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TECHNICAL MEMORANDUM #1
SOURCE CHARACTERIZATION
STA-RITE INDUSTRIES, INC.
CONTRACT SF-90-02

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PLATES

ACRONYMS

BRA	Baseline Risk Assessment
BTEX	Benzene, toluene, ethylbenzene and xylene
cfm	Cubic feet per minute
FS	Feasibility Study
FFS	Focused Feasibility Study
gpm	Gallons per minute
GWE	Ground-Water Extraction
NIOSH	National Institute for Occupational Safety and Health
NPL	National Priority List
OU	Operable Unit
PCE	Tetrachloroethylene
PID	Photoionization Detector
ppm	parts per million
ppb	parts per billion
RA	Remedial Action
RD	Remedial Design
RI	Remedial Investigation
SER	Site Evaluation Report
SVE	Soil Vapor Extraction
TCA	1,1,1-trichloroethane
TCE	Trichloroethylene

ACRONYMS (CONT'D.)

TM	Technical Memorandum
TOC	Total organic carbon
USCS	Unified Soil Classification System
VOC	Volatile Organic Compound
WDHSS	Wisconsin Department of Health and Social Service
WDNR	Wisconsin Department of Natural Resources

1.0 EXECUTIVE SUMMARY

This Technical Memorandum presents the results of Remedial Investigation (RI) source characterization activities performed in accordance with the Task II Project Work Plans, Remedial Investigation/Feasibility Study (RI/FS), Sta-Rite Industries, Inc., Delavan Wisconsin (Work Plans) and supplemental investigation activities performed per Addenda #1, #2, and #3 to the Work Plans, approved by Wisconsin Department of Natural Resources on January 6 and March 12, 1992. Investigative activities included borehole installation, field screening of soil headspace using a photoionization detector (PID), soil sample collection for laboratory analyses of volatile organic compounds (VOCs), monitor well, soil vent, and ground-water extraction (GWE) well installation in selected boreholes ground-water sampling for VOCs, soil gas probe installation in selected shallow boreholes, selected soil gas sample collection, and soil vapor extraction (SVE) testing in selected soil vents.

The investigations conducted for the City of Delavan Well #4 National Priority List (NPL) site (Plant #2) reported herein included Work Plan activities designated as operable units (OUs) OU-2A and OU-2B and confirmatory Addendum #2 activities. Plant #1 activities included Work Plan investigations designated as OU-1A and OU-1B and confirmatory Addendum #3 activities. Addendum #1 included a soil gas survey that encompassed both locations. Addenda #2 and #3 included confirmatory borehole installations, soil vent and combination soil vent/ground water extraction well installations as well as pilot testing of SVE technology at the two plant facilities.

Soil impacts near Plant #2 were found to be mainly trichloroethylene (TCE) and tetrachloroethylene (PCE). Two source areas were detected as part of the RI and Addenda investigations; the former sump location remains a source area, and the area previously suspected southeast of Plant #2 was confirmed as a source area during Addenda #1 and #2 activities. Soil and ground-water impacts were verified along the west edge of asphalt southeast of Plant #2, confirming the soil gas survey results. The SVE pilot testing indicated that SVE technology is feasible at Plant #2, and that SVE and/or combined SVE and GWE can be utilized to help remediate residual impacts in these source areas.

Historically, VOC impacts found at Plant #1 have consisted mainly of TCE and 1,1,1-trichloroethane (TCA). Monitor wells and GWE wells located immediately south and west of Plant #1, including TW-4, D-12, EX-2, and EX-3, have historically had the highest VOC impacts at Plant #1. The known and suspected source areas at Plant #1 were investigated by installing boreholes below the floor of Plant #1 and in suspected source areas southeast and southwest of Plant #1. In addition, a soil gas survey and SVE tests were performed in suspected source areas to confirm the locations of impacted areas and to evaluate the feasibility for their remediation through SVE and/or GWE.

RI and Addendum #1 investigations at Plant #1 have indicated that VOCs are present beneath the floor of Plant #1 in general areas where solvents were used in the manufacturing process. Although several specific areas investigated appear to have residual soil impacts which may be capable of adversely affecting ground-water quality (Sump #2, Sump #8, Sump #12, Area #15), the concentrations of VOCs beneath the plant and VOC concentration trends in ground water suggest the primary source area is located to the southeast of Plant #1.

The suspected source area southeast of Plant #1 was confirmed via ground-water sample results (MW-1026 and MW-1027) from an area upgradient (southeast) of the plant which was known to have received surface discharges of spent solvents. This area(s) was further investigated through a soil gas survey performed as part of Addendum #1 which indicated two potential source area locations. The magnitude and extent of impacts suggested by the soil gas survey were confirmed through borehole installation and soil PID screening, soil sample collection and analyses and SVE testing performed as part of Addendum #3 activities.

SVE pilot testing in the identified source areas of Plants #1 and #2 confirmed the feasibility of this technology as an appropriate remedial measure, complementing the existing system already in operation. GWE was also evaluated in these source areas and found to be feasible to provide hydraulic controls on VOC migration through ground water until remediation of the sources through SVE is completed.

2.0 INTRODUCTION

2.1 Purpose

This Draft Technical Memorandum (TM) presents the results of Remedial Investigation (RI) activities which were performed to characterize the location and the physical and chemical aspects of the residual impacts to soils at the Sta-Rite Industries, Inc. (Sta-Rite) manufacturing facility in Delavan, Wisconsin. The source characterization focuses on impacts to soils in the unsaturated zone in that these impacts have the potential to be a "source" of secondary impacts to the ground-water media via downward migration. Site characterization activities encompassed by this memorandum therefore included determining the location, type, physical and chemical characteristics and properties of these residual impacts.

In accordance with the Contract (SF-90-02) and Statement of Work between the Wisconsin Department of Natural Resources (WDNR) and Sta-Rite, this TM #1 was originally submitted to WDNR on March 12, 1992 as an Interim Draft. At that time, it was apparent that additional source characterization activities were warranted by Sta-Rite following the RI activities identified in the Task II Project Work Plans. In efforts to maintain timely response to the RI findings, Sta-Rite previously submitted Work Plan Addendum #1 (Simon Hydro-Search, January 6, 1992) which expanded the investigation of source area extent via performance of a soil gas survey. Addenda #2 and #3, which proposed confirmation of the soil gas survey results via borehole installation, photoionization detector (PID) screening, soil vent and extraction well installation, soil and ground-water sampling, and performance of soil vapor extraction (SVE) pilot testing were subsequently submitted and approved. These Addenda were completed between April and July, 1992 and the results are reported herein. This Draft TM #1 incorporates the findings of the RI Addenda activities, and thereby replaces TM #5, Supplemental Site Investigations.

2.2 Scope

The scope of work performed during the RI is detailed in the Task II Project Work Plans (Work Plans), Sta-Rite Industries, Inc., Delavan, Wisconsin (Hydro-Search, Inc., September 27, 1991). Subsequent supplemental investigations performed were described in Addenda #1, #2, and #3 to the Work Plans, which were submitted to and approved by WDNR (Appendix A.3). The Work Plans organized the RI activities into operable units (OUs) based on an earlier evaluation of likely response actions for the site and identification of those remedial activities which had the potential to be conducted independently during the Remedial Investigation/Feasibility Study (RI/FS) and Remedial Design/Remedial Action (RD/RA). The OUs were categorized by specific media (e.g. soil, ground water, etc.) and/or location (e.g. Plant #1, Plant #2; Plate I) based on work elements which could be conducted relatively independently.

Source characterization activities performed during the RI were intended to fulfill the objectives of the four OUs which focused on the evaluation of known and suspected sources of impacts in soils. Pump tests and other hydraulic studies conducted previously by Hydro-Search, Inc. (Hydro-Search, January 23, 1990) have indicated that the City of Delavan Well #4 capture zone includes the area of Sta-Rite Plant #2. Therefore, the RI activities for the City of Delavan Well #4 National Priority List (NPL) Site (City Well #4) encompasses known source areas at Plant #2 (OU-2A) and suspected source areas at Plant #2 (OU-2B). Known and suspected source areas at Plant #1, which appear to be hydraulically isolated from City Well #4, are addressed in OU-1A and OU-1B, respectively. The site layout is presented on Plate I. The objectives of each of these OUs are summarized below.

OU-2A: Evaluate the magnitude of known soil impacts at the former sump and determine if additional impacts occur beneath Plant #2 at the floor drain leading to the former sump (Figure 2-1). If impacts are present beneath the building, evaluate whether they are controlled by the existing SVE system.

Develop an operation and monitoring plan for the SVE system if it proves to be effective in removing soil impacts, or implement plans to further evaluate the SVE system if impacts are not being controlled.

OU-2B: Evaluate the presence, extent, and magnitude of suspected soil and ground-water impacts southeast of Plant #2. Characterize the subsurface conditions to evaluate potential remedial alternatives if impacts are present.

OU-1A: Determine if highly impacted areas are present beneath the floor of Plant #1 additions and in areas of high former solvent use (Figure 2-2). Evaluate the extent and magnitude of impacts which are found, and characterize the subsurface conditions.

OU-1B: Evaluate the potential presence of suspected soil and ground-water impacts southeast of Plant #1, and the potential presence of suspected impacted soils along the drainageway southwest of Plant #1. Characterize the subsurface conditions to evaluate potential remedial alternatives if impacts are present.

Additional source characterization activities are provided for in Addenda #1, #2, and #3 to the Work Plans. Objectives of these additional activities are given below:

Addendum #1: Further characterize the suspected source areas upgradient (southeast) of Plant #1 and Plant #2 via soil gas survey. Evaluate the extent and possible magnitude of the suspected source areas near Plants #1 and #2. Evaluate the southern extent of ground-water impacts via collection of a ground-water sample using a screened auger borehole installed southwest of Plant #2. Based on the results of the soil gas survey, determine the need to evaluate the separation of plumes between Plant #1 and Plant #2.

Addendum #2: Confirm the magnitude and extent of impacts in the source area defined as part of Addendum #1 activities southeast of Plant #2. Utilize soil borehole installation, PID screening, soil sample and ground-water sample analyses to verify the absence, or presence and magnitude of impacts to soil and ground-water. Perform the screened auger ground-water sample collection southeast of Plant #2 as proposed in Addendum #1. If indicated, perform SVE pilot testing at the source area using vents installed specifically for that purpose. If warranted, install, develop, and sample potential ground-water extraction (GWE) wells.

Addendum #3: Confirm the magnitude and extent of impacts in the source area defined as part of Addendum #1 activities south and southeast of Plant #1. Utilize soil borehole installation, PID screening, and soil sample analyses to verify the absence, or presence and magnitude of residual impacts. If indicated, perform SVE pilot testing of at the source area(s) using vents installed specifically for that purpose. If warranted, install, develop, and sample potential (GWE) wells.

2.3 Principal Compounds of Concern

A summary of the physical and chemical characteristics of compounds detected to-date in site soil or ground-water samples is provided in Table 2-1. The compilation of this table was based on data collected during RI activities as well as data from previous site reports. The compounds which are the most prevalent at the site are the target compounds trichloroethylene (TCE), 1,1,1-trichloroethane (TCA), and tetrachloroethylene (PCE). These three compounds have been identified as the compounds of greatest potential concern based on their potential toxicity and concentrations observed at the site. The other organic compounds which are less prevalent at the site and which have occurred at relatively low concentrations in ground-water samples probably represent miscellaneous, small volume releases of organic solvents, and/or degradation products. Methylene chloride is likely a laboratory artifact in most samples since widely varying concentrations have been observed and it is not consistently detected. Toluene was also present in the analytical results from the RI and is suspected to be a laboratory artifact in most of the samples.

2.4 Background

The following section provides a summary of the site history related to potential residual source areas. A more complete site history and background can be found in the Task I Site Evaluation Report, RI/FS, Sta-Rite Industries, Inc., Delavan, Wisconsin (SER, Hydro-Search, Inc, 1990).

In March, 1982, TCE in excess of suggested water quality standards as set by the Wisconsin Department of Health and Social Service (WDHSS) was detected in City Well #4 (Plate I) during a random public well sampling program by WDNR. The concentration of TCE in the sample exceeded the WDHSS suggested drinking water limit at that time of 45 ppb. WDNR subsequently recommended that City Well #4 be removed from the municipal water supply system. The City complied in July, 1982.

The City Well #4 well was nominated to the NPL in 1983 and listed in 1984. In March, 1988, the WDNR also listed the site on the Hazard Ranking List as part of the State's Environmental Response and Repair Program. Sta-Rite and WDNR subsequently executed a contract (SF-90-02) on September 21, 1990, which became effective on September 28, 1990, to conduct RI/FS and RD/RA on the City of Delavan Well #4 NPL site.

Various solvents have been used during past manufacturing processes at the Sta-Rite facilities. TCE was used throughout both plants in various manufacturing and cleaning processes up until 1977. Other solvents used at the facilities included TCA and PCE. The discussion below describes locations on the property where solvents were utilized and potentially released.

2.4.1 City of Delavan Well #4 NPL Site

In Plant #2, which is the area identified as a source of impacts to City Well #4, TCE was used in a vapor degreaser and as a cold cleaner from 1968 until 1977. A sump located adjacent to the northern wall of the plant (Figure 2-1) collected liquids from spills and other discharges. The sump was constructed of joined 3-foot concrete sewer manhole sections with no bottom section and functioned as a disposal point for liquids. The practice of discharging waste liquids in this manner was discontinued in 1977, when all manufacturing operations ceased at Plant #2. A liquid sample taken from the sump in December, 1982, contained TCA at 2,940 ppb, TCE at 77 ppb, and PCE at 28 ppb. A soil sample collected in late 1983 at a point 18 feet below the land surface, directly beneath the sump, contained TCE at 980,000 ppb and PCE at 280,000 ppb. The sump and adjacent impacted soils were excavated in 1983.

Sta-Rite personnel have indicated that some spent solvents and other waste liquids generated in Plant #2 may also have been released to the ground surface located near the southeast corner of the paved area to the east of Plant #2. This practice was discontinued in 1976. This area had not been evaluated for impacts in previous studies.

2.4.2 Plant #1

In Plant #1, TCE was used as a paint thinner from 1960 through 1974, for cold washing of metal parts from 1960 through 1977, and in a vapor degreaser from 1976 through 1977. Figure 2-2 shows the locations of sites throughout Plant #1 where solvent use occurred and where spent solvents and other waste liquids may have been disposed.

A series of floor drains and catch basins in the 1958 and 1974 sections of the plant (Figure 2-2) collected spills and other discharges, some of which contained TCE and/or other solvents. The purpose of the catch basins was to separate sludges and solids from the spills prior to their discharge to the storm sewer system. The catch basins were constructed of concrete block and were installed when the plant was built in 1958. Due to the construction materials of the catch basins, leakage to the soil below the plant may have occurred at these locations. In 1982 through 1984 most of the catch basins and floor drains were permanently sealed. The numbering system used in Figure 2-2 is consistent with that developed by Sta-Rite in 1983.

From 1958 until the early 1980s, most of the catch basins drained to the existing plant storm sewer system, which discharged into an open drainageway running along the south side of the main entrance to Plant #1. This drainageway continued west to another drainageway running south along the east side of Wright St., which drained into a small marshy area located directly south of Plant #2. Overflow from this marshy area drained to the west through a culvert underneath Wright St. into a small vacant field south of and adjacent to City Well #4. The City of Delavan installed a storm sewer system in 1982, eliminating this above ground drainage system. It is believed some regrading was performed during the storm sewer installation such that existing drainage may not reflect conditions which existed prior to 1982.

Sites #2 and #9 (Figure 2-2) were located in the casting room (Site #16). These catch basins were approximately 3.5 feet square by 5 feet deep with an open grated manhole cover. Spent solvent and other waste liquids were routinely disposed of at these catch basins until they plugged up, at which time the spent solvents and other waste liquids were disposed of at Site #15 (discussed below). Discharge from these catch basins drained to the storm sewer system via the catch basin at Site #8. Use of these sites was discontinued in 1982 and 1979, respectively. These sites were designed as suspected areas of soil impacts in the SER.

Site #4 consisted of a catch basin adjacent to a paint booth which was used to separate paint sludge out from drain water from the paint booth. The dimensions of this catch basin were similar to dimensions of the catch basins at Sites #2 and #9. This catch basin drained into the storm sewer system via the catch basin at Site #8. Use of this site was discontinued in 1982. An aeration/hood system in the paint booth collects volatilized paint components which are discharged to the atmosphere. This site was not designated as a suspected source of soil impacts in the SER.

Site #8 is a catch basin which received all liquid spills and discharges collected by miscellaneous floor drains throughout the original 1958 plant which were plugged by 1983. It also received discharges from Sites #2, #4, #9, and #12. Site #8 also receives water from the roof drains, pump testing (city water) and non-contact cooling water. Discharge from this catch basin is to the storm sewer line directly outside the plant wall (Outfall 001). This site is still in use, and was not designated as a suspected source of soil impacts in the SER.

Site #12 was a catch basin which was located at the original outside truck dock location. This catch basin was 2.7 feet square by 10 feet deep. Use of this catch basin was discontinued when the 1974 plant expansion was built. Discharge from this catch basin was to the storm sewer system, via the catch basin at Site #8. This site was designated as a suspected area of soil impacts in the SER.

Site #13 is a large oil/water/solids separator used to separate oil, sludge, and other solids from miscellaneous discharges collected by the sanitary sewer system for the 1974 and later plant expansions. Discharge from this separator is pumped to the 1958 portion of the plant sanitary sewer system. This site is still in use, and is not a suspected source of soil impacts.

Table 2-2 presents the results of analytical testing performed on sludge or liquid samples taken from each of the above sites in 1982.

Site #15 consists of a catch basin which discharged to a drain field which extended northeast of Sump #15. This site received spent solvent and other waste liquids from the casting room (Site #16) after the catch basins (Sites #2 and #9) located in this area of the plant clogged. This site is now covered by the 1974 plant expansion, and was designated as a suspected source of soil impacts in the SER.

Site #17 is a suspected location where spent solvents and other waste liquids may have been released in open pits and the ground surface during the period from 1958 to 1974. This area is now covered by the 1974 plant expansion. Other areas covered by the 1974 plant expansion may have received similar discharges but cannot be specifically located with any certainty at this time. The practice of releases to open pits or the ground surface was discontinued in the mid-1970s.

Other methods of disposal of spent solvents besides discharge to the plant's storm sewer system were also utilized prior to 1976. Small amounts were evaporated out of barrels. Some was poured onto hoppers of cast iron chips for evaporation. The chips were stored outside southeast of Plant #1 at a separate location pending disposal to a scrap dealer. In 1976, Sta-Rite began returning spent solvents to the vendor for recycling. Solvent recycling equipment was also purchased by Sta-Rite in 1985 enabling recycling on-site.

2.5 Memorandum Organization

Section 3.0 presents a summary of the investigative activities performed as part of OU-1A, OU-1B, OU-2A, and OU-2B, as well as other investigative activities described in the Work Plans and Addenda #1, #2, and #3 to the Work Plans. Section 4.0 describes the results of those investigations. Section 5.0 presents conclusions and recommendations drawn from the results of the RI and Addenda investigations as well as previous investigations.

Other documents have been previously submitted to WDNR which supplement the TM #1 source characterization. Investigations performed to evaluate migration pathways are presented in TM #2. Investigative activities performed to provide WDNR with information to perform a Baseline Risk Assessment (BRA) are included in TM #3. TM #4 (in progress) will summarize the nature and extent of impacts, based on all RI activities.

In addition to the above Technical Memoranda, a Focused Feasibility Study (FFS) was submitted by Sta-Rite to WDNR on September 29, 1992 to initiate remedial activities in the source areas described herein as interim remedial measures. The FFS is currently in agency review and includes the results of SVE and GWE pilot testing as an appendix.

3.0 SOURCE AREA CHARACTERIZATION INVESTIGATION

A summary of investigative activities performed as part of OU-1A, OU-1B, OU-2A, and OU-2B is presented below, as well as additional investigations performed as part of other OUs relevant to the source characterization and Addenda activities. Tables 3-1 and 3-2 summarize the borehole and well installations performed at Plant #2 and Plant #1, respectively, per the Work Plans and Addenda. With the exception of well development and ground-water sampling activities, all RI and Addenda activities were observed by staff from Camp, Dresser, and McKee, who were retained by WDNR to provide oversight of field activities. The methods of investigation used during the RI and Addenda activities conformed to procedures presented in the Work Plans unless deviations approved by WDNR are noted herein.

3.1 City of Delavan Well #4 NPL Site Known and Suspected Source Areas

3.1.1 OU-2A: Known Release Area

3.1.1.1 Work Plan Activities

The known source area near the former sump at Plant #2 was investigated by installing two shallow (<5 feet) hand auger boreholes inside the building along the floor drain known to have received spent solvent spills (Figure 3-1). Soil from these boreholes was collected every foot for PID screening and potential laboratory analysis. One soil sample collected from each of these locations was submitted for volatile organic compound (VOC) analysis via United States Environmental Protection Agency (U.S. EPA) Method 8021. Soil vapor probes were installed in these boreholes to aid in evaluating the existing SVE system effectiveness at that source area.

Three boreholes were installed outside of Plant #2 (Figure 3-1) in the general vicinity of the former sump as part of OU-2A. SB-2007 was installed approximately 30 feet east of the existing SVE system to help evaluate the eastern extent of soil impacts. SB-2008 was installed near the former sump to evaluate the change in concentration of VOCs since the start of remediation, to help evaluate the effectiveness of the existing system. P-2009 was installed west of the existing SVE system near D-15 to provide soil data west of the known source area. Soil samples from SB-2007, SB-2008, and SB-2009 were collected for PID screening and possible laboratory analysis. One soil sample each from SB-2007 and SB-2009, and two soil samples from SB-2008 were submitted for laboratory analysis of VOCs via U.S. EPA Method 8021. In addition, five soil samples were submitted from SB-2009 for analysis of pH and total organic carbon (TOC) per the Work Plan. These analyses were collected for use in the BRA, per WDNR request.

The effectiveness of the existing SVE system at removing VOCs from the soil was evaluated by performing multiple tests on the system. Two tests were performed, one as part of RI activities and one as part of Addendum #2 activities.

During the RI, the exhaust gasses from the discharge of the existing SVE system were sampled and analyzed for VOCs by National Institute for Occupational Safety and Health (NIOSH) Method 1003. Gases were collected from the discharge side of the system using a charcoal sorbent tubes (400 mg/200 mg). Sampling flow rates were determined and monitored with a precision rotameter calibrated to a film flow meter demonstrating an accuracy of ±0.5%. Air flow rates were measured before and after collection of each sample.

The sampling flow rate was maintained in a range of 122 to 127 cc/min using a SKC Model 224-PCXR3 air sampler and low flow controller. A preliminary analyses of TCE concentration in the exhaust stream was conducted via Draeger detector tubes prior to sample collection to assure the capacity of the charcoal sorbent tubes would not be exceeded. Soil vapors were drawn through the charcoal tubes through flexible tygon tube attached to the sampling port. Temperature and pressure of the exhaust vapors were monitored during the sampling periods.

Charcoal tube samples were submitted for laboratory analysis of halogenated hydrocarbons. Samples submitted to the laboratory included field blanks. The blanks were handled and analyzed in an identical manner as the samples.

Static pressure testing was performed on selected vents which were isolated from the remaining vents such that the full system vacuum was applied to the vent being tested. Vacuum induced in nearby vents was then measured. This procedure allowed evaluation of the potential radius of vacuum influence for the tested vents. Figure 3-2 shows the SVE system configuration at the time the testing was performed. The vents tested were assumed to be representative of existing vents.

As part of the preparation for the radius of influence (ROI) testing, each vent was closed off from the main header system one by one, and the change in vacuum across the remaining system was monitored at several places along the main header system (Figure 3-2). This was done, in part, to evaluate the condition of the above-ground header system.

3.1.1.2 Addenda Activities

Addenda activities were also performed to better define the extent of the known source area near the former sump. The investigations, described in Work Plan Addenda #1 and #2, included a soil gas survey north of Plant #2 near the existing SVE system to better indicate the probable extent of the source area in this location, and verification of soil gas results through borehole, soil vent, and possibly extraction well installation.

Addendum #1 consisted of a soil gas survey which was performed at several locations east of the former sump. Methodology for the soil gas survey, which was performed by Enviro-Scan, is presented along with the Enviro-Scan report in Appendix H.1. In general, the soil-gas survey consisted of hydraulically driving temporary soil-gas probes into the shallow subsurface near the suspected source area and the known source area. The probes were inserted to a depth beneath the upper silt layer; approximately 7 feet, or to where applied vacuum from a sampling device could recover a soil gas sample. Soil gas was then extracted through the probe for PID screening and for potential laboratory submission for VOC analysis.

As part of Addendum #2, additional testing of the existing SVE system was performed to evaluate the potential for system enhancement. The pilot test is described in Appendix C of the FFS (Simon Hydro-Search, September 29, 1992) and includes the results of SVE pilot testing activities. The general procedure included attaching an SVE pilot unit to one or two of the existing extraction vents, and monitoring induced vacuum in selected remaining vents in order to evaluate the ROI of the extraction vent. Samples from the exhaust vapors were collected on charcoal tubes for possible laboratory analysis of TCE, TCA, and PCE.

This procedure was performed using the following vents as the extraction points; 21, 2, 2 and 4 combined, 4, 8, 9, 12, 8, and 17 (Figure 3-2). Charcoal tube samples of soil gas were collected from the combined vents 2 and 4, and from vent 21. Only the sample from combined vents 2 and 4 was submitted for laboratory analysis.

3.1.2 Suspected Source Area

3.1.2.1 Work Plan Activities

Two shallow boreholes, MW-2005 and SB-2006, were installed southeast of Plant #2 (Figure 3-1) to evaluate the potential presence of impacts along the drainageway which carried surface-water flow from the paved area. Previous solvent releases were suspected to have occurred off the edge of pavement southeast of the plant, but the nature and extent of impacts was not known. These two boreholes were continuously sampled for PID screening and possible laboratory analysis. One sample each from MW-2005 and SB-2006 were submitted for laboratory analysis of VOCs via U.S. EPA Method 8021. Based on elevated PID readings at a depth of twenty feet, MW-2005 was extended to the water table per Work Plan contingency, and a water table monitor well was installed. SB-2006 did not have elevated PID readings at a depth of 20 feet, therefore drilling was discontinued and the borehole was properly abandoned per NR141.

PID results indicated the area along the border of the asphalt pavement southeast of Plant #2 was a potential source area. Two additional 10-foot boreholes were installed to the east (SB-2011) and west (SB-2012, Figure 3-1) of the drainageway to help evaluate whether the noted impacts were confined to the drainageway. These boreholes were continuously screened with a PID and one soil sample from each borehole was collected for laboratory analysis of VOCs. The sample selected corresponded with the highest PID impacts.

3.1.2.2 Addenda Activities

Supplemental investigations were performed to further define the area verified to be a source area by OU-2B investigations. These supplemental investigations, described in Work Plan Addenda #1 and #2 (Appendix A.3), included a soil gas survey to evaluate the extent of residual soil impacts southeast of Plant #2, confirmatory boreholes, soil vent and extraction well installations, and associated soil and ground-water sampling to verify the results of the soil gas survey. SVE pilot testing was also performed to evaluate the potential for remediation using SVE technology. In addition, one ground-water sample was collected from a borehole installed southwest of Plant #2 using a screened auger. This sample was intended to verify the southern extent of the impacted ground-water plume emanating from Plant #2. These activities are described in greater detail below.

Addendum #1 included a soil gas survey performed southeast of Plant #2 in a suspected source area to better indicate the probable extent of the source area in this location. Methodology for this survey, which was performed by Enviro-Scan, is presented along with the Enviro-Scan report in Appendix H.1. In general, the soil-gas survey consisted of hydraulically driving temporary soil-gas probes into the shallow subsurface near the suspected source area and the known source area. The probes were inserted to a depth beneath the upper silt layer; approximately 7 feet, or to where applied vacuum from a sampling device could recover a soil gas sample. Soil gas was then extracted through the probe for PID screening and for potential laboratory submission for VOC analysis.

Activities performed as part of Addendum #2 included installation of three boreholes; one which was abandoned, one which was completed as a soil vent for use in pilot testing and potential subsequent SVE, and one which was completed as a combination GWE well and SVE vent. These boreholes were continuously screened with the PID to evaluate the magnitude and extent of residual soil impacts. Soil samples were collected per the Work Plan methodology, and one to two soil samples per borehole were submitted for laboratory analysis of VOCs. The combined GWE well/SVE vent (SV/EX-2014) was developed (Appendix B.5) and a hydraulic conductivity test was performed (Appendix D). A groundwater sample was also collected for VOC analysis (Appendix F.4).

Pilot SVE testing was subsequently performed at the newly installed soil vents. Testing was initially performed by BioVac in May, 1992, but the test method proved unsuccessful in that no induced vacuum was measured in the observation probes. The BioVac report presented in Appendix H.3 includes the methodology and testing configuration as well as the results of the test. A second SVE test was performed by Simon Hydro-Search with a modified testing procedure and observation probe design to evaluate the potential for using SVE at the facility. This second test proved successful. The test is described in Appendix C of the FFS (Simon Hydro-Search, September 29, 1992).

The general pilot test procedure included installation of five observation probes, constructed of 1-inch ID PVC, at distances of 4, 8, and 12 feet from the dual purpose SVE/GWE vent (SV/EX-2014), and monitoring induced vacuum in the observation probes in order to evaluate the radius of vacuum influence of the extraction vent. Samples from the exhaust vapors were collected on charcoal tubes for possible laboratory analysis of TCE, TCA, and PCE.

3.2 Plant #1 Source Areas

3.2.1 OU-1A: Known Release Areas

Area #17

Suspected sources in Area #17, below the floor of Plant #1 and immediately southeast of the 1974 plant addition were investigated by installing 15 shallow (5-foot to 7-foot) boreholes for soil screening and soil gas analysis; SB-1001 through SB-1015 (Figure 3-3). One shallow borehole originally proposed on the 100-foot grid spacing covering the 1974 Plant addition was not installed due to its proximity to subsurface electrical cables. Two boreholes, SB-1003 and SB-1004, in the grassy area southeast of Plant #1, were added to the originally approved grid at the request of WDNR. Concurrence with the WDNR Project Manager was obtained prior to modifying the approved scope of work (Appendix A.1). All changes to the scope of work were documented in monthly progress reports to the WDNR.

Eleven shallow boreholes were installed through the floor of the plant, two were installed through the asphalt driveway immediately southeast of the plant, and two were installed in the grassy area beyond the pavement southeast of the plant (Figure 3-3). Soil samples were collected from each of these boreholes for possible laboratory analysis.

SB-1005, SB-1006, and SB-1010 were extended to a depth of approximately 20 to 30 feet to characterize subsurface conditions and to evaluate soil impacts with depth. Two additional boreholes were originally proposed to evaluate the vertical extent of impacts in potential source areas discovered during shallow borehole installation in Area #17. With WDNR concurrence, these boreholes were eliminated due to low PID headspace results in the shallow soil boreholes (Appendix B.2). The soil was continuously sampled via standard split barrel sampling technique, and a portion of each sample was collected and stored for possible laboratory analysis. A second portion was field screened using a PID to evaluate the vertical distribution of VOCs. PID field screening results are presented in Appendix B.2. Two soil samples from each of these three boreholes were submitted for laboratory analysis of VOCs via U.S. EPA Method 8021. A total of three soil samples from the remaining 12 shallow boreholes were submitted for laboratory analysis of VOCs per the Work Plan. The samples selected for analysis were those with the highest PID readings, found in boreholes SB-1007, SB-1010, and SB-1013. Laboratory results are presented in Appendix F.3.

Soil vapor probes were installed in the shallow outdoor boreholes (SB-1001 through SB-1004) and in seven of the indoor boreholes (SB-1007, SB-1008, SB-1011 through SB-1015). Soil gas samples were collected for PID screening from these locations. The sampling equipment consisted of a vacuum pump (SKC Model 224-PCXR3 air stripper) which was connected to the soil probe and operated at a rate of 1 liter/minute. The vacuum pump discharge was connected to a tee; the PID was connected to one end of the tee to sample the discharge. The other end of the tee was open to the air to allow the PID to draw sample without forcing sample air into the PID. The open end of the PID maintained air discharge conditions throughout the PID screening process, ensuring no ambient air in the sample. Results of PID screening are presented in Appendix B.4. No soil gas probe was installed in SB-1009 due to a cobble at a depth of 6 feet. The three deeper boreholes, SB-1005, SB-1006, and SB-1010, were also not fitted with vapor probes.

Sumps

One borehole was installed near each sump which was known or suspected to have received spent solvents. Borehole SB-1018 was installed near Sump #2, SB-1020 near Sump #8, SB-1017 near Sump #9, and SB-1005, which also served as a shallow borehole described above, was installed near the subsurface drainage field at Sump #15. Boreholes SB-1019 and SB-1016 were installed in the 1958 section of the building to help define the edges of soil impacts. Two soil samples from each of these boreholes were collected for VOC analysis using U.S. EPA Method 8021. In addition, five soil samples each were collected from SB-1016 and SB-1018 for analysis of soil pH and TOC. These analyses were collected for use in the BRA, per WDNR request.

3.2.2 OU-1B: Suspected Release Areas

3.2.2.1 Work Plan Activities

Two boreholes, SB-1024 and SB-1025, were installed in the drainageway southwest of Plant #1, in the area which formerly served as a storm drainage for discharges from Sump #8. The boreholes were installed to a depth of 10 feet and screened with a PID to evaluate potential soil impacts. As directed by the Work Plans, PID headspace screening results did not indicate the presence of a source area, therefore the boreholes were properly abandoned per NR141. One confirmatory soil sample was collected from the depth with the highest PID reading in each of these boreholes and submitted for laboratory analysis of VOCs via U.S. EPA Method 8021.

Two monitor wells, MW-1026 and MW-1027, were installed downgradient of the former chip storage area as part of OU-1B to evaluate potential ground-water impacts from the suspected solvent releases in undefined areas southeast of Plant #1 (Figure 3-3). No soil sampling was performed on these boreholes because they were not located in a suspected source area. The monitor well locations were designed to address the potential for the presence of an upgradient source area near the former chip storage area and vicinity. Ground-water samples from these two monitor wells were submitted for VOC analysis via U.S. EPA Method 502.2.

3.2.2.2 Addenda Activities

Supplemental site investigations were also performed to better define areas which were confirmed as source areas during OU-1B investigations. These additional investigations, described in Work Plan Addenda #1 and #3, included a soil gas survey southeast of Plant #1 to define the probable extent of the source area(s), installation of four additional soil boreholes to confirm the results of the soil gas investigations, and pilot SVE testing to evaluate the potential for use of SVE as a remediation technique. These activities are described in greater detail below.

Addendum #1 included a soil gas survey performed southeast of Plant #1 to better indicate the probable extent of the source area in this location. Methodology for this survey, which was performed by Enviro-Scan, is presented along with the Enviro-Scan report in Appendix H.1. In general, the soil-gas survey consisted of hydraulically driving temporary soil-gas probes into the shallow subsurface near the suspected source area and the known source area. The probes were inserted to a depth beneath the upper silt layer; approximately 7 feet, or to where applied vacuum from a sampling device could recover a soil gas sample. Soil gas was then extracted through the probe for PID screening and for potential laboratory submission for VOC analysis.

Activities performed as part of Addendum #3 included installation of four boreholes (Figure 3-3); two were abandoned, one was completed as a soil vent for use in pilot testing and subsequent SVE, and one was completed as a combination GWE well and SVE vent. These boreholes were continuously screened with the PID to evaluate the magnitude and extent of residual soil impacts. Soil samples were collected per the Work Plan methodology, and one to two soil samples per borehole were submitted for laboratory analysis of VOCs. The GWE well/SVE vent (SV/EX-1033) was developed (Appendix B.5) and a hydraulic conductivity test was performed (Appendix D). A ground-water sample was also collected for VOC analysis (Appendix F.4).

Pilot SVE testing was subsequently performed at newly installed soil vents. Testing was initially performed by BioVac in May, 1992, but the test method proved unsuccessful in that no induced vacuum was measured in the observation probes. The BioVac report is presented in Appendix H.3 and includes the methodology and testing configuration as well as the results of the test. A second SVE test was performed by Simon Hydro-Search with a modified testing procedure and observation probe design to evaluate the potential for using SVE at the facility. This second test proved successful. The test is described in Appendix C of the FFS (Simon Hydro-Search, September 29, 1992).

The general SVE pilot test procedure included installation of five observation probes, constructed of 1-inch ID PVC, at distances of 4, 8, and 12 feet from the soil vent SV-1034, and monitoring induced vacuum in the observation probes in order to evaluate the radius of vacuum influence of the extraction vent. Samples from the exhaust vapors were collected on charcoal tubes for possible laboratory analysis of TCE, TCA, and PCE.

3.3 Geology

RI activities pertaining to geologic conditions at the site are described below. The results of geologic investigations are presented in Section 4.1, and are described in more detail as part of the Migration Pathway Assessment in TM #2, and the results of Contaminant Extent Characterization in TM #4.

3.3.1 City of Delavan Well #4 NPL Site

Additional geologic investigations performed at Plant #2, not part of OU-2A, OU-2B, or Addenda activities, included installation or extension of two boreholes near the former sump; P-2009 was extended beyond the water table to a depth of 72.5 feet, and P-2010 was installed as a 151-foot vertical profile borehole near P-2009 to provide additional geologic data. Geologic data were also collected during installation of MW-2004 and SB-2003 (Figure 3-1) west and north of Plant #2, respectively.

3.3.2 Plant #1

Additional geologic investigations performed at Plant #1, not part of OU-1A, OU-1B or Addenda activities, included installation of a three-well nest, MW-1023 (56.5 feet), P-1022 (86 feet), and P-1021 (102 feet) near extraction well EX-2 (Figure 3-3), and installation of three off-site deep profile boreholes, SB-1028 (185 feet), SB-1029 (184 feet), and SB-1030 (198 feet, Figure 3-4). No soil samples were collected from these boreholes for analysis, but geologic information was utilized for source area characterization.

3.4 Ground Water

Ground-water investigations pertaining to source area characterization are described below. The results of other ground-water investigations will be described in detail as part of TM #4, Contaminant Extent Characterization.

3.4.1 City of Delavan Well #4 NPL Site

Ground-water investigations performed at Plant #2 as part of source characterization activities include sampling of water table monitor well MW-2005 and soil vent/extraction well SV/EX-2014 east of Plant #2 (Figure 3-1). MW-2005 was installed per Work Plan contingencies because elevated soil PID readings were detected at depth as part of soil screening indicating the potential for a source area at or near that location. A well was therefore installed to evaluate potential ground-water impacts. SV/EX-2014 was installed as part of Addendum #2 activities because PID screening detected VOCs which could potentially impact ground water at that location.

3.4.2 Plant #1

Ground-water investigations performed at Plant #1 as part of the source area characterization include the installation and sampling of two water table monitor wells, MW-1026 and MW-1027, downgradient of the former chip storage area, and one dual purpose SVE/GWE well, SV/EX-1033 in the source area defined during the gas survey (Figure 3-3). MW-1026 and MW-1027 were installed to evaluate the potential for upgradient sources in the general vicinity of the former chip storage area. SV/EX-1033 was installed to define the magnitude of impacts at the source area and, if feasible, to provide interim remediation and control of residual soil and ground-water impacts through SVE and GWE.

3.5 Air Investigations

Air quality sampling for source characterization included collection of one air sample at the discharge point for the SVE system for analysis of VOCs via NIOSH Method 1003. This sample was collected while testing the existing SVE system. The results were utilized as part of OU-2A for evaluating the effectiveness of the SVE system. Air samples were collected during pilot testing of two soil vents, one at the source area southeast of Plant #2 and one at the source area southeast of Plant #1. Although these samples are technically soil gas samples, SVE units discharge to the atmosphere, thereby potentially impacting on the air pathway. Therefore, the samples collected from the exhaust of the SVE are considered air samples for purposes of evaluating potential VOC discharges to air during operation of an SVE system. All air media sample results are contained in Appendix F.5.

4.0 NATURE AND EXTENT OF SOURCE AREAS

This first section, 4.1, describes the geologic setting at and near the site. The site geology is important in determining the nature and extent of source areas because geology is a controlling factor in the distribution and migration of residual impacts. Sections 4.2 and 4.3 describe those areas at Plants #1 and #2, respectively, at which known or suspected historical releases of solvents to the surface and shallow subsurface have been confirmed based on RI and Addenda results. These confirmed source areas have residual impacts in the unsaturated site soils which can potentially be leached into the ground-water.

4.1 Site Geologic Setting

4.1.1 Regional Geologic Setting

The general stratigraphy in the vicinity of the site is presented in detail in the SER (Hydro-Search, 1990) and TM #2. Regional stratigraphy, summarized in Table 4-1, generally consists of topsoil overlying approximately 420 feet of sand, gravel, and silt outwash deposits, overlying dolomite bedrock. The Sta-Rite facility is situated between the Darien Moraine and the Elkhorn Moraine, in an area where the surficial deposit comprises the New Berlin Formation of the Lake Michigan Lobe of deposition. The underlying glacial deposits probably include members of the Walworth Formation. The total thickness of surficial deposits in the Delavan area is approximately 420 feet.

The upper bedrock unit in the Delavan area is the Ordovician-age dolomite of the Sinnipee Group, which includes the Galena, Decorah, and Platteville Formations (Ketelle, 1971; Zaprozek, 1982;, SEWRPC, 1971, Borman, 1976). The bedrock stratigraphy is shown in Table 4-1.

4.1.2 Site Geologic Setting

The site geologic setting determined during RI and Work Plan Addenda #1, #2, and #3 activities are described in detail below to aid in interpretation of data collected as part of source characterization activities. Cross-sections of the unconsolidated deposits are shown on Plates III, IV, and V based on RI and Addenda data. The locations of these cross sections are shown on Plate II.

The site stratigraphy generally consists of 1/2-foot to 9 feet of topsoil and silty clay overlying a 5-foot to 35-foot thick layer of silty fine to coarse sand overlying a fairly clean, well-sorted sand and gravel outwash layer approximately 100 to 125 feet thick with a discontinuous 3-foot to 10-foot thick silt to silty clay layer at a depth of approximately 45 feet below the ground surface. The sand and gravel outwash unit is underlain by a dense silty clay till at a depth of approximately 130 feet below the ground surface. No boreholes were extended deeper than 198 feet, and boreholes extending beyond 130 feet all terminated in this clay till. These units are described in more detail below, in descending order.

Topsoil and Silty Clay

The surficial layer found across the Sta-Rite facility consists of a discontinuous 1/2-foot to 9-foot layer of topsoil and silty clay, with less than 10% sand and/or gravel. Some horizonation typical of early soil formation was observed, including an upper layer richer in organic matter, with some eluviation and illuviation of clay minerals. This unit is probably a loess which was deposited after the Lake Michigan Lobe of glaciation retreated.

Silty Sand to Sandy Silt

Underlying the silty clay is a 5-foot to 35-foot thick layer of silty fine to coarse sand with approximately 5% to 25% gravel, 40% to 55% sand, 15% to 35% silt and clay (Appendix

F.1). Most of these samples which had grain size analyses performed were classified according to the Unified Soil Classification System (USCS) as SM - silty sands or silty gravelly sands. This unit is light yellowish brown in color, medium dense, and fairly cohesive. The sand generally has subrounded fine to very fine-grains. Stratigraphically, this unit probably correlates with the New Berlin Formation, and the description corresponds to that of the upper member.

Sand and Gravel Outwash Unit

Below the silty sand is a fairly clean, well-sorted sand and gravel outwash layer approximately 100 to 125 feet thick consisting of approximately 1% to 70% gravel, 30% to 90% sand, and less than 10% silt and clay. Sieve analyses indicate USCS designations for this unit are well to poorly graded sand or sandy gravel with silt (SW-SM, SP-SM, GW-GM; Appendix F.1). Sand and gravel are subrounded and of mixed lithology. The maximum particle size observed during RI activities was approximately 5 cm, however, occasionally large cobbles or boulders would block sample recovery and hamper drilling efforts, so larger particles are present. This unit may correlate with the lower member of the New Berlin Till.

The silt content in the sand and gravel unit appears to increases at the east edge of the Sta-Rite facility to a maximum of 18% fines (P200 content) in SV/EX-1033. This increased silt content locally decreases the hydraulic conductivity of the sand and gravel unit as evidenced by yields from the GWE wells. Similarly, designed extraction wells on the east side of Plants #1 and #2 yield about 8 to 10 gpm while the existing wells on the west side of the buildings are yielding 50 gpm or more. These findings are confirmed by well hydraulic test results. A discontinuous 3-foot to 10-foot thick silt to silty clay layer was noted within the outwash unit at a depth of approximately 45 feet below the ground surface. This unit was most pronounced in borehole D-1R, to the point of inhibiting well installation. The borehole was redrilled and the well was set using water to help prevent very fine sand and silt from migrating up the open bore. Additional discontinuous silt lenses were found at depth in the saturated sand and gravel unit. These silt layers probably act as vertical barriers to contaminant migration.

Clay Till

The sand and gravel outwash unit is underlain by a dense silty clay till at a depth of approximately 130 feet below the ground surface. No boreholes were extended deeper than 198 feet, and boreholes extending beyond 130 feet all terminated in this clay till. This layer description correlates with the Foxhollow Member of the Walworth Formation. The Clinton Member of the Walworth Formation and members of the Zenda Formation may or may not be present; these units were not differentiated in the deep boreholes installed during RI activities.

4.1.3 Additional Soil Analyses

Soil samples from three boreholes were analyzed for pH and TOC content as part of RI activities. The results, presented in Appendix F.3 and summarized in Table 4-2, indicate a slightly basic pH, ranging from 6.78 to 8.75 with an average pH of 7.80. Results of TOC analyses (Table 4-2) indicated concentrations ranging from 1,330 parts per million (ppm) for the sand and gravel outwash unit to 16,800 ppm for topsoil. Values for the silty sand unit ranged between 1,470 ppm and 10,900 ppm. The higher TOC values were found in borehole SB-1018, which also had the highest VOC impacts, according to laboratory results.

4.2 City of Delavan Well #4 NPL Site

4.2.1 Overview

The results of the soil gas survey, soil PID screening and soil and ground-water laboratory analyses indicate two likely source areas near Plant #2. The first area is located north of Plant #2 near the former sump and the floor drain leading to the sump. The second area is located along the border of the asphalt pavement southeast of Plant #2. The testing of the SVE system currently in place at the sump north of Plant #2 indicated there is potential for enhancement performance of this system. The SVE pilot testing performed in the area southeast of Plant #2 confirmed that SVE technology is a feasible remedial alternative for this source area.

Table 4-3 summarizes the results of PID screening with depth in boreholes installed at Plant #2. Analytical results for target compounds (TCE, TCA, and PCE) in soil samples from Plant #2 are presented on Figures 4-1, 4-2, and 4-3, respectively. Results of all compounds detected in soils at Plant #2 are summarized on Table 4-4. The results of investigations at Plant #2 are described in the following sections.

4.2.1.1 OU-2A: Plant #2 Former Sump

PID Headspace Screening

PID readings inside Plant #2 (boreholes SB-2001 and SB-2002) indicated the presence of impacts immediately adjacent to the interior drain (SB-2001, 3,000 ppm), but not along the drainpipe (SB-2002, <4 ppm).

The area near the former sump was investigated by installing boreholes SB-2007, SB-2008, and SB-2009. The highest PID response occurred at borehole SB-2008 near the location of the former sump, in the area previously excavated and then backfilled with soil and gravel. No surface seal or clay cap exists over the filled area. This area is currently being remediated by an SVE system.

Impacts in SB-2008 had PID responses between 100 ppm and 200 ppm at depths of 15 to 33 feet below ground level. These results are indicative of residual impacts in the soil. PID responses at SB-2007 were less than 5 ppm from 0 to 20 feet, reached maximum concentrations of 8.2 ppm at a depth of 27 feet, and decreased to 2.9 ppm by 35 feet. PID response at SB-2009 were below 5.5 ppm to a depth of 31 feet, and reached a maximum value of 9.2 ppm immediately above the water table at a depth of 34 feet. These PID responses are probably due to volatilization from impacted ground-water rather than from residual soil impacts.

Soil Analyses

SB-2001, located near the drain below the floor of Plant #2, was sampled at a depth of 3.5 feet and SB-2002, located below the floor of Plant #2 along the drainpipe leading to the former sump, was sampled at a depth of 4 feet. PCE was detected in SB-2001 at a concentration of 693 ppb and TCE and TCA at a concentration of 5 ppb each. SB-2002 had one minor detection of 1 ppb TCA. Therefore, a small leak probably occurred at the floor drain, but the pipe leading to the exterior sump appears to be intact.

Laboratory results for soil samples indicate the highest concentration of residual impacts in SB-2008 near the former sump where soil collected at a depths of 26 feet and 30 feet had TCE concentrations of >8,200 ppb and 2,800 ppb, respectively, PCE concentrations of >23,000 ppb and >50,000 ppb respectively, TCA concentrations of approximately 10 ppb (Figures 4-2 and 4-3). Petroleum compounds in the form of toluene, ethylbenzene, xylenes (BTEX compounds indicative of petroleum products), as well as chlorinated benzenes (Table 4-4) were also present in SB-2008.

VOC impacts with concentrations significantly lower than those found in SB-2008 were detected in soil samples collected from SB-2007 (at a depth of 27 feet), and SB-2009 (at a depth of 34 feet), corresponding to the highest PID impacts noted during headspace screening. These boreholes are located east and west of SB-2008, respectively. TCE concentrations in SB-2007 and SB-2009 were between 100 and 200 ppb, PCE concentrations were less than 2,000 ppb in SB-2007 and less than 100 ppb at SB-2009, and TCA concentrations were 10 ppb or less. SB-2007 had ethylbenzene, xylene, and toluene as well, while SB-2009 had only a low detection of toluene which may represent a laboratory artifact. As previously noted, based on the sample depth and PID screening indicating little to no overlying impacts, it is likely that the impacts noted in SB-2007 and SB-2009 are a result of migration in the ground water rather than residual soil impacts. The source area associated with the former sump therefore, appears to be limited to the area encompassed by the existing SVE system.

Soil Gas Survey

The soil gas survey performed north and east of the former sump indicate the source area appears to be confined to the area currently encompassed by the existing SVE system (Figure 4-4, Table 4-5). Soil gas PID readings beyond the area of borings SB-2007 were 1 ppm or less suggesting the impacted area remains in close proximity to the sump.

4.2.1.1.1 SVE System Evaluation

Historical Data

Prior to the RI activities, colorimetric indicator tube samples were collected for TCE in the 21 individual extraction vents and on the suction side of the main header pipe leading to the blower. The results of this testing indicated TCE concentrations ranging from not detectable to greater than 200 ppm in individual vents, as well as PCE concentrations of 6 to 10 ppm and TCE concentrations of 15 to 20 ppm in the main header. A summary of historical colorimetric indicator tube test results is provided on Tables 4-6 and 4-7. The vents which have consistently had detections include 1, 3, 6, 8, and 17, located along the wall of Plant #2, and 20 and 21, located at the west end of the SVE system. Vents 4, 5, 7, 9, 10, and 19 have also had occasional detections above 20 ppm using indicator tubes. The remaining eight vents, located near the former sump in the middle of the SVE system, have no documented TCE detections from periodic sampling (Table 4-6).

RI Activities

The existing SVE system was tested as part of the RI and subsequent Addendum #2 activities to evaluate the VOC emission rates, ROI, and the potential for system enhancement. The first test was performed as part of the original Work Plans using the existing equipment. The second test was performed using the pilot test equipment with greater blower capacity. The location and designation for existing soil vents is shown on Figure 3-2. Results of SVE system testing are presented in Appendix H.3 and Appendix C of the FFS (Simon Hydro-Search, September 29, 1992).

The first SVE system test was performed on December 10, 1991. To test the potential radius of vacuum influence for individual vents, the valves of 20 of the vents were closed off and the full system vacuum was directed to one vent at a time. Measurements were collected of vacuum induced in nearby vents. Vents tested as extraction points included 6, 8, 15, 19, and 21. In general, vacuum response in the nearest vent was negligible. The best response to the test was 2.7 inches of water column induced in vent 20 when a vacuum of 12.5 inches of water was applied to vent 19.

Static pressure testing was also performed as part of the first test to provide an indication of the similarity or differences in vacuum response in order to evaluate the continued usefulness of the existing soil vents. Table 4-8 provides a summary of the static pressure test results. Each of the 21 existing vents has a valve which allows it to be isolated from the above ground header system. The test was performed by consecutively closing off the extraction vent valves and monitoring the change in system vacuum at various points along the header system (Figure 3-2). The results, summarized in Table 4-8, indicated negligible change in vacuum at most vents. Vent 11, which had a cracked valve, provided the greatest change in overall system vacuum; 5.5 inches of water column. Vents 2, 5, 9, and 13 caused a change of approximately 1 inch of water column to the overall system vacuum.

One sample of the exhaust vapors was collected during the first test and analyzed for VOCs. No VOCs were detected (Appendix F.5), indicating that the current configuration operation is not optimum. As noted above, this is probably due in part to cracks and leaks in the header system as well as a lack of a surface seal in the area previously excavated and backfilled. Some of this backfill includes gravel which may be causing preferential air flow in the area of the former sump. Modification will be required to increase the VOC removal efficiency of the SVE system.

The results of the first test indicate that leaks or cracks in the header system and/or lack of sufficient surface seal in the vicinity of the excavation of the former sump are the major factor affecting the overall system vacuum response. Cracks, leaks, and system short-circuiting, due to the input of fresh air from the previously excavated area, probably also affect the concentration of VOCs discharged to the atmosphere. Therefore, no significant conclusions regarding the condition of the existing vents could be determined based on data collected during the first system test. A second test of the SVE system was needed to provide information on the radius of vacuum influence and the potential rate of VOC removal to determine whether system modification can improve on the current configuration.

The second test of the existing SVE system was performed in conjunction with the SVE pilot testing at the two newly defined source areas. This test utilized as SVE pilot unit rather than the existing equipment. Periodically, during the second SVE pilot test, field monitoring was performed using colorimetric indicator tubes and PID screening. Depending on the SVE vent being tested, the colorimetric tubes indicated TCE concentrations ranged from 0 to 100 parts per million (ppm), and PID readings of the exhaust vapors indicated concentrations of total organics between 1 and 8 ppm. The SVE vent with the highest measured concentrations of TCE and total ionizable (VOCs) was SVE vent 4; SVE vent 2 indicated no vapors.

One exhaust vapor sample collected during testing of the existing SVE system was submitted for laboratory analysis of TCE, TCA, and PCE. The analytical results for the exhaust vapor sample included 42.4 ppm TCE, 6.6 ppm PCE, and 0 ppm TCA.

The State of Wisconsin has air emissions requirements with specific limits on the amount of total VOCs emitted to the atmosphere. The requirements specify that no more than 5.7 lbs/hour of total VOCs and 300 lbs/year of benzene can be emitted from a site without an air emissions permit. Benzene is not a compound of concern anywhere at the Sta-Rite facility. The hourly discharge of total VOCs, therefore, must be evaluated for the Sta-Rite facility to determine the need for an air emissions permit.

Based on analytical results, sampling conditions, and assumed total VOCs equal to the sum of TCE, PCE, and TCA, and an assumed soil vapor discharge of 100 scfm on a continuous 24-hour basis, the calculated pounds of total VOCs that would be discharged daily from the tested vents 2 and 4 is 0.11 lb VOCs/hour/vent. Assuming all 21 SVE vents are equal, the total calculated discharge from the existing SVE the total calculated discharge from the existing SVE system, operated under pilot test conditions (~ 10 inches Hg and 50 scfm/vent) would be 2.31 lbs VOCs/hour which is below the 5.7 lbs/hour limit.

During the testing of the existing SVE system, it became apparent that the SVE vents which were installed in the former excavation did not register any induced vacuum and the two produced very low applied vacuum when used as extraction points. This indicates a direct conduit to the surface probably exists in the soil and gravel backfill area.

Despite the apparent short circuit in the middle of the system for certain SVE vents, 0.1 inches of water column induced vacuum was detected in SVE vents as far as 47 feet from the extraction vent, indicating at least parts of the existing system are still potentially useful.

The ROI was evaluated for each of the tested SVE vents for which measurable vacuum response was recorded in isolated observation probes. The results vary depending on which SVE vents were tested and observed (Table 4-9). Induced vacuum measured in those vents determined to have been influenced by the potential short-circuit effect of the gravel backfill were eliminated from calculations. Calculated results indicate a ROI ranging from 10 to 28 feet, depending on which SVE vent was tested.

4.2.1.2 OU-2B: Suspected Release Area

PID Headspace Screening

Southeast of Plant #2 a drainageway suspected by Sta-Rite to be a potential surface release area was investigated by installing two boreholes; MW-2005 and SB-2006. PID responses above 10 ppm were assumed to be indicative of impacted soils. MW-2005 had PID responses above 10 ppm at depths from 0-2 feet, 4-14 feet and 16-24 feet. Therefore, according to SAP contingencies, MW-2005 was completed as a water table monitor well. SB-2006, located along the same drainageway approximately 60 feet south of MW-2005 (further from the suspected source area) had maximum PID responses of 6.2 ppm at a depth of 3 feet. Below a depth of 5 feet PID response decreased to below 4 ppm, and SB-2006 was therefore properly abandoned per NR141 guidelines.

In order to evaluate if PID response above 10 ppm extended adjacent to the trend of this drainageway, two additional boreholes, SB-2011 and SB-2012, were installed to a depth of ten feet to the west and east, respectively, of MW-2005 (Figure 3-1). PID screening in these boreholes indicated a maximum PID response of 8.7 ppm in SB-2012, and 5.8 ppm in SB-2011.

Soil Analyses

Laboratory analyses were performed for soils collected from MW-2005 at a depth of 5 feet, SB-2006 at a depth of 3 feet, SB-2011 and SB-2012 at a depth of 9 feet, SV-2013 and SB-2014 at a depth of 14 feet, SV/EX-2014 at a depth of 22 feet, and SB-2015 at a depth of 6 feet. Analytical results, summarized in Table 4-4, indicate the highest concentrations of TCE in SV/EX-2014 (103 ppb), with concentrations in the other 8 boreholes ranging from 1 to 38 ppb. The highest concentrations of PCE were 222 ppb in SB-2006 and 198 ppb in SB-2012, with 51 ppb in SB-2005, and <10 ppb in the other boreholes. TCA concentrations were all less than 10 ppb (Appendix F.3). These results indicate SB-2011 and SB-2015 are relatively unimpacted, thus marking the eastern extent of impacts. The other boreholes appear to be within a potential source area, with local variations in target compound concentrations possibly controlled by individual discharge locations and the depth at which the soil sample was collected. SB-2006 is probably at the southern margin of shallow impacts, possibly caused by runoff in the drainageway.

Soil Gas Survey

A soil gas survey was performed to evaluate the probable extent of this source area southeast of Plant #2. The results of the soil gas survey (Figure 4-4, Table 4-5) indicate that soil impacts occur immediately east of the paved area near the southeast corner of asphalt. Laboratory analyses for soil gas were obtained from one location (SG-2007) and the results indicated TCA concentrations greater than 40 ppb (the detector tube was saturated), TCE concentrations of 250 ppb, and no detection of PCE. Other compounds detected at concentrations at or below 10 ppb included 1,1-dichloroethane and 1,1-dichloroethylene. Based on soil gas results, the source area appears to be fairly limited in extent along and beyond the paved area.

Ground-Water Analyses

Monitor well MW-2005 was installed per the contingency described in the SAP, because PID screening during drilling indicated impacts above 10 ppm at a depth of 20 feet. Two rounds of ground-water samples were collected from MW-2005 as part of the RI activities. In addition, one water sample was collected from SV/EX-2014 following installation and development to evaluate the magnitude of impacts at that location. The analytical results indicate PCE concentrations below detection levels at SV/EX-2014 and approximately 30 ppb at MW-2005, TCE concentrations of 21 ppb at MW-2005 and 34 ppb at SV/EX-2014, and TCA concentrations of approximately 3 ppb at MW-2005 and 440 ppb at SV/EX-2014. The concentrations of the target compounds exceed the Preventive Action Limits and the Enforcement Standards in at least one compound for each of the two wells, which indicates the southeast drainageway represents an additional source area of impacts to ground-water. Ground-water analytical results are presented in Appendix F.4.

SVE Pilot Testing Results

SVE pilot testing was performed at the source area southeast of Plant #2. The first test, performed by BioVac, yielded inconclusive results. The second test, performed by Simon Hydro-Search using a modification of the first test, yielded results indicating that SVE is a viable technology for remediation of this source area. The results and conclusions from the second pilot testing are presented in Appendix C of the FFS (Simon Hydro-Search, September 29, 1992) and are summarized below.

- The SVE pilot test performed by Simon Hydro-Search indicates that the SVE technology is a feasible remedial alternative for this area. The results of the previous BioVac SVE pilot test were likely due to equipment problems, improper observation probe locations and/or construction and installation procedures; and/or siltation of the SVE vent/well.

- The radius of vacuum influence calculated during the SVE pilot test was 15 feet in the shallow silty sand unit and up to 25 feet in the deeper sand and gravel unit.

- The average emission rate from vent/well SV/EX-2014 calculated from the pilot test data was 0.13 lbs/hour total VOCs.

- The applied vacuum to the SVE/GWE vent/well increased the ground-water recovery rate from 8 gpm to 12 gpm; a 50% increase.

4.3 Plant #1 Investigation Results

4.3.1 Overview

The investigation of source areas at Plant #1 included soil, soil gas, and ground-water investigations as well as pilot testing of SVE methodology. Table 4-10 summarizes the results of PID screening with depth in boreholes installed at Plant #1. Target compound analytical results of soil sampling at Plant #1 are presented on Figures 4-5, 4-6, and 4-7. PID headspace results are summarized on Table 4-10 and a summary of VOCs detected in soil analyses is presented in Table 4-11. Figure 4-8 shows the results of PID screening during the soil gas survey for Plant #1.

4.3.1.1 OU-1A: Known Release Areas

Site #16

Former Sump #2, located in the casting room (Site #16), was investigated through installation of borehole SB-1018. SB-1018 had maximum PID responses of 100 ppm to 120 ppm from 11 to 20 feet, decreasing to 16 ppm at the total depth of 23 feet. A strong solvent odor was noted during drilling activities at SB-1018. Laboratory results indicated a TCA concentration of 46 ppb at a depth of 16 feet (corresponding to the highest PID response in the silty sand unit), but the sample from a depth of 23 feet (in the underlying sand and gravel unit) had decreased to 21 ppb TCA. TCE concentrations at both depths were consistent at 13 and 14 ppb, respectively, and minor PCE impact of 8 ppb was detected in the 23-foot sample. Bromoform, chloroform, and BETX compounds were also found in low concentrations at this location. Based on PID and laboratory data, Sump #2 appears to have sufficient residual impacts to be a potential source area.

Former Sump #9, also located in the casting room (Site #16), was investigated by installing borehole SB-1017. PID headspace screening during borehole installation indicated maximum impacts of 16 ppm at a depth of 18 feet, with the remaining PID responses below 10 ppm. PID response dropped to below 2.5 ppm from 19 feet to the bottom of the borehole at 23 feet. Laboratory results for SB-1017 were collected from 10 feet in the silty sand unit and 20 feet in the underlying outwash unit. The results indicated TCA in concentrations of 20 and 14 ppb, respectively, TCE concentrations of 21 and 6 ppb, respectively, chloroform concentrations of 61 and 69 ppb, respectively and low concentrations (<10 ppb) of BETX compounds. The PID and laboratory results indicate relatively minor residual impacts remain at this location, and Sump #9 does not appear to be a source area.

Sump #12

Sump #12 was located at the original outside truck dock at the northeast side of the 1958 plant. Impacts at this location were verified by previous installation and sampling of D-12.

The casting room was an area of the plant identified by Sta-Rite as formerly representing the largest use of solvents. Water table well D-12, located in the casting room area, has historically exhibited high VOC concentrations, but it is unknown at this time if the magnitude of impacts in ground water are attributed to casting room releases or migration from upgradient sources.

Area #15 - Drainfield

Area #15 was investigated by installing borehole SB-1005 in or near the drainfield associated with Sump #15 (Figure 3-3). SB-1005 had PID response above 10 ppm at depths from 5 to 11 feet and 13 to 23 feet, with a maximum PID response of 38 ppm at 20 feet. The PID response at the total depth of 33 feet was 6.8 ppm. Analytical results from SB-1005 indicate TCE and TCA concentrations in excess of 250 ppb in the 20-foot soil sample, and less than 20 ppb in the 26-foot sample. No other compounds were detected in this location. Based on PID and laboratory results, Area #15 contains relatively minor residual impacts which may or may not currently reach the water table, but which may be a potential source area.

Sump #8

Sump #8, an active sump which formerly received liquid spills and discharges collected by floor drains in the original 1958 plant, as well as discharges from Sumps #2, #9, and #12, was investigated by installing borehole SB-1020. SB-1020 had maximum PID response of 10.2 ppm at a depth of 16 feet. All other PID responses were less than 10 ppm. PID response below 21 feet decreased to less than 5 ppm. Laboratory samples were collected at depths of 16 and 20 feet. Results of analyses indicated TCA concentrations of <1 ppb and 143 ppb, respectively, and TCE concentrations of 41 and 240 ppb, respectively. Additional compounds detected included breakdown products and BETX compounds. Based on the results of PID and laboratory analyses, sump #8 is a potential source area. In addition, the highest impacts based on laboratory results are found in the deeper sample, indicating that impacts are migrating downward toward the water table.

Site #13

Site #13, the oil/water/solids separator for miscellaneous discharges collected by the sanitary sewer system for the 1974 and later plant expansions, was not originally identified as a suspected source. Boreholes SB-1001 and SB-1002 located outside Plant #1 were originally intended to be an extension of the Area #17 investigation. Coincidentally, they are located near Site #13. The results of headspace analysis on soil samples collected in these boreholes did not indicate a surface spill source area (<3 ppm PID response). However, the soil gas samples collected from the probes installed in those boreholes had PID response above 25 ppm in SB-1001, and above 7 ppm in SB-1002. As this area is probably within the impacted ground-water plume indicated by MW-1026 and MW-1027, the soil gas results may reflect volatilization from the water table. One borehole, SV-1032, was installed near this location. The PID results showed impacts generally around 30 ppm to 30 feet, and laboratory results from this borehole indicated impacts of 120 ppb TCE, 19 ppb TCA, and 3 ppb PCE exist at a depth of 18 feet. This area has sufficient evidence of residual impacts as to be considered a potential source area.

Site #4

Site #4, the catch basin located adjacent to a paint booth, was not a suspected source area and was not directly investigated. No indication of sources in the western part of the building were apparent as part of the shallow soil borehole and soil gas probe installation and sampling, as discussed in Area #17 below.

Area #17

Area #17 included the area beneath the 1974 and later Plant #1 additions where spent solvents were thought to have been released to open pits and the ground surface. Area #17 and the rest of the newer additions were investigated by installing shallow boreholes SB-1001 through SB-1015. SB-1005 was discussed above and suggests a possible source area at the Sump #15 drainfield. With the exception of SB-1007, the shallow boreholes headspace readings were below 5 ppm. SB-1007 had a PID response of 22 ppm at 4 feet, however the sample smelled of manure, and based on soil appearance, odor, laboratory results, and interviews with Sta-Rite personnel, the high PID reading was not suspected of being related to solvent use.

SB-1006 and SB-1010 were installed to depths of greater than 20 feet as part of the RI activities to evaluate impacts with depth in Area #17. PID results for SB-1006 indicated no responses above 5 ppm, and laboratory results for target compounds were less than 10 ppb. Methylene chloride (dichloromethane) was found in the 8-foot sample at a concentration of 39 ppb. Other impacts are not thought to be significant. The highest PID headspace response at SB-1010 was 5.8 ppm at a depth of 3 to 5 feet, with all remaining PID responses less than 2 ppm.

Laboratory samples were collected from SB-1010 at depths of 4 feet, 8.5 feet, and 16 feet. Laboratory results in the 4-foot sample were highest, but concentrations of target compounds (total) at all depths sampled were less than 15 ppb. Other compounds detected include BETX compounds, chloroform, methylene chloride, and breakdown products. Most compounds were detected at or near the detection limit, and total concentrations decreased with depth. Samples from SB-1006 were collected at depths of 8 feet and 26 feet. Total target compound concentrations were less than 10 ppb at each depth. Minor impacts from methylene chloride, ethylbenzene, and chloroform were also detected in the 8-foot sample. Other samples analyzed included SB-1007 and SB-1013 at depths of 4 feet and 6 feet. In each case, minor impacts of target compounds (<10 ppb) were detected. The SB-1007 sample had a concentration of 117 ppb xylene as well, and minor (<5 ppb) concentrations of the other BETX compounds. The impacts detected at this location are very minor, and have no mechanism for leaching into the ground water due to the presence of Plant #1. Therefore, Area #17 is not considered to be a source area.

Extent of Impacts

SB-1016 and SB-1019 were installed to evaluate the extent of soil impacts beneath the floor of Plant #1. No obvious sources are located in this area. SB-1016 had one PID response of 11 ppm at a depth of 4 feet. The remaining PID responses were below 10 ppm. Laboratory results from SB-1016 indicate total VOCs of 39 ppb at a depth of 12 feet and 21 ppb at a depth of 18 feet. Of the total, approximately 50% is TCE, 5 to 10% is TCA, and 20 to 25% is BETX compounds. PCE was also detected at a depth of 12 feet, but not at 18 feet.

SB-1019 had no PID response above 3.3 ppm. Laboratory samples for SB-1019 were submitted from depths of 6 feet and 20 feet. The laboratory results indicated a concentration of 375 ppb 1,3-dichlorobenzene in the shallow sample accounting for most of the 418 ppb total VOCs at that depth, with the remainder comprised mainly of chloroform, 1,3-dichloropropene, toluene and xylene. The 20-foot sample had a total of 67 ppb VOCs, comprised mainly of 12 ppb 1,3-dichlorobenzene, 29 ppb chloroform, 6 ppb TCA, and 3 ppb TCE along with 6 ppb xylene and 3 ppb toluene. The VOCs detected at this location are not indicative of the target compounds, and are not found in the downgradient extraction wells in significant concentrations. In addition, the deeper of the two samples collected had significantly lower concentrations of VOCs, and no mechanism for leaching impacts from the higher impacts is present. Therefore this area is not thought to be a significant source area.

4.3.1.2 OU-1B: Suspected Release Areas

Surface Drainageway

The former surface drainageway along the south side of the main plant entrance received discharges from Sump #8 which in turn received combined flows from other sumps in the plant, as noted above. The drainageway was investigated by installing two boreholes, SB-1024 and SB-1025. PID responses for these boreholes were all less than 1 ppm. Laboratory analyses were performed on samples collected at a depth of 5 feet from SB-1025, located nearest the parking lot, and 7 feet in SB-1024. The laboratory results for target compounds were 18 ppb in SB-1025 and 6 ppb in SB-1024. SB-1025 also has low concentrations of many other compounds, including chloroform, methylene chloride (dichloromethane) and BETX compounds, probably as a result of runoff from the driveway and parking areas. Based on PID and laboratory results, this drainageway does not appear to be a source area of ground-water impacts.

Southeast of Plant #1

Southeast of Plant #1 spent solvents were reportedly released onto cast iron chips in the former chip storage area and onto the ground in adjacent areas. This potential source was investigated by installing two water table monitor wells to evaluate if ground-water impacts were present downgradient of the known source areas. As part of subsequent Addenda activities, one dual purpose SVE/GWE vent/well was installed in the former chip storage area to verify impacts via soil and ground-water sample collection, and to serve as an extraction point during SVE pilot testing and, if possible, during remediation. The former chip storage area is confirmed as a source area based on evidence from ground-water sampling of MW-1026 MW-1027, and SV/EX-1033, soil gas survey results, soil samples collected from confirmatory borehole installations, and SVE pilot test results.

Ground Water

Ground-water analytical results for water table monitor wells MW-1026 and MW-1027 indicate the presence of a source area upgradient (southeast) of these two wells. Ground-water results for SV/EX-1033 confirmed VOC impacts at that location (Appendix F.4). VOC concentrations in ground water in MW-1026 and MW-1027 were greater than 17 ppm. Compounds detected in these wells included the target compounds TCA, PCE, and TCE. The degradation product 1,1-dichloroethylene was also detected, along with various other chlorinated solvents as well as benzene and toluene. VOC concentrations in ground-water sampled at SV/EX-1033 were greater than 8.6 ppm. Compounds detected in SV/EX-1033 include 1,1-dichloroethylene, TCA, and TCE. Ground-water analytical results are presented in Appendix F.4.

Soil Gas

Soil gas PID screening was performed at the eleven soil vapor probes installed by Simon Hydro-Search in the shallow soil boreholes beneath and adjacent to Plant #1 (OU-1A, Area 17). In addition, a soil gas survey was subsequently performed by Enviro-Scan to confirm initial soil gas results and to evaluate the probable extent of residual soil impacts.

The results of soil gas PID screening performed by Simon Hydro-Search are shown on Figure 4-8. In several boreholes below Plant #1, the results of the soil vapor probe screening indicated slightly higher concentrations of VOCs than did headspace screening. This difference could be due either to proximity to a soil source area or to an impacted ground-water plume which is affecting soil gas quality through volatilization from the water table. A general area of higher impacts was noted near SB-1001, SB-1002, SB-1003 and SB-

1004 outside of Plant #1. SB-1001 is located by the original truck loading dock Sump #12, and was discussed above as a potential source area. SB-1003 and SB-1004 are located near the former chip storage area. Donohue previously noted PID impacts in this area ranging from 0-950 ppm in test pits installed in 1984.

The soil gas survey performed by Enviro-Scan as part of Addendum #1 included collection of soil gas samples from 26 locations south and east of Plant #1 (Figure 4-8, Appendix H.1). Soil gas was screened with a PID, and the results ranged from 0 to 17.5 ppm (Table 4-12). One soil gas sample, collected from SG-1007, was analyzed for VOCs. Results of soil gas analyses indicated no PCE, 7.2 ppb TCE, >40 ppb TCA (the sample tube was saturated), and 14.7 ppb 1,1-dichloroethylene. Two areas of potentially impacted soils were indicated based on the soil gas survey; one immediately south of Plant #1, and one southeast of Plant #1 near the edge of asphalt in the former chip storage area (Figure 4-8).

SVE Pilot Testing

SVE pilot testing was performed at the source area southeast of Plant #1. The first test, performed by BioVac, yielded inconclusive results. The second test, performed by Simon Hydro-Search using a modification of the first test, yielded results indicating that SVE is a viable technology for remediation of this source area. The results of SVE pilot testing are presented in Appendix C of the FFS (Simon Hydro-Search, September 29, 1992) and are summarized below.

- The SVE pilot test performed by Simon Hydro-Search indicates that the SVE technology is a feasible remedial alternative for this area. The results of the previous BioVac SVE pilot test were likely due to improper observation probe locations and/or construction/installation procedures; and siltation of the SVE vent/well.

- The ROI was 10 feet in the shallow silty sand unit and up to 25 feet in the deeper sand and gravel unit.

- The average emission rate from SVE vent SV-1033 calculated from the pilot test data was 0.02 lbs/hour total VOCs.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The following sections describe the conclusions and recommendations of the source area characterization conducted during the RI and subsequent Work Plan Addenda #1, #2, and #3 activities.

5.1 City of Delavan Well #4 NPL Site

Two areas of residual soil impacts were detected near Plant #2, one near the former sump, and one southeast of Plant #2. The two source areas were evaluated via soil, soil gas, ground water and SVE pilot test investigations. The major compounds of concern at Plant #2 include the target compounds PCE and TCE. Based on RI and subsequent Addenda activities, the following specific conclusions have been reached about source areas near Plant #2.

5.1.1 Source Area Near the Former Sump

- The former sump area at Plant #2 continues to exhibit elevated VOC concentrations in soil. The area which appears to be residual soil impacts encompasses that area which is currently being treated with SVE system. The former sump location is a confirmed source area.

- Soil impacts were found at depths immediately above the water table to the east and west of the former sump, however, these impacts appear to be related to migration of impacted ground-water, either through vertical changes in water table elevation or through volatilization from the impacted water. Impacts north of Plant #2 beyond the area currently being treated with the SVE system do not appear to be source areas. These are downstream of the source area southeast of Plant #2 which are not hydraulically controlled by the GWE well network.

- The existing SVE system has been in place and operational since May 1988. The previous excavation of soils around the former sump and backfilling with soil and gravel did not allow an adequate surface seal of the excavated area, which has affected the performance of the existing SVE system.

- The two rounds of testing performed on the SVE system as well as soil analytical results performed as part of the RI indicate that removal of residual soil impacts can be significantly enhanced with modifications to the existing system, including increasing blower capacity and repairing system piping leaks.

5.1.2 Southeast of Plant #2

A source area upgradient of the former sump (southeast of Plant #2) was identified during the RI and subsequent Addenda activities. Soil impacts are present off the edge of asphalt pavement southeast of Plant #2. Ground-water impacts also occur in this area exceeding NR140 Enforcement Standards, as indicated by water table well MW-2005 and GWE well SV/EX-2014. This source area appears to be confined to an area approximately 150 to 180 feet long and 50 feet wide. SVE combined with GWE appears to be the most appropriate remediation technique for the area, based on the relatively large size, relatively small mass of VOCs, and proven effectiveness of this remediation technique at the former sump area. Specific recommendations are summarized below:

- To remediate soils at this source area, SVE vents should be installed in the upper silty sand unit at 20 to 30-foot spacings. Dual purpose SVE/GWE vent/wells should be installed in the lower sand and gravel unit at 40- to 50-foot spacings. The recommended conceptual is shown schematically in the FFS (Simon Hydro-Search, September 29, 1992).

- Ground-water removal is necessary for optimization of SVE operation to minimize ground-water mounding below the SVE vents. Therefore, the deeper SVE vents should be constructed as dual purpose SVE/GWE vent/wells, and impacted vapors and ground water should be removed simultaneously.

- Thorough development of the dual purpose SVE/GWE wells and simultaneous removal of vapors and ground water during system operation should be adequate in preventing siltation of these vent/wells which was experienced in the BioVac pilot test. Single purpose SVE vents should be completed to a depth of no more than 20 to 25 feet to avoid entry of water and silt into the vent.

5.2 Plant #1

Potential source areas near Plant #1 were evaluated via soil, soil gas, ground-water and SVE pilot test investigations. Pervasive low levels of VOCs have been detected beneath the floor of Plant #1 adjacent to floor sumps in general areas where solvents were used and discharged in the manufacturing process. The main compounds of concern found at Plant #1 include TCE and TCA. PCE was detected, but in very low concentrations consistent with historical ground-water analytical results. Several other compounds were detected at selected locations, including BETX compounds, chloroform, and other chlorinated hydrocarbons. Although several specific areas investigated appear to exhibit residual soil impacts, trends of concentrations of VOCs in ground water beneath the plant do not appear to account for the relatively high concentrations of impacts detected in ground-water samples collected from nearby site monitor wells and extraction wells. Migration of target compounds is likely affected by minimal moisture infiltration caused by the existence of Plant #1 over the source areas.

Based on RI and Addenda results, the following specific conclusions have been reached regarding source areas at Plant #1:

- Former Sump #2, located in the former casting room, was found to have a strong solvent odor, high PID response, and laboratory results indicating residual VOC impacts to soils which indicate a possible source area of impacts to ground water. BETX compounds were also present at this location.

- Former Sump #9, also located in the former casting room, exhibited very minor soil impacts and PID response. This area is not believed to represent a source area.

- Sump #12 was previously confirmed by historical soil and ground-water data to be a possible source area based on sampling results at former monitor well D-12.

- Area #15 and the associated former drainfield were found to have PID responses and laboratory results suggesting residual impacts are present and have the potential to affect ground-water quality.

- Sump #8, which is an active sump with water flowing through continuously, was found to have impacts of target compounds which increased with depth, indicating migration of impacts to the water table. Based on RI results Sump #8 is a potential source area.

- Site #13, located south of the existing Plant #1, was investigated through the shallow soil headspace investigations, subsequent soil gas surveys, and borehole and soil vent installation. The results of these investigations indicate residual soil impacts of target compounds are present which have the potential to impact ground-water quality. This area, therefore, appears to be a source area.

- PID responses from shallow soil investigations and soil gas survey results performed during the RI confirm that no source area appears to exist in Area #17. Minor soil impacts were detected in laboratory analyses, but the concentrations of target compounds detected (<15 ppb) are not high enough to indicate a source area of concern.

- PID response of subsoils in the surface drainageway southwest of Plant #1 did not indicate the presence of a source area. Results of laboratory analysis in the sample from the borehole closest to the parking facility detected a suite of VOCs, many of which probably occur as a result of runoff from the parking area and drive which is directed to this drainageway.

- An area southeast of Plant #1, upgradient of MW-1026 and MW-1027 (near the former chip storage area), was identified as an additional source area. The probable extent of soil impacts in this area was indicated through a soil gas survey and subsequent confirmatory borehole and well installations and SVE pilot testing. Impacts appear to originate from an area near the edge of asphalt southeast of Plant #1. The impacted area is probably the result of numerous distinct point discharges, and therefore the area of residual soil impacts may not be completely delineated by any one of the methods used. The apparent area of residual impacts is approximately 200 feet long by 100 feet wide. The ground-water quality data suggest this area is the most significant source of VOCs to ground-water intercepted by the extraction wells.

Monitor wells and extraction wells located immediately south and west of Plant #1, including TW-4, D-12, EX-2, and EX-3, have historically exhibited the highest ground-water impacts. Based on the relatively low concentrations of target compounds found in soils during the RI in source areas below Plant #1, direction of ground-water flow, and the fact that the plant facilities provide an effective barrier to infiltration of surface water, it would not appear that the concentrations observed under Plant #1 would account for the magnitude of VOC impacts detected in monitor wells and extraction wells located immediately south and west of Plant #1 (TW-4, EX-2, EX-3).

5.3 Recommendations

Given the high level of VOCs observed in water table wells MW-1026 and MW-1027 southeast of Plant #1, and the verification of residual soil impacts southeast of Plant #1, the significance and contribution, if any, of possible source areas under Plant #1 cannot be verified. It is recommended that remediation efforts at this time focus on the source area southeast of Plant #1 at the former chip storage area, and that potential source areas located under and immediately adjacent to Plant #1 continue to be monitored through the extraction well system performance/effectiveness. The significance of areas under Plant #1 can be better evaluated separately, if remediation of the source area southeast of Plant #1 is not effective in achieving Applicable or Relevant and Appropriate Requirements.

Soil impacts are present in the source area southeast of Plant #1 identified as part of RI and subsequent Addenda activities. Ground-water impacts also occur in this area, as indicated by GWE vent/well SV/EX-1033 and downgradient monitor wells MW-1026 and MW-1027. This source appears to be confined to an area approximately 200 feet long and 100 feet wide. Ground-water impacts exceed NR140 Enforcement Standards and, therefore, remediation is recommended. SVE combined with GWE appear to be the most appropriate remediation techniques for the area, based on the relatively large size, relatively small mass of VOCs, and proven effectiveness of SVE/GWE techniques in site remediation the former Plant #2 sump. Specific recommendations regarding conceptual design of this system are addressed in the FFS (Simon Hydro-Search, September 29, 1992).

6.0 REFERENCES

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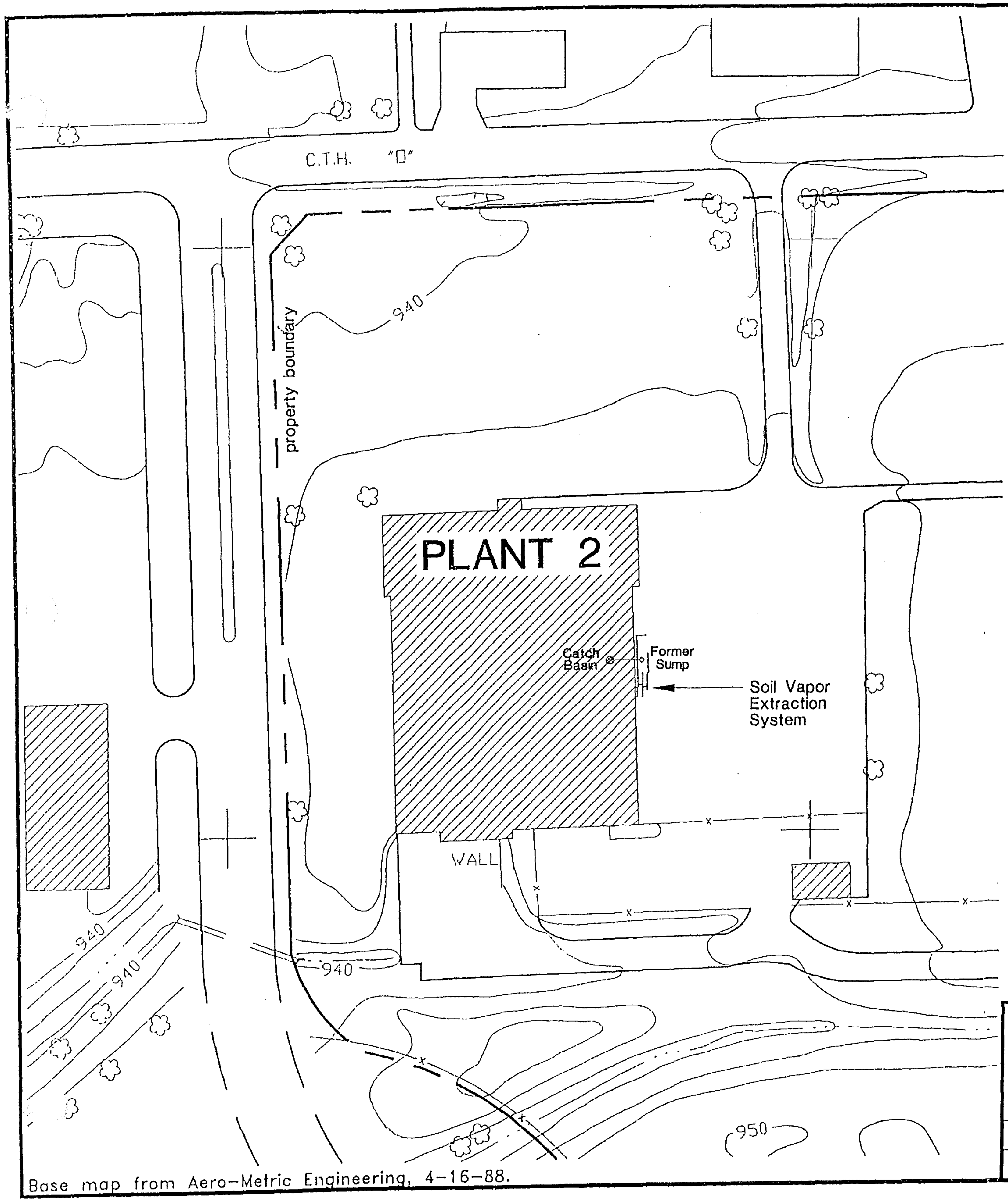
Simon Hydro-Search, September 29, 1992, Focused Feasibility Study for Interim Remedial Measures, Sta-Rite Industries, Inc.



Base map from Aero-Metric Engineering, 4-16-88.

SIMON HYDRO-SEARCH

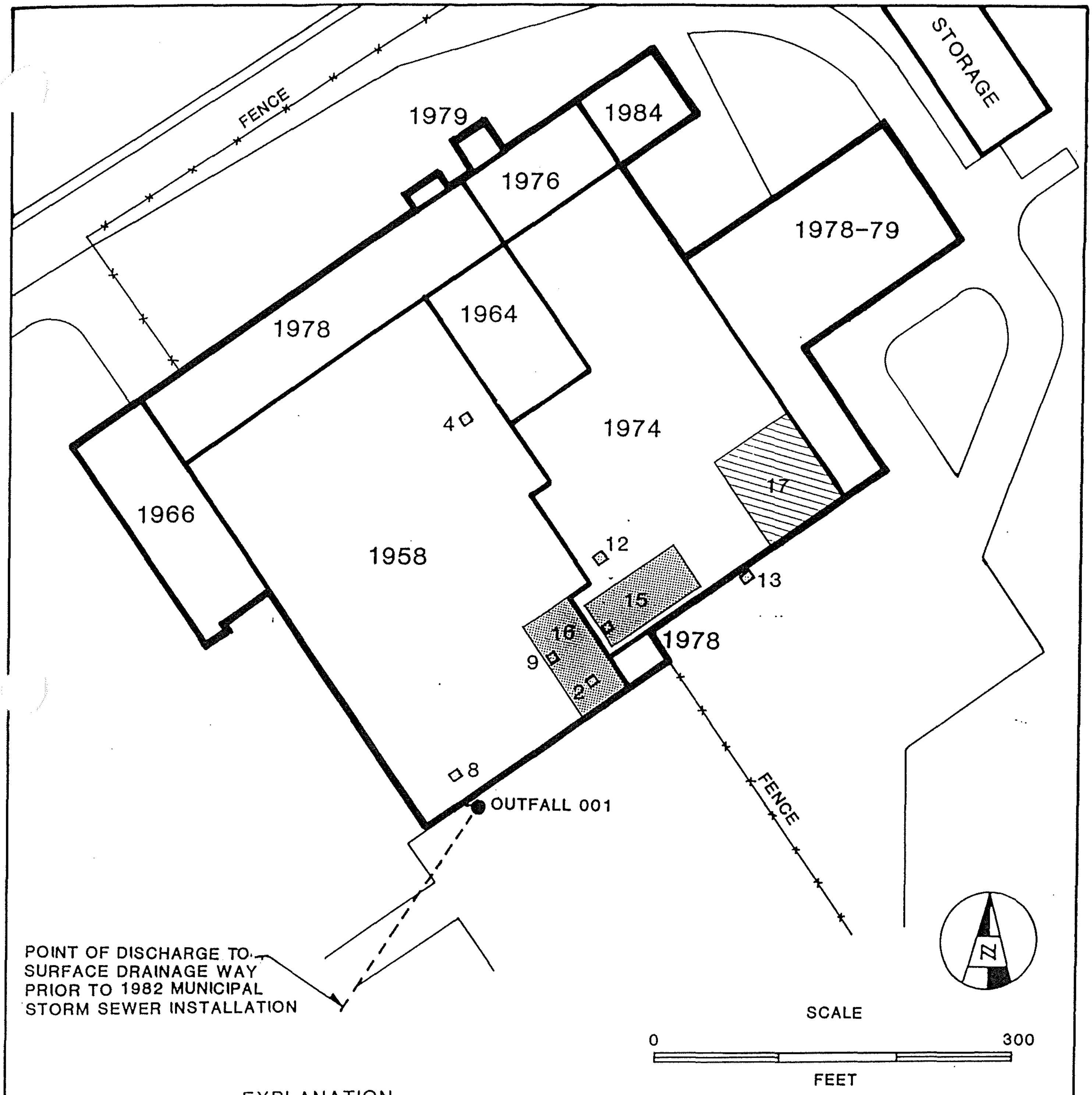
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

Dsgn. by:	Chk. by:	Apprv. by:
PROJECT: 350115013	DATE: 02/27/92	

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 2
FACILITY LAYOUT

DRAWING NO.: 1501-15	FIGURE: 2-1



EXPLANATION

1978 BUILDING ADDITION LOCATION AND DATE

▨ 12 SOLVENT USE/DISPOSAL LOCATION AND DESIGNATION

▨ 17 SUSPECTED SOLVENT DISPOSAL LOCATION AND DESIGNATION

□ CATCH BASIN

SOURCE: STA-RITE PLANT DRAWINGS

STA-RITE INDUSTRIES, INC.
DELAVAN, WI

SOLVENT
USE/DISPOSAL SITES
PLANT 1

PROJECT: 350115013 DATE: 03/11/92

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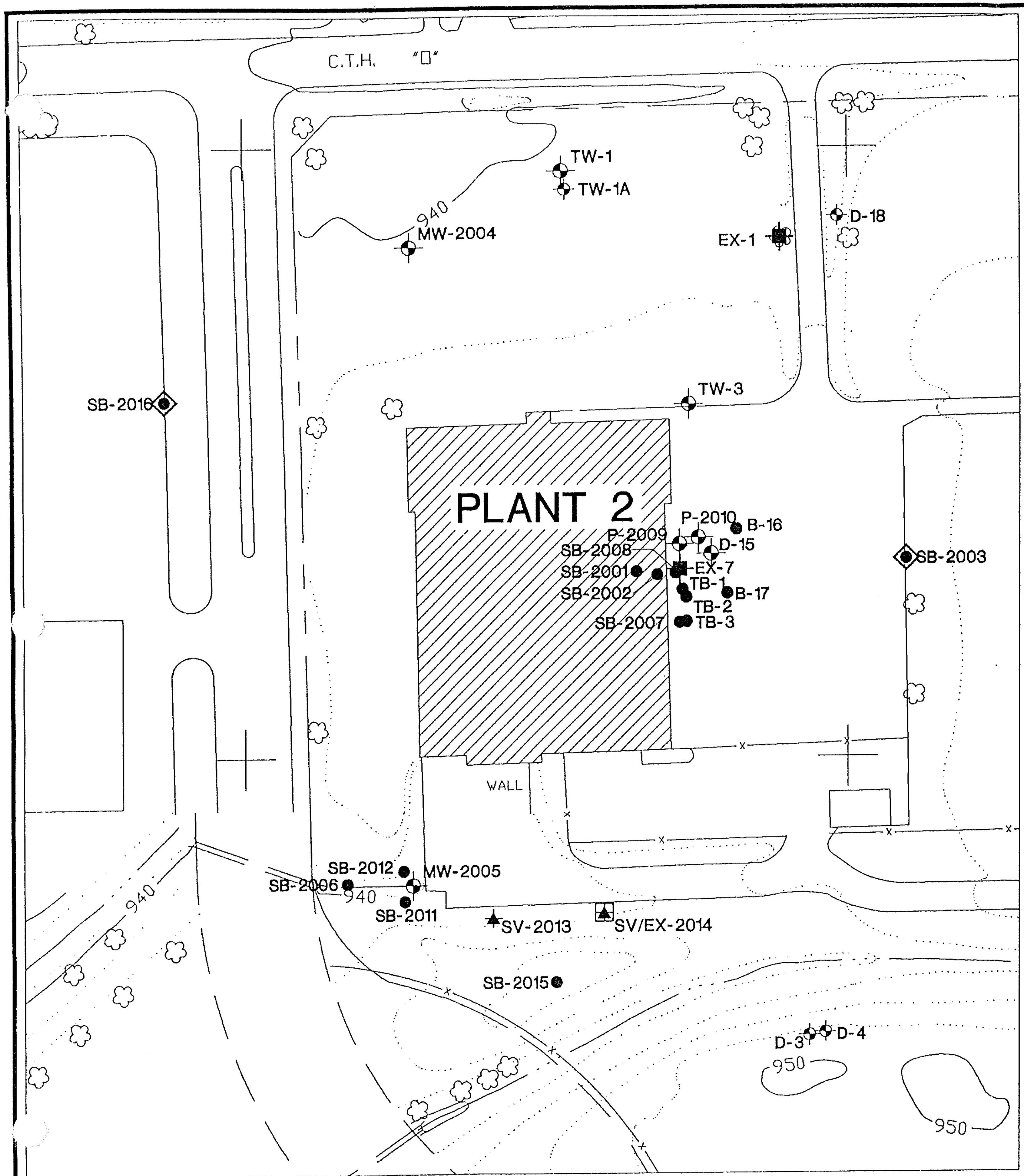
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

FIGURE 2-2



Base map from Aero-Metric engineering, Inc., 04/16/88.
Contour interval two foot based on mean sea level.

EXPLANATION

MW-2005 ⌖	MONITOR WELL LOCATION AND DESIGNATION
EX-1 ✚	EXTRACTION WELL LOCATION AND DESIGNATION
SB-2007 ●	BOREHOLE LOCATION AND DESIGNATION
SB-2003 ◈	EXISTING SCREENED AUGER LOCATION AND DESIGNATION
SV-2013 ▲	SOIL GAS EXTRACTION VENT LOCATION AND DESIGNATION
SV/EX-2014 ▣	GROUND WATER/SOIL GAS EXTRACTION WELL LOCATION AND DESIGNATION

Well Designations:
MW-1023 Installed by Simon Hydro-Search
D-24R Replacement Installed by Simon Hydro-Search
P-1022 Piezometer Installed by Simon Hydro-Search
D-27 Installed by Donohue
TW-2 Installed by Warzyn

Borehole Designations:
SB-1006 Installed by Simon Hydro-Search

N

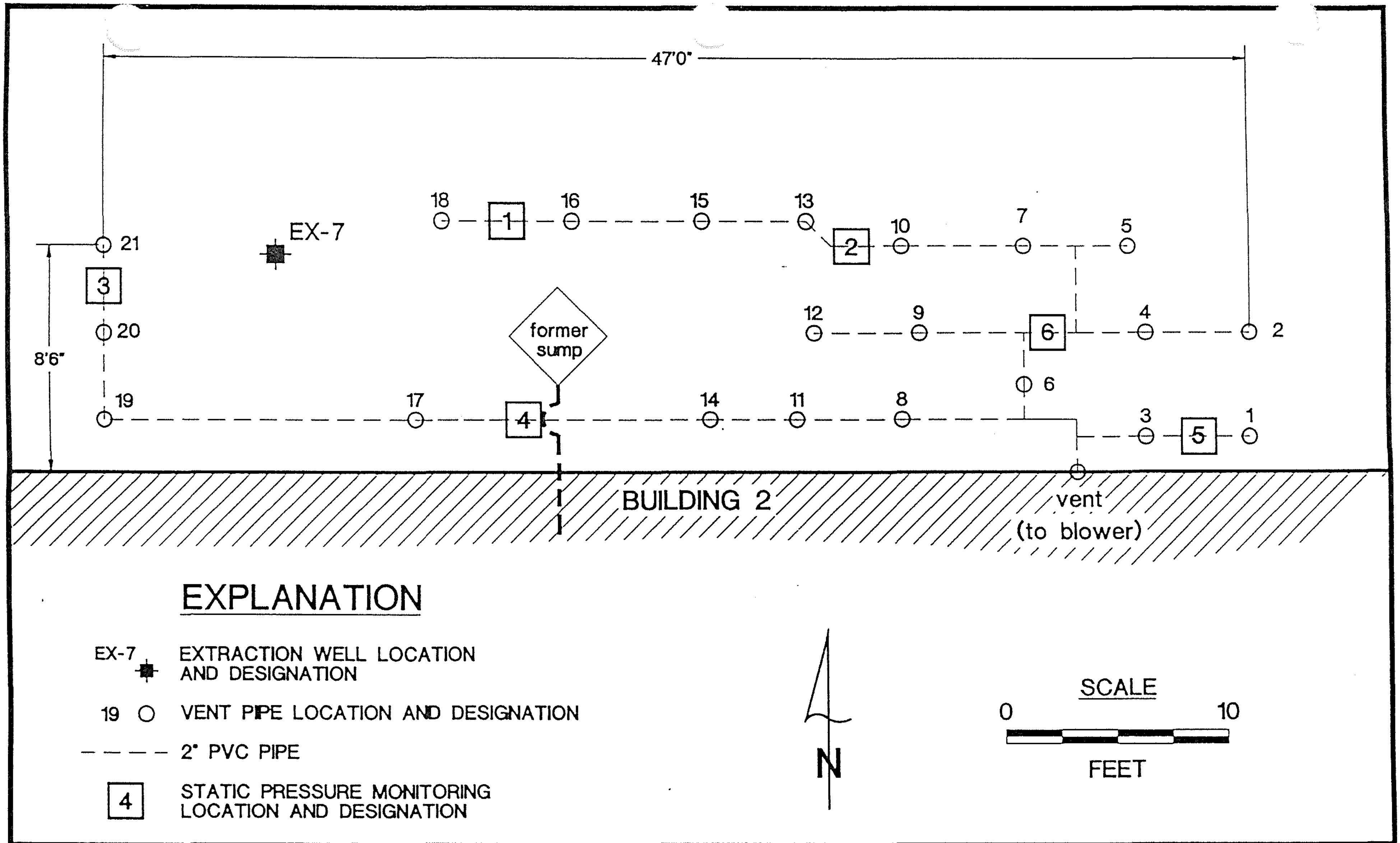
SCALE
0 300
Feet

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 2
SAMPLE LOCATIONS

Dsgn. by: | Chk. by: | Apprv. by:
PROJECT: 350115013 | DATE: 10/27/92
DRAWING NO.: 1501-60 | FIGURE: 3-1



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175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

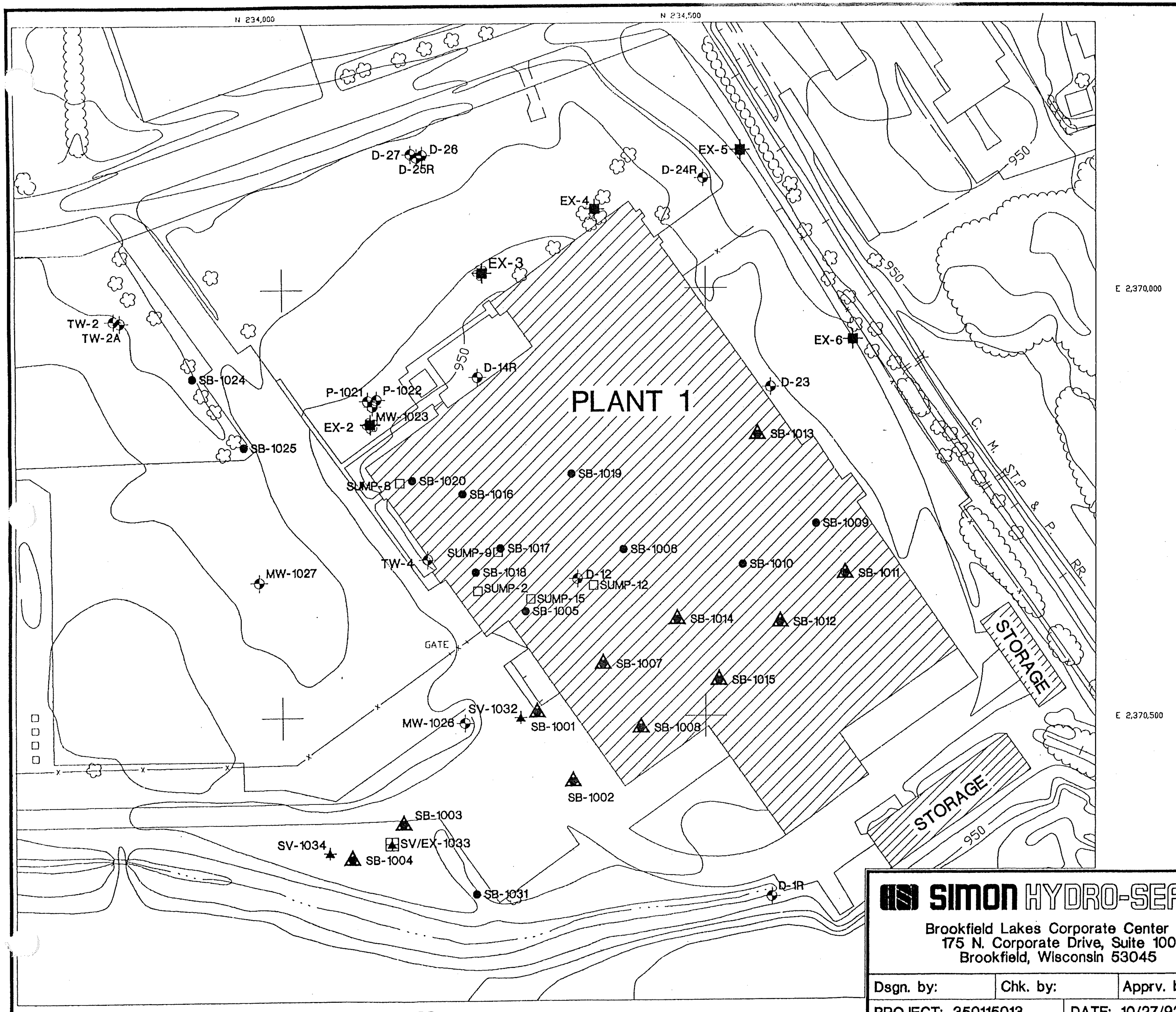
Dsgn. by:	Chk. by:	Apprv. by:
PROJECT: 350115013	DATE: 04/21/92	

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

SOIL VAPOR EXTRACTION SYSTEM TESTING CONFIGURATION

DRAWING NO.: 1211-14

FIGURE: 3-2



Base map from Aero-Metric Engineering, 4-16-88.

EXPLANATION

MW-2005	⊕	MONITOR WELL LOCATION AND DESIGNATION
EX-7	■	EXTRACTION WELL LOCATION AND DESIGNATION
SB-1017	●	BOREHOLE LOCATION AND DESIGNATION
SB-1008	▲	BOREHOLE/SOIL GAS PROBE LOCATION AND DESIGNATION
SUMP-9	□	SUMP LOCATION AND DESIGNATION
SV/EX-1033	▲	GROUND WATER/SOIL GAS EXTRACTION WELL LOCATION AND DESIGNATION
SV-1032	▲	SOIL GAS EXTRACTION VENT LOCATION AND DESIGNATION

Well Designations:

MW-1023 Installed by Simon Hydro-Search
D-24R Replacement installed by Simon Hydro-Search
P-1022 Piezometer installed by Simon Hydro-Search
SV-1032 Installed by Simon Hydro-Search
SV/EX-1033 Installed by Simon Hydro-Search
D-27 Installed by Donohue
TW-2 Installed by Warzyn

Borehole Designations:

SB-1006 Installed by Simon Hydro-Search

N

SCALE

0 250

FEET

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175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

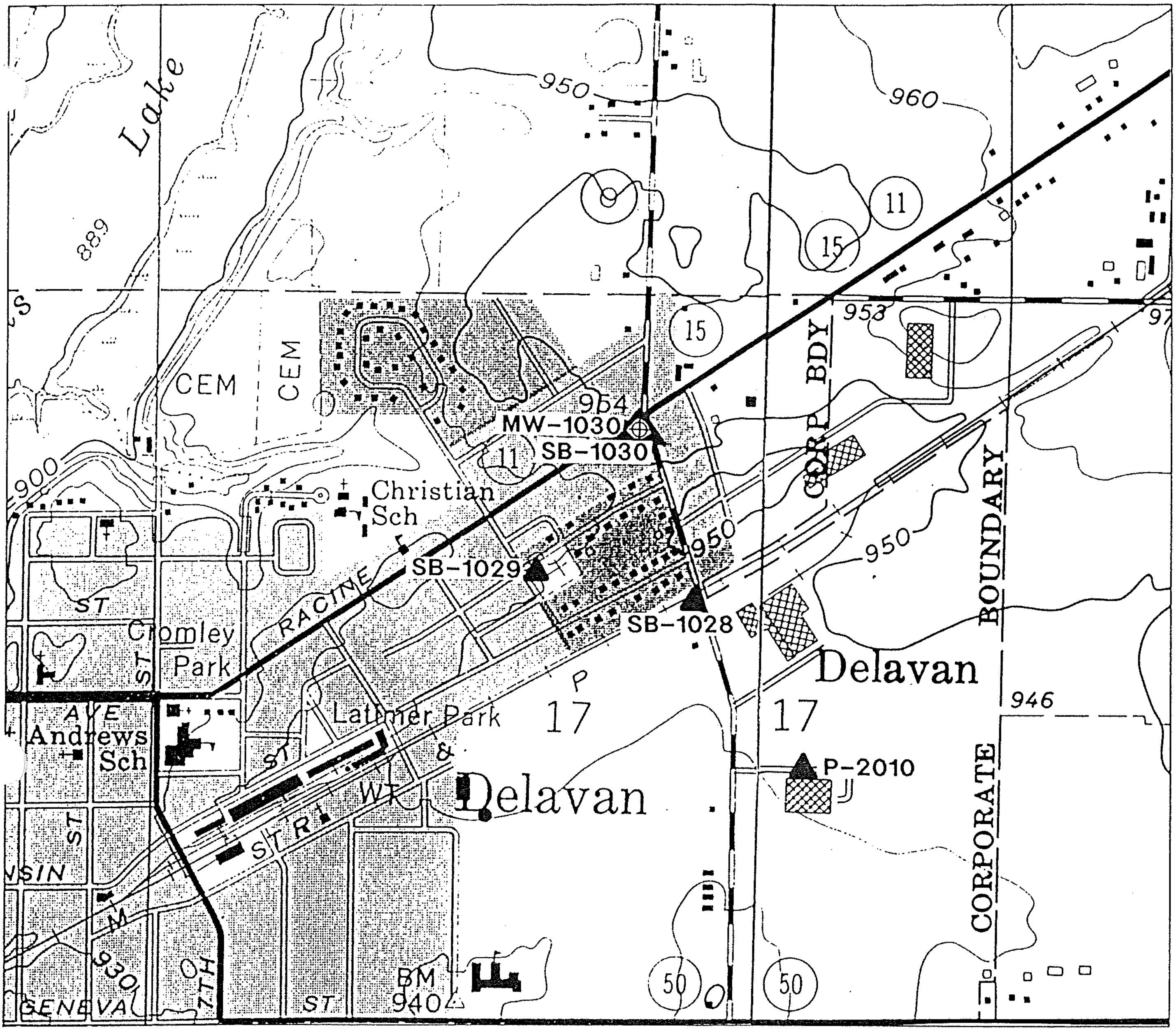
Dsgn. by:	Chk. by:	Apprv. by:
PROJECT: 350115013	DATE: 10/27/92	

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 1
SAMPLING LOCATIONS

DRAWING NO.: 1501-10

FIGURE: 3-3



EXPLANATION

MW-1030 MONITOR WELL LOCATION AND DESIGNATION

SB-1028 VERTICAL GROUND-WATER PROFILE AND DESIGNATION

SCALE

0 2000

FEET

N

Hydro-Search, Inc.

HYDROLOGISTS
GEOLOGISTS
ENGINEERS

Reno Denver Milwaukee Irvine

PROJECT: 351115013

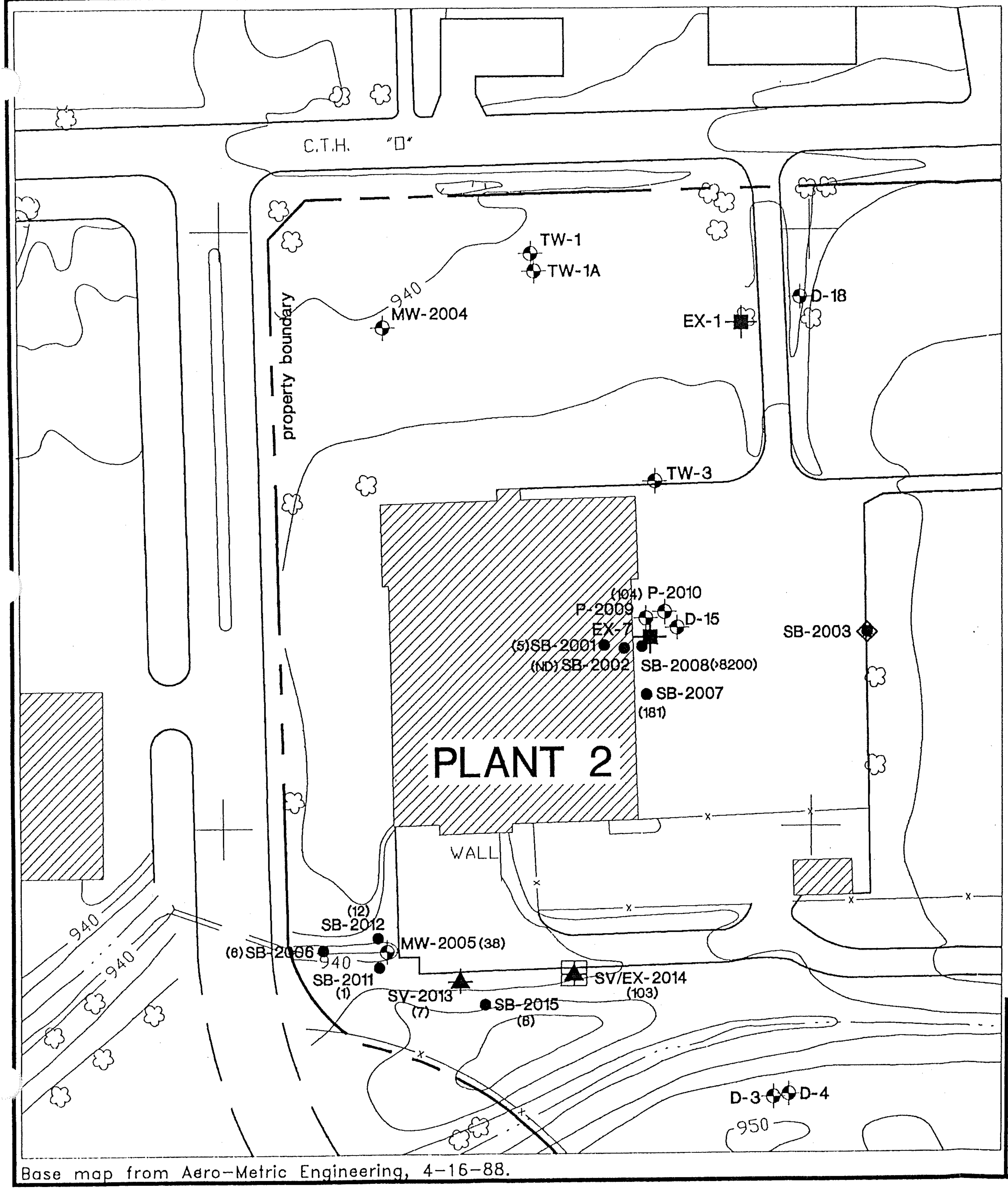
DATE: 03/11/92

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

VERTICAL PROFILE BOREHOLE LOCATIONS

DRAWING NO.: 1211-10

FIGURE: 3-4



Base map from Aero-Metric Engineering, 4-16-88.

EXPLANATION

(104) MW-2005	⌖	MONITOR WELL LOCATION DESIGNATION, AND TCE CONCENTRATION (ppb)
EX-7	■	EXTRACTION WELL LOCATION AND DESIGNATION
(181) SB-2007	●	BOREHOLE LOCATION, DESIGNATION AND TCE CONCENTRATION (ppb)
SB-2003	◈	EXISTING SCREENED AUGER LOCATION AND DESIGNATION
SV/EX-2014	▲	GROUND WATER/SOIL GAS EXTRACTION WELL LOCATION, DESIGNATION, AND TCE CONCENTRATION (ppb)
SV-2014	▲	SOIL GAS EXTRACTION VENT LOCATION, DESIGNATION, AND TCE CONCENTRATION (ppb)

NOTES: Analytical results for highest concentration reported. Sampling depths and results are summarized on Table 4-4

<u>Well Designations:</u>

MW-1023 Installed by Simon Hydro-Search
D-24R Replacement installed by Simon Hydro-Search
P-1022 Piezometer installed by Simon Hydro-Search
SV-1032 Installed by Simon Hydro-Search
SV/EX-1033 Installed by Simon Hydro-Search
D-27 Installed by Donohue
TW-2 Installed by Warzyn

<u>Borehole Designations:</u>

SB-1006 Installed by Simon Hydro-Search

N

SCALE

0 300

FEET

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Brookfield, Wisconsin 53045

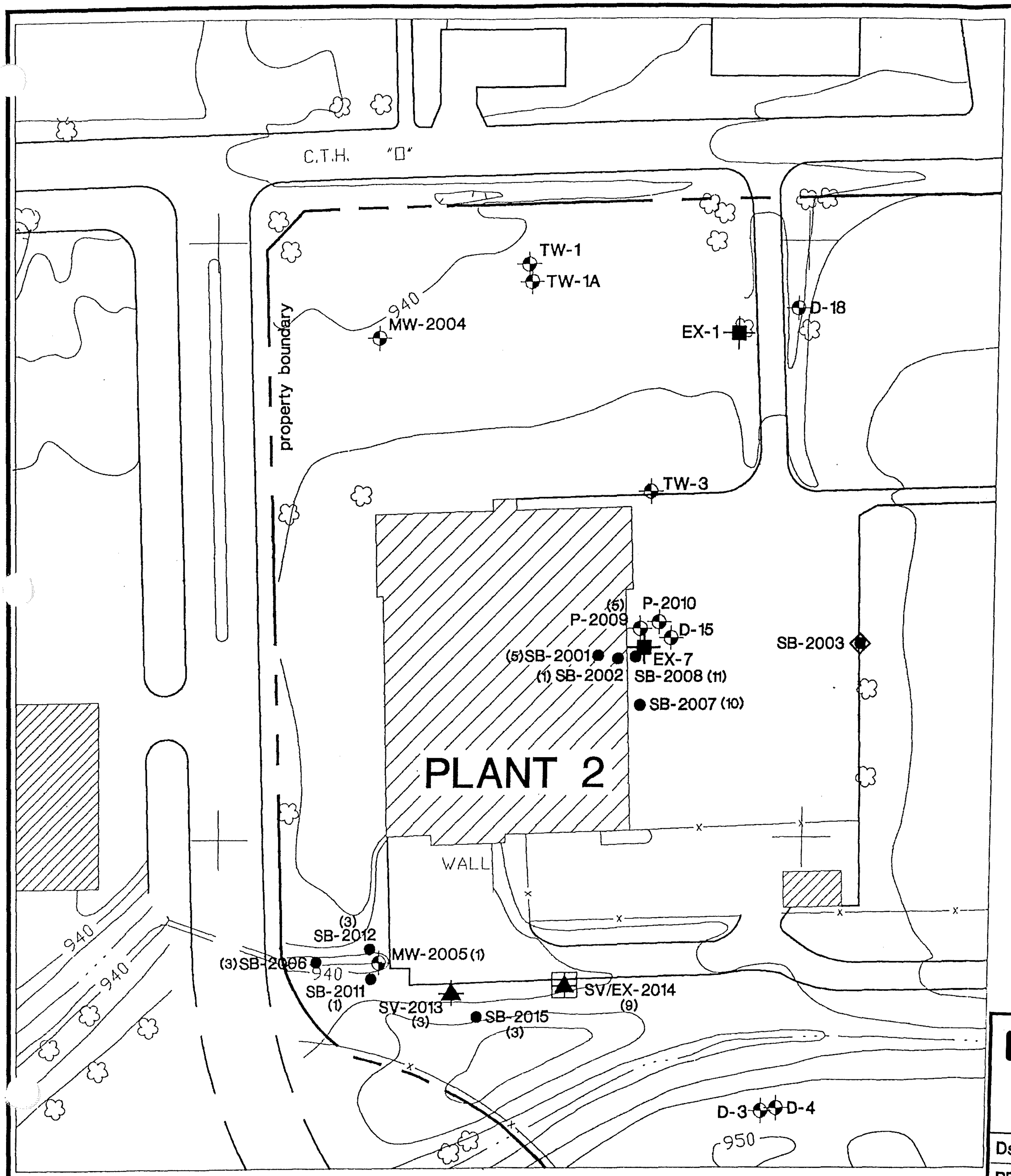
STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 2 SOIL SAMPLING RESULTS - TCE

Dsgn. by:	Chk. by:	Apprv. by:
PROJECT: 350115013	DATE: 05/04/92	

DRAWING NO.: 1501-8

FIGURE: 4-1



Base map from Aero-Metric Engineering, 4-16-88.

EXPLANATION

(1) MW-2005 ⊕ MONITOR WELL LOCATION DESIGNATION, AND TCA CONCENTRATION (ppb)

EX-7 ■ EXTRACTION WELL LOCATION AND DESIGNATION

(1) SB-2007 ● BOREHOLE LOCATION, DESIGNATION AND TCA CONCENTRATION (ppb)

SB-2003 ◈ EXISTING SCREENED AUGER LOCATION AND DESIGNATION

SV/EX-2014 ▲ GROUND WATER/SOIL GAS EXTRACTION WELL LOCATION, DESIGNATION, AND TCA CONCENTRATION (ppb)

SV-2014 ▲ SOIL GAS EXTRACTION VENT LOCATION, DESIGNATION, AND TCA CONCENTRATION (ppb)

NOTES: Analytical results for highest concentration reported. Sampling depths and results are summarized on Table 4-4

Well Designations:

MW-1023 Installed by Simon Hydro-Search
D-24R Replacement installed by Simon Hydro-Search
P-1022 Piezometer installed by Simon Hydro-Search
SV-1032 Installed by Simon Hydro-Search
SV/EX-1033 Installed by Simon Hydro-Search
D-27 Installed by Donohue
TW-2 Installed by Warzyn

Borehole Designations:

SB-1006 Installed by Simon Hydro-Search

N

SCALE

0 300

FEET

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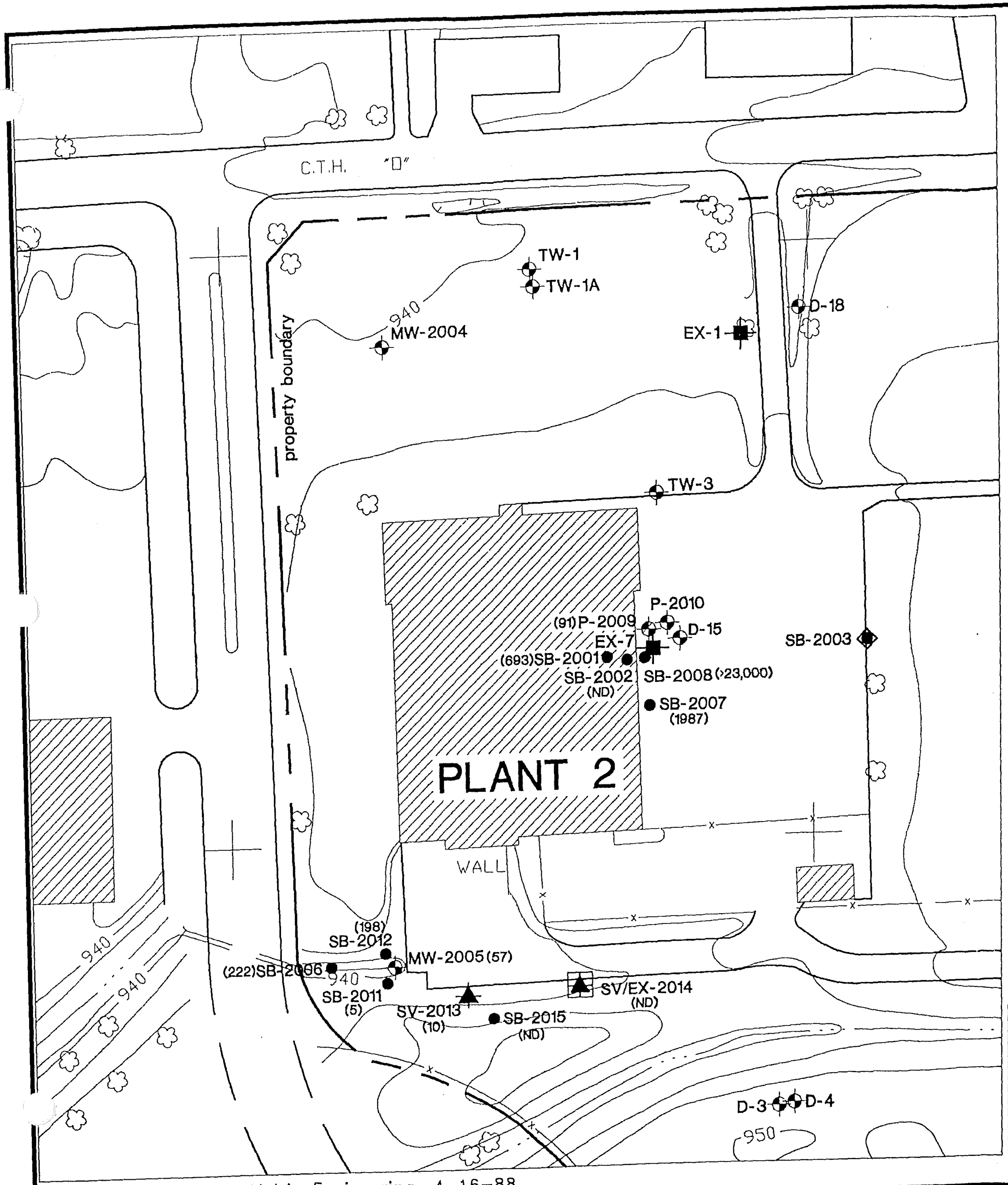
STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 2 SOIL SAMPLING RESULTS - TCA

Dsgn. by:	Chk. by:	Apprv. by:

PROJECT: 350115013 | DATE: 05/04/92

DRAWING NO.: 1501-6 | FIGURE: 4-2



Base map from Aero-Metric Engineering, 4-16-88.

EXPLANATION

(91) MW-2005 ⌖	MONITOR WELL LOCATION DESIGNATION, AND PCE CONCENTRATION (ppb)
EX-7 ■	EXTRACTION WELL LOCATION AND DESIGNATION
(1987) SB-2007 ●	BOREHOLE LOCATION, DESIGNATION AND PCE CONCENTRATION (ppb)
SB-2003 ◈	EXISTING SCREENED AUGER LOCATION AND DESIGNATION
SV/EX-2014 ▲	GROUND WATER/SOIL GAS EXTRACTION WELL LOCATION, DESIGNATION, AND PCE CONCENTRATION (ppb)
SV-2014 ▲	SOIL GAS EXTRACTION VENT LOCATION, DESIGNATION, AND PCE CONCENTRATION (ppb)

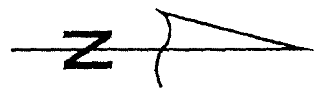
NOTES: Analytical results for highest concentration reported. Sampling depths and results are summarized on Table 4-4

Well Designations:

MW-1023 Installed by Simon Hydro-Search
D-24R Replacement installed by Simon Hydro-Search
P-1022 Piezometer installed by Simon Hydro-Search
SV-1032 Installed by Simon Hydro-Search
SV/EX-1033 Installed by Simon Hydro-Search
D-27 Installed by Donohue
TW-2 Installed by Warzyn

Borehole Designations:

SB-1006 Installed by Simon Hydro-Search



SCALE

0 300

FEET

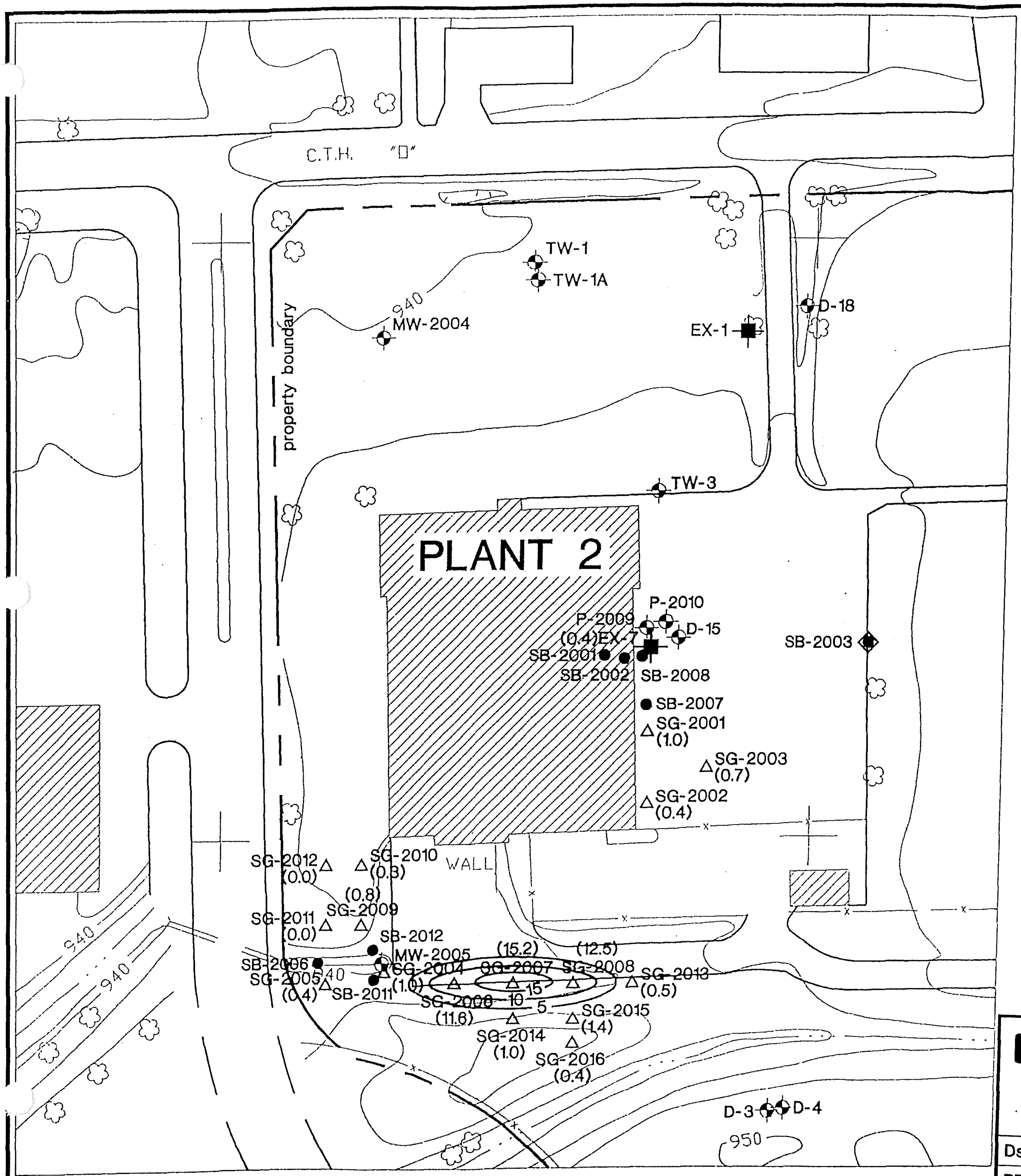
SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

Dsgn. by: Chk. by: Apprv. by:
PROJECT: 350115013 DATE: 05/04/92

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 2 SOIL SAMPLING RESULTS - PCE

DRAWING NO.: 1501-7 FIGURE: 4-3



Base map from Aero-Metric Engineering, 4-16-88.

EXPLANATION

MW-2005 ⌖	MONITOR WELL LOCATION AND DESIGNATION
EX-7 ■	EXTRACTION WELL LOCATION AND DESIGNATION
SB-2007 ●	BOREHOLE LOCATION AND DESIGNATION
SB-2003 ◈	EXISTING SCREENED AUGER LOCATION AND DESIGNATION
SG-1024 △ (8.2)	SOIL GAS SAMPLING LOCATION, DESIGNATION AND PID READING (ppm)
10	PHOTOIONIZATION DETECTOR CONTOUR (ppm)

NOTES: Analytical results for highest concentration reported. Sampling depths and results are summarized on Table

<u>Well Designations:</u>
MW-2004 Installed by Simon Hydro-Search
P-2010 Piezometer installed by Simon Hydro-Search
D-15 Installed by Donohue
TW-1 Installed by Warzyn

<u>Borehole Designations:</u>
SB-2007 Installed by Simon Hydro-Search

N

SCALE

0 300

FEET

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

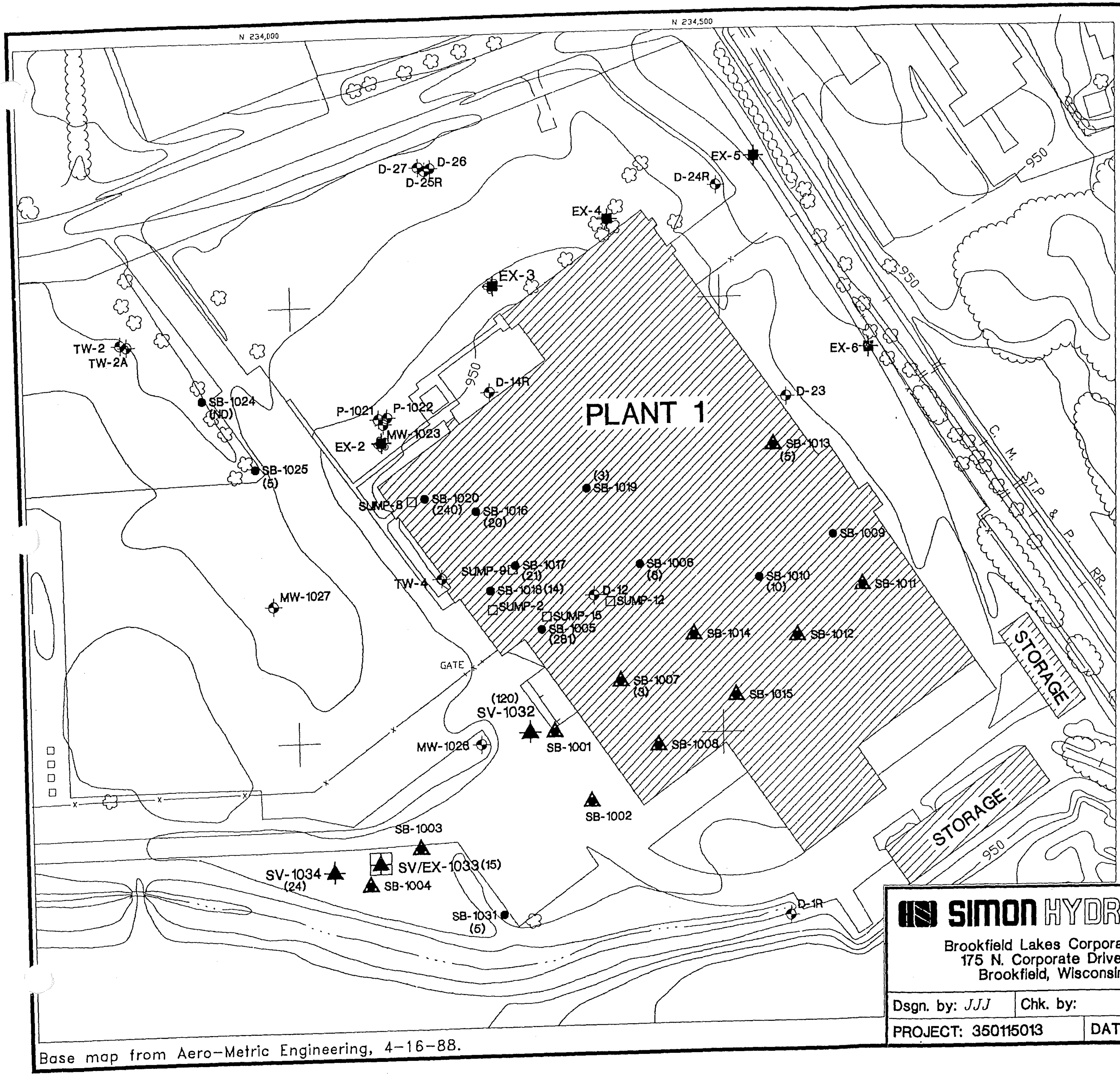
Dsgn. by: Chk. by: Apprv. by:

PROJECT: 350115013
DATE: 02/27/92

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 2 SOIL GAS
SAMPLING RESULTS

DRAWING NO.: 1501-16
FIGURE: 4-4



Base map from Aero-Metric Engineering, 4-16-88.

EXPLANATION

MW-1023 ⊕	MONITOR WELL LOCATION AND DESIGNATION
EX-2 ■	EXTRACTION WELL LOCATION AND DESIGNATION
SB-1006 ● (6)	BOREHOLE LOCATION, DESIGNATION, AND TCE CONCENTRATION (ppb)
SB-1008 ▲	BOREHOLE/SOIL GAS PROBE LOCATION AND DESIGNATION
SUMP-9 ☐	SUMP LOCATION AND DESIGNATION
SV/EX-2014 ▲	GROUND WATER/SOIL GAS EXTRACTION WELL LOCATION, DESIGNATION, AND TCE CONCENTRATION (ppb)
SV-2014 ▲	SOIL GAS EXTRACTION VENT LOCATION, DESIGNATION, AND TCE CONCENTRATION (ppb)

NOTES: Analytical results for highest concentration reported. Sampling depths and results are summarized on Table 4-10

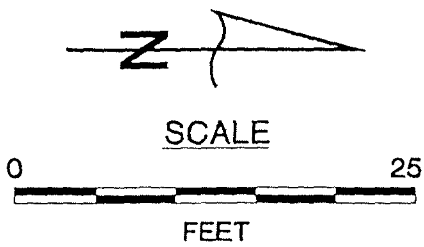
(ND) Indicates not detected above analytical detection limit.

Well Designations:

MW-1023 Installed by Simon Hydro-Search
D-24R Replacement installed by Simon Hydro-Search
P-1022 Piezometer installed by Simon Hydro-Search
SV-1032 Installed by Simon Hydro-Search
SV/EX-1033 Installed by Simon Hydro-Search
D-27 Installed by Donohue
TW-2 Installed by Warzyn

Borehole Designations:

SB-1006 Installed by Simon Hydro-Search



SIMON HYDRO-SEARCH

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Brookfield, Wisconsin 53045

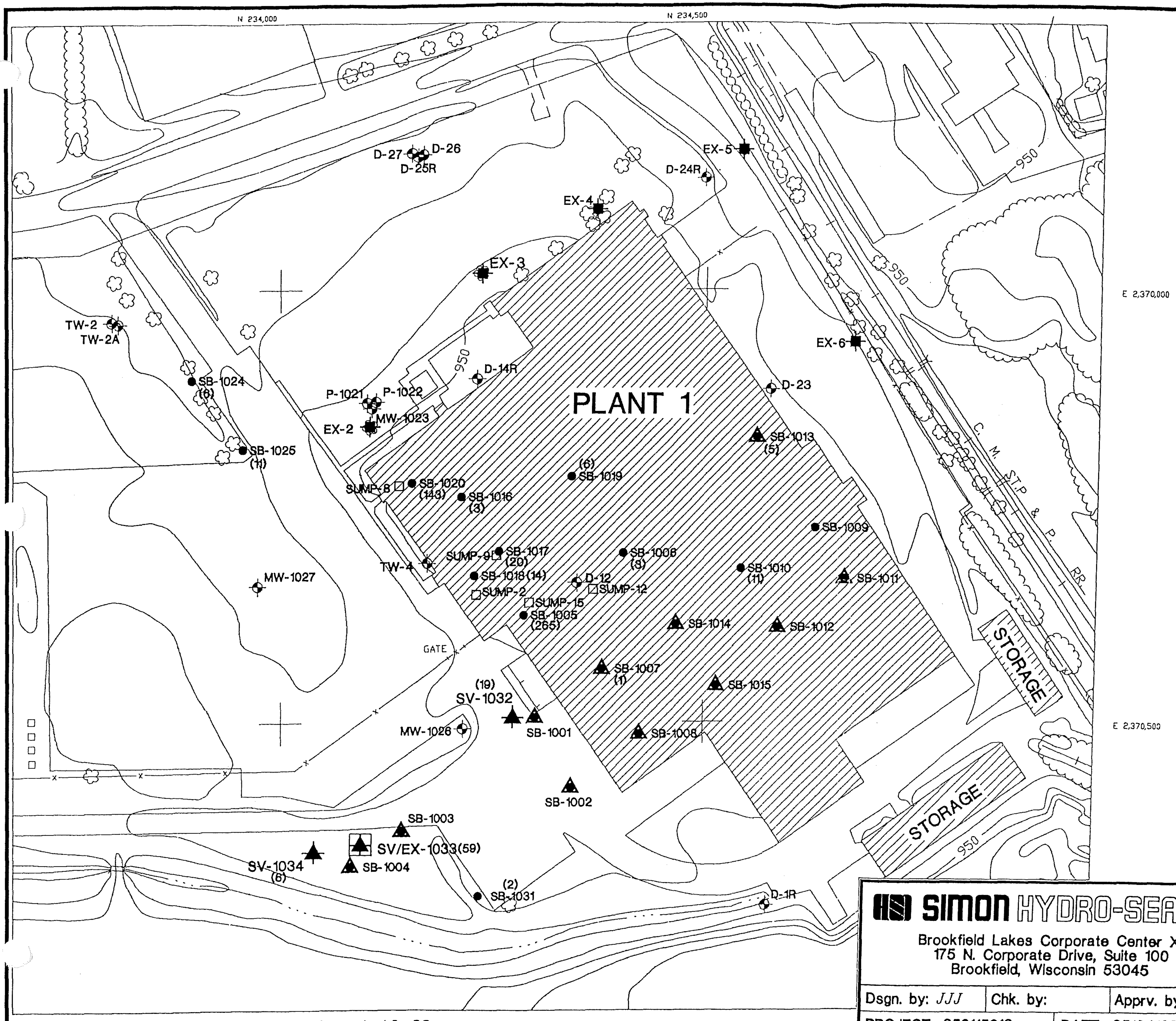
STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 1 SOIL SAMPLING RESULTS - TCE

Dsgn. by: *JJJ*	Chk. by:	Apprv. by:
PROJECT: 350115013	DATE: 05/04/92	

DRAWING NO.: 1501-14

FIGURE: 4-5



Base map from Aero-Metric Engineering, 4-16-88.

EXPLANATION

MW-2005	⊕	MONITOR WELL LOCATION AND DESIGNATION
EX-7	■	EXTRACTION WELL LOCATION AND DESIGNATION
SB-1017 (20)	●	BOREHOLE LOCATION, DESIGNATION, AND TCA CONCENTRATION (ppb)
SB-1008	▲	BOREHOLE/SOIL GAS PROBE LOCATION AND DESIGNATION
SUMP-9	□	SUMP LOCATION AND DESIGNATION
SV/EX-2014	▲	GROUND WATER/SOIL GAS EXTRACTION WELL LOCATION, DESIGNATION, AND TCA CONCENTRATION (ppb)
SV-2014	▲	SOIL GAS EXTRACTION VENT LOCATION, DESIGNATION, AND TCA CONCENTRATION (ppb)

NOTES: Analytical results for highest concentration reported. Sampling depths and results are summarized on Table 4-10.

Well Designations:

MW-1023	Installed by Simon Hydro-Search
D-24R	Replacement installed by Simon Hydro-Search
P-1022	Piezometer installed by Simon Hydro-Search
SV-1032	Installed by Simon Hydro-Search
SV/EX-1033	Installed by Simon Hydro-Search
D-27	Installed by Donohue
TW-2	Installed by Warzyn

Borehole Designations:

SB-1008	Installed by Simon Hydro-Search

SCALE

0 250

FEET

SIMON HYDRO-SEARCH

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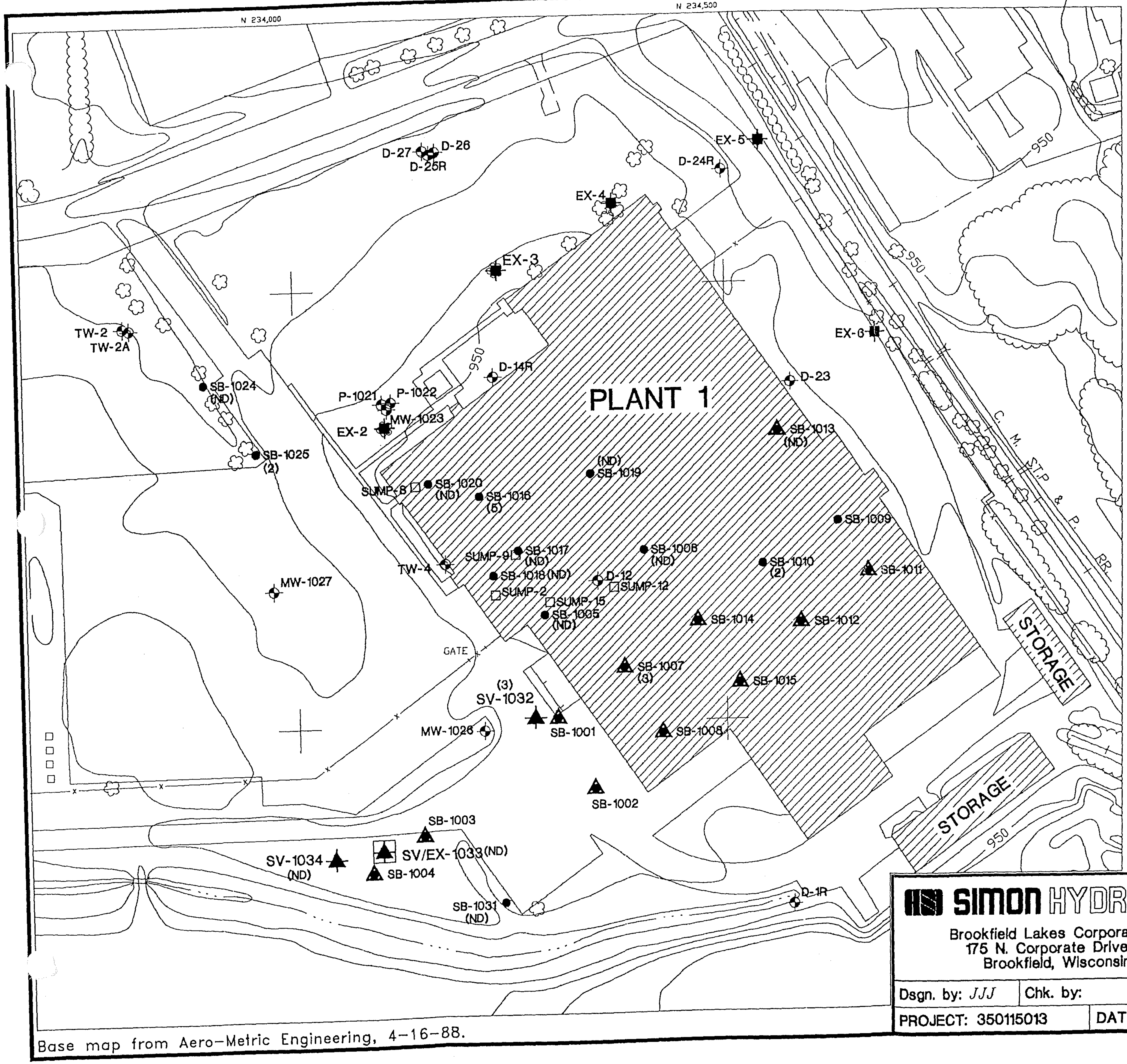
Brookfield, Wisconsin 53045

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 1 SOIL SAMPLING RESULTS - TCA

Dsgn. by: *JJJ*	Chk. by:	Apprv. by:
PROJECT: 350115013	DATE: 05/04/92	
DRAWING NO.: 1501-12	FIGURE: 4-6	



Base map from Aero-Metric Engineering, 4-16-88.

EXPLANATION

MW-1023	⊕	MONITOR WELL LOCATION AND DESIGNATION
EX-2	■	EXTRACTION WELL LOCATION AND DESIGNATION
SB-1016 (5)	●	BOREHOLE LOCATION, DESIGNATION, AND PCE CONCENTRATION (ppb)
SB-1008	▲	BOREHOLE/SOIL GAS PROBE LOCATION AND DESIGNATION
SUMP-9	□	SUMP LOCATION AND DESIGNATION
SV/EX-2014	▲	GROUND WATER/SOIL GAS EXTRACTION WELL LOCATION, DESIGNATION, AND PCE CONCENTRATION (ppb)
SV-2014	▲	SOIL GAS EXTRACTION VENT LOCATION, DESIGNATION, AND PCE CONCENTRATION (ppb)

NOTES: Analytical results for highest concentration reported. Sampling depths and results are summarized on Table 4-10

(ND) Indicates not detected above analytical detection limit.

Well Designations:

MW-1023 Installed by Simon Hydro-Search
D-24R Replacement installed by Simon Hydro-Search
P-1022 Piezometer installed by Simon Hydro-Search
SV-1032 Installed by Simon Hydro-Search
SV/EX-1033 Installed by Simon Hydro-Search
D-27 Installed by Donohue
TW-2 Installed by Warzyn

Borehole Designations:

SB-1006 Installed by Simon Hydro-Search

Z

SCALE

0 250

FEET

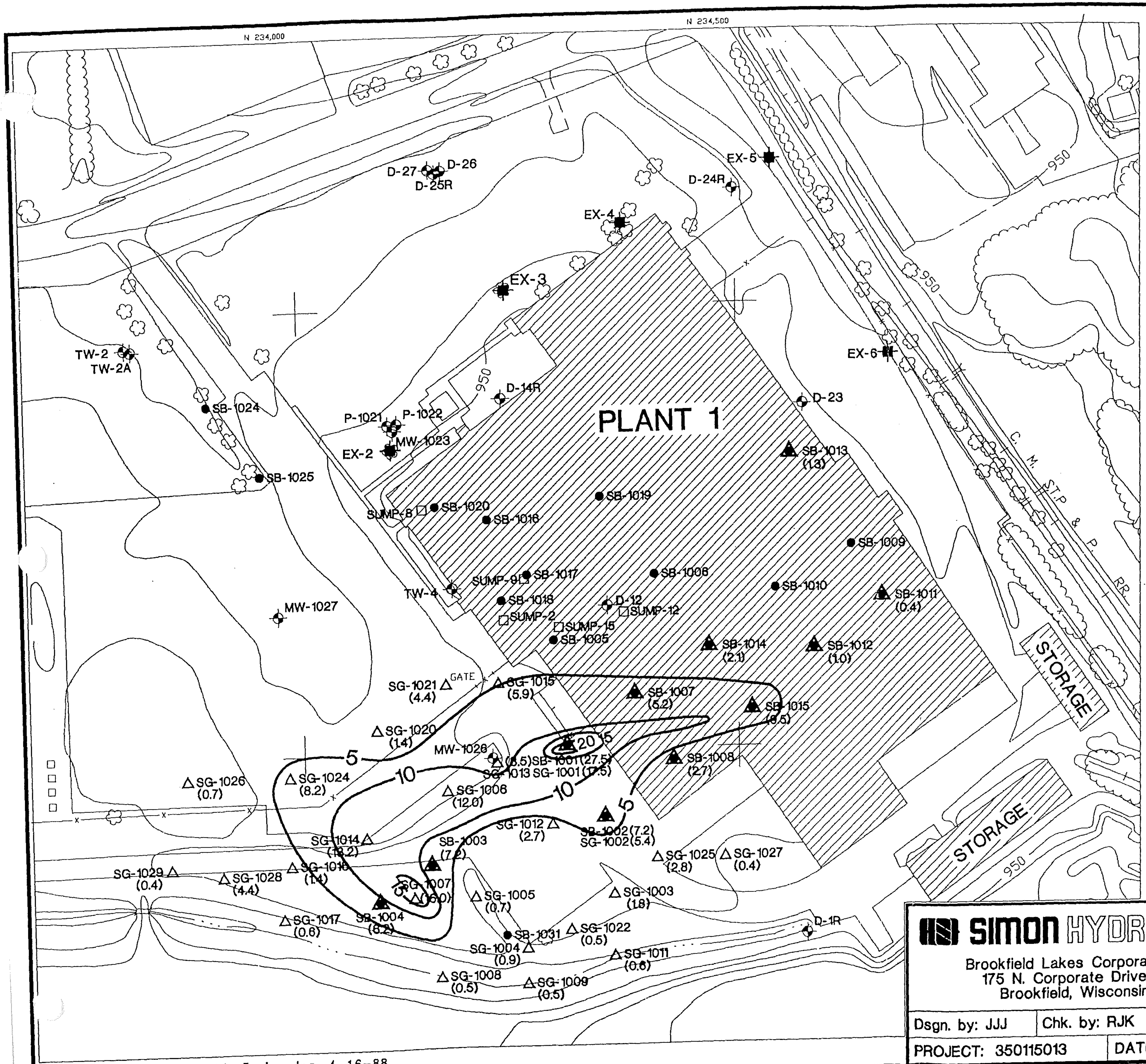
SIMON HYDRO-SEARCH

Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 1 SOIL SAMPLING RESULTS - PCE

Dsgn. by: *JJJ* | Chk. by: | Apprv. by:
PROJECT: 350115013 | DATE: 05/04/92
DRAWING NO.: 1501-13 | FIGURE: 4-7



Base map from Aero-Metric Engineering, 4-16-88.

EXPLANATION

MW-1023 ⊕	MONITOR WELL LOCATION AND DESIGNATION
EX-2 ■	EXTRACTION WELL LOCATION AND DESIGNATION
SB-1006 ●	BOREHOLE LOCATION AND DESIGNATION
SB-1008 ▲	BOREHOLE/SOIL GAS PROBE LOCATION, DESIGNATION AND PID READING (ppm)
SG-1024 (8.2) △	SOIL GAS SAMPLING LOCATION, DESIGNATION AND PID READING (ppm)
SUMP-9 □	SUMP LOCATION AND DESIGNATION
—10—	PHOTOIONIZATION DETECTOR CONTOUR (ppm)

NOTES: Analytical results for highest concentration reported. Sampling depths and results are summarized on Table

(ND) Indicates not detected above analytical detection limit.

Well Designations:

MW-1023 Installed by Simon Hydro-Search
D-24R Replacement installed by Simon Hydro-Search
P-1022 Piezometer installed by Simon Hydro-Search
D-27 Installed by Donohue
TW-2 Installed by Warzyn

Borehole Designations:

SB-1006 Installed by Simon Hydro-Search

N

SCALE

0 250

FEET

SIMON HYDRO-SEARCH

Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 1 SOIL GAS SAMPLING RESULTS

Dsgn. by: JJJ
Chk. by: RJK
Apprv. by:
PROJECT: 350115013
DATE: 09/29/92
DRAWING NO.: 1501-9
FIGURE 4-8

TABLE 2-1. PHYSICAL AND CHEMICAL DATA FOR DETECTED COMPOUNDS

NUMBERS IN BRACKETS INDICATE INFORMATION SOURCE CODES FOR THAT COLUMN; EXCEPTIONS WHERE NOTED

CHEMICAL NAME [2,3,5]	PHYSICAL FORM [3,5]	PHYSICAL DESCRIPTION [3]	GENERAL CHEMICAL CLASS [2]	MOLECULAR WEIGHT [2]	SPECIFIC GRAVITY @ 20° C [5]	HENRY'S LAW CONSTANT	LOG-OCTANOL -WATER PARTITION COEFFICIENT	VISCOSITY CENTIPOISES @ 20° C [4]	SOLUBILITY IN WATER mg/l [2,5]	SURFACE TENSION DYNES/CM @ 20° C [4,5]	VAPOR PRESSURE REID [5] TORR [2]
Benzene (Isopropyl Acetate, Benzol, Benzole, Cyclohexatriene)	watery liquid	colorless gasoline odor	aromatic hydrocarbon	78.12	0.879	5.59E-03 [1]	2.12 [1]	0.652	1,780-1,800	28.85	Reid: 3.22 psia Torr: 95.2
Bromodichloromethane (Dichlorobromomethane) [7]	colorless liquid [7]	--	--	163.83 [7]	1.98 [7]	2.4E-03 to 2.12E-04 [7]	1.88 [7]	--	4,500 @ 0°C [7]	--	50 mm @ 20°C [7]
Bromoform (Tribromomethane, methyl tribromide) [3]	heavy liquid	colorless, odor and taste similar to chloroform	--	252.73 [7]	2.887 [3]	5.6E-04 [7]	2.30 to 2.38 [7]	1.89 W 25°C	3,010 @ 20°C [7]	41.53 [7]	4 mm @ 20°C [7]
Carbon Tetrachloride (Methane tetrachl. perchloromethane, benzinoform, others)	watery liquid	colorless, sweet odor	halogenated hydrocarbon	153.8	1.59	30.2E-03	2.64	0.969	800	26.95	Reid: 3.8 psia Torr: 90
Chlorobenzene (Monochlorobenzene benzene chloride, phenol chloride, phenyl chloride, MCB)	clear liquid	volatile, almond-like odor	aromatic hydrocarbon	112.6	1.11	3.93E-03	2.84	0.799	472	33.0 @ 25°C	Reid: 0.5 psia Torr: Not given
Chloroethane (Ethyl Chloride, monochloroethane, hydrochloric ether, muriatic ether)	gas at room temperature	ether-like odor, burning taste, when compressed, colorless volatile liquid	halogenated hydrocarbon	64.52	0.9214 [3] 0.906 @ 12.2°C [5]	1.46E-02	1.54	93.7	5,740	19.5	Reid: 34.5 psia Torr: 1,000
Chloroform (Trichloromethane)	watery liquid	colorless, sweet odor	halogenated hydrocarbon	119.4	1.49	3.39E-03	1.97	0.58	9,600	27.1	Reid: 6.39 psia Torr: 150
Chloromethane (Methyl chloride, artic)	colorless gas	odorless or sweet odor	--	50.49 [5]	0.997 @ -24°C	8.82E-03 to 6.6E-03 [7]	0.90 to 0.91 [7]	104 @ 15°C	6,450 to 7,250 @ 20°C [7]	16.2	Reid: 116.7 psia

TABLE 2-1. PHYSICAL AND CHEMICAL DATA FOR DETECTED COMPOUNDS (CONT'D.)

NUMBERS IN BRACKETS INDICATE INFORMATION SOURCE CODES FOR THAT COLUMN; EXCEPTIONS WHERE NOTED

CHEMICAL NAME [2,3,5]	PHYSICAL FORM [3,5]	PHYSICAL DESCRIPTION [3]	GENERAL CHEMICAL CLASS [2]	MOLECULAR WEIGHT [2]	SPECIFIC GRAVITY @ 20° C [5]	HENRY'S LAW CONSTANT	LOG-OCTANOL -WATER PARTITION COEFFICIENT	VISCOSITY CENTIPOISES @ 20° C [4]	SOLUBILITY IN WATER mg/l [2,5]	SURFACE TENSION DYNES/CM @ 20° C [4,5]	VAPOR PRESSURE REID [5] TORR [2]
o-Chlorotoluene (2-Chloro-l-methylbenzene, 1-chloro-2-methylbenzene)	liquid	colorless	--	126.58 [6]	1.0776 [3]	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene, orthodichlorobenzene, downtherm-e)	liquid	colorless, pleasant odor	aromatic hydrocarbon	147.01 [5]	1.306	1.94E-03	3.38	--	145	--	Reid: 0.06 psia Torr: 1.5
1,3-Dichlorobenzene (m-Dichlorobenzene, metadichlorobenzene)	colorless liquid	combustible, irritating to skin and eyes	aromatic hydrocarbon	147.0	1.2884	2.63E-03	3.38	--	123	36.01	Reid: N/A Torr: 2.28
1,4-dichlorobenzene (P-dichlorobenzene, para-dichlorobenzene, Paramoth)	solid white crystals	volatile, mothball odor [3,5]	aromatic hydrocarbon	147.0	1.458	2.72E-03	3.93	--	79	--	Reid: N/A Torr: 1.18
1,1-Dichloroethane (Ethylidene Chloride, Ethylidene Dichloride, Chlorinated Hydrochloric Ether)	oily liquid	colorless, chloroform-like ethereal	halogenated hydrocarbon	98.97 [5]	1.174	5.45E-03	1.79		5,500		Reid: 7.35 psia Torr: 180
1,2-Dichloroethane (Ethylene dichloride, Glycol Dichloride)	oily liquid	colorless, chloroform-like odor, sweet taste	halogenated hydrocarbon	98.98	1.26	1.10E-03	1.48	--	8,300	32.2 [5]	Reid: 2.7 psia Torr: 61
1,1-Dichloroethylene (1,1-Dichloroethene, Vinylidine Chloride, Vinylidene Chloride, 1,1-DCE)	colorless liquid	sweet odor, flammable	halogenated hydrocarbon	96.94	1.21	15.0E-03	1.48	--	5,000	31.53	Reid: 0.07 psia Torr: 591
trans-1,2-Dichloroethylene cis-1,2-Dichloroethylene (1-1,2-Dichloroethylene, Acetylene Dichloride, Dioform)	liquid	colorless, sweet, pleasant aroma	halogenated hydrocarbon	96.94	1.27	5.32E-03	1.48		6,300		Torr: 200

TABLE 2-1. PHYSICAL AND CHEMICAL DATA FOR DETECTED COMPOUNDS (CONT'D.)

NUMBERS IN BRACKETS INDICATE INFORMATION SOURCE CODES FOR THAT COLUMN; EXCEPTIONS WHERE NOTED

CHEMICAL NAME [2,3,5]	PHYSICAL FORM [3,5]	PHYSICAL DESCRIPTION [3]	GENERAL CHEMICAL CLASS [2]	MOLECULAR WEIGHT [2]	SPECIFIC GRAVITY @ 20° C [5]	HENRY'S LAW CONSTANT	LOG-OCTANOL -WATER PARTITION COEFFICIENT	VISCOSITY CENTIPOISES @ 20° C [4]	SOLUBILITY IN WATER mg/l [2,5]	SURFACE TENSION DYNES/CM @ 20° C [4,5]	VAPOR PRESSURE REID [5] TORR [2]
1,2-Dichloropropane (Propylene Chloride, Propylene Dichloride)	liquid	colorless, chloroform-like odor	halogenated hydrocarbon	113.0	1.158	2.82E-03	2.28	--	2,700	29.0 [5]	Reid: 1.9 psia Torr: 42
1,3-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--
2,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene (1,3-dichloropropene, 1,3-dichloropropylene, cis-1,3-dichloropropene, telone)	liquid	colorless, sweet odor	halogenated hydrocarbon	110.98 [5]	1.2	3.55E-03	1.98	--	2,800 (trans) 2,700 (cis)	--	Reid: 4.0 psia Torr: 25
Ethylbenzene (Phenylethane, Ethylbenzol)	liquid	not available	aromatic hydrocarbon	106.2	0.867	6.44E-03	3.15	1 @ 17°C	206	29.20	Reid: 1.9 psia Torr: 7
Methylene Chloride (Methylene Dichloride, Dichloromethane, Methane Dichloride, others)	watery liquid	colorless, sweet, pleasant odor odor	halogenated hydrocarbon	84.94	1.322	3.19E-03	1.25	49 @ 15°C	16,700	26.52	Reid: 13.9 psia Torr: 362
Tetrachloroethylene (Perchloroethylene, Tetrachloroethene, Tetracap, Perklene, Perk)	watery liquid	colorless, sweet odor	halogenated hydrocarbon	165.8	1.63	28.7E-03	2.88		150	31.74	Reid: N/A Torr: 14
Toluene (Methylbenzene, Toluol, Phenylmethane, Methacide, Methylbenzol)	watery liquid	colorless, pleasant odor	aromatic hydrocarbon	92.13	0.867	5.93E-03	2.69	.590	535	28.5	Reid: 1.1 psia Torr: 28.7
1,1,1-Trichloroethane (Methyl Chloroform, Chlorotene, Genklene, Bbaltana, Aerothene, others)	watery liquid	colorless, sweet odor	halogenated hydrocarbon	133.4	1.31	4.92E-03	2.17		950		Reid: 4.0 psia Torr: 96.0

TABLE 2-1. PHYSICAL AND CHEMICAL DATA FOR DETECTED COMPOUNDS (CONT'D.)

NUMBERS IN BRACKETS INDICATE INFORMATION SOURCE CODES FOR THAT COLUMN; EXCEPTIONS WHERE NOTED

CHEMICAL NAME [2,3,5]	PHYSICAL FORM [3,5]	PHYSICAL DESCRIPTION [3]	GENERAL CHEMICAL CLASS [2]	MOLECULAR WEIGHT [2]	SPECIFIC GRAVITY @ 20° C [5]	HENRY'S LAW CONSTANT	LOG-OCTANOL -WATER PARTITION COEFFICIENT	VISCOSITY CENTIPOISES @ 20° C [4]	SOLUBILITY IN WATER mg/l [2,5]	SURFACE TENSION DYNES/CM @ 20° C [4,5]	VAPOR PRESSURE REID [5] TORR [2]
1,1,2-Trichloroethane (Vinyl Trichloride)	liquid	colorless	halogenated hydrocarbon	133.4	1.4432 [3]	8.46E-04	2.17		4,500	2.0 @ 114°C	Reid: N/A Torr: 19
Trichloroethylene (Trichloroethene, Ethylene Trichloride, Trychloran, Trilene, Chlorylen, Algylen, others)	watery liquid	colorless, sweet odor	halogenated hydrocarbon	131.4	1.46	11.7E-03	2.29		1,100		Reid: 2.5 psia Torr: 57.9
Trichloroflouromethane (F-11, freon-11, flouro-carbon -11, genetron -11, arcton 9, eskimon 11, frig en 11, isotron 11, ucon 11,flourotrichloromethane)	colorless liquid	volatile, nearly odorless	halogenated hydrocarbon	137.4	1.494 [3]	58.3E-03	2.53	--	1,100	N/A	Reid: N/A Torr: 667
Xylenes (Dimethylbenzenes, methyl-toluenes, xylol)	clear liquid	insoluble in water, flammable, irritating vapor is produced	aromatic hydrocarbon	106.2	0.86	6.12E-03	Not available	O-Xylene: 0.810 m-Xylene: 0.620 p-Xylene: 0.648	Insoluble	O-Xylene: 30.53 m-Xylene: 28.6 p-Xylene: 28.3	Reid: 0.34 psia Torr: 10

Information Source Codes:

[1] EPA, 1986, Superfund Public Health Evaluation Manual, 1986; Office of Emergency and Remedial Response, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, DC, 144 p. plus appendices.
[2] EPA, 1981, Treatability Manual, 1981, Office of Research and Development, U.S. Environmental Protection Agency, Washington, DC; Volume 1.
[3] Hawley, Gessner G., 1981, The Condensed Chemical Dictionary, 1981, Van Nostrand Reinhold Company, New York, NY; Tenth Edition, 1135 p.
[4] Weast, Dr. Robert C., 1986, CRC Handbook of Chemistry and Physics, 1986; CRC Press Inc., Boca Raton, FL; 67th Edition.
[5] Weiss, G., 1986, Hazardous Chemicals Data Book, 1986; Noyes Data Corporation, Park Ridge, NJ; Second Edition, 1069 p.
[6] Windholz, M., S. Budavar; R. F. Blummetti, E.S. Otterbein, eds., 1983, The Merck Index, Merck & Co., Rahway, NJ; Tenth Edition, 1463 p.
[7] Montgomery, J.H. and L.M. Welkom, 1990, Groundwater Chemicals Desk Reference, Lewis Publishers, Inc., Chelsea, MI; 640 p.

N/A = Not available

Table 2-2. Analytical Results for Samples Taken From Plant #1 Solvent Use/Disposal Sites, 1982

Site	Sample Date	Sample Form	Trichloroethylene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Tetrachloroethane
Catch Basin #2	12-8-82	Sludge	80,400	347,000	3,000	4,000
Catch Basin #2	12-8-82	Liquid	970	1,000	400	650
Catch Basin #4	12-13-82	Liquid	18	<10	<10	<10
Catch Basin #8	12-21-82	Liquid	57	11	<10	<10
Catch Basin #9	12-8-82	Sludge	1,200,000	6,400	22,000	60,000
Catch Basin #12	12-8-82	Liquid	6,700	2,970	<10	<10
Catch Basin #13	12-8-82	Liquid	<10	84	71	31

All values reported as parts per billion.

Table 3-1.

SUMMARY OF PROPOSED VS. ACTUAL BOREHOLE INSTALLATIONS AND SOIL SAMPLING

PLANT #2

Borehole/ Well ID	OU#	Date Installed	Estimated Borehole Depth (Feet)	Actual Borehole Depth (Feet)	Probe/ Well Depth (Feet)	Proposed Number and Type of Soil Samples	Actual Number and Type of Soil Samples	Highest PID Reading (ppm)	At Depth (Feet)
SB-2001	OU-2A	09/06/91	5	4.3	7	0-1 VOC	1 VOC	3,000	3.5
SB-2002	OU-2A	09/06/91	5	4.3	7	0-1 VOC	1 VOC	3.2	1
SB-2003	OU-2D	09/09/91	45	45	B	1 water VOC	1 water VOC	3.2	15-17
MW-2004	OU-2D	09/05/91	40	40	37	0	0	3.6	30-32
MW-2005	OU-2B	09/05/91	20	35	34.7	0-1 VOC	1 VOC	19.2	4-6
SB-2006	OU-2B	09/04/91	20	20	B	0-1 VOC	1 VOC	6.2	2-4
SB-2007	OU-2A	09/10/91	35	36	B	1-2 VOC	1 VOC	8.2	26-28
SB-2008	OU-2A	09/10/91	35	35	B	1-2 VOC	2 VOC	200+	23-33
P-2009	OU-2A	09/11/91	35	35	B	1-2 VOC,	1 VOC	9.2	33-35
	OU-2C	09/11/91	35	35	B	5 pH, TOC	5 pH, TOC	NA	NA
	OU-2C	09/18/91	70	72.5	71.05	0	0	4.5	63-65
P-2010	OU-2C	10/15/91	90	151	90	0	0	NA	NA
	OU-2D	10/11/91	175	151	B	0, (5+ VOC water)	0	NA	NA
SB-2011	OU-2B*	09/27/91	0*	10	B	0	1 VOC	5.8	8-10
SB-2012	OU-2B*	09/27/91	0*	10	B	0	1 VOC	22	8-10
SV/EX-2013	A-2	04/09/92	10+	29	22.8	1-2 VOC	1 VOC	28.2	21-23
SV-2014	A-2	04/08/92	10+	43	40.6	1-2 VOC	1 VOC	36.3	21-23
SB-2015	A-2	04/07/92	10+	15	B	1-2 VOC	2 VOC	0.6	11-13
SB-2016	A-2	04/13/92	35	33	B	1 water TCE,TCA,PCE	1 water TCE,TCA,PCE	NA	NA

Notes:
B = Borehole abandoned per NR141 requirements
* = Boreholes added to Sampling and Analysis Plan. See text for explanation.
NA = Not applicable

Table 3-2.

SUMMARY OF PROPOSED VS. ACTUAL BOREHOLE INSTALLATIONS AND SOIL SAMPLING

PLANT #1

Borehole/ Well ID	OU#	Date Installed	Estimated Borehole Depth (Feet)	Actual Borehole Depth (Feet)	Probe/ Well Depth (Feet)	Proposed # and Type of Soil Samples	Actual # and Type of Soil Samples	Highest PID Reading (ppm)	At Depth (Feet)
SB-1001	OU-1A	08/15/91	5	5	7	0-1 VOC	0	1.7	3-5
SB-1002	OU-1A	09/11/91	5	7	9	0-1 VOC	0	1.2	5-7
SB-1003	OU-1A	08/15/91	5	5	7	0-1 VOC	0	2.2	3.5-4.5
SB-1004	OU-1A	08/15/91	5	5	7	0-1 VOC	0	1.5	3-5
SB-1005	OU-1A	09/05/91 09/05/91	5 35	5 35	B B	0-1 VOC 2 VOC	0 2 VOC	9.5 38	3-5 19-21
SB-1006	OU-1A OU-1A	09/05/91 09/05/91	5 35	5 29.5	B B	0-1 VOC 2 VOC	0 2 VOC	2.0 5.0	4-6 7.5-9.5 25-27
SB-1007	OU-1A	09/09/91	5	5	7	0-1 VOC	1 VOC	22	3-5
SB-1008	OU-1A	09/09/91	5	5	7	0-1 VOC	0	0.2	3-5
SB-1009	OU-1A	09/10/91	5	5	7	0-1 VOC	0	0.5	3-5
SB-1010	OU-1A	09/10/91 09/13/91	5 35	5 21.5	B B	0-1 VOC 2 VOC	1 VOC 2 VOC	5.8 1.4	3-5 15-17
SB-1011	OU-1A	09/10/91	5	5	7	0-1 VOC	0	0.2	3-5
SB-1012	OU-1A	09/10/91	5	5	7	0-1 VOC	0	0.4	3-5
SB-1013	OU-1A	09/10/91	5	7	9	0-1 VOC	1 VOC	1.6	5-7
SB-1014	OU-1A	09/10/91	5	5	7	0-1 VOC	0	1.0	3-5
SB-1015	OU-1A	09/10/91	5	5	7	0-1 VOC	0	0.7	3-5
SB-1016	OU-1A OU-1C	09/11/91 09/11/91	35 35	19 19	B B	2 VOC 5 pH, TOC	2 VOC 5 pH, TOC	8.6	11-13
SB-1017	OU-1A	09/12/91	35	24	B	2 VOC	2 VOC	9.2	9-11
SB-1018	OU-1A OU-1C	09/12/91 09/12/91	35 35	23 23	B B	2 VOC 5 pH, TOC	2 VOC 5 pH, TOC	120	15-17
SB-1019	OU-1A	09/12/91	35	21	B	2 VOC	2 VOC	3.3	5-7
SB-1020	OU-1A	09/12/91	35	25.5	B	2 VOC	2 VOC	10.2	15-17
P-1021	OU-1C	09/25/91	100	102	99.6	0	0	NA	NA
P-1022	OU-1C	09/26/91	80	86	82	0	0	NA	NA
MW-1023	OU-1C	09/23/91	55	56.5	55.5	0	0	6.2	41-43
SB-1024	OU-1B	09/11/91	15	16	B	1 VOC	1 VOC	0.7	2-4
SB-1025	OU-1B	09/12/91	15	16	B	1 VOC	1 VOC	0.8	12-14
MW-1026	OU-1B	09/12/91	40	44	42	0	0	4 7.4	20-22 35-37
MW-1027	OU-1B	09/17/91	40	41.5	40.6	0	0	4.0	35-37
SB-1028	OU-1D	10/02/91	185+	185	B	0	0	NA	NA
SB-1029	OU-1D	10/03/91	185+	184	B	0	0	NA	NA
SB-1030	OU-1D	10/10/91	185+	198	50.3	0	0	NA	NA
SB-1031	A-3	04/17/92	10-15+	15	B	1-2 VOC	2 VOC	0.6	1-3
SV-1032	A-3	04/17/92	10-15+	35	30.5	1-2 VOC	1 VOC	46.7	8-10
SV/EX-1033	A-3	04/13/92	10-15+	48	46.8	1-2 VOC	1 VOC	97.9	27-29
SV-1034	A-3	04/10/92	10-15+	35	31.8	1-2 VOC	1 VOC	24.4	27-20

Notes:
B = Borehole abandoned per NR141 requirements.
NA = Not analyzed

Table 4-1. Glacial and Bedrock Statigraphy near Sta-Rite Industries

System	Rock Unit	Graphic Log	Lithology	Thickness (ft.)	Aquifers and Hydraulic Properties
Quaternary	Pleistocene deposits		Unconsolidated clay, silt, sand, gravel, cobbles, boulders, and organic matter.	0-450	SAND AND GRAVEL AQUIFER Source for most private water supply wells. Saturated thickness 0 to 300 feet. Hydraulic conductivity range based on specific capacity data, 2.8 x 10^{-2} to >1.4 x 10^{-1} cm/sec.
Ordovician	Sinnipee Group (Galena, Decorah, and Platteville Formations)		Dolomite and some slightly shaly dolomite, light gray to blue gray.	0-350	GALENA-PLATTEVILLE AQUIFER In some areas not overlain by Maquoketa shale and not deeply buried, yields small to moderate supplies. Saturated thickness range <50 ft. to >300 ft. Effective porosity 0.03. Hydraulic conductivity range based on specific capacity data, 3.5 x 10^{-4} to <4.6 x 10^{-2} cm/sec.
	St. Peter Formation		Sandstone, fine- to medium-grained, white to light gray; dolomitic in some places, shaly at base in some places	0-345	SANDSTONE AQUIFER Yields small to large supplies to wells. Saturated thickness range <800 ft. to >2000 ft. Effective porosity 0.10. Hydraulic conductivity range based on specific capacity data, <9.5 x 10^{-4} to 1.7 x 10^{-3} cm/sec. Regional potentiometric surface slopes east to southeast at 16 ft/mile.
	Prairie du Chien Group		Dolomite, gray or white; some sandstone and sandy dolomite	0-275	
Cambrian	Trempealeau Formation		Sandstone, very fine- to medium-grained; dolomite, light gray, interbedded with siltstone		
	Tunnel City Group		Sandstone, very fine- to medium-grained; siltstone or dolomite at base	50-330	
	Wonewoc Sandstone		Sandstone, fine- to medium-grained, light gray	10-100	
	Eau Claire Sandstone		Sandstone, fine- to medium-grained, light gray to light pink, dolomitic, some shale beds	375-570	
	Mount Simon Sandstone		Sandstone, white to light-gray; fine- to coarse-grained, mostly medium; some beds dolomitic; some interbedded shale	1200-2900	
Precambrian	Precambrian rocks, undifferentiated		Crystalline rocks	Unknown	Not considered an aquifer

Table 4-2. Soil pH and Total Organic Carbon Content

Sample ID	Sample Depth (ft.)	pH (standard units)	TOC* (ppm, mg/kg)	USCS** Classification
SB-1016	1 - 3	7.59	3,750	SM (fill)
	5 - 7	6.78	5,350	CL (topsoil)
	9 - 11	7.95	1,880	SM-ML (till)
	15 - 17	7.88	5,460	SM-ML (till)
	17 - 19	7.81	1,530	SM-ML (till)
		7.60 Average		
SB-1018	1 - 3	7.97	8,980	SM (fill)
	5 - 7	7.76	9,530	CL-ML (till)
	9 - 11	7.95	2,680	ML-SM (till)
	14 - 15	7.88	10,900	ML-SM (till)
	19	7.86	12,400	ML-SM (till)
		7.88 Average		
P-2009	0 - 1	8.75	16,800	OL (topsoil)
	5 - 6	7.76	1,470	ML (till)
	10 - 11	7.69	1,670	ML (till)
	20 - 21	7.81	2,440	ML (till)
	31 - 33	7.60	1,330	ML/SP (till/ outwash)
		7.92 Average		

* Detection Limit 50 ppm
** Unified Soil Classification System

Table 4-3. Photoionization Detector Field Screening Results, Plant 2

Depth (ft.)	Borehole ID / Date Screened										
	SB-2001 9/6/91	SB-2002 9/6/91	SB-2003 9/6/91	MW-2004 9/5/91	SB-2005 9/4&5/91	SB-2006 9/4/91	SB-2007 9/9/91	SB-2008 9/10/91	P-2009 9/10,11&17/91	SB-2011 9/27/91	SB-2012 9/27/91
1	1.2	3.2	2.6	1.4	15.0	1.2	1.4		1.8	2.2	3.0
2	2.0 120	1.2									
3	2700	2.0 0.5			5.6	6.2	2.0		2.0	4.2	5.6
4	3000	0.6									
5					19.2	5.4	2.2	1.2	2.2	4.6	8.7
6			2.4	2.0							
7					18.6	3.4	2.1		3.0	5.2	
8											
9						3.0	2.2		2.0	5.8	2.4
10											
11			2.6	2.2	18.2	3.0	2.2	2.2	1.2		
12											
13					18.8	2.4	2.3		1.2		
14									1.3		
15					6.0	2.3	2.5				
16			3.2	2.2				100	1.6		
17					12.4	2.3	2.4				
18								170	1.5		
19					12.0	2.5	2.4				
20								100	1.0		
21			2.8	2.3	18.0		5.2				
22								160	1.0		
23					11.0		7.8				
24								200	2.0		
25					6.6		7.8				
26			2.4	3.4				200	5.2		
27					4.4		8.2				
28								200	4.2		
29							4.2				
30								200	0.6		
31			2.3	3.6	2.8		6.0				
32								200	6.3		
33							3.7				
34								170	9.2		
35				3.0			2.9				
36											
42-44									3.2		
47-49									4.0		
52-54									3.0		
58-60									3.4		
63-65									4.5		
68-70									4.0		

Table 4-3. Photoionization Detector Field Screening Results, Plant 2 (Cont'd.)

Depth (ft.)	Borehole ID / Date Screened			
	SB-2013 4/8/92	SB-2014 4/8/92	SB-2015 4/7/92	MW-2016 4/13/92
1				
2	2.2	5.4	1.4	
3				
4	7.2	5.0	1.2	
5				
6	10.2	16.2	2.2	
7				
8	9.8	6.4	2.0	
9				
10	24	17.2	1.6	
11				
12	30	19.2	1.8	
13				
14	30	18.2/18	2.5/3.2	
15				1.2
16	5.0	7.4		
17				
18	28/24	30		
19				
20	26	34		
21				
22	30	38		
23				1.2
24	30	30		
25				
26	5.2	32		
27				
28	12.2	30		
29				
30				1.2
31				
32				
33				
34		5.6		
35				
36				
42-44				
47-49				
52-54				
58-60				
63-65				
68-70				

Table 4-4. Plant #2 Soil Analytical Results

PARAMETER	BOREHOLE ID AND DEPTH													
	SB-2001 3-5′	SB-2002 4′	MW-2005 4-6′	SB-2006 2-4′	SB-2007 26-28′	SB-2008 25-27′	SB-2008 29-31′	P-2009 33-35′	SB-2011 8-10′	SB-2012 8-10′	SB-2013 13-15′	P-2014 21-23′	SB-2015 5-7′	SB-2015 13-15′
TARGET COMPOUNDS (ug/kg or ppb)														
Tetrachloroethylene	693	<1	51	222	1987	> 23,000	> 50,000	91	5	198	10	<1	3	2
1,1,1-Trichloroethane	5	1	1	3	10	<10	11	5	1	3	3	9	<1	3
Trichloroethylene	5	<1	38	6	181	> 8,200	2,800	104	1	12	7	103	6	5
Total VOCs	703	1	140	316	3131	> 57,475	>156,185	216	15	229	54	146	40	26
PID (as ppm benzene equiv)	2700	0.6	19.2	6.2	8.2	200	200	9.2	5.8	2.4	30	38	2.2	3.2
OTHER DETECTED VOCs (ug/kg or ppb)														
Carbon Tetrachloride	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	4	<2
Chloroform	<1	<1	1	6	29	13	<10	6	4	9	<1	5	4	3
1,2-Dichlorobenzene	<2	<2	<2	<2	<20	142	287	<10	<2	<2	<2	<2	<2	<2
1,4-Dichlorobenzene	<2	<2	<2	<2	<20	<20	31	<10	<2	<2	<2	<2	<2	<2
1,1-Dichloroethane	<1	<1	<1	<1	<10	<10	17	<5	<1	<1	<1	<1	<1	<1
1,1-Dichloroethylene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	4	<2
Dichloromethane	<2	<2	<2	59	<20	<20	<20	<10	<2	<2	11	8	9	6
1,3-Dichloropropene	<1	<1	1	6	<10	<10	<10	<5	<1	<1	<1	<1	<1	<1
Ethylbenzene	<1	<1	15	1	187	> 5,900	> 77,000	<5	<1	<1	2	2	<1	<1
Toluene	<1	<1	3	5	32	169	17	10	2	4	3	3	2	2
1,1,2-Trichloroethane	<1	<1	<1	<1	<10	51	22	<5	<1	<1	<1	<1	<1	<1
Xylenes	<1	<1	30	8	705	> 20,000	> 26,000	<10	2	3	18	16	8	8

Table 4-5. Soil Gas Survey PID Screening Results, Plant #2*

Soil Gas Location	Sample Depth (ft.)	Background PID (ppm)	Sample PID (ppm)
SG-2001	8	0.6	1.0
SG-2002	6	0.5	0.4
SG-2003	8	0.5	0.7
SG-2004	7.5	0.4	1.0
SG-2005	8	0.5	0.4
SG-2006	8	0.5	11.6
SG-2007	7.5	0.6	15.2
SG-2008	7	0.5	17.5
SG-2009	8	0.6	0.8
SG-2010	8	0.3	0.3
SG-2011	8	0.4	0.0
SG-2012	8	0.4	0.0
SG-2013	8	0.4	0.5
SG-2014	8	0.5	1.0
SG-2015	6	0.5	1.4
SG-2016	6	0.6	0.4
SG-2017	6	0.6	0.4

* Soil Gas Survey performed by Enviro-Scan, Inc. Complete results are presented in Appendix H.1

Table 4-6. SVE System Historical Indicator Tube TCE Concentration

Vent	Measured Depth (ft. below top of PVC)	Approximate TCE Concentration (ppm)			
		12/10/91	4/3/91	10/11/90	1/9/90
1	28.6	--	80	>100	80
2	15.0	--	0	--	0
3	27.9	--	20	30	10
4	27.2	--	0	>100	0
5	22.75	--	20	20	0
6	30.9	--	240	>100	180
7	28.2	--	0	>100	0
8	18.0	--	10	20	30
9	24.9	--	70	>100	0
10	28.0	--	40	>100	0
11	26.6	--	0	--	0
12	15.25	--	0	--	0
13	17.6	--	0	--	0
14	14.4	--	0	--	0
15	31.25	--	0	--	0
16	29.5	--	0	--	0
17	19.1	--	50	30	20
18	23.0	--	0	--	0
19	13.8	~1	0	0	50
20	30.0	50	100	>200	90
21	29.0	--	12	20	10

-- = Not tested

Table 4-7. SVE System Historical Main Vent Indicator Tube TCE Concentration

Sampled	Tetrachloroethylene (ppm)	Trichloroethylene (ppm)
6/2/89	10	20
6/5/89	10	18
6/9/89	8	18
6/21/89	6	15
6/28/89	10	17

Note: Samples were collected from the discharge pipe on the suction side. Analyses were via indicator tubes, therefore, concentrations are approximate.

Table 4-8. SVE System Performance Test 12/10/91

Vent Pipe[1,2] Shut Off	Monitoring Point Manometer Readings (Inches H_2O Static Pressure[3])							Comments
	1	2	3	4	5	6	Main	
All Open	<.1"	<.1"	<.1"	<.1"	<.1"	.1"	4" (3-5)	
21	<.1"	<.1"	<.1"	<.1"	<.1"	.1"	4"	
20 + Above	<.1"	<.1"	<.1"	<.1"	<.1"	.1"	4"	
19 + Above	<.1"	<.1"	<.1"	<.1"	<.1"	.1"	4"	
18 + Above	<.1"	<.1"	<.1"	.1"	.1"	.1"	4"	
17 + Above	<.1"	<.1"	<.1"	.1"	.1"	.1"	4"	
16 + Above	<.1"	<.1"	<.1"	.1"	.1"	.1"	4"	
15 + Above	.1"	<.1"	<.1"	.1"	.1"	.1"	4"	
14 + Above	.1"	.2"	.3"	.4"	.6"	.4"	4"	
13 + Above	1.5"	1.5"	1.5"	1.5"	1.4"	1.5"	5"	11 has cracked valve and makes noise
12 + Above	2.3"	2.3"	2.2"	2.2"	2.4"	2.4"	7"	
10 + Above	2.5"	2.4"	2.4"	2.4"	2.5"	2.4"	7"	
11 + Above	8"	8.1"	8	8.2"	8.3"	8.4"	11.5"	
9 + Above	9.5"	9.6"	9.3"	9.5"	9.8"	9.7"	11.5"	
7 + Above	Value for #7 Frozen, Stuck Closed							
5 + Above	10.8"	11"	10.9"	10.8"	11.1"	11.1"	12"	Noise around #7, 17, 11
2 + Above	12.5"	12.4"	12.5"	12.5"	12.5"	12.3"	12.5"	Noise around 1,7, main, 17, 11 whistles
4 + Above	12.6"	12.4"	12.6"	12.6"	12.7"	12.8"	12.8"	Same as above
8 + Above	12.8"	12.7"	12.6"	12.7"	12.7"	12.9"	12.9"	Above plus 26
1 + Above	12.8"	12.7"	12.6"	12.7"	12.7"	12.9"	12.9"	Same as above
3 + Above	13.1"	13.2"	13.0"	13.1"	13.3"	13.2"	13.2"	Same as above

[1] Vents shut off in sequence starting with most distant well and ending with vents nearest the blower.

[2] Vent 6 left open

[3] See Figure 3.2 for location of monitoring points.

Table 4-9. Induced Vacuum Measurements, Existing SVE System

Observation Vent ID	1	5	9	13	17	19	21	16
Extraction Vent	2	2	-	2	2	2	2	-
Distance (ft.)	4.2	6	-	18	34	47	47	-
Induced Vacuum	3.9	3.4	-	0	0	0	0.1	-
(in. H20)	4.2	3.6	-	0	0	0	0.1	-
Extraction Vent	2 & 4	2 & 4	2 & 4	2 & 4	2 & 4	2 & 4	2 & 4	-
Distance (ft.)	-	-	-	-	-	-	-	-
Induced Vacuum	13.7	18.6	-	0	0	0	0.15	-
(in. H20)	14.2	18.9	1.5	0	0	0	0.2	-
Extraction Vent	4	4	4	4	4	-	4	-
Distance (ft.)	6	4	9	14	30	-	43	-
Induced Vacuum	14.7	19.5	1.5	0	0	-	0.2	-
Extraction Vent	9	9	-	9	9	-	9	-
Distance (ft.)	15	9.5	-	5.8	21	-	33	-
Induced Vacuum	3.5	4.7	-	0	0	-	0.2	-
Extraction Vent	12*	12*	-	-	-	-	-	-
Distance (ft.)	13.5	12.5	-	-	-	-	-	-
Induced Vacuum	1.4	1.6	-	-	-	-	-	-
(in. H20)	0.6	0.3	-	-	-	-	-	-
Extraction Vent	14*	-	-	-	-	-	-	-
Distance (ft.)	-	-	-	-	-	-	-	-
Induced Vacuum	-	-	-	-	-	-	-	-
Extraction Vent	8	8	8	8	8	-	8	-
Distance (ft.)	13.5	11	4	9	19.5	-	32	-
Induced Vacuum	0.6	0	2.2	0	0	-	0.1	-
Extraction Vent	17	17	17	17	17	-	17	-
Distance (ft.)	33	24	20	17.5	0	-	13	-
Induced Vacuum	0.7	0.4	0.3	0	-	-	1	-
Extraction Vent	21	21	-	21	21	21	21	21
Distance (ft.)	47	42	-	28.5	30	7	0	19
Induced Vacuum	0.5	0.5	-	0	0	2.1	-	0
(in. H20)	0.4	0.3	-	0	0	2.2	-	0

\- Not measured.
* Negligible vacuum developed in extraction well.

Table 4-10. PID Field Screening Results, Plant 1

Depth (ft.)	Borehole ID / Date Screened													
	SB-1001 8/15/91	SB-1002 9/11/91	SB-1003 8/15/91	SB-1004 8/15/91	SB-1005 9/5/91	SB-1006 9/4/91	SB-1007 9/9/91	SB-1008 9/10/91	SB-1009 9/13/91	SB-1010 9/10/91	SB-1011 9/10/91	SB-1012 9/10/91	SB-1013 9/10/91	SB-1014 9/10/91
1														
2														
3	1.7													
4		2.2	2.2	0.8	9.5		22.0	0.2	0.5	5.8	0.2	0.4		0.7
5						2.0								
6					10.0					1.2			1.6	
7														
8					15.0	5.0				1.2				
9														
10					19.2									
11						2.5				1.0				
12					8.8									
13						3.2				1.0				
14					12.5									
15														
16					16.5	2.0				1.4				
17														
18					28.0	1.8				1.0				
19														
20					38.0					1.1				
21						0.6				1.1				
22					11.0									
23						0.6								
24					4.7									
25														
26					9.0	5.0								
27														
28					8.8									
29						2.5								
30					5.2									
31														
32					6.8									
33														
34														
35														

Table 4-10. PID Field Screening Results, Plant 1 (Cont'd.)

Depth (ft.)	Borehole ID / Date Screened												
	SB-1015 9/10/91	SB-1016 9/11/91	SB-1017 9/12/91	SB-1018 9/12/91	SB-1019 9/12/91	SB-1020 9/12/91	P-1021 9/24/91	MW-1023 9/18/91	SB-1024 9/11/91	SB-1025 9/11/91	MW-1026 9/12/91	MW-1027 9/16&17/91	SB-1029 10/2/91
1								2.8	0.7	0.8			
2		2.0	5.6	4.8	1.4	3.4							
3									0.7	0.4			
4	0.5	11.0	9.0	30.0	1.5	2.0							
5										0.6			
6		1.3	8.8	24.0	3.3	5.2		2.6			0.8	2.0	
7									0.5	0.8			
8		4.0	6.2	42.0	1.0	3.2							
9								2.8	0.5	0.6			
10		5.8	9.2	35.0	0.8	3.4							
11									0.5	0.5	1.6	3.7	
12		8.6	3.3	100.0	0.9	5.0							
13									0.6	0.8			
14		4.6	8.8	100.0	0.7	8.0							
15										0.5			
16		4.4	9.6	120.0	1.3	10.2		3.2			1.4	3.0	
17													
18		4.6	16.0	100.0	0.8	4.0							
19													
20			2.2		0.8	9.8							
21				80.0				3.0			4.0	3.4	
22			1.0	16.0		4.2							
23						2.6							
24													
25						2.8							
26								4.2				3.0	
27													
28													
29													
30													
31											1.0	2.6	
32													
33													
34													
35													
36								2.0			7.4	4.0	
37													0.8
38													
41-43								6.2					
46-48								5.5					
51-53								5.6					
58-60							2.2						
68-70							2.1						
77-78							1.6						
82													
83							1.6						0.7
84													
87-89							1.6						
92-94							1.3						
97-99							3.2						

Table 4-10. PID Field Screening Results, Plant 1 (Cont'd.)

Depth (ft.)	Borehole ID / Date Screened			
	SB-1031 4/07/92	SB-1032 4/07/92	SB-1033 4/09/92	SB-1034 4/09/92
1				
2	2.0	24	1.8	3.2
3				
4	1.4	29	3.2	2.0
5				
6			5.2	2.2
7				
8	1.6	24	5.4	2.2
9				
10	1.6	48	12.2	4.4
11				
12	1.6	25	28	7.2
13				
14		26/34	22	12.2/7.4
15				
16		30	50	10.2
17				
18		50	48	9.4
19				
20		30	60/54	12.4
21				
22		40	70	15
23				
24		20/30	90	14
25				
26		30	92	16
27				
28		20	100	26
29				
30		22	72/94	16
31				
32		12	60	12.2/17.2
33				
34		30	70	26
35				
36				
37				
38				
41-43				
46-48				
51-53				
58-60				
68-70				
77-78				
82				
83				
84				
87-89				
92-94				
97-99				

Table 4-11. Soil Analytical Results, Plant #1

PARAMETER	BOREHOLE ID AND DEPTH												
	SB-1005 19-21′	SB-1005 25-27′	SB-1006 7.5-8′	SB-1006 25-27′	SB-1007 3-5′	SB-1010 3-5′	SB-1010 7.5-9.5′	SB-1010 15-17′	SB-1013 5-7′	SB-1016 11-13′	SB-1016 17-19′	SB-1017 9-11′	SB-1017 19-21′
TARGET COMPOUNDS (ug/kg or ppb)													
Tetrachloroethylene	<1	<1	<1	<1	<1	<1	<5	<2	<1	5	<1	<2	<2
1,1,1-Trichloroethane	265	18	3	3	1	3	11	6	3	2	3	20	14
Trichloroethylene	281	9	6	3	3	10	<5	<2	5	20	10	21	6
Total VOCs	546	27	55	8	134	75	39	36	24	39	21	125	104
PID (as ppm benzene equiv)	38	9.0	5.0	5.0	22	5.8	1.2	1.4	1.6	8.6	4.6	9.2	2.2
OTHER DETECTED VOCs (ug/kg or ppb)													
Benzene	<1	<1	<1	<1	1	1	<5	2	<1	<1	<1	<2	<2
Bromoform	<1	<1	<1	<1	<1	<1	<5	2	<1	<1	<1	<2	<2
Bromodichloromethane	<1	<1	<1	<1	<1	<1	<5	<2	<1	<1	<1	<2	<2
Carbon Tetrachloride	<2	<2	<2	<2	<2	<2	<10	<4	<2	<2	<2	<4	<4
Chloroethane	<2	<2	<2	<2	<2	<2	<10	<4	<2	<2	<2	<4	<4
Chlorobenzene	<1	<1	<1	<1	<1	<1	<5	<2	<1	<1	<1	<2	<2
Chloroform	<1	<1	3	2	2	6	14	6	3	3	3	61	69
1,2-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<10	<4	<2	<2	<2	<4	<4
1,3-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<10	<4	<2	<2	<2	<4	<4
1,4-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<10	<4	<2	<2	<2	<4	<4
1,1-Dichloroethane	<1	<1	<1	<1	4	4	<5	<2	<1	<1	<1	<2	<2
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<5	<2	<1	<1	<1	<2	<2
1,1-Dichloroethylene	<2	<2	<2	<2	<2	<2	<10	<4	<2	<2	<2	<4	<4
Dichloromethane	<1	<1	39	<1	<1	39	<10	<4	7	<1	<1	4	5
1,2-Dichloropropene	<1	<1	<1	<1	<1	<1	<5	<2	<1	<1	<1	<2	<2
1,3-Dichloropropene	<1	<1	<1	<1	<1	1	<5	3	<1	1	<1	<2	<2
Ethylbenzene	<1	<1	4	<1	<1	1	<5	<2	<1	1	1	2	<2
Toluene	<1	<1	<1	<1	4	3	<5	<2	3	2	1	9	4
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<5	9	<1	<1	<1	<2	<2
Trichlorofluoromethane	<2	<2	<2	<2	<2	<2	<10	<10	<2	<2	<2	<4	<4
Xylenes	<1	<1	<1	<1	119	5	14	10	3	5	3	8	6

Table 4-11.   Soil Analytical Results, Plant #1 (Cont'd.)

PARAMETER	**BOREHOLE ID AND DEPTH**												
	SB-1018 15-17′	SB-1018 22-23′	SB-1019 5-7′	SB-1019 19-20′	SB-1020 15-17′	SB-1020 19-21′	SB-1024 6-8′	SB-1025 4-6′	SB-1031 1-3′	SB-1031 13-15′	SB-1032 17-19′	SV/EX-1033 27-29′	SV-1034 27-29′
TARGET COMPOUNDS (ug/kg or ppb)													
Tetrachloroethylene	<1	8	<1	<1	<1	<1	<1	2	<2	<2	3	<2	<2
1,1,1-Trichloroethane	46	21	3	6	<1	143	6	11	3	2	19	59	6
Trichloroethylene	13	14	<1	3	41	240	<1	5	6	5	120	15	24
Total VOCs	309	76	418	67	126	397	16	111	38	27	228	147	78
PID (as ppm benzene equiv)	120	60	3.3	0.8	10.2	9.8	0.5	0.6	2.0	1.6	50	100	26
OTHER DETECTED VOCs (ug/kg or ppb)													
Benzene	<5	<2	<2	<2	10	<10	<5	2	<1	<1	<1	1	1
Bromoform	36	4	<2	<2	<10	<10	<5	2	<1	<1	<1	<1	<1
Bromodichloromethane	<5	<2	<2	<2	<10	<10	<1	3	<1	<1	<1	<1	<1
Carbon Tetrachloride	<10	<4	<4	<4	<20	<20	<10	3	<2	<2	<2	<2	<2
Chloroethane	<10	<4	<4	<4	<20	<20	<10	<2	<2	<2	<2	<2	<2
Chlorobenzene	<2	<2	<2	<2	<2	<2	<5	2	<1	<1	<1	<1	<1
Chloroform	71	20	18	29	23	14	<5	42	4	3	4	3	<2
1,2-Dichlorobenzene	23	<4	<4	4	<20	<20	<10	2	<2	<2	<2	<2	<2
1,3-Dichlorobenzene	<10	<4	375	12	<20	<20	<2	<2	<2	<2	<2	<2	<2
1,4-Dichlorobenzene	10	<4	<4	<4	<20	<20	<10	3	<2	<2	<2	<2	<2
1,1-Dichloroethane	<5	<2	<2	4	26	<10	<5	4	<1	<1	<1	<1	<1
1,2-Dichloroethane	<5	<2	<2	<2	<10	<10	<5	3	<1	<1	<1	<1	<1
1,1-Dichloroethylene	<10	<4	<4	<4	<20	<20	<10	2	<2	<2	<2	<2	<2
Dichloromethane	<10	<4	<4	<4	<20	<20	<5	12	10	6	8	8	6
1,2-Dichloropropene	<5	<2	<2	<2	<10	<10	<5	2	<1	<1	<1	<1	<1
1,3-Dichloropropene	<5	<2	12	<2	<10	<10	<5	1	<1	<1	4	<1	<1
Ethylbenzene	20	3	<2	<2	<10	<10	<5	2	2	<1	9	9	6
Toluene	28	<2	5	3	<10	<10	10	6	3	2	7	6	6
1,1,2-Trichloroethane	<1	<2	<2	<2	<10	<10	<5	1	<1	<1	4	<1	<1
Trichlorofluoromethane	<10	<4	<4	<4	<20	<20	<10	<1	<2	<2	<2	<2	<2
Xylenes	62	6	5	6	26	<10	<5	7	10	9	<2	46	29

Table 4-12. Soil Gas Survey PID Screening Results, Plant #1*

Soil Gas Location	Sample Depth (ft.)	Background PID (ppm)	Sample PID (ppm)
SG-1001	8	0.6	17.5
SG-1002	8	0.6	5.4
SG-1003	7.5	1.8	1.8
SG-1004	8	0.5	0.9
SG-1005	7	0.6	0.7
SG-1006	8	0.6	12.0
SG-1007	8	0.6	16.0
SG-1008	7	0.6	0.5
SG-1009	8	0.6	0.5
SG-1011	6	0.6	0.6
SG-1012	8	0.6	2.7
SG-1013	7	0.6	8.5
SG-1014	5	0.6	13.2
SG-1015	8	0.6	5.9
SG-1016	8	0.6	1.4
SG-1017	7	0.6	0.6
SG-1020	8	0.6	1.4
SG-1021	8	0.6	4.4
SG-1022	8	0.5	0.5
SG-1023	6	0.6	0.7
SG-1024	6	0.6	8.3
SG-1025	6	0.6	2.8
SG-1026	6	0.5	0.7
SG-1027	7.5	0.6	0.4
SG-1028	6	0.6	4.4
SG-1029	6	0.6	0.4

* Soil Gas Survey performed by Enviro-Scan, Inc. Complete results are presented in Appendix H.1

Note: No samples collected at stations SG-1010, SG-1018, or SG-1019.

EXPLANATION

MW-1023 ⌖	MONITOR WELL LOCATION AND DESIGNATION
EX-2 ■	EXTRACTION WELL LOCATION AND DESIGNATION
SB-1006 ●	BOREHOLE LOCATION AND DESIGNATION
SB-1008 ▲	BOREHOLE/SOIL GAS PROBE LOCATION AND DESIGNATION
SUMP-9 □	SUMP LOCATION AND DESIGNATION
— — —	PROPERTY BOUNDARY
A A'	GEOLOGIC CROSS SECTION LOCATION AND DESIGNATION

Well Designations:

MW-1023	Installed by Simon Hydro-Search
D-24R	Replacement installed by Simon Hydro-Search
P-1022	Piezometer installed by Simon Hydro-Search
D-27	Installed by Donohue
TW-2	Installed by Warzyn

Borehole Designations:

SB-1006	Installed by Simon Hydro-Search
B-11	Installed by Donohue
TB-7	Installed by Warzyn

NOTE: Locations of existing monitor wells, boreholes, and test pits are based on scaled locations from other drawings. The accuracy of these locations is unknown.

Base map from Aero-Metric Engineering, 04/16/88.
Contour interval two foot based on mean sea level datum.

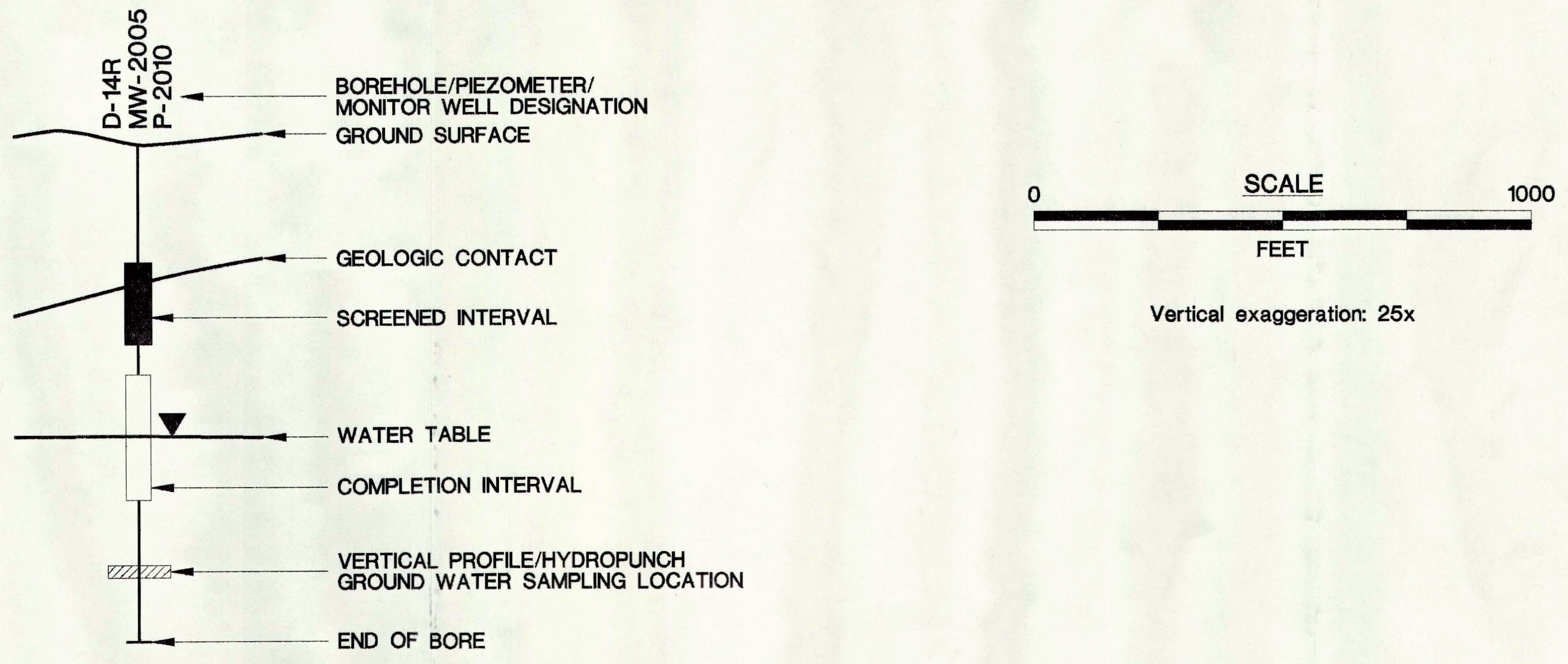
Map 4

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

GEOLOGIC CROSS SECTION LOCATIONS

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

DATE:	02/27/92	
DESIGNED BY:	jjj	02/27/92
CHECKED BY:		
APPROVED BY:		
DRAWING NO:	1501-p2	
PROJECT:	350115013	
SHEET:	2 of 4	



Vertical exaggeration: 25x

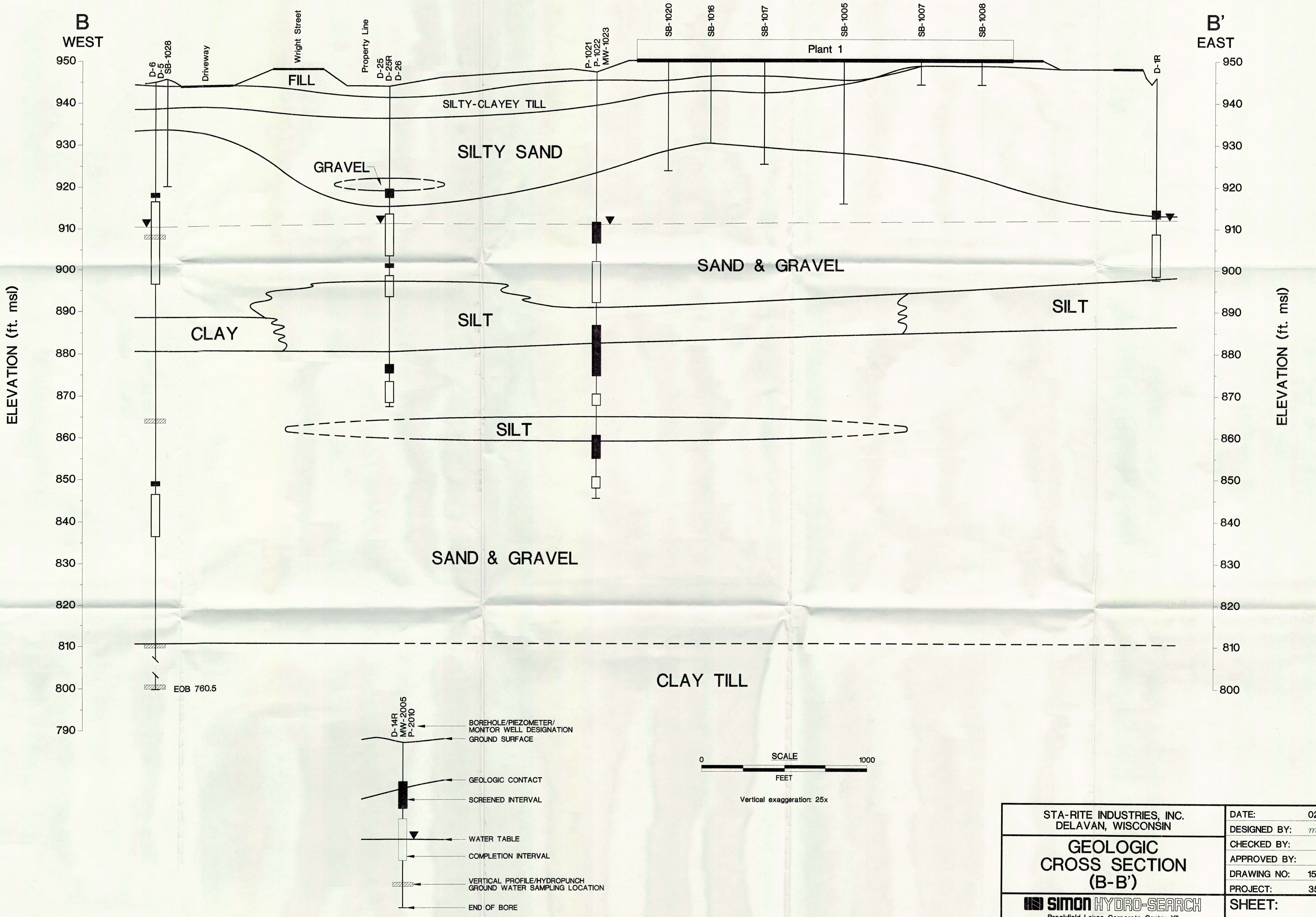
map 3

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

GEOLOGIC CROSS SECTION (A-A')

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

DATE:	02/13/92	
DESIGNED BY:	mam	02/03/92
CHECKED BY:		
APPROVED BY:		
DRAWING NO:	1501-p10	
PROJECT:	350115013	
SHEET:	3 of 4	



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STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

GEOLOGIC CROSS SECTION (B-B')

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

DATE:	02/13/92	
DESIGNED BY:	mam	02/03/92
CHECKED BY:		
APPROVED BY:		
DRAWING NO:	1501-p9	
PROJECT:	350115013	
SHEET:	4 of 4	