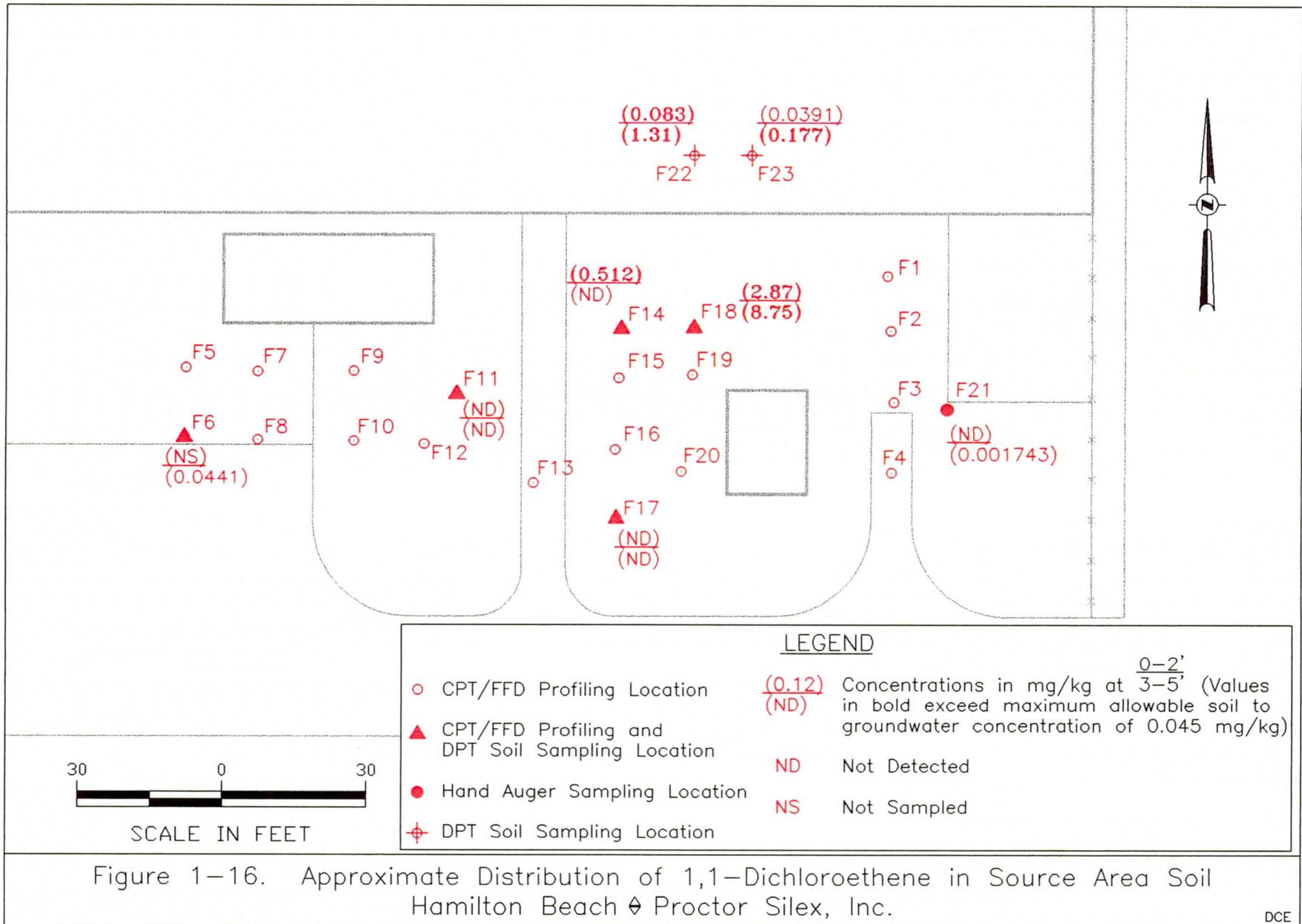


Figure 1-14. Approximate Distribution of Ethylbenzene in Source Area Soil
Hamilton Beach & Proctor Silex, Inc.





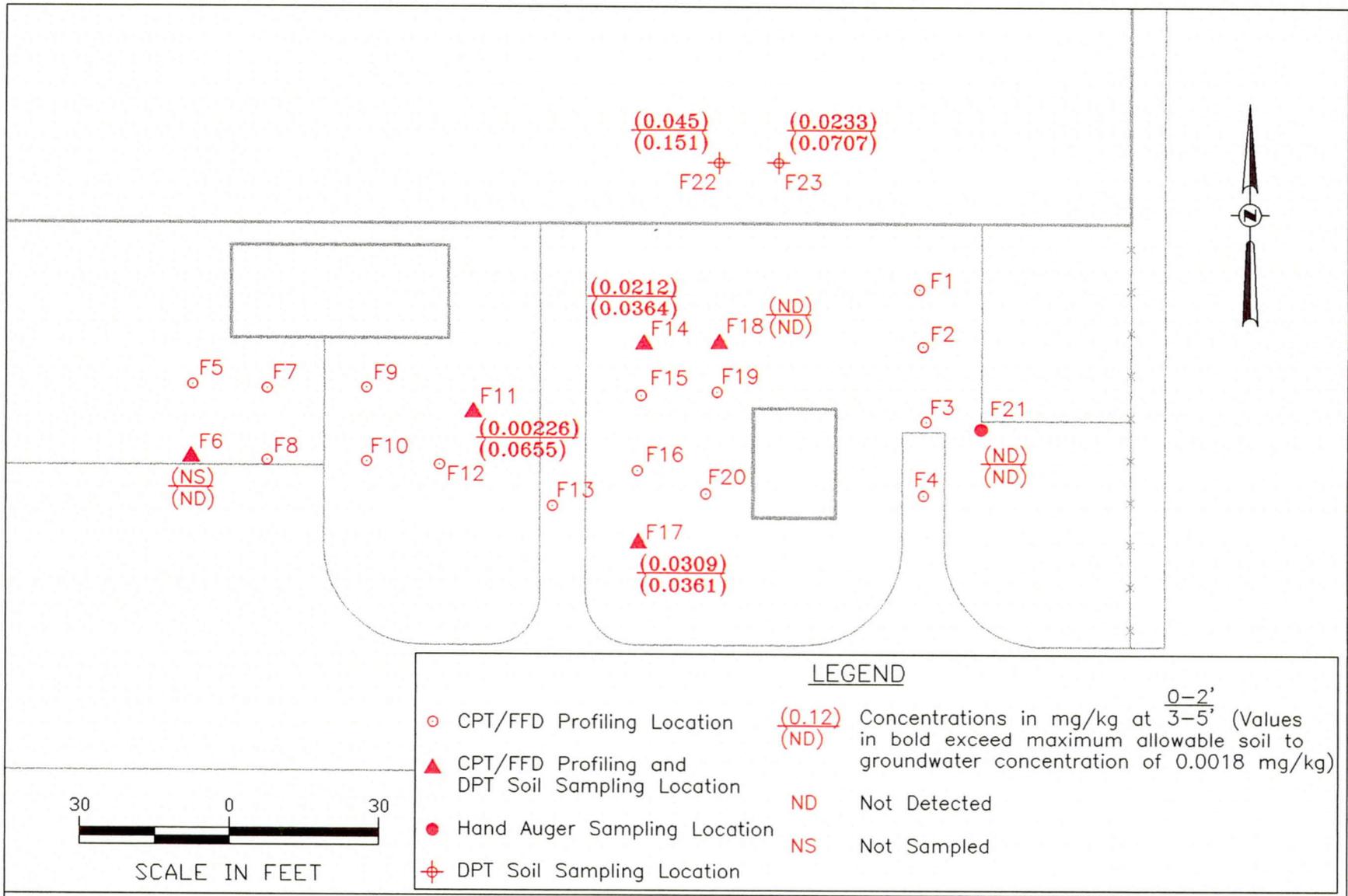


Figure 1-17. Approximate Distribution of 1,2-Dichloroethane in Source Area Soil Hamilton Beach Proctor Silex, Inc.

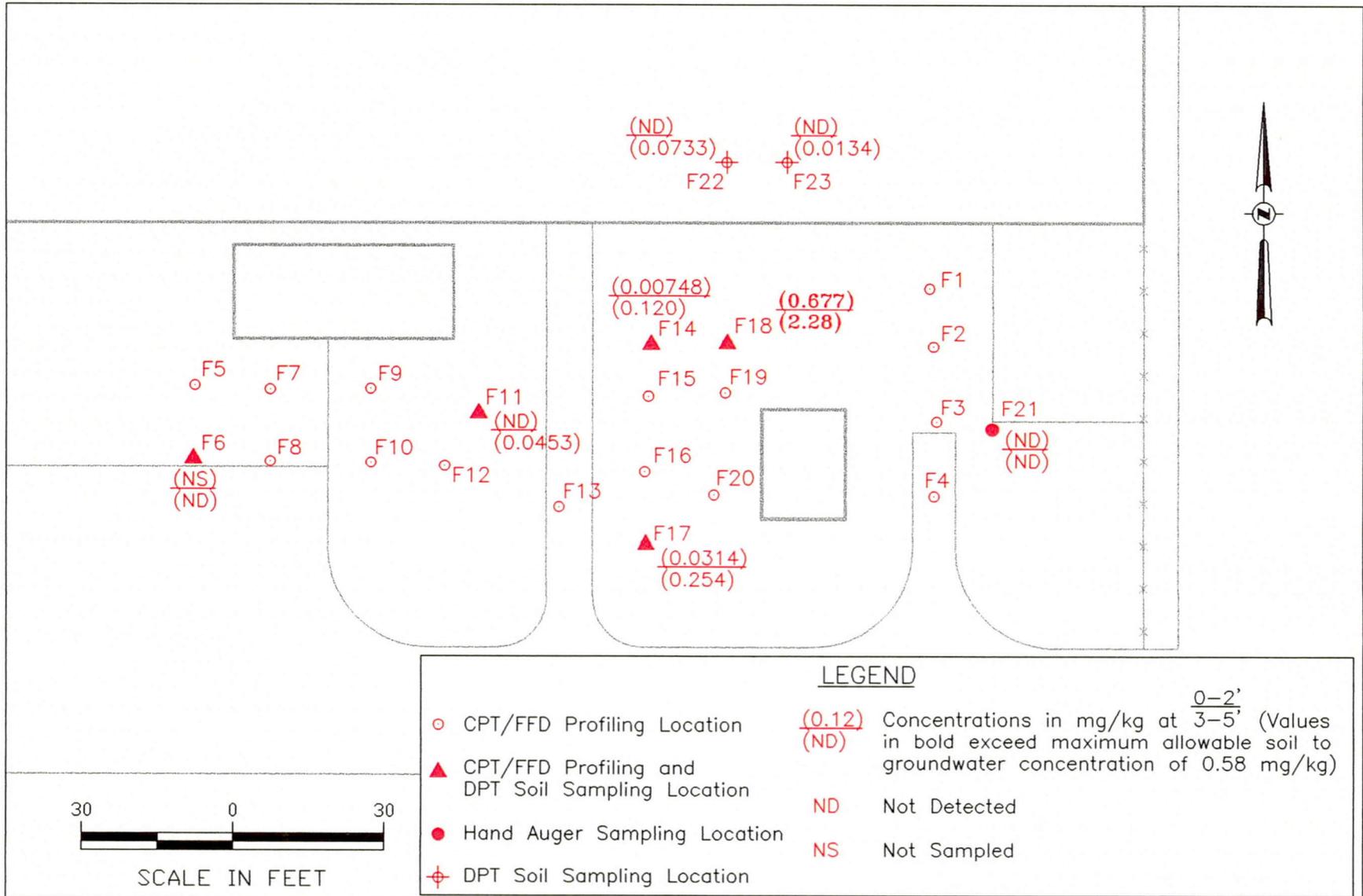
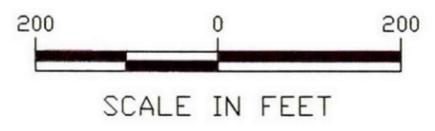
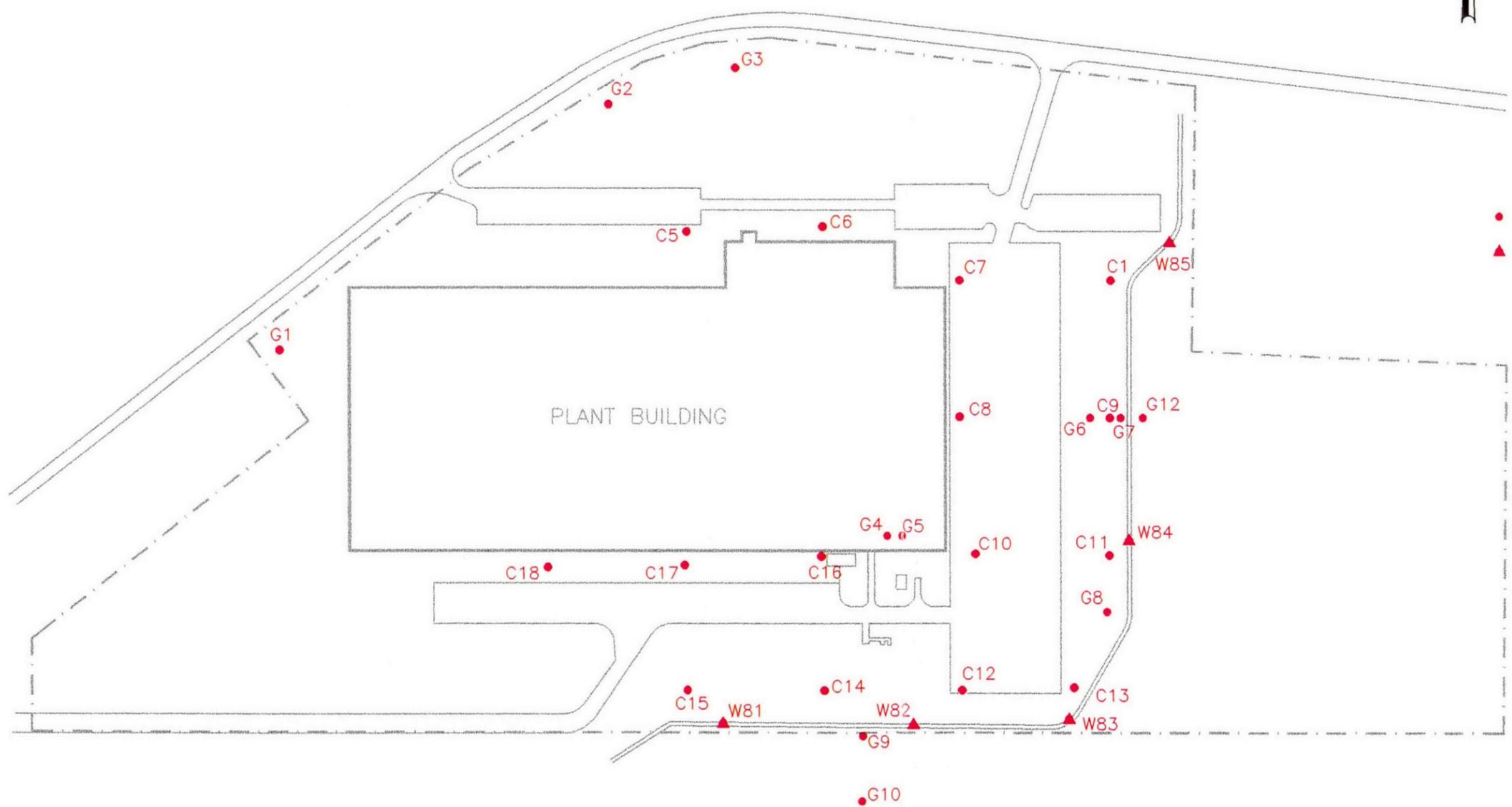


Figure 1-18. Approximate Distribution of Naphthalene in Source Area Soil Hamilton Beach & Proctor Silex, Inc.



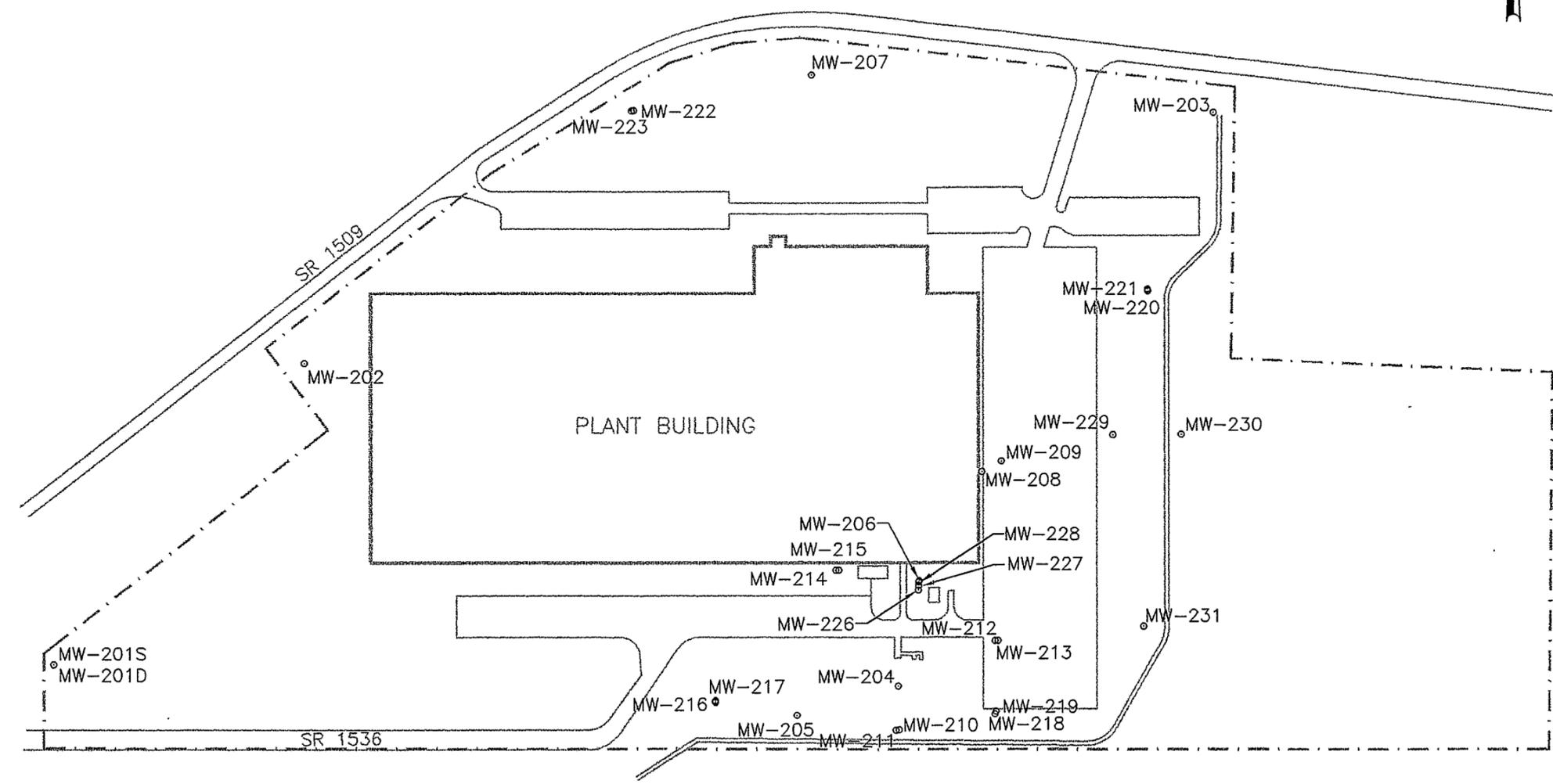
LEGEND

- DPT Groundwater Sampling Location
- ▲ Surface Water Sampling Location



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	16DEC98	DRAWING TITLE	Figure 1-19. Water Sampling Locations Hamilton Beach & Proctor Silex, Inc.		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	16DEC98				
	 RADIAN INTERNATIONAL	CHECKED BY	BPG	DATE	08JAN99				
	<small>A DAVIS & MOORE GROUP COMPANY</small>	APPROVED BY		DATE					
	<small>ISSUED WHILE THE NEW BUILDING WAS UNDER CONSTRUCTION</small>								
						CONTRACT NO.	650138.0601	DRAWING NO.	DPT-MON
								REV.	0

D:\HBPS\WASHINGTON\DPT-MON\27MAY98-1455

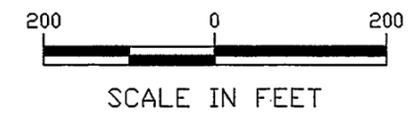


LEGEND

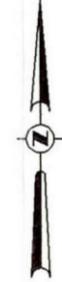
○ Monitoring Well

Note:
Well MW-206 was properly
closed in October 1998.

D:\HBPS\WASHINGTON\MONITOR\27MAY98-1455

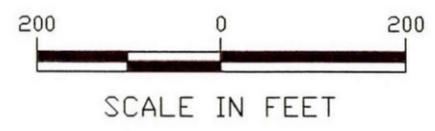
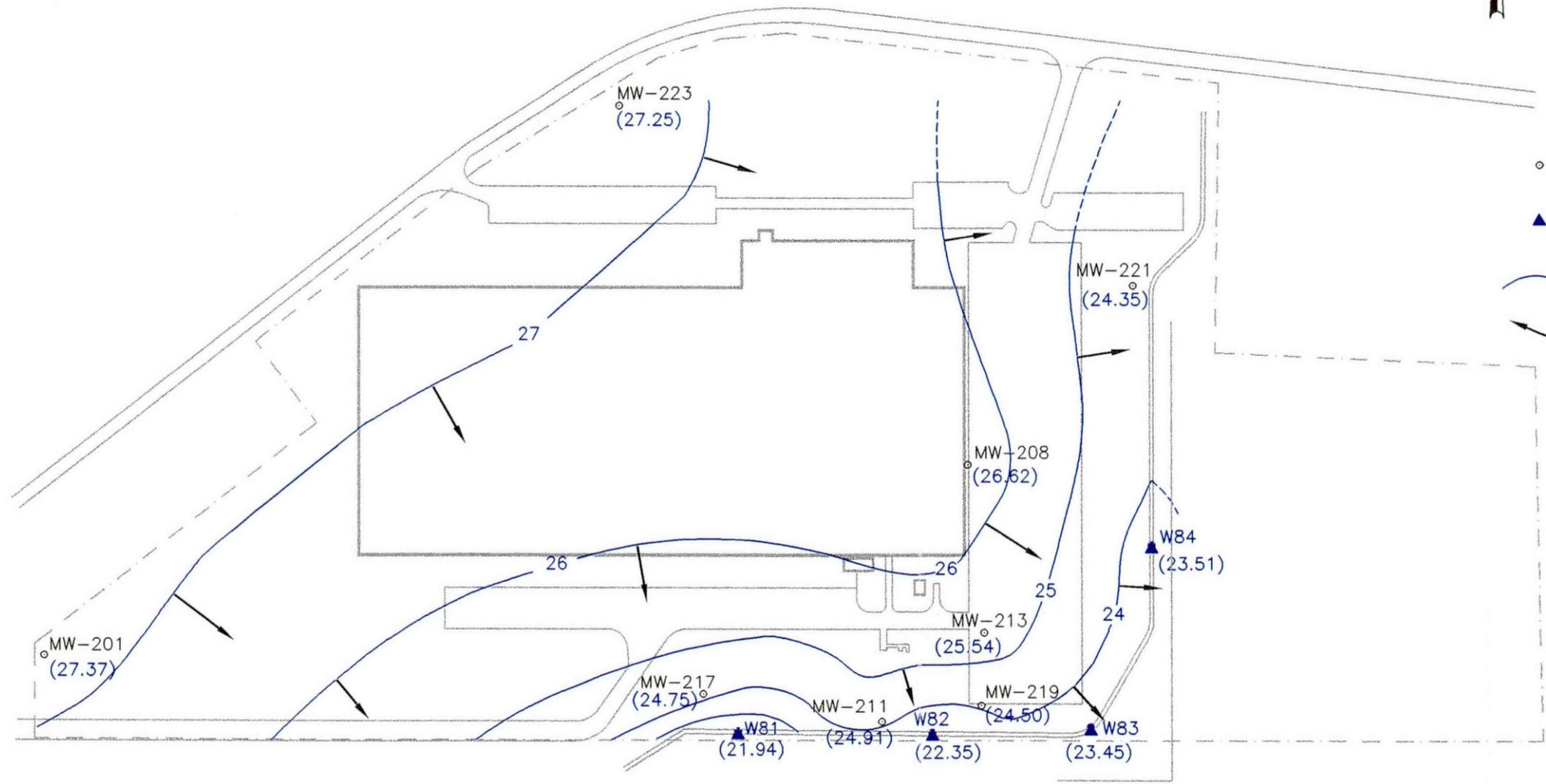


SCALE	AS SHOWN	REVISION BY	JN	DATE	14DEC98	DRAWING TITLE Figure 1-20. Location of Monitoring Wells Hamilton Beach & Proctor Silex, Inc
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	14DEC98	
	RADIAN INTERNATIONAL A DAVENPORT & ASSOCIATES COMPANY	CHECKED BY	BPG	DATE	08JAN99	CONTRACT NO. 650138.0601
		APPROVED BY		DATE		
						REV. 0



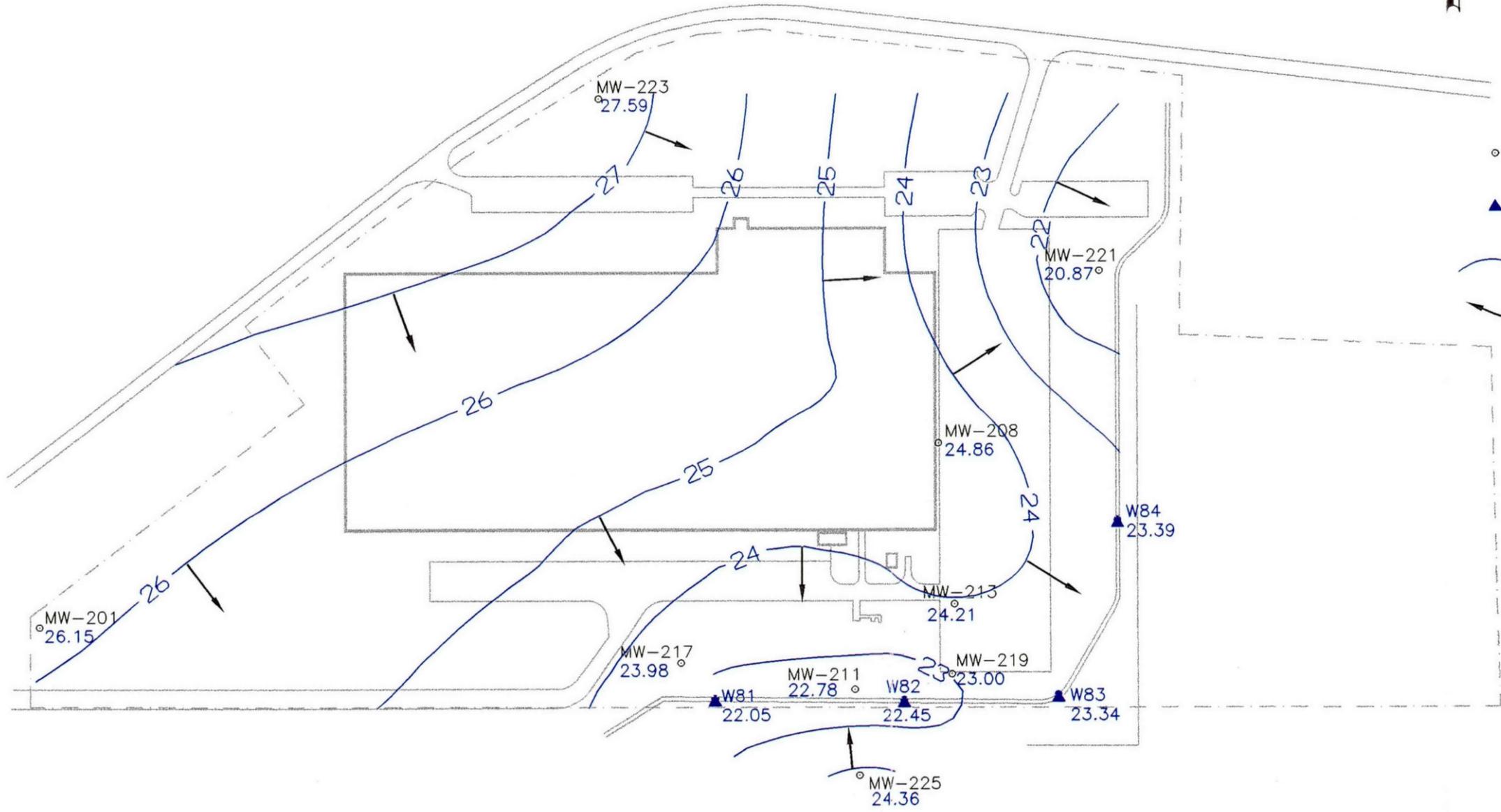
LEGEND

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



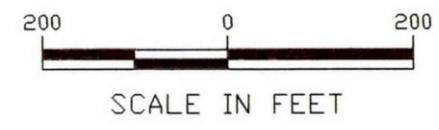
SCALE	AS SHOWN	DESIGNED BY	JN	DATE	16DEC98	DRAWING TITLE	Figure 1-21. Potentiometric Surface Map, Unit A, May 1998		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	16DEC98		Hamilton Beach & Proctor-Silex Inc.		
	RADIAN INTERNATIONAL	CHECKED BY	BPG	DATE	08JAN99	CONTRACT NO.	650138.0601	DRAWING NO.	SHALLOW-5
	A CH2M HILL COMPANY	APPROVED BY		DATE				REV.	0

D:\HBPS\WASHINGTON\SHALLOW\27MAY98-1455



LEGEND

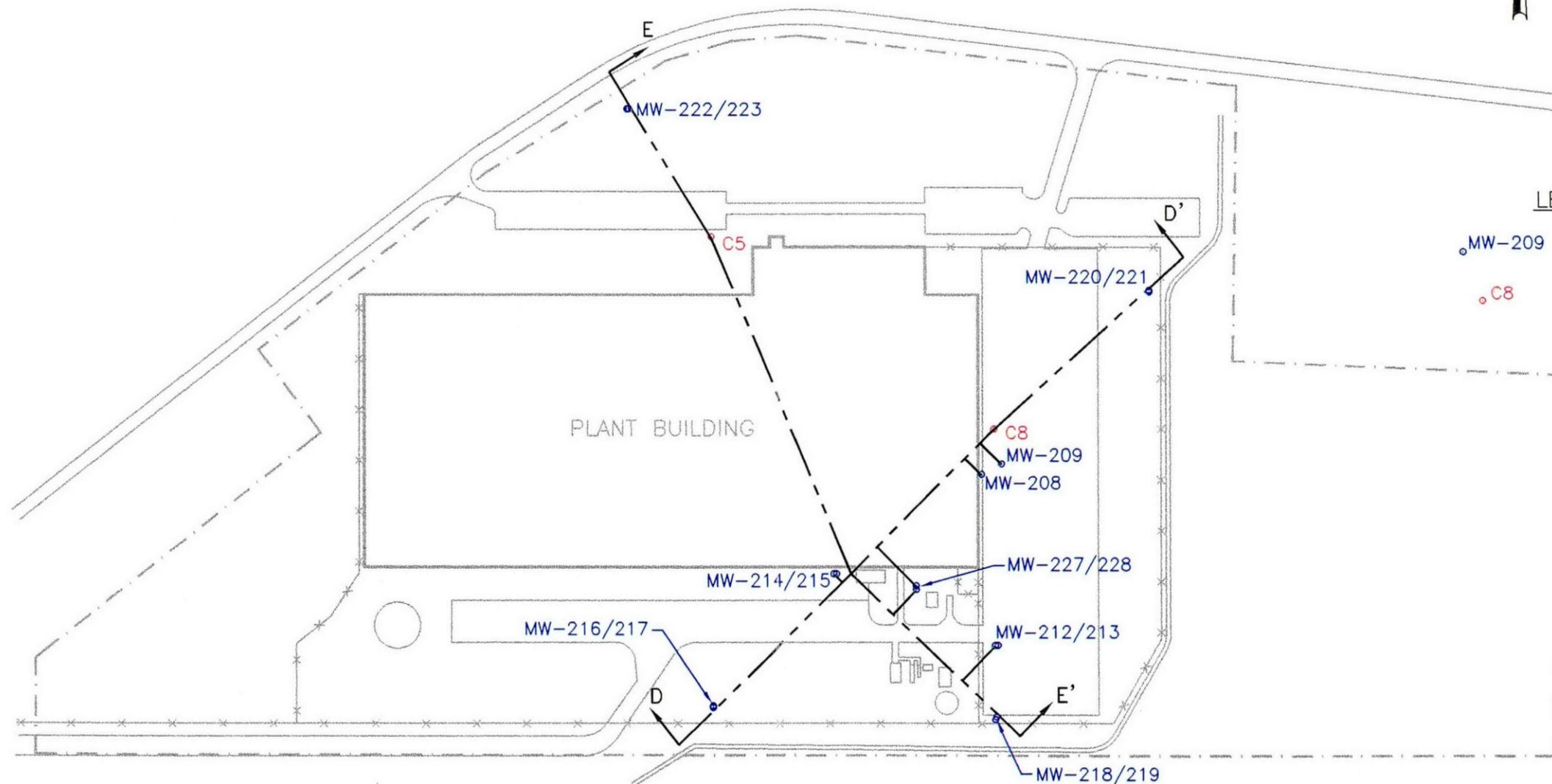
- Monitoring Well with Groundwater Elevation (MSL)
- ▲ Surface Water Measuring Point with Water Elevation
- Potentiometric Surface Contour (dashed where inferred)
- Groundwater Flow Direction



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	16DEC98	DRAWING TITLE	Figure 1-23. Potentiometric Surface Map, Unit A, November 1998 Hamilton Beach & Proctor-Silex Inc.		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	16DEC98				
	 RADIAN INTERNATIONAL	CHECKED BY	BPG	DATE	08JAN99				
	<small>A CHAMBER & MOORE GROUP COMPANY</small>	APPROVED BY		DATE					
	<small>82000 SHALLOW (REV. 08/05/98) 7/20</small>					CONTRACT NO.	650138.0601	DRAWING NO.	SHALLOW-11
						REV.			0

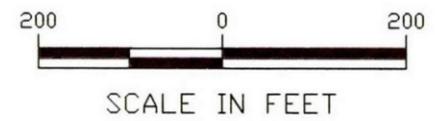
D:\HBFS\WASHINGTON\SHALLOW\27MAY98-1455

D:\HBPS\DE-SECT-23DEC98



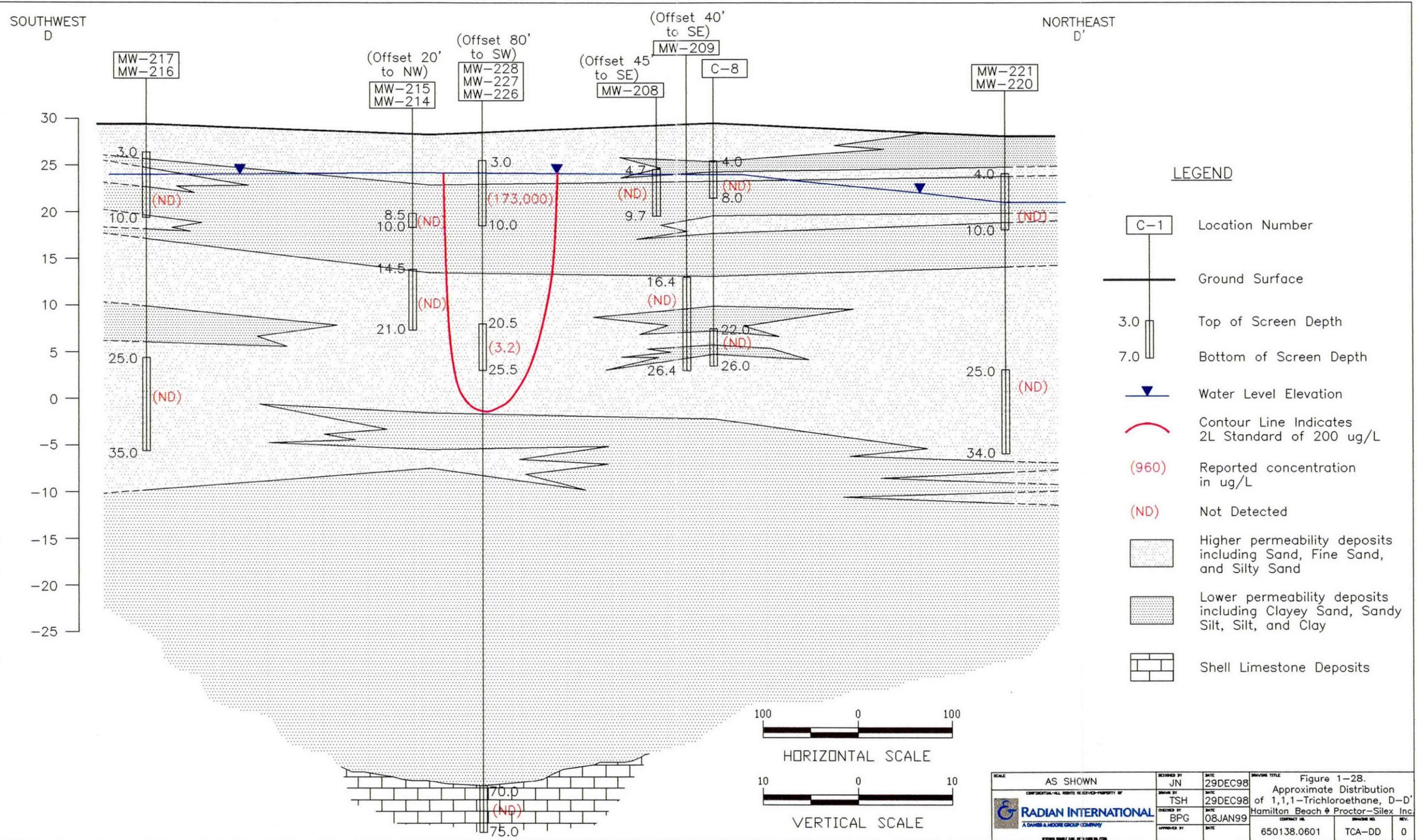
LEGEND

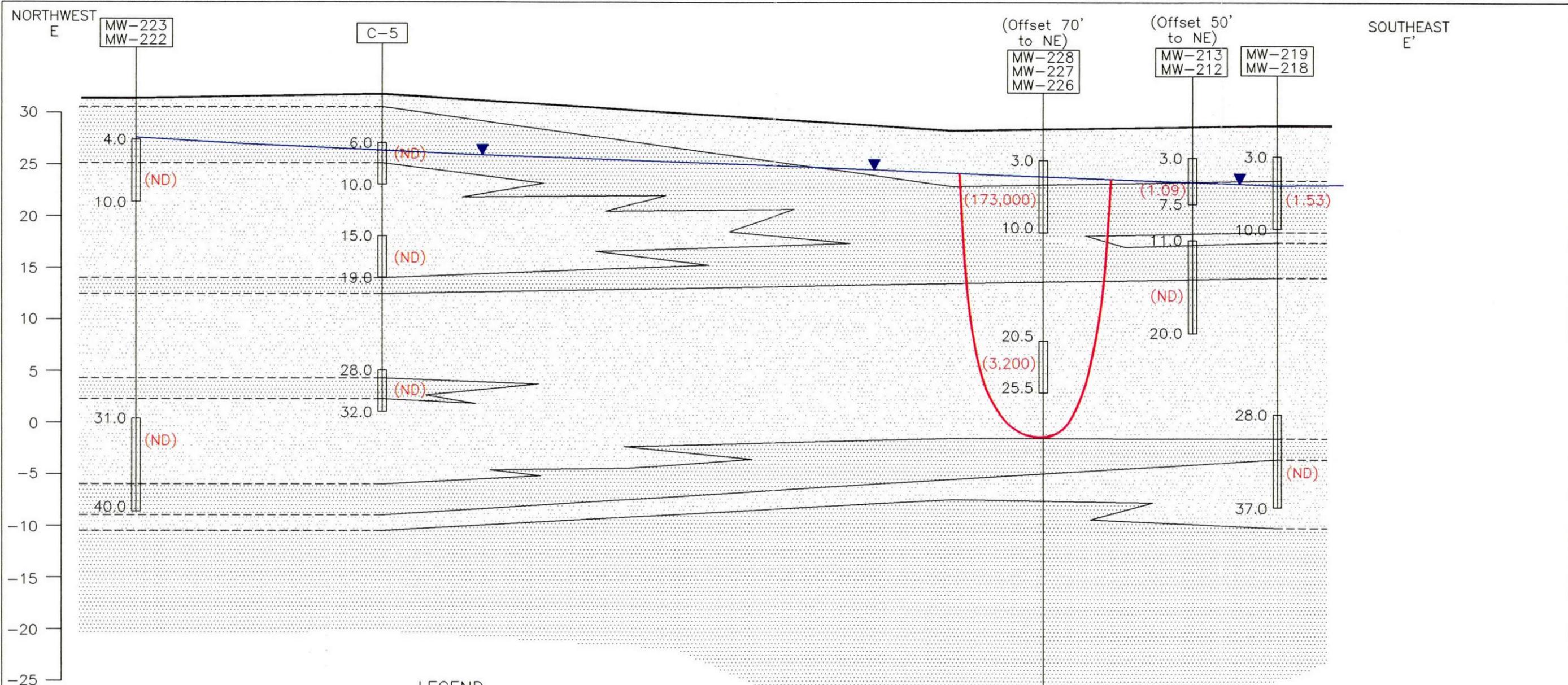
- MW-209 Monitoring Well
- C8 Groundwater Screening Location



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	23DEC98	DRAWING TITLE	Figure 1-25. Cross Section Locations Hamilton Beach & Proctor-Silex Inc.		
	<small>CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF</small>	DRAWN BY	TSH	DATE	23DEC98	DWG REVISION FIELD:			
	RADIAN INTERNATIONAL <small>A TAYLOR & FRANCIS GROUP COMPANY</small>	CHECKED BY	BPG	DATE	08JAN99	CONTRACT NO.	650138.0601	DRAWING NO.	DE-SECT
	<small>ISSUED UNDER FILE # 100 00100 070</small>	APPROVED BY		DATE					REV. 0

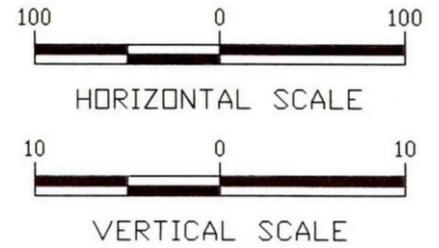
D:\HBPS\WASHINGTON\TCA-DD\31DEC98





LEGEND

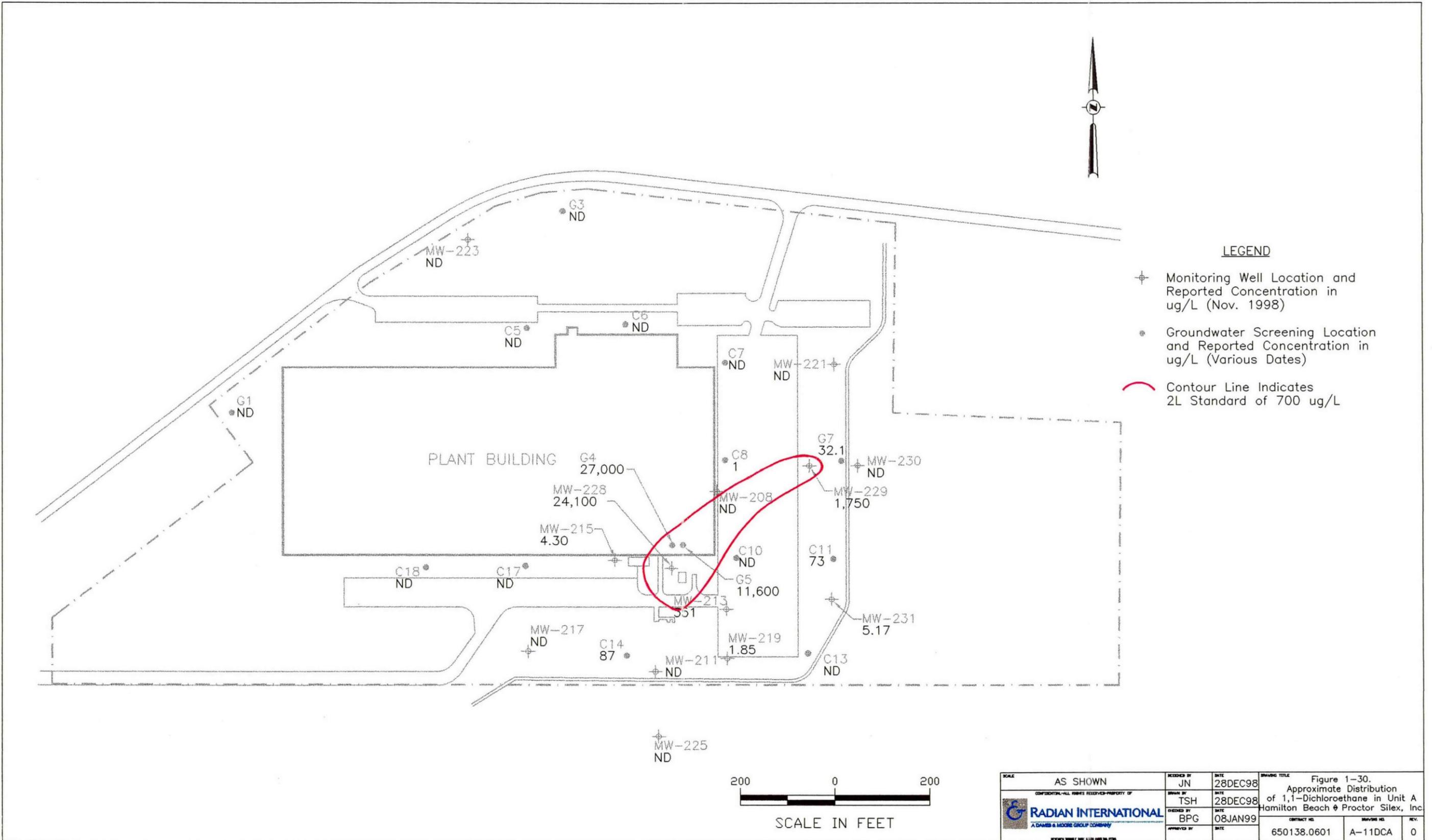
- C-1 Location Number
- Ground Surface Elevation
- Top of Screen Depth
- Bottom of Screen Depth
- Water Level Elevation
- Contour Line Indicates 2L Standard of 200 ug/L
- (960) Reported concentration in ug/L
- (ND) Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay
- Shell Limestone Deposits



D:\HBPS\WASHINGTON\TCA-EE\30DEC98

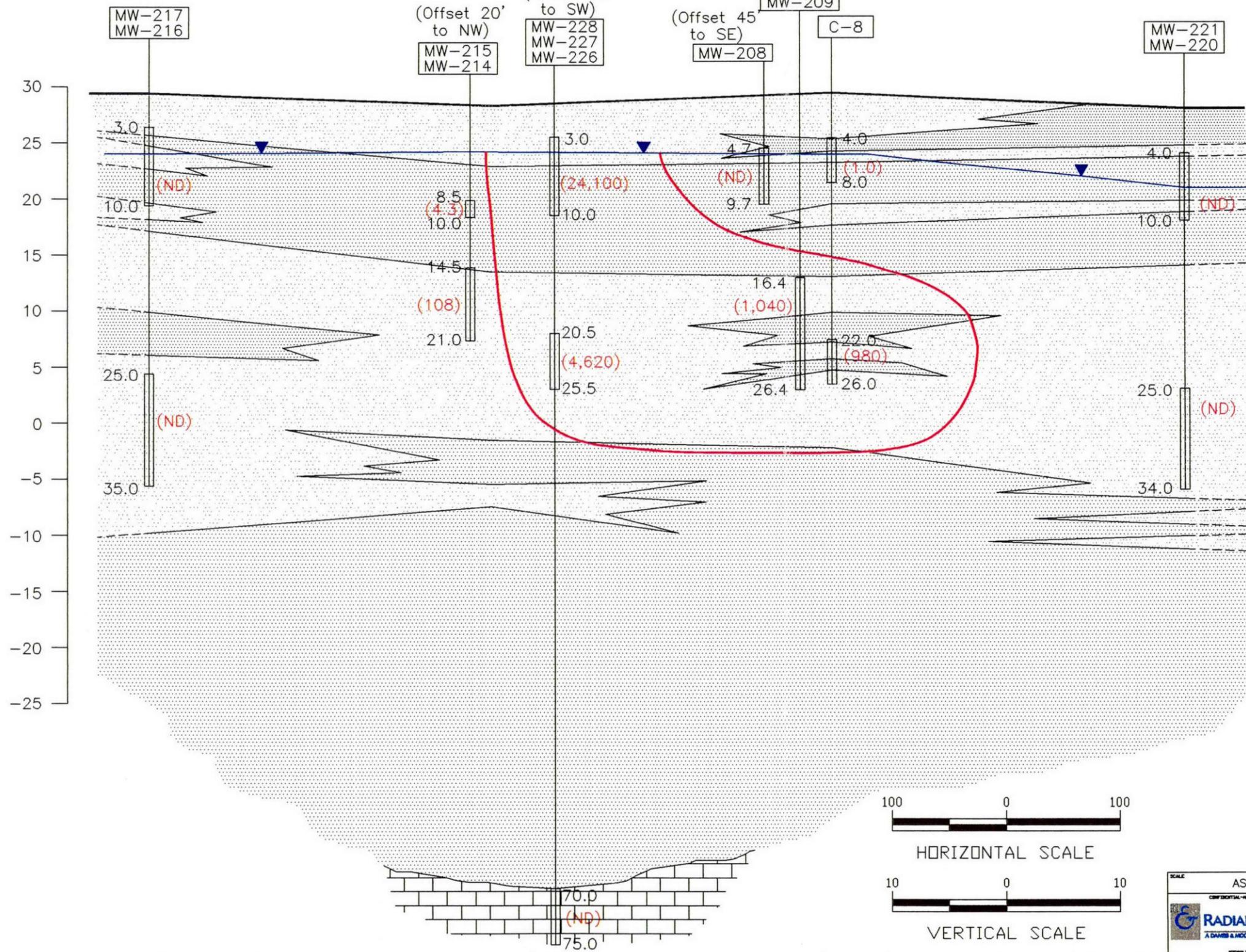
AS SHOWN		DESIGNED BY	JN	DATE	30DEC98	DRAWING TITLE Figure 1-29. Approximate Distribution of 1,1,1-Trichloroethane, E-E' Hamilton Beach & Proctor-Sillex Inc.	
CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF		DRAWN BY	TSH	DATE	30DEC98		
RADIAN INTERNATIONAL A DANIEL & JOHNSON GROUP COMPANY		CHECKED BY	BPG	DATE	08JAN99		
		APPROVED BY		DATE			
		CONTRACT NO.	650138.0601	DRAWING NO.	TCA-EE	REV.	0

D:\HBPS\UNITA\15DEC9898



SOUTHWEST
D

NORTHEAST
D'



LEGEND

- C-1 Location Number
- Ground Surface
- 3.0 Top of Screen Depth
- 7.0 Bottom of Screen Depth
- Water Level Elevation
- Contour Line Indicates 2L Standard of 700 ug/L
- (960) Reported concentration in ug/L
- (ND) Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay
- Shell Limestone Deposits



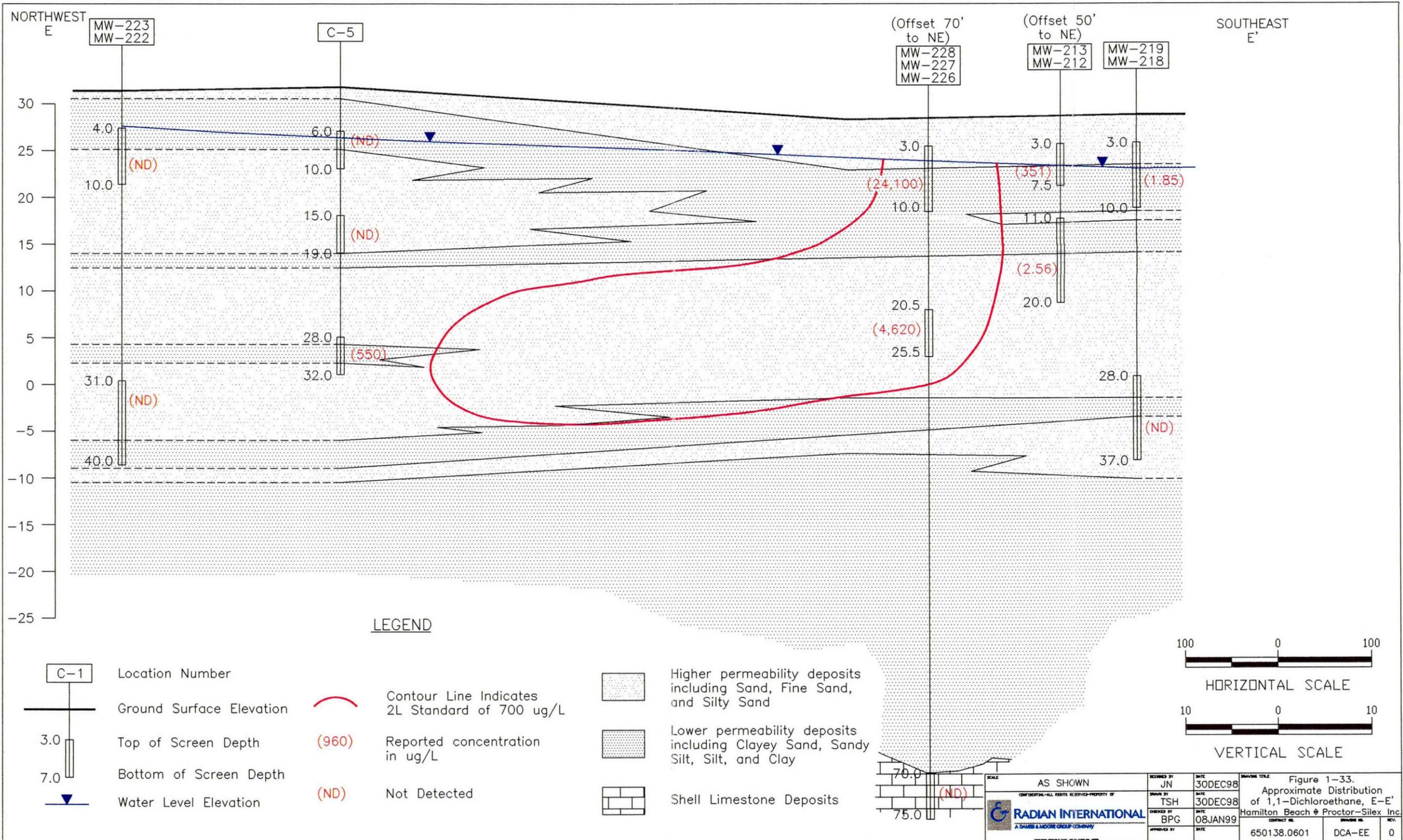
HORIZONTAL SCALE



VERTICAL SCALE

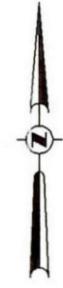
SCALE	AS SHOWN	REVIEWED BY	JN	DATE	29DEC98	DRAWING TITLE	Figure 1-32. Approximate Distribution of 1,1-Dichloroethane, D-D' Hamilton Beach & Proctor-Silex Inc.		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	29DEC98				
	RADIANT INTERNATIONAL A DANIEL & ANCORE GROUP COMPANY	ORDERED BY	BPG	DATE	08JAN99				
		APPROVED BY		DATE		CONTRACT NO.	650138.0601	DRAWING NO.	DCA-DD
									REV. 0

D:\HBPS\WASHINGTON\CA-DD\31DEC98



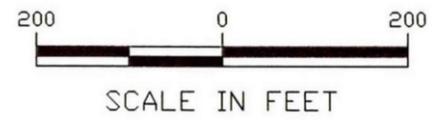
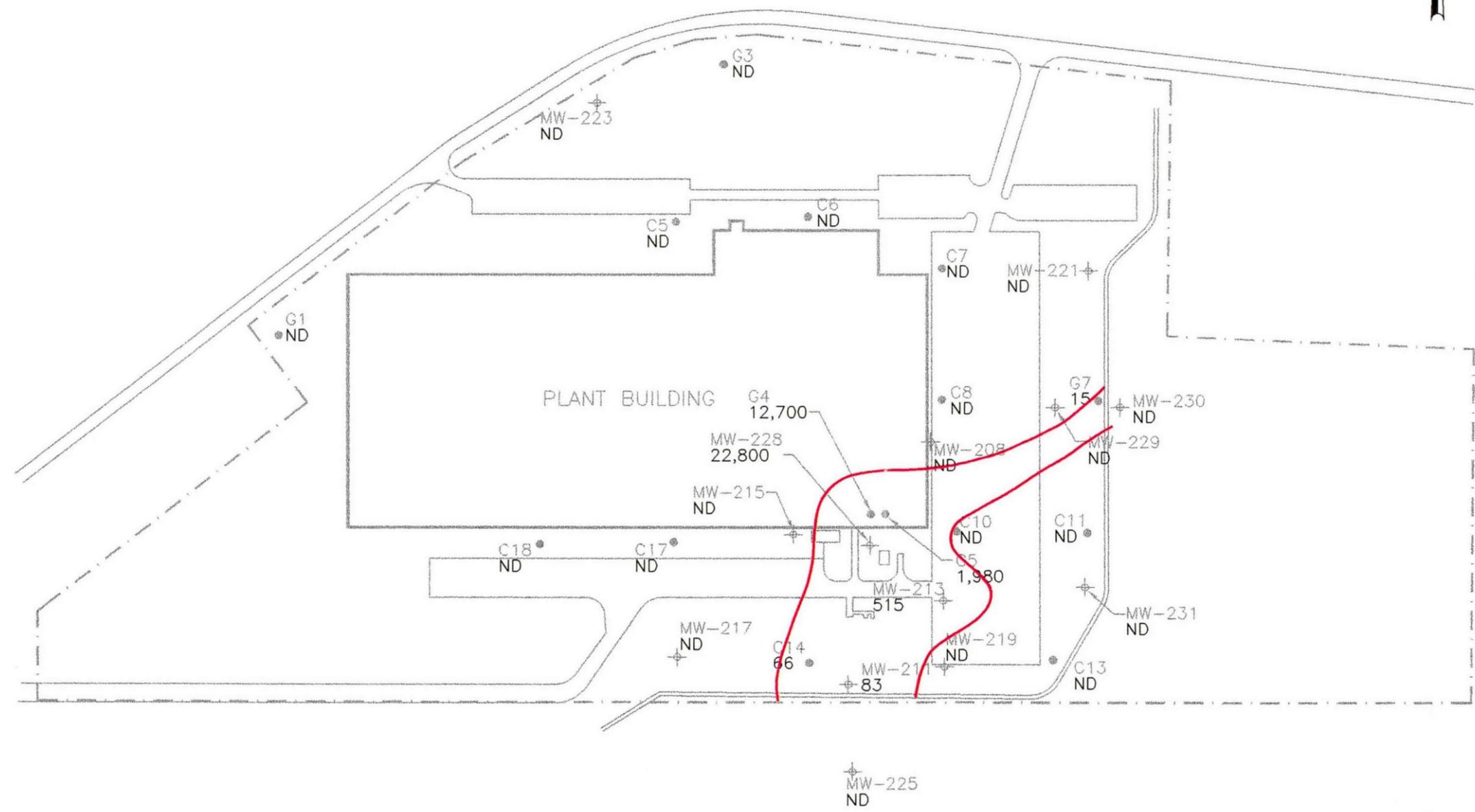
D:\HBPS\WASHINGTON\CA-EE\30DEC98

AS SHOWN		REVISION BY	JN	DATE	30DEC98	DRAWING TITLE	Figure 1-33. Approximate Distribution of 1,1-Dichloroethane, E-E' Hamilton Beach & Proctor-Silex Inc.		
CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF		DRAWN BY	TSH	DATE	30DEC98		CONTRACT NO.	DRAWING NO.	REV.
		CHECKED BY	BPG	DATE	08JAN99	650138.0601	DCA-EE	0	
RADIANT INTERNATIONAL A DANIEL & JOHNSON COMPANY		APPROVED BY		DATE					



LEGEND

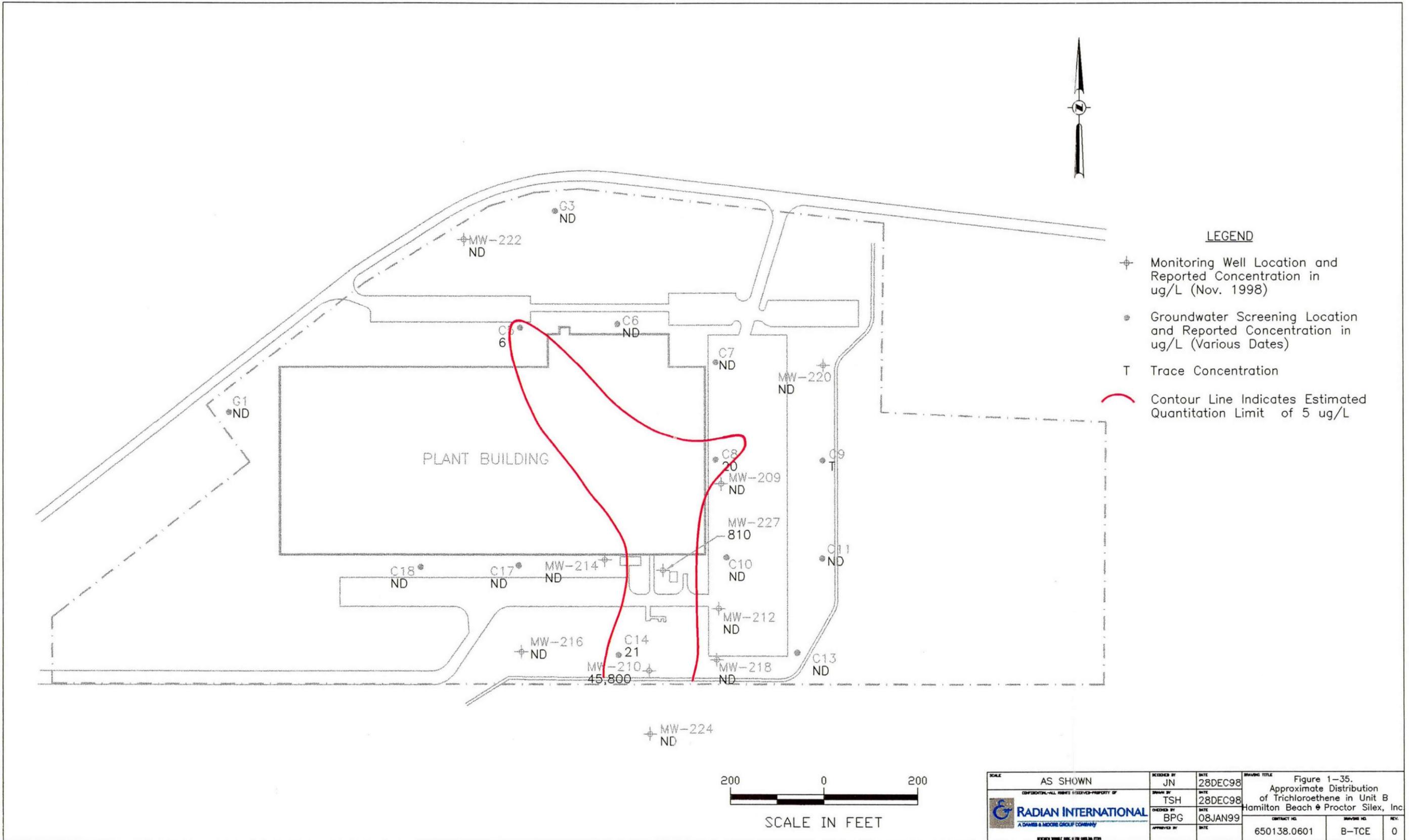
- ⊕ Monitoring Well Location and Reported Concentration in ug/L (Nov. 1998)
- Groundwater Screening Location and Reported Concentration in ug/L (Various Dates)
- Contour Line Indicates Estimated Quantitation Limit of 5 ug/L



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	28DEC98	DRAWING TITLE	Figure 1-34. Approximate Distribution of Trichloroethene in Unit A Hamilton Beach & Proctor Silex, Inc.		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28DEC98		CONTRACT NO.	DRAWING NO.	REV.
	RADIANT INTERNATIONAL A DANIEL & JOHNSON GROUP COMPANY	CHECKED BY	BPG	DATE	08JAN99	650138.0601	UNITA-TCE	0	
		APPROVED BY		DATE					

D:\HBPS\UNITA\15DEC9898

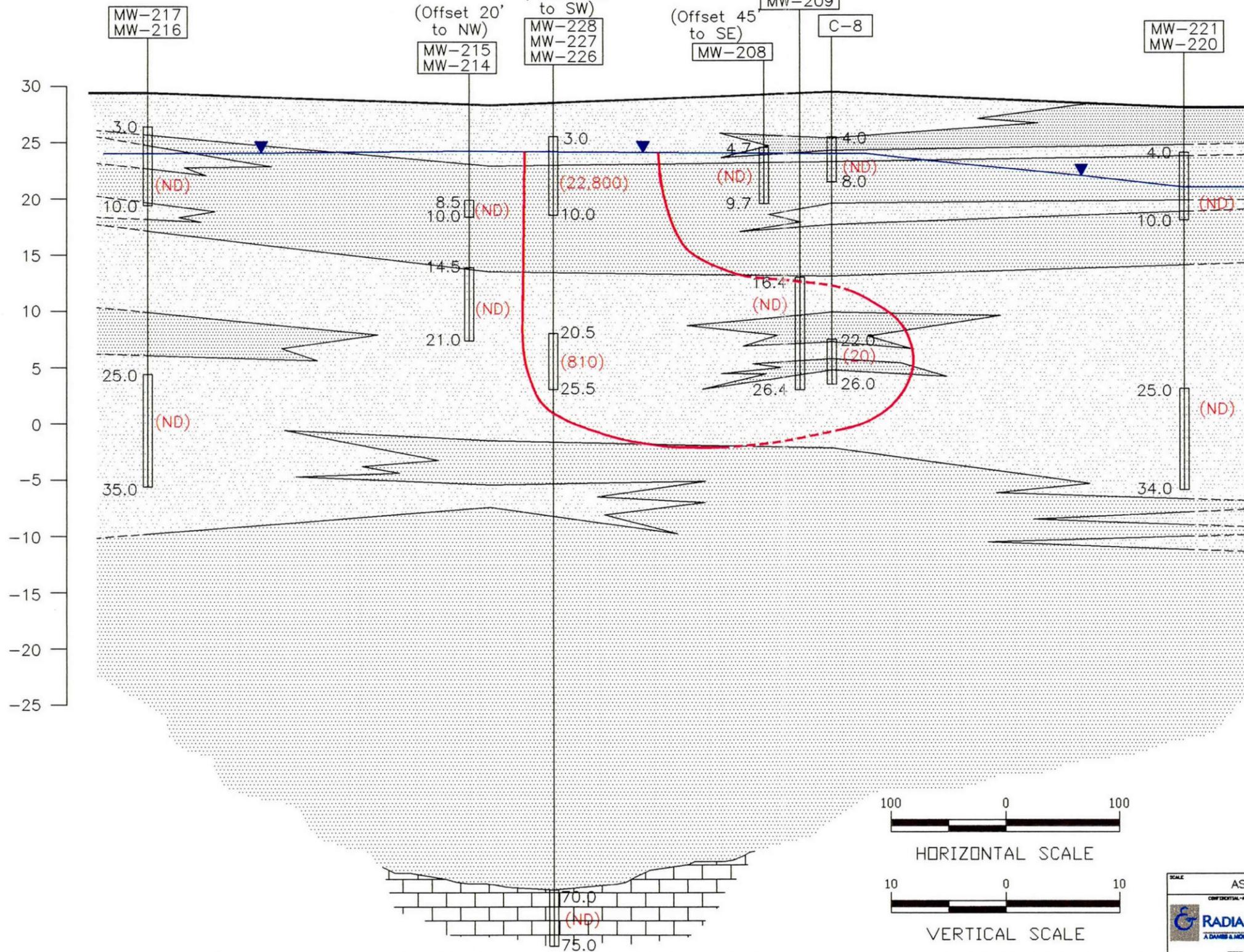
D:\HBPS\UNITA\15DEC9898



<small>CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF</small> <small>A DAMBER & MOORE GROUP COMPANY</small> <small>SEARCH ENGINE NO. 178 00124 070</small>	DESIGNED BY	JN	DATE	28DEC98	<small>DRAWING TITLE</small> Figure 1-35. Approximate Distribution of Trichloroethene in Unit B Hamilton Beach Proctor Silex, Inc
	DRAWN BY	TSH	DATE	28DEC98	
	CHECKED BY	BPG	DATE	08JAN99	
	APPROVED BY		DATE		
<small>SCALE</small>		AS SHOWN		<small>CONTRACT NO.</small>	650138.0601
				<small>DRAWING NO.</small>	B-TCE
				<small>REV.</small>	0

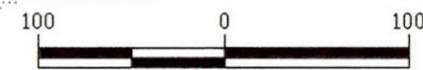
SOUTHWEST
D

NORTHEAST
D'



LEGEND

- C-1 Location Number
- Ground Surface
- 3.0 Top of Screen Depth
- 7.0 Bottom of Screen Depth
- ▼ Water Level Elevation
- Contour Line Indicates Estimated Quantitation Limit of 5 ug/L
- - - Dashed Line Indicates that Plume is Offset from Section Shown
- (960) Reported concentration in ug/L
- (ND) Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay
- Shell Limestone Deposits



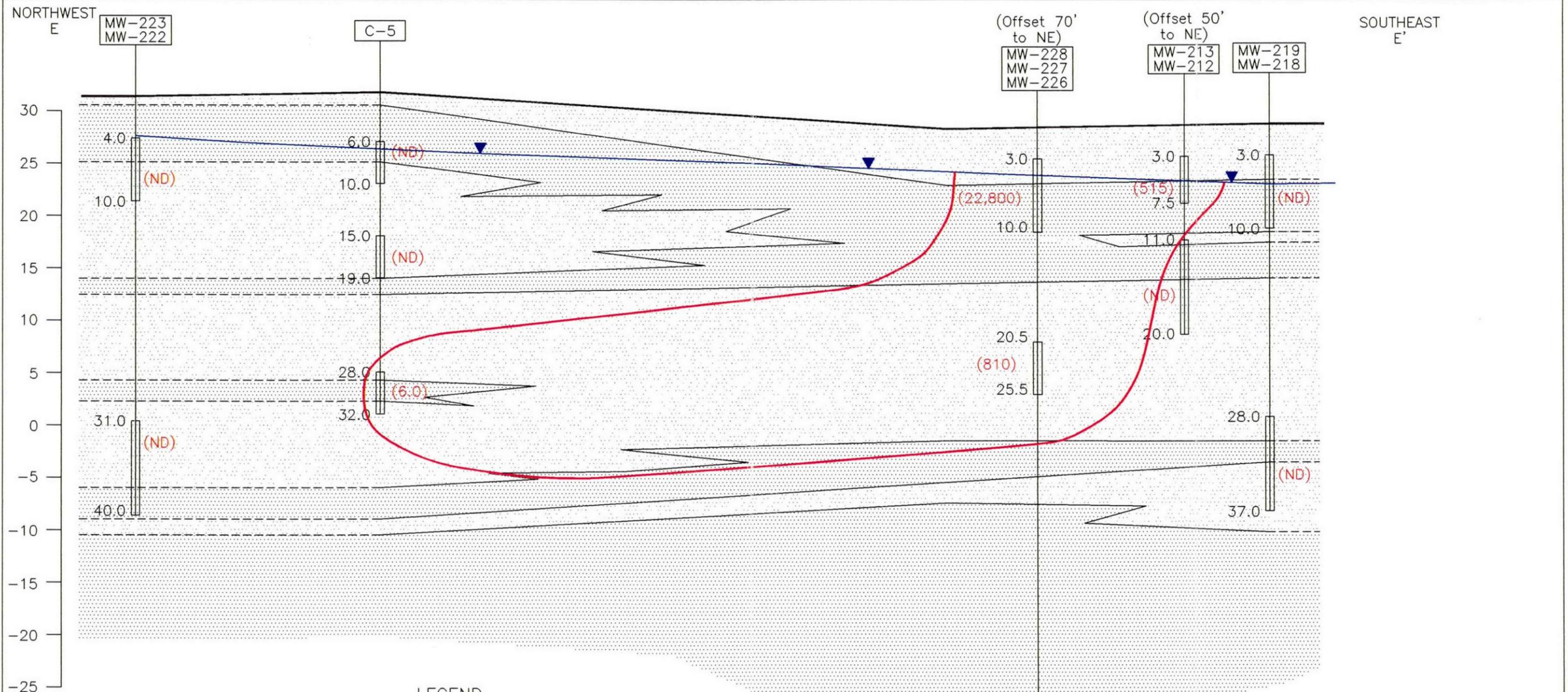
HORIZONTAL SCALE



VERTICAL SCALE

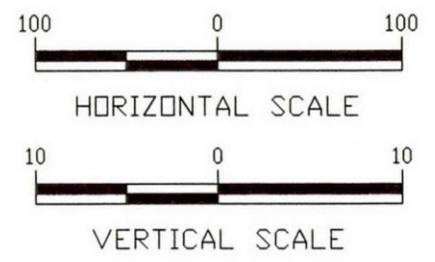
SCALE	AS SHOWN	REVISIONS BY	JN	DATE	29DEC98	DRAWING TITLE	Figure 1-36. Approximate Distribution of Trichloroethene, D-D'		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	29DEC98		Hamilton Beach & Proctor-Silex Inc.		
	RADIAN INTERNATIONAL <small>A DANBRO & ANDREWS GROUP COMPANY</small>	CHECKED BY	BPG	DATE	08JAN99	CONTRACT NO.	650138.0601	DRAWING NO.	TCE-DD
		APPROVED BY		DATE				REV.	0

D:\HBPS\WASHINGTON\TCA-DD\31DEC98



LEGEND

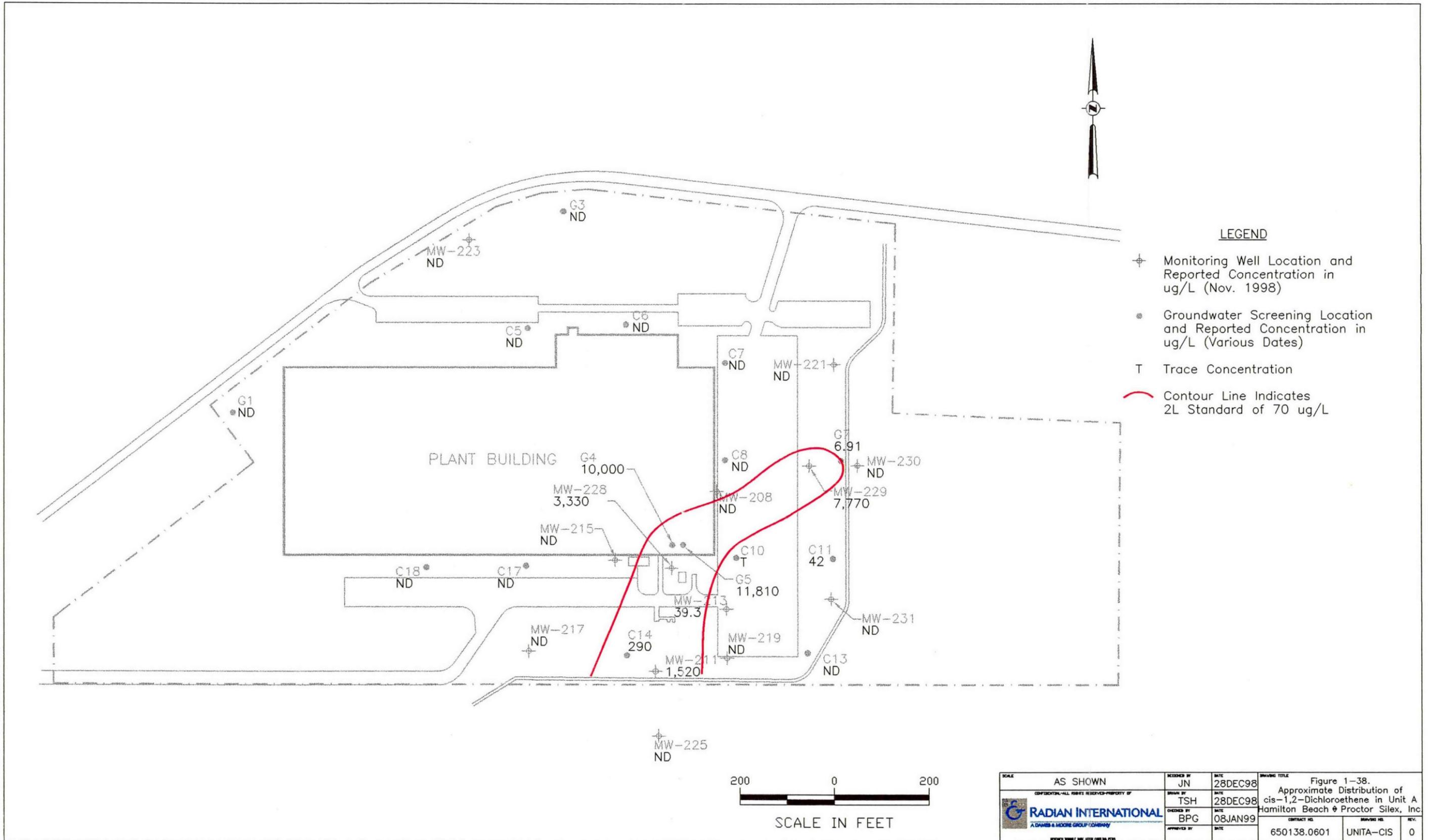
- Location Number
- Ground Surface Elevation
- Top of Screen Depth
- Bottom of Screen Depth
- Water Level Elevation
- Contour Line Indicates Estimated Quantitation Limit of 5 ug/L
- Reported concentration in ug/L
- Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay
- Shell Limestone Deposits



SCALE AS SHOWN		REVISION BY JN	DATE 30DEC98	DRAWING TITLE Figure 1-37. Approximate Distribution of Trichloroethene, E-E' Hamilton Beach & Proctor-Sillex Inc. CONTRACT NO. 650138.0601 DRAWING NO. TCE-EE REV. 0
CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF		DRAWN BY TSH	DATE 30DEC98	
		CHECKED BY BPG	DATE 08JAN99	
A DAVIS & MOORE GROUP COMPANY		APPROVED BY	DATE	

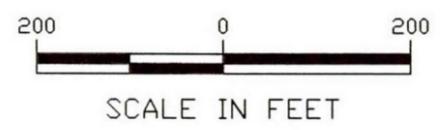
D:\HBPS\WASHINGTON\TCA-EE\30DEC98

D:\HBPS\UNITA\15DEC9898



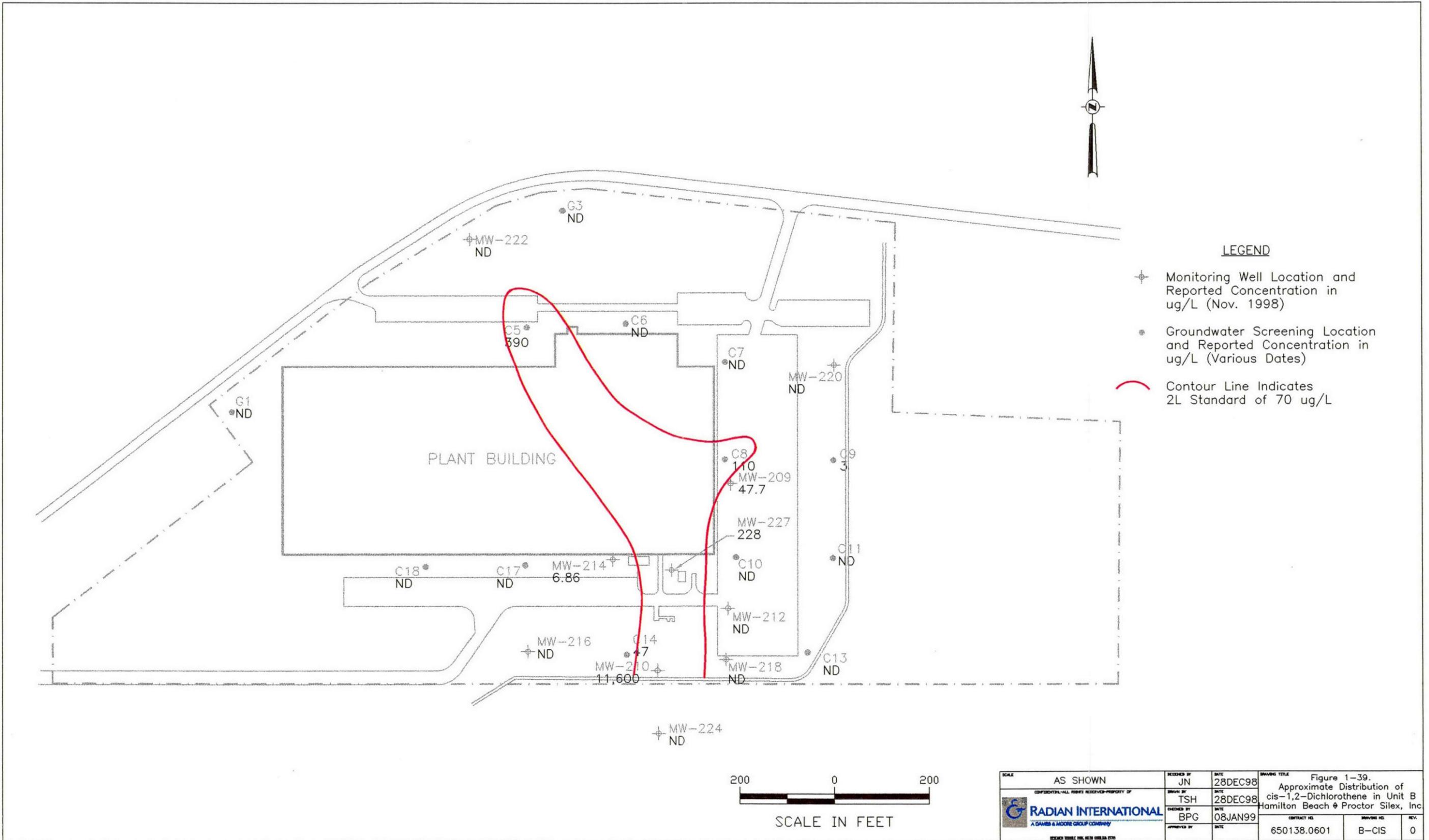
LEGEND

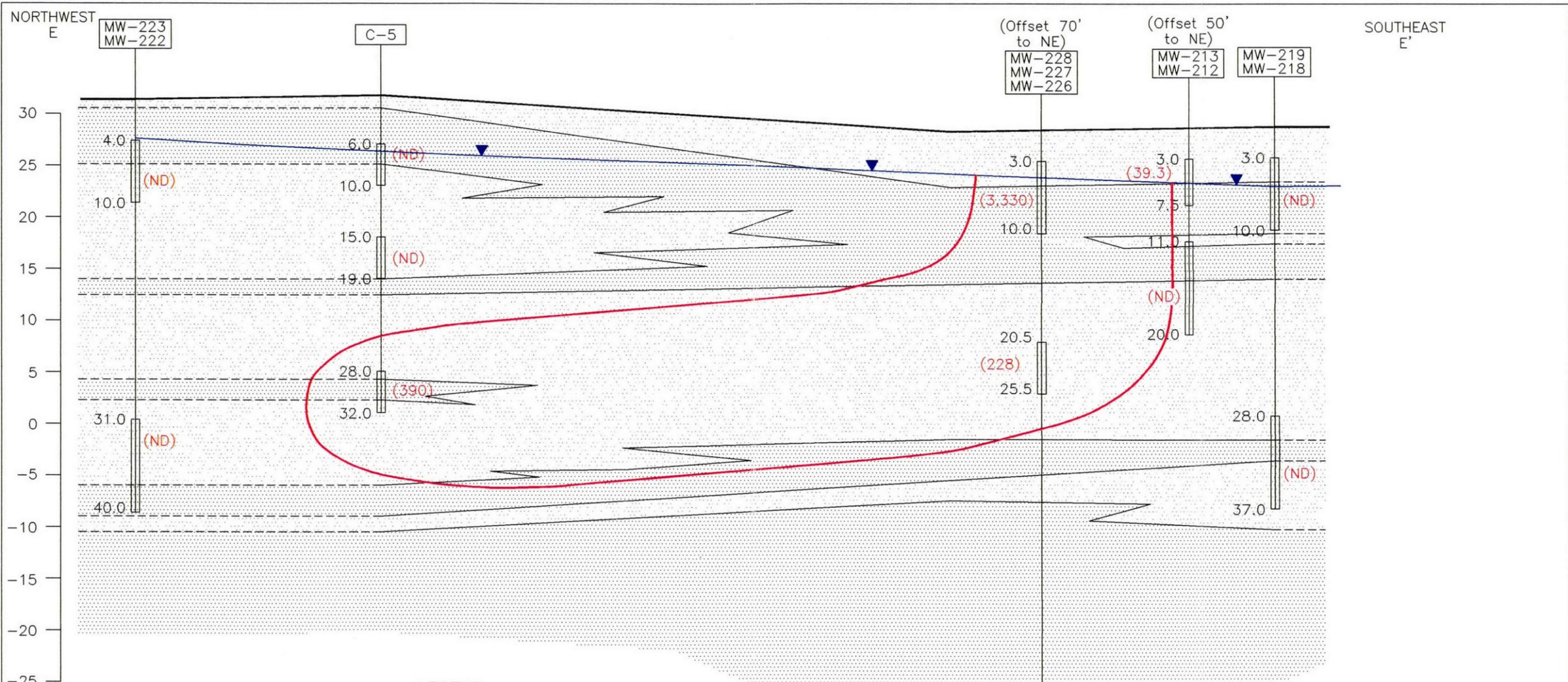
- ⊕ Monitoring Well Location and Reported Concentration in ug/L (Nov. 1998)
- Groundwater Screening Location and Reported Concentration in ug/L (Various Dates)
- T Trace Concentration
- Contour Line Indicates 2L Standard of 70 ug/L



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	28DEC98	DRAWING TITLE	Figure 1-38.
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28DEC98	Approximate Distribution of	cis-1,2-Dichloroethene in Unit A
	RADIAN INTERNATIONAL	CHECKED BY	BPG	DATE	08JAN99	Hamilton Beach & Proctor Silcox, Inc.	
	A DAMBER & MOORE GROUP COMPANY	APPROVED BY		DATE		CONTRACT NO.	650138.0601
						DRAWING NO.	UNITA-CIS
						REV.	0

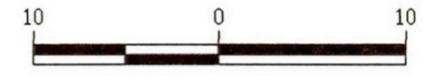
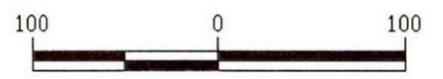
D:\HBPS\UNITA\15DEC9898





LEGEND

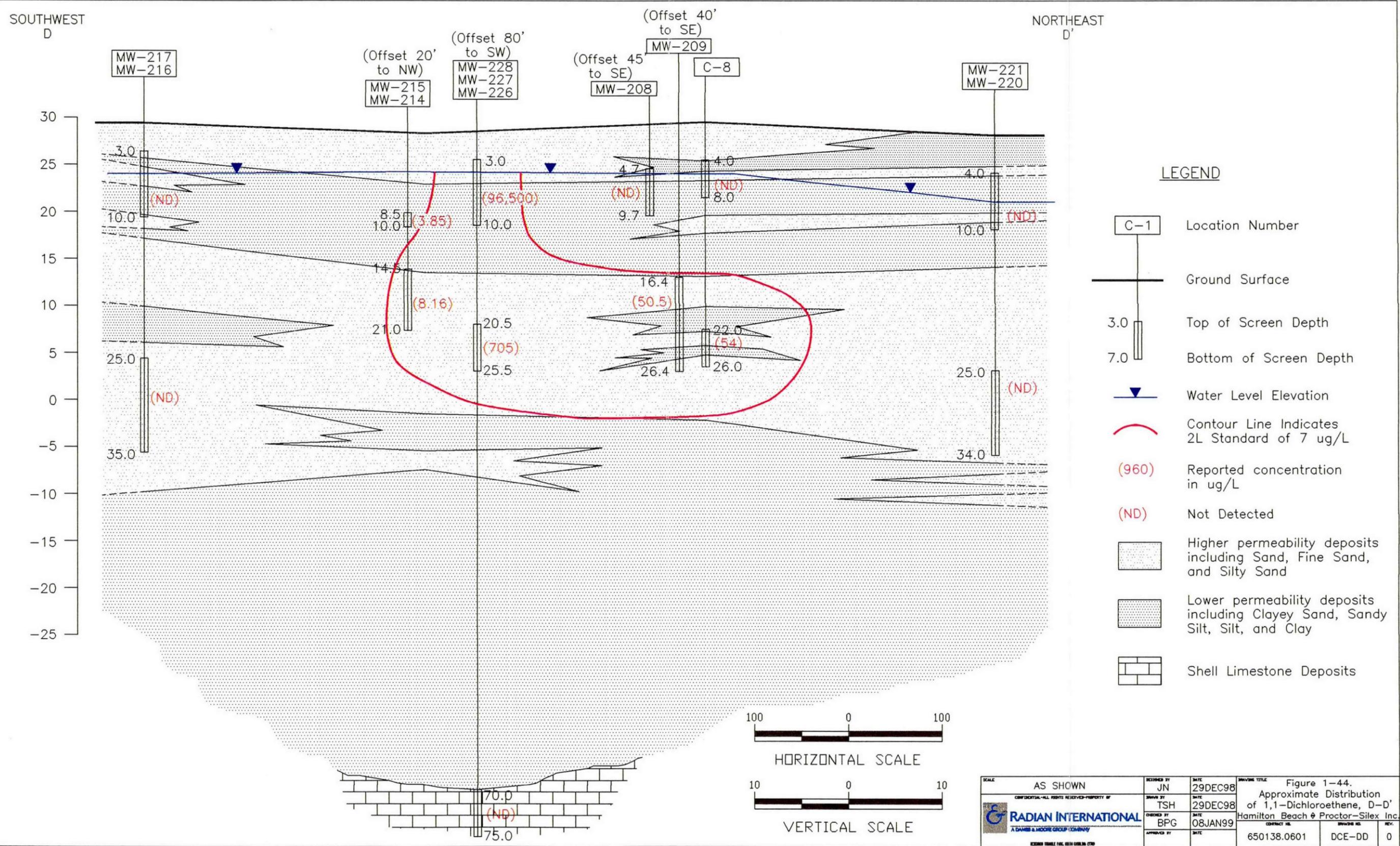
- Location Number
- Ground Surface Elevation
- Top of Screen Depth
- Bottom of Screen Depth
- Water Level Elevation
- Contour Line Indicates 2L Standard of 70 ug/L
- Reported concentration in ug/L
- Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay
- Shell Limestone Deposits

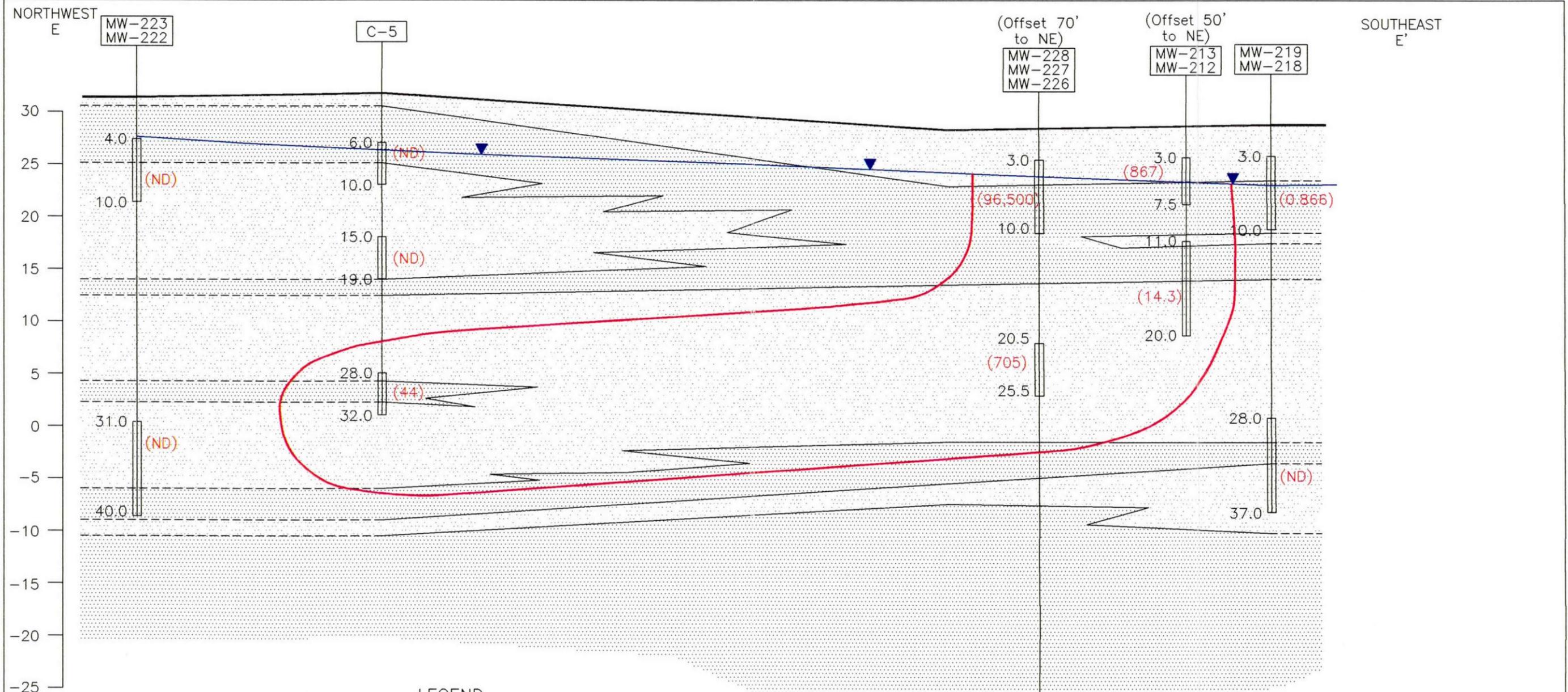


SCALE	AS SHOWN	REVISIONS	DATE	BY	FIGURE TITLE
		JN	30DEC98		Figure 1-41.
		TSH	30DEC98		Approximate Distribution of
		BPG	08JAN99		cis-1,2-Dichloroethene, E-E'
					Hamilton Beach & Proctor-Silex, Inc.
					CONTRACT NO.
					650138.0601
					REV.
					0

D:\HBPS\WASHINGTON\CIS-EE\30DEC98

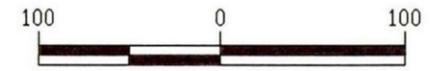
D:\HBPS\WASHINGTON\DCE-DD\31DEC98



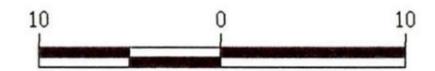


LEGEND

- Location Number
- Ground Surface Elevation
- Top of Screen Depth
- Bottom of Screen Depth
- Water Level Elevation
- Contour Line Indicates 2L Standard of 7 ug/L
- Reported concentration in ug/L
- Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay
- Shell Limestone Deposits



HORIZONTAL SCALE

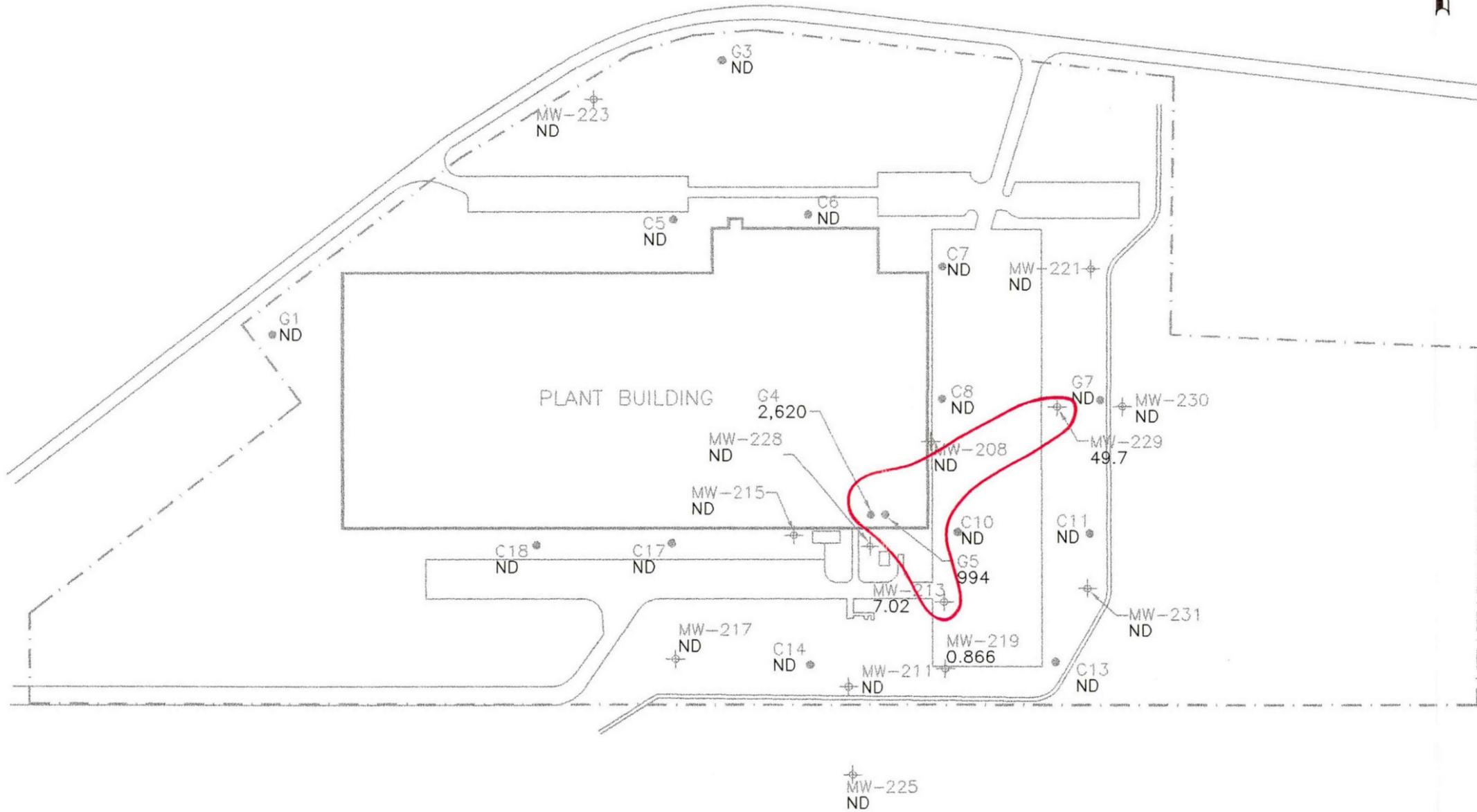


VERTICAL SCALE

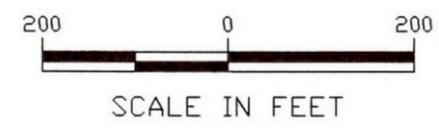
D:\HBPS\WASHINGTON\DCE-EE\30DEC98

SCALE		AS SHOWN		REVISION BY	JN	DATE	30DEC98	DRAWING TITLE Figure 1-45. Approximate Distribution of 1,1-Dichloroethene, E-E' Hamilton Beach & Proctor-Silex, Inc.
CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF		RADIANT INTERNATIONAL		DRAWN BY	TSH	DATE	30DEC98	
A DAMAS & MOORE GROUP COMPANY		A DAMAS & MOORE GROUP COMPANY		CHECKED BY	BPG	DATE	08JAN99	
REGARD TRADE MARK, SEE OTHER SHEETS				APPROVED BY		DATE		
				CONTRACT NO.		650138.0601		DRAWING NO. DCE-EE
				REV.		0		

D:\HBPS\UNITA\15DEC9898

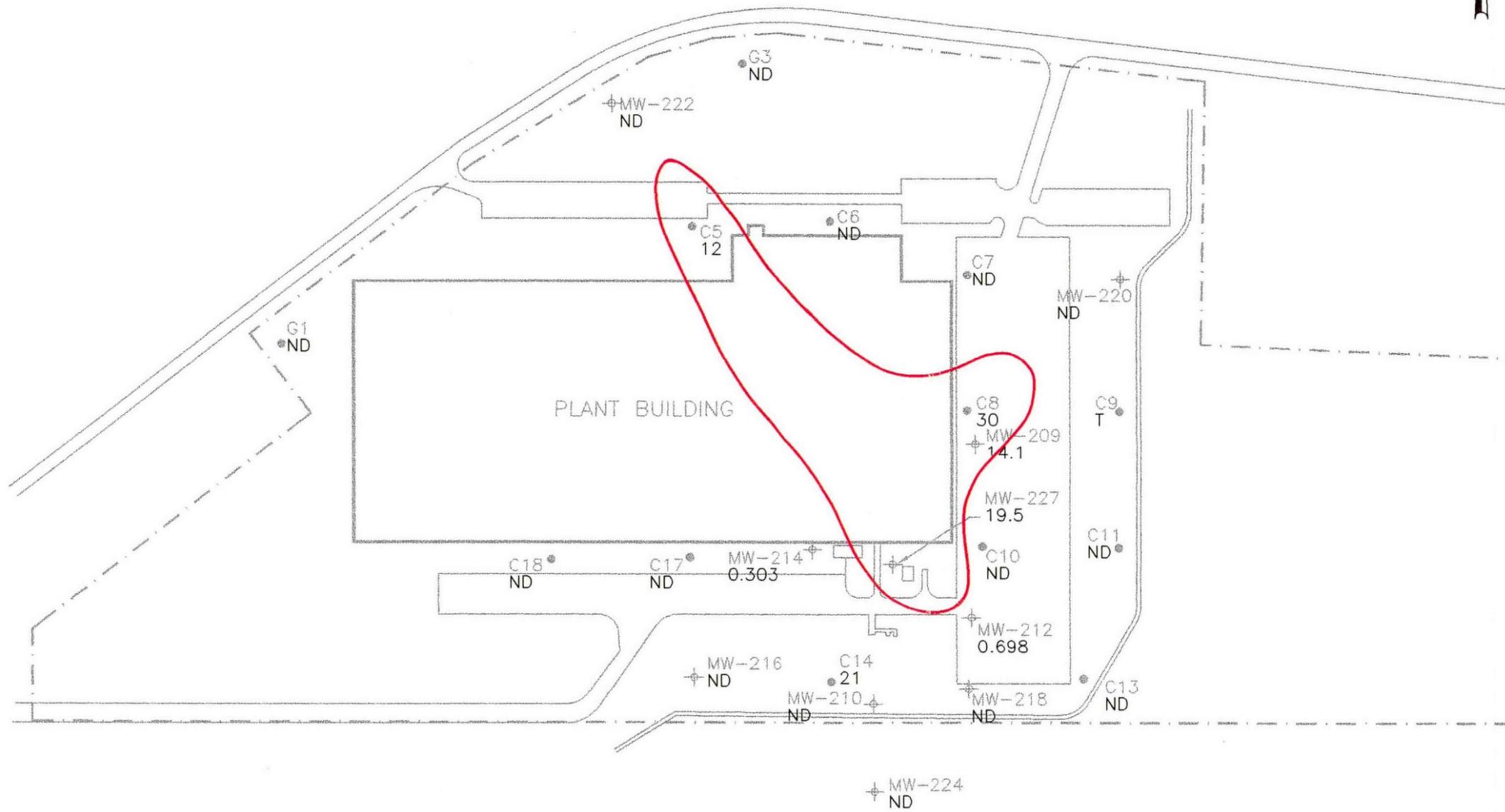


- LEGEND**
- ⊕ Monitoring Well Location and Reported Concentration in ug/L (Nov. 1998)
 - Groundwater Screening Location and Reported Concentration in ug/L (Various Dates)
 - Contour Line Indicates Estimated Quantitation Limit of 5 ug/L

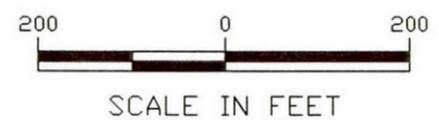


SCALE	AS SHOWN	DESIGNED BY	JN	DATE	28DEC98	DRAWING TITLE	Figure 1-46. Approximate Distribution of 1,2-Dichloroethane in Unit A Hamilton Beach & Proctor Silex, Inc.		
	CONFIDENTIAL - ALL RIGHTS RESERVED - PROPERTY OF	DRAWN BY	TSH	DATE	28DEC98				
	RADIANT INTERNATIONAL A DANBARD & MOORE GROUP COMPANY	CHECKED BY	BPG	DATE	08JAN99				
		APPROVED BY		DATE					
						CONTRACT NO.	650138.0601	DRAWING NO.	UNITA-DCA
						REV.			0

D:\HBPS\UNITA\15DEC9898



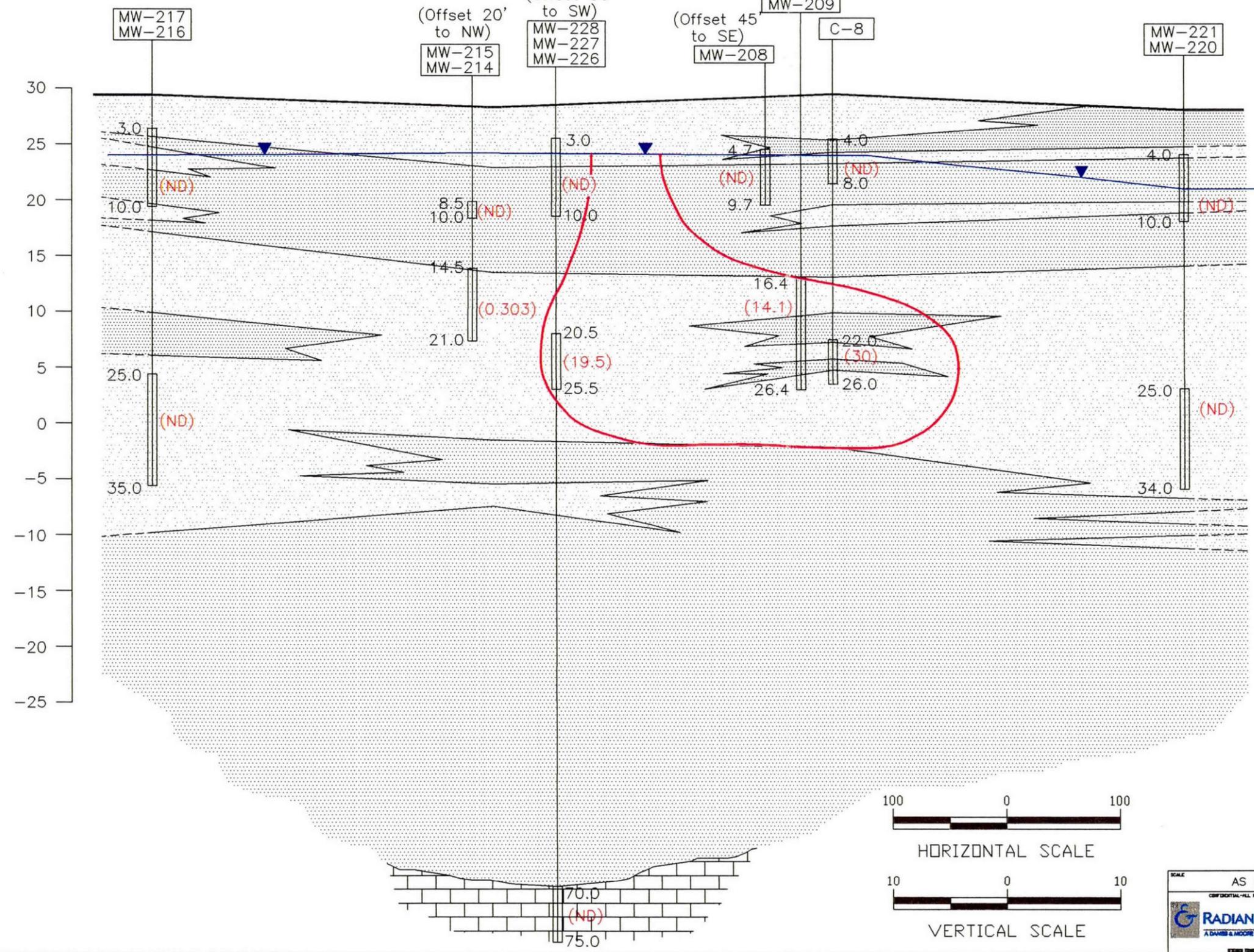
- LEGEND**
- ⊕ Monitoring Well Location and Reported Concentration in ug/L (Nov. 1998)
 - Groundwater Screening Location and Reported Concentration in ug/L (Various Dates)
 - Contour Line Indicates Estimated Quantitation Limit of 5 ug/L



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	28DEC98	DRAWING TITLE		
	CONFIDENTIAL - ALL RIGHTS RESERVED - PROPERTY OF	DRAWN BY	TSH	DATE	28DEC98	Figure 1-47. Approximate Distribution of 1,2-Dichloroethane in Unit B Hamilton Beach & Proctor Silix, Inc		
	RADIANT INTERNATIONAL A DAMBER & MOORE GROUP COMPANY	CHECKED BY	BPG	DATE	28DEC98	CONTRACT NO.	DRAWING NO.	REV.
	SEARCH NUMBER: 100, NEW YORK 16, 1770	APPROVED BY		DATE		650138.0601	B-12DCA	0

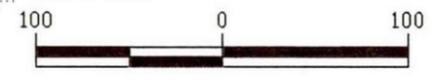
SOUTHWEST
D

NORTHEAST
D'

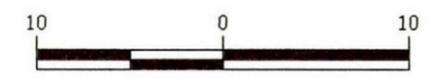


LEGEND

- C-1 Location Number
- Ground Surface
- 3.0 [] Top of Screen Depth
- 7.0 [] Bottom of Screen Depth
- ▼ Water Level Elevation
- Contour Line Indicates Estimated Quantitation Limit of 5 ug/L
- (960) Reported concentration in ug/L
- (ND) Not Detected
- [] Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- [] Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay
- [] Shell Limestone Deposits



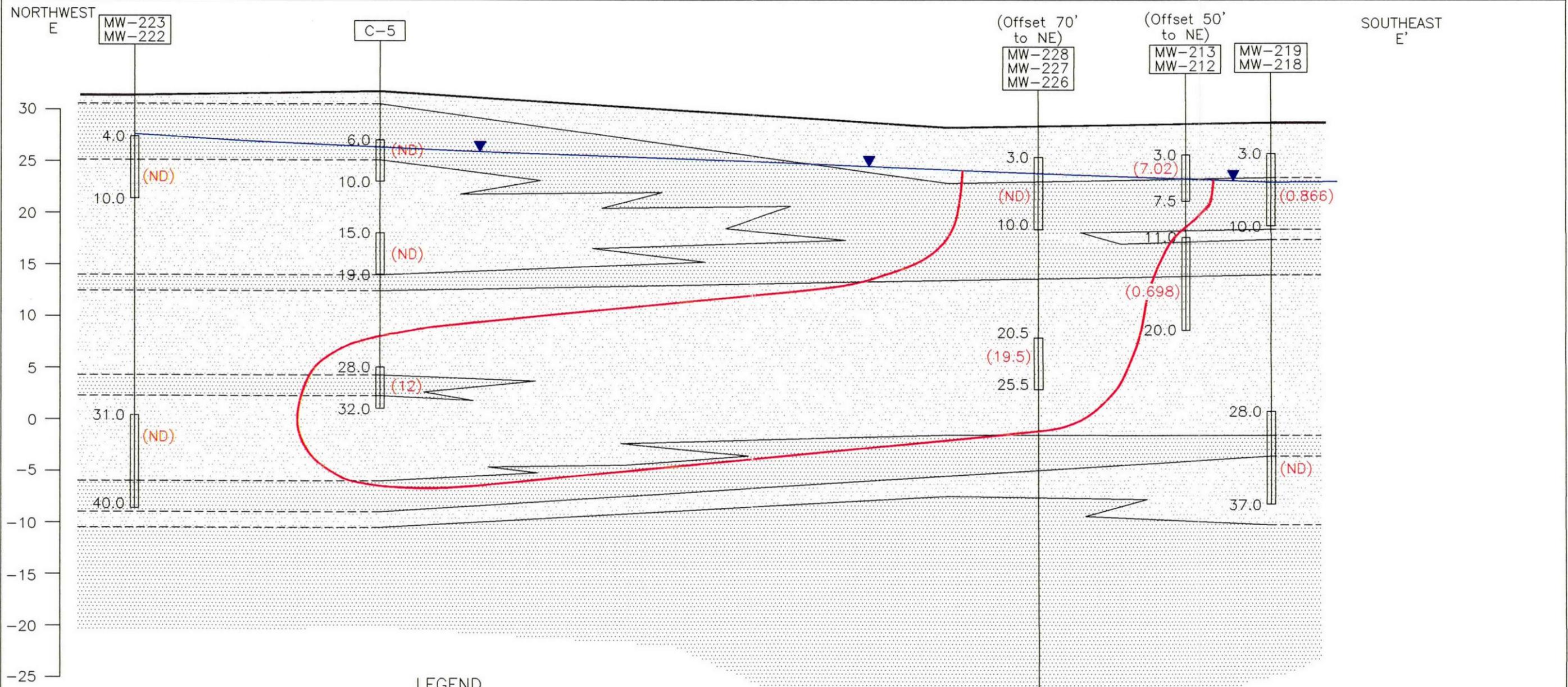
HORIZONTAL SCALE



VERTICAL SCALE

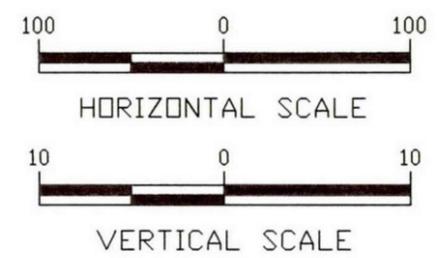
SCALE	AS SHOWN	REVISIONS BY	JN	DATE	29DEC98	DRAWING TITLE Figure 1-48. Approximate Distribution of 1,2-Dichloroethane, D-D'
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	29DEC98	
	RADIAN INTERNATIONAL A DANIEL & JOHNSON GROUP COMPANY	CHECKED BY	BPG	DATE	08JAN99	Hamilton Beach & Proctor-Sillex Inc.
	EXCEEDS 2000 LBS. PER 60 MIN. (75)	APPROVED BY		DATE		CONTRACT NO. 650138.0601
						DRAWING NO. 12DCA-DD
						REV. 0

D:\HBPS\WASHINGTON\12DCA-DD\31DEC98



LEGEND

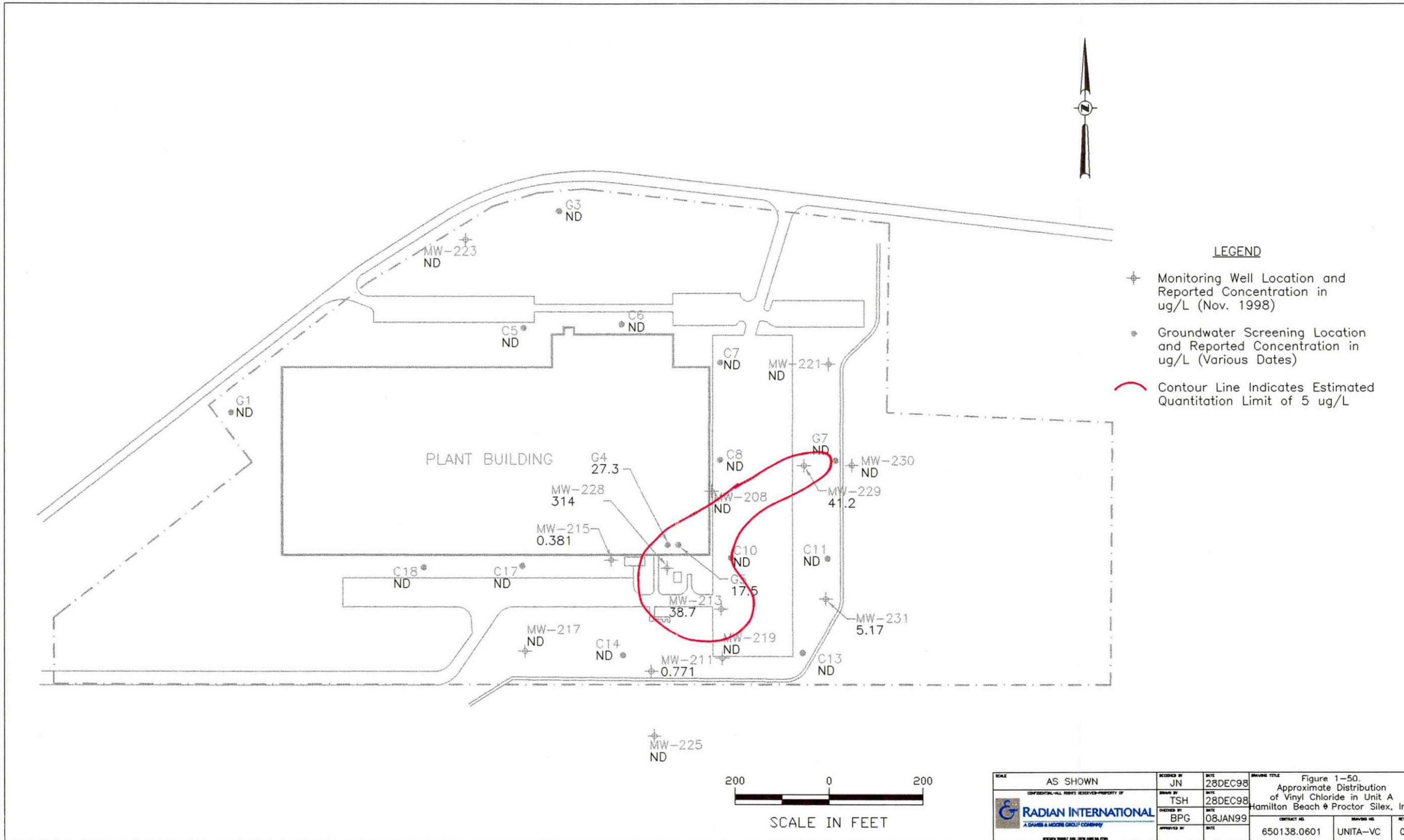
- Location Number
- Ground Surface Elevation
- Top of Screen Depth
- Bottom of Screen Depth
- Water Level Elevation
- Contour Line Indicates Estimated Quantitation Limit of 5 ug/L
- Reported concentration in ug/L
- Not Detected
- Higher permeability deposits including Sand, Fine Sand, and Silty Sand
- Lower permeability deposits including Clayey Sand, Sandy Silt, Silt, and Clay
- Shell Limestone Deposits



D:\HBPS\WASHINGTON\12DCA-EE\30DEC98

SCALE	AS SHOWN	DESIGNED BY	JN	DATE	30DEC98	DRAWING TITLE	Figure 1-49.
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	30DEC98	Approximate Distribution of 1,2-Dichloroethane, E-E'	
		ORDERED BY	BPG	DATE	08JAN99	Hamilton Beach & Proctor-Silex, Inc.	
	A DAMBER & MOORE GROUP COMPANY	APPROVED BY		DATE		CONTRACT NO.	650138.0601
	REVISION TABLE FILE WITH DRAWING 778					DRAWING NO.	12DCA-EE
						REV.	0

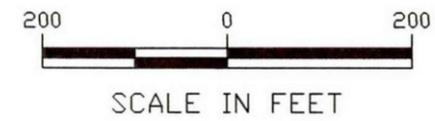
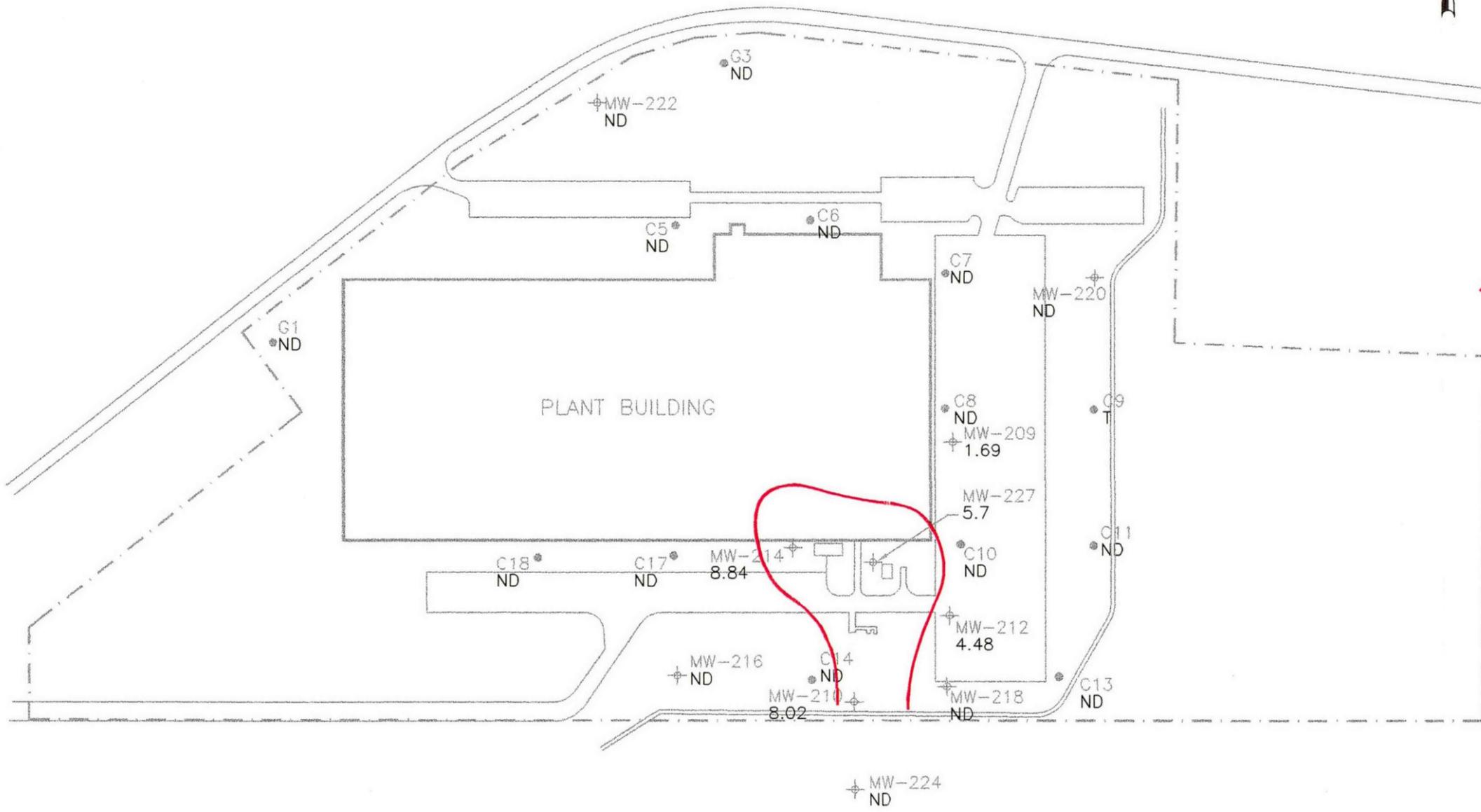
D:\HBPS\UNITA\15DEC9898





LEGEND

- ⊕ Monitoring Well Location and Reported Concentration in ug/L (Nov. 1998)
- Groundwater Screening Location and Reported Concentration in ug/L (Various Dates)
- Contour Line Indicates Estimated Quantitation Limit of 5 ug/L



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	28DEC98	DRAWING TITLE	Figure 1-51. Approximate Distribution of Vinyl Chloride in Unit B Hamilton Beach & Proctor Silex, Inc		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	28DEC98				
	 RADIAN INTERNATIONAL A DANBES & MOORE GROUP COMPANY	CHECKED BY	BPG	DATE	08JAN99				
	SEARCH ENGINE NO. WITH SERIAL 079	APPROVED BY		DATE		CONTRACT NO.	650138.0601	DRAWING NO.	B-VC
								REV.	0

D:\HBPS\UNITA\15DEC9898

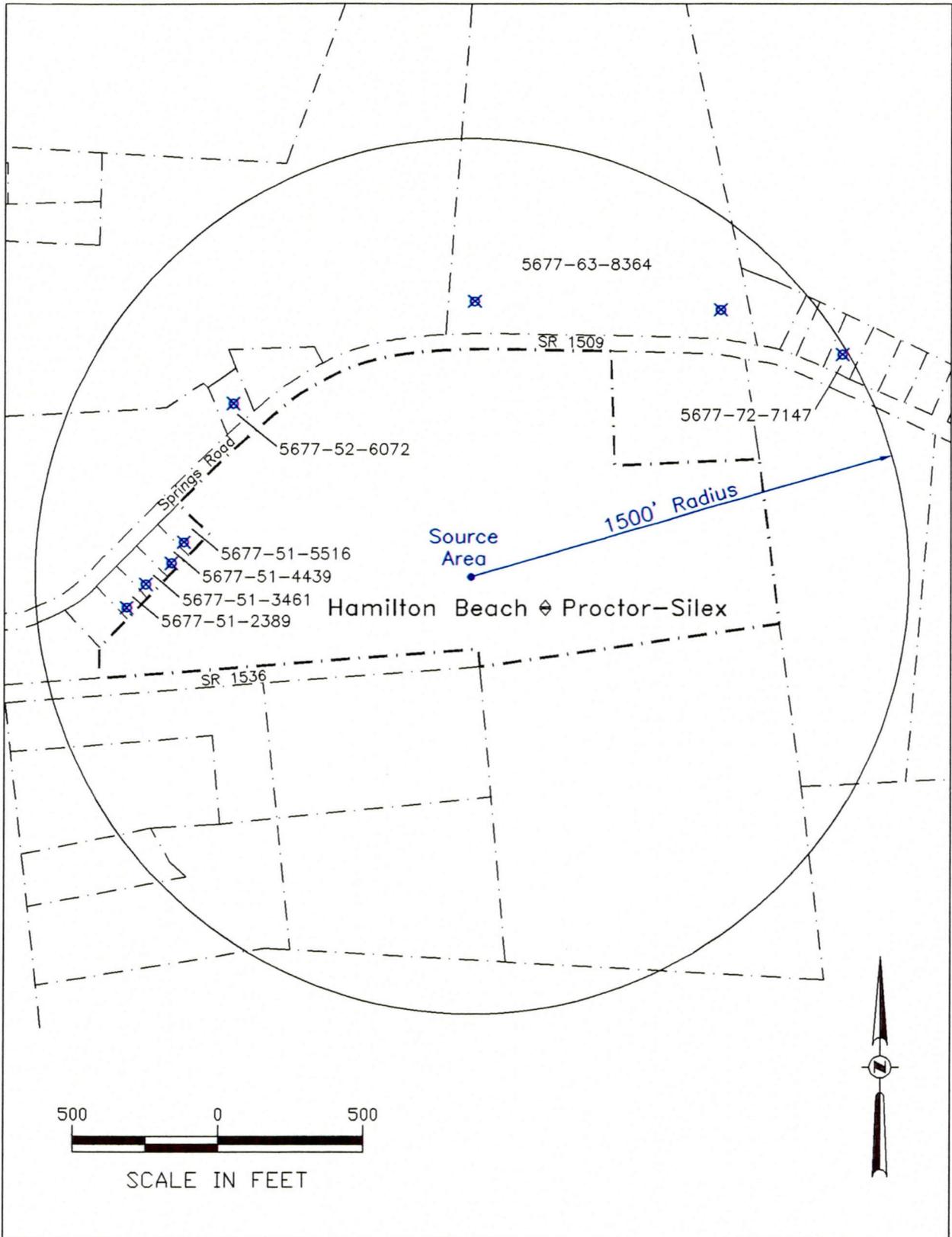


Figure 3-1. Location of Surrounding Water Supply Wells
Hamilton Beach & Proctor Silex, Inc.

SUPPLY

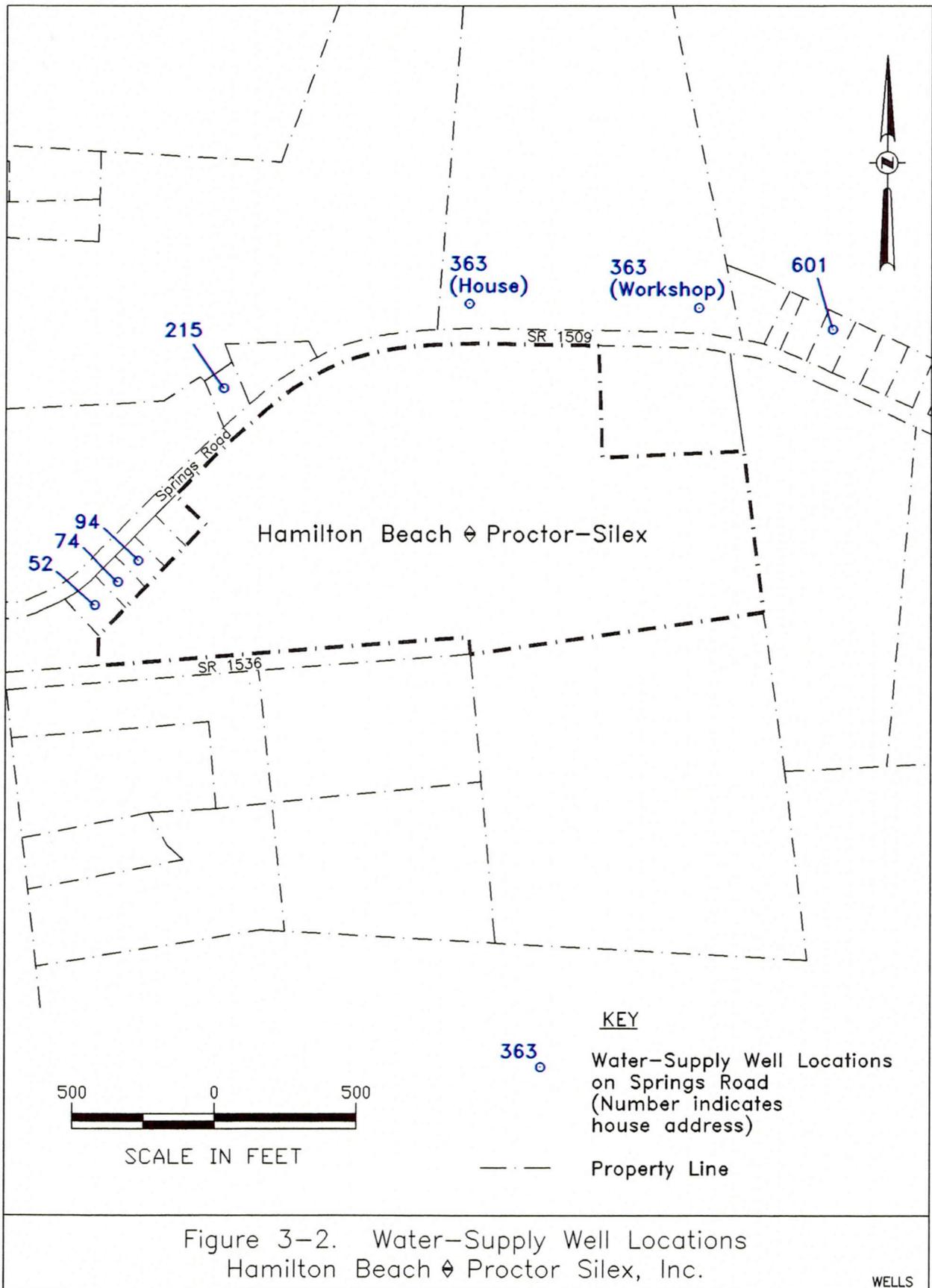
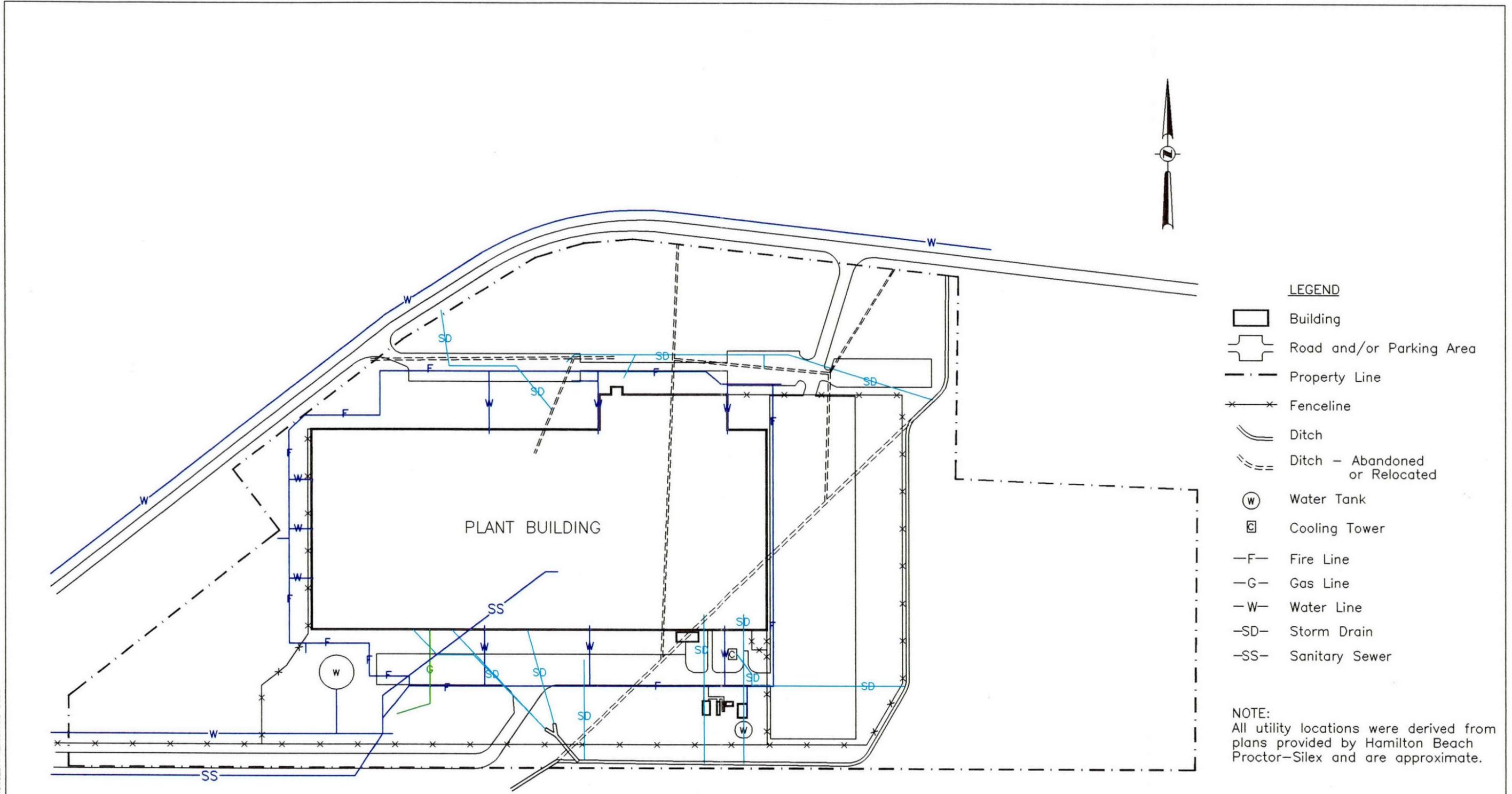


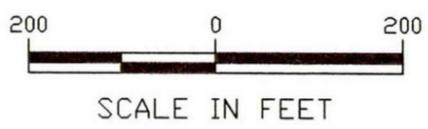
Figure 3-2. Water-Supply Well Locations
Hamilton Beach ◊ Proctor Silex, Inc.

D:\HBPS\WASHINGTON\UTILITY\27MAY98-1455



- LEGEND**
- Building
 - Road and/or Parking Area
 - Property Line
 - Fenceline
 - Ditch
 - Ditch - Abandoned or Relocated
 - Water Tank
 - Cooling Tower
 - Fire Line
 - Gas Line
 - Water Line
 - Storm Drain
 - Sanitary Sewer

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



SCALE	AS SHOWN	DESIGNED BY	JN	DATE	16DEC98	DRAWING TITLE	Figure 3-3. Subsurface Utilities Hamilton Beach & Proctor-Silex Inc.		
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	TSH	DATE	16DEC98	OWNER'S FILE NO.			
	RADIANT INTERNATIONAL A CHAMBER & MCGEE GROUP COMPANY	CHECKED BY	BPG	DATE	08JAN99	CONTRACT NO.	650138.0601	DRAWING NO.	UTILITY
	ISSUED UNDER FILE NO. 9801455	APPROVED BY		DATE				REV.	0

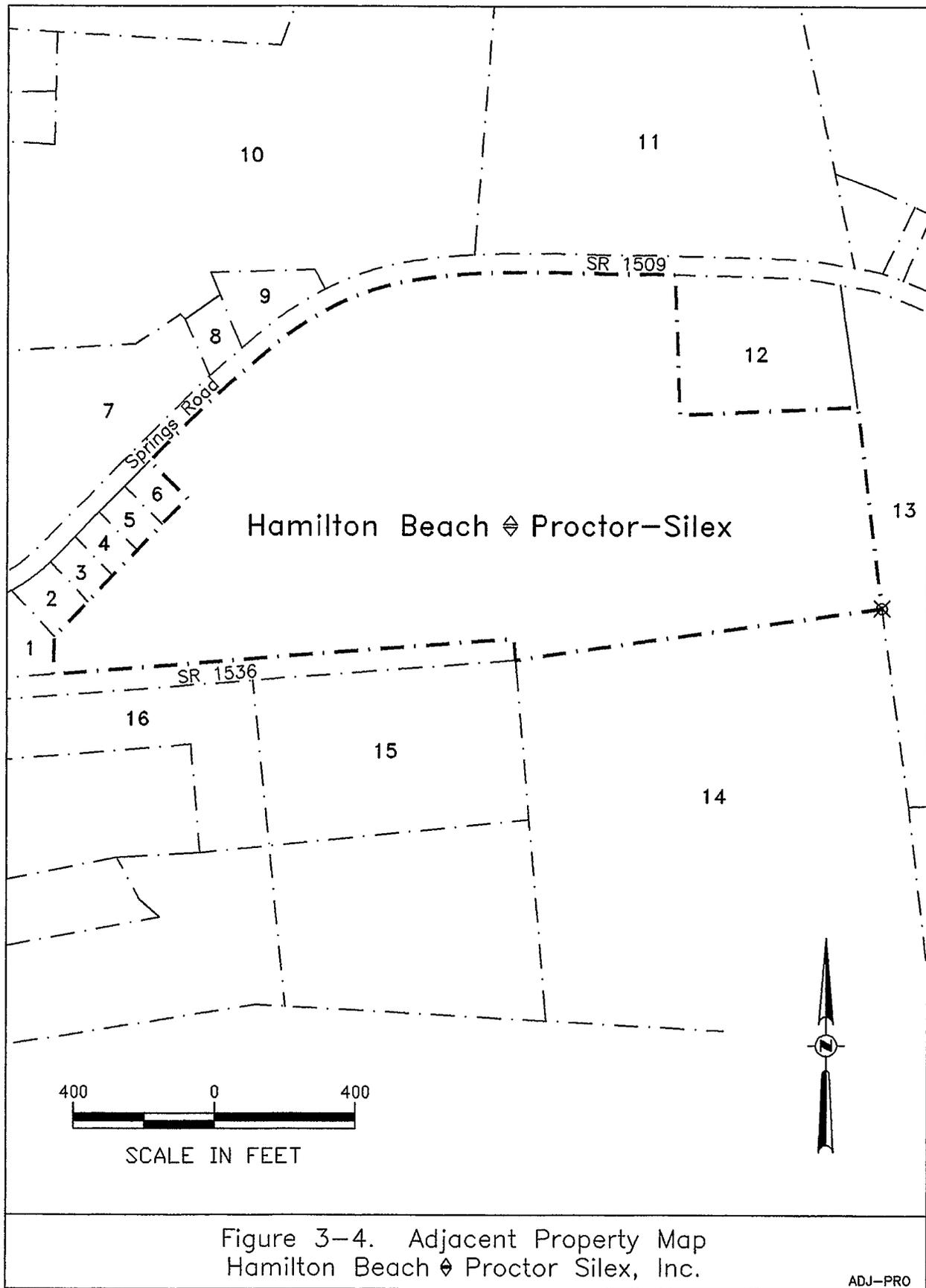


Figure 3-4. Adjacent Property Map
Hamilton Beach & Proctor Silex, Inc.

ADJ-PRO

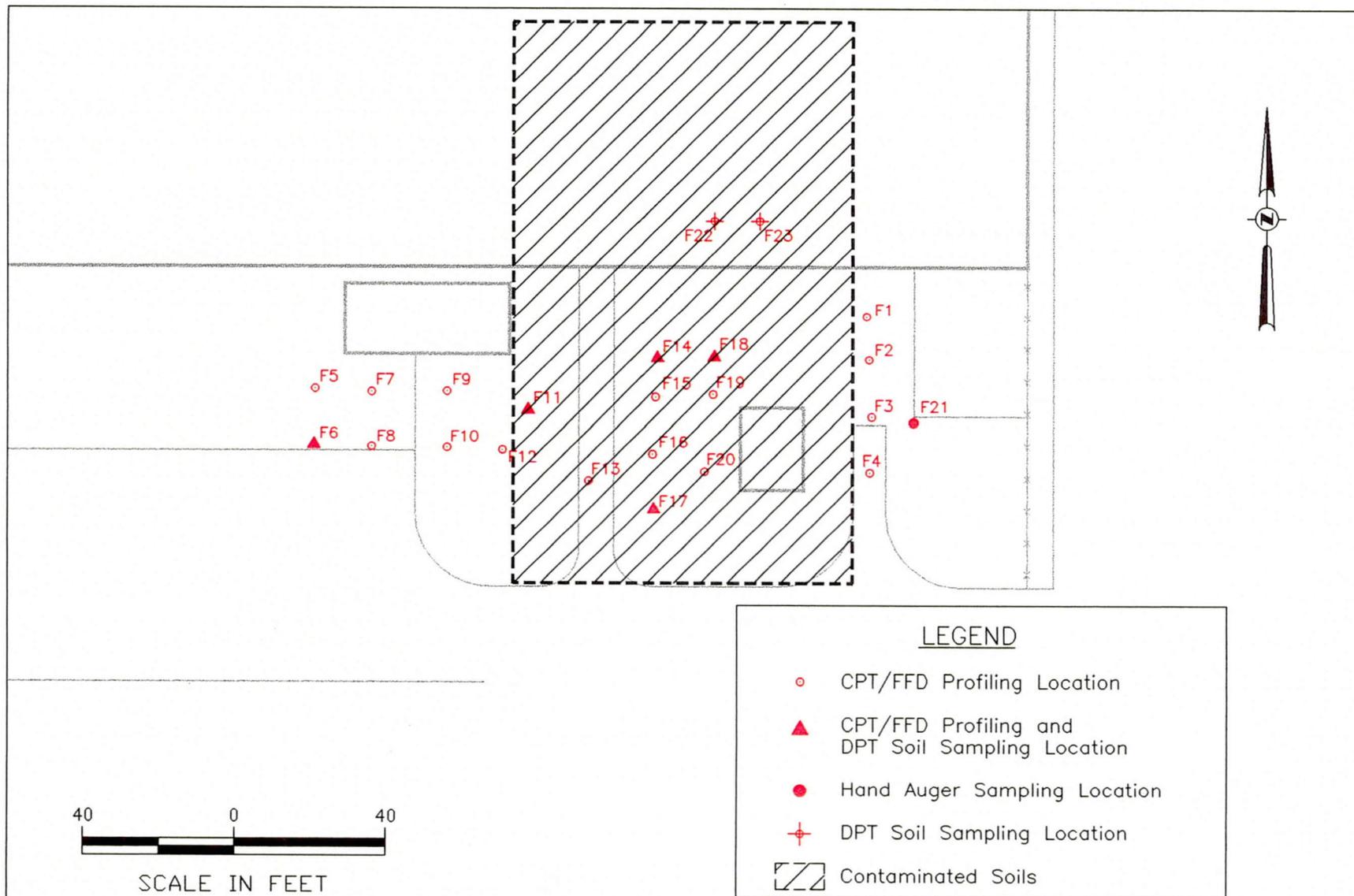


Figure 5-1. Approximate Distribution of Contaminated Soils
Hamilton Beach & Proctor Silex, Inc.

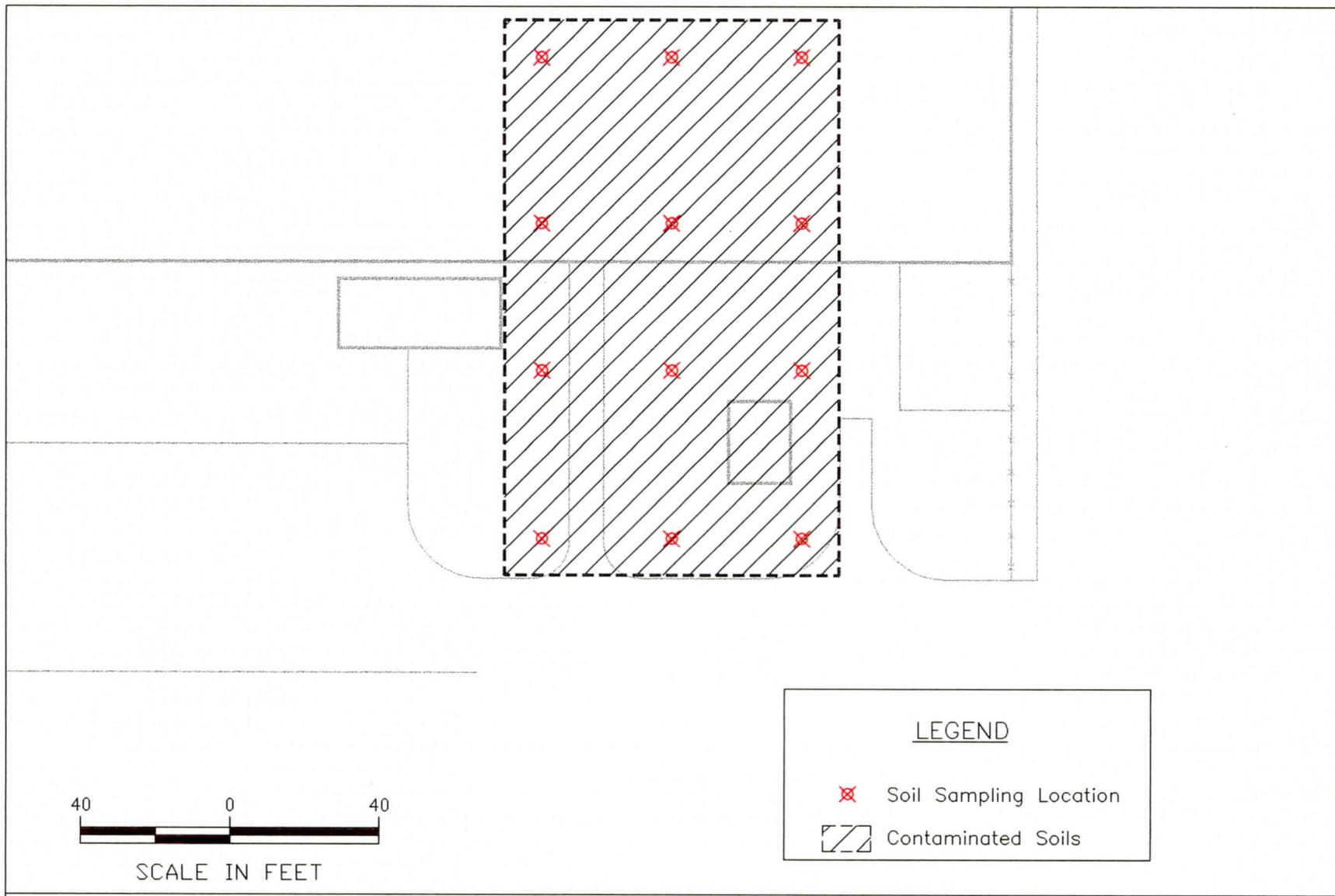
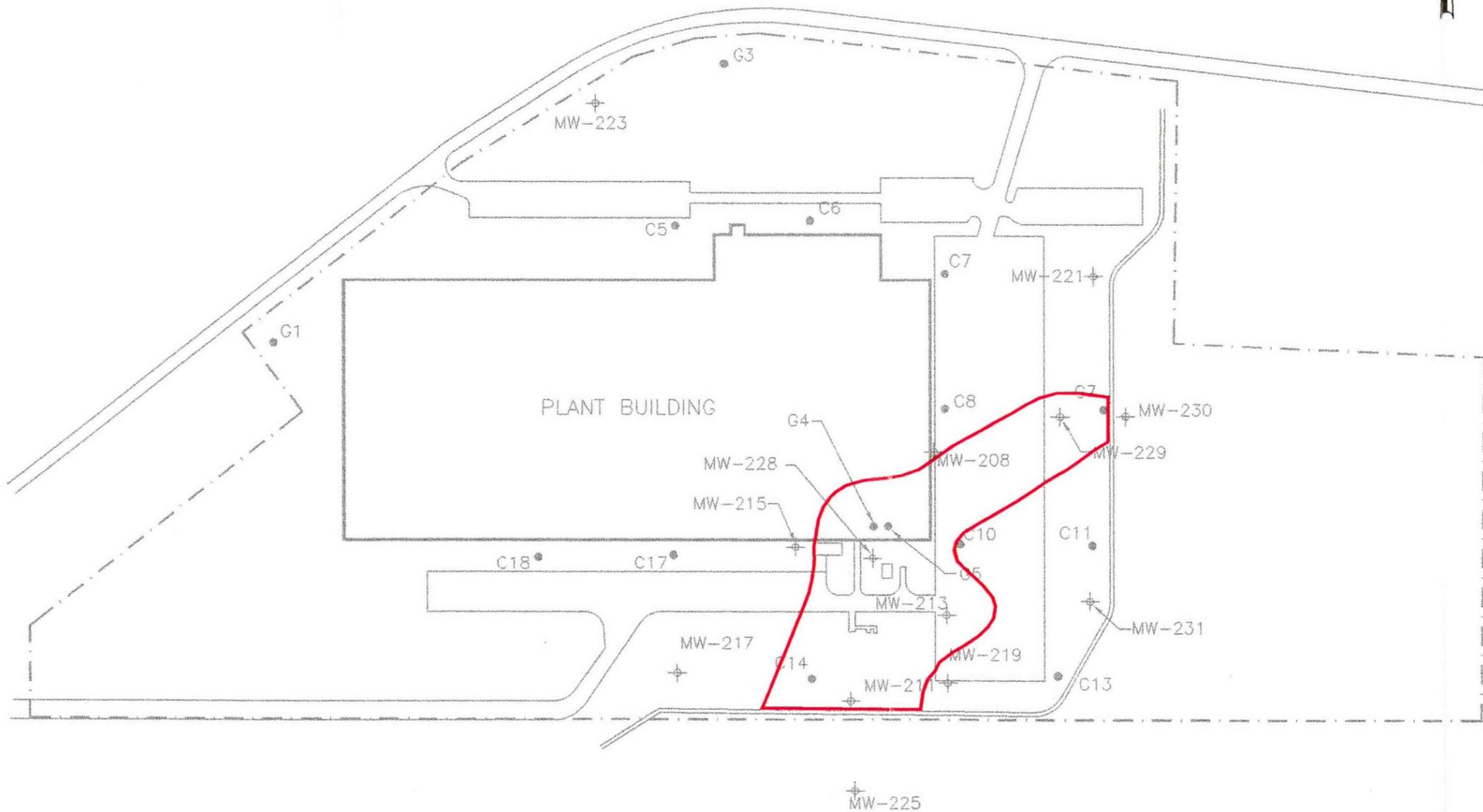


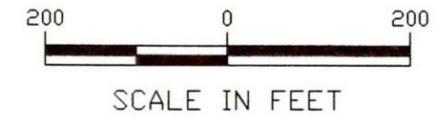
Figure 5-2. Post-Remediation Confirmatory Soil Sampling Locations
Hamilton Beach & Proctor Silex, Inc.

D:\HBPS\UNITA-AREA\17 JUN99



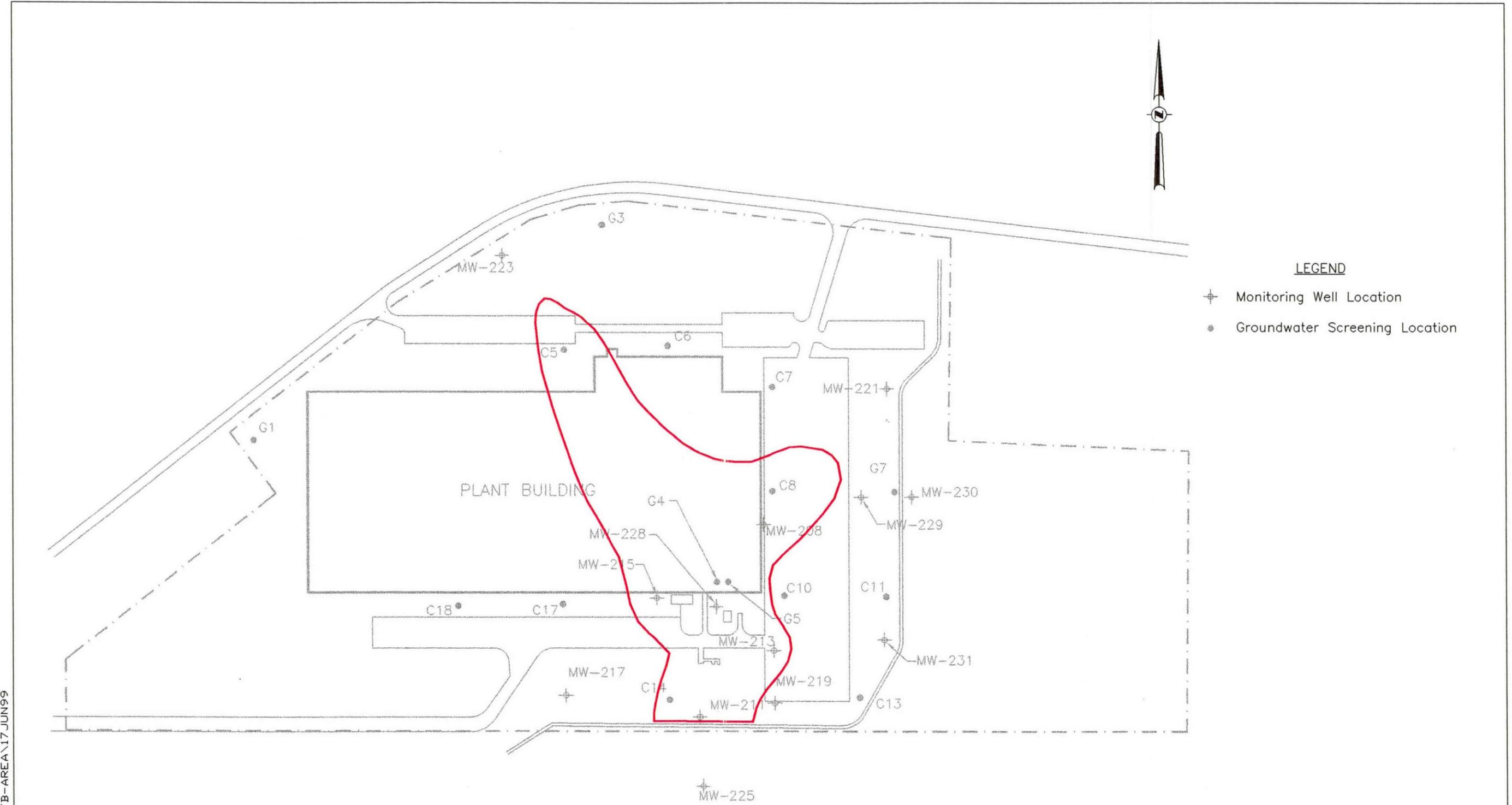
LEGEND

- ⊕ Monitoring Well Location
- Groundwater Screening Location



SCALE	AS SHOWN	DESIGNED BY	DATE	DRAWING TITLE
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	DATE	Figure 5-3. Unit A Groundwater Contaminant Distribution Hamilton Beach & Proctor Silex, Inc.
	 RADIAN INTERNATIONAL A DANIEL & JOHNSON GOLF COMPANY	TSH	17JUN99	
		CHECKED BY	DATE	CONTRACT NO.
		APPROVED BY	DATE	DRAWING NO.
				REV.
				650138.0701
				UNITA-AREA
				0

D:\HBPS\UNITB-AREA\17 JUN99



LEGEND

- ⊕ Monitoring Well Location
- Groundwater Screening Location



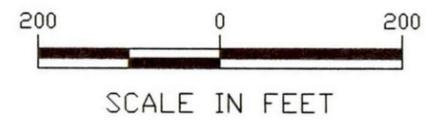
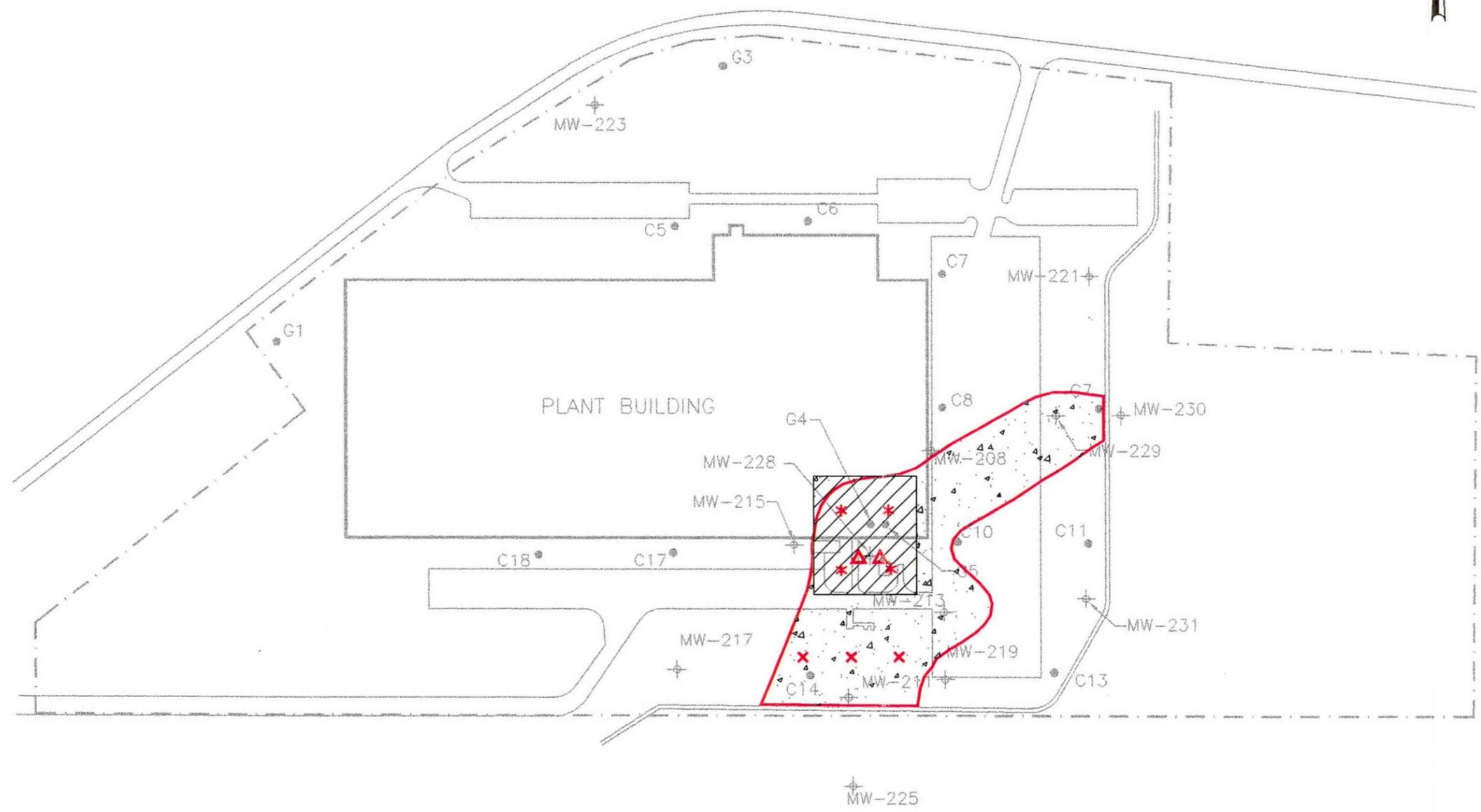
SCALE IN FEET

SCALE	AS SHOWN	DESIGNED BY	DATE	DRAWING TITLE
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	DATE	Figure 5-4. Unit B
	RADIAN INTERNATIONAL	TSH	17JUN99	Groundwater Contaminant Distribution
	A DAVIS & MOORE GROUP COMPANY	CHECKED BY	DATE	Hamilton Beach & Proctor Silix, Inc.
	DESIGNED BY: MIC. NEW ORLEANS, LA	APPROVED BY	DATE	CONTRACT NO.
				650138.0701
				DRAWING NO.
				UNITB-AREA
				REV.
				0



LEGEND

- ⊕ Monitoring Well Location
- Groundwater Screening Location
-  Remediation with Chemical Oxidization
-  Remediation with Zero-Valence Iron and a Carbon Source
- ✕ Zero-Valence Iron and a Carbon Source Pilot-Scale Testing Injection Location
- △ Chemical Oxidation Pilot-Scale Testing Injection Location (Groundwater)
- * Chemical Oxidation Pilot-Scale Testing Injection Location (Unsaturated Soil)



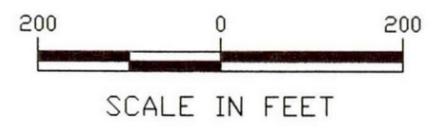
SCALE	AS SHOWN	DESIGNED BY	DATE	DRAWING TITLE
		DRAWN BY	DATE	Figure 5-5. Unit A Groundwater Remediation Scenario Hamilton Beach Proctor Silix, Inc.
		CHECKED BY	DATE	
		APPROVED BY	DATE	CONTRACT NO.
				650138.0701
				DRAWING NO.
				UNITA-SCEN
				REV.
				0

D:\HBPS\UNITA-AREA\17 JUN99



LEGEND

- ⊕ Monitoring Well Location
- Groundwater Screening Location
- ▭ Remediation with Zero-Valence Iron and a Carbon Source
- ⊗ Zero-Valence Iron and a Carbon Source Pilot-Scale Testing Injection Location - 6 Points on 8' Centers



SCALE	AS SHOWN	DESIGNED BY	DATE	DRAWING TITLE
	CONFIDENTIAL-ALL RIGHTS RESERVED-PROPERTY OF	DRAWN BY	DATE	Figure 5-6. Unit B Groundwater Remediation Scenario Hamilton Beach & Proctor Silix, Inc.
	 RADIAN INTERNATIONAL A DAMBER & JACOBE GROUP COMPANY	CHECKED BY	DATE	
	DESIGNED BY	DATE		
		APPROVED BY	DATE	
				CONTRACT NO. 650138.0701
				DRAWING NO. UNITB-SCEN
				REV. 0

D:\HBPS\UNITB-AREA\17 JUN99

TABLES

Table 1-1

**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 ¹ (mg/kg)	Date of Analysis (Purgeable TPH)	Extractable TPH ² (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
F22A	0-2	9/21/98	ND (2.33) U	10/1/98	ND (12.8) U	10/4/98	26.2	9/24/98
F22B	3-5	9/21/98	8.78 X	10/1/98	1,820	10/5/98	5,760	9/24/98
F23A	0-2	9/21/98	ND (1.31)	10/1/98	ND (5.37) U	10/4/98	30.2	9/24/98
F23B	3-5	9/21/98	ND (3.37) U	10/1/98	1,730 J	10/5/98	4,830	9/24/98
P01A	0-2	9/21/98	ND (1.29)	10/1/98	ND (6.90) U	10/4/98	44.1	9/24/98
P01B	2-4	9/21/98	ND (1.41)	10/1/98	ND (6.17) U	10/4/98	ND (15.3) U	9/24/98

Table 1-1 (Continued)

Sample ID	Sample Interval (ft. below surface)	Date of Sampling	Purgeable TPH ¹ (mg/kg)	Date of Analysis (Purgeable TPH)	Extractable TPH ² (mg/kg)	Date of Analysis (Extractable TPH)	Oil and Grease (mg/kg)	Date of Analysis (Oil and Grease)
P02A	0-2	9/22/98	ND (1.27)	9/30/98	ND (11.9) U	9/30/98	ND (20.5) U	9/24/98
P02B	2-4	9/22/98	ND (1.37)	9/30/98	ND (8.28) U	9/30/98	ND (8.86) U	9/24/98
P03A	0-2	9/21/98	ND (1.27)	10/1/98	ND (4.69) U	10/4/98	ND (17.2) U	9/24/98
P03B	2-4	9/21/98	ND (1.35)	10/1/98	ND (4.79) U	10/4/98	ND (8.49) U	9/24/98
P04A	0-2	9/22/98	ND (1.33)	10/1/98	ND (4.21) U	9/30/98	ND (8.28) U	9/24/98
P04B	2-4	9/22/98	ND (1.43)	9/30/98	ND (1.96) U	9/30/98	ND (9.01) U	9/24/98
P05A	0-2	9/21/98	ND (1.23)	10/1/98	27.0 DA	10/4/98	78.3	9/24/98
P05B	2-4	9/21/98	ND (1.25)	10/1/98	ND (3.58) U	10/5/98	ND (7.91) U	9/24/98
P06A	0-2	9/22/98	ND (1.22)	9/30/98	ND (4.53) U	9/30/98	25.8	9/24/98
P06B	2-4	9/22/98	ND (1.27)	9/30/98	ND (3.38) U	9/30/98	ND (7.95) U	9/24/98

¹Purgeable TPH value represents sum of gasoline species and other unidentified organics.

²Extractable TPH value represents sum of diesel species and other unidentified organics.

Bold values exceed site evaluation screening levels.

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

Table 1-2

**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	0.0910	0.160 J	ND (0.0431) U
Acetonitrile	ND (0.0247)	ND (0.0215)	ND (0.0222)	ND (0.0271)	ND (0.0236)	ND (0.0206)
Acrolein	ND (0.0264)	ND (0.0230)	ND (0.0237)	ND (0.0226)	ND (0.0253)	ND (0.0221)
Benzene	ND (0.00160) U	ND (0.00164) U	ND (0.00407) U	0.0100	0.0143 J	ND (0.00183) U
2-Butanone (MEK)	0.0151	ND (0.00593) U	0.0488	0.0330	0.239 J	0.0524
n-Butylbenzene	ND (0.00136)	ND (0.00119)	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

Table 1-2 (Continued)

Sample ID	F6A	F11A	F11B	F14A	F14B	F17A
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 (0.00230)	0.791	0.576	0.210 J	0.417
trans-1,2-Dichloroethene	0.00113 J	0.00451	0.0143	0.00743	0.00630 J	0.00604
Ethylbenzene	0.0766	0.00278	0.0330	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
Propanenitrile	ND (0.0112)	ND (0.00974)	ND (0.0101)	ND (0.00956)	ND (0.0107) UJ	ND (0.0103)
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

Table 1-2 (Continued)

Sample ID	F6A	F11A	F11B	F14A	F14B	F17A
1,3,5-Trimethylbenzene	ND (0.00368) U	ND (0.00219)	0.0327	0.0320	0.0638 J	0.0303
Vinyl acetate	ND (0.00223)	ND (0.00194)	ND (0.00201)	ND (0.00191)	ND (0.00213) UJ	ND (0.00206)
Vinyl chloride	0.00536	0.00167 J	ND (0.375)	0.125	0.0520 J	ND (0.349)
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.

Bold values exceed site evaluation screening levels.

NA = Not analyzed.

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

Table 1-2 (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
Analyte (mg/kg)					
Acetone	ND (0.0612) U	0.0904 J	ND (0.0396) UJ	ND (0.00294) UJ	ND (0.00982) UJ
Acetonitrile	ND (0.0229)	ND (0.0209) UJ	ND (0.0215) UJ	ND (0.0203)	ND (0.0224)
Acrolein	ND (0.0244)	ND (0.0223) UJ	ND (0.0230) UJ	ND (0.0217)	ND (0.0240)
Benzene	ND (0.00332) U	0.3403 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	0.0415 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)

Table 1-2 (Continued)

Sample ID	F17B	F18A	F18B	F21A	F21B
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)
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
Propanenitrile	ND (0.0103)	ND (0.00945) UJ	ND (0.00975) UJ	ND (0.00918) UJ	ND (0.0101) UJ
n-Propylbenzene	0.0960 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	0.0390
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 acetate	ND (0.00206)	ND (0.00189) UJ	ND (0.00195) UJ	ND (0.00183) UJ	ND (0.00202) UJ
Vinyl chloride	ND (0.392)	0.0888 J	0.0530 J	ND (0.00342)	ND (0.00378)

Table 1-2 (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.

Bold values exceed site evaluation screening levels.

NA = Not analyzed.

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

Table 1-2 (Continued)

Sample ID	F22A	F22B	F23A	F23B	P01A	P01B
Sample Interval (ft. below surface)	0-2	3-5	0-2	3-5	0-2	3-5
Date of Sampling	9/21/98	9/21/98	9/21/98	9/21/98	9/21/98	9/21/98
Date of Analysis*	10/3/98	10/3/98	10/3/98	10/3/98	10/3/98	10/3/98
Analyte (mg/kg)						
Acetone	0.203	0.0980 J	0.133	0.0680	ND (0.00289)	ND (0.00309)
Acetonitrile	ND (0.0109)	ND (0.0113) UJ	ND (0.0112)	0.0128 J	ND (0.0114)	ND (0.0122)
Acrolein	0.00810 J	ND (0.0205) UJ	0.00901 J	ND (0.0213)	ND (0.0207)	ND (0.0221)
Benzene	ND (0.00153)	0.00160 J	ND (0.00157)	ND (0.00164)	ND (0.00160)	ND (0.00171)
2-Butanone (MEK)	0.169	0.900 J	0.0358	0.173	ND (0.00151)	ND (0.00162)
n-Butylbenzene	0.000966 J	0.0218 J	ND (0.00119)	0.00530	ND (0.00121)	ND (0.00130)
sec-Butylbenzene	ND (0.00115)	0.00643 J	ND (0.00117)	0.00210	ND (0.00120)	ND (0.00128)
Carbon disulfide	ND (0.00166) U	ND (0.00249) UJ	ND (0.00196) U	ND (0.00178) U	ND (0.00173)	ND (0.00185) U
Carbon tetrachloride	ND (0.00144)	ND (0.00149) UJ	ND (0.00149) UJ	ND (0.00155)	ND (0.00150)	ND (0.00160)
Chloroethane	ND (0.00108)	ND (0.00111) UJ	ND (0.00110)	ND (0.00115)	ND (0.00112) UJ	ND (0.00120)
3-Chloropropene	ND (0.00145)	ND (0.00150) UJ	ND (0.00149)	ND (0.00156)	ND (0.00151)	ND (0.00162)
1,1-Dichloroethane	0.125	0.455	0.0278	0.150 J	ND (0.00273)	ND (0.00291)
1,2-Dichloroethane	0.0450	0.151 J	0.0233	0.0707	ND (0.00126)	ND (0.00135) U
1,1-Dichloroethene	0.0830	1.31	0.0391	0.177 J	0.000594 J	ND (0.00192)
cis-1,2-Dichloroethene	0.826	0.710	0.138	0.267	ND (0.00160) U	ND (0.00169)
trans-1,2-Dichloroethene	0.0192	0.0801 J	0.00519	0.0116	ND (0.00237)	ND (0.00253)

Table 1-2 (Continued)

Sample ID	F22A	F22B	F23A	F23B	P01A	P01B
Ethylbenzene	0.0134	0.0447 J	0.00610	0.00807	ND (0.00116)	ND (0.00124)
2-Hexanone	0.00148	0.00296 J	ND (0.000963)	0.00227	ND (0.000980)	ND (0.00105)
Isopropylbenzene	0.00178	0.00970 J	0.000825 J	0.00232	ND (0.00117)	ND (0.00126)
p-Isopropyltoluene	0.00262	0.00968 J	0.00999	0.00279	ND (0.00120)	ND (0.00128)
Methyl t-butyl ether	ND (0.00243)	ND (0.00251) UJ	ND (0.00249)	ND (0.00261)	ND (0.00253)	ND (0.00271)
4-Methyl-2-pentanone (MIBK)	0.000873 J	0.00152 J	ND (0.00110)	0.00114 J	ND (0.00112)	ND (0.00120)
Napthalene	ND (0.000874)	0.0733 J	ND (0.000895)	0.0134	ND (0.000910)	ND (0.000973)
Propanenitrile	0.00642 J	0.0126 J	ND (0.0128)	0.00766 J	ND (0.0130)	ND (0.0139)
n-Propylbenzene	0.0139	0.0678 J	0.00407	0.0116	ND (0.00131)	ND (0.00140)
Styrene	ND (0.00122)	0.000774 J	ND (0.00125)	0.000561 J	ND (0.00127)	ND (0.00136)
Tetrachloroethene	0.00108 J	0.0171 J	0.00324	0.00651	ND (0.00142)	ND (0.00151)
Tetrahydrofuran	0.00150	0.00377 J	ND (0.00153)	0.00207	ND (0.00156)	ND (0.00167)
Toluene	0.0661	0.164 J	0.0365	0.0316	0.00208	ND (0.00139)
1,1,1-Trichloroethane	0.870	1.31	0.316	1.31	0.00163	ND (0.00125)
1,1,2-Trichloroethane	0.0180	0.0229 J	0.0120	0.0109	ND (0.000736)	ND (0.000787)
Trichloroethene	0.102	0.293 J	0.0860	0.293 J	ND (0.00436)	ND (0.00461)
Trichlorofluoromethane	ND (0.00229)	ND (0.00237) UJ	ND (0.00235)	ND (0.00246)	ND (0.00239)	ND (0.00255)
1,2,4-Trimethylbenzene	0.0190	0.296	ND (0.00120)	0.0505	ND (0.00123)	ND (0.00131)
1,3,5-Trimethylbenzene	0.00782	0.110 J	ND (0.00117)	0.0165	ND (0.00119)	ND (0.00127)
Vinyl acetate	0.00226 J	0.00189 J	0.00209 J	ND (0.00611)	ND (0.00593) UJ	ND (0.00634)
Vinyl chloride	ND (0.00141)	ND (0.00145) UJ	ND (0.00144)	ND (0.00151)	ND (0.00147)	ND (0.00157)

Table 1-2 (Continued)

Sample ID	F22A	F22B	F23A	F23B	P01A	P01B
m&p-Xylene	0.0223	0.102 J	0.00595	0.0151	ND (0.00263)	ND (0.00281)
o-Xylene	0.0251	0.110 J	0.00662	0.0167	ND (0.00109)	ND (0.00116)

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

Target analytes not listed were not detected.

Bold values exceed site evaluation screening levels.

NA = Not analyzed.

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

Table 1-2 (Continued)

Sample ID	P02A	P02B	P03A	P03B	P04A	P04B
Sample Interval (ft. below surface)	0-2	2-4	0-2	2-4	0-2	2-4
Date of Sampling	9/22/98	9/22/98	9/21/98	9/21/98	9/22/98	9/22/98
Date of Analysis*	10/2/98	10/2/98	10/2/98	10/2/98	10/2/98	10/2/98
Analyte (mg/kg)						
Acetone	ND (0.00283)	ND (0.00314)	ND (0.00277)	ND (0.0150) U	ND (0.0253) U	ND (0.00319)
Acetonitrile	ND (0.0111)	ND (0.0124)	ND (0.0109)	ND (0.0116)	ND (0.0116)	ND (0.0125)
Acrolein	ND (0.0202)	ND (0.0224)	ND (0.0197)	ND (0.0210)	ND (0.0210)	ND (0.0228)
Benzene	ND (0.00156)	ND (0.00173)	ND (0.00153)	ND (0.00163)	ND (0.00162)	ND (0.00176)
2-Butanone (MEK)	ND (0.00148)	ND (0.00164)	ND (0.00145)	ND (0.00154)	0.00189	ND (0.00167)
n-Butylbenzene	ND (0.00118)	ND (0.00132)	ND (0.00116)	ND (0.00124)	ND (0.00123)	ND (0.00134)
sec-Butylbenzene	ND (0.00117)	ND (0.00130)	ND (0.00114)	ND (0.00122)	ND (0.00121)	ND (0.00132)
Carbon disulfide	ND (0.00169) U	ND (0.00182) U	ND (0.00165)	ND (0.00176)	ND (0.00176)	ND (0.00190) U
Carbon tetrachloride	ND (0.00147)	ND (0.00163)	ND (0.00144)	ND (0.00153)	ND (0.00153)	ND (0.00165)
Chloroethane	ND (0.00109)	ND (0.00122)	ND (0.00107)	ND (0.00114)	ND (0.00114)	ND (0.00124)
3-Chloropropene	ND (0.00148)	ND (0.00164)	ND (0.00145)	ND (0.00154)	ND (0.00154)	ND (0.00167)
1,1-Dichloroethane	ND (0.00266)	ND (0.00296)	ND (0.00261)	ND (0.00278)	ND (0.00277)	ND (0.00300)
1,2-Dichloroethane	ND (0.00123)	ND (0.00137)	ND (0.00121) U	ND (0.00128) U	ND (0.00128)	ND (0.00139)
1,1-Dichloroethene	ND (0.00177)	ND (0.00197)	ND (0.00173)	ND (0.00185)	ND (0.00184)	ND (0.00200)
cis-1,2-Dichloroethene	ND (0.00156)	ND (0.00173)	ND (0.00153) U	ND (0.00163) U	ND (0.00162)	ND (0.00176)
trans-1,2-Dichloroethene	ND (0.00231)	ND (0.00257)	ND (0.00226)	ND (0.00241)	ND (0.00240)	ND (0.00261)

Table 1-2 (Continued)

Sample ID	P02A	P02B	P03A	P03B	P04A	P04B
Ethylbenzene	ND (0.00113)	ND (0.00126)	ND (0.00111)	ND (0.00118)	ND (0.00118)	ND (0.00128)
2-Hexanone	ND (0.000957)	ND (0.00106)	ND (0.000937)	ND (0.000998)	ND (0.000996)	ND (0.00108)
Isopropylbenzene	ND (0.00115)	ND (0.00128)	ND (0.00112)	ND (0.00120)	ND (0.00119)	ND (0.00129)
p-Isopropyltoluene	ND (0.00117)	ND (0.00130)	ND (0.00115)	ND (0.00122)	ND (0.00122)	ND (0.00132)
Methyl t-butyl ether	ND (0.00247)	ND (0.00275)	ND (0.00242)	ND (0.00258)	ND (0.00257)	ND (0.00279)
4-Methyl-2-pentanone (MIBK)	ND (0.00109)	ND (0.00122)	ND (0.00107)	ND (0.00114)	ND (0.00114)	ND (0.00123)
Napthalene	ND (0.000889)	ND (0.000989)	ND (0.000870)	ND (0.000927)	ND (0.000925)	ND (0.00100)
Propanenitrile	ND (0.0127)	ND (0.0141)	ND (0.0124)	ND (0.0132)	ND (0.0132)	ND (0.0143)
n-Propylbenzene	ND (0.00128)	ND (0.00142)	ND (0.00125)	ND (0.00133)	ND (0.00133)	ND (0.00144)
Styrene	ND (0.00124)	ND (0.00138)	ND (0.00122)	ND (0.00130)	ND (0.00129)	ND (0.00140)
Tetrachloroethene	ND (0.00138)	ND (0.00154)	ND (0.00135)	ND (0.00144)	ND (0.00144)	ND (0.00156)
Tetrahydrofuran	ND (0.00152)	ND (0.00170)	ND (0.00149)	ND (0.00159)	ND (0.00159)	ND (0.00172)
Toluene	0.00211	ND (0.00141)	0.00180	ND (0.00132)	ND (0.00132)	ND (0.00143)
1,1,1-Trichloroethane	ND (0.00115)	ND (0.00128)	ND (0.00204) U	ND (0.00139) U	ND (0.00120)	ND (0.00130)
1,1,2-Trichloroethane	ND (0.000719)	ND (0.000800)	ND (0.000704)	ND (0.000750)	ND (0.000748)	ND (0.000811)
Trichloroethene	ND (0.00426)	ND (0.00474)	ND (0.00417) U	ND (0.00444)	ND (0.00443)	ND (0.00480)
Trichlorofluoromethane	ND (0.00233)	ND (0.00260)	ND (0.00228)	ND (0.00243)	ND (0.00243)	ND (0.00263)
1,2,4-Trimethylbenzene	ND (0.00120)	ND (0.00133)	ND (0.00117)	ND (0.00125)	ND (0.00124)	ND (0.00135)
1,3,5-Trimethylbenzene	ND (0.00116)	ND (0.00129)	ND (0.00114)	ND (0.00121)	ND (0.00121)	ND (0.00131)
Vinyl acetate	ND (0.00579)	ND (0.00644)	ND (0.00567)	ND (0.00604)	ND (0.00603)	ND (0.00653)
Vinyl chloride	ND (0.00143)	ND (0.00159)	ND (0.00140)	ND (0.00149)	ND (0.00149)	ND (0.00161)

Table 1-2 (Continued)

Sample ID	P02A	P02B	P03A	P03B	P04A	P04B
m&p-Xylene	0.000668 J	ND (0.00286)	ND (0.00251)	ND (0.00268)	ND (0.00267)	ND (0.00290)
o-Xylene	ND (0.00106)	ND (0.00118)	ND (0.00104)	ND (0.00111)	ND (0.00111)	ND (0.00120)

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

Target analytes not listed were not detected.

Bold values exceed site evaluation screening levels.

NA = Not analyzed.

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

Table 1-2 (Continued)

Sample ID	P05A	P05B	P06A	P06B		
Sample Interval (ft. below surface)	0-2	2-4	0-2	2-4		
Date of Sampling	9/21/98	9/21/98	9/22/98	9/22/98		
Date of Analysis*	10/2/98	10/2/98	10/2/98	10/2/98		
Analyte (mg/kg)						
Acetone	ND (0.00272)	ND (0.00279)	ND (0.00270)	ND (0.00281)		
Acetonitrile	ND (0.0107)	ND (0.0110)	ND (0.0106)	ND (0.0110)		
Acrolein	ND (0.0194)	ND (0.0199)	ND (0.0192)	ND (0.0201)		
Benzene	ND (0.00150)	ND (0.00154)	ND (0.00149)	ND (0.00155)		
2-Butanone (MEK)	ND (0.00142)	ND (0.00146)	ND (0.00141)	ND (0.00147)		
n-Butylbenzene	ND (0.00114)	ND (0.00117)	ND (0.00113)	ND (0.00118)		
sec-Butylbenzene	ND (0.00112)	ND (0.00115)	ND (0.00111)	ND (0.00116)		
Carbon disulfide	ND (0.00162) U	ND (0.00167)	ND (0.00161) U	ND (0.00168) U		
Carbon tetrachloride	ND (0.00141)	ND (0.00145)	ND (0.00140)	ND (0.00146)		
Chloroethane	ND (0.00105)	ND (0.00108)	ND (0.00104)	ND (0.00109)		
3-Chloropropene	ND (0.00142)	ND (0.00146)	ND (0.00141)	ND (0.00147)		
1,1-Dichloroethane	ND (0.00256)	ND (0.00263)	ND (0.00254)	ND (0.00265)		
1,2-Dichloroethane	ND (0.00118)	ND (0.00122)	ND (0.00117)	ND (0.00122)		
1,1-Dichloroethene	ND (0.00170)	ND (0.00175)	ND (0.00169)	ND (0.00176)		
cis-1,2-Dichloroethene	ND (0.00150)	ND (0.00154)	ND (0.00149)	ND (0.00155)		
trans-1,2-Dichloroethene	ND (0.00222)	ND (0.00228)	ND (0.00220)	ND (0.00230)		

Table 1-2 (Continued)

Sample ID	P05A	P05B	P06A	P06B		
Ethylbenzene	ND (0.00109)	ND (0.00112)	ND (0.00108)	ND (0.00113)		
2-Hexanone	ND (0.000921)	ND (0.000946)	ND (0.000913)	ND (0.000952)		
Isopropylbenzene	ND (0.00110)	ND (0.00113)	ND (0.00109)	ND (0.00114)		
p-Isopropyltoluene	ND (0.00113)	ND (0.00116)	ND (0.00112)	ND (0.00117)		
Methyl t-butyl ether	ND (0.00238)	ND (0.00245)	ND (0.00236)	ND (0.00246)		
4-Methyl-2-pentanone (MIBK)	ND (0.00105)	ND (0.00108)	ND (0.00104)	ND (0.00109)		
Napthalene	ND (0.000855)	ND (0.000879)	ND (0.000848)	ND (0.000884)		
Propanenitrile	ND (0.0122)	ND (0.0125)	ND (0.0121)	ND (0.0126)		
n-Propylbenzene	ND (0.00123)	ND (0.00126)	ND (0.00122)	ND (0.00127)		
Styrene	ND (0.00120)	ND (0.00123)	ND (0.00119)	ND (0.00124)		
Tetrachloroethene	ND (0.00133)	ND (0.00137)	ND (0.00132)	ND (0.00138)		
Tetrahydrofuran	ND (0.00147)	ND (0.00151)	ND (0.00145)	ND (0.00152)		
Toluene	0.000941 J	ND (0.00125)	ND (0.00121)	ND (0.00126)		
1,1,1-Trichloroethane	ND (0.00111) U	ND (0.00114) U	0.000365 J	ND (0.00115)		
1,1,2-Trichloroethane	ND (0.000692)	ND (0.000711)	ND (0.000686)	ND (0.000715)		
Trichloroethene	ND (0.00410)	ND (0.00421)	ND (0.00406)	ND (0.00423)		
Trichlorofluoromethane	ND (0.00225)	ND (0.00231)	ND (0.00223)	ND (0.00232)		
1,2,4-Trimethylbenzene	ND (0.00115)	ND (0.00118)	ND (0.00114)	ND (0.00119)		
1,3,5-Trimethylbenzene	ND (0.00112)	ND (0.00115)	ND (0.00111)	ND (0.00115)		
Vinyl acetate	ND (0.00557)	ND (0.00573)	ND (0.00553)	ND (0.00576)		

Table 1-2 (Continued)

Sample ID	P05A	P05B	P06A	P06B		
Vinyl chloride	ND (0.00138)	ND (0.00141)	ND (0.00136)	ND (0.00142)		
m&p-Xylene	ND (0.00247)	ND (0.00254)	ND (0.00245)	ND (0.00255)		
o-Xylene	ND (0.00102)	ND (0.00105)	ND (0.00101)	ND (0.00106)		

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

Target analytes not listed were not detected.

Bold values exceed site evaluation screening levels.

NA = Not analyzed.

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

Table 1-3

**Summary of Qualified Soil Analytical Results:
Semivolatile Organic Compounds by Method 8270C
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
Analyte (mg/kg)						
Acenaphthene	ND (0.0170)	ND (0.0148)	ND (0.0152)	ND (0.0146)	ND (0.0165)	ND (0.0142)
Acetophenone	ND (0.0139)	ND (0.0122)	ND (0.0125)	ND (0.0120)	ND (0.0135)	ND (0.0116)
Benz(a)pyrene	ND (0.0155)	ND (0.0136)	ND (0.0139)	ND (0.0134)	ND (0.0150)	ND (0.0129)
Benzo(b)fluoranthene	ND (0.0131)	ND (0.0115)	ND (0.0118)	ND (0.0113)	ND (0.0127)	ND (0.0109)
Benzo(k)fluoranthene	ND (0.0274)	ND (0.0240)	ND (0.0246)	ND (0.0236)	ND (0.0266)	ND (0.0228)
Benzoic acid	0.676 J	R	R	R	0.149 J	R
Butylbenzylphthalate	ND (0.00968)	ND (0.00845)	ND (0.00867)	ND (0.00832)	ND (0.00938)	ND (0.00806)
Chrysene	ND (0.0230)	ND (0.0201)	ND (0.0206)	ND (0.0198)	ND (0.0223)	ND (0.0192)
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)

Table 1-3 (Continued)

Sample ID	F6A	F11A	F11B	F14A	F14B	F17A
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)

Target analytes not listed were not detected.

ND () = Not detected at specified detection limit.

Bold values exceed site evaluation screening levels.

J = Estimated value.

R = Unusable data; laboratory specification not met.

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

UJ = Not detected and the detection limit is estimated.

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

Table 1-3 (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	4/22/98	4/22/98	4/22/98	5/18/98	5/18/98
Analyte (mg/kg)					
Acenaphthene	ND (0.0159)	0.111	ND (0.0148)	ND (0.0140)	ND (0.0156)
Acetophenone	ND (0.0130)	ND (0.0119)	ND (0.0121)	ND (0.0115)	ND (0.0128)
Benz(a)pyrene	ND (0.0146)	ND (0.0133)	ND (0.0135)	ND (0.0128)	ND (0.0142)
Benzo(b)fluoranthene	ND (0.0123)	ND (0.0112)	ND (0.0114)	ND (0.0108)	ND (0.0120)
Benzo(k)fluoranthene	ND (0.0257)	ND (0.0235)	ND (0.0239)	ND (0.0226)	ND (0.0251)
Benzoic acid	R	R	R	ND (1.43)	ND (1.58)
Butylbenzylphthalate	ND (0.00907)	ND (0.00829)	ND (0.00842)	ND (0.00798)	ND (0.00886)
Chrysene	ND (0.0216)	ND (0.0197)	ND (0.0201)	ND (0.0190)	ND (0.0211)
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)

Table 1-3 (Continued)

Sample ID	F17B	F18A	F18B	F21A	F21B
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.

Bold values exceed site evaluation screening levels.

J = Estimated value.

R = Unusable data; laboratory specification not met.

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

UJ = Not detected and the detection limit is estimated.

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

Table 1-3 (Continued)

Sample ID	F22A	F22B	F23A	F23B	P01A	P01B
Sample Interval (ft. below surface)	0-2	3-5	0-2	3-5	0-2	2-4
Date of Sampling	9/21/98	9/21/98	9/21/98	9/21/98	9/21/98	9/21/98
Date of Analysis	9/29/98	9/29/98	9/29/98	9/29/98	9/29/98	9/30/98
Analyte (mg/kg)						
Acenaphthene	ND (0.0139)	ND (0.0145)	ND (0.0143)	ND (0.0148)	ND (0.0145)	ND (0.0154)
Acetophenone	0.0134	ND (0.0118)	ND (0.0117)	ND (0.0121)	ND (0.0119)	ND (0.0126)
Benz(a)pyrene	ND (0.0127)	ND (0.0132) UJ	ND (0.0131)	ND (0.0135) UJ	ND (0.0132)	ND (0.0141)
Benzo(b)fluoranthene	ND (0.0107)	ND (0.0112) UJ	ND (0.0110)	ND (0.0114) UJ	ND (0.0112)	ND (0.0119)
Benzo(k)fluoranthene	ND (0.0224)	ND (0.0233) UJ	ND (0.0231)	ND (0.0239) UJ	ND (0.0234)	ND (0.0249)
Benzoic acid	0.414 J	0.0912 J	0.170 J	ND (1.50) UJ	ND (1.47) UJ	ND (1.57) UJ
Butylbenzylphthalate	ND (0.00789)	0.0867	ND (0.00814)	0.194	0.0214	ND (0.00877)
Chrysene	ND (0.0188)	ND (0.0196)	ND (0.0194)	0.0572 J	ND (0.0196)	ND (0.0209)
Dibenzofuran	ND (0.00939)	ND (0.00980)	ND (0.00969)	ND (0.0100)	ND (0.00982)	ND (0.0104)
bis(2-Ethylhexyl)phthalate	ND (0.0470) U	ND (0.184) U	ND (0.103) U	ND (0.170) U	ND (0.0612) U	ND (0.0522) U
Fluoranthene	ND (0.0139)	0.0104 J	ND (0.0143)	ND (0.0148)	ND (0.0145)	ND (0.0154)
Fluorene	ND (0.0131)	ND (0.0137)	ND (0.0135)	ND (0.0140)	ND (0.0137)	ND (0.0145)
2-Methylnaphthalene	ND (0.0138)	0.0739	ND (0.0143)	0.0327	ND (0.0144)	ND (0.0154)
4-Methylphenol/3-Methylphenol	0.472 J	ND (0.0190)	0.324 J	ND (0.0195)	ND (0.0191)	ND (0.0203)
Naphthalene	ND (0.0172)	0.0992	ND (0.0177)	0.0247	ND (0.0180)	ND (0.0191)

Table 1-3 (Continued)

Sample ID	F22A	F22B	F23A	F23B	P01A	P01B
Phenanthrene	ND (0.0235)	0.0402	ND (0.0242)	0.0273	ND (0.0246)	ND (0.0261)
Pyrene	ND (0.0191)	0.0249 J	ND (0.0197)	ND (0.0204)	ND (0.0200)	ND (0.0212)

Target analytes not listed were not detected.

ND () = Not detected at specified detection limit.

Bold values exceed site evaluation screening levels.

J = Estimated value.

R = Unusable data; laboratory specification not met.

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

UJ = Not detected and the detection limit is estimated.

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

Table 1-3 (Continued)

Sample ID	P02A	P02B	P03A	P03B	P04A	P04B
Sample Interval (ft. below surface)	0-2	2-4	0-2	2-4	0-2	2-4
Date of Sampling	9/22/98	9/22/98	9/21/98	9/21/98	9/22/98	9/22/98
Date of Analysis	9/30/98	9/29/98	9/30/98	9/30/98	9/30/98	9/29/98
Analyte (mg/kg)						
Acenaphthene	ND (0.0241)	ND (0.0157)	ND (0.0139)	ND (0.0149)	ND (0.0251)	ND (0.0274)
Acetophenone	ND (0.00925)	ND (0.0129)	ND (0.0114)	ND (0.0122)	ND (0.00964)	ND (0.0105)
Benz(a)pyrene	ND (0.0324)	ND (0.0144)	0.00315 J	ND (0.0136)	ND (0.0337)	ND (0.0368)
Benzo(b)fluoranthene	ND (0.0273)	ND (0.0121)	0.00674 J	ND (0.0115)	ND (0.0285)	ND (0.0311)
Benzo(k)fluoranthene	ND (0.0140)	ND (0.0253)	0.00674 J	ND (0.0240)	ND (0.0146)	ND (0.0159)
Benzoic acid	ND (0.121) UJ	ND (1.60) UJ	ND (1.42) UJ	ND (1.51) UJ	ND (0.126) UJ	ND (0.137) UJ
Butylbenzylphthalate	ND (0.0115)	ND (0.00894)	0.0120	ND (0.00846)	ND (0.0120)	ND (0.0131)
Chrysene	ND (0.0243)	ND (0.0213)	ND (0.0189)	ND (0.0201)	ND (0.0254)	ND (0.0276)
Dibenzofuran	ND (0.0126)	ND (0.0106)	ND (0.00945)	ND (0.0101)	ND (0.0131)	ND (0.0143)
bis(2-Ethylhexyl)phthalate	ND (0.0414)	ND (0.0532)	ND (0.0472) U	ND (0.0503)	ND (0.0431)	ND (0.0470)
Fluoranthene	0.0160 J	0.0114 J	ND (0.0140)	ND (0.0149)	ND (0.0245)	ND (0.0267)
Fluorene	ND (0.0303)	ND (0.0148)	ND (0.0132)	ND (0.0140)	ND (0.0316)	ND (0.0345)
2-Methylnaphthalene	ND (0.0189)	ND (0.0157)	ND (0.0139)	ND (0.0148)	ND (0.0197)	ND (0.0214)
4-Methylphenol/3-Methylphenol	ND (0.0233)	ND (0.0207)	ND (0.0184)	ND (0.0196)	ND (0.0243)	ND (0.0264)
Naphthalene	ND (0.0197)	ND (0.0195)	ND (0.0173)	ND (0.0184)	ND (0.0205)	ND (0.0224)

Table 1-3 (Continued)

Sample ID	P02A	P02B	P03A	P03B	P04A	P04B
Phenanthrene	ND (0.0231)	ND (0.0266)	ND (0.0236)	ND (0.0252)	ND (0.0241)	ND (0.0263)
Pyrene	0.0129 J	0.0101 J	ND (0.0192)	ND (0.0205)	ND (0.0153)	ND (0.0166)

Target analytes not listed were not detected.

ND () = Not detected at specified detection limit.

Bold values exceed site evaluation screening levels.

J = Estimated value.

R = Unusable data; laboratory specification not met.

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

UJ = Not detected and the detection limit is estimated.

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

Table 1-3 (Continued)

Sample ID	P05A	P05B	P06A	P06B		
Sample Interval (ft. below surface)	0-2	2-4	0-2	2-4		
Date of Sampling	9/21/98	9/21/98	9/22/98	9/22/98		
Date of Analysis	9/30/98	9/30/98	9/29/98	9/29/98		
Analyte (mg/kg)						
Acenaphthene	ND (0.0136)	ND (0.0140)	ND (0.0136)	ND (0.0141)		
Acetophenone	ND (0.0111)	ND (0.0114)	ND (0.0112)	ND (0.0116)		
Benz(a)pyrene	ND (0.0124)	ND (0.0128)	ND (0.0125)	ND (0.0129)		
Benzo(b)fluoranthene	0.00705 J	ND (0.0108)	ND (0.0105)	ND (0.0109)		
Benzo(k)fluoranthene	0.00736 J	ND (0.0225)	ND (0.0220)	ND (0.0228)		
Benzoic acid	ND (1.38) UJ	ND (1.42) UJ	ND (1.39) J	ND (1.43) J		
Butylbenzylphthalate	0.0289	ND (0.00795)	ND (0.00776)	ND (0.00803)		
Chrysene	0.0141 J	ND (0.0129)	ND (0.0185)	ND (0.0191)		
Dibenzofuran	ND (0.00920)	ND (0.00946)	ND (0.00924)	ND (0.00956)		
bis(2-Ethylhexyl)phthalate	ND (0.165) U	ND (0.0473) U	ND (0.350) U	ND (0.0478)		
Fluoranthene	0.00962 J	ND (0.0140)	ND (0.0137)	ND (0.0141)		
Fluorene	ND (0.0128)	ND (0.0132)	ND (0.0129)	ND (0.0133)		
2-Methylnaphthalene	ND (0.0135)	ND (0.0139)	ND (0.0136)	ND (0.0141)		
4-Methylphenol/3-Methylphenol	ND (0.0179)	ND (0.0184)	ND (0.0179)	ND (0.0186)		
Naphthalene	ND (0.0169)	ND (0.0173)	ND (0.0169)	ND (0.0175)		

Table 1-3 (Continued)

Sample ID	P05A	P05B	P06A	P06B		
Phenanthrene	ND (0.0230)	ND (0.0236)	ND (0.0231)	ND (0.0239)		
Pyrene	0.00834 J	ND (0.0192)	ND (0.0188)	ND (0.0194)		

Target analytes not listed were not detected.

ND () = Not detected at specified detection limit.

Bold values exceed site evaluation screening levels.

J = Estimated value.

R = Unusable data; laboratory specification not met.

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

UJ = Not detected and the detection limit is estimated.

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

Table 1-4

**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
Analyte (mg/kg)						
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 1-4 (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 1-5

**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

Table 1-5 (Continued)

Sample ID	F6A	F11A	F11B	F14A	F14B	F17A
Manganese	15.2	8.41	8.05	12.2	6.94	4.78
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 1-5 (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

Table 1-5 (Continued)

Sample ID	F17B	F18A	F18B	F21A	F21B
Nickel	2.34	1.60	1.17	2.74	2.63
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 1-6

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

Sample ID	Date of Sampling	pH	Date of Analysis (pH)	TOC (mg/Kg)	Date of Analysis (TOC)
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
F22A	9/21/98	4.87	9/23/98	NA	NA
F22B	9/21/98	4.29	9/23/98	NA	NA
F23A	9/21/98	4.72	9/23/98	NA	NA
F23B	9/21/98	3.85	9/23/98	NA	NA
P01A	9/21/98	7.25	9/23/98	624	10/1/98
P01B	9/21/98	4.60	9/23/98	NA	NA

Table 1-6(Continued)

Sample ID	Date of Sampling	pH	Date of Analysis (pH)	TOC (mg/Kg)	Date of Analysis (TOC)
P02A	9/22/98	5.16	9/24/98	NA	NA
P02B	9/22/98	4.61	9/24/98	2,570	10/1/98
P03A	9/21/98	5.60	9/23/98	NA	NA
P03B	9/21/98	4.56	9/23/98	NA	NA
P04A	9/22/98	4.04	9/24/98	NA	NA
P04B	9/22/98	4.69	9/24/98	NA	NA
P05A	9/21/98	5.13	9/23/98	NA	NA
P05B	9/21/98	4.45	9/23/98	NA	NA
P06A	9/22/98	4.94	9/24/98	4,270	10/1/98
P06B	9/22/98	4.42	9/24/98	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 1-7

**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
TCLP Volatile Organics (µg/L) by Method 8260B		
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
TCLP Semivolatiles (µg/L) by Method 8270C		
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 1-7 (Continued)

Analyte	Concentration	Regulatory Level
TCLP Pesticides ($\mu\text{g/L}$) by Method 8081A		
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
TCLP Herbicides ($\mu\text{g/L}$) by Method 8151A		
2,4-D	ND (0.980)	10,000
2,4,5-TP (Silvex)	ND (0.265)	1,000
TCLP Metals (mg/L) by Method 6010B or 7470A*		
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 1-8

**Groundwater Elevations: May 13, 1998
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Well	Measuring Point Elevation (ft. above MSL)	Depth to Water (ft. below MP)	Water-Level Elevation (ft. above MSL)
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
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Measuring Point	Measuring Point Elevation (ft. above MSL)	Depth to Water (ft. below MP)	Water-Level Elevation (ft. above MSL)
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 1-9

**Groundwater Elevations: November 16, 1998
Hamilton Beach ◊ Proctor-Silex, Washington, North Carolina**

Well	Measuring Point Elevation (ft. above MSL)	Depth to Water (ft. below MP)	Water-Level Elevation (ft. above MSL)
MW-201S	29.74	3.59	26.15
MW-208	32.11	7.25	24.86
MW-209	32.93	11.25	21.68
MW-210	32.49	9.30	23.19
MW-211	31.75	8.97	22.78
MW-212	28.45	5.95	22.50
MW-213	28.44	4.23	24.21
MW-214	27.93	5.75	22.18
MW-215	28.06	3.87	24.19
MW-216	32.82	10.45	22.37
MW-217	32.75	8.77	23.98
MW-218	31.55	9.40	22.15
MW-219	31.83	8.83	23.00
MW-220	31.5	10.95	20.55
MW-221	31.39	10.52	20.87
MW-222	35.11	15.12	19.99
MW-223	35.15	7.56	27.59
MW-224	33.43	9.79	23.64
MW-225	33.43	9.07	24.36
MW-226	28.46	20.03	8.43
MW-227	28.47	6.09	22.38
MW-228	28.71	5.70	23.01
MW-229	30.44	8.67	21.77
MW-230	33.47	12.33	21.14
MW-231	31.94	9.58	22.36

**Surface Water Elevations
Hamilton Beach ◊ Proctor-Silex, Washington, North Carolina**

Measuring Point	Measuring Point Elevation (ft. above MSL)	Depth to Water (ft. below MP)	Water-Level Elevation (ft. above MSL)
W81	22.73	0.68	22.05
W82	23.16	0.71	22.45
W83	23.99	0.65	23.34
W84	23.99	0.60	23.39
W85	24.25	0.96	23.29

Table 1-10

**Summary of Groundwater Screening Results:
Volatile Organic Compounds by Method 8260A and 8260B (G4 through G12)
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	C1-4	C1-19	C5-8	C5-17	C5-30	C6-8	C6-26	C7-5	C7-24
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
Analyte (µg/L)									
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Bromoform	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	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)
Chloroform	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
3-Chloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA
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)

Table 1-10 (Continued)

Sample ID	C1-4	C1-19	C5-8	C5-17	C5-30	C6-8	C6-26	C7-5	C7-24
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)
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
p-Isopropyltoluene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
Methyl t-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
Napthalene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
n-Propylbenzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
Styrene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
1,1,1,2-Tetrachloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
1,1,2,2-Tetrachloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)
Tetrachloroethene	ND (1)	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)
1,1,2-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)
1,2,4-Trimethylbenzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)

Table 1-10 (Continued)

Sample ID	C1-4	C1-19	C5-8	C5-17	C5-30	C6-8	C6-26	C7-5	C7-24
1,3,5-Trimethylbenzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	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)
o-Xylene	ND (1)	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)

Target analytes not listed were not detected.

NA = Not analyzed.

ND () = Not detected at specified detection limit.

J = Estimated value.

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

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

UJ = Not detected and the detection limit is estimated.

All samples were collected using a Tubing Check-Valve System within a screen point sampler or within a temporary well (C1-4, C13-3, C14-5, G4-7, and G5-7) advanced by DPT.

Table 1-10 (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
Analyte ($\mu\text{g/L}$)									
Acetone	NA								
Acetonitrile	NA								
Benzene	ND (1)	ND (10)	ND (10)	ND (1)					
Bromoform	ND (1)	ND (10)	ND (10)	ND (1)					
2-Butanone (MEK)	NA								
n-Butylbenzene	ND (1)	ND (10)	ND (10)	ND (1)					
Carbon disulfide	NA								
Carbon tetrachloride	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)
Chloroform	ND (1)	ND (10)	ND (10)	ND (1)					
3-Chloropropene	NA								
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)					

Table 1-10 (Continued)

Sample ID	C8-5	C8-24	C9-4	C9-25	C10-4	C10-25	C10-49	C11-4	C11-25
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	ND (1)	ND (10)	ND (10)	ND (1)					
p-Isopropyltoluene	ND (1)	ND (10)	ND (10)	ND (1)					
Methyl t-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	ND (1)	ND (10)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)	3	ND (1)
Napthalene	ND (1)	ND (10)	ND (10)	ND (1)					
n-Propylbenzene	ND (1)	ND (10)	ND (10)	ND (1)					
Styrene	ND (1)	ND (10)	ND (10)	ND (1)					
1,1,1,2-Tetrachloroethane	ND (1)	ND (10)	ND (10)	ND (1)					
1,1,2,2-Tetrachloroethane	ND (1)	ND (10)	ND (10)	ND (1)					
Tetrachloroethene	ND (1)	ND (10)	ND (10)	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)
1,1,2-Trichloroethane	ND (1)	ND (10)	ND (10)	ND (1)					
Trichloroethene	ND (1)	20	480	T	2	ND (1)	ND (1)	ND (1)	ND (1)
1,2,4-Trimethylbenzene	ND (1)	ND (10)	ND (10)	ND (1)					
1,3,5-Trimethylbenzene	ND (1)	ND (10)	ND (10)	ND (1)					
Vinyl chloride	ND (1)	ND (10)	11	ND (1)					

Table 1-10 (Continued)

Sample ID	C8-5	C8-24	C9-4	C9-25	C10-4	C10-25	C10-49	C11-4	C11-25
m&p-Xylene	ND (2)	ND (20)	ND (20)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
o-Xylene	ND (1)	ND (10)	ND (10)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)

Target analytes not listed were not detected.

NA = Not analyzed.

ND () = Not detected at specified detection limit.

J = Estimated value.

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

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

UJ = Not detected and the detection limit is estimated.

All samples were collected using a Tubing Check-Valve System within a screen point sampler or within a temporary well (C1-4, C13-3, C14-5, G4-7, and G5-7) advanced by DPT.

Table 1-10 (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
Analyte ($\mu\text{g/L}$)									
Acetone	NA								
Acetonitrile	NA								
Benzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Bromoform	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
2-Butanone (MEK)	NA								
n-Butylbenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Carbon disulfide	NA								
Carbon tetrachloride	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Chloroethane	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Chloroform	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
3-Chloropropene	NA								
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)				

Table 1-10 (Continued)

Sample ID	C12-4	C12-18	C12-29	C13-3	C13-24	C14-5	C14-23	C14-51	C15-5
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
p-Isopropyltoluene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Methyl t-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Napthalene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
n-Propylbenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Styrene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
1,1,1,2-Tetrachloroethane	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
1,1,2,2-Tetrachloroethane	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Tetrachloroethene	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)
1,1,2-Trichloroethane	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Trichloroethene	ND (1)	66	21	16	ND (1)				
1,2,4-Trimethylbenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
1,3,5-Trimethylbenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				
Vinyl chloride	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				

Table 1-10 (Continued)

Sample ID	C12-4	C12-18	C12-29	C13-3	C13-24	C14-5	C14-23	C14-51	C15-5
m&p-Xylene	ND (2)	ND (20)	ND (2)	ND (2)	ND (2)				
o-Xylene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)				

Target analytes not listed were not detected.

NA = Not analyzed.

ND () = Not detected at specified detection limit.

J = Estimated value.

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

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

UJ = Not detected and the detection limit is estimated.

All samples were collected using a Tubing Check-Valve System within a screen point sampler or within a temporary well (C1-4, C13-3, C14-5, G4-7, and G5-7) advanced by DPT.

Table 1-10 (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 ($\mu\text{g/L}$)									
Acetone	NA								
Acetonitrile	NA								
Benzene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
Bromoform	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
2-Butanone (MEK)	NA								
n-Butylbenzene	T	ND (10)	ND (10)	ND (10)	ND (1)				
Carbon disulfide	NA								
Carbon tetrachloride	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
Chloroethane	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
Chloroform	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
3-Chloropropene	NA								
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

Table 1-10 (Continued)

Sample ID	C15-24	C16-4	C16-18	C16-28	C17-4	C17-25	C18-5	C18-25	G1-20
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
p-Isopropyltoluene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
Methyl t-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
Napthalene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
n-Propylbenzene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
Styrene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
1,1,1,2-Tetrachloroethane	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
1,1,2,2-Tetrachloroethane	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
Tetrachloroethene	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)				
1,1,2-Trichloroethane	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
Trichloroethene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
1,2,4-Trimethylbenzene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
1,3,5-Trimethylbenzene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				
Vinyl chloride	ND (1)	ND (10)	44	ND (10)	ND (1)				

Table 1-10 (Continued)

Sample ID	C15-24	C16-4	C16-18	C16-28	C17-4	C17-25	C18-5	C18-25	G1-20
m&p-Xylene	ND (2)	ND (20)	ND (20)	ND (20)	ND (2)	ND (2)	ND (2)	ND (2)	T
o-Xylene	ND (1)	ND (10)	ND (10)	ND (10)	ND (1)				

Target analytes not listed were not detected.

NA = Not analyzed.

ND () = Not detected at specified detection limit.

J = Estimated value.

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

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

UJ = Not detected and the detection limit is estimated.

All samples were collected using a Tubing Check-Valve System within a screen point sampler or within a temporary well (C1-4, C13-3, C14-5, G4-7, and G5-7) advanced by DPT.

Table 1-10 (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
Analyte ($\mu\text{g/L}$)								
Acetone	NA							
Acetontrile	NA							
Benzene	ND (1)							
Bromoform	ND (1)							
2-Butanone (MEK)	NA							
n-Butylbenzene	ND (1)							
Carbon disulfide	NA							
Carbon tetrachloride	ND (1)							
Chloroethane	ND (1)							
Chloroform	ND (1)							
3-Chloropropene	NA							
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)							

Table 1-10 (Continued)

Sample ID	G1-30	G1-40	G2-20	G2-30	G2-40	G3-20	G3-30	G3-40
2-Hexanone	NA							
Isopropylbenzene	ND (1)							
p-Isopropyltoluene	ND (1)							
Methyl t-butyl ether	NA							
4-Methyl-2-pentanone (MIBK)	NA							
Methylene chloride	ND (1)							
Napthalene	ND (1)							
n-Propylbenzene	ND (1)							
Styrene	ND (1)							
1,1,1,2-Tetrachloroethane	ND (1)							
1,1,2,2-Tetrachloroethane	ND (1)							
Tetrachloroethene	ND (1)							
Toluene	ND (1)	ND (1)	ND (1)	T	ND (1)	ND (1)	ND (1)	ND (1)
1,1,1-Trichloroethane	ND (1)							
1,1,2-Trichloroethane	ND (1)							
Trichloroethene	ND (1)							
1,2,4-Trimethylbenzene	ND (1)							
1,3,5-Trimethylbenzene	ND (1)							
Vinyl chloride	ND (1)							

Table 1-10 (Continued)

Sample ID	G1-30	G1-40	G2-20	G2-30	G2-40	G3-20	G3-30	G3-40
m&p-Xylene	ND (2)							
o-Xylene	ND (1)							

Target analytes not listed were not detected.

NA = Not analyzed.

ND () = Not detected at specified detection limit.

J = Estimated value.

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

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

UJ = Not detected and the detection limit is estimated.

All samples were collected using a Tubing Check-Valve System within a screen point sampler or within a temporary well (C1-4, C13-3, C14-5, G4-7, and G5-7) advanced by DPT.

Table 1-10 (Continued)

Sample ID	G4-7	G5-7	G6-7	G7-7	G8-7
Sample Interval (ft. below surface)	5.5 - 10.5	4-9	5-9	5-9	5-9
Date of Sampling	9/22/98	9/22/98	9/22/98	9/22/98	9/22/98
Analyte (µg/L)					
Acetone	49.8 J	591 J	ND (0.834)	ND (1.67)	ND (1.67)
Acetonitrile	ND (1.39) UJ	81.0 J	ND (1.39) UJ	ND (2.78) UJ	ND (2.78) UJ
Benzene	6.71 J	21.6 J	0.445	0.203	ND (0.169)
Bromoform	0.768 J	ND (0.346) UJ	ND (0.346) UJ	ND (0.692)	ND (0.692) UJ
2-Butanone (MEK)	29400	4110	ND (0.415)	ND (0.830)	ND (0.830)
n-Butylbenzene	1.00 J	0.282 J	ND (0.104)	ND (0.208)	ND (0.208)
Carbon disulfide	ND (0.136) UJ	ND (0.136) UJ	ND (0.136) UJ	ND (0.272) UJ	ND (0.272) UJ
Carbon tetrachloride	ND (0.137) UJ	0.963 J	ND (0.137)	ND (0.274)	ND (0.274) UJ
Chloroethane	38.4 J	21.7 J	0.815	ND (0.292)	ND (0.292)
Chloroform	75.6 J	44.1 J	ND (0.158)	ND (0.316)	ND (0.316)
3-Chloropropene	ND (0.116) UJ	ND (0.116) UJ	ND (0.116) UJ	ND (0.232) UJ	ND (0.232) UJ
1,1-Dichloroethane	27,000	11,600	2,300	32.1	2.84
1,2-Dichloroethane	2,620	994	33.2	0.918	ND (0.246)
1,1-Dichloroethene	15,600	13,700	747	6.91	0.540
cis-1,2-Dichloroethene	10,000	11,800	6,900	91.2	ND (0.212)
trans-1,2-Dichloroethene	261	156	50.7	0.858	ND (0.300)
Ethylbenzene	37.2 J	3.30 J	0.156	ND (0.242)	ND (0.242)
2-Hexanone	90.3 J	45.3 J	ND (0.237)	ND (0.474)	ND (0.474)
Isopropylbenzene	2.29 J	0.288 J	ND (0.0864)	ND (0.173)	ND (0.173)

Table 1-10 (Continued)

Sample ID	G4-7	G5-7	G6-7	G7-7	G8-7
p-Isopropyltoluene	0.461 J	ND (0.0669) UJ	ND (0.0669)	ND (0.134)	ND (0.134)
Methyl t-butyl ether	ND (0.105) UJ	1.29 J	ND (1.05)	ND (0.210)	ND (0.210)
4-methyl-2-pentanone (MIBK)	26.6 J	19.4 J	ND (0.203)	ND (0.406)	ND (0.406)
Methylene chloride	ND (255) U	68.3 J	ND (4.67) U	ND (1.18) U	ND (1.02) U
Napthalene	37.5 J	3.40 J	ND (0.103)	ND (0.206)	ND (0.206)
n-Propylbenzene	12.1 J	1.36 J	ND (0.0857)	ND (0.171)	ND (0.171)
Styrene	0.129 J	0.255 J	ND (0.0927)	ND (0.185)	ND (0.185)
1,1,1,2-Tetrachloroethane	1.67 J	ND (0.101) UJ	ND (0.101)	ND (0.202)	ND (0.202)
1,1,2,2-Tetrachloroethane	1.15 J	ND (0.152) UJ	ND (0.152)	ND (0.304)	ND (0.304)
Tetrachloroethene	20.8 J	1.43 J	0.478	0.371	0.244 J
Toluene	642	53.5 J	2.26	2.18	2.02
1,1,1-Trichloroethane	303,000	20,700 J	ND (0.108)	ND (0.216)	ND (0.216)
1,1,2-Trichloroethane	256	87.3 J	2.26	ND (0.166)	ND (0.166)
Trichloroethene	12,400	1980	374	15.0	ND (0.322)
1,2,4-Trimethylbenzene	67.1 J	7.53 J	ND (0.0730)	ND (0.146)	ND (0.146)
1,3,5-Trimethylbenzene	17.7 J	2.30 J	ND (0.0898)	ND (0.180)	ND (0.180)
Vinyl chloride	27.3 J	17.5 J	19.1	ND (0.272)	ND (0.272)

Table 1-10 (Continued)

Sample ID	G4-7	G5-7	G6-7	G7-7	G8-7
m&p-Xylene	86.7 J	7.18 J	0.495	0.471	0.394 J
o-Xylene	94.2 J	8.88 J	ND (0.0951)	ND (0.190)	ND (0.190)

Target analytes not listed were not detected.

NA = Not analyzed.

ND () = Not detected at specified detection limit.

J = Estimated value.

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

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

UJ = Not detected and the detection limit is estimated.

All samples were collected using a Tubing Check-Valve System within a screen point sampler or within a temporary well (C1-4, C13-3, C14-5, G4-7, and G5-7) advanced by DPT.

Table 1-10 (Continued)

Sample ID	G9-6	G9-17	G9-28	G10-6	G10-17
Sample Interval (ft. below surface)	4-8	15-19	26-30	4-8	15-19
Date of Sampling	9/21/98	9/21/98	9/21/98	9/21/98	9/21/98
Analyte ($\mu\text{g/L}$)					
Acetone	7.02	ND (1.67)	6.87	7.97 J	5.66J
Acetrontrile	ND (1.39) UJ	ND (2.78) UJ	ND (1.39) UJ	ND (1.39) J	ND (1.39) UJ
Benzene	ND (0.0847)	0.229	0.354	ND (0.0847)	0.136
Bromoform	ND (0.346)	ND (0.692) UJ	ND (0.346)	ND (0.346) UJ	ND (0.346)
2-Butanone (MEK)	ND (0.415)	ND (0.830)	ND (0.415)	ND (0.415) UJ	ND (0.415)
n-Butylbenzene	ND (0.104)	ND (0.208)	ND (0.104)	ND (0.104)	ND (0.104)
Carbon disulfide	ND (0.136) UJ	ND (0.272) UJ	ND (0.136) UJ	ND (0.136) UJ	ND (0.136) UJ
Carbon tetrachloride	ND (0.137)	ND (0.274)	ND (0.137)	ND (0.137) UJ	ND (0.137)
Chloroethane	ND (0.146)	ND (0.292)	ND (0.146)	ND (0.146)	ND (0.146)
Chloroform	ND (0.158)	ND (0.316)	ND (0.158)	ND (0.158)	ND (0.158)
3-Chloropropene	0.354	ND (0.232) UJ	ND (0.116)	ND (0.116) UJ	ND (0.116)
1,1-Dichloroethane	4.41	ND (0.220)	1.29	ND (0.110)	ND (0.110)
1,2-Dichloroethane	ND (0.123)	ND (0.246)	ND (0.123)	ND (0.123)	ND (0.123)
1,1-Dichloroethene	3.52	ND (0.296)	0.598	ND (0.148)	ND (0.148)
cis-1,2-Dichloroethene	ND (0.106)	ND (0.212)	ND (0.106)	ND (0.106)	ND (0.106)
trans-1,2-Dichloroethene	ND (0.150)	ND (0.300)	ND (0.150)	ND (0.150)	ND (0.150)
Ethylbenzene	0.139	0.248	0.407	0.0474 J	0.227
2-Hexanone	ND (0.237)	ND (0.474)	ND (0.237)	ND (0.237)	ND (0.237)

Table 1-10 (Continued)

Sample ID	G9-6	G9-17	G9-28	G10-6	G10-17
Isopropylbenzene	ND (0.0864)	ND (0.173)	ND (0.0864)	ND (0.0864)	ND (0.0864)
p-Isopropyltoluene	ND (0.0669)	ND (0.134)	ND (0.0669)	ND (0.0669)	ND (0.0669)
Methyl t-butyl ether	ND (0.105)	ND (0.210)	ND (0.105)	ND (0.105)	ND (0.105)
4-methyl-2-pentanone (MIBK)	ND (0.203)	ND (0.406)	ND (0.203)	ND (0.203)	ND (0.203)
Methylene chloride	ND (0.334) U	ND (0.695) U	ND (0.262) U	ND (0.281) U	ND (0.258) U
Napthalene	ND (0.103)	ND (0.206)	ND (0.103)	ND (0.103)	ND (0.103)
n-Propylbenzene	ND (0.0857)	ND (0.171)	ND (0.0857)	ND (0.0857)	ND (0.0857)
Styrene	ND (0.0927)	ND (0.185)	ND (0.0927)	ND (0.0927)	ND (0.0927)
1,1,1,2-Tetrachloroethane	ND (0.101)	ND (0.202)	ND (0.101)	ND (0.101)	ND (0.101)
1,1,2,2-Tetrachloroethane	ND (0.152)	ND (0.304)	ND (0.152)	ND (0.152)	ND (0.152)
Tetrachloroethene	0.596	0.461	0.562	0.224	0.304
Toluene	1.88	3.23	3.34	0.996	2.23
1,1,1-Trichloroethane	2.37	ND (0.216)	ND (0.108)	ND (0.108)	ND (0.108)
1,1,2-Trichloroethane	ND (0.0832)	ND (0.166)	ND (0.0832)	ND (0.0832)	ND (0.0832)
Trichloroethene	3.21	ND (0.322)	0.901	ND (0.161)	ND (0.161)
1,2,4-Trimethylbenzene	ND (0.0730)	ND (0.146)	ND (0.0730)	ND (0.0730)	ND (0.0730)
1,3,5-Trimethylbenzene	ND (0.0898)	ND (0.180)	ND (0.0898)	ND (0.0898)	ND (0.0898)
Vinyl chloride	ND (0.136)	ND (0.272)	ND (0.136)	ND (0.136)	ND (0.136)

Table 1-10 (Continued)

Sample ID	G9-6	G9-17	G9-28	G10-6	G10-17
m&p-Xylene	0.375	1.05	0.375	ND (0.211)	0.840
o-Xylene	ND (0.0951)	ND (0.190)	0.349	ND (0.0951)	0.264

Target analytes not listed were not detected.

NA = Not analyzed.

ND () = Not detected at specified detection limit.

J = Estimated value.

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

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

UJ = Not detected and the detection limit is estimated.

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 1-10 (Continued)

Sample ID	G10-28	G11-6	G11-17	G11-28	G12-7
Sample Interval (ft. below surface)	26-30	4-8	15-19	26-30	10-14
Date of Sampling	9/21/98	9/21/98	9/21/98	9/21/98	9/22/98
Analyte (µg/L)					
Acetone	5.34 J	ND (1.67)	ND (1.67)	5.51 J	7.59
Acetronitrile	ND (1.39) UJ	ND (2.78) UJ	ND (2.78) UJ	ND (1.39) UJ	ND (1.39) UJ
Benzene	0.300	ND (0.169)	0.223	0.324	0.118
Bromoform	ND (0.346)	ND (0.692)	ND (0.232) UJ	ND (0.346)	ND (0.346) UJ
2-Butanone (MEK)	2.38	ND (0.830)	ND (0.830)	ND (0.415)	ND (0.415)
n-Butylbenzene	ND (0.104)	ND (0.208)	ND (0.208)	ND (0.104)	ND (0.104)
Carbon disulfide	ND (0.136) UJ	ND (0.272)	ND (0.272) UJ	ND (0.136) UJ	ND (0.136) UJ
Carbon tetrachloride	ND (0.137)	ND (0.274)	ND (0.274)	ND (0.137)	ND (0.137)
Chloroethane	ND (0.146)	ND 0.292)	ND (0.292)	ND (0.146)	ND (0.146)
Chloroform	ND (0.158)	ND (0.316)	ND (0.316)	ND (0.158)	ND (0.158)
3-Chloropropene	ND (0.116)	ND (0.232)	ND (0.692) UJ	ND (0.116)	ND (0.116) UJ
1,1-Dichloroethane	ND (0.110)	ND 0.220)	ND (0.220)	ND (0.110)	ND (0.110)
1,2-Dichloroethane	ND (0.123)	ND (0.246)	ND (0.246)	ND (0.123)	ND (0.123)
1,1-Dichloroethene	ND (0.148)	ND (0.296)	ND (0.296)	ND (0.148)	0.330
cis-1,2-Dichloroethene	ND (0.106)	ND (0.212)	ND 0.212)	ND (0.106)	ND (0.440) U
trans-1,2-Dichloroethene	ND (0.150)	ND (0.300)	ND (0.300)	ND (0.150)	ND (0.150)
Ethylbenzene	0.452	ND (0.242)	0.216 J	0.346	0.0735 J
2-Hexanone	ND (0.237)	ND (0.474)	ND (0.474)	ND (0.237)	ND (0.237)

Table 1-10 (Continued)

Sample ID	G10-28	G11-6	G11-17	G11-28	G12-7
Isopropylbenzene	ND (0.0864)	ND (0.173)	ND (0.173)	ND (0.0864)	ND (0.0864)
p-Isopropyltoluene	ND (0.0669)	ND (0.134)	ND (0.134)	ND (0.0669)	ND (0.0669)
Methyl t-butyl ether	ND (0.105)	ND (0.210)	ND (0.210)	ND (0.105)	ND (0.105)
4-methyl-2-pentanone (MIBK)	ND (0.203)	ND (0.406)	ND (0.406)	ND (0.203)	ND (0.203)
Methylene chloride	ND (0.227) U	ND (0.608) U	ND (0.826) U	ND (0.256) U	ND (0.249) U
Napthalene	ND (0.103)	ND (0.206)	ND (0.206)	ND (0.103)	ND (0.103)
n-Propylbenzene	ND (0.0857)	ND (0.171)	ND (0.171)	ND (0.0857)	ND (0.0857)
Styrene	ND (0.0927)	ND (0.185)	ND (0.185)	ND (0.0927)	ND (0.0927)
1,1,1,2-Tetrachloroethane	ND (0.101)	ND (0.202)	ND (0.202)	ND (0.101)	ND (0.101)
1,1,2,2-Tetrachloroethane	ND (0.152)	ND (0.304)	ND (0.304)	ND (0.152)	ND (0.152)
Tetrachloroethene	0.475	ND (0.284)	ND (0.284)	0.457	0.208
Toluene	3.42	1.41	2.71	3.36	1.44
1,1,1-Trichloroethane	ND (0.108)	ND (0.232) U	ND (0.216)	ND (0.108)	ND (0.108)
1,1,2-Trichloroethane	ND (0.0832)	ND (0.166)	ND (0.166)	ND (0.0832)	ND (0.0832)
Trichloroethene	ND (0.161)	ND (0.322)	ND (0.322)	ND (0.161)	0.837
1,2,4-Trimethylbenzene	ND (0.0730)	ND (0.146)	ND (0.0730)	ND (0.0730)	ND (0.0730)
1,3,5-Trimethylbenzene	ND (0.0898)	ND (0.180)	ND (0.180)	ND (0.0898)	ND (0.0898)
Vinyl chloride	ND (0.136)	ND (0.272)	ND (0.272)	ND (0.136)	ND (0.136)

Table 1-10 (Continued)

Sample ID	G10-28	G11-6	G11-17	G11-28	G12-7
m&p-Xylene	1.25	ND (0.422)	0.954	0.677	0.592
o-Xylene	0.374	ND (0.190)	ND (0.190)	0.240	0.203

Target analytes not listed were not detected.

NA = Not analyzed.

ND () = Not detected at specified detection limit.

J = Estimated value.

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

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

UJ = Not detected and the detection limit is estimated.

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 1-11

**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
Analyte (µg/L)			
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 1-12

**Summary of Qualified Groundwater Analytical Results: May 1998
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.

Bold values exceed site evaluation screening levels.

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 1-13

**Summary of Qualified Groundwater Analytical Results: November 1998
Volatile Organic Compounds by Method 8260B
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	MW-208	MW-209	MW-210	MW-211	MW-212	MW-213
Date of Sampling	11/17/98	11/17/98	11/17/98	11/17/98	11/18/98	11/18/98
Analyte (µg/L)						
Acetone	ND (0.413)	11.0	ND (0.413)	ND (0.413)	ND (0.413)	ND (0.413)
Benzene	ND (0.0375)	ND (0.0375)	ND (0.0375)	ND (0.0375)	0.171	0.724
2-Butanone (MEK)	R	3.82 J	R	R	ND (0.222) UJ	ND (0.222) UJ
n-Butylbenzene	ND (0.116)	ND (0.116)	ND (0.116)	ND (0.116)	ND (0.116)	0.240
sec-Butylbenzene	ND (0.0782)	ND (0.0782)	ND (0.0782)	ND (0.0782)	ND (0.0782)	0.315
Carbon disulfide	ND (0.0547)	ND (0.0547)	ND (0.0547)	ND (0.0547)	ND (0.0547)	ND (0.0547)
Carbon tetrachloride	ND (0.0576)	ND (0.0576)	ND (0.0576)	ND (0.0576)	ND (0.0576)	ND (0.0576)
Chloroethane	ND (0.0441)	1.16	ND (0.0441)	2.78	0.768	ND (0.0441)
Chloroform	ND (0.0480)	ND (0.0480)	0.226	ND (0.0480)	ND (0.0480)	0.793
1,2-Dichlorobenzene	ND (0.0733)	ND (0.0733)	ND (0.0733)	ND (0.0733)	ND (0.0733)	0.642
1,1-Dichloroethane	ND (0.0576)	1,040	ND (18.8) U	ND (4.50) U	2.56	351
1,2-Dichloroethane	ND (0.0348)	14.1	ND (0.0348)	ND (0.0348)	0.698	7.02
1,1-Dichloroethene	ND (0.0715)	50.5	48.5	20.1	14.3	867
cis-1,2-Dichloroethene	ND (0.0383)	47.7	11,600	1,520	ND (0.188) U	39.3
trans-1,2-Dichloroethene	ND (0.0618)	1.46	96.1	16.5	ND (0.0618)	2.22
Ethylbenzene	ND (0.0928)	ND (0.0928)	6.26	ND (0.0928)	ND (0.0928)	2.03

Table 1-13 (Continued)

Sample ID	MW-208	MW-209	MW-210	MW-211	MW-212	MW-213
2-Hexanone	R	R	R	R	ND (0.232) UJ	ND (0.232) UJ
Isopropylbenzene	ND (0.0661)	ND (0.0661)	ND (0.0661)	ND (0.0661)	ND (0.0661)	0.618
p-Isopropyltoluene	ND (0.106)	ND (0.106)	0.688	0.332	ND (0.106)	ND (0.106)
Methyl t-butyl ether	ND (0.0365) UJ	ND (0.0365) UJ	ND (0.0365) UJ	ND (0.0365) UJ	ND (0.0365)	ND (0.0365)
4-Methyl-2-pentanone (MIBK)	R	R	R	R	ND (0.160) UJ	ND (0.160) UJ
Napthalene	ND (0.578) UJ	ND (0.578) UJ	ND (0.578) UJ	ND (0.578) UJ	ND (0.578) UJ	15.7 J
n-Propylbenzene	ND (0.0577)	ND (0.0577)	ND (0.0577)	ND (0.0577)	ND (0.0577)	ND (0.0577)
1,1,1,2-Tetrachloroethane	ND (0.0848)	ND (0.0848)	ND (0.0848)	ND (0.0848)	ND (0.0848)	ND (0.0848)
1,1,2,2-Tetrachloroethane	ND (0.102)	ND (0.102)	0.645	ND (0.102)	ND (0.102)	ND (0.102)
Tetrachloroethene	ND (0.0515)	ND (0.0515)	502	ND (0.454) U	ND (0.0515)	61.3
Tetrahydrofuran	ND (0.489) UJ	ND (0.489) UJ	ND (0.489) UJ	8.11 J	ND (0.489) UJ	7.63 J
Toluene	ND (0.0522)	3.24	14.1	15.6	ND (0.0522)	1.48
1,1,1-Trichloroethane	ND (0.0658)	ND (0.0658)	ND (0.0658)	0.187	ND (0.0658)	1.09
1,1,2-Trichloroethane	ND (0.0602)	1.58	ND (0.0602)	ND (0.0602)	ND (0.0602)	6.03
Trichloroethene	ND (0.0892)	ND (3.27) U	45,800	83.0	ND (0.579) U	515
Trichlorofluoromethane	ND (0.0473)	ND (0.0473)	ND (0.0473)	ND (0.0473)	ND (0.0473)	0.575
1,2,4-Trimethylbenzene	ND (0.0952) UJ	ND (0.0952) UJ	ND (0.0952) UJ	ND (0.0952) UJ	ND (0.0952)	ND (0.0952)
1,3,5-Trimethylbenzene	ND (0.0800)	ND (0.0800)	ND (0.0800)	ND (0.0800)	ND (0.0800)	ND (0.0800)
Vinyl chloride	ND (0.0639)	1.69	8.02	0.771	4.48	38.7

Table 1-13 (Continued)

Sample ID	MW-208	MW-209	MW-210	MW-211	MW-212	MW-213
m&p-Xylene	ND (0.115)	ND (0.115)	0.860	ND (0.115)	ND (0.115)	1.57
o-Xylene	ND (0.0414)	ND (0.0414)	0.292	ND (0.0414)	ND (0.0414)	3.43

Target analytes not listed were not detected.

ND () = Not detected at specified detection limit.

Bold values exceed site evaluation screening levels.

J = Estimated value.

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

UJ = Not detected and the detection limit is estimated.

R = Unusable data.

The sample from MW-228 was collected using a disposable bailer; samples from all other wells were collected using an inertial foot-valve pump.

Table 1-13 (Continued)

Sample ID	MW-214	MW-215	MW-216	MW-217	MW-218	MW-219
Date of Sampling	11/18/98	11/18/98	11/16/98	11/16/98	11/16/98	11/16/98
Analyte ($\mu\text{g/L}$)						
Acetone	ND (0.809)	ND (0.809)	ND (0.413) UJ	ND (0.413) UJ	ND (0.413) UJ	ND (0.413) UJ
Benzene	0.172 J	0.0963 J	ND (0.0375) UJ	ND (0.0375) UJ	ND (0.0375)	ND (0.0375)
2-Butanone (MEK)	ND (0.231)	ND (0.231)	R	R	R	R
n-Butylbenzene	ND (0.116)	ND (0.116)	ND (0.116) UJ	ND (0.116) UJ	ND (0.116)	ND (0.116)
sec-Butylbenzene	ND (0.156)	ND (0.156)	ND (0.0782) UJ	ND (0.0782) UJ	ND (0.0782)	ND (0.0782)
Carbon disulfide	ND (0.132)	ND (0.132)	ND (0.0547) UJ	ND (0.0547) UJ	ND (0.0547)	ND (0.0547)
Carbon tetrachloride	ND (0.0576)	ND (0.0576)	ND (0.0576) UJ	ND (0.0576) UJ	ND (0.0576)	ND (0.0576)
Chloroethane	0.485 J	ND (0.0977)	ND (0.0441) UJ	ND (0.0441) UJ	ND (0.0441)	ND (0.0441)
Chloroform	ND (0.0933)	ND (0.0933)	ND (0.0480) UJ	ND (0.0480) UJ	ND (0.0480)	ND (0.0480)
1,2-Dichlorobenzene	ND (0.334)	ND (0.334)	ND (0.0733) UJ	ND (0.0733) UJ	ND (0.0733)	ND (0.0733)
1,1-Dichloroethane	108	4.30	ND (0.0576) UJ	ND (0.0576) UJ	ND (0.0576)	1.85
1,2-Dichloroethane	0.303 J	ND (0.0989)	ND (0.0348) UJ	ND (0.0348) UJ	ND (0.0348)	ND (0.0348)
1,1-Dichloroethene	8.16	3.85	ND (0.0715) UJ	ND (0.0715) UJ	ND (0.0715)	0.866
cis-1,2-Dichloroethene	6.86	ND (0.104) U	ND (0.359) UJ	ND (0.373) UJ	ND (0.0383)	ND (0.239) U
trans-1,2-Dichloroethene	0.478	ND (0.0835)	ND (0.0618) UJ	ND (0.0618) UJ	ND (0.0618)	ND (0.0618)
Ethylbenzene	ND (0.234)	0.0601 J	ND (0.0928) UJ	ND (0.0928) UJ	ND (0.0928)	ND (0.0928)
2-Hexanone	ND (0.737)	ND (0.737)	R	R	R	R
Isopropylbenzene	ND (0.255)	ND (0.255)	ND (0.0661) UJ	ND (0.0661) UJ	ND (0.0661)	ND (0.0661)

Table 1-13 (Continued)

Sample ID	MW-214	MW-215	MW-216	MW-217	MW-218	MW-219
p-Isopropyltoluene	0.181 J	ND (0.136)	ND (0.106) UJ	ND (0.106) UJ	ND (0.106)	ND (0.106)
Methyl t-butyl ether	ND (0.0646)	1.22	ND (0.0365) UJ	ND (0.0365) UJ	ND (0.0365) UJ	ND (0.0365) UJ
4-Methyl-2-pentanone (MIBK)	ND (0.160) UJ	ND (0.160) UJ	ND (0.160) UJ	ND (0.160) UJ	R	R
Napthalene	ND (0.578) UJ	ND (0.578) UJ	ND (0.578) UJ	ND (0.578) UJ	ND (0.578) UJ	ND (0.578) UJ
n-Propylbenzene	ND (0.239)	ND (0.239)	ND (0.0577) UJ	ND (0.0577) UJ	ND (0.0577)	ND (0.0577)
1,1,1,2-Tetrachloroethane	ND (0.158)	ND (0.158)	ND (0.0848) UJ	ND (0.0848) UJ	ND (0.0848)	ND (0.0848)
1,1,2,2-Tetrachloroethane	ND (0.102)	ND (0.102)	ND (0.102) UJ	ND (0.102) UJ	ND (0.102)	ND (0.102)
Tetrachloroethene	ND (0.340)	ND (0.340)	ND (0.0515) UJ	ND (0.0515) UJ	ND (0.0515)	ND (0.0515)
Tetrahydrofuran	ND (0.920)	58.6	R	R	R	R
Toluene	ND (0.141)	ND (0.141)	ND (0.0522) UJ	ND (0.0522) UJ	ND (0.0522)	ND (0.0522)
1,1,1-Trichloroethane	ND (0.0965)	ND (0.0965)	ND (0.0658) UJ	ND (0.0658) UJ	ND (0.0658)	1.53
1,1,2-Trichloroethane	ND (0.0881)	ND (0.0881)	ND (0.0602) UJ	ND (0.0602) UJ	ND (0.0602)	ND (0.0602)
Trichloroethene	ND (0.587) U	ND (0.322) U	ND (0.0892) UJ	ND (0.0892) UJ	ND (0.0892)	ND (0.0892)
Trichlorofluoromethane	ND (0.182)	ND (0.182)	ND (0.0473) UJ	ND (0.0473) UJ	ND (0.0473)	ND (0.0473)
1,2,4-Trimethylbenzene	ND (0.205)	ND (0.205)	ND (0.0952) UJ	ND (0.0952) UJ	ND (0.0952)	ND (0.0952)
1,3,5-Trimethylbenzene	ND (0.205)	ND (0.205)	ND (0.0800) UJ	ND (0.0800) UJ	ND (0.0800)	ND (0.0800)
Vinyl chloride	8.84	0.381 J	ND (0.0639) UJ	ND (0.0639) UJ	ND (0.0639)	ND (0.0639)

Table 1-13 (Continued)

Sample ID	MW-214	MW-215	MW-216	MW-217	MW-218	MW-219
m&p-Xylene	ND (0.500)	0.0885 J	ND (0.115) UJ	ND (0.115) UJ	ND (0.115)	ND (0.115)
o-Xylene	ND (0.259)	ND (0.259)	ND (0.0414) UJ	ND (0.0414) UJ	ND (0.0414)	ND (0.0414)

Target analytes not listed were not detected.

ND () = Not detected at specified detection limit.

Bold values exceed site evaluation screening levels.

J = Estimated value.

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

UJ = Not detected and the detection limit is estimated.

R = Unusable data.

The sample from MW-228 was collected using a disposable bailer; samples from all other wells were collected using an inertial foot-valve pump.

Table 1-13 (Continued)

Sample ID	MW-220	MW-221	MW-222	MW-223	MW-224	MW-225
Date of Sampling	11/16/98	11/16/98	11/17/98	11/17/98	11/16/98	11/16/98
Analyte ($\mu\text{g/L}$)						
Acetone	ND (0.413) UJ	ND (0.413) UJ	ND (0.413)	ND (0.413)	ND (0.413) UJ	7.33 J
Benzene	ND (0.0375)	ND (0.0375) UJ	ND (0.0375)	ND (0.0375)	ND (0.0375)	ND (0.0375)
2-Butanone (MEK)	R	R	R	R	R	R
n-Butylbenzene	ND (0.116)	ND (0.116) UJ	ND (0.116)	ND (0.116)	ND (0.116)	ND (0.116)
sec-Butylbenzene	ND (0.0782)	ND (0.0782) UJ	ND (0.0782)	ND (0.0782)	ND (0.0782)	ND (0.0782)
Carbon disulfide	ND (0.0547)	ND (0.0547) UJ	ND (0.0547)	ND (0.0547)	ND (0.0547)	ND (0.0547)
Carbon tetrachloride	ND (0.0576)	ND (0.0576) UJ	ND (0.0576)	ND (0.0576)	ND (0.0576)	ND (0.0576)
Chloroethane	ND (0.0441)	ND (0.0441) UJ	ND (0.0441)	ND (0.0441)	ND (0.0441)	ND (0.0441)
Chloroform	ND (0.0480)	ND (0.0480) UJ	ND (0.0430)	ND (0.0480)	ND (0.0480)	ND (0.0480)
1,2-Dichlorobenzene	ND (0.0733)	ND (0.0733) UJ	ND (0.0733)	ND (0.0733)	ND (0.0733)	ND (0.0733)
1,1-Dichloroethane	ND (0.0576)	ND (0.0576) UJ	ND (0.0576)	ND (0.0576)	ND (0.0576)	ND (0.0576)
1,2-Dichloroethane	ND (0.0348)	ND (0.0348) UJ	ND (0.0348)	ND (0.0348)	ND (0.0348)	ND (0.0348)
1,1-Dichloroethene	ND (0.0715)	ND (0.0715) UJ	ND (0.0715)	ND (0.0715)	ND (0.0715)	ND (0.0715)
cis-1,2-Dichloroethene	ND (0.0383)	ND (0.0383) UJ	ND (0.223) U	ND (0.369) U	ND (0.0383)	ND (0.0383)
trans-1,2-Dichloroethene	ND (0.0618)	ND (0.0618) UJ	ND (0.0618)	ND (0.0618)	ND (0.0618)	ND (0.0618)
Ethylbenzene	ND (0.0928)	ND (0.0928) UJ	ND (0.0928)	ND (0.0928)	ND (0.0928)	ND (0.0928)
2-Hexanone	R	R	R	R	R	R
Isopropylbenzene	ND (0.0661)	ND (0.0661) UJ	ND (0.0661)	ND (0.0661)	ND (0.0661)	ND (0.0661)

Table 1-13 (Continued)

Sample ID	MW-220	MW-221	MW-222	MW-223	MW-224	MW-225
p-Isopropyltoluene	ND (0.106)	ND (0.106) UJ	ND (0.106)	ND (0.106)	ND (0.106)	ND (0.106)
Methyl t-butyl ether	ND (0.0365) UJ					
4-Methyl-2-pentanone (MIBK)	R	ND (1.60) UJ	R	R	R	ND (0.160) UJ
Napthalene	ND (0.578) UJ					
n-Propylbenzene	ND (0.0577)	ND (0.0577) UJ	ND (0.0577)	ND (0.0577)	ND (0.0577)	ND (0.0577)
1,1,1,2-Tetrachloroethane	ND (0.0848)	ND (0.0848) UJ	ND (0.0848)	ND (0.0848)	ND (0.0848)	ND (0.0848)
1,1,2,2-Tetrachloroethane	ND (0.102)	ND (0.102) UJ	ND (0.102)	ND (0.102)	ND (0.102)	ND (0.102)
Tetrachloroethene	ND (0.0515)	ND (0.0515) UJ	ND (0.0515)	ND (0.0515)	ND (0.0515)	ND (0.0515)
Tetrahydrofuran	R	R	ND (0.489) UJ	ND (0.489) UJ	R	R
Toluene	ND (0.0522)	ND (0.0522) UJ	ND (0.0522)	ND (0.0522)	ND (0.0522)	ND (0.0522)
1,1,1-Trichloroethane	ND (0.0658)	ND (0.0658) UJ	ND (0.0658)	ND (0.0658)	ND (0.0658)	ND (0.0658)
1,1,2-Trichloroethane	ND (0.0602)	ND (0.0602) UJ	ND (0.0602)	ND (0.0602)	ND (0.0602)	ND (0.0602)
Trichloroethene	ND (0.0892)	ND (0.0892) UJ	ND (0.832) U	ND (1.10) U	ND (0.0892)	ND (0.0892)
Trichlorofluoromethane	ND (0.0473)	ND (0.0473) UJ	ND (0.0473)	ND (0.0473)	ND (0.0473)	ND (0.0473)
1,2,4-Trimethylbenzene	ND (0.0952)	ND (0.0952) UJ	ND (0.0952) UJ	ND (0.0952) UJ	ND (0.0952)	ND (0.0952)
1,3,5-Trimethylbenzene	ND (0.0800)	ND (0.0800) UJ	ND (0.0800)	ND (0.0800)	ND (0.0800)	ND (0.0800)
Vinyl chloride	ND (0.0639)	ND (0.0639) UJ	ND (0.0639)	ND (0.0639)	ND (0.0639)	ND (0.0639)

Table 1-13 (Continued)

Sample ID	MW-220	MW-221	MW-222	MW-223	MW-224	MW-225
m&p-Xylene	ND (0.115)	ND (0.115) UJ	ND (0.115)	ND (0.115)	ND (0.115)	ND (0.115)
o-Xylene	ND (0.0414)	ND (0.0414) UJ	ND (0.0414)	ND (0.0414)	ND (0.0414)	ND (0.0414)

Target analytes not listed were not detected.

ND () = Not detected at specified detection limit.

Bold values exceed site evaluation screening levels.

J = Estimated value.

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

UJ = Not detected and the detection limit is estimated.

R = Unusable data.

The sample from MW-228 was collected using a disposable bailer; samples from all other wells were collected using an inertial foot-valve pump.

Table 1-13 (Continued)

Sample ID	MW-226	MW-227	MW-228	MW-229	MW-230	MW-231
Date of Sampling	11/16/98	11/18/98	11/18/98	11/17/98	11/17/98	11/17/98
Analyte (µg/L)						
Acetone	ND (0.413) UJ	29.9 J	307 J	31.0	ND (0.413)	ND (0.809) UJ
Benzene	ND (0.0375)	0.668 J	51.3 J	0.539	ND (0.0375)	ND (0.0647) UJ
2-Butanone (MEK)	R	42.5 J	21.3 J	R	ND (0.222) UJ	ND (0.231) UJ
n-Butylbenzene	ND (0.116)	0.437 J	15.6 J	ND (0.116)	ND (0.116)	ND (0.116) UJ
sec-Butylbenzene	ND (0.0782)	ND (0.0782) UJ	5.27 J	ND (0.0782)	ND (0.0782)	ND (0.156) UJ
Carbon disulfide	ND (0.0547)	0.573 J	ND (0.0547) UJ	ND (0.0547)	ND (0.0547)	ND (0.132) UJ
Carbon tetrachloride	ND (0.0576)	ND (0.0576) UJ	42.2 J	ND (0.0576)	ND (0.0576)	ND (0.143) UJ
Chloroethane	ND (0.0441)	2.14 J	74.7 J	3.68	ND (0.0441)	ND (0.0977) UJ
Chloroform	ND (0.0480)	1.64 J	12.8 J	ND (0.0480)	ND (0.0480)	ND (0.0933) UJ
1,2-Dichlorobenzene	ND (0.0733)	ND (0.0733) UJ	ND (0.0733) UJ	ND (0.0733)	ND (0.0733)	ND (0.334) UJ
1,1-Dichloroethane	ND (0.0576)	4,620	24,100	1,750	ND (0.0576)	5.17 J
1,2-Dichloroethane	ND (0.0348)	19.5 J	ND (0.0348) UJ	49.7	ND (0.0348)	ND (0.0989) UJ
1,1-Dichloroethene	ND (0.0715)	705	96,500	467	ND (0.306) U	1.08 J
cis-1,2-Dichloroethene	ND (0.0383)	228	3,330	7,770	ND (2.67) U	ND (0.736) U
trans-1,2-Dichloroethene	ND (0.0618)	3.66 J	24.2 J	72.4	ND (0.0618)	ND (0.0835) UJ
Ethylbenzene	ND (0.0928)	3.58 J	544	ND (0.0928)	ND (0.0928)	ND (0.234) UJ
2-Hexanone	R	ND (0.232) UJ	45.1 J	R	ND (0.232) UJ	ND (0.737) UJ
Isopropylbenzene	ND (0.0661)	0.392 J	41.5 J	ND (0.0661)	ND (0.0661)	ND (0.255) UJ

Table 1-13 (Continued)

Sample ID	MW-226	MW-227	MW-228	MW-229	MW-230	MW-231
p-Isopropyltoluene	ND (0.106)	0.194 J	6.80 J	ND (0.106)	ND (0.106)	ND (0.136) UJ
Methyl t-butyl ether	ND (0.0365) UJ	ND (0.0365) UJ	5.21 J	ND (0.0365) UJ	ND (0.0365) UJ	ND (0.0646) UJ
4-Methyl-2-pentanone (MIBK)	R	ND (0.160) UJ	12.3 J	R	ND (0.160) UJ	ND (0.160) UJ
Napthalene	ND (0.578) UJ	3.73 J	608	ND (0.578) UJ	ND (0.578) UJ	ND (0.578) UJ
n-Propylbenzene	ND (0.0577)	2.25 J	200	ND (0.0577)	ND (0.0577)	ND (0.239) UJ
1,1,1,2-Tetrachloroethane	ND (0.0848)	ND (0.0848) UJ	0.810 J	ND (0.0848)	ND (0.0848)	ND (0.158) UJ
1,1,2,2-Tetrachloroethane	ND (0.102)	ND (0.102) UJ	0.688 J	ND (0.102)	ND (0.102)	ND (0.102) UJ
Tetrachloroethene	ND (0.0515)	1.41 J	30.5 J	ND (0.0515)	ND (0.0515)	0.231 J
Tetrahydrofuran	R	ND (0.489) UJ	ND (0.489) UJ	ND (0.489) UJ	ND (0.489) UJ	ND (0.920) UJ
Toluene	ND (0.0522)	29.6 J	1,460	0.323	ND (0.0522)	ND (0.141) UJ
1,1,1-Trichloroethane	ND (0.0658)	3,200	173,000	ND (0.0658)	ND (0.0658)	0.0437 J
1,1,2-Trichloroethane	ND (0.0602)	3.20 J	49.3 J	3.41	ND (0.0602)	ND (0.0881) UJ
Trichloroethene	ND (0.0892)	810	22,800	ND (20.3) U	ND (2.05) U	ND (1.50) UJ
Trichlorofluoromethane	ND (0.0473)	ND (0.0473) UJ	12.7 J	ND (0.0473)	ND (0.0473)	ND (0.182) UJ
1,2,4-Trimethylbenzene	ND (0.0952)	10.8 J	1,270	ND (0.0952) UJ	ND (0.0952) UJ	ND (0.205) UJ
1,3,5-Trimethylbenzene	ND (0.0800)	3.37 J	309	ND (0.0800)	ND (0.0800)	ND (0.205) UJ
Vinyl chloride	ND (0.0639)	5.70 J	314	41.2	ND (0.0639)	ND (0.162) UJ

Table 1-13 (Continued)

Sample ID	MW-226	MW-227	MW-228	MW-229	MW-230	MW-231
m&p-Xylene	ND (0.115)	8.78 J	1,540	ND (0.115)	ND (0.115)	ND (0.500) UJ
o-Xylene	ND (0.0414)	8.91 J	1,330	ND (0.0414)	ND (0.0414)	ND (0.259) UJ

Target analytes not listed were not detected.

ND () = Not detected at specified detection limit.

Bold values exceed site evaluation screening levels.

J = Estimated value.

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

UJ = Not detected and the detection limit is estimated.

R = Unusable data.

The sample from MW-228 was collected using a disposable bailer; samples from all other wells were collected using an inertial foot-valve pump.

Table 1-14

**Summary of Qualified Groundwater Analytical Results: May 1998
Semivolatile Organic Compounds by Method 8270C
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-/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 1-14 (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 ($\mu\text{g/L}$)									
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.

Bold values exceed site evaluation screening levels.

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 1-15

**Summary of Qualified Groundwater Analytical Results: November 1998
Semivolatile Organic Compounds by Method 8270C
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	MW-208	MW-209	MW-210	MW-211	MW-212	MW-213
Date of Sampling	11/17/98	11/17/98	11/17/98	11/17/98	11/18/98	11/18/98
Analyte (μg/L)						
Acenaphthene	ND (0.459)	ND (0.450)	ND (0.468)	ND (0.468)	ND (0.386)	ND (0.386)
Acetophenone	ND (0.165)	ND (0.162)	ND (0.168)	ND (0.168)	ND (0.833)	ND (0.833)
Benz (a) anthracene	ND (0.193)	ND (0.190)	ND (0.197)	ND (0.197)	ND (0.296)	0.313
Benzoic acid	R	R	6.01 J	R	ND (32.5) UJ	ND (32.5) UJ
Benzyl alcohol	ND (0.682)	ND (0.669)	ND (0.695)	ND (0.695)	ND (0.779)	ND (0.779)
Dibenzofuran	ND (0.140)	ND (0.137)	ND (0.143)	ND (0.143)	ND (0.350)	ND (0.350)
Diethylphthalate	ND (0.209)	ND (0.205)	ND (0.213)	ND (0.213)	ND (0.277)	ND (0.277)
bis(2-Ethylhexyl)phthalate	ND (4.88)	ND (4.79)	2.58 J	ND (4.97)	ND (4.20)	2.63 J
Fluoranthene	ND (0.230)	ND (0.226)	ND (0.235)	ND (0.235)	ND (0.205)	0.817
Fluorene	ND (0.307)	ND (0.301)	ND (0.313)	ND (0.313)	ND (0.350)	ND (0.350)
Isophorone	ND (0.0943)	ND (0.0925)	ND (0.0961)	ND (0.0961)	ND (0.275)	ND (0.275)
2-Methylnaphthalene	ND (0.292)	ND (0.287)	ND (0.298)	ND (0.298)	ND (0.279)	9.19
2-Methylphenol	ND (0.204)	ND (0.200)	ND (0.208)	ND (0.208)	ND (0.446)	ND (0.446)
4-/3-Methylphenol	ND (0.217)	ND (0.213)	ND (0.221)	ND (0.221)	ND (0.581)	ND (0.581)
Naphthalene	ND (0.382)	ND (0.375)	ND (0.389)	ND (0.389)	ND (0.424)	16.4
Phenanthrene	ND (0.297)	ND (0.292)	ND (0.303)	ND (0.303)	ND (0.480)	0.513

Table 1-15 (Continued)

Sample ID	MW-208	MW-209	MW-210	MW-211	MW-212	MW-213
Phenol	ND (0.230)	ND (0.226)	ND (0.235)	ND (0.235)	ND (0.209)	ND (0.209)
Pyrene	ND (0.269)	ND (0.264)	ND (0.274)	ND (0.274)	ND (0.302)	0.666

Target analytes not listed were not detected.

ND () = Not detected at specified detection limit.

Bold values exceed site evaluation screening levels.

J = Estimated value.

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

UJ = Not detected and the detection limit is estimated.

R = Unusable data.

The sample from MW-228 was collected using a disposable bailer; samples from all other wells were collected using a peristaltic pump.

Table 1-15 (Continued)

Sample ID	MW-214	MW-215	MW-216	MW-217	MW-218	MW-219
Date of Sampling	11/18/98	11/18/98	11/16/98	11/17/98	11/16/98	11/17/98
Analyte ($\mu\text{g/L}$)						
Acenaphthene	ND (0.386)	ND (0.393)	ND (0.459)	ND (0.459)	ND (0.459)	ND (0.459)
Acetophenone	ND (0.833)	ND (0.849)	ND (0.165)	ND (0.165)	ND (0.165)	ND (0.165)
Benz (a) anthracene	ND (0.296)	ND (0.302)	ND (0.193)	ND (0.193)	ND (0.193)	ND (0.193)
Benzoic acid	ND (32.5) UJ	ND (33.1) UJ	ND (30.2)	R	ND (30.2)	R
Benzyl alcohol	ND (0.779)	ND (0.793)	ND (0.682)	ND (0.682)	ND (0.682)	ND (0.682)
Dibenzofuran	ND (0.350)	ND (0.356)	ND (0.140)	ND (0.140)	ND (0.140)	ND (0.140)
Diethylphthalate	ND (0.277)	ND (0.282)	ND (0.209)	ND (0.209)	ND (0.209)	ND (0.209)
bis(2-Ethylhexyl)phthalate	1.24 J	ND (4.28)	ND (4.88)	ND (4.88)	ND (4.88)	0.911 J
Fluoranthene	ND (0.205)	ND (0.209)	ND (0.230)	ND (0.230)	ND (0.230)	ND (0.230)
Fluorene	ND (0.350)	ND (0.357)	ND (0.307)	ND (0.307)	ND (0.307)	ND (0.307)
Isophorone	ND (0.275)	ND (0.280)	ND (0.0943)	ND (0.0943)	ND (0.0943)	ND (0.0943)
2-Methylnaphthalene	ND (0.279)	ND (0.284)	ND (0.292)	ND (0.292)	ND (0.292)	ND (0.292)
2-Methylphenol	ND (0.446)	ND (0.454)	ND (0.204)	ND (0.204)	ND (0.204)	ND (0.204)
4-/c-Methylphenol	ND (0.581)	ND (0.592)	ND (0.217)	ND (0.217)	ND (0.217)	ND (0.217)
Naphthalene	ND (0.424)	ND (0.432)	ND (0.382)	ND (0.382)	ND (0.382)	ND (0.382)

Table 1-15 (Continued)

Sample ID	MW-214	MW-215	MW-216	MW-217	MW-218	MW-219
Phenanthrene	ND (0.480)	ND (0.490)	ND (0.297)	ND (0.297)	ND (0.297)	ND (0.297)
Phenol	ND (0.209)	ND (0.213)	ND (0.230)	ND (0.230)	ND (0.230)	ND (0.230)
Pyrene	ND (0.302)	ND (3.08)	ND (0.269)	ND (0.269)	ND (0.269)	ND (0.269)

Target analytes not listed were not detected.

ND () = Not detected at specified detection limit.

Bold values exceed site evaluation screening levels.

J = Estimated value.

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

UJ = Not detected and the detection limit is estimated.

R = Unusable data.

The sample from MW-228 was collected using a disposable bailer; samples from all other wells were collected using a peristaltic pump.

Table 1-15 (Continued)

Sample ID	MW-220	MW-221	MW-222	MW-223	MW-224	MW-225
Date of Sampling	11/16/98	11/16/98	11/17/98	11/17/98	11/16/98	11/17/98
Analyte ($\mu\text{g/L}$)						
Acenaphthene	ND (0.463)	ND (0.463)	ND (0.459)	ND (0.473)	ND (0.459)	ND (0.468)
Acetophenone	ND (0.166)	ND (0.166)	ND (0.165)	ND (0.170)	ND (0.165)	ND (0.168)
Benz (a) anthracene	ND (0.195)	ND (0.195)	ND (0.193)	ND (0.199)	ND (0.193)	ND (0.197)
Benzoic acid	ND (30.5)	ND (30.5)	R	R	4.26 J	R
Benzyl alcohol	ND (0.688)	ND (0.688)	ND (0.682)	ND (0.702)	ND (0.682)	ND (0.695)
Dibenzofuran	ND (0.141)	ND (0.141)	ND (0.140)	ND (0.144)	ND (0.140)	ND (0.143)
Diethylphthalate	ND (0.211)	ND (0.211)	ND (0.209)	ND (0.215)	0.930	ND (0.213)
bis(2-Ethylhexyl)phthalate	ND (4.92)	ND (4.92)	ND (4.88)	ND (5.02)	ND (4.88)	1.53 J
Fluoranthene	ND (0.233)	ND (0.233)	ND (0.230)	ND (0.237)	ND (0.230)	ND (0.235)
Fluorene	ND (0.310)	ND (0.310)	ND (0.307)	ND (0.316)	ND (0.307)	ND (0.313)
Isophorone	ND (0.0952)	ND (0.0952)	ND (0.0943)	ND (0.0971)	ND (0.0943)	ND (0.0961)
2-Methylnaphthalene	ND (0.295)	ND (0.295)	ND (0.292)	ND (0.301)	ND (0.292)	ND (0.298)
2-Methylphenol	ND (0.206)	ND (0.206)	ND (0.204)	ND (0.210)	ND (0.204)	ND (0.208)
4-/3-Methylphenol	ND (0.219)	ND (0.219)	ND (0.217)	ND (0.224)	ND (0.217)	ND (0.221)
Naphthalene	ND (0.386)	ND (0.386)	ND (0.382)	ND (0.393)	ND (0.382)	ND (0.389)
Phenanthrene	ND (0.300)	ND (0.300)	ND (0.297)	ND (0.306)	ND (0.297)	ND (0.303)

Table 1-15 (Continued)

Sample ID	MW-220	MW-221	MW-222	MW-223	MW-224	MW-225
Phenol	ND (0.233)	ND (0.233)	ND (0.230)	ND (0.237)	87.2	ND (0.235)
Pyrene	ND (0.271)	ND (0.271)	ND (0.269)	ND (0.276)	ND (0.269)	ND (0.274)

Target analytes not listed were not detected.

ND () = Not detected at specified detection limit.

Bold values exceed site evaluation screening levels.

J = Estimated value.

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

UJ = Not detected and the detection limit is estimated.

R = Unusable data.

The sample from MW-228 was collected using a disposable bailer; samples from all other wells were collected using a peristaltic pump.

Table 1-15 (Continued)

Sample ID	MW-226	MW-227	MW-228	MW-229	MW-230	MW-231
Date of Sampling	11/16/98	11/18/98	11/18/98	11/17/98	11/17/98	11/18/98
Analyte ($\mu\text{g/L}$)						
Acenaphthene	ND (0.455)	ND (0.386)	3.41	ND (0.473)	ND (0.450)	ND (0.536)
Acetophenone	ND (0.163)	ND (0.833)	22.4	ND (0.170)	ND (1.02) U	ND (1.16)
Benz (a) anthracene	ND (0.192)	ND (0.296)	ND (0.302)	ND (0.199)	ND (0.190)	ND (0.412)
Benzoic acid	2.69 J	4.09 J	114 J	R	R	ND (45.2) UJ
Benzyl alcohol	ND (0.675)	ND (0.779)	8.05	ND (0.702)	ND (0.669)	ND (1.08)
Dibenzofuran	ND (0.139)	ND (0.350)	2.39	ND (0.144)	ND (0.137)	ND (0.486)
Diethylphthalate	ND (0.207)	ND (0.277)	ND (0.282)	ND (0.215)	ND (0.205)	ND (0.384)
bis(2-Ethylhexyl)phthalate	14.7	ND (4.20)	ND (4.28)	1.30 J	2.00 J	ND (5.83)
Fluoranthene	ND (0.228)	ND (0.205)	ND (0.209)	ND (0.237)	ND (0.226)	ND (0.284)
Fluorene	ND (0.304)	ND (0.350)	3.9	ND (0.316)	ND (0.301)	ND (0.487)
Isophorone	ND (0.0934)	ND (0.275)	1.49	ND (0.0971)	ND (0.0925)	ND (0.382)
2-Methylnaphthalene	ND (0.290)	0.736	92.8	ND (0.301)	ND (0.287)	ND (0.387)
2-Methylphenol	ND (0.202)	ND (0.446)	4.69	ND (0.210)	ND (0.200)	ND (0.619)
4-/3-Methylphenol	ND (0.215)	ND (0.581)	30.4 J	ND (0.224)	6.23 J	ND (0.808)
Naphthalene	ND (0.378)	5.64	720	ND (0.393)	ND (0.375)	ND (0.590)
Phenanthrene	ND (0.294)	0.536	3.77	ND (0.306)	ND (0.292)	ND (0.668)

Table 1-15 (Continued)

Sample ID	MW-226	MW-227	MW-228	MW-229	MW-230	MW-231
Phenol	6.39	9.72	27.5	5.51	ND (0.226)	ND (0.291)
Pyrene	ND (0.266)	ND (0.302)	ND (0.308)	ND (0.276)	ND (0.264)	ND (0.419)

Target analytes not listed were not detected.

ND () = Not detected at specified detection limit.

Bold values exceed site evaluation screening levels.

J = Estimated value.

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

UJ = Not detected and the detection limit is estimated.

R = Unusable data.

The sample from MW-228 was collected using a disposable bailer; samples from all other wells were collected using a peristaltic pump.

Table 1-16

**Summary of Qualified Groundwater Analytical Results: May 1998
Metals by Methods 6010B and 7470A (Mercury)
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Sample ID	MW-201S	MW-206	MW-207	MW-216	MW-217	MW-218
Date of Sampling	5/13/98	5/12/98	5/12/98	5/12/98	5/13/98	5/12/98
Analyte (mg/L)						
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)
Molybdenum	ND (0.00112) U	0.0311	ND (0.00100)	ND (0.00111) U	ND (0.00100)	0.00238

Table 1-16 (Continued)

Sample ID	MW-201S	MW-206	MW-207	MW-216	MW-217	MW-218
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.

Sample MW-206 was collected with a disposable bailer; all other samples were collected with a peristaltic pump.

Table 1-16 (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
Analyte (mg/L)					
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
Selenium	ND (0.00144)	ND (0.00144)	ND (0.00144)	0.00242	ND (0.00144)

Table 1-16 (Continued)

Sample ID	MW-219	MW-220	MW-221	MW-222	MW-223
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.

Sample MW-206 was collected with a disposable bailer; all other samples were collected with a peristaltic pump.

Table 1-17

**Groundwater Chemistry: November 1998
Hamilton Beach ◇ Proctor-Silex, Washington, North Carolina**

Sample ID	MW-208	MW-209	MW-210	MW-211	MW-212	MW-213
Date of Sampling	11/17/98	11/17/98	11/17/98	11/17/98	11/18/98	11/18/98
Analyte (mg/L)						
Nitrate-Nitrite	0.949	0.0452	ND (0.0418) U	0.0445	0.0104	0.00970
Sulfate	11.2	2.96	ND (0.0421)	10.5	ND (0.0421)	41.1
Total Alkalinity	18.5	111	64.0	12.6	100	51.1 J
Total Dissolved Solids	NA	NA	228 J	92.0 J	NA	NA

Sample ID	MW-214	MW-215	MW-216	MW-217	MW-220	MW-221
Date of Sampling	11/18/98	11/18/98	11/16/98	11/17/98	11/16/98	11/17/98
Analyte (mg/L)						
Nitrate-Nitrite	0.0166	0.0305	ND (0.0625)	0.563	0.0636	0.0574
Sulfate	3.13	7.77	ND (0.0421)	37.3	1.86	5.13
Total Alkalinity	102	14.4	245	ND (0.754)	37.3	ND (3.95)
Total Dissolved Solids	NA	NA	NA	NA	NA	NA

Table 1-17 (Continued)

Sample ID	MW-222	MW-223	MW-224	MW-225	MW-227	MW-228
Date of Sampling	11/17/98	11/17/98	11/16/98	11/17/98*	11/18/98	11/18/98
Analyte (mg/L)						
Nitrate-Nitrite	ND (0.0166) U	ND (0.0350) U	0.274	8.61	0.0485	0.0824
Sulfate	21.7	19.4	3.92	19.4	15.2	26.6
Total Alkalinity	174	ND (0.489)	252	ND (1.08)	216	ND (0.358)
Total Dissolved Solids	298 J	134 J	310 J	162	384	1,280

ND () = Not detected at specified detection limit.

NA = Not analyzed

J = Estimated value

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

mg/L = milligrams per liter

Alkalinity by EPA Method 301.1

Nitrate-Nitrite by EPA Method 353.1

Sulfate by EPA Method 300.0

Total Dissolved Solids by EPA Method 160.1

Samples were collected using a peristaltic pump.

*Samples from MW-225 were collected over a two-day period commencing on 11/17/98.

Table 1-18

Field Measurements: May 1998
Hamilton Beach ♦ Proctor-Silex, Washington, North Carolina

Well	Purged Volume ^a (Gallons)	Temperature (°C)	Specific Conductance (μ S)	pH
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

^aVolume is at least three times the well volume unless well was purged dry.

Table 1-19

Field Measurements: November 1998
Hamilton Beach◇Proctor-Silex, Washington, North Carolina

Well	Purged Volume* (Gallons)	Temperature (°C)	Specific Conductance (μ S)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Fe ²⁺ (mg/L)
MW-208	2.4	21.5	75	4.6	172	0.64	1.0
MW-209	6.0	22.0	350	5.6	51	0.37	3.0
MW-210	6.0	19.5	190	5.9	80	0.13	4.0
MW-211	0.9	20.0	75	4.5	215	0.35	3.0
MW-212	6.6	22.0	215	6.0	36	0.45	3.0
MW-213	1.5	22.0	380	5.3	159	0.56	3.0
MW-214	7.5	22.0	295	5.5	52	0.51	3.5
MW-215	1.75 (dry)	23.0	180	5.7	96	1.43	2.0
MW-216	0.9	19.0	405	7.0	-44	0.44	1.5
MW-217	0.01 (dry)	21.5	90	6.0	91	NM	NM
MW-218	0.9	20.0	405	7.0	NM	NM	NM
MW-219	0.01 (dry)	22.0	150	6.6	NM	NM	NM
MW-220	0.75	19.0	100	5.7	205	0.60	2.0
MW-221	0.02 (dry)	21.0	50	6.0	60	NM	0.5
MW-222	0.75	18.5	360	6.3	4	0.68	1.5
MW-223	0.025 (dry)	20.0	80	4.4	12	NM	0.5
MW-224	0.75	19.0	440	6.9	-433	0.11	4.0

Table 1-19 (Continued)

Well	Purged Volume* (Gallons)	Temperature (°C)	Specific Conductance (μ S)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Fe ²⁺ (mg/L)
MW-225	0.01 (dry)	22.0	260	5.3	54	NM	NM
MW-226	18.0	20.0	415	8.9	NM	NM	NM
MW-227	9.0	22.0	550	7.4	165	0.33	0.0
MW-228	2.5	23.0	2,450	3.1	385	0.78	3.5
MW-229	0.1 (dry)	20.0	215	3.5	NM	NM	NM
MW-230	0.05 (dry)	19.0	185	4.2	NM	NM	NM
MW-231	0.1 (dry)	19.0	80	4.3	NM	NM	NM

*Volume is at least three times the well volume unless well was purged dry.

NM = Not measured.

ORP = Oxidation-reduction potential.

Table 1-20

Summary of Qualified Surface Water Analytical Results: May 1998
 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 1-21

Summary of Qualified Surface Water Analytical Results: May 1998
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 (μ /L)					
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 1-22

**Summary of Qualified Surface Water Analytical Results: May 1998
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
Analyte (mg/L)					
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 1-22 (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.

Table 2-1

**Proposed Cleanup Goals (CUGs) for Soil
Total Petroleum Hydrocarbons
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

TPH Range	CUG (mg/kg)	Basis
Purgeable (gas)	10	Section 6.2, DENR (1998)
Extractable (diesel)	40	Section 6.2, DENR (1998)
Oil & Grease	250	Section 6.2, DENR (1998)

Table 2-2

**Proposed Cleanup Goals (CUGs) for Soil Leachate
Generated through the Synthetic Precipitation Leaching Procedure (SPLP)
Volatile Organic Compounds
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Compound	mg/kg	CUG (µg/L)	mg/L	Basis
Benzene	22	5	22 000	Estimated Quantitation Limit*
2-Butanone (MEK)		170		Standard established in 15A NCAC 2L.0202
Carbon tetrachloride		5		Estimated Quantitation Limit
1,2-Dichloroethane	7	5	7 000	Estimated Quantitation Limit
1,1-Dichloroethene	4	7	4 000	Standard established in 15A NCAC 2L.0202
cis-1,2-Dichloroethene		70		Standard established in 15A NCAC 2L.0202
Ethylbenzene	.24	29	240	Standard established in 15A NCAC 2L.0202
p-Isopropyltoluene		5		Estimated Quantitation Limit
Naphthalene	.58	21	580	Standard established in 15A NCAC 2L.0202
Propanenitrile		5		Estimated Quantitation Limit
Tetrachloroethene		5		Estimated Quantitation Limit
1,1,1-Trichloroethane		200		Standard established in 15A NCAC 2L.0202
1,1,2-Trichloroethane		5		Estimated Quantitation Limit
Trichloroethene		5		Estimated Quantitation Limit
Vinyl chloride		5		Estimated Quantitation Limit

* = Estimated quantitation limit for Method 8260B using a 5-mL purge.

Table 2-3

**Proposed Cleanup Goals (CUGs) for Soil Leachate
Generated through the Synthetic Precipitation Leaching Procedure (SPLP)
Semivolatile Organic Compounds
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Compound	CUG ($\mu\text{g/L}$)	Basis
4-Methylphenol / 3-Methylphenol	10	Estimated Quantitation Limit

Table 2-4

**Proposed Cleanup Goals (CUGs) for Groundwater
Volatile Organic Compounds
Hamilton Beach◇Proctor-Silex, Washington, North Carolina.**

Compound	CUG ($\mu\text{g/L}$)	Basis
Benzene	5	Estimated Quantitation Limit*
Carbon tetrachloride	5	Estimated Quantitation Limit
Chloroform	5	Estimated Quantitation Limit
1,1-Dichloroethane	700	Standard established in 15A NCAC 2L.0202
1,2-Dichloroethane	5	Estimated Quantitation Limit
1,1-Dichloroethene	7	Standard established in 15A NCAC 2L.0202
cis-1,2-Dichloroethene	70	Standard established in 15A NCAC 2L.0202
trans-1,2-Dichloroethene	70	Standard established in 15A NCAC 2L.0202
Ethylbenzene	29	Standard established in 15A NCAC 2L.0202
p-Isopropyltoluene	5	Estimated Quantitation Limit
Naphthalene	21	Standard established in 15A NCAC 2L.0202
n-Propylbenzene	70	Interim Maximum Allowable Concentration
Tetrachloroethene	5	Estimated Quantitation Limit
Toluene	1000	Standard established in 15A NCAC 2L.0202
1,1,1-Trichloroethane	200	Standard established in 15A NCAC 2L.0202
1,1,2-Trichloroethane	5	Estimated Quantitation Limit
Trichloroethene	5	Estimated Quantitation Limit
1,2,4-Trimethylbenzene	350	Interim Maximum Allowable Concentration
Vinyl chloride	5	Estimated Quantitation Limit

Table 2-4 (Continued)

Compound	CUG ($\mu\text{g/L}$)	Basis
m&p-Xylene	530	Standard established in 15A NCAC 2L.0202
o-Xylene	530	Standard established in 15A NCAC 2L.0202

*Estimated quantitation limit for Method 8260B using a 5-mL purge.

Table 2-5

**Proposed Cleanup Goals (CUGs) for Groundwater
Semivolatile Organic Compounds
Hamilton Beach ◇ Proctor-Silex, Washington, North Carolina**

Compound	CUG ($\mu\text{g/L}$)	Basis
bis(2-Ethylhexyl)phthalate	10	Estimated Quantitation Limit
2-Methylnaphthalene	28	Standard established in 15A NCAC 2L .0202
4-Methylphenol / 3- Methylphenol	10	Estimated Quantitation Limit

Table 3-1

**Surrounding Water Supply Wells^a
Hamilton Beach ◊ Proctor-Silex, Washington, North Carolina**

Well No.^b	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.	(252) 946-5095	WS	110	NA	NA	1,250 ft.
5677-51-3451	Larry & Carolyn Walker	94 Springs Road Washington, N.C.	(252) 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.	(252) 975-6494	Unused	NA	NA	NA	1,050 ft.
5677-52-6072	James & Hilda Watters	215 Springs Road Washington, N.C.	(252) 946-4395	WS	NA	NA	NA	1,050 ft.
5677-63-8364 (2 Wells)	Kermit & Grace Arnold	363 Springs Road Washington, N.C.	(252) 946-6811	WS	150+	NA	NA	950/1,200 ft.
5677-72-7147	Charlie Corey	601 Springs Road Washington, N.C.	(252) 946-2643	WS	100+	NA	NA	1,500 ft.

^aSource: Groundwater Management Associates, Inc. (1998)

^bIndex to Figure 3-1.

bgs = below ground surface

WS = water supply

NA = not available

Table 3-2

**Adjacent Property Ownership^a
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

Map Index ^b	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	(252) 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	(252) 946-5095
4	94 Springs Road Washington, N.C.	Larry R. & Carolyn L. Walker	94 Springs Road Washington, N.C. 27889	(252) 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	(252) 946-4395
9	Springs Road Washington, N.C.	Down East Properties, Inc.	930 West 15 th 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	(252) 946-6811

Table 3-2 (Continued)

Map Index ^b	Street Address	Owner	Mailing Address	Telephone Number
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	Mr. Armistead Perry	P.O. Box 534 Washington, N.C. 27889	(252) 946-7131
16	1851 Carolina Avenue Washington, N.C.	D. S. Swain Gas Company	1851 Carolina Avenue Washington, N.C. 27889	(252) 946-5178

^aOwner and property information obtained from Beaufort County, North Carolina, tax records.

^bIndex to Figure 3-3.

NA = Not Available.

Table 4-1

**Promising Corrective Action Technologies for Soil
Hamilton Beach◇Proctor Silex, Inc.**

General Response Action	Promising Technology	Advantages	Disadvantages
Institutional Controls	Deed Restrictions	<ul style="list-style-type: none"> Easily implemented Eliminates or reduces exposure 	<ul style="list-style-type: none"> Does not reduce contamination
	Land Use Restrictions	<ul style="list-style-type: none"> Easily implemented Eliminates or reduces exposure 	<ul style="list-style-type: none"> Does not reduce contamination
	Fencing	<ul style="list-style-type: none"> Easily implemented Eliminates or reduces exposure 	<ul style="list-style-type: none"> Does not reduce contamination
Containment	Concrete Cap	<ul style="list-style-type: none"> Easily implemented Eliminates or reduces exposure Portions of the site are currently covered by concrete 	<ul style="list-style-type: none"> Does not reduce contamination
	Asphalt Cap	<ul style="list-style-type: none"> Easily implemented Eliminates or reduces exposure Portions of the site are currently covered by concrete 	<ul style="list-style-type: none"> Does not reduce contamination
Removal	Excavation	<ul style="list-style-type: none"> Reliable and proven method 	<ul style="list-style-type: none"> Limited to relatively shallow depths Subject to access constraints Requires ex-situ treatment and/or disposal
Ex-Situ Treatment	High Temperature Thermal Desorption	<ul style="list-style-type: none"> Effectively destroys VOCs 	<ul style="list-style-type: none"> High cost May require permitting if conducted on-site
	Rotary Kiln Incineration	<ul style="list-style-type: none"> Reliable and proven method Readily implemented 	<ul style="list-style-type: none"> High cost Ash disposal will be necessary
Disposal	Off-site RCRA Landfill	<ul style="list-style-type: none"> Reliable and proven method Readily implemented 	<ul style="list-style-type: none"> Does not treat contamination May require treatment prior to disposal Does not eliminate future liability

Table 4-1 (Continued)

General Response Action	Promising Technology	Advantages	Disadvantages
In-Situ Treatment	Chemical Oxidation	<ul style="list-style-type: none">• Effectively destroys chlorinated VOCs and petroleum hydrocarbons• Minimal waste generated	<ul style="list-style-type: none">• May require pilot testing• May require permit for injection
	Biological Treatment	<ul style="list-style-type: none">• Effective for petroleum hydrocarbons	<ul style="list-style-type: none">• May require permit for injection

Table 4-2

**Promising Technologies for Groundwater
Hamilton Beach◇Proctor-Silex, Washington, North Carolina**

General Response Action	Promising Technology	Advantages	Disadvantages
Institutional Controls	Groundwater Monitoring	<ul style="list-style-type: none"> • Low capital costs and O&M costs • Precludes exposure to toxic contaminants by detecting migration of plume 	<ul style="list-style-type: none"> • Ineffective at treatment of contamination • When used alone, regulatory and public approval may be difficult.
	Surface Water Monitoring	<ul style="list-style-type: none"> • Low capital and O&M costs • Ensures that if contaminants are not remediated effectively, the local population will not be affected 	<ul style="list-style-type: none"> • Ineffective at treatment of contamination • When used alone, regulatory and public approval may be difficult • Must be implemented jointly with groundwater monitoring
	Land and Groundwater Use Restrictions	<ul style="list-style-type: none"> • Low capital and O&M costs • Effective at preventing human exposure to contaminants 	<ul style="list-style-type: none"> • Ineffective at treatment of contamination • When used alone, regulatory and public approval is difficult
Containment	Hydraulic Controls	<ul style="list-style-type: none"> • Limits migration of contaminants 	<ul style="list-style-type: none"> • Ineffective at treatment of contamination • Moderate capital and O&M costs
	Slurry Wall, Grout Curtain, Hydraulic Barrier, or Sheet Pile Wall	<ul style="list-style-type: none"> • Easy to implement for shallow aquifers • Prevents plume migration off site • Low O&M cost 	<ul style="list-style-type: none"> • High capital cost • May require surface cap or groundwater extraction
	Funnel & Gate Subsurface Barrier	<ul style="list-style-type: none"> • Effective for directing contamination to remediation areas • Low O&M 	<ul style="list-style-type: none"> • Does not treat contaminants
Extraction	French Drain	<ul style="list-style-type: none"> • Low O&M cost • Easy to implement in shallow aquifer • Removes contaminated groundwater 	<ul style="list-style-type: none"> • May require ex-situ wastewater treatment • May produce residual waste products
	Multiphase Extraction	<ul style="list-style-type: none"> • Effective and reliable for VOCs and fuel hydrocarbons in low permeability formations 	<ul style="list-style-type: none"> • High capital and O&M costs • May require ex-situ vapor and wastewater treatment

Table 4-2 (Continued)

General Response Action	Promising Technology	Advantages	Disadvantages
Extraction (Cont.)	Air Sparging	<ul style="list-style-type: none"> • Able to volatize the VOCs in the groundwater • Increase oxygen content, encouraging aerobic degradation of BTEX and vinyl chloride 	<ul style="list-style-type: none"> • May require collection and treatment of the mobilized vapor-phase contaminants • Reduces effectiveness of naturally occurring reduction dechlorination
	Phytoremediation	<ul style="list-style-type: none"> • Easily implemented • Low O&M cost 	<ul style="list-style-type: none"> • Effectiveness may be unpredictable
Ex-Situ Treatment	Carbon Adsorption	<ul style="list-style-type: none"> • Proven effective on a large range of VOCs 	<ul style="list-style-type: none"> • Produces residual waste products • Carbon costs are high
	Air Stripping	<ul style="list-style-type: none"> • Easily implemented, proven technology 	<ul style="list-style-type: none"> • Unit may be subject to scaling
Disposal	Discharge into Nearby Ditch	<ul style="list-style-type: none"> • Easily implemented 	<ul style="list-style-type: none"> • Requires treatment prior to discharge • May require permit
	Discharge via On-site ReInjection Wells	<ul style="list-style-type: none"> • Easily implemented 	<ul style="list-style-type: none"> • May require UIC permit • May cause localized groundwater mounding in injection areas
	Discharge to Storm Sewer	<ul style="list-style-type: none"> • Easily implemented 	<ul style="list-style-type: none"> • Requires treatment prior to discharge • May require permit
	Discharge to POTW	<ul style="list-style-type: none"> • Easily implemented 	<ul style="list-style-type: none"> • May require pre-treatment • Approval status unknown
In-Situ Treatment	Passive Treatment Walls	<ul style="list-style-type: none"> • Effective for treatment of halogenated VOCs or fuel hydrocarbons • Low O&M costs • Applicable to shallow groundwater conditions 	<ul style="list-style-type: none"> • May have to be recharged occasionally
	Biologically Enhanced Permeable Treatment Walls	<ul style="list-style-type: none"> • Effective for treatment of some halogenated VOCs • Low O&M costs 	<ul style="list-style-type: none"> • High capital costs • May require periodic recharging of wall

Table 4-2 (Continued)

General Response Action	Promising Technology	Advantages	Disadvantages
In-Situ (Cont.)	Reductive Dechlorination	<ul style="list-style-type: none"> • Effective for treatment of TCE • Low capital and O&M costs • Effective in existing anaerobic groundwater conditions 	<ul style="list-style-type: none"> • Ineffective for treatment of BTEX • Degradation product (vinyl chloride) may be generated temporarily
	Co-metabolic Processes	<ul style="list-style-type: none"> • Effective for treatment of halogenated VOCs • May also remediate other types of contaminants 	<ul style="list-style-type: none"> • Not effective for PCE • May require permit for injection
	Chemical Oxidation	<ul style="list-style-type: none"> • Effective for chlorinated VOCs and petroleum hydrocarbons • Minimal waste generation 	<ul style="list-style-type: none"> • May require permit for injection
	Natural Attenuation	<ul style="list-style-type: none"> • Low capital and O&M costs • Proven natural remediation for halogenated volatiles and hydrocarbons when preceded by source control 	<ul style="list-style-type: none"> • Long-term groundwater monitoring would be required • Computer modeling may be required to demonstrate effectiveness • Community acceptance not known
	Oxygen Enhancement with ORCs	<ul style="list-style-type: none"> • Natural biodegradation may be increased with oxygen in the form of ORCs such as magnesium peroxide • Low capital and O&M costs • Proven effective on vinyl chloride 	<ul style="list-style-type: none"> • Long-term groundwater monitoring required • Computer modeling may be required to demonstrate effectiveness • Presence of oxygen may inhibit degradation of other halogenated VOCs such as PCE and TCE • Community acceptance not known • UIC permit may be required

O&M Operation and Maintenance
 ORC Oxygen Releasing Compound
 PCE Tetrachloroethene
 TCE Trichloroethene
 UIC Underground Injection Control
 VOC Volatile Organic Compound

APPENDIX A
NOTIFICATION LETTER



RADIAN INTERNATIONAL

A DAMES & MOORE GROUP COMPANY

January 27, 1999

Ms. Tamara Hower-Williams
Director
Beaufort County Health Department
1436 Highland Drive
Washington, NC 27889

Mailing Address:
Post Office Box 13000
Research Triangle Park,
North Carolina 27709

Physical/Shipping Address:
1600 Penimeter Park Drive,
Morrisville, North Carolina 27560

919 461 1100 Tel
919 461 1415 Fax

Dear Ms. Hower-Williams

Radian International, on behalf of Hamilton Beach◇Proctor-Silex, Inc., is sending you this letter in accordance with Subchapter 2L, Title 15A, North Carolina Administrative Code. Its purpose is to inform you that a comprehensive site assessment (CSA) has been conducted within your jurisdiction at the Hamilton Beach◇Proctor-Silex manufacturing plant on Springs Road in Washington, North Carolina. The objective of the investigation was to assess the extent of groundwater contamination resulting from the use of fuels and solvents at the facility.

As required by Title 15A, this letter describes the area (areal extent) of the contaminant plume, the chemical constituents in the groundwater that exceed the state's groundwater standards, actions taken and intended to mitigate threats to human health, the location of wells installed for the purpose of monitoring the contaminant plume, and the frequency of sampling.

The information is summarized below:

Areal Extent. The contaminant plume originates near the southeast corner of the plant building and has been detected in groundwater within two hydrogeologic units that underlie the site. The areal extent of the contaminant plume in the upper and lower units, as represented by the distribution of trichloroethene, is illustrated in Figures 1 and 2, respectively. No chemical constituents were detected in any off-site monitoring well at concentrations exceeding their numerical groundwater standards.

Chemical Constituents. Laboratory analysis of groundwater samples from the site detected 24 chemical constituents, which are characteristic of solvents and petroleum, at concentrations exceeding established, interim, or proposed groundwater standards. A list of these chemical constituents is included Table 1.

Response Actions. Aggressive Fluid-Vapor Recovery technology was implemented on a series of occasions to remove free-phase petroleum and dissolved chemical constituents from the groundwater. Also, as required by the rules, a CSA was performed to assess the extent of contamination. This action was taken to support the preparation of a corrective action plan (CAP) for remediating the affected groundwater. A copy of the CSA report is on file with the Department of Environmental and Natural Resources (DENR), Groundwater Section, 943 Washington Square Mall, Washington, North Carolina 27889 and is available for review during normal business hours, or you may call DENR at (252) 946-6481.



RADIAN INTERNATIONAL

A DAMES & MOORE GROUP COMPANY

Ms. Hower-Williams
January 27, 1999
Page 2

Proposed Monitoring. The location of wells installed at the site to monitor the contaminant plume are shown on Figure 3. In addition, four domestic water supply wells located on Springs Road were sampled during an investigation that preceded the CSA. The sampling results for the domestic wells indicated that no chemical constituents were present. Future sampling of selected monitoring wells will be performed according to a schedule that will be developed and included in the CAP.

If you have any questions please don't hesitate to call Mario Kuhar at Hamilton Beach◇Proctor-Silex at (804) 527-7222.

Sincerely,

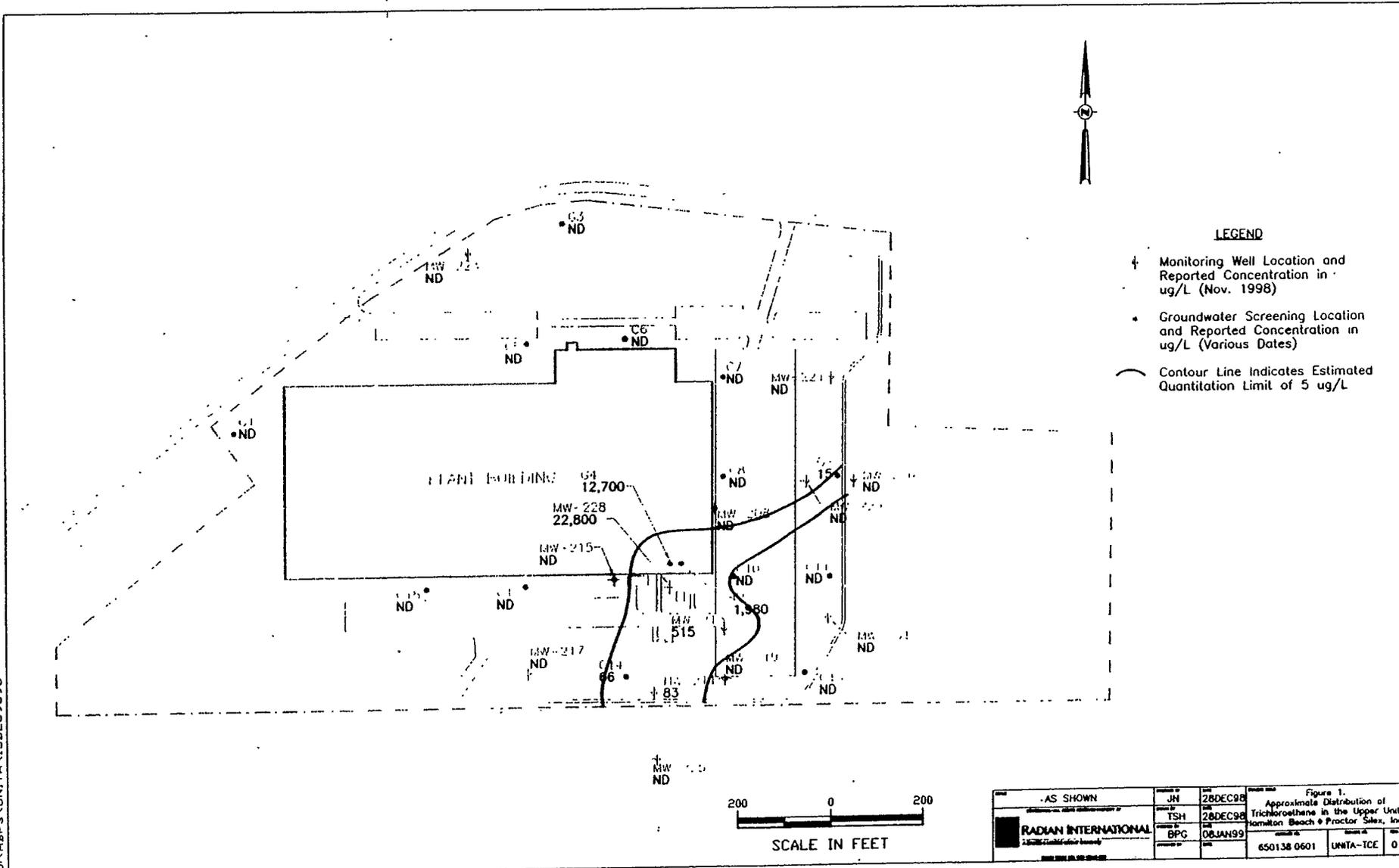
RADIAN INTERNATIONAL

James Narkunas
Sr. Staff Scientist

Enclosures

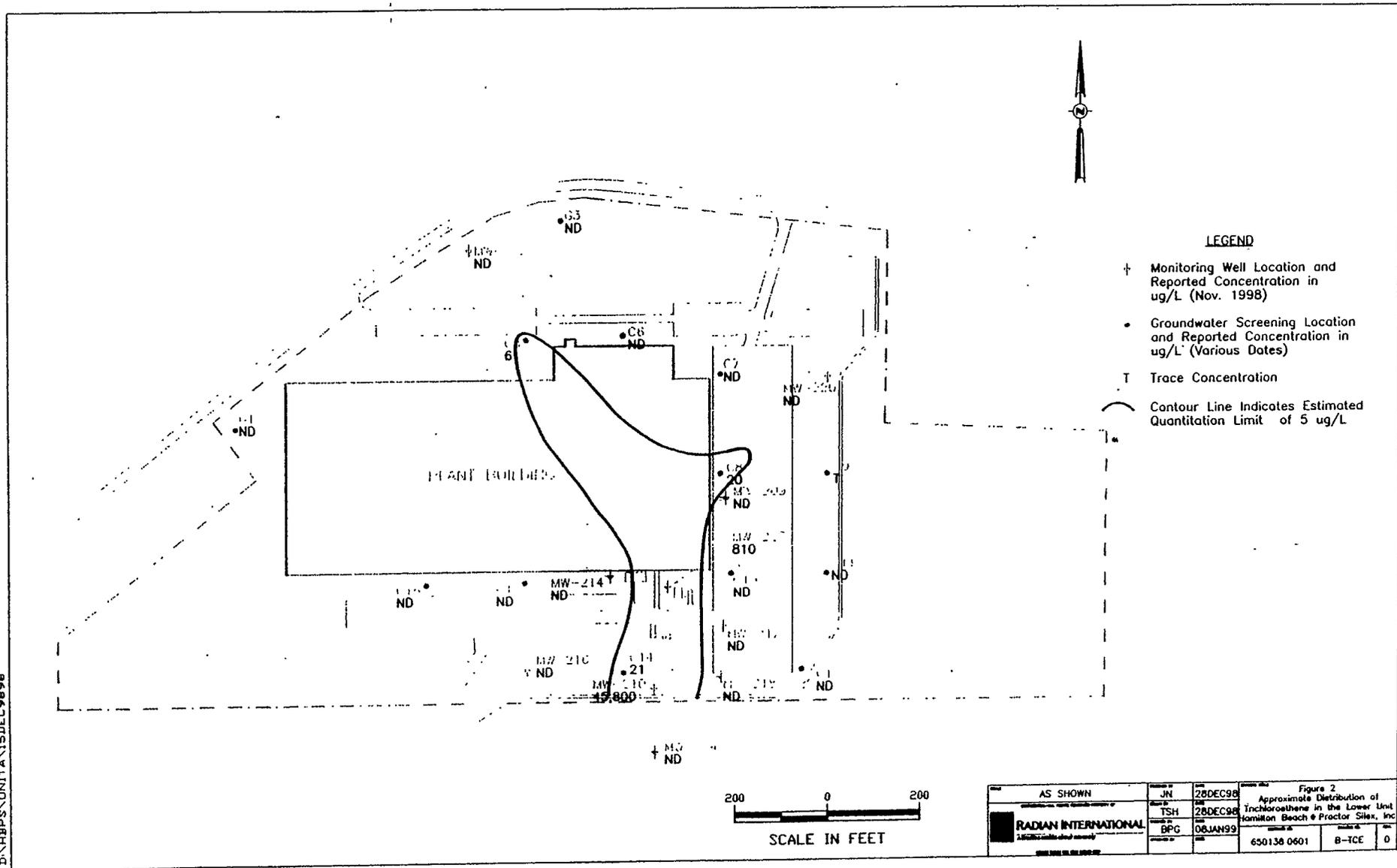
cc: Mario Kuhar/Hamilton Beach◇Proctor-Silex
Brad A. De Vore, Womble Carlyle Sandridge & Rice, LLC
File

D:\HBPS\UNTA\15DEC98\98



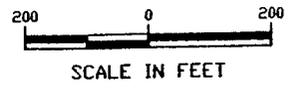
AS SHOWN	JN	28DEC98	Figure 1.
TSH	TSH	28DEC98	Approximate Distribution of
BPG	BPG	08JAN99	Trichloroethene in the Upper Unit
			Hamilton Beach & Proctor Sites, Inc
			UNTA-TCE 0

D:\HBPS\UNITA\15DEC9898

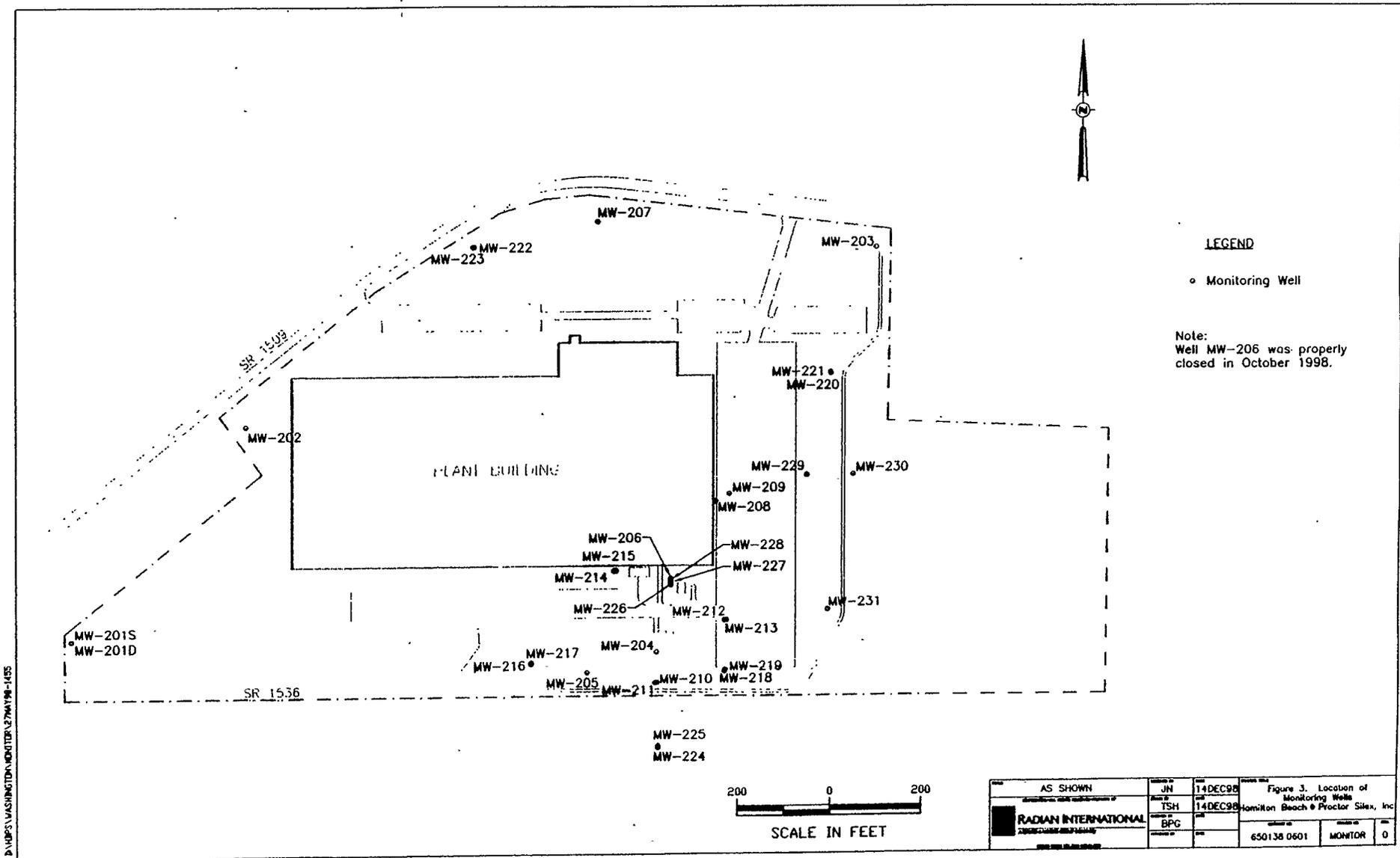


LEGEND

- † Monitoring Well Location and Reported Concentration in ug/L (Nov. 1998)
- Groundwater Screening Location and Reported Concentration in ug/L (Various Dates)
- T Trace Concentration
- Contour Line Indicates Estimated Quantitation Limit of 5 ug/L



AS SHOWN	DATE	28DEC98	FIGURE NO.	2
RADIAN INTERNATIONAL	CLIENT	JN	Approximate Distribution of Trichloroethene in the Lower Unit Hamilton Beach & Proctor Sites, Inc	
	PROJECT	TSH	DATE	28DEC98
	PREPARED BY	BPG	DATE	06JAN99
	PROJECT NO.	650138 0601	SCALE	B-TCE 0



LEGEND

• Monitoring Well

Note:
Well MW-206 was properly
closed in October 1998.

200 0 200
SCALE IN FEET

AS SHOWN	JN	14DEC98	Figure 3. Location of Monitoring Wells
RADIAN INTERNATIONAL	TSH	14DEC98	Hamilton Beach & Proctor Sites, Inc
	BPG		
		650138 0601	MONITOR 0

D:\RIPS\WASHINGTON\MONITOR\27MAY98-1455

Table 1

**Chemical Constituents in Groundwater
Hamilton Beach◇Proctor-Silex, Inc.**

Compound
Benzene
bis(2-Ethylhexyl)phthalate
Carbon tetrachloride
Chloroform
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Ethylbenzene
p-Isopropyltoluene
2-Methylnaphthalene

Compound
4-/3-Methylphenol
Napthalene
n-Propylbenzene
Tetrachloroethene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
1,2,4-Trimethylbenzene
Vinyl chloride
m&p-Xylene
o-Xylene

A complete copy of the CSA Report was submitted via Federal Express to the following addressee:

R. L. Willoughby
City Manager
City of Washington
102 East Second Street
Washington, North Carolina 27889

APPENDIX B

SYNTHETIC PRECIPITATION LEACHING PROCEDURE

METHOD 1312

SYNTHETIC PRECIPITATION LEACHING PROCEDURE

1.0 SCOPE AND APPLICATION

1.1 Method 1312 is designed to determine the mobility of both organic and inorganic analytes present in liquids, soils, and wastes.

2.0 SUMMARY OF METHOD

2.1 For liquid samples (*i.e.*, those containing less than 0.5% dry solid material), the sample, after filtration through a 0.6 to 0.8 μm glass fiber filter, is defined as the 1312 extract.

2.2 For samples containing greater than 0.5% solids, the liquid phase, if any, is separated from the solid phase and stored for later analysis; the particle size of the solid phase is reduced, if necessary. The solid phase is extracted with an amount of extraction fluid equal to 20 times the weight of the solid phase. The extraction fluid employed is a function of the region of the country where the sample site is located if the sample is a soil. If the sample is a waste or wastewater, the extraction fluid employed is a pH 4.2 solution. A special extractor vessel is used when testing for volatile analytes (see Table 1 for a list of volatile compounds). Following extraction, the liquid extract is separated from the solid phase by filtration through a 0.6 to 0.8 μm glass fiber filter.

2.3 If compatible (*i.e.*, multiple phases will not form on combination), the initial liquid phase of the waste is added to the liquid extract, and these are analyzed together. If incompatible, the liquids are analyzed separately and the results are mathematically combined to yield a volume-weighted average concentration.

3.0 INTERFERENCES

3.1 Potential interferences that may be encountered during analysis are discussed in the individual analytical methods.

4.0 APPARATUS AND MATERIALS

4.1 Agitation apparatus: The agitation apparatus must be capable of rotating the extraction vessel in an end-over-end fashion (see Figure 1) at 30 ± 2 rpm. Suitable devices known to EPA are identified in Table 2.

4.2 Extraction Vessels

4.2.1. Zero Headspace Extraction Vessel (ZHE). This device is for use only when the sample is being tested for the mobility of volatile analytes (*i.e.*, those listed in

Table 1). The ZHE (depicted in Figure 2) allows for liquid/solid separation within the device and effectively precludes headspace. This type of vessel allows for initial liquid/solid separation, extraction, and final extract filtration without opening the vessel (see Step 4.3.1). These vessels shall have an internal volume of 500-600 ml and be equipped to accommodate a 90-110 mm filter. The devices contain VITON^{®1} O-rings which should be replaced frequently. Suitable ZHE devices known to EPA are identified in Table 3.

For the ZHE to be acceptable for use, the piston within the ZHE should be able to be moved with approximately 15 psig or less. If it takes more pressure to move the piston, the O-rings in the device should be replaced. If this does not solve the problem, the ZHE is unacceptable for 1312 analyses and the manufacturer should be contacted.

The ZHE should be checked for leaks after every extraction. If the device contains a built-in pressure gauge, pressurize the device to 50 psig, allow it to stand unattended for one hour, and recheck the pressure. If the device does not have a built-in pressure gauge, pressurize the device to 50 psig, submerge it in water, and check for the presence of air bubbles escaping from any of the fittings. If pressure is lost, check all fittings and inspect and replace O-rings, if necessary. Retest the device. If leakage problems cannot be solved, the manufacturer should be contacted.

Some ZHEs use gas pressure to actuate the ZHE piston, while others use mechanical pressure (see Table 3). Whereas the volatiles procedure (see Step 7.3) refers to pounds-per-square-inch (psig), for the mechanically actuated piston, the pressure applied is measured in torque-inch-pounds. Refer to the manufacturer's instructions as to the proper conversion.

4.2.2 Bottle Extraction Vessel. When the sample is being evaluated using the nonvolatile extraction, a jar with sufficient capacity to hold the sample and the extraction fluid is needed. Headspace is allowed in this vessel.

The extraction bottles may be constructed from various materials, depending on the analytes to be analyzed and the nature of the waste (see Step 4.3.3). It is recommended that borosilicate glass bottles be used instead of other types of glass, especially when inorganics are of concern. Plastic bottles, other than polytetrafluoroethylene, shall not be used if organics are to be investigated. Bottles are available from a number of laboratory suppliers. When this type of extraction vessel is used, the filtration device discussed in Step 4.3.2 is used for initial liquid/solid separation and final extract filtration.

4.3 Filtration Devices: It is recommended that all filtrations be performed in a hood.

¹ VITON[®] is a trademark of Du Pont.

4.3.1. Zero-Headspace Extraction Vessel (ZHE): When the sample is evaluated for volatiles, the zero-headspace extraction vessel described in Step 4.2.1 is used for filtration. The device shall be capable of supporting and keeping in place the glass fiber filter and be able to withstand the pressure needed to accomplish separation (50 psig).

NOTE: When it is suspected that the glass fiber filter has been ruptured, an in-line glass fiber filter may be used to filter the material within the ZHE.

4.3.2 Filter Holder: When the sample is evaluated for other than volatile analytes, a filter holder capable of supporting a glass fiber filter and able to withstand the pressure needed to accomplish separation may be used. Suitable filter holders range from simple vacuum units to relatively complex systems capable of exerting pressures of up to 50 psig or more. The type of filter holder used depends on the properties of the material to be filtered (see Step 4.3.3). These devices shall have a minimum internal volume of 300 mL and be equipped to accommodate a minimum filter size of 47 mm (filter holders having an internal capacity of 1.5 L or greater, and equipped to accommodate a 142 mm diameter filter, are recommended). Vacuum infiltration can only be used for wastes with low solids content (<10%) and for highly granular, liquid-containing wastes. All other types of wastes should be filtered using positive pressure filtration. Suitable filter holders known to EPA are listed in Table 4.

4.3.3 Materials of Construction: Extraction vessels and filtration devices shall be made of inert materials which will not leach or absorb sample components of interest. Glass, polytetrafluoroethylene (PTFE), or type 316 stainless steel equipment may be used when evaluating the mobility of both organic and inorganic components. Devices made of high-density polyethylene (HDPE), polypropylene (PP), or polyvinyl chloride (PVC) may be used only when evaluating the mobility of metals. Borosilicate glass bottles are recommended for use over other types of bottles, especially when inorganics are analytes of concern.

4.4 Filters: Filters shall be made of borosilicate glass fiber, shall contain no binder materials, and shall have an effective pore size of 0.6 to 0.8 μm . Filters known to EPA which meet these specifications are identified in Table 5. Pre-filters must not be used. When evaluating the mobility of metals, filters shall be acid-washed prior to use by rinsing with 1N nitric acid followed by three consecutive rinses with reagent water (a minimum of 1-L per rinse is recommended). Glass fiber filters are fragile and should be handled with care.

4.5 pH Meters: The meter should be accurate to ± 0.05 units at 25°C.

4.6 ZHE Extract Collection Devices: TEDLAR^{®2} bags or glass, stainless steel or PTFE gas-tight syringes are used to collect the initial liquid phase and the final extract when using the ZHE device. These devices listed are recommended for use under the following conditions:

² TEDLAR[®] is a registered trademark of Du Pont.

4.6.1 If a waste contains an aqueous liquid phase or if a waste does not contain a significant amount of nonaqueous liquid (i.e., <1% of total waste), the TEDLAR[®] bag or a 600 mL syringe should be used to collect and combine the initial liquid and solid extract.

4.6.2 If a waste contains a significant amount of nonaqueous liquid in the initial liquid phase (i.e., >1% of total waste), the syringe or the TEDLAR[®] bag may be used for both the initial solid/liquid separation and the final extract filtration. However, analysts should use one or the other, not both.

4.6.3. If the waste contains no initial liquid phase (is 100% solid) or has no significant solid phase (is <0.5% solid), either the TEDLAR[®] bag or the syringe may be used. If the syringe is used, discard the first 5 mL of liquid expressed from the device. The remaining aliquots are used for analysis.

4.7 ZHE Extraction Fluid Transfer Devices: Any device capable of transferring the extraction fluid into the ZHE without changing the nature of the extraction fluid is acceptable (e.g., a positive displacement or peristaltic pump, a gas-tight syringe, pressure filtration unit (see Step 4.3.2), or other ZHE device).

4.8 Laboratory Balance: Any laboratory balance accurate to within ± 0.01 grams may be used (all weight measurements are to be within ± 0.1 grams).

4.9 Beaker or Erlenmeyer flask, glass, 500 mL.

4.10 Watchglass, appropriate diameter to cover beaker or Erlenmeyer flask.

4.11 Magnetic stirrer.

5.0 REAGENTS

5.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

5.2 Reagent Water. Reagent water is defined as water in which an interferant is not observed at or above the method's detection limit of the analyte(s) of interest. For nonvolatile extractions, ASTM Type II water or equivalent meets the definition of reagent water. For volatile extractions, it is recommended that reagent water be generated by any of the following methods. Reagent water should be monitored periodically for impurities.

5.2.1 Reagent water for volatile extractions may be generated by passing tap water through a carbon filter bed containing about 500 grams of activated carbon (Calgon Corp., Filtrasorb-300 or equivalent).

5.2.2 A water purification system (Millipore Super-Q or equivalent) may also be used to generate reagent water for volatile extractions.

5.2.3. Reagent water for volatile extractions may also be prepared by boiling water for 15 minutes. Subsequently, while maintaining the water temperature at 90 ± 5 degrees C, bubble a contaminant-free inert gas (e.g., nitrogen) through the water for one hour. While still hot, transfer the water to a narrow mouth screw-cap bottle under zero-headspace and seal with a Teflon-lined septum and cap.

5.3 Sulfuric acid/nitric acid (60/40 weight percent mixture) H_2SO_4/HNO_3 . Cautiously mix 60 g of concentrated sulfuric acid with 40 g of concentrated nitric acid. If preferred, a more dilute H_2SO_4/HNO_3 acid mixture may be prepared and used in steps 5.4.1 and 5.4.2 making it easier to adjust the pH of the extraction fluids.

5.4 Extraction fluids.

5.4.1 Extraction fluid #1: This fluid is made by adding the 60/40 weight percent mixture of sulfuric and nitric acids (or a suitable dilution) to reagent water (Step 5.2) until the pH is 4.20 ± 0.05 . The fluid is used to determine the leachability of soil from a site that is east of the Mississippi River, and the leachability of wastes and wastewaters.

NOTE: Solutions are unbuffered and exact pH may not be attained.

5.4.2 Extraction fluid #2: This fluid is made by adding the 60/40 weight percent mixture of sulfuric and nitric acids (or a suitable dilution) to reagent water (Step 5.2) until the pH is 5.00 ± 0.05 . The fluid is used to determine the leachability of soil from a site that is west of the Mississippi River.

5.4.3 Extraction fluid #3: This fluid is reagent water (Step 5.2) and is used to determine cyanide and volatiles leachability.

NOTE: These extraction fluids should be monitored frequently for impurities. The pH should be checked prior to use to ensure that these fluids are made up accurately. If impurities are found or the pH is not within the above specifications, the fluid shall be discarded and fresh extraction fluid prepared.

5.5 Analytical standards shall be prepared according to the appropriate analytical method.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All samples shall be collected using an appropriate sampling plan.

6.2 There may be requirements on the minimal size of the field sample depending upon the physical state or states of the waste and the analytes of concern. An aliquot is needed for the preliminary evaluations of the percent solids and the particle size. An aliquot may be needed to conduct the nonvolatile analyte extraction procedure. If volatile organics are of concern, another aliquot may be needed. Quality control measures may require additional aliquots. Further, it is always wise to collect more sample just in case something goes wrong with the initial attempt to conduct the test.

6.3 Preservatives shall not be added to samples before extraction.

6.4 Samples may be refrigerated unless refrigeration results in irreversible physical change to the waste. If precipitation occurs, the entire sample (including precipitate) shall be extracted.

6.5 When the sample is to be evaluated for volatile analytes, care shall be taken to minimize the loss of volatiles. Samples shall be collected and stored in a manner intended to prevent the loss of volatile analytes (e.g., samples should be collected in Teflon-lined septum capped vials and stored at 4°C. Samples should be opened only immediately prior to extraction).

6.6 1312 extracts should be prepared for analysis and analyzed as soon as possible following extraction. Extracts or portions of extracts for metallic analyte determinations must be acidified with nitric acid to a pH < 2, unless precipitation occurs (see Step 7.2.14 if precipitation occurs). Extracts should be preserved for other analytes according to the guidance given in the individual analysis methods. Extracts or portions of extracts for organic analyte determinations shall not be allowed to come into contact with the atmosphere (i.e., no headspace) to prevent losses. See Step 8.0 (Quality Control) for acceptable sample and extract holding times.

7.0 PROCEDURE

7.1 Preliminary Evaluations

Perform preliminary 1312 evaluations on a minimum 100 gram aliquot of sample. This aliquot may not actually undergo 1312 extraction. These preliminary evaluations include: (1) determination of the percent solids (Step 7.1.1); (2) determination of whether the waste contains insignificant solids and is, therefore, its own extract after filtration (Step 7.1.2); and (3) determination of whether the solid portion of the waste requires particle size reduction (Step 7.1.3).

7.1.1 Preliminary determination of percent solids: Percent solids is defined as that fraction of a waste sample (as a percentage of the total sample) from which no liquid may be forced out by an applied pressure, as described below.

7.1.1.1 If the sample will obviously yield no free liquid when subjected to pressure filtration (i.e., is 100% solid), weigh out a representative subsample (100 g minimum) and proceed to Step 7.1.3.

7.1.1.2 If the sample is liquid or multiphasic, liquid/solid separation to make a preliminary determination of percent solids is required. This involves the filtration device discussed in Step 4.3.2, and is outlined in Steps 7.1.1.3 through 7.1.1.9.

7.1.1.3 Pre-weigh the filter and the container that will receive the filtrate.

7.1.1.4 Assemble filter holder and filter following the manufacturer's instructions. Place the filter on the support screen and secure.

7.1.1.5 Weigh out a subsample of the waste (100 gram minimum) and record the weight.

7.1.1.6 Allow slurries to stand to permit the solid phase to settle. Samples that settle slowly may be centrifuged prior to filtration. Centrifugation is to be used only as an aid to filtration. If used, the liquid should be decanted and filtered followed by filtration of the solid portion of the waste through the same filtration system.

7.1.1.7 Quantitatively transfer the sample to the filter holder (liquid and solid phases). Spread the sample evenly over the surface of the filter. If filtration of the waste at 4°C reduces the amount of expressed liquid over what would be expressed at room temperature, then allow the sample to warm up to room temperature in the device before filtering.

Gradually apply vacuum or gentle pressure of 1-10 psig, until air or pressurizing gas moves through the filter. If this point is not reached under 10 psig, and if no additional liquid has passed through the filter in any 2-minute interval, slowly increase the pressure in 10 psig increments to a maximum of 50 psig. After each incremental increase of 10 psig, if the pressurizing gas has not moved through the filter, and if no additional liquid has passed through the filter in any 2-minute interval, proceed to the next 10-psig increment. When the pressurizing gas begins to move through the filter, or when liquid flow has ceased at 50 psig (*i.e.*, filtration does not result in any additional filtrate within any 2-minute period), stop the filtration.

NOTE: If sample material (>1% of original sample weight) has obviously adhered to the container used to transfer the sample to the filtration apparatus, determine the weight of this residue and subtract it from the sample weight determined in Step 7.1.1.5 to determine the weight of the sample that will be filtered.

NOTE: Instantaneous application of high pressure can degrade the glass fiber filter and may cause premature plugging.

7.1.1.8 The material in the filter holder is defined as the solid phase of the sample, and the filtrate is defined as the liquid phase.

NOTE: Some samples, such as oily wastes and some paint wastes, will obviously contain some material that appears to be a liquid, but even after applying vacuum or pressure filtration, as outlined in Step 7.1.1.7, this material may not filter. If this is the case, the material within the filtration device is defined as a solid. Do not replace the original filter with a fresh filter under any circumstances. Use only one filter.

7.1.1.9 Determine the weight of the liquid phase by subtracting the weight of the filtrate container (see Step 7.1.1.3) from the total weight of the filtrate-filled container. Determine the weight of the solid phase of the sample by subtracting the weight of the liquid phase from the weight of the total sample, as determined in Step 7.1.1.5 or 7.1.1.7.

Record the weight of the liquid and solid phases. Calculate the percent solids as follows:

$$\text{Percent solids} = \frac{\text{Weight of solid (Step 7.1.1.9)}}{\text{Total weight of waste (Step 7.1.1.5 or 7.1.1.7)}} \times 100$$

7.1.2 If the percent solids determined in Step 7.1.1.9 is equal to or greater than 0.5%, then proceed either to Step 7.1.3 to determine whether the solid material requires particle size reduction or to Step 7.1.2.1 if it is noticed that a small amount of the filtrate is entrained in wetting of the filter. If the percent solids determined in Step 7.1.1.9 is less than 0.5%, then proceed to Step 7.2.9 if the nonvolatile 1312 analysis is to be performed, and to Step 7.3 with a fresh portion of the waste if the volatile 1312 analysis is to be performed.

7.1.2.1 Remove the solid phase and filter from the filtration apparatus.

7.1.2.2 Dry the filter and solid phase at $100 \pm 20^\circ\text{C}$ until two successive weighings yield the same value within $\pm 1\%$. Record the final weight.

Caution: The drying oven should be vented to a hood or other appropriate device to eliminate the possibility of fumes from the sample escaping into the laboratory. Care should be taken to ensure that the sample will not flash or violently react upon heating.

7.1.2.3 Calculate the percent dry solids as follows:

$$\text{Percent dry solids} = \frac{(\text{Weight of dry sample} + \text{filter}) - \text{tared weight of filter}}{\text{Initial weight of sample (Step 7.1.1.5 or 7.1.1.7)}} \times 100$$

7.1.2.4 If the percent dry solids is less than 0.5%, then proceed to Step 7.2.9 if the nonvolatile 1312 analysis is to be performed, and to Step 7.3 if the volatile 1312 analysis is to be performed. If the percent dry solids is greater than or equal to 0.5%, and if the nonvolatile 1312 analysis is to be performed, return to the beginning of this Step (7.1) and, with a fresh portion of sample, determine whether particle size reduction is necessary (Step 7.1.3).

7.1.3 Determination of whether the sample requires particle-size reduction (particle-size is reduced during this step): Using the solid portion of the sample, evaluate the solid for particle size. Particle-size reduction is required, unless the solid has a surface area per gram of material equal to or great than 3.1 cm², or is smaller than 1 cm in its narrowest dimension (*i.e.*, is capable of passing through a 9.5 mm (0.375 inch) standard sieve). If the surface area is smaller or the particle size larger than described above, prepare the solid portion of the sample for extraction by crushing, cutting, or grinding the waste to a surface area or particle size as described above. If the solids are prepared for organic volatiles extraction, special precautions must be taken (see Step 7.3.6).

NOTE: Surface area criteria are meant for filamentous (*e.g.*, paper, cloth, and similar) waste materials. Actual measurement of surface area is not required, nor is it recommended. For materials that do not obviously meet the criteria, sample-specific methods would need to be developed and employed to measure the surface area. Such methodology is currently not available.

7.1.4 Determination of appropriate extraction fluid:

7.1.4.1 For soils, if the sample is from a site that is east of the Mississippi River, extraction fluid #1 should be used. If the sample is from a site that is west of the Mississippi River, extraction fluid #2 should be used.

7.1.4.2 For wastes and wastewater, extraction fluid #1 should be used.

7.1.4.3 For cyanide-containing wastes and/or soils, extraction fluid #3 (reagent water) must be used because leaching of cyanide-containing samples under acidic conditions may result in the formation of hydrogen cyanide gas.

7.1.5 If the aliquot of the sample used for the preliminary evaluation (Steps 7.1.1. - 7.1.4.) was determined to be 100% solid at Step 7.1.1.1, then it can be used for the Step 7.2 extraction (assuming at least 100 grams remain), and the Step 7.3 extraction (assuming at least 25 grams remain). If the aliquot was subjected to the procedure in Step 7.1.1.7, then another aliquot shall be used for the volatile extraction procedure in Step 7.3. The aliquot of the waste subjected to the procedure in Step 7.1.1.7 might be appropriate for use for the Step 7.2 extraction if an adequate amount of solid (as determined by Step 7.1.1.9) was obtained. The amount of solid necessary is dependent upon whether a sufficient amount of extract will be produced to support the analyses. If an adequate amount of solid remains, proceed to Step 7.2.10 of the nonvolatile 1312 extraction.

7.2 Procedure When Volatiles Are Not Involved

A minimum sample size of 100 grams (solid and liquid phases) is recommended. In some cases, a larger sample size may be appropriate, depending on the solids content of the waste sample (percent solids, See Step 7.1.1), whether the initial liquid phase of the waste will be miscible with the aqueous extract of the solid, and whether inorganics, semivolatile organics, pesticides, and herbicides are all analytes of concern. Enough solids should be generated for extraction such that the volume of 1312 extract will be sufficient to support all of the analyses required. If the amount of extract generated by a single 1312 extraction will not be sufficient to perform all of the analyses, more than one extraction may be performed and the extracts from each combined and aliquoted for analysis.

7.2.1 If the sample will obviously yield no liquid when subjected to pressure filtration (i.e., is 100% solid, see Step 7.1.1), weigh out a subsample of the sample (100 gram minimum) and proceed to Step 7.2.9.

7.2.2 If the sample is liquid or multiphasic, liquid/solid separation is required. This involves the filtration device described in Step 4.3.2 and is outlined in Steps 7.2.3 to 7.2.8.

7.2.3 Pre-weigh the container that will receive the filtrate.

7.2.4 Assemble the filter holder and filter following the manufacturer's instructions. Place the filter on the support screen and secure. Acid wash the filter if evaluating the mobility of metals (see Step 4.4).

NOTE: Acid washed filters may be used for all nonvolatile extractions even when metals are not of concern.

7.2.5 Weigh out a subsample of the sample (100 gram minimum) and record the weight. If the waste contains <0.5% dry solids (Step 7.1.2), the liquid portion of the waste, after filtration, is defined as the 1312 extract. Therefore, enough of the sample should be filtered so that the amount of filtered liquid will support all of the analyses

required of the 1312 extract. For wastes containing >0.5% dry solids (Steps 7.1.1 or 7.1.2), use the percent solids information obtained in Step 7.1.1 to determine the optimum sample size (100 gram minimum) for filtration. Enough solids should be generated by filtration to support the analyses to be performed on the 1312 extract.

7.2.6 Allow slurries to stand to permit the solid phase to settle. Samples that settle slowly may be centrifuged prior to filtration. Use centrifugation only as an aid to filtration. If the sample is centrifuged, the liquid should be decanted and filtered followed by filtration of the solid portion of the waste through the same filtration system.

7.2.7 Quantitatively transfer the sample (liquid and solid phases) to the filter holder (see Step 4, 3, 2). Spread the waste sample evenly over the surface of the filter. If filtration of the waste at 4°C reduces the amount of expressed liquid over what would be expressed at room temperature, then allow the sample to warm up to room temperature in the device before filtering.

Gradually apply vacuum or gentle pressure of 1-10 psig, until air or pressurizing gas moves through the filter. If this point is not reached under 10 psig, and if no additional liquid has passed through the filter in any 2-minute interval, slowly increase the pressure in 10-psig increments to maximum of 50 psig. After each incremental increase of 10 psig, if the pressurizing gas has not moved through the filter, and if no additional liquid has passed through the filter in any 2-minute interval, proceed to the next 10-psig increment. When the pressurizing gas begins to move through the filter, or when the liquid flow has ceased at 50 psig (*i.e.*, filtration does not result in any additional filtrate within a 2-minute period), stop the filtration.

NOTE: If waste material (>1% of the original sample weight) has obviously adhered to the container used to transfer the sample to the filtration apparatus, determine the weight of this residue and subtract it from the sample weight determined in Step 7.2.5, to determine the weight of the waste sample that will be filtered.

NOTE: Instantaneous application of high pressure can degrade the glass fiber filter and may cause premature plugging.

7.2.8 The material in the filter holder is defined as the solid phase of the sample, and the filtrate is defined as the liquid phase. Weigh the filtrate. The liquid phase may now be either analyzed (see Step 7.2.12) or stored at 4°C until time of analysis.

NOTE: Some wastes, such as oily wastes and some paint wastes, will obviously contain some material which appears to be a liquid. Even after applying vacuum or pressure filtration, as outlined in Step 7.2.7, this material may not filter. If this is the case, the material within the filtration device is defined as a solid, and is carried through the extraction as a solid. Do not replace the original filter with a fresh filter under any circumstances. Use only one filter.

7.2.9 If the sample contains <0.5% dry solids (see Step 7.1.2), proceed to Step 7.2.13. If the sample contains >0.5 % dry solids (see Step 7.1.1 or 7.1.2), and if particle-size reduction of the solid was needed in Step 7.1.3, proceed to Step 7.2.10. If the sample as received passes a 9.5mm sieve, quantitatively transfer the solid material into the extractor bottle along with the filter used to separate the initial liquid from the solid phase, and proceed to Step 7.2.11.

7.2.10 Prepare the solid portion of the sample for extraction by crushing, cutting, or grinding the waste to a surface area or particle-size as described in Step 7.1.3. When the surface area or particle-size has been appropriately altered, quantitatively transfer the solid material into an extractor bottle. Include the filter used to separate the initial liquid from the solid phase.

NOTE: Sieving of the waste is not normally required. Surface area requirements are meant for filamentous (e.g., paper, cloth) and similar waste materials. Actual measurement of surface area is not recommended. If sieving is necessary, a Teflon-coated sieve should be used to avoid contamination of the sample.

7.2.11 Determine the amount of extraction fluid to add to the extractor vessel as follows:

$$\text{Weight of extraction fluid} = \frac{20 \times \% \text{ solids (Step 7.1.1)} \times \text{weight of waste filtered (Step 7.2.5 or 7.2.7)}}{100}$$

Slowly add this amount of appropriate extraction fluid (see Step 7.1.4) to the extractor vessel. Close the extractor bottle tightly (it is recommended that Teflon tape be used to ensure a tight seal), secure in rotary extractor device, and rotate at 30 ± 2 rpm for 18 ± 2 hours. Ambient temperature (i.e., temperature of room in which extraction takes place) shall be maintained at $23 \pm 2^\circ\text{C}$ during the extraction period.

NOTE: As agitation continues, pressure may build up within the extractor bottle for some types of sample (e.g., limed or calcium carbonate-containing sample may evolve gases such as carbon dioxide). To relieve excess pressure, the extractor bottle may be periodically opened (e.g., after 15 minutes, 30 minutes, and 1 hour) and vented into a hood.

7.2.12 Following the 18 ± 2 hour extraction, separate the material in the extractor vessel into its component liquid and solid phases by filtering through a new glass fiber filter, as outlined in Step 7.2.7. For final filtration of the 1312 extract, the glass fiber filter may be changed, if necessary, to facilitate filtration. Filter(s) shall be acid-washed (see Step 4.4) if evaluating the mobility of metals.

7.2.13 Prepare the 1312 extract as follows:

7.2.13.1 If the sample contained no initial liquid phase, the filtered liquid material obtained from Step 7.2.12 is defined as the 1312 extract. Proceed to Step 7.2.14.

7.2.13.2 If compatible (e.g., multiple phases will not result on combination), combine the filtered liquid resulting from Step 7.2.12 with the initial liquid phase of the sample obtained in Step 7.2.7. This combined liquid is defined as the 1312 extract. Proceed to Step 7.2.14.

7.2.13.3 If the initial liquid phase of the waste, as obtained from Step 7.2.7, is not or may not be compatible with the filtered liquid resulting from Step 7.2.12, do not combine these liquids. Analyze these liquids, collectively defined as the 1312 extract, and combine the results mathematically, as described in Step 7.2.14.

7.2.14 Following collection of the 1312 extract, the pH of the extract should be recorded. Immediately aliquot and preserve the extract for analysis. Metals aliquots must be acidified with nitric acid to pH < 2. If precipitation is observed upon addition of nitric acid to a small aliquot of the extract, then the remaining portion of the extract for metals analyses shall not be acidified and the extract shall be analyzed as soon as possible. All other aliquots must be stored under refrigeration (4°C) until analyzed. The 1312 extract shall be prepared and analyzed according to appropriate analytical methods. 1312 extracts to be analyzed for metals shall be acid digested except in those instances where digestion causes loss of metallic analytes. If an analysis of the undigested extract shows that the concentration of any regulated metallic digestion of the extract is not necessary. However, data on undigested extracts alone cannot be used to demonstrate that the waste is not hazardous. If the individual phases are to be analyzed separately, determine the volume of the individual phases (to ± 0.5%), conduct the appropriate analyses, and combine the results mathematically by using a simple volume-weighted average:

$$\text{Final Analyte Concentration} = \frac{(V_1) (C_1) + (V_2) (C_2)}{V_1 + V_2}$$

where:

V_1 = The volume of the first phase (L).

C_1 = The concentration of the analyte of concern in the first phase (mg/L).

V_2 = The volume of the second phase (L).

C_2 = The concentration of the analyte of concern in the second phase (mg/L).

7.2.15 Compare the analyte concentrations in the 1312 extract with the levels identified in the appropriate regulations. Refer to Section 8.0 for quality assurance requirements.

7.3 Procedure When Volatiles Are Involved.

Use the ZHE device to obtain 1312 extract for analysis of volatile compounds only. Extract resulting from the use of the ZHE shall not be used to evaluate the mobility of non-volatile analytes (e.g., metals, pesticides, etc.).

The ZHE device has approximately a 500 mL internal capacity. The ZHE can thus accommodate a maximum of 25 grams of solid (defined as that fraction of a sample from which no additional liquid may be forced out by an applied pressure of 50 psig), due to the need to add an amount of extraction fluid equal to 20 times the weight of the solid phase.

Charge the ZHE with sample only once and do not open the device until the final extract (of the solid) has been collected. Repeated filling of the ZHE to obtain 25 grams of solid is not permitted.

Do not allow the sample, the initial liquid phase, or the extract to be exposed to the atmosphere for any more time than is absolutely necessary. Any manipulation of these materials should be done when cold (4°C) to minimize loss of volatiles.

7.3.1 Pre-weigh the (evacuated) filtrate collection container (see Step 4.6) and set aside. If using a TEDLAR bag, express all liquid from the ZHE device into the bag, whether for the initial or final liquid/solid separation, and take an aliquot from the liquid in the bag for analysis. The containers listed in Step 4.6 are recommended for use under the conditions stated in Steps 4.6.1-4.6.3.

7.3.2 Place the ZHE piston within the body of the ZHE (it may be helpful first to moisten the piston O-rings slightly with extraction fluid). Adjust the piston within the ZHE body to a height that will minimize the distance the piston will have to move once the ZHE is charged with sample (based upon sample size requirements determined from Step 7.3, Step 7.1.1 and/or 7.1.2). Secure the gas inlet/outlet flange (bottom flange) onto the ZHE body in accordance with the manufacturer's instructions. Secure the glass fiber filter between the support screens and set aside. Set liquid inlet/outlet flange (top flange) aside.

7.3.3 If the sample is 100% solid (see Step 7.1.1), weigh out a subsample (25 gram maximum) of the waste, record weight, and proceed to Step 7.3.5.

7.3.4 If the sample contains <0.5% dry solids (Step 7.1.2), the liquid portion of waste, after filtration, is defined as the 1312 extract. Filter enough of the sample so that the amount of filtered liquid will support all of the volatile analyses required. For samples containing $\geq 0.5\%$ dry solids (Steps 7.1.1 and/or 7.1.2), use the percent solids information obtained in Step 7.1.1 to determine the optimum sample size to charge into the ZHE. The recommended sample size is as follows;

7.3.4.1 For samples containing <5% solids (see Step 7.1.1), weigh out a 500 gram subsample of waste and record the weight.

7.3.4.2 For wastes containing >5% solids (see Step 7.1.1), determine the amount of waste to charge into the ZHE as follows:

$$\text{Weight of waste to charge ZHE} = \frac{25}{\text{percent solid (Step 7.1.1)}} \times 100$$

Weigh out a subsample of the waste of the appropriate size and record the weight.

7.3.5 If particle-size reduction of the solid portion of the sample was required in Step 7.1.3, proceed to Step 7.3.6. If particle-size reduction was not required in Step 7.1.3, proceed to Step 7.3.7.

7.3.6 Prepare the sample for extraction by crushing, cutting, or grinding the solid portion of the waste to a surface area or particle size as described in Step 7.1.3.1. Wastes and appropriate reduction equipment should be refrigerated, if possible, to 4°C prior to particle-size reduction. The means used to effect particle-size reduction must not generate heat in and of itself. If reduction of the solid phase of the waste is necessary, exposure of the waste to the atmosphere should be avoided to the extent possible.

NOTE: Sieving of the waste is not recommended due to the possibility that volatiles may be lost. The use of an appropriately graduated ruler is recommended as an acceptable alternative. Surface area requirements are meant for filamentous (e.g., paper, cloth) and similar waste materials. Actual measurement of surface area is not recommended.

When the surface area or particle-size has been appropriately altered, proceed to Step 7.3.7.

7.3.7 Waste slurries need not be allowed to stand to permit the solid phase to settle. Do not centrifuge samples prior to filtration.

7.3.8 Quantitatively transfer the entire sample (liquid and solid phases) quickly to the ZHE. Secure the filter and support screens into the top flange of the device and secure the top flange to the ZHE body in accordance with the manufacturer's instructions. Tighten all ZHE fittings and place the device in the vertical position (gas inlet/outlet flange on the bottom). Do not attach the extraction collection device to the top plate.

NOTE: If sample material (>1% of original sample weight) has obviously adhered to the container used to transfer the sample to the ZHE, determine the weight of this residue and subtract it from the sample weight determined in Step 7.3.4 to determine the weight of the waste sample that will be filtered.

Attach a gas line to the gas inlet/outlet valve (bottom flange) and, with the liquid inlet/outlet valve (top flange) open, begin applying gentle pressure of 1-10 psig (or more if necessary) to force all headspace slowly out of the ZHE device into a hood. At the first appearance of liquid from the liquid inlet/outlet valve, quickly close the valve and discontinue pressure. If filtration of the waste at 4°C reduces the amount of expressed liquid over what would be expressed at room temperature, then allow the sample to warm up to room temperature in the device before filtering. If the waste is 100% solid (see Step 7.1.1), slowly increase the pressure to a maximum of 50 psig to force most of the headspace out of the device and proceed to Step 7.3.12.

7.3.9 Attach the evacuated pre-weighed filtrate collection container to the liquid inlet/outlet valve and open the valve. Begin applying gentle pressure of 1-10 psig to force the liquid phase of the sample into the filtrate collection container. If no additional liquid has passed through the filter in any 2-minute interval, slowly increase the pressure in 10-psig increments to a maximum of 50 psig. After each incremental increase of 10 psig, if no additional liquid has passed through the filter in any 2-minute interval, proceed to the next 10-psig increment. When liquid flow has ceased such that continued pressure filtration at 50 psig does not result in any additional filtrate within a 2-minute period, stop the filtration. Close the liquid inlet/outlet valve, discontinue pressure to the piston, and disconnect and weigh the filtrate collection container.

NOTE: Instantaneous application of high pressure can degrade the glass fiber filter and may cause premature plugging.

7.3.10 The material in the ZHE is defined as the solid phase of the sample and the filtrate is defined as the liquid phase.

NOTE: Some samples, such as oily wastes and some paint wastes, will obviously contain some material which appears to be a liquid. Even after applying pressure filtration, this material will not filter. If this is the case, the material within the filtration device is defined as a solid, and is carried through the 1312 extraction as a solid.

If the original waste contained <0.5% dry solids (see Step 7.1.2), this filtrate is defined as the 1312 extract and is analyzed directly. Proceed to Step 7.3.15.

7.3.11 The liquid phase may now be either analyzed immediately (see Steps 7.3.13 through 7.3.15) or stored at 4°C under minimal headspace conditions until time of analysis. Determine the weight of extraction fluid #3 to add to the ZHE as follows:

$$\text{Weight of extraction fluid} = \frac{20 \times \% \text{ solids (Step 7.1.1)} \times \text{weight of waste filtered (Step 7.3.4 or 7.3.8)}}{100}$$

7.3.12 The following steps detail how to add the appropriate amount of extraction fluid to the solid material within the ZHE and agitation of the ZHE vessel. Extraction fluid #3 is used in all cases (see Step 5.4.3).

7.3.12.1 With the ZHE in the vertical position, attach a line from the extraction fluid reservoir to the liquid inlet/outlet valve. The line used shall contain fresh extraction fluid and should be preflushed with fluid to eliminate any air pockets in the line. Release gas pressure on the ZHE piston (from the gas inlet/outlet valve), open the liquid inlet/outlet valve, and begin transferring extraction fluid (by pumping or similar means) into the ZHE. Continue pumping extraction fluid into the ZHE until the appropriate amount of fluid has been introduced into the device.

7.3.12.2 After the extraction fluid has been added, immediately close the liquid inlet/outlet valve and disconnect the extraction fluid line. Check the ZHE to ensure that all valves are in their closed positions. Manually rotate the device in an end-over-end fashion 2 or 3 times. Reposition the ZHE in the vertical position with the liquid inlet/outlet valve on top. Pressurize the ZHE to 5-10 psig (if necessary) and slowly open the liquid inlet/outlet valve to bleed out any headspace (into a hood) that may have been introduced due to the addition of extraction fluid. This bleeding shall be done quickly and shall be stopped at the first appearance of liquid from the valve. Re-pressurize the ZHE with 5-10 psig and check all ZHE fittings to ensure that they are closed.

7.3.13 Following the 18 ± 2 hour agitation period, check the pressure behind the ZHE piston by quickly opening and closing the gas inlet/outlet valve and noting the escape of gas. If the pressure has not been maintained (i.e., no gas release observed), the ZHE is leaking. Check the ZHE for leaking as specified in Step 4.2.1, and perform the extraction again with a new sample of waste. If the pressure within the device has been maintained, the material in the extractor vessel is once again separated into its component liquid and solid phases. If the waste contained an initial liquid phase, the liquid may be filtered directly into the same filtrate collection container (i.e., TEDLAR[®] bag) holding the initial liquid phase of the waste. A separate filtrate collection container must be used if combining would create multiple phases, or there is not enough volume left within the filtrate collection container. Filter through the glass fiber filter, using the ZHE device as discussed in Step 7.3.9. All extracts shall be filtered and collected if the TEDLAR[®] bag is used, if the extract is multiphasic, or if the waste contained an initial liquid phase (see Steps 4.6 and 7.3.1).

NOTE: An in-line glass fiber filter may be used to filter the material within the ZHE if it is suspected that the glass fiber filter has been ruptured.

7.3.14 If the original sample contained no initial liquid phase, the filtered liquid material obtained from Step 7.3.13 is defined as the 1312 extract. If the sample contained

an initial liquid phase, the filtered liquid material obtained from Step 7.3.13 and the initial liquid phase (Step 7.3.9) are collectively defined as the 1312 extract.

7.3.15 Following collection of the 1312 extract, immediately prepare the extract for analysis and store with minimal headspace at 4°C until analyzed. Analyze the 1312 extract according to the appropriate analytical methods. If the individual phases are to be analyzed separately (i.e., are not miscible), determine the volume of the individual phases (to 0.5%), conduct the appropriate analyses, and combine the results mathematically by using a simple volume - weighted average:

$$\text{Final Analyte Concentration} = \frac{(V_1) (C_1) + (V_2) (C_2)}{V_1 + V_2}$$

where:

V_1 = The volume of the first phase (L).

C_1 = The concentration of the analyte of concern in the first phase (mg/L).

V_2 = The volume of the second phase (L).

C_2 = The concentration of the analyte of concern in the second phase (mg/L).

7.3.16 Compare the analyte concentrations in the 1312 extract with the levels identified in the appropriate regulations. Refer to Step 8.0 for quality assurance requirements.

8.0 QUALITY CONTROL

8.1 A minimum of one blank (using the same extraction fluid as used for the samples) for every 20 extractions that have been conducted in an extraction vessel. Refer to Chapter One for additional quality control protocols.

8.2 A matrix spike shall be performed for each waste type (e.g., wastewater treatment sludge, contaminated soil, etc.) unless the result exceeds the regulatory level and the data is being used solely to demonstrate that the waste property exceeds the regulatory level. A minimum of one matrix spike must be analyzed for each analytical batch. As a minimum, follow the matrix spike addition guidance provided in each analytical method.

8.2.1 Matrix spikes are to be added after filtration of the 1312 extract and before preservation. Matrix spikes should not be added prior to 1312 extraction of the sample.

8.2.2 In most cases, matrix spike levels should be added at a concentration equivalent to the corresponding regulatory level. If the analyte concentration is less than one half the regulatory level, the spike concentration may be as low as one half of the analyte concentration, but may not be less than five times the method detection limit. In order to avoid differences in matrix effects, the matrix spikes must be added to the same nominal volume of 1312 extract as that which was analyzed for the unspiked sample.

8.2.3 The purpose of the matrix spike is to monitor the performance of the analytical methods used, and to determine whether matrix interferences exist. Use of other internal calibration methods, modification of the analytical methods, or use of alternate analytical methods may be needed to accurately measure the analyte concentration in the 1312 extract when the recovery of the matrix spike is below the expected analytical method performance.

8.2.4 Matrix spike recoveries are calculated by the following formula:

$$\%R (\% \text{ Recovery}) = 100 (X_s - X_u) / K$$

where:

X_s = measured value for the spiked sample

X_u = measured value for the unspiked sample, and

K = known value of the spike in the sample.

8.3 All quality control measures described in the appropriate analytical methods shall be followed.

8.4 The use of internal calibration quantitation methods shall be employed for a metallic contaminant if: (1) Recovery of the contaminant from the 1312 extract is not at least 50% and the concentration does not exceed the appropriate regulatory level, and (2) The concentration of the contaminant measured in the extract is within 20% of the appropriate regulatory level.

8.4.1 The method of standard additions shall be employed as the internal calibration quantitation method for each metallic contaminant.

8.4.2 The method of standard additions requires preparing calibration standards in the sample matrix rather than reagent water or blank solution. It requires taking four identical aliquots of the solution and adding known amounts of standard to three of these aliquots. The fourth aliquot is the unknown. Preferably, the first additional should be prepared so that the resulting concentration is approximately 50% of the expected concentration of the sample. The second and third additions should be prepared so that the concentration of the sample. All four aliquots are maintained at the same final volume by adding reagent water or a blank solution, and may need dilution adjustment to maintain the signals in the linear range of the instrument technique. All four aliquots are analyzed.

8.4.3 Prepare a plot, or subject data to linear regression, of instrument signals or external- calibration-derived concentrations as the dependent variable (y-axis) versus concentrations of the additions of standards as the independent variable (x-axis). Solve for the intercept of the abscissa (the independent variable, x-axis) which is the concentration in the unknown.

8.4.4 Alternately, subtract the instrumental signal or external-calibration-derived concentration of the unknown (unspiked) sample from the instrumental signals or external-calibration-derived concentrations of the standard additions. Plot or subject to linear regression of the corrected instrument signals or external-calibration-derived concentrations as the dependent variable versus the independent variable. Derive concentrations for the unknowns using the internal calibration curve as if it were an external calibration curve.

8.5 Samples must undergo 1312 extraction with in the following time periods:

SAMPLE MAXIMUM HOLDING TIMES (days)

	From: Field Collection	From: 1312 extraction	From: Preparative extraction	Total Elapsed Time
	To: 1312 extraction	To: Preparative extraction	To: Determinative analysis	
Volatiles	14	NA	14	28
Semi-volatiles	14	7	40	61
Mercury	28	NA	28	56
Metals, except mercury	180	NA	180	360
NA = Not Applicable				

If sample holding times are exceeded, the values obtained will be considered minimal concentrations. Exceeding the holding time is not acceptable in establishing that a waste does not exceed the regulatory level. Exceeding the holding time will not invalidate characterization if the waste exceeds the regulatory level.

9.0 METHOD PERFORMANCE

9.1 Precision results for semi-volatiles and metals: An eastern soil with high organic content and a western soil with low organic content were used for the semi-volatile and metal leaching experiments. Both types of soil were analyzed prior to contaminant spiking. The results are shown in Table 6. The concentration of contaminants leached from the soils were reproducible, as shown by the moderate relative standard deviations (RSDs) of the recoveries (averaging 29% for the compounds and elements analyzed).

9.2 Precision results for volatiles: Four different soils were spiked and tested for the extraction of volatiles. Soils One and Two were from western and eastern Superfund sites. Soils Three and Four were mixtures of a western soil with low organic content and two different municipal sludges. The results are shown in Table 7. Extract concentrations of volatile organics from the eastern soil were lower than from the western soil. Replicate leachings of Soils Three and Four showed lower precision than the leachates from the Superfund soils.

10.0 REFERENCES

1. Environmental Monitoring Systems Laboratory, "Performance Testing of Method 1312; QA Support for RCRA Testing: Project Report". EPA/600/4-89/022. EPA Contract 68-03-3249 to Lockheed Engineering and Sciences Company, June 1989.
2. Research Triangle Institute, "Interlaboratory Comparison of Methods 1310, 1311, and 1312 for Lead in Soil". U.S. EPA Contract 68-01-7075, November 1988.

Table 1. Volatile Analytes¹

Compound	CAS No.
Acetone	67-64-1
Benzene	71-43-2
n-Butyl alcohol	71-36-3
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chloroform	67-66-3
1, 2-Dichloroethane	107-06-2
1, 1-Dichloroethylene	75-35-4
Ethyl acetate	141-78-6
Ethyl benzene	100-41-4
Ethyl ether	60-29-7
Isobutanol	78-83-1
Methanol	67-56-1
Methylene chloride	75-09-2
Methyl ethyl ketone	78-93-3
Methyl isobutyl ketone	108-10-1
Tetrachloroethylene	127-18-4
Toluene	108-88-3
1, 1, 1-Trichloroethane	71-55-6
Trichloroethylene	79-01-6
Trichlorofluoromethane	75-69-4
1, 1, 2-Trichloro-1, 2, 2-trifluoroethane	76-13-1
Vinyl chloride	75-01-4
Xylene	1330-20-7

¹ When testing for any or all of these analytes, the zero-headspace extractor vessel shall be used instead of the bottle extractor.

Table 2. Suitable Rotary Agitation Apparatus¹

Company	Location	Model No.
Analytical Testing and Consulting Services, Inc.	Warrington, PA (215) 343-4490	4-vessel extractor (DC20S); 8-vessel extractor (DC20); 12-vessel extractor (DC20B)
Associated Design and Manufacturing Company	Alexandria, VA (703) 549-5999	2-vessel (3740-2); 4-vessel (3740-4); 6-vessel (3740-6); 8-vessel (3740-8); 12-vessel (3740-12); 24-vessel (3740-24)
Environmental Machine and Design Inc.	Lynchburg, VA (804) 845-6424	8-vessel (08-00-00) 4-vessel (04-00-00)
IRA Machine Shop and Laboratory	Santurce, PR (809) 752-4004	8-vessel (011001)
Lars Lande Manufacturing	Whitmore Lake, MI (313) 449-4116	10-vessel (10VRE) 5-vessel (5VRE)
Millipore Corp.	Bedford, MA (800) 225-3384	4-ZHE or 4 l-liter bottle extractor (YT300RAHW)

¹ Any device that rotates the extraction vessel in an end-over-end fashion at 30 ±2 rpm is acceptable.

Table 3. Suitable Zero-Headspace Extractor Vessels¹

Company	Location	Model No.
Analytical Testing & Consulting Services, Inc.	Warrington, PA (215) 343-4490	C102, Mechanical Pressure Device
Associated Design and Manufacturing Company	Alexandria, VA (703) 549-5999	3745-ZHE, Gas Pressure Device
Lars Lande Manufacturing ²	Whitmore Lake, MI (313) 449-4116	ZHE-11, Gas Pressure Device
Millipore Corporation	Bedford, MA (800) 225-3384	YT30090HW, Gas Pressure Device
Environmental Machine and Design, Inc.	Lynchburg, VA (804) 845-6424	VOLA-TOX1, Gas Pressure Device

¹ Any device that meets the specifications listed in Step 4.2.1 of the method is suitable.

² This device uses a 110 mm filter.

Table 4. Suitable Filter Holders¹

Company	Location	Model/ Catalogue #	Size
Nucleopore Corporation	Pleasanton, CA (800) 882-7711	425910 410400	142 mm
Micro Filtration Systems	Dublin, CA (800) 334-7132 (415) 828-6010	302400311400	142mm 47 mm
Millipore Corporation	Bedford, MA (800) 225-3384	YT30142HW XX1004700	142 mm 47 mm

Table 5. Suitable Filter Media¹

Company	Location	Model/ Catalogue #	Size
Millipore Corporation	Bedford, MA (800) 225-3384	AP40	0.7
Nucleopore Corporation	Pleasanton, CA (415) 463-2530	211625	0.7
Whatman Laboratory Products, Inc.	Clifton, NJ (201) 773-5800	GFF	0.7
Micro Filtration Systems	Dublin, CA (800) 334-7132 (415) 828-6010	GF75	0.7

¹ Any device capable of separating the liquid from the solid phase of the waste is suitable, providing that it is chemically compatible with the waste and the constituents to be analyzed. Plastic devices (not listed above) may be used when only inorganic analytes are of concern. The 142 mm size filter holder is recommended.

¹ Any filter that meets the specifications in Step 4.4 of the Method is suitable.

Table 6. Method 1312 Precision Results for Semi-Volatiles and Metals

	<u>Eastern Soil (pH 4.2)</u>			<u>Western Soils (pH 5.0)</u>	
	<u>Amount Spiked</u> (Hg)	<u>Amount Recovered</u> (Hg)	<u>% RSD</u>	<u>Amount Recovered*</u> (Hg)	<u>% RSD</u>
<u>Fortified Analyties</u>					
bis (2-Chloroethyl) - ether	1040	834	12.5	616	14.2
2-Chlorophenol	1620	1010	6.8	525	54.9
1, 4-Dichlorobenzene	2000	344	12.3	272	34.6
1, 2-Dichlorobenzene	8920	1010	8.0	1520	28.4
2-Methylphenol	3940	1860	7.7	1130	32.6
Nitrobenzene	1010	812	10.0	457	21.3
2, 4-dimethylphenol	1460	200	18.4	18	87.6
Hexachlorobutadiene	6300	95	12.9	280	22.8
Acenephtene	3640	210	8.1	310**	7.7
2, 4-Dinitrophenol	1300	896**	6.1	23**	15.7
2, 4-Dinitrotoluene	1900	1150	5.4	585	54.4
Hexachlorobenzene	1840	3.7	12.0	10	173.2
gamma BHC (Lindane)	7440	230	16.3	1240	55.2
beta BHC	640	35	13.3	65.3	51.7
<u>Metals</u>					
Lead	5000	70	4.3	10	51.7
Cadmium	1000	387	2.3	91	71.3

* - Triplicate analyses.

** - Duplicate analyses; one value was rejected as an outlier at the 90% confidence level using the Dixon Q test.

Table 7. Method 1312 Precision Results for Volatiles

<u>Compound Name</u>	<u>Soil No. 1</u> (Western)		<u>Soil No. 2</u> (Eastern)		<u>Soil No. 3</u> (Western and Sludge)		<u>Soil No. 4</u> (Western and Sludge)	
	<u>Avg.%</u> <u>Rec.*</u>	<u>%</u> <u>RSD</u>	<u>Avg. %</u> <u>Rec.*</u>	<u>%</u> <u>RSD</u>	<u>Avg. %</u> <u>Rec.**</u>	<u>%</u> <u>RSD</u>	<u>Avg. %</u> <u>Rec.**</u>	<u>%</u> <u>RSD</u>
Acetone	44.0	12.2	43.8	2.25	116.0	11.5	21.3	71.4
Acrylonitrile	52.5	68.4	50.5	70.0	49.3	44.9	51.8	4.6
Benzene	47.8	8.29	34.8	16.3	49.8	36.7	33.4	41.1
n-Butyl Alcohol (1-Butanol)	55.5	2.91	49.2	14.6	65.5	37.2	73.0	13.9
Carbon disulfide	21.4	16.4	12.9	49.5	36.5	51.5	21.3	31.5
Carbon tetrachloride	40.6	18.6	22.3	29.1	36.2	41.4	24.0	34.0
Chlorobenzene	64.4	6.76	41.5	13.1	44.2	32.0	33.0	24.9
Chloroform	61.3	8.04	54.8	16.4	61.8	29.1	45.8	38.6
1, 2-Dichloroethane	73.4	4.59	68.7	11.3	58.3	33.3	41.2	37.8
1, 1-Dichloroethane	31.4	14.5	22.9	39.3	32.0	54.4	16.8	26.4
Ethyl acetate	76.4	9.65	75.4	4.02	23.0	119.8	11.0	115.5
Ethylbenzine	56.2	9.22	23.2	11.5	37.5	36.1	27.2	28.6
Ethyl ether	48.0	16.4	55.1	9.72	37.3	31.2	42.0	17.6
Isobutanol (4-Methyl 1-propanol)	0.0	ND	0.0	ND	61.8	37.7	76.0	12.2
Methylene chloride	47.5	30.3	42.2	42.9	52.0	37.4	37.3	16.6
Methyl ethyl ketone (2-Butanone)	56.7	5.94	61.9	3.94	73.7	31.3	40.6	39.0
Methyl isobutyl ketone	81.1	10.3	88.9	2.99	58.3	32.6	39.8	40.3
1, 1, 1, 2-Tetrachloro- ethane	69.0	6.73	41.1	11.3	50.8	31.5	36.8	23.8
1, 1, 2, 2-Tetrachloro- ethane	85.3	7.04	58.9	4.15	64.0	25.7	53.6	15.8
Tetrachloroethene	45.1	12.7	15.2	17.4	26.2	44.0	18.6	24.2
Toluene	59.2	8.06	49.3	10.5	45.7	35.2	31.4	37.2
1, 1, 1-Trichloro- ethane	47.2	16.0	33.8	22.8	40.7	40.6	26.2	38.8
1, 1, 2-Trichloro- ethane	76.2	5.72	67.3	8.43	61.7	28.0	46.4	25.4
Trichloroethane	54.5	11.1	39.4	19.5	38.8	40.9	25.6	34.1
Trichloro- fluoromethane	20.7	24.5	12.6	60.1	28.5	34.0	19.8	33.9
1, 1, 2-Trichloro- trifluoroethane	18.1	26.7	6.95	58.0	21.5	67.8	15.3	24.8
Vinyl chloride	10.2	20.3	7.17	72.8	25.0	61.0	11.8	25.4

- * Triplicate analyses
- ** Six replicate analyses
- *** Five replicate analyses

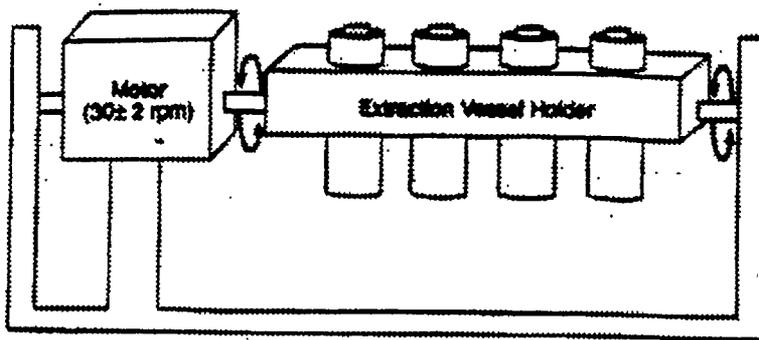


Figure 1. Rotary Agitation Apparatus

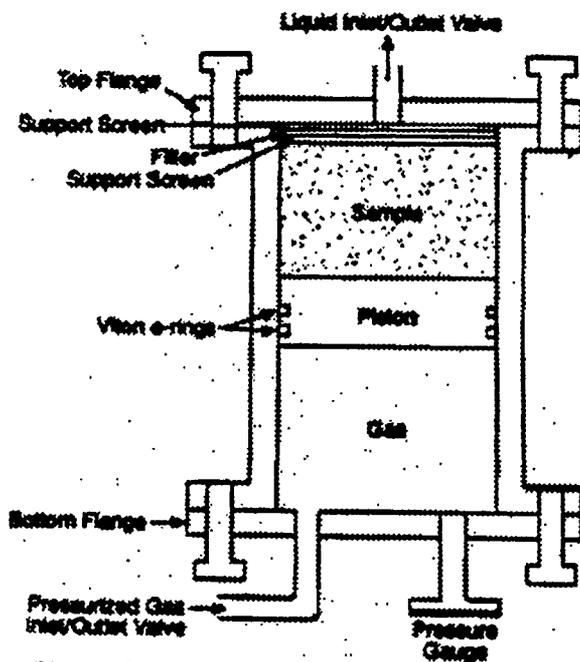


Figure 2. Zero-Headspace Extractor (ZHE)

1312 - 28

Revision 0
September 1994

