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PRELIMINARY DESIGN REPORT
FOR THE
GROUNDWATER REMEDIAL ACTION

REVISION 0

CRAB ORCHARD NATIONAL WILDLIFE REFUGE
PCB OPERABLE UNIT - SITES 32/33
MARION, ILLINOIS

PREPARED BY
RMT, INC.
MADISON, WISCONSIN

May 2001

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VOLUME 1 OF 2

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List of Acronyms and Abbreviations

[Note: All acronyms and abbreviations may not be used in this document.]

µg/L	micrograms per liter
AA	atomic absorption
ARARs	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
bgs	below ground surface
BNA	base-neutral-acid extractables
BOD	biochemical oxygen demand
CADD	computer-aided design and drafting
CCB	continuing calibration blank
CCC	calibration check compound
CCV	continuing calibration verification
CE	chloroethene (also known as vinyl chloride)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
cm/s	centimeter per second
COC	Chain of Custody
CONWR	Crab Orchard National Wildlife Refuge
COPC	constituent of potential concern
CRDL	Contract Required Detection Limits
CRL	Central Regional Laboratory
CRQL	Contract Required Quantitation Limits
1,2-DCE	1,2-dichloroethene
DCF	document control format
DO	dissolved oxygen
DOD	United States Department of Defense
DOI	United States Department of the Interior
DQO	Data Quality Objective

FCR	field change request
FERA	Final Effective Risk Assessment
FFA	Federal Facility Agreement
FID	flame ionization detector
FIT	field investigation team
FS	Feasibility Study
FSP	Field Sampling Plan
F&WS	United States Fish and Wildlife Service
GC/MS	gas chromatograph/mass spectrophotometer
gpm	gallons per minute
HSC	Health and Safety Coordinator
HSP	Health and Safety Plan
HSR	Health and Safety Representative
IAC	Illinois Administrative Code
ICB	initial calibration blank
ICP	inductively coupled plasma
ICS	interface check samples
ID	internal diameter
IDW	investigation-derived waste
IEPA	Illinois Environmental Protection Agency
IQAT	Independent Quality Assurance Team
kg	kilogram
L	liter
LCS	laboratory control sample
LRA	linear range analysis
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDL	Method Detection Limit
mg	milligram
mL	milliliter
MNA	monitored natural attenuation
MS	matrix spike
MS/MSD	matrix spike/matrix spike duplicate
MSD	matrix spike duplicate

M.S.L.	mean sea level
mV	millivolt
NCP	National Contingency Plan
ng	nanogram
NGVD	National Geodetic Vertical Datum, 1929
NIST	National Institute of Standards and Technology
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NTU	nephelometric turbidity units
O&M	operation and maintenance
ORP	oxidation-reduction potential
OSC	On-site Coordinator
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCBOU	PCB Operable Unit
PCDD	polychlorinated dibenzo(p)dioxin
PCDF	polychlorinated dibenzofuran
pg	picogram
pH	negative logarithm (base 10) of hydrogen ion activity
PID	photoionization detector
PLFA	phospholipid fatty acid
PM	Project Manager
ppb	parts per billion
PPE	personal protective equipment
ppm-v	parts per million - volume basis
PRP	Potentially Responsible Party
PVC	polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manual
QAMP	Quality Assurance Management Plan
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan

QC	quality control
RA	remedial action
RAGS	Risk Assessment Guidance for Superfund
RAS	routine analytical services
RCRA	Resource Conservation and Recovery Act
RD	remedial design
the Refuge	Crab Orchard National Wildlife Refuge
RF	response factor
RI	Remedial Investigation
ROD	Record of Decision
ROI	radius of influence
RPD	relative percent difference
RPM	Remedial Project Manager
RSD	relative standard deviation
RT	retention time
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SAS	special analytical services
SC	specific conductance
SHERP	Safety, Health, and Emergency Response Plan
SI	Supplemental Investigation
SII	Schlumberger Industries, Inc.
SMC	Sample Management Coordinator
SOP	standard operating procedure
SOW	Statement of Work
SPCC	system performance check compound
SRM	standard reference materials
S.U.	standard units
SVOC	semivolatile organic compound
SW846	Test Methods for Evaluating Solid Waste, 1986
TAL	Target Analyte List
TBD	to be determined
TCE	trichloroethene
TCL	Target Compound List

TCLP	Toxicity Characteristic Leaching Procedure
TEMP	temperature
TIC	Tentatively Identified Compound
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TSCA	Toxic Substance Control Act
TTU	Thermal Treatment Unit
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOA	volatile organic analysis
VOC	volatile organic compound

Section 1
Introduction

1.1 Background

The PCB Areas Operable Unit (PCBOU) consists of four of the original "study sites" defined in the remedial investigation for the Crab Orchard National Wildlife Refuge Superfund Site. Two of these sites, Site 32 (Area 9 Landfill) and Site 33 (Area 9 Building Complex), are addressed in this document.

As required in the Record of Decision (ROD) for the PCBOU issued by the United States Environmental Protection Agency (USEPA) in 1990, remedial action of PCBs was performed at Sites 32/33 from late 1995 to June 1997. This action included several excavations of PCB-impacted soil near Building I-1-23 and near Building I-1-2, and from surface water drainage swales at the sites. PCB-impacted soil beneath the landfill area was also excavated after removal and disposal of waste materials from the Area 9 Landfill. PCB-impacted sediment was also dredged from the Crab Orchard Lake embayment.

During the PCB remedial action, three of the excavated PCB source areas at Sites 32/33 (Area 9 Repository, Building I-1-23, Building I-1-2) were further characterized. During this additional sampling, volatile organic compounds (VOCs) were detected in groundwater. The VOC-contaminated groundwater was determined to warrant further characterization. An additional groundwater investigation was performed at the Sites in the 3rd quarter of 1997. The results from this work were presented in a report in March 1998, which indicated that at least three plumes of VOC-contaminated groundwater were present in the shallow aquifer. However, the nature and extent (horizontal and vertical) of the contamination and the site characteristics were not sufficiently defined at that time to allow selection of a remedial approach for groundwater. Therefore, a workplan proposing further groundwater investigation and on-site pilot tests of preselected cleanup technologies was issued in March 1998; a May 1998 revision of the workplan was approved by the USEPA.

The work defined in the May 1998 workplan was performed during the summer of 1998. A sampling round that included confirmatory investigation sampling of monitoring wells and other sampling for Performance Standards Compliance Monitoring for the PCBOU under the Consent Decree was performed in December 1998.

A document titled Groundwater Investigation Report and Focused Feasibility Study was submitted to the USEPA in July 1999 (Revision 0). That report contained a summary and

analysis of the results of the summer 1998 groundwater investigation (GWI) for Sites 32/33 and the December 1998 sampling for all sites within the PCBOU, and a Focused Feasibility Study (FFS) that evaluated a number of alternatives for remediation of contaminated groundwater at Sites 32/33. The document was subsequently revised to address the USEPA's comments on Revision 0, and was reissued in January 2000 (Revision 1) (RMT, 2000a). Final review comments on the Revision 1 GWI/FFS report were received from the USEPA in February 2000. Following discussions with the USEPA to resolve these comments, the Revision 1 report was approved by the USEPA.

In June 2000, the USEPA issued an Explanation of Significant Differences (ESD) for the PCBOU. The ESD specifies the remedy selected for additional source removal to address the TCE contamination in the soil and to mitigate further degradation of the groundwater associated with Sites 32/33 at the PCBOU. The remedy to be implemented is described as Alternative "E" in the Revision 1 GWI/FFS report. This alternative addresses the sources of VOCs through the use of multi-phase extraction (MPE) wells to be installed at each VOC source area. The selected alternative also includes the use of phytoremediation (planting of hybrid poplar trees) to provide for the remediation of the groundwater plumes at their farthest downgradient extent and to reduce VOC concentrations in the groundwater before it discharges to Crab Orchard Lake or to drainage swales tributary to the lake. The use of monitored natural attenuation (MNA) is also included as a component of the remedy. Further information regarding the design and components of Alternative "E" is included in the FFS, Revision 1 (RMT, 2000a).

A Pre-design Workplan presenting the investigation and pilot testing needed to develop data for final design, construction, and operation of the remedial action for groundwater selected in the ESD was submitted to the USEPA in March 2000 (Revision 0). A Quality Assurance Project Plan (QAPP) presenting the specific quality assurance and quality control activities associated with the pre-design fieldwork was submitted to the USEPA in May 2000 (Revision 0). The QAPP included a Field Sampling Plan (FSP) as an attachment. These documents were subsequently revised to address the USEPA's comments on Revision 0, and were reissued in early August 2000 (Revision 1) (RMT, 2000b and RMT, 2000c). The Pre-design Workplan – Revision 1 and QAPP – Revision 1 were approved by the USEPA in late August 2000. The investigation fieldwork and pilot testing were conducted from September to November 2000.

1.2 Purposes of Report

The purposes of this Preliminary Design Report include the following:

- To present a description of the tasks performed as part of the pre-design investigation and pilot testing.
- To document the results and data associated with the pre-design fieldwork program.

- To present a comprehensive evaluation of the nature and extent of soil contamination in apparent VOC source areas at the site.
- To present a preliminary design of a remedial system, consistent with the FFS and ESD, to address groundwater contamination at the site.

1.3 Scope of Report

This Preliminary Design Report includes the following key components:

- A description of the investigation and pilot testing tasks completed during fall 2000.
- Presentation of data and results from the pre-design fieldwork program.
- An updated description of the site hydrogeology, including site stratigraphy, groundwater occurrence and flow, and contaminant plume extent.
- A description of the nature and extent of soil contamination in the various source areas of groundwater contamination.
- A discussion of the zone of influence, air flow and water pumping rates, and contaminant recovery rates achieved during pilot testing.
- A preliminary design for the remedial systems, including well spacings and depths, liquid and air treatment methods, and locations and types of equipment and structures.
- A preliminary design for the phytoremediation system, including locations and density, depths, and types of plantings.

Section 2
Scope of Work Performed

2.1 Summary of Work Performed

From September through the first week of November 2000, RMT conducted a pre-design field investigation at Sites 32/33 of the PCBOU. The overall purpose of the pre-design fieldwork program was to collect sufficient data to support the design and implementation of Remedial Alternative "E" as described in the FFS (RMT, 2000a) for each area at Sites 32/33 identified as a source of the VOC contamination observed in groundwater. The term "source area" as used in this report refers to an approximate area of soil containing significant concentrations of VOCs that are causing or contributing to the contaminated groundwater plumes at the site.

The primary components of the fieldwork program are summarized below. The specific purpose, rationale, and details for each work item are presented in the remaining sections of this Report. A Site Plan showing the key features of Sites 32/33 is shown on Figure 2-1.

2.1.1 Multi-phase Extraction Pilot Tests

MPE wells and associated monitoring points were installed, and an MPE pilot test was performed, at the following two VOC source areas:

- Building I-1-23
- Beneath the Area 9 Repository

2.1.2 Soil Vapor Extraction Pilot Tests

SVE wells and associated monitoring points were installed, and an SVE pilot test was performed, at the following two VOC source areas:

- Building I-1-23
- Building I-1-2

2.1.3 Installation of Groundwater Monitoring Wells

Groundwater monitoring wells were installed at the following locations (refer to Figure 2-1):

- A 2-well nest (33MWC-44 and 33MWC-45) located near Highway 148 on the southwestern side of Sites 32/33 (for the I-1-2 west plume); water table well screened only in Upper Clay; piezometer screened only in Upper Sand

- A 2-well nest (33MWC-42 and 33MWC-43) located on the eastern side of the East Swale, adjacent to the Repository (for the East Repository plume); water table well screened only in Upper Clay; piezometer screened only in Upper Sand
- A 2-well nest (33MWC-48 and 33MWC-49) in the vicinity of Building I-1-36A; water table well screened only in Upper Clay; piezometer screened only in Upper Sand
- A 2-well nest (33MWC-46 and 33MWC-47) in the area adjacent to the southern side of the Repository; water table well screened only in Upper Clay; piezometer screened only in Upper Sand

See Subsection 2.3 for more detailed information.

2.1.4 Slug Tests of New Monitoring Wells

Slug tests were performed at all eight groundwater monitoring wells installed during the pre-design fieldwork program.

2.1.5 Soil Sampling and Analysis for VOC Characterization

Soil samples were collected from the unsaturated and saturated Upper Clay at the locations listed below and were analyzed for VOCs using an on-site mobile laboratory with off-site analysis of confirmation samples at a commercial analytical laboratory:

- Building I-1-2 VOC source area
- Building I-1-3 VOC source area
- Building I-1-23 VOC source area
- Beneath the Area 9 Repository
- Building I-1-36A vicinity
- Area south of the Area 9 Repository

See Subsection 2.2 for a more detailed description.

2.1.6 Soil Sampling and Testing for Non-Chemical Design Data

Soil borings were installed and soil samples were collected and analyzed from the Upper Clay and the Upper Sand units at five of the areas listed in Subsection 2.1.5 to provide non-chemical data for use in the design of the MPE wells, the horizontal extraction wells, and the phytoremediation areas.

See Subsection 2.4 for more detailed information.

2.1.7 Groundwater Sampling and Analyses

Groundwater samples were collected from selected existing monitoring wells at the known VOC source areas, from all new monitoring wells, and from selected Geoprobe® borings installed during the pre-design program. Samples were analyzed for VOCs and natural attenuation indicator parameters.

See Subsection 2.6 for more detailed information.

2.1.8 Staff Gauges

More durable staff gauges were installed to replace the staff gauges installed at Sites 32/33 during the summer 1998 fieldwork, and four additional staff gauges were installed to aid in the interpretation of groundwater/surface water interaction at the site.

See Subsection 2.7 for more detailed information.

2.1.9 Surveying

Surveying was done to document elevations and coordinates for the wells and soil borings completed during the pre-design program and to provide information needed for final design.

See Subsection 2.8.

2.1.10 Reconnaissance and Testing for Phytoremediation Design

Site reconnaissance, soil sampling, and soil testing were performed as needed to provide information for final design of the phytoremediation component of the remedial action.

See Subsection 2.5 for more detailed information.

2.1.11 General Reconnaissance for Design Information

General reconnaissance of Sites 32/33 was performed to collect information needed to complete the final design and to manage construction logistics.

2.2 Soil Sampling and Analysis for VOC Characterization

2.2.1 Direct-Push Sampling Program

A soil sampling program using direct-push technology was conducted to further identify the horizontal and vertical extent of residual chlorinated volatile organic compounds (CVOCs) in soil at each of the six areas that were known to be, or were

found to be, sources of contamination. Geoprobe® equipment, operated by MATECO, Inc., of Grand Rapids, Michigan, was used to bore through the Upper Clay and Upper Sand units and into the top of the Lower Clay. Initially, 66 Geoprobe® borings were proposed for five areas (RMT, 2000b). Additional borings were advanced based on results of the mobile laboratory analysis. A total of 93 Geoprobe® borings were completed at the site.

Continuous soil samples were collected from each boring using a 2-inch–diameter Geoprobe® MacroCore discrete interval sampler. The samples were field-screened with a photoionization detector (PID) and were logged in the field by RMT geologists. The field logs were reviewed, edited to conform to the Unified Soil Classification System (USCS), and finalized on Illinois Environmental Protection Agency (IEPA) standard boring log forms. Copies of the original field logs and finalized boring logs are included in Appendix A.

When sampling was completed, each boring was abandoned by tremie-grouting with a bentonite slurry. The location of each boring was marked, photographed, and surveyed. The Geoprobe® unit and all downhole equipment were decontaminated between sampling locations using a high-pressure, hot-water rinse at the decontamination pad that was constructed for use during the PCB remedial action.

2.2.2 On-Site Mobile Laboratory

All soil samples collected for chemical analysis were screened for VOCs using an on-site mobile laboratory operated by Environmental Chemistry Consulting Services (ECCS), of Madison, Wisconsin, utilizing conventional laboratory-grade equipment. The quality of these data and the relatively low detection limits (compared to other screening methods) allow these data to be used as the primary means for characterizing VOCs in site soil. The relatively rapid turnaround time (1 working day) allowed real-time field decisions to be made for adjustment of the original soil sampling locations and depths as presented in the Pre-design Workplan (RMT, 2000b). Twenty-seven soil borings were added to the proposed program based on the results of the soil screening.

Three to seven soil samples from each boring location (a total of 377 samples) were collected and submitted to the mobile on-site laboratory for analysis of selected VOCs. The soil samples were selected based on the depth below ground surface, field-screening (PID) results, and visual and olfactory observations made during boring. Soil samples for analysis were collected immediately after field-screening and preserved using syringe soil samplers provided by U.S. Analytical Services, of Crandon, Wisconsin. The soil samples were placed on ice immediately after collection and transported to the

mobile on-site laboratory after the soil boring was completed, generally within 2 hours of collection.

2.2.3 Off-Site Laboratory

Approximately one soil sample for every ten submitted to the on-site laboratory was also submitted to an off-site commercial laboratory, Severn Trent Laboratories (STL) of Canton, Ohio, for confirmatory VOC analysis. A total of 55 samples were submitted to the off-site laboratory. These samples were analyzed for VOCs using USEPA Contract Laboratory Program (CLP) methods. The soil samples were collected at the same time, from the same location in the soil core, and using the same methodology as those submitted to the on-site laboratory.

2.3 Monitoring Well Installation

Detailed well installation methods and materials were as described in the Field Sampling Plan (FSP) (RMT, 2000c). An overview of these methods and materials is presented below.

2.3.1 Drilling and Soil Sampling

The borings for the monitoring wells were advanced with 4 ¼-inch–ID hollow-stemmed augers. Continuous soil samples were collected using either a standard split-spoon sampler or a Shelby tube sampler. The soil samples were logged in the field by an RMT geologist. The field logs were reviewed by RMT in the office, edited to conform to the Unified Soil Classification System (USCS), and finalized on standard IEPA boring log forms. The field and finalized logs are presented in Appendix B. The drilling and sampling equipment was decontaminated between sampling locations using a high-pressure hot-water rinse at the decontamination pad.

2.3.2 Well Installation and Construction

Upon completion of each monitoring well boring, a 2-inch–diameter groundwater monitoring well constructed of Type 316 stainless-steel riser and screen was installed in each boring. The well screens are factory-slotted Type 316 stainless steel with 0.010-inch slots. The length of well screen installed at each drilling location was based on the geologic unit in which it was completed. Five-foot well screens were installed in the Upper Sand unit, 15-foot well screens were installed in the Upper Clay unit at well locations 33MWC-44, 33MWC-46, and 33MWC-48, and a 10-foot well screen was installed at well 33MWC-42. Wherever possible, 15-foot well screens were installed in the Upper Clay, where seasonal water table fluctuations can be quite high (up to 9 feet).

However, at 33MWC-42, the shallow depth to water and to the top of the Upper Sand required shortening the well screen.

A sand pack of 20- to 40-mesh washed silica was placed from approximately 6 inches below to 2 feet above each well screen. At water table wells, the sand pack was shortened slightly to allow for a longer seal. A filter pack seal consisting of between 6 inches to 1 foot of fine silica sand (#60 American Materials, or equivalent) followed by a minimum of 5 feet of $^{3}/_{8}$-inch bentonite pellets was tremmied into place above the filter pack. The bentonite pellets were allowed to hydrate and expand for a minimum of 20 minutes prior to the placement of the annular space seal. Because the total depth of the annular space seal did not exceed 50 feet at any location, $^{3}/_{8}$-inch bentonite chips were used for the annular space seal material. The annular space seal was placed around the well casing from the top of the filter pack using the auger flights to tremmie material to the bottom of the open hole. Bentonite pellets placed above the water table were hydrated as the augers were removed. A 6-inch–diameter carbon steel surface casing with lockable steel cap was placed over each well. A concrete pad, approximately 2 feet by 2 feet, was poured around the base of the surface casing. Steel barrier posts were embedded in concrete to protect the wells from vehicles. IEPA well construction diagrams, showing the specific details of each completed monitoring well, are included in Appendix B.

2.3.3 Monitoring Well Development

Each monitoring well was developed within 2 weeks of installation to remove suspended fine material from the well and surrounding sand pack to allow the well to yield relatively sediment-free water samples.

Wells were developed by surging the well with a small-diameter submersible pump with polyethylene tubing for approximately 5 minutes, followed by pumping. Up to five cycles of surging and purging were conducted in each well. Three successive readings of water stabilization parameters within 10 percent of each other, in conjunction with water clarity, were used as the criteria to confirm proper well development. Wells completed in the Upper Clay, which could not sustain a 1 gpm pumping rate, were surged and purged dry. Up to 8 gallons of distilled water were added to these wells to aid in the removal of suspended sediment from the filter pack and screen zone. Each of these wells was then purged, allowed to recover, and purged again, until at least three times the volume of distilled water added had been removed.

2.3.4 *In Situ* Hydraulic Conductivity Testing

In situ hydraulic conductivity tests were performed in each new monitoring well and in several pilot test wells following development. The results of these tests were used to further characterize the hydraulic characteristics of the Upper Clay and Upper Sand.

Rising-head (baildown) tests were performed. The head in the well was lowered using a bailer and by removing approximately 1 gallon of water. The recovery rate of the water level in the well was measured and recorded with an electric water level indicator. The results of the tests were recorded on forms in the field. The data were analyzed using the method of Bouwer and Rice (1976). The data and calculations are included in Appendix C.

2.4 Soil Sampling and Testing for Non-chemical Design Data

Several soil samples from each major soil unit (Upper Clay, Upper Sand, and Lower Clay) were collected for physical testing. Two samples of the Upper Clay unit and one from the Upper Sand unit were collected at each of the Area 9 Repository and Building I-1-23 area. At the Building I-1-2 area, where the Upper Sand is not present, one sample was collected from the Upper Clay. At the Building I-1-36A area and the south side of the Repository, two soil samples were collected from each of the piezometer borings: one from the Upper Clay and one from the Lower Clay. In addition, samples of the Upper and Lower Clay were collected from piezometer borings 33MWC-43 and 33MWC-45 at locations downgradient of the Repository and Building I-1-2 source areas, respectively. Each of the soil samples were analyzed for the following:

- ***Permeability*** – to more accurately quantify the hydraulic conductivity of the Upper Clay unit.
- ***Grain-size distribution*** – to accurately classify soil samples according to the Unified Soil Classification System (USCS) and to properly determine screen slot sizes and gravel pack gradation for construction of MPE and groundwater extraction wells.
- ***Atterberg Limits*** – to properly classify soil in accordance with the USCS system.
- ***Moisture content, wet and dry bulk density, and total organic carbon content*** – to provide critical parameters for estimating partitioning of contaminants between soil and water phases and for modeling of contaminant transport.
- ***Capillary pressure/water saturation relationship*** – to determine the air emergence pressure (vacuum pressure) that will need to be applied to the saturated soil to initiate air flow and to estimate the soil moisture content that is expected to remain at a given vacuum pressure created in the soil by the MPE well system.

The results of the physical testing are discussed in Section 7 of this report. Capillary pressure/water saturation relationship tests were performed only on samples of the Upper Clay

and permeability tests were performed on samples of the Upper Clay and the Lower Clay. Each soil sample for physical testing was collected using a Shelby Tube sampler. After the samples were collected from the borings, the tube was capped, sealed with tape, and placed in a cooler for shipment to STL.

2.5 Soil Sampling and Testing for Phytoremediation Design Data

Soil samples were collected in the areas where phytoremediation is planned: downgradient of Building I-1-23 and downgradient of the Area 9 Repository. The soil samples were collected at a sampling density of approximately one composite sample per acre to be planted. The majority of the samples were collected from shallow intervals (1 to 1.5 feet bgs) using a shovel. Some of the samples were collected from deeper intervals (4 to 5 feet bgs) using direct-push (Geoprobe®) technology.

In the areas where samples were collected using a Geoprobe®, the areas were divided into quadrants, with 3 soil borings per quadrant. The Geoprobe® borings were advanced to 4 feet bgs, and the soil from each quadrant was composited and placed in a sample bag provided by Advanced Terra Testing, Inc.

A total of eight soil samples were collected and analyzed by A&L Heartland Laboratories, Inc., for the agronomic parameters listed below:

- Soil pH
- Soluble salts
- Cation exchange capacity
- Percent organic matter
- Nitrates
- Ammonium
- Phosphorus
- Potassium
- Calcium
- Magnesium
- Sodium
- Zinc
- Iron
- Manganese
- Copper
- Sulfates
- Boron
- Texture

No soil samples were collected in areas where groundwater occurs at less than 1.5 to 2 feet bgs. The survival rate of the trees in these conditions would be low, therefore, trees will not be planted in these areas. The depth to the water table and the general stratigraphy were evaluated in each of the areas where the trees will be planted using existing data and soil boring logs.

2.6 Groundwater Sampling and Analysis

One round of groundwater samples was collected from the eight newly installed monitoring wells, from several of the existing monitoring wells, and from selected Geoprobe® soil borings. The groundwater samples were analyzed for VOCs and several indicator-type parameters. The results of the analyses are discussed in Section 5 of this Report. The sampling program and methodology is summarized in the following subsections.

2.6.1 Geoprobe® Boring Groundwater Sampling and Analysis

Groundwater samples were collected from three of the Geoprobe® soil borings at the Building I-1-36A area (SB-301, SB-302, and SB-303), from three Geoprobe® borings at the area south of the Repository (SB-502, SB-503, and SB-504), and from one Geoprobe® boring from the I-1-2 area (SB-128).

Selection of the Geoprobe® borings that were sampled was determined in the field, based on the on-site soil sampling results. The groundwater samples were collected from the upper portion of the Upper Sand unit, and sent to STL for analysis.

Sample Collection Methods and Analysis

The borings for collecting groundwater samples were advanced at least 1 foot into the Upper Sand unit with the Geoprobe®. A temporary PVC or stainless steel well was then placed in the boring such that the screened interval was just below the Upper Clay. The groundwater sample was collected through HDPE tubing lowered down the temporary well and into the screen. Well purging techniques were similar to the monitoring well sampling and are described in the following section. After purging the temporary well, the groundwater samples were extracted with a peristaltic pump and transferred directly into appropriate sample containers.

All groundwater samples collected from Geoprobe® soil borings followed the same analytical program as the monitoring well samples and were analyzed for VOCs, alkalinity, nitrogen (ammonia and nitrate + nitrite), sulfate, total dissolved solids (TDS), and total organic carbon (TOC). Field duplicate, trip blank, and MS/MSD samples were collected at the frequency specified in the QAPP. Sample handling and custody procedures were the same as those for the monitoring well groundwater samples and are described below.

2.6.2 Monitoring Well Sampling and Analysis

Groundwater samples were collected from the eight newly installed monitoring wells at the site following their installation, development, and an approximately two-week stabilization period. One groundwater sample was also collected from pilot test well MPE-US at the Building I-1-23 area.

In addition, eight existing wells were sampled, including two wells located in the vicinity of the source area for each of the three primary plumes identified at the site, and two downgradient wells in the I-1-23 plume that have had historically significant VOC concentrations, as follows:

- Wells 33MWC-13 and 33MWC-24 (I-1-2/I-1-3 plume source area)
- Wells 33MWC-07 and 33MWC-21 (I-1-23 plume source area)
- Wells 33MWC-09 and 33MWC-27 (Area 9 Repository plume source area)
- Wells 33MWC-08 and 33MWC-30 (downgradient I-1-23 plume)

Sample Collection Methods and Analysis

Most of the shallow monitoring wells were purged and sampled using a peristaltic pump and dedicated 3/8-inch–O.D. high-density polyethylene (HDPE) tubing. At one well, 33MWC-27, where the depth to water was greater than 20 feet, a small-diameter submersible pump was used instead of the peristaltic pump. The tubing (or submersible pump intake) was placed approximately 1 to 2 feet above the base of the well screen, and the well was pumped at a flowrate ranging from <0.5 liter/min to 1 liter/min. The pumping rate for each monitoring well was dependent on the hydraulic properties of the formation the well is screened across and was determined in the field to be the highest flowrate attainable without creating drawdown greater than approximately 1 foot, or at a minimum flowrate of 100 mL/minute. Wells that could not be purged at a minimum flowrate of 100 mL/minute without excessive drawdown were purged dry at a higher flowrate or were purged until a minimum of 5 well casing volumes of water were removed.

A Geotech Model P3 flow-through cell (or equivalent) equipped with temperature, specific electrical conductance, and pH electrodes was connected to the discharge tubing from the peristaltic or submersible pump. Each of these parameters was measured at each well during purging to evaluate stabilization. Groundwater chemistry was considered stable when the temperature change was ≤0.5°C, the conductance change was ≤10 percent, and the pH change was ≤0.1 pH unit between three successive 1-liter sampling intervals. The wells

were sampled immediately following stabilization or after five casing volumes were removed. The samples were taken from the pump discharge after the flow-through cell had been disconnected.

Field duplicate, trip blank, and MS/MSD samples were collected at the frequency described in the QAPP (RMT, 2000c). All samples were stored in coolers at 4°C while awaiting shipment to STL under chain-of-custody procedures. Each sample was analyzed for VOCs using USEPA Contract Laboratory Program - Statement of Work (CLP SOW) methodology low-level detection and for the same indicator parameters as the Geoprobe® water samples.

2.7 Surface Water Staff Gauge Installation

Eight surface water staff gauges were installed at the site to aid in the interpretation of groundwater/surface water interaction. The gauges are constructed of galvanized steel fence posts with attached enamel elevation gauges. The posts were driven into the stream sediment with a fence-post driver. Four of the staff gauges were direct replacements for the four existing gauges (SG-1 through SG-4) (Figure 2-1). Four new gauges were installed: SG-6 in the Center Swale due east of the Repository near monitoring well 33MWC-18, SG-7 in the East Swale near surface water sampling location 32R-233, SG-8 in the East Swale near monitoring well 33MWC-15, and SG-5 in the intermittent stream to the west of the I-1-2/I-1-3 area near surface water sampling location 32R-250. The new staff gauge locations and numbers are shown on Figure 2-1.

Water levels at each location will be recorded whenever groundwater or surface water samples are collected at the site. The surface water elevations will be compared with groundwater elevations from nearby monitoring wells to identify those stretches of streams that are losing water to groundwater and those stretches that are gaining water from groundwater discharging to the stream.

2.8 Surveying

The locations and elevations of the soil borings, monitoring wells, staff gauges, and pilot test wells were surveyed by Shawnee Surveying and Consulting, Inc. (SSCI), of Vienna, Illinois. The survey results are presented in Appendix C.

Section 3
Site Hydrology and Hydrogeology

3.1 Regional Physiography and Geology

The Crab Orchard National Wildlife Refuge is located in Southern Illinois, just south and west of the city of Marion. The Refuge consists of approximately 42,620 acres of land primarily within Williamson County, extending west and south into Jackson, Union, and Johnson Counties. Crab Orchard Lake is the largest of 12 lakes within the Refuge. The western portion of the Refuge around Crab Orchard Lake is open to public use for recreational purposes, while the eastern portion of the Refuge is a wildlife sanctuary that is closed to general public access. Land around the eastern portions of Crab Orchard Lake is also used for industrial purposes (O'Brien & Gere, 1988).

The construction of Crab Orchard Lake was completed in 1940 as part of The Crab Orchard Project for Land Utilization. The dam that impounds the waters of Crab Orchard Creek and its tributaries, creating Crab Orchard Lake reservoir, is located at the extreme western end of the lake and has a spillway elevation of 405 feet M.S.L. Crab Orchard Lake is approximately 9 miles long and varies in width from approximately 1.5 miles in the west near the dam to approximately 0.5 mile in the eastern end (Stall, et al., 1954). The resulting surface area of the lake is 6,965 acres with a watershed drainage area of 72,525 acre-feet. The average water depth varies over the area of Crab Orchard Lake from approximately 2 to 9 feet with a maximum depth of 30 feet (Kelly and Hite, 1981, as cited in O'Brien and Gere, June 1988).

Crab Orchard Lake is located just north of the southern terminus of Illinoian continental glaciation. In pre-Illinoian time, river basins had eroded into Pennsylvanian sandstone, siltstone, and shale, resulting in topographically mature drainage basins. Illinoian glacial drift forms a thin (less than 25 feet thick), generally discontinuous mantle over the mature pre-Illinoian bedrock topography. The till generally ranges in composition from a very clayey, sandy silt to a silty clay and often does not exist on top of bedrock hills. Overlying the Illinoian till are Woodfordian outwash and slackwater lake deposits and Wisconsinan loess. The Woodfordian deposits are generally weakly bedded silty clay and clayey silt, locally interbedded with silt and sand with a lacustrine structure (Frye, et al., 1972).

3.2 Site Geology

Site geologic conditions were interpreted from soil boring logs from previous site investigations by O'Brien & Gere (1988), IT Corporation (1995), Fluor Daniel (FDGTI, 1997 and 1998), and the

year 2000 soil and groundwater investigation performed by RMT. A summary of the available well construction information for all monitoring wells and soil borings installed at the site prior to the 2000 investigation, including existing wells and abandoned wells, is provided in the GWI Report (RMT, 2000a).

A total of 44 monitoring wells had been installed at the site prior to the year 2000 soil and groundwater investigations. A majority of these monitoring wells were installed near the groundwater table surface, at depths between 15 and 25 feet below ground surface (bgs). Six of these monitoring wells have subsequently been abandoned. FDGTI installed a total of 73 Geoprobe® soil borings in the summer of 1998. The depths of these borings ranged from 15 to 58 feet bgs, just to the top of the Upper Sand. The boring logs associated with the FDGTI investigation are in Appendix A of the GWI Report (RMT, 2000a).

During the fall of 2000, RMT advanced a total of 93 Geoprobe® borings and installed eight groundwater monitoring wells at the site. The logs of these borings are included in Appendices A and B, and the well construction forms are included in Appendix B. The locations of the soil borings and monitoring wells are shown on Figures 3-1 through 3-7. Table 3-1 summarizes the depths and approximate locations of all soil borings installed by RMT in 2000, and Table 3-2 includes a summary of the well construction information. With the eight monitoring wells installed in 2000, there is now a total of 46 monitoring wells at Sites 32/33.

The Geoprobe® borings completed in 2000 ranged from 20 feet to 60 feet in depth, and were advanced into the upper portion of the Lower Clay. The year 2000 groundwater monitoring wells were generally installed in nests of two wells; the shallow wells were set in the Upper Clay such that the well screen would intersect the water table, and the piezometers were set at the base of, and screened only in, the Upper Sand. The shallow monitoring wells installed in 2000 were completed at depths of approximately 15 to 20 feet bgs, and the piezometers were completed at approximately 25 to 40 feet bgs.

Geologic cross sections were created for each of the six VOC source areas. The cross-section locations are shown on Figures 3-1 through 3-7, and the cross sections are shown on Figures 3-8 through 3-22. The geology encountered during this investigation was generally consistent with previous investigations (RMT, 2000a) and is summarized below.

3.2.1 Site Unconsolidated Sediment

The site is underlain by Recent and Quaternary unconsolidated deposits ranging from 30 to 100 feet thick (RMT, 2000a). The unconsolidated deposits consist of the following units:

Upper Clay

The Upper Clay occurs from the ground surface to depths of approximately 25 feet bgs beneath most of the site, but thins to approximately 15 feet in the north near Crab Orchard Lake. The Upper Clay consists of weakly bedded, mottled brown and gray silty clays and clayey silts, with occasional silty sand seams and lenses. Iron and manganese staining is prevalent in many of the samples, especially in the upper half of the unit. Many boring logs indicate structure within the Upper Clay, including laminar bedding or alternating 2- to 3-inch beds of finer and coarser material within the clay and silt, especially in the lower half of the unit beneath the Repository (Appendix A). Vertical to sub-vertical fractures were observed throughout this unit. The calculated hydraulic conductivity of this unit is on the order of 10^{-4} to 10^{-6} cm/s, which is consistent with a silt or loess (Freeze and Cherry, 1979). The general composition and structure of the Upper Clay indicates that it is a weathered loess deposit, possibly underlain in some locations by slackwater lake deposits as described by Frye, et al., 1972.

Upper Sand

The Upper Sand occurs at elevations between approximately 380 feet and 400 feet above mean sea level (M.S.L.) and varies in thickness from 1 to 2 feet in the southern part of the site to approximately 20 feet in the western part and 15 feet in the northwestern part. The Upper Sand is possibly absent in the southeastern and central portions of the site, where the Lower Clay rises above approximately 400 feet M.S.L. Composition of the Upper Sand ranges from a clayey sand to a well-graded sand. In some locations, fine layering within the Upper Sand is noted in the boring logs, and there is a general coarsening downward sequence at most locations. This unit is consistent with either a glacio-lacustrine or a glacial outwash deposit.

Lower Clay

The Lower Clay occurs between elevations of approximately 340 feet M.S.L. and 410 feet M.S.L., with the higher elevations in the southern and southcentral portions of the site. The upper surface of the Lower Clay unit is eroded to form hills and valleys, with upper surface elevations varying from 380 feet to 410 feet M.S.L. This unit ranges in composition from a silty clay to a clayey silt and contains a trace to little fine sand and angular gravel. The gravel content includes fragments of weathered sandstone and coal. The Lower Clay has a very uniform color and texture with no depositional structures noted. Vertical

to sub-vertical fracturing is common at the top of the Lower Clay. At some drilling locations, sandy interbedding was noted within the upper 20 feet of the Lower Clay. These sand lenses appear to be discontinuous and are not present beneath much of the site. The Lower Clay is representative of Illinoian glacial till, as described by Frye, et al., 1972.

Lower Sand

The Lower Sand, where present, occurs immediately above the bedrock surface. The top of the Lower Sand occurs at approximately 340 to 350 feet M.S.L. This unit ranges from 10 to 20 feet thick in the northern portion of the site beneath Crab Orchard Lake to approximately 2 feet thick in the southwestern portion and is not present in the southern and southeastern portions where the bedrock surface rises above approximately 350 feet M.S.L. The Lower Sand is consistently logged as a silty sand. Hydraulic conditions encountered during drilling in the Lower Sand caused sand to heave up inside the auger flights. As a result, few undisturbed soil samples have been obtained from this unit. This unit is consistent with a glacial outwash deposit.

3.2.2 Site Bedrock

The bedrock surface below Williamson County consists of Pennsylvanian rocks. These rocks are predominantly weak shales, but include thin (less than 25 feet thick) limestones, sandstones, and coal beds. The Pennsylvanian rocks generally have low porosity and permeability and yield small amounts of water through interconnected pores, fractures, and joints (Csallany, 1966).

Bedrock encountered during the 1998 groundwater investigations was described as a gray fine-grained micaceous sandstone, and drilling logs indicate that it is competent and well cemented. The sandstone has been identified as a part of the Carbondale Formation (AAPG 1965, as cited in O'Brien and Gere, 1988).

Topographically, the top of the bedrock surface slopes to the north and west toward Crab Orchard Lake (RMT, 2000a). Bedrock elevations range from approximately 400 feet M.S.L. in the southern and southeastern portions of the site to approximately 320 to 340 feet M.S.L. in the northern and western portions of the site, respectively.

3.2.3 VOC Source Area Geology

The geology encountered at each individual investigation area can generally be described as above. 3-D depictions of the site geology at Buildings I-1-2, I-1-3, I-1-23,

and the Repository are included on Figures 3-23 through 3-26. Each area has distinct geologic features, which are summarized below.

Area I-1-2/I-1-3

- Bedrock is very shallow in this area, generally within 30 feet of the ground surface near Building I-1-2, sloping downward to the north, east, and west.
- Lower Sand does not exist in this area due to the shallow bedrock.
- Upper Sand does not exist in northern, western, and southern portions of this area. The Upper Sand pinches out against the Lower Clay where the Lower Clay rises above approximately 405 feet M.S.L.
- The easternmost extent of the Upper Sand is slightly west of boring SB-102, and the unit thickens to approximately 20 feet thick to the west near Hwy. 148.

Area I-1-23

- The Upper and Lower Sand units are both present in this area. Bedrock occurs at approximately 100 feet below ground surface (bgs).
- The upper surface of the Lower Clay appears to have an incised channel running from south to north through the area.
- The Upper Sand varies in thickness from 7 feet on the edges of the channel to nearly 20 feet in the center (boring SB-206). The Upper Sand also appears to thin to the south of Area I-1-23.

Area 9 Repository

- The Repository fill material ranges in thickness up to approximately 35 feet and is underlain by the Upper Clay.
- Bedrock occurs at approximately 100 feet below original ground surface beneath the Repository.
- The Upper Sand is not present beneath the Area 9 Repository.
- The lower portions of the Upper Clay unit at the Repository indicate lacustrine features such as finely banded silts and clays, varves, and occasional sandy lenses.

Building I-1-36A

- The Upper Sand is present beneath the entire I-1-36A area, and ranges in thickness from 8 to 18 feet.
- The Upper Sand unit appears to thin slightly to the north.

South of Repository

- The Upper Sand appears to be continuous south of boring SB-503, and is not continuous to the north toward the Repository.
- The Upper Sand unit thins to the west.
- The Lower Clay surface rises in elevation from south to north to approximately 390 feet M.S.L. in the north.
- Lacustrine features are common in the lower portion of the Upper Clay in this location.

3.3 Groundwater

3.3.1 Regional Hydrogeology

Regionally, the shallowest groundwater occurs within the unconsolidated glacio-lacustrine deposits that mantle the bedrock surface throughout much of Southern Illinois. Groundwater is often encountered within 20 feet of the ground surface. Shallow groundwater contours are a subdued reflection of the ground surface topography, with groundwater flowing from areas of high ground surface elevation to discharge areas at lower elevations, such as streambeds or lakes.

Water-bearing sand and gravel units within the glacial and lacustrine deposits of Southern Illinois are common but are generally thin. Groundwater yields from these units are not adequate for municipal supplies. In areas within the vicinity of the site, some thin scattered sand and gravel deposits provide adequate yield for farm and domestic water supplies (Frankie, et al., 1995).

The water-yielding characteristics of the Pennsylvanian bedrock are highly variable. In Williamson County, sandstone aquifer yields are adequate for domestic supplies throughout most of the county. The groundwater in these rocks becomes highly mineralized with depth, and production wells are rarely installed more than 200 to 300 feet into the bedrock. Domestic supplies from the sandstone aquifers are easily obtained at depths ranging from 50 to 80 feet (Csallany, 1966).

3.3.2 Monitoring Well Network

A total of 51 monitoring wells have been installed at Sites 32/33. Five of these monitoring wells (32-061, 32-062, 32-109, 32-110, and 33MWC-04) were abandoned during the PCB remediation and subsequent construction of the Area 9 Repository. Well COW-1 was destroyed and replaced by 32-063 prior to the RI in 1988 (O'Brien & Gere, 1988). Table 3-2 presents a summary of the available information for all

monitoring wells that have been installed at Sites 32/33, including installation dates and the consulting firm responsible for the work. Figure 3-27 shows locations for all of the wells.

A total of 46 monitoring wells currently exist at Sites 32/33. Of these, 27 monitoring wells (32-063, 33-340, 33-341, 33-342, 33MWC-01 through 33MWC-20, 33MWC-42, 33MWC-44, 33MWC-46, and 33MWC-48) are shallow water table wells. Most of these wells are screened across the lower portion of the Upper Clay unit and the upper portion of the Upper Sand unit. The remaining 19 monitoring wells (numbered 33MWC-21 through 33MWC-41, 33MWC-43, 33MWC-45, 33MWC-47, and 33MWC-49) were installed at deeper intervals to monitor hydraulic head and groundwater chemistry in the Upper Sand and Lower Sand and within sand seams in the Lower Clay.

3.3.3 Site Groundwater Occurrence and Flow

Groundwater levels at all but two of the 46 existing groundwater monitoring wells and surface water elevations at eight staff gauges (Figure 2-1) were measured in October 2000. Water levels at monitoring wells 33MWC-01 and 33MWC-05 were not recorded during this event. Groundwater elevations at the site have been recorded at variable intervals since December 1986. A summary of the available groundwater elevation data is presented in Table 3-3. A water table map for the October 2000 monitoring event is presented on Figure 3-27, and a potentiometric surface map for the Lower Sand unit for the October 2000 conditions is presented on Figure 3-28. Vertical hydraulic gradients were calculated for well nests at the site and are summarized in Table 3-4.

Generally, the water table at the site is a subdued reflection of the topography, with flow northward toward Crab Orchard Lake. As shown in Table 3-4, and as discussed in the GWI Report (RMT, 2000a), groundwater flow within the clay units has a significant downward component, except in locations of groundwater discharge near surface water, while flow within the sand units is predominantly horizontal.

Upper Sand/Upper Clay

Groundwater is generally encountered between 1 foot to 15 feet below ground surface (bgs) in the Upper Clay unit at the site. The one exception is beneath the Area 9 Repository, where groundwater occurs approximately 21 to 25 feet below the top of the Repository (approximately 1 to 5 feet below the original pre-Repository ground surface elevation). Groundwater elevations at most well locations fluctuate approximately 3 to 8 feet during the year (Table 3-3).

Figure 3-27 shows the water table configuration for October 2000. The water table map was constructed using the shallow water table well data where available. Water level data from piezometers constructed in the Upper Sand unit were used where water table well data were not available. This approximation appears to be generally valid based on a comparison of hydraulic head in adjacent wells completed in the two different units (e.g., 33MWC-13 and 33MWC-24). The water table configurations are generally consistent with previous investigations (e.g., IT Corp., 1995; RMT, 2000a). The additional wells installed during the fall 2000 field investigation allow a more detailed interpretation of the water table surface configuration than previously available.

Shallow groundwater beneath the site generally flows northward toward Crab Orchard Lake but is affected locally by surface water drainage ways and by the Area 9 Repository. In the Building I-1-2 area, shallow groundwater flows radially away from a local groundwater high. A majority of the groundwater flow from this area is easterly, toward the East Swale, and westerly, toward the Heron Flats impoundment area located west of Highway 148. Horizontal hydraulic gradients in the Building I-1-2 area range from 0.003 to 0.006.

In the Building I-1-23 area, groundwater flows primarily northward toward Crab Orchard Lake, with a lesser component of flow to the northeast toward the Area 9 Repository. A groundwater mound is present beneath the Area 9 Repository. This causes shallow groundwater to flow to the east toward the Center Swale (located immediately adjacent to the Repository) and to the north toward Crab Orchard Lake. Horizontal hydraulic gradients in the Building I-1-23 area range from 0.004 to 0.006. Horizontal hydraulic gradients at the Area 9 Repository range from 0.01 to 0.02 (Table 4-3).

Lower Sand Unit

A potentiometric surface map for the Lower Sand unit for October 2000 is shown on Figure 3-28. Groundwater in the Lower Sand unit flows to the north toward Crab Orchard Lake. The horizontal hydraulic gradient in the Lower Sand ranges from 0.0004 to 0.0005 (Table 4-3).

Over most of the site, the head in the Lower Sand is generally 1 to 3 feet lower than the head in the Upper Sand, indicating a downward potential. However, near Crab Orchard Lake this is reversed indicating an upward potential as groundwater discharges to the lake. This effect was previously exhibited by

well 32-110 (now abandoned), which was a flowing artesian well with a piezometric head elevation at least 3 feet above the lake elevation.

Groundwater Hydraulic Characteristics

Slug tests were performed at each of the eight new groundwater monitoring wells and at several of the pilot test wells installed in 2000 after they were developed. Rising-head tests were performed at each of the monitoring wells. The slug test data were analyzed with AQTESOLV Version 2.5 for Windows, using the Bouwer-Rice Solution for a Slug Test in a Confined Aquifer (1976). Slug test data and AQTESOLV input and output files are included in Appendix D. The results from these tests and slug test results from previous investigations are summarized in Table 3-5.

A total of 34 slug tests have been performed at the site since the RI. Fifteen of the tests were conducted in wells completed within the Upper Clay, eleven were conducted in wells completed in the Upper Sand, three were conducted in wells completed across sand seams in the Lower Clay, and five were conducted in wells completed in the Lower Sand.

The slug test results were generally consistent within each unit. In the Upper Clay, the calculated hydraulic conductivities ranged from 1.4×10^{-6} to 7.7×10^{-4} cm/s, with a geometric mean of 4.6×10^{-5} cm/s. These conductivity values are consistent with values reported for silt and loess of 10^{-7} to 10^{-3} cm/s (Freeze and Cherry, 1979).

In the Upper Sand, the calculated hydraulic conductivities ranged from 1.3×10^{-5} cm/s to 4.4×10^{-3} cm/s, with a geometric mean of 3.0×10^{-4} cm/s. These conductivity values are consistent with values reported for a silty sand or fine sand.

Slug test results from monitoring wells 33MWC-22, 33MWC-28, and 33MWC-31, which are screened across sand seams within the Lower Clay, were consistently on the order of 10^{-6} cm/s. The calculated hydraulic conductivity for these sand lenses is an order of magnitude below the range expected for a silty sand and is generally more consistent with that of a glacial till (Freeze and Cherry, 1979). The apparent low hydraulic conductivity of these sand lenses may indicate the lack of continuity of the lenses or may be the result of smearing clay within the borehole during drilling, and inadequate well development.

In the Lower Sand, calculated hydraulic conductivities generally ranged from 9.4×10^{-4} to 4.1×10^{-3} cm/s, with a geometric mean of 1.9×10^{-3} cm/s. These values fall within the observed range for a silty sand of 10^{-5} to 10^{-2} cm/s documented in literature (Freeze and Cherry, 1979). Well 33MWC-35, which is screened completely within the Lower Sand unit, has a low hydraulic conductivity of 6.3×10^{-6} cm/s, inconsistent with other wells in the same unit. This measurement, in conjunction with abnormally high pH and specific conductance measurements taken during sampling, indicates that this well may be affected by cement-bentonite grout.

During the MPE pilot testing conducted at the Building I-1-23 area and the Area 9 Repository, water levels were measured in the nearby monitoring points within the Upper Sand. These drawdown data were evaluated with the AQTESOLV Version 2.5 for Windows using the Hantush Method for leaky aquifers. The data and calculations are included in Appendix E. The results of the tests are summarized in Table 3-6.

The MPE test results yielded hydraulic conductivities for the Upper Sand that are very similar to the slug test results. The hydraulic conductivities calculated at the Building I-1-23 area ranged from 2.8×10^{-3} to 5.0×10^{-3} cm/s, with an average of 4.0×10^{-3} cm/s. The hydraulic conductivities calculated at the Area 9 Repository ranged from 6.2×10^{-4} cm/s to 6.3×10^{-3} cm/s, with an average of 3.4×10^{-3} cm/s. The more variable and slightly lower hydraulic conductivity calculated at the Repository is likely due to the discontinuous nature of sand seams at this location.

Vertical Flow

Vertical gradients were calculated using the October 2000 water level data for each of the well nests (Table 3-4). Vertical gradients are downward over most of the site, including each of the currently identified VOC source areas (e.g., well nest 33MWC-27 through 33MWC-29). However, upward gradients are present near Crab Orchard Lake where groundwater discharge to the lake is occurring (e.g., well nest 33MWC-30 through 33MWC-32). There are also vertical upward gradients immediately below and adjacent to the lower reaches of the swales and intermittent streams (where the swales and streams approach larger surface water bodies), where groundwater is discharging to surface water. One exception is the area downgradient to the west of Building I-1-2 (well nest 33MWC-44 and –45). At this location, there is still a downward

component of groundwater flow, which suggests that the discharge area is still further to the west, near Heron Flats.

3.4 Surface Water

3.4.1 Site Surface Water Occurrence and Flow

Surface water drainageways are present at several locations at the site (Figures 2-1 and 3-27). In the southwestern portion of the site, an intermittent stream that appears to originate near monitoring well 33-342 flows westerly toward Highway 148, passes beneath Highway 148 through a culvert pipe, and discharges into the Heron Flats impoundment area on the western side of the highway. The Center Swale originates east of Building I-1-11 and runs northeasterly along the eastern and southern sides of the Area 9 Repository before discharging to Crab Orchard Lake. The West Swale runs northward from the vicinity of Building I-1-23 and discharges to Crab Orchard Lake. The East Swale runs northward along the entire eastern boundary of Sites 32/33 and discharges to Crab Orchard Lake. The swales and the intermittent stream are often dry in their upper reaches, except following rainfall events. The lower reaches appear to be receiving groundwater inflow and are likely continuously flowing.

3.4.2 Staff Gauge Levels

Eight staff gauges, SG-01 through SG-08, were installed in surface water bodies at the site (Figure 3-27). Water levels were measured at the staff gauges in October 2000. The water level readings and calculated water elevations are summarized in Table 3-3.

3.5 Groundwater/Surface Water Relationship

During the fall 2000 field investigation, all but two of the surface water monitoring locations were dry. The lake elevation at staff gauge SG-03 (404.02 feet M.S.L.) was approximately 1.5 feet lower than previous recorded lake levels, and the water present at the location of staff gauge SG-02 was ponded water from a recent rainfall event. No standing or flowing water was present at any of the other staff gauge locations, however, the sediment in the lower reaches of the swales was moist. This may indicate that groundwater is discharging to the lower reaches of the swales but at a rate that will not result in flowing water. Based on these observations, water table data from the site monitoring wells, and previous investigations (RMT, 2000a), it appears that the lower reaches of the swales and the intermittent stream are zones of groundwater discharge during most, if not all, of the year.

Section 4
Soil Analysis Results

4.1 General

Soil borings were advanced in each potential VOC source area to collect soil samples for chemical analysis of VOCs. The results of these analyses were used to evaluate the nature and extent of VOC contamination in soil that has caused or contributed to the observed groundwater contaminant plumes that appear to originate in or near these areas. See Subsection 2.2 for sampling and analysis procedures. The data output from the mobile laboratory is presented in Appendix F. The STL data are presented in Appendix G.

A comparison was made between the results obtained from the on-site laboratory versus results for adjacent samples analyzed by the off-site laboratory (see Appendix H). In general, the results showed an excellent correlation between the two laboratories, verifying the validity of the on-site laboratory results. The minor differences between the two laboratories are likely due to the fact that these were not true splits of the same samples but discrete adjacent samples. As indicated in the results, relatively rapid changes in concentrations occur with depth, and the agreement in results between the on-site and off-site laboratories was better than expected.

The soil analysis results were validated by evaluating the raw laboratory data and reports and appropriate modifications and qualifiers were made to the data. A listing of these qualifiers is presented in Table 4-1.

The validated VOC results are summarized in Table 4-2. A side-by-side comparison of the on-site laboratory results with the off-site laboratory results is presented in Table 4-3.

4.2 Building I-1-2

Prior to the fall 2000 fieldwork, the Building I-1-2 area had been identified as the sole VOC source area at the southern end of the site. As the pre-design fieldwork progressed, it became obvious that an area adjacent to Building I-1-3 was a VOC source area that was distinct and separate from the Building I-1-2 source area. Therefore, the results of the soil analyses for these two areas are discussed separately.

A total of 17 soil borings were advanced in the Building I-1-2 area to evaluate the extent of VOCs in soil (see Figure 3-1). The borings were primarily located in and around areas previously remediated (by excavation) for PCBs and metals, consistent with the conceptual model indicating co-disposal of solvents with the PCBs and metals at the site. The borings

ranged in depth from approximately 24 to 38 feet. Most borings were terminated at refusal at the bedrock surface.

Three to seven soil samples per boring were analyzed for VOCs by the on-site laboratory. The results of these analyses are summarized in Table 4-2. Chemical concentration isopleth maps illustrating the concentrations of total VOCs in various depth intervals are shown on Figures 4-1 through 4-3.

In addition, chemical concentration cross sections illustrating the vertical distribution of total VOCs are shown on Figures 4-4 and 4-5. Finally, three-dimensional (3D) depictions of soil VOC concentrations that illustrate the shape of the contaminant source areas are shown on Figures 4-6 and 4-7.

Inspection and interpretation of the tabulated results and the various chemical concentration figures yields the following observations and conclusions:

- Shallow soil contamination (depths of less than 12 feet) is limited to a relatively small area (see Figures 4-1, 4-4, and 4-5). This is almost certainly a result of the previously completed remedial excavation of PCB- and metals-impacted soil that also removed significant quantities of VOCs in the shallow soil.
- The intermediate depth interval (12- to 24-foot depth) has a relatively larger area of impacts (see Figure 4-2). This is likely due to lateral spreading of VOCs via horizontal groundwater transport.
- The lowest depth interval (24- to 36-foot depth) has a smaller area of impact than the intermediate depth interval, particularly for higher concentrations (see Figure 4-3). This suggests that the Lower Clay unit significantly retarded the horizontal and vertical migration of VOCs at depth.
- High concentrations of VOCs (hundreds or thousands of ppm) were <u>not</u> detected in this area. The highest total VOC concentration of 22 ppm was measured at the 22- to 24-foot sample in boring SB-100. If higher concentrations were present at one time, they have either dissipated with time or were removed during the previous remedial excavation work.
- The relatively large areas of low concentrations (1 to 5 ppm total VOCs) are likely primarily a result of groundwater transport of VOCs from other areas of higher concentrations. Of particular note are the impacted zones extending westward under Building I-1-2. This impacted soil zone extends in the same direction as the mapped groundwater plume and is consistent with the primary groundwater flow direction mapped for this area.
- The primary constituent detected in most samples was TCE. Much lower concentrations of PCE, DCE, and vinyl chloride were occasionally detected (see Table 4-2).
- Freon 113 was detected at a concentration greater than 1 ppm in several borings in this area.

4.3 Building I-1-3

A total of 18 soil borings were advanced in the Building I-1-3 area. The borings ranged in depth from approximately 20 to 48 feet. Three to seven soil samples per boring were analyzed for VOCs in the on-site laboratory. The results of those analyses are presented in Table 4-2. Chemical concentration isopleth maps (Figures 4-8 through 4-11), chemical concentration cross sections (Figures 4-12 and 4-13), and 3D diagrams (Figures 4-14 and 4-15) illustrate the areal and vertical distribution of total VOCs.

Observations and conclusions regarding VOC distribution in the soil are as follows:

- As in the Building I-1-2 area, the horizontal extent of shallow contamination is relatively limited and is probably a result of previous remedial excavations for PCBs and metals in this area (see Figures 4-8, 4-12, and 4-13).
- The highest VOC concentrations in shallow soil are outside of the deeper excavation areas previously completed at the site.
- There is a distinct gap of over 200 feet between the impacted zones in this area and the impacted zones in the Building I-1-2 area. This gap coincides with a former manufacturing building that was located between I-1-2 and I-1-3. The approximate outline of that former building is shown on Figure 4-8. It appears that the releases that caused the VOC soil contamination occurred outside of the building rather than within or beneath it.
- The highest VOC concentrations occur at depth within the Lower Clay and are centered in the vicinity of boring SB-126 (see Figures 4-14 and 4-15).
- The lowest part of the Lower Clay unit appears to mark the maximum downward extent of significant VOC contamination.
- The increased area of impacts with depth, as indicated on Figures 4-9 and 4-10, is likely a result of horizontal spreading with groundwater flow and the previous removal of overlying VOC-impacted soil during the excavation of soil impacted by PCBs and metals. The soil chemistry data also indicate that the VOC source material moved downward in an irregular lateral and vertical pattern through preferential pathways in clay in this area.

4.4 Building I-1-23

A total of 19 soil borings were advanced in the Building I-1-23 area (see Figure 3-3). The borings ranged in depth from approximately 32 to 48 feet. Three to six soil samples per boring were analyzed for VOCs. The results of the analyses are presented in Table 4-2. Chemical isopleth maps (Figures 4-16 through 4-18), chemical concentration cross sections (Figures 4-19 and 4-20), and 3D diagrams (Figures 4-21 and 4-22) illustrate areal and vertical distribution of VOCs in soil.

Observations and conclusions related to VOC distribution in soil are as follows:

- As in the previously described source areas, the area of shallow zone (0 to 12 foot depth) impacts is relatively small and is limited to three apparently isolated spots (see Figures 4-16, 4-19, and 4-20). The largest of these shallow areas is located in the vicinity of the former Building I-1-23 annex. According to the excavation contours shown on Figure 4-16, limited excavation occurred in this area during the PCB and metals remediation. The other two shallow source spots are located along the base or sidewalls of deeper excavations completed during the PCB and metals remediation.
- Somewhat larger areas of VOC impacts are present at greater depth intervals (see Figures 4-17, 4-18, 4-19, and 4-20). In particular, in several areas there appears to be migration of significant concentrations of VOCs through the Upper Clay into the Upper Sand unit.
- There are significant areas of lower VOC concentrations (1 to 5 ppm) that are a result of transfer via groundwater flow from the areas of original release and impact.
- The Lower Clay unit appears to have effectively limited downward migration of VOCs in this area.
- Significant concentrations of 1,2,3- and 1,2,4-trichlorobenzene (TCB) were detected in off-site laboratory analysis of soil samples from borings SB-212 and SB-217. These compounds were quantified as tentatively identified compounds (TICs) for these samples. The highest concentration detected (1,000 mg/kg in the sample from SB-17 and 38- to 40-feet) also had relatively high concentrations of PCE (24 mg/kg) and TCE (28 mg/kg). In general, the detected TCBs were in samples that had significant concentrations of other VOCs.

4.5 Area 9 Repository

A total of 24 borings were advanced in and immediately west of the Area 9 Repository. The borings ranged in depth from 28 feet (completed outside and immediately west of the Repository) to 60 feet (completed on top of the Repository). Three to five soil samples per boring underwent laboratory analysis of VOCs. The results of the analyses are presented in Table 4-2. Chemical concentration isopleth maps (Figures 4-23 through 4-28), chemical concentration cross sections (Figures 4-29 through 4-32), and 3D diagrams (Figures 4-33 and 4-34) illustrate the areal and vertical distribution of VOCs in soil.

Observations and conclusions related to VOC distribution in soil are as follows:

- In general, the fill in the Area 9 Repository had low to nondetectable concentrations of VOCs. The materials placed in the Repository are not likely to be a source of VOCs in the groundwater beneath the Repository.
- The borings completed to the west (upgradient) of the Repository (SB-400, SB-401, SB-402, and SB-404) had low to nondetectable concentrations of VOCs indicating that impacts associated with the Repository are not derived from contaminated groundwater flowing toward the Repository.

- VOC contamination occurs primarily in the relatively thin Upper Clay unit, immediately below the fill in the Repository. The Lower Clay unit appears to have effectively limited further downward contaminant migration and limits the thickness of the contaminated zone to approximately 15 to 20 feet beneath the Repository fill materials.
- The highest concentrations of VOCs were detected in two primary locations: one near the southeastern corner of the Repository in the vicinity of boring SB-411 (total VOCs of 108 mg/kg at a depth of 36 to 38 feet), and the second near the southwestern corner of the Repository in the vicinity of boring SB-423 (total VOCs of 100 mg/kg at a depth of 26 to 28 feet below ground surface).
- Relatively large areas of low to moderate concentrations of VOCs are present in the eastern half of the Repository and in the northwestern third of the Repository surrounding boring SB-423.
- There is no continuous definable Upper Sand unit in the Repository area. This lack of a permeable conduit for contaminant migration explains the relatively low concentrations of VOCs in wells downgradient of the Repository.
- The primary contaminant detected was TCE, with occasional and much lower concentrations of PCE and DCE. Trace concentrations of vinyl chloride, toluene, and xylenes were detected in a few scattered locations.

4.6 Building I-1-36A

A total of nine borings were advanced in the Building I-1-36A area. The borings ranged in depth from approximately 36 to 49 feet. Three to five soil samples per boring were analyzed for VOCs (see Table 4-2). A chemical concentration distribution map (Figure 3-4) was prepared to illustrate the areal and vertical distribution of total VOCs in soil. Because of the low concentration of VOCs detected in the soil, no chemical isopleth maps, chemical concentration cross sections, or 3D diagrams were prepared.

Observations and conclusions from the soil analyses in this area are as follows:

- No "source area" VOCs were detected in the soil in this area. Significant concentrations of VOCs were detected only in the Upper Sand unit and were comparable to measured groundwater concentrations in this area. No significant concentrations were detected in the shallow soil that could be the source of the VOCs detected in groundwater at this location.
- No VOCs were detected in samples from the soil borings placed in the flowline of the Center Swale, located to the south of I-1-36A (SB-305, SB-307, and SB-308). This indicates that past spills or releases of VOC-containing materials onto the ground surface or in the truck dock at I-1-36A (which has a drain line to the Center Swale) apparently did not occur.
- The highest total VOC concentration detected was 1.3 mg/kg at 40 to 42 feet (Upper Sand unit) in boring SB-301. No other sample had concentrations of total VOCs above 1 mg/kg.

- The predominant constituent detected was generally PCE rather than TCE. Considerably lower concentrations of TCE, DCE, and vinyl chloride were detected in a number of samples (see Table 4-2).
- Based on the lack of an identified shallow source in this area and the presence of VOCs in the Upper Sand, it is apparent that an unidentified source area upgradient (to the west) of the Building I-1-36A area remains, in the general direction of Building I-1-12.
- Further attempts to locate the VOC source area with additional soil borings and soil sampling does not appear warranted for the following reasons:
  - The groundwater plume from this source area is well defined and relatively minor compared to others at the site, suggesting that the source is less significant.
  - The plume from this source area merges with the plume from the Area 9 Repository and dissipates rapidly in the area to the east of the Repository.
  - The planned phytoremediation in the vicinity of the Center and East Swales will reduce the already low concentrations in that area prior to discharge to the swales. The groundwater chemistry and flow data indicate that, in the unlikely event that this VOC source area could be located, the overall improvement in groundwater quality that would result from remediation of this source area would be minimal.

4.7 South Side, Area 9 Repository

A total of six borings were advanced in the area to the south of the Repository. The borings ranged in depth from 32 to 36 feet. Three to four soil samples per boring were analyzed for VOCs (see Table 4-2). A chemical concentration distribution map illustrating the areal and vertical distribution of total VOCs in soil is shown on Figure 3-5. Because of the low concentrations of VOCs detected in the soil, no chemical isopleth maps, chemical concentration cross sections, or 3D diagrams were prepared.

Observations and conclusions related to the soil analysis results for this area are as follows:

- As in the I-1-36A area, no "source area" VOCs were detected in the soil in this area. The only significant VOCs were detected in the Upper Sand unit, and these were comparable to measured groundwater concentrations in this area. No significant concentrations of VOCs were detected in the shallow (Upper Clay) soil that could be the source of the VOCs detected in groundwater on the south side of the Repository.
- The only constituent detected, other than one minor detect of 1,2-DCA, was PCE. This is also consistent with previous groundwater results in this area.
- Based on the lack of an identified shallow source in this area and the presence of VOCs in the Upper Sand, it is apparent that an undiscovered VOC source area upgradient (to the southwest) remains. Taking into account the results of the previous groundwater investigation in this area, it appears that this source area may not be associated with the

previously identified operational areas, but may be a relatively isolated source in the undeveloped area to the east and south of Building I-1-36A.

- Further attempts to locate the VOC source area south of the Area 9 Repository is not warranted for the same reasons as given for the source that is upgradient of Building I-1-36A.

Section 5
Groundwater Analysis Results

5.1 Overview of Groundwater Contaminant Occurrence

Groundwater samples were collected from 16 wells (33MWC-07, -08, -09, -13, -21 –24, -27, -30, and 33MWC-42 through –49) and analyzed for volatile organic compounds (VOCs) and indicator parameters. See Subsection 2.6 for more information on groundwater sampling and analysis. The laboratory reports for the groundwater samples collected during the fall 2000 investigation are presented in Appendix H. Summaries of the constituents detected in these samples, including field-measured parameters, are presented in Tables 5-1 and 5-2.

The results are generally consistent with previous investigations. CVOCs, particularly PCE, TCE, cis-1,2-DCE, and vinyl chloride, make up the majority of the constituents detected in groundwater. However, petroleum-related VOCs (e.g., benzene and toluene) were detected sporadically across the site. In addition, several less soluble chlorinated organic compounds (trichlorobenzene and dichlorobenzenes) were detected in groundwater samples from the VOC source areas near Buildings I-1-2 and I-1-23 and in the vicinity of Building I-1-36A.

5.2 Groundwater Contaminant Sources and Plumes

A chemical isopleth map was prepared to illustrate the areal distribution of CVOCs (the primary contaminants) in groundwater at the site. Figure 5-1 shows the distribution of total CVOCs in the Upper Clay and the Upper Sand units. This figure was developed using groundwater data generated by FDGTI in 1998 ("GP-" designated borings), RMT in 1998 (all site monitoring wells), and RMT in 2000 (16 wells and 6 Geoprobe® water samples; "SB-" designated borings). Data collected prior to 2000 are reported in the GWI Report – Revision 1 (RMT, 2000a). For ease of review, the total CVOC isopleth map generated after the 1998 investigations is included in Appendix I.

The results are generally consistent with the previous investigations. The new groundwater data allow a more detailed interpretation of the extent of contamination than was previously available. Six apparently separate CVOC source areas exist at the site: at Building I-1-2, Building I-1-3, Building I-1-23, upgradient of Building I-1-36A, beneath the Area 9 Repository, and the south side of the Area 9 Repository. CVOC plumes within the Upper Sand unit extend from 500 feet to over 1,000 feet downgradient from each of the source areas.

The distribution of CVOCs in groundwater at the site is controlled largely by the hydraulic gradients in the shallow flow system (Figure 3-27); however, the transport of CVOCs from the source areas is also dependent on the geology. In areas where the Upper Sand is not present or is discontinuous, CVOCs have been transported shorter distances than in areas where the Upper Sand is continuous.

5.3 Descriptions of Individual Plumes

5.3.1 Buildings I-1-2/I-1-3

Based on the soil chemistry data, there appear to be two separate VOC source areas in the Building I-1-2 area. One source area is located directly east of Building I-1-2, just south of the former location of a manufacturing building. The second source is located just east of Building I-1-3, north of the former building. The two source areas, although separate, form one plume to the east and one plume to the west of the combined I-1-2/I-1-3 area. Therefore, the results of the groundwater data from the two areas are discussed together.

Two plumes of CVOCs extend downgradient to the east and west of the Buildings I-1-2/I-1-3 source areas (Figure 5-1). The orientations of these plumes are consistent with the previously identified source area and the groundwater flow pattern in that area (Figure 3-27). Transport of contaminants to the north and south appears to be very limited in extent, as evidenced by nondetectable CVOC concentrations at wells 33MWC-01 (the background well), 33MWC-10, and Geoprobe® borings GP-03D and GP-06D. While these locations are technically downgradient of the Buildings I-1-2/I-1-3 source areas, a groundwater divide effectively splits the groundwater flow at the source areas to the east and west (Figure 3-27). In addition, the Upper Sand appears to be absent to the north and to the east of Buildings I-1-2/I-1-3 (Figures 3-8 through 3-11). This results in very little groundwater flow from the Buildings I-1-2/I-1-3 source areas to the north or south.

The primary CVOC constituents detected in groundwater wells nearest to the I-1-2 source area are TCE and DCE (33MWC-13 and 33MWC-24). However, in October 2000, 22,000 $\mu g/L$ of a tentatively identified compound (TIC), 1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113), was detected at well 33MWC-24. In addition, historical data from wells 33MWC-13, 33MWC-14, and 33MWC-24 indicate the presence of significant concentrations (on the order of 10 to 100 ppb) of trichloro-, dichloro-, and monochloro-benzenes. These compounds have low water solubility (19 ppm to 500 ppm) compared to TCE (1,100 ppm) and DCE (6,400 ppm), and are generally restricted to the immediate source area.

Groundwater from well 33MWC-13, completed in the Upper Clay, generally contains a total CVOC concentration one order of magnitude higher than that from adjacent well 33MWC-24, which is completed across the Upper Sand. This illustrates the importance of the Upper Clay as the primary source of VOCs leaching downward into the Upper Sand unit. Downgradient to the west, groundwater from wells and Geoprobe® borings completed in the Upper Clay (e.g., 33MWC-12 and GP-06C) contained low to nondetectable CVOC concentrations, while groundwater from an adjacent well in the Upper Sand (33MWC-33) contained over 2,000 ppb CVOCs in December 1998. These data indicate that, while the highest CVOC concentrations occur within the shallow fine-grained sediment (Upper Clay) in the source area, lateral transport of CVOCs occurs primarily within the Upper Sand, and downgradient areas of the Upper Clay are not impacted.

The CVOC plume to the west of Building I-1-2 is of a greater extent, and contains higher CVOC concentrations, than the plume to the east. The difference in CVOC distribution is explained by the geology described in the GWI Report – Revision 1 (RMT, 2000a), and in Subsection 3.2.1 of this report. The Upper Sand thickens to the west, which allows significant transport of contaminants, but appears to be discontinuous to the east, which limits lateral transport in that direction. As a result, the CVOC plume to the east extends only approximately 800 feet downgradient toward the East Swale, while to the west total CVOC concentrations on the order of 2,000 µg/L persist more than 1,300 feet downgradient of the source area. Transport of CVOCs to the west is toward the intermittent stream and low-lying area on the east side of Highway 148. Monitoring wells 33MWC-44 and 33MWC-45 were installed downgradient to the west of Building I-1-2 to better define the extent of CVOC contamination in the Upper Sand. No significant concentrations of CVOCs were detected in groundwater from either well in October 2000.

5.3.2 Building I-1-23

Concentrations of CVOCs on the order of 3,000 ppb extend from the Building I-1-23 source area northward (downgradient) to Crab Orchard Lake (Figure 5-1). Similar to the Building I-1-2 source area, the primary CVOC constituents detected in monitoring wells nearest to the source area are PCE, TCE, and DCE; however, a high concentration of chlorobenzene (18,000 ppb) was detected at well 33MWC-07 in October 2000, and historical data indicate chlorobenzene concentrations ranging from almost 10,000 ppb to 39,000 ppb. Historical data also show trichlorobenzene concentrations up to 170 ppb at well 33MWC-16. As in the Building I-1-2 plume, trichloro- and monochloro-benzenes have not been detected in downgradient wells.

The vertical distribution of CVOCs within the Building I-1-23 source area saturated zone is very similar to that observed in the Building I-1-2 source area. Groundwater from shallow (Upper Clay) well 33MWC-07 contained a total CVOC concentration one order of magnitude higher than adjacent source area well 33MWC-21, completed across the Upper Sand. Unlike the Building I-1-2 area, however, total CVOC concentrations in the Upper Sand and the Upper Clay in the extreme downgradient monitoring wells and Geoprobe® borings near Crab Orchard Lake (33MWC-30 and GP-01B) are very similar. This is the result of upward vertical gradients in the immediate vicinity of Crab Orchard Lake that cause upward movement of impacted groundwater from the Upper Sand, through the Upper Clay, and discharge to the West Swale and to Crab Orchard Lake.

5.3.3 Area 9 Repository

A plume of CVOCs extends eastward from beneath the Area 9 Repository toward the Center and East Swales, and some migration of CVOCs has occurred to the north toward Crab Orchard Lake. The distribution of contaminants emanating from soil beneath the Area 9 Repository is explained by the water table configurations shown on Figure 3-27, and by the geology depicted on cross-sections (Figures 3-16 through 3-19). A groundwater mound is present beneath the Repository during much of the year, causing groundwater to flow both to the north toward Crab Orchard Lake and to the east toward the Center and East Swales. The thin and clay-rich nature of the Upper Sand beneath the Repository greatly reduces (by adsorption) the transport of CVOCs away from the source area, particularly to the north where the deposit becomes very clayey. The transport of CVOCs that does occur is primarily to the east, where the Upper Sand is thicker and of lower clay content. Therefore, it is believed that the Area 9 Repository plume discharges to the Center and East Swales.

The primary CVOC constituents detected include PCE, TCE and DCE. Little to no trichloro-, dichloro-, or monochloro-benzenes have been detected in groundwater at the Area 9 Repository. Concentrations of PCE and its degradation products are highest within the source area. TCE, DCE, and vinyl chloride are transported downgradient of the source area, but unlike the CVOC plumes from the other source areas at the site, the concentrations of these compounds generally decrease in downgradient locations. The decrease of biodegradation products in the downgradient areas of the plume is the result of relatively low groundwater flow velocities in the vicinity of the Area 9 Repository. Low flow velocity limits the transport of PCE source material downgradient, thus reducing concentrations of biodegradation products in these areas.

No CVOCs were detected at 33MWC-39, completed in the Upper Sand to the northeast of the Area 9 Repository in the December 1998 sample. A concentration of 63 μg/L total

CVOCs was detected in a sample collected at this location in June 1998. Variations in groundwater chemistry at this location appear to be the result of variations in the groundwater flow direction and possibly seasonal water table fluctuations. No CVOCs were detected in the Upper Sand at well 33MWC-43 east of the East Swale and only a trace of TCE (0.12 µg/L) was detected at the water table well at the same location, 33MWC-42, in October 2000. These data, in addition to the upward hydraulic gradients at well nests 33MWC-42/-43 and 33MWC-39/-41, indicate that groundwater flowing east from the Area 9 Repository is discharging to the East Swale. No significant groundwater contamination extends east of the East Swale.

5.3.4 Building I-1-36A

The primary CVOC constituents detected in groundwater in the vicinity of Building I-1-36A are PCE, TCE, and DCE. Low concentrations of several dichlorobenzene compounds were detected in groundwater at soil boring SB-302 (20 ppb total DCB) and new monitoring well 33MWC-48 (0.6 ppb total DCB).

CVOCs in groundwater in the area of Building I-1-36A form a plume, which extends first easterly toward the Center Swale where it merges with a plume originating south of the Area 9 Repository, and then north and eastward toward the East Swale and Crab Orchard Lake (Figure 5-1). Here, the CVOC plume from the direction of Building I-1-36A merges with the Area 9 Repository plume to the east of the Repository. Eastward transport of CVOCs from the area of Building I-1-36A is aided by intermittent recharge from the Center Swale. Near Building I-1-36A, there is also a northerly component to the flow system that causes low CVOC concentrations at the perimeter of the Building I-1-36A plume to merge with the Building I-1-23 plume. The western extent of CVOC concentrations in groundwater in the area upgradient of Building I-1-36A is unknown; however, the presence of low concentrations of dichlorobenzenes in the shallow groundwater at SB-302 and 33MWC-48 suggest that the source area is nearby.

5.3.5 South Side, Area 9 Repository

A plume, designated the South Side plume, appears to originate from a separate source area located to the south of the Area 9 Repository and to the east of the Center Swale (Figure 5-1). The nature and extent of the South Side CVOC plume was primarily defined by the FDGTI Geoprobe® investigation in 1998. Further investigation of this source area was conducted by RMT in 2000, which included the installation of two monitoring wells (33MWC-46 and 33MWC-47) and groundwater samples collected from seven Geoprobe® borings.

Groundwater chemistry results from the Geoprobe® borings and the new monitoring wells indicate that the primary CVOC constituents are PCE, TCE, and DCE, similar to the other site source areas. Unlike the other source areas, trichloro-, dichloro-, and monochloro-benzenes were not detected in the groundwater samples. However, carbon tetrachloride (CTET) was detected at concentrations ranging from 14 to 160 ppb in groundwater from the Upper Sand unit at Geoprobe® boring locations GP-17A and GP-19A and new monitoring well 33MWC-47. Like the chlorobenzene compounds, CTET is relatively insoluble in water (S_w = 800 ppm). Its presence in groundwater at these locations and its absence elsewhere at the site indicates that the South Side plume has a separate source area located near 33MWC-47.

The South Side plume merges with the Building I-1-36A plume (from the west) and extends to the northeast toward the eastern side of the Area 9 Repository, following the trend of the Center Swale. Here it merges with the Area 9 Repository plume. The combined CVOC plume is then transported to the east and north where it emerges as surface water in the East Swale, which then flows into Crab Orchard Lake.

5.4 Adequacy of Monitoring Well Network

The eight new monitoring wells installed at the site have closed the data gaps previously identified in the Groundwater Investigation Report (RMT, 2000a).

Section 6
Multi-phase Extraction and Soil Vapor Extraction Pilot Tests

6.1 Pilot Test Objectives

As stated in the Pre-design Workplan Rev. 1 (RMT, 2000b), the objectives for pilot testing were similar in each of the areas for multi-phase extraction (MPE) (Area 9 Repository and near Building I-1-23) and in each area for soil vapor extraction (SVE) (near Building I-1-2 and near Building I-1-23).

Differences in the actual stratigraphy compared with the expected conditions discussed in the Pre-design Workplan were discovered while installing the pilot test wells. In some cases, these differences were significant. Specifically, at the Area 9 Repository, the Upper Sand layer was completely absent or existed only as a very thin and likely discontinuous silty sand layer (Figure 6-1). This discovery required field modifications of the MPE well and its associated monitoring points (MPs), and introduced uncertainty regarding the effectiveness of the MPE well screened in the Upper Sand, and the associated MPs targeted on the silty sand layer during the pilot test. As a result, the actual air and water flowrates during the pilot test were lower than expected.

The objectives of the MPE pilot tests were as follows:

1. To determine the design parameters, such as the vacuum radius-of-influence in the Upper Clay and Upper Sand units
2. To determine the design air/vapor flowrate
3. To determine the VOC vapor concentrations, to estimate the VOC recovery rate, and to determine the requirements for off-gas treatment
4. To determine the groundwater extraction flowrates from the saturated Upper Clay and Upper Sand units
5. To determine the feasibility of the selected drilling and well construction techniques
6. To determine the effectiveness of a liquid-ring or two-stage regenerative vacuum pump system in dewatering the Upper Clay and also in sustaining a pumping rate from the Upper Sand, as well as recovering VOC vapor from both soil units

It was recognized and acknowledged in the Pre-design Workplan that sufficient dewatering may not occur in the targeted geologic units within the time frame allotted for the MPE pilot

tests to accurately assess the full-scale air flow, the vacuum radius-of-influence, and the VOC vapor recovery rate. SVE pilot tests were conducted as planned in the Building I-1-23 and the Building I-1-2 areas, with the intent of supplementing information related to these parameters.

The objectives of the SVE tests were as follows:

1. To determine the design parameters, such as vacuum radius-of-influence in the unsaturated Upper Clay unit
2. To provide data to assist in determining the design air/vapor flowrate for the MPE wells
3. To determine the VOC vapor concentrations, to estimate the VOC recovery rate, and to determine requirements for off-gas treatment

6.2 Multi-phase Extraction Pilot Tests

6.2.1 Test Description

On October 17 through 21, 2000, RMT performed a multi-phase extraction (MPE) pilot test at the Area 9 Repository (see Appendix K for photographs). The test was performed using a 10-hp oil-sealed liquid ring vacuum pump system. The abbreviations "US" and "UC" were used in the MPE identification numbers to designate whether the well is screened in the Upper Sand (US) or Upper Clay (UC) unit. Connections were made to three MPE wells: MPE-US, MPE-UC1, and MPE-UC2 (Figure 6-2). Each MPE well was screened in a separate geologic layer: Upper Sand, Upper Clay 1, and Upper Clay 2. However, both of the MPE wells designated Upper Clay 1 and 2 are actually screened in the geologic unit that is considered to be the Lower Clay (Figure 6-1). As mentioned in Subsection 6.1, the actual stratigraphy differed from what was expected prior to installing the pilot test wells. The well nomenclature designated in the Pre-design Workplan (MPE-UC1, MP-UC2) remained unchanged in spite of this finding in the field. Refer to Appendix L for pilot test well construction information.

Throughout the test, a "stinger" tube was lowered inside each MPE well into the groundwater table, starting with MPE-US, followed by MPE-UC1, then MPE-UC2. A high vacuum produced by the vacuum pump (up to 25 in. Hg) was applied to the stinger tubes. This resulted in wellhead vacuum pressures in the range of 15 to 18 in. Hg. Both liquid and air/vapor phases were simultaneously extracted from the ground. The extracted groundwater was separated from the air phase in a knockout tank prior to the liquid ring pump. The water was then pumped to a collection tank for later off-site treatment and disposal. The air phase was treated with two activated carbon canisters in series prior to discharge to the atmosphere.

Vacuum influence and groundwater drawdown data were collected frequently throughout the test from nine monitoring points surrounding the MPE wells. Pilot test field data sheets are contained in Appendix M. Air pressure data were collected using magnehelic gauges connected to the monitoring points with well plugs. Pressure readings were taken after the monitoring point wells reached equilibrium with the formation pressure. A water level indicator was used to monitor groundwater drawdown in each monitoring point.

Groundwater extraction rates and cumulative flow volume were monitored during each data collection round. Grab samples of the composite groundwater flow to the collection tank were collected within 1 hour after startup, after 24 hours, and at the end of the MPE pilot test. Table 6-1 shows a summary of the groundwater analytical data, and laboratory data sheets are located in Appendix N.

The air-phase flowrate was measured using a Venturi-type flow sensor located between the liquid ring pump and the activated carbon canisters. The air-phase volatile organic compound concentration was monitored during each round of data collection with a photoionization detector (PID). The PID was calibrated regularly using an isobutylene standard. Air was monitored at three locations: prior to, between, and after the carbon canisters.

Air-phase samples were collected for laboratory analysis using 1-liter Summa canisters. Air samples were collected at the inlet of the carbon canisters at the start of the MPE pilot test, every 24 hours during the test, and at the end of the test. Air samples were also collected from the outlet of the final carbon canister on the same sampling schedule as the inlet air samples, to monitor VOC emissions to the atmosphere. Table 6-2 summarizes the laboratory air data, and analytical laboratory data sheets are located in Appendix O.

From October 22 through 25, 2000, RMT performed a MPE pilot test at Building I-1-23. The same equipment and monitoring procedures used for the pilot test at the Area 9 Repository were used at Building I-1-23. Connections were made to two MPE wells screened in two separate geologic layers: Upper Clay (MPE-UC) and Upper Sand (MPE-US). Refer to Figure 6-3 for well locations and Figure 6-4 for site stratigraphy. The test was started by applying vacuum only to MPE-UC initially; vacuum was applied to MPE-US later in the test.

6.2.2 Vacuum Zone of Influence

As expected, vacuum zone of influence measurements were limited by high water table elevations that covered some or all of the well screens at most of the monitoring points. This is due to the limited groundwater drawdown achieved during the 4- to 5-day MPE tests. During the MPE pilot test at the Area 9 Repository, all monitoring point well screens were within saturated soil throughout the test; therefore, no meaningful vacuum influence data were obtained (see Appendix P for a summary of vacuum influence data). The inability to create groundwater table drawdown of any significance in the Upper Clay, and the resulting inability to obtain soil vapor vacuum measurements in the saturated clay, were expected limitations of the short MPE pilot tests. As discussed in the Pre-design Workplan – Revision 1 (RMT, 2000b), soil vapor extraction (SVE) tests were also run in the shallow unsaturated clay zone at two site locations (see Subsection 6.3) in an attempt to provide data to define the achievable soil vapor vacuum influence in the unsaturated Upper Clay.

Four monitoring points had some or all of the well screen above the groundwater table during the MPE pilot test at Building I-1-23. These included MP-1B, MP-2A, MP-2B, and MP-3A. However, MP-2A was dry throughout the pilot test likely because the well screen may have been blinded during construction, and was suspected of giving false readings.

Plots of vacuum pressure normalized with the wellhead vacuum versus distance from the MPE well are included in Appendix P. The data obtained during the MPE pilot tests are inconclusive in determining a radius of vacuum influence. The limited amount of vacuum influence data from the Building I-1-23 MPE test indicate that the radius of vacuum influence (vacuum pressure ≥ 1 percent of the source vacuum) in the Upper Clay is less than 4 feet.

It is likely that more conclusive vacuum influence data could have been obtained if greater groundwater table drawdown had been achieved during the test (see Subsection 6.2.3).

6.2.3 Pumping Zone of Influence

Groundwater table drawdown measurements were recorded from the monitoring points throughout the MPE pilot tests at the Area 9 Repository and at Building I-1-23. Limited drawdown was observed in the Upper Clay at Building I-1-23, whereas substantial drawdown was observed in the Upper Sand at Building I-1-23 and also at the Area 9 Repository. A summary of the groundwater pumping rate and drawdown is shown in Table 6-3, and the field data are located in Appendix P.

At Building I-1-23, groundwater was extracted at an average rate of 0.21 gpm from the Upper Clay and 7.32 gpm from the Upper Sand. The maximum drawdown observed was 0.8 foot (MP-3B) in the Upper Clay and 3.8 feet (MP-1C) in the Upper Sand.

Figure 6-5 shows the groundwater drawdown and pumping flowrate versus time at the closest (4 foot) monitoring points at Building I-1-23. Minimal drawdown occurred in the Upper Clay during the MPE pilot test. However, increasing drawdown was noted in the Upper Sand throughout the test.

At the Area 9 Repository, groundwater was extracted at an average rate of 0.37 gpm from the Upper Sand and 0.33 gpm from the Lower Clay units. The maximum drawdown observed was 4.9 feet in the monitoring point screened in the Upper Sand (MP-1A) and 8.1 feet in the Lower Clay monitoring point (MP-2C).

The groundwater drawdown and pumping flowrate at the Area 9 Repository are depicted on Figure 6-6. This figure shows that observable drawdown was obtained in both the Upper Sand and Lower Clay monitoring points.

Drawdown data were used to predict the flowrates needed to achieve drawdown at Building I-1-23 and the Area 9 Repository. The results of this modeling are presented in Subsection 7.2.2.

6.2.4 Contaminant Recovery – MPE Pilot Tests

To evaluate the initial VOC contamination levels within the extracted air/vapor and groundwater as well as to estimate contaminant removal rates for a full-scale system at startup, air and groundwater samples were collected during the MPE pilot tests. Tables 6-1 and 6-2 present summaries of the analytical results from air and groundwater samples, respectively. All laboratory analytical data for the groundwater and air samples are presented in Appendix N and O, respectively. Figure 6-7 depicts the VOC concentrations extracted in air/vapor correlated with the groundwater table elevation over time during the MPE pilot tests at the Area 9 Repository and Building I-1-23.

Building I-1-23

Detected VOCs - A total of 10 VOCs were detected in the five carbon inlet air samples and the three extracted groundwater samples collected during MPE testing at Building I-1-23. Each contaminant and its highest corresponding concentration in both air and groundwater are listed below:

CONTAMINANT	HIGHEST CONCENTRATION DETECTED IN AIR (μg/m³)	HIGHEST CONCENTRATION DETECTED IN GROUNDWATER (μg/L)
PCE	9,300	73
TCE	120,000	230
cis-1,2-DCE	3,800	7.1 J
Chlorobenzene	2,700	7.6 J
MEK (2-butanone)	1,500	900
Tetrahydrofuran	1,200	NA
1,2,4-Trichlorobenzene	36,000	1,200
1,4-Dichlorobenzene	1,400	29 J
1,2-Dichlorobenzene	1,200	28 J
Acetone	ND	56 J
Total VOCs	**180,751***	**1,575***

Notes:
ND = not detected.
NA = not analyzed.
J = analyte above the instrument detection limit but below the Practical Quantitation Limit.
* = includes sum of concentrations for all detected compounds.

Groundwater - Groundwater extraction rates of 0.15 to 8.7 gallons per minute (gpm) were observed during the Building I-1-23 MPE test. Analytical results of the influent water samples collected during this test indicated total VOC concentrations ranging from 226.7 to 1,575 micrograms/liter (μg/L). Assuming an average concentration of 949 μg/L and an average extraction rate of 6.27 gpm, an estimated total VOC removal rate of approximately 32.66 g/day (0.072 lb/day) was achieved via groundwater extraction. Table 6-4 presents a summary of VOC mass removal via groundwater extraction during the MPE tests at both Building I-1-23 and the Repository.

PCBs may be present on suspended solids that will be present in the extracted groundwater, based on the wastewater sampling data from the pre-design fieldwork.

Air - Air extraction rates of 0 to 26.4 scfm were observed. Analytical results of air samples collected upstream of the carbon canisters indicated that total VOC concentrations ranged from a minimum of 19,970 micrograms/cubic meter

($\mu g/m^3$) to a maximum of 126,640 $\mu g/m^3$, with an overall average of 95,508 $\mu g/m^3$. At an average flowrate of 17.9 scfm and an average total VOC concentration of 95,508 $\mu g/m^3$ in the air stream, an estimated average total VOC removal rate of approximately 70.3 g/day (0.15 lb/day) was achieved via air extraction during the MPE test. Total VOC concentrations were consistently increasing within the extracted air/vapor stream throughout the test, with the highest concentration in the final sample. This increase in VOC concentration could be due to the lowering of the groundwater table, which exposed a portion of the capillary fringe and "smear zone" to vapor extraction. The VOC increase in the air phase could also have been due to increasing VOCs in the groundwater entering the MPE wells, which were then air-stripped due to the high air/water turbulence in the wells and conveyance piping. Table 6-5 presents mass removal rates via air extraction during the MPE test at Building I-1-23.

Area 9 Repository

A total of eight VOCs were detected in the six carbon canister air inlet samples and the three extracted groundwater samples collected during MPE testing at the Repository. Each contaminant and its highest corresponding concentration in both air and groundwater are listed below:

CONTAMINANT	HIGHEST CONCENTRATION DETECTED IN AIR ($\mu g/m^3$)	HIGHEST CONCENTRATION DETECTED IN GROUNDWATER ($\mu g/L$)
PCE	150	2.4 J
TCE	120,000	140
cis-1,2-DCE	1,900	5 J
MEK (2-Butanone)	2,100	1,600
Tetrahydrofuran	1,200	54 J
Styrene	2,800	12
1,2,4-Trichlorobenzene	ND	11
Acetone	ND	42 J
Total VOCs	**126,640***	**1,685***

Notes:
ND = not detected.
NA = not analyzed.
J = analyte above the instrument detection limit but below the Practical Quantitation Limit.
* = includes sum of concentrations for all detected compounds.

Groundwater - Groundwater extraction rates of 0.23 to 0.56 gpm were observed during the Repository MPE test (average of 0.35 gpm). Analytical results for extracted groundwater samples during this test indicated total VOC concentrations ranging from 267.3 to 1,685 µg/L. At an average concentration of 959.9 µg/L and an average extraction flowrate of 0.35 gpm, an estimated total VOC removal rate of approximately 1.96 g/day (0.0043 lb/day) was achieved via groundwater extraction. The total VOC concentrations were consistently decreasing in the extracted groundwater throughout the test. Table 6-4 presents a summary of mass removal rates obtained via groundwater extraction during the MPE tests at both Building I-1-23 and the Repository.

Air - Air extraction rates of 18.0 to 37.9 scfm were observed. Analytical results for air samples indicated that total VOC concentrations ranged from a minimum of 20,090 µg/m^3 to a maximum of 180,751 µg/m^3, with an overall average of 82,108 µg/m^3. At an average flowrate of 29.4 scfm and an average total VOC concentration of 82,108 µg/m^3 in the air stream, an estimated average total VOC removal rate of approximately 98.5 g/day (0.22 lb/day) was achieved during the MPE test. Table 6-6 presents a summary of mass removal rates obtained via air extraction during the MPE test at the Repository.

6.3 Soil Vapor Extraction Pilot Tests

6.3.1 Test Description

From October 18 through 21, 2000, RMT performed a soil vapor extraction (SVE) pilot test at Building I-1-23 (see Appendix K for photographs). A 15-hp COVAC multi-stage regenerative-type blower was used. The extracted soil vapor was treated with two activated carbon canisters in series prior to discharge to the atmosphere. No groundwater was extracted during the SVE pilot test. An average wellhead vacuum of 13.3 inches of mercury was applied on the SVE well during the pilot test. Refer to Figure 6-3 for pilot test well locations and Figure 6-4 for site stratigraphy. Appendix L contains pilot test well construction information.

Vacuum pressure data were recorded regularly using magnehelic gauges connected to the three monitoring points. Pressure readings were taken after the monitoring point wells reached equilibrium with the formation pressure. A water level indicator was used to monitor groundwater elevations at each monitoring point prior to the start of the test and periodically throughout the test.

The air-phase flowrate was measured using a Venturi-type flow sensor located between the multi-stage blower and the activated carbon canisters. The air-phase volatile organic compound concentration was monitored during each round of data collection with a PID. The PID was calibrated regularly using an isobutylene standard. Air was monitored at three locations: prior to, between, and after the carbon canisters. The PID readings recorded during the pilot tests showed that no breakthrough of the lead carbon canister occurred.

Air-phase samples were collected for laboratory analysis using 1-liter Summa canisters. Air samples were collected at the inlet of the carbon canisters both at the start and at the end of the SVE test. Air samples were also collected from the outlet of the final carbon canister both at the start and at the end of the test, to monitor VOC emissions to the atmosphere.

From October 21 through 24, 2000, RMT performed a SVE pilot test at Building I-1-2. Refer to Figure 6-8 for pilot test well locations and Figure 6-9 for site stratigraphy. The same equipment and monitoring procedures used for the pilot test at Building I-1-23 were used at Building I-1-2. An average wellhead vacuum of 20.7 inches of mercury was applied on the SVE well during the pilot test.

6.3.2 Vacuum Zone of Influence

Vacuum zone of influence measurements during the SVE pilot tests were limited by high groundwater table elevations that covered some or all of the monitoring point well screens. This was a result of perched water from a heavy rain that occurred on October 16. All of the monitoring point well screens were within saturated soil during the SVE test at Building I-1-23. All three monitoring points at Building I-1-2 were above the water table during the SVE pilot test, although MP-2 was dry throughout the pilot test and was suspected of giving false readings, likely because the well screen was blinded as a result of faulty construction.

A summary of vacuum pressure data and plots of normalized vacuum versus distance are contained in Appendix P. Vacuum pressure data obtained during the SVE test at Building I-1-2 indicate that the vacuum radius-of-influence (vacuum pressure ≥ 1 percent of the source vacuum) is less than 4 feet in the clay unit.

6.3.3 Contaminant Recovery – SVE Pilot Tests

As presented in Subsection 6.2.4, to evaluate the initial contamination levels within the extracted air/vapor as well as to estimate contaminant removal rates for a full-scale system, air samples were collected during SVE pilot testing for laboratory analyses.

Table 6-2 presents a summary of the analytical results from the air-phase samples. Laboratory analytical data for the air-phase sampling are presented in Appendix O.

Building I-1-23

Detected VOCs - A total of four VOCs were detected in the two carbon inlet air samples collected during SVE testing at I-1-23. The "additional VOC" parameters in the complete TO-14 scan were not analyzed in these samples. The primary contaminants and their highest corresponding concentration are listed below:

CONTAMINANT	HIGHEST DETECTED CONCENTRATION IN AIR ($\mu g/m^3$)
PCE	86
TCE	14,000
cis-1,2-DCE	74
MEK (2-Butanone)	380
Total VOCs	**14,763***

Note:
* = Number is greater than the sum of the above because it includes the sum of concentrations for all detected compounds.

Air/Vapor extraction rates of 37 to 41.1 scfm were observed. These extraction rates include bleed air and potential short circuiting. However, air samples were collected, including this bleed air, and mass recovery rates are therefore representative of this source area. Analytical results indicated that total VOC concentrations ranged from a minimum of 12,154 $\mu g/m^3$ to a maximum of 14,763 $\mu g/m^3$, with an overall average of 13,475 $\mu g/m^3$. At an average flowrate of 39 scfm and an average total VOC concentration of 13,475 $\mu g/m^3$ in the air stream, an estimated average total VOC removal rate of approximately 21.5 g/day (0.047 lb/day) was achieved via air/vapor extraction during the SVE test. Table 6-7 presents a summary of mass removal rates obtained during SVE testing at Building I-1-23.

Building I-1-2

Detected VOCs - A total of six VOCs were detected in the four carbon inlet air samples collected during SVE testing at Building I-1-2. Each contaminant and its highest corresponding concentration are listed below:

CONTAMINANT	HIGHEST DETECTED CONCENTRATION IN AIR ($\mu g/m^3$)
TCE	1,400
cis-1,2-DCE	54
Freon 113	1,200
Acetone	100
Tetrahydrofuran	85
1,2,4-Trichlorobenzene	57
Total VOCs	**2,896***

Note:
* = includes sum of concentrations for all detected compounds.

Air extraction exhaust rates of 49.2 to 65.7 scfm were observed. These extraction rates include bleed air and potential short circuiting. However, air samples were collected, including this bleed air, and mass recovery rates are therefore representative of this source area. Analytical results indicated that total VOC concentrations ranged from a minimum of 1,150 $\mu g/m^3$ to a maximum of 2,890 $\mu g/m^3$, with an overall average of 2,135 $\mu g/m^3$. At an average flowrate of 60.2 scfm and an average total VOC concentration of 2,135 $\mu g/m^3$ in the air stream, an estimated average total VOC removal rate of approximately 5.25 g/day (0.012 lb/day) was achieved via air/vapor extraction during the SVE test. Table 6-8 presents a summary of mass removal rates obtained during SVE testing at Building I-1-2. Table 6-9 presents an overall summary of operating conditions and mass removal rates observed during the test.

6.4 Conclusions

Pilot testing at this site, while limited in some respects, provided much useful information for the design of the selected remedial action. Lack of drawdown and dewatering during the MPE pilot tests affected the outcome of the tests, resulting in the need to use conservative values for several design criteria, such as groundwater extraction rates, air/vapor extraction flowrates, air-phase CVOC concentrations, and vacuum radius-of-influence. These criteria are discussed in more detail in Section 7.

Section 7
Multi-phase Extraction System Design Criteria

7.1 Objectives

In the pre-design phase, design concepts were developed and data were obtained to develop and enhance those concepts. In the remedial design phase of the project, this information will be used collectively to produce the detailed design for the remedial action at the site. The objectives for the design of the remedial action provide general direction during the design phase.

An overall objective for the remedial design is to develop detailed plans and specifications for remedial actions and systems that will operate on a short-term basis (approximately 2 years), during which the purpose and focus is to remove CVOC contaminant mass from the areas of highest concentration, or "source areas." The exceptions to this objective are phytoremediation, which will be implemented to provide a long-term buffer zone to minimize migration of contaminated groundwater to the lake, and monitored natural attenuation (MNA) which will provide further improvements in groundwater quality over time.

Another objective of the design is to anticipate changing operation requirements driven by changes in the quality of the water and air recovered by the systems, and to build flexibility into the systems to address and adjust to those changes as they occur.

The following sections provide comments and recommendations based on the evaluation of data obtained during the pre-design fieldwork. This information will be used in light of the design objectives above to proceed with the detailed design of the remedial action at the site.

7.2 Zone of Influence/Well Spacing

7.2.1 Vacuum

Building I-1-23

The zone of vacuum influence during the MPE pilot test was limited because of the limited thickness of the unsaturated clay and the inability to effectively draw down the groundwater during the time frame of the pilot test. The zone

of vacuum influence in the dewatered Upper Sand is expected to be similar to that which is common among other soil vapor extraction systems operating in similar coarse-grained soil, in the range of 40 to 60 feet.

Limited zone of vacuum influence is expected in the Upper Clay at Building I-1-23, based on the pilot test. Therefore, well spacing will be based on the closest practical spacing from a well and wellhead construction standpoint. The well spacing is estimated to be 10 feet between MPE wells in the Upper Clay. This is based on 2-inch MPE wells with a 4-inch wellhead construction. The MPE wells will also be connected to 2-inch manifold piping installed below grade.

Area 9 Repository

The zone of vacuum influence during the MPE pilot test was limited because of the inability to effectively draw down the groundwater during the time frame of the pilot test. A well spacing of 10 feet between MPE wells will be the closest practical distance based on well and wellhead construction constraints.

Building I-1-2

As expected prior to starting the test, the zone of vacuum influence determined during the SVE pilot test was limited because of the low permeability of the clay formation in which the test was conducted. Also, the zone of influence was likely reduced due to short-circuiting of airflow from the ground surface, as noted during the pilot test.

Well spacing will be based on the closest practical distance between MPE wells of 10 feet. Well construction will include 2-inch MPE wells with a 4-inch wellhead connected to 2-inch manifold piping installed below grade. The MPE wells in the full-scale system will be screened in zones of higher VOC concentrations at depths lower than the SVE pilot test well, therefore reducing the potential for short-circuiting.

Building I-1-3

No pilot test was performed at Building I-1-3. However, results from soil borings in the area indicate lithology similar to the Building I-1-2 area. As a result, well spacing will be similar to spacing at the Building I-1-2 area. The zone of influence will likely be limited because of the low-permeability clay, but may be increased if the MPE well screens intersect higher permeability sand lenses.

7.2.2 Groundwater Pumping

Building I-1-23

During the MPE pilot test, limited groundwater flowrates and drawdown were observed in the Upper Clay. However, more effective flowrates and drawdown occurred in the Upper Sand at Building I-1-23. The groundwater extraction rate was limited by the capacity of the MPE pilot test equipment, and the amount of drawdown was limited by the short time frame of the MPE pilot test.

Extraction well locations and configurations in the Upper Sand will be based on the number and type required to achieve effective drawdown to expose most or all of the Upper Sand unit in the higher VOC concentration areas.

Using the calibrated groundwater model (Modflow) already used in the Groundwater Investigation Report (RMT, 2000a), it is predicted that two horizontal wells located as shown on Figure 7-1 will provide effective drawdown, pumping at a combined flowrate of approximately 100 gpm. A submersible pump will be installed in each horizontal well, and a high vacuum will be applied to four vapor-only extraction wells screened in the Upper Sand. The horizontal wells will be designed to provide drawdown in the Upper Sand layer to within 3 to 4 feet of the Lower Clay unit. This will expose the VOC contamination in that zone to removal in the vapor phase via the vapor-only extraction wells, which is more efficient than removal via pumping of dissolved-phase contaminants in groundwater using a two-stage regenerative-type vacuum pump.

Area 9 Repository

Groundwater extraction rates during the MPE pilot test were limited due to the low permeability of the Lower Clay unit. In addition, the Upper Sand unit was found to be of limited thickness, thus reducing the effectiveness of dewatering the formation. Based on the MPE pilot test, approximately 0.4 gpm can be expected per well.

Building I-1-2

A MPE pilot test was not performed at Building I-1-2. However, soil boring information indicates that the Upper and Lower Clay at Building I-1-2 will respond in a manner similar to the Lower Clay at the Area 9 Repository. A flowrate of approximately 0.5 gpm is expected per MPE well.

Building I-1-3

Since VOCs were only recently discovered in the area, pilot tests were not planned at Building I-1-3. Based on soil boring information, the clay units at Building I-1-3 are likely similar to those at Building I-1-2 and the Area 9 Repository. A flowrate of approximately 0.5 gpm is expected per MPE well.

7.3 Contaminant Mass Recovery and Flowrates

Calculations were performed using laboratory results from analysis of air and groundwater samples, in conjunction with system performance data collected in the field, to estimate air/vapor and groundwater recovery rates. The rates observed during the pilot study can be expected, at least initially, during operation of a full-scale system. The pre-design VOC recovery rates are estimated initial conditions, which can be expected to change over time. For example, air-phase VOC concentrations may increase as the target area becomes dewatered and exposes additional impacted soil to vapor recovery. Following this dewatering, after the initial "slug" of vapor and groundwater is recovered, VOC concentrations can be expected to decrease with time. A conceptual relationship of VOC recovery rate to operational time is presented below.

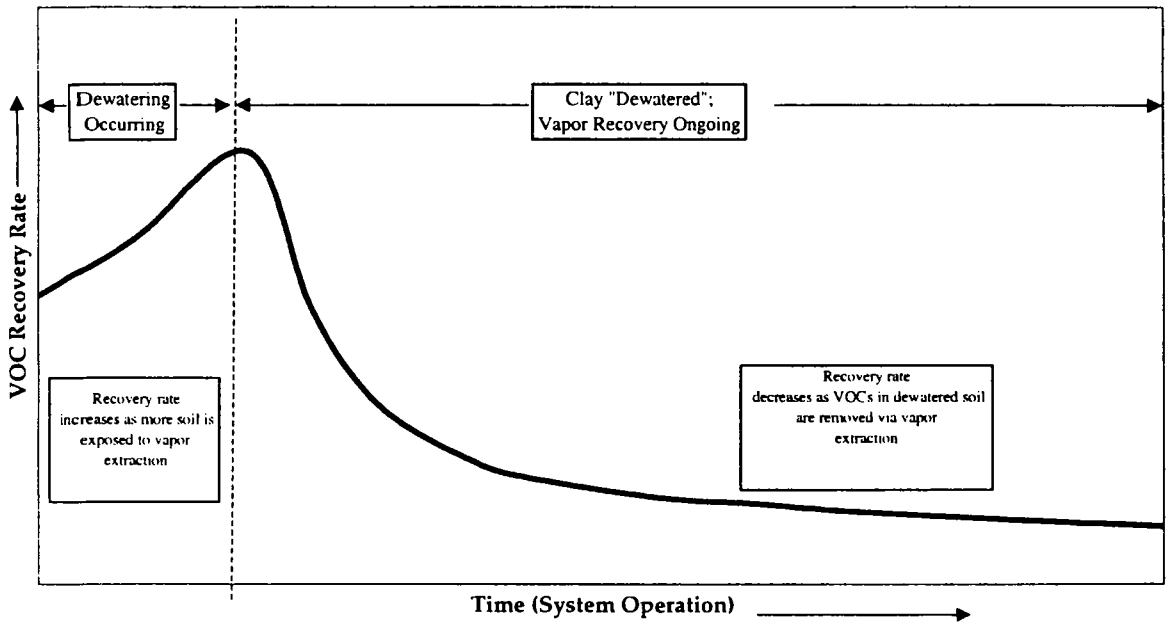

Table 7-1 presents a summary of the estimated MPE operating rates and conditions for both air and groundwater flow during remediation of the Repository, Building I-1-23, Building I-1-2, and Building I-1-3 source areas.

7.3.1 Area 9 Repository

Initial full-scale extraction rates were estimated for the Lower Clay unit in the area of the Repository. The air and groundwater extraction rates and their corresponding estimated initial contaminant concentrations are based on the pilot study results. The preliminary design operating conditions for all areas are summarized in Table 7-1.

Groundwater

The preliminary design groundwater extraction rate for the Lower Clay MPE wells is estimated at 0.4 gpm per extraction well. As observed during the pilot study, the estimated average initial total VOC concentration in the extracted groundwater is 1,000 µg/L.

The preliminary design flowrate for the full-scale system of 25 MPE wells is 10 gpm.

Air

As with the groundwater, estimated initial air/vapor extraction rates were based on pilot study observations. The preliminary design air-phase flowrate is 30 scfm per MPE well. This rate includes aspiration air required to obtain two-phase flow. It is necessary to "bleed" atmospheric air into the extraction wells to establish enough air flow to entrain liquid droplets into the air stream and up the well. Aspiration air is necessary if the natural formation cannot yield enough soil vapor to sustain two-phase flow. The estimated initial total VOC concentration is 111,000 $\mu g/m^3$, based on the pilot study results. The preliminary design total air/vapor extraction rate for the full-scale system of 25 MPE wells is 750 scfm.

7.3.2 Building I-1-23

As with the Area 9 Repository, initial full-scale extraction rates were estimated for the Building I-1-23 Upper Sand and Upper Clay units. These groundwater and air extraction rates and their corresponding estimated initial contaminant concentrations were based on the pilot study results and groundwater modeling (Upper Sand unit). The preliminary design operating conditions for all areas are summarized in Table 7-1.

Groundwater

The preliminary design groundwater extraction rates for the Upper Sand and Upper Clay are estimated at 50 gpm per (horizontal) well and 0.25 gpm per (vertical) well, respectively. Groundwater will not be extracted from the vertical vapor-only extraction wells screened in the Upper Sand. As observed during the pilot study, the estimated average initial total VOC concentration in the extracted groundwater is 1,000 $\mu g/L$ for both the Upper Sand and Upper Clay. The total groundwater extraction rate for the full-scale system of two horizontal groundwater extraction-only wells (in the Upper Sand) and 18 MPE wells (in the Upper Clay) is approximately 105 gpm.

Air

The preliminary design initial air/vapor extraction rates are based on pilot study observations and on experience from other sites. The initial air flowrates are estimated at 75 scfm per Upper Sand vapor extraction well and 25 scfm per Upper Clay MPE well. The MPE air removal rate includes some aspiration air. Estimated initial total VOC concentrations are 120,000 $\mu g/m^3$ and 21,000 $\mu g/m^3$ for the Upper Sand and Upper Clay wells, respectively, based on the pilot

study results. The preliminary design total vapor extraction rate for the full-scale system of four vapor extraction wells and 18 MPE wells is 750 scfm.

7.3.3 Building I-1-2

The estimated initial extraction rates and VOC concentrations were extrapolated from the pilot MPE test results obtained in the Area 9 Repository and Building I-1-23 areas. The preliminary design operating conditions for all areas are summarized in Table 7-1.

Groundwater

The preliminary design groundwater extraction rates for the Upper Clay MPE wells are estimated at 0.5 gpm per extraction well. The estimated initial total VOC concentration in the extracted groundwater is 1,000 μg/L. The preliminary design total groundwater extraction rate for the full-scale system of 27 Upper Clay MPE wells is 13.5 gpm.

Air

The preliminary design initial air/vapor extraction rates were extrapolated from the pilot study results. The preliminary design air removal rate is 20 scfm per MPE well. As with the other areas, this rate accounts for some aspiration air, but also excludes the excessive flow caused by short circuiting from the surface that occurred during the SVE pilot test in this area. The estimated initial total VOC concentration in the air flow is 100,000 $\mu g/m^3$. The preliminary design total air/vapor extraction rate for the full-scale system of 27 MPE wells is 540 scfm.

7.3.4 Building I-1-3

The estimated initial extraction rates and total VOC concentrations were extrapolated from the MPE pilot test results obtained at the Area 9 Repository and Building I-1-23 areas. The preliminary design operating conditions for all areas are summarized in Table 7-1.

Groundwater

The preliminary design groundwater extraction rates for the Upper Clay MPE wells are estimated at 0.5 gpm per extraction well. The estimated initial total VOC concentration in the extracted groundwater is 1,000 μg/L. The preliminary design total groundwater extraction rate for the full-scale system of 24 MPE wells is 12 gpm.

Air

The preliminary design initial air/vapor extraction rates were extrapolated from the pilot study results. The preliminary design air removal rate is 20 scfm per MPE well. As with the other areas, this rate accounts for some aspiration air. The estimated initial total VOC concentration in the air stream is 100,000 $\mu g/m^3$. The preliminary design total air/vapor extraction rate for the full-scale system of 24 MPE wells is 480 scfm.

7.4 Soil Physical Characteristics

This section presents a description of the physical characteristics of the lithological units (Upper Clay, Upper Sand, and Lower Clay units). Seven soil samples were collected via the Shelby tube sampling technique. Each of the seven soil samples was collected while drilling the MPE and SVE pilot test wells at the Repository and at Buildings I-1-2 and I-1-23. The samples were collected from the interval where the well screens were installed. Table 7-2 presents a summary of the physical parameters and the respective testing methodologies and sample identification. Tables 7-3 and 7-4 present summaries of the physical parameter results and specific lithological unit physical parameter averages, respectively. All physical parameter testing data are presented in Appendix Q.

7.4.1 Upper Clay

The physical characteristic values of the Upper Clay unit include an average hydraulic conductivity of 5.8×10^{-8} cm/s, a moisture content of 22.4 percent by weight, a porosity of 37.9 percent, a dry density of 104.8 pcf, and an average silt and clay (fines) content of 86 percent. These geotechnical values are indicative of stiff, inorganic clay. The hydraulic conductivity values from the laboratory tests are lower than the average values stated in previous reports. They represent the vertical hydraulic conductivity of the matrix, since the samples were collected using Shelby tubes, and the samples were tested in a vertical orientation. The previous values were obtained using slug tests, and represent a bulk hydraulic conductivity that would have a higher probability of including the effects of fractures, bedding planes, or other horizontal and diagonal geologic features that would increase the overall hydraulic conductivity of a formation.

The Upper Clay has a relatively low average total organic carbon content of 0.13 percent. At maximum vacuum pressure for standard conditions (29.92 in. Hg), an average of 82.8 percent of the original sample moisture content is retained in this soil. This characteristic limits the potential for rapid dewatering resulting from the pressure differential alone. Therefore, the VOC vapor removal rate of this unit is expected to be limited until sufficient drying of the clay has occurred through evaporation of the

retained water into the soil vapor flow that can be induced by the MPE wells. Also, surface recharge resulting from rainfall events will hinder the dewatering progress in the Upper Clay. To minimize this impact, a surface seal (e.g., HDPE/PVC membrane or asphalt pavement) may be necessary, and would also provide a beneficial means of minimizing short-circuiting of air to the MPE wells from the surface.

7.4.2 Upper Sand

The hydraulic conductivity of the Upper Sand unit is more variable than that for the clay units. The conductivity of the two samples ranged from 1.9×10^{-3} to 5.9×10^{-5} cm/s. This is likely due to heterogeneity within the sand unit caused by a varying percentage of fines (as evidenced by values of 6.9 percent and 32.5 percent fines for the two samples collected). The other physical parameter results were more consistent for the two samples, with average values of 21.1 percent for moisture content, 37.9 percent for porosity, and 105.4 pcf for dry density. The physical parameter results for the Upper Sand unit are representative of a silty sand material. As with the Upper Clay, this lithological unit also has a low average total organic carbon content (0.09 percent), which is typical for an inorganic sandy material. At maximum vacuum pressure for standard conditions (29.92 in. Hg), the soil remains an average of 42.6 percent saturated.

7.4.3 Lower Clay

Similar to the Upper Clay unit, the Lower Clay was found to have very consistent physical characteristic values. The averages of 22.8 percent moisture content, 36.7 percent porosity, 105.9 pcf dry density, and average fines content of 82.1 percent are very similar to the respective values of the Upper Clay material, and the specific gravity for the Upper and Lower Clays is identical (2.73). Although the average hydraulic conductivity of the Lower Clay (2.2×10^{-8} cm/s) is less than that of the Upper Clay (5.8×10^{-8} cm/s), it is well within one order of magnitude. The average total organic carbon content (0.51 percent) of the Lower Clay is greater than that for the above-lying lithological units. As with the Upper Clay, the Lower Clay geotechnical values are indicative of stiff inorganic clay material. At maximum vacuum pressure for standard conditions (29.92 in. Hg), the soil remains an average of 78.9 percent saturated. This characteristic limits the dewatering, and therefore the VOC vapor removal rate potential of this unit.

7.5 Preliminary Design Considerations

This subsection provides preliminary design criteria for the groundwater remediation systems. As described in Sections 4 and 5, four main source locations will be targeted for remediation. These include Building I-1-23, beneath the Area 9 Repository, Building I-1-2, and Building I-1-3.

Three remediation technologies will be applied in various combinations, depending on the specific source area: MPE, phytoremediation, and monitored natural attenuation. Table 7-5 summarizes the remediation system for each source area. Refer to Section 8 for discussions regarding phytoremediation.

The MPE well systems will be focused on the locations within each source area that contain the higher percentages of the VOCs. Soil zones with VOC concentrations that are within approximately 50 percent of the maximum VOC concentration observed in each respective source area will be targeted for remediation with the MPE well systems. In locations where the maximum VOC concentration is relatively low (e.g., 10 to 15 ppm), a minimum number of six wells is used to address the impacts in that location.

7.5.1 MPE Well Fields and Soil Excavation

MPE well fields will be located at the four source area locations noted above. The well fields will consist of multiple 2-inch–diameter PVC extraction wells with a 4-inch wellhead. The "stinger" pipe in each well will be connected to a manifold piping system that is routed to a treatment building. Shut-off valves at each MPE wellhead will allow extraction from selected wells and flow control at each wellhead. Low-permeability surface seals, such as PVC membranes or asphalt pavement, may be an option if atmospheric "short-circuiting" occurs at the ground surface around the MPE wellheads, or if needed to minimize the amount of surface water infiltration into the clay. Such a seal would alleviate or greatly reduce such short-circuiting by sealing the subsurface from the atmosphere.

Building I-1-23

The remediation at the Building I-1-23 source area will target soil and groundwater with the highest VOC concentrations. This includes areas near SB-202, SB-203, and SB-212, as shown on Figure 7-1. The remediation will include MPE wells in the Upper Clay, and horizontal groundwater extraction wells and vapor-only vertical extraction wells in the Upper Sand.

MPE well fields will be located near SB-202 and SB-212 and screened in the Upper Clay. Horizontal wells will be screened in the Upper Sand unit, and located near the MPE well fields in the Upper Clay. Four vapor-only extraction wells will also be screened in the upper portion of the Upper Sand.

Area 9 Repository

The remediation at the Area 9 Repository source area will use MPE wells that target soil and groundwater near SB-411 and SB-423, where VOC concentrations are highest. Refer to Figure 7-2 for locations. Two separate well fields will be located near SB-411 and SB-423. MPE wells in each area will be screened in the Lower Clay.

Building I-1-2

MPE wells will be used to remediate areas of the higher VOC concentrations in the soil and groundwater. MPE well fields will be located near SB-102 and SB-133. The wells near SB-102 will be screened in the Upper Clay, and the wells near SB-133 will be screened in the Lower Clay. Refer to Figure 7-3 for locations.

Building I-1-3

Areas of highest VOC concentrations in soil and groundwater will be targeted using MPE wells in the Upper and Lower Clay units. An MPE well field will be located near SB-126 and screened in the Upper and Lower Clay (Figure 7-3). The existing building will remain undisturbed during this remedial activity.

7.5.2 Conveyance Piping

The "stinger" pipes in the MPE wells will be connected to the vacuum pump skids through a PVC pipe manifold. This piping will be installed above grade and will be insulated and heat-traced at key points to prevent freezing. Aboveground piping will be simpler to install, service, and inspect than buried piping.

7.5.3 Treatment Buildings and Equipment

Three separate treatment buildings will be constructed at the site: one building located at the Area 9 Repository, one at Buildings I-1-2 and I-1-3, and one at Building I-1-23. In addition, the existing Wastewater Treatment Building northwest of the Area 9 Repository will be used to treat groundwater extracted from Building I-1-23 and the Area 9 Repository. Refer to Figure 7-4 for locations.

In general, each treatment building will house the MPE skid and the air-phase carbon treatment systems specific to each source area. Both power and telephone connections will be made to each treatment building. Each treatment system will be designed for automatic and unattended operation to the fullest practical extent. System faults or

alarms will automatically shut down the system in the event of a mechanical or electrical failure. The control system will have the ability to dial-out in the event of a system fault so that the problem can be addressed in a timely manner.

Building I-1-23

The treatment building at Building I-1-23 (North MPE Building) will serve as the location of the MPE and air treatment skid, including the vacuum blower, the air/water separator, and the water transfer pump. Figure 7-5 shows the general process flow diagram for the I-1-23 system.

Groundwater will be extracted from both the horizontal wells (with submersible pumps) and the MPE wells (with MPE vacuum pumps). The extracted groundwater will be transferred to the existing Wastewater Treatment Building via transfer pump(s) and a new buried forcemain. Pretreatment will be provided to remove suspended solids via multi-media filters. Refer to Figure 7-6 for the preliminary flow diagram. These filters will be sized to treat the combined water flow from Building I-1-23 and the Area 9 Repository, which is anticipated to be approximately 115 gpm. Based on wastewater sampling data from the pre-design fieldwork, sediment containing PCBs may be collected in the pretreatment multi-media filter, particularly during the initial startup period. This sediment may require special analytical testing and off-site disposal. After this pretreatment, the groundwater will be treated to remove VOCs via liquid-phase carbon adsorption. The treated water will then be discharged to Crab Orchard Lake. Due to the expected VOC concentrations, flowrates, and the lower required operation and maintenance effort, liquid-phase carbon alone was selected over air stripping and air-phase carbon treatment to reduce costs. The lead vessel is anticipated to require change-out every 85 days, and will be sized to treat a flowrate of approximately 115 gpm.

Air extracted from both the air-only and MPE wells will be treated at the North MPE Building using air-phase carbon prior to discharge into the atmosphere. At the VOC loading rate expected at startup, the lead vessel would require change-out after approximately 120 days, and the system will be able to treat a flowrate of 750 cfm.

Area 9 Repository

Both the MPE skid and the air-phase carbon treatment systems will be housed in a treatment building located on the Area 9 Repository (Repository MPE Building) between the two source locations near SB-411 and SB-423 (see Figure 7-2). Groundwater extracted from the MPE wells will be transferred to the existing Wastewater Treatment Building via a new buried forcemain for treatment with the I-1-23 groundwater using multi-media pressure filters and liquid-phase carbon units (Figure 7-6). Air/Vapor extracted from the MPE wells will be treated using air-phase carbon prior to discharge into the atmosphere. The air-phase carbon will be sized to treat a flowrate of 750 cfm, and it is expected that the lead vessel will require change-out approximately every 60 days, at the initial VOC loading rate. Refer to Figure 7-7 for a process flow diagram of the Repository source area systems.

Building I-1-2

Groundwater and air extracted from MPE wells with the MPE vacuum pump will be transferred to a treatment building to be constructed near the southern end of Building I-1-3 (see Figure 7-3). This building (South MPE Building) will house the MPE skid, the air-phase treatment, and the liquid-phase treatment systems. The process flow diagram on Figure 7-8 shows the general treatment components, including the MPE vacuum pump, the air/water separator, the in-line filter, the liquid-phase carbon, and the air-phase carbon. It is estimated that the lead vessel of the liquid-phase and air-phase carbon will require change-out approximately every 140 and 80 days, respectively, at the initial VOC loading rates. Flowrates are estimated to be 1,020 cfm in the air phase and 25 gpm in the liquid phase. Treated water will be discharged into the East Swale via a new buried forcemain. Treated air will be vented to the atmosphere through an exhaust stack at the South MPE Building.

Building I-1-3

Both the groundwater and the air extracted from MPE wells at Building I-1-3 will be conveyed to the South MPE Building located near the southern end of Building I-1-3 (Figure 7-3) via a buried collection pipe header. The systems will treat the air and groundwater from both Building I-1-2 and Building I-1-3.

7.5.4 Discharge Locations

Building I-1-23

Treated air will be discharged through an exhaust stack at the North MPE Building. Treated water will be discharged from the Wastewater Treatment Building to Crab Orchard Lake. Refer to Figure 7-4 for locations.

Area 9 Repository

The treated air phase will exhaust into the atmosphere at the Repository MPE Building. Treated water will be discharged from the Wastewater Treatment Building to Crab Orchard Lake (Figure 7-4).

Buildings I-1-2 and I-1-3

The air-phase and liquid-phase discharge locations are shown on Figure 7-4. The treated MPE system air will be vented through an exhaust stack at the South MPE Building. Treated water will be discharged into the East Swale via a new buried forcemain.

7.6 Permit Considerations

Construction and operation of the treatment systems will comply with all substantive requirements of pertinent state and federal regulations. The major regulatory considerations for the proposed treatment systems include the discharge of the extracted soil vapor/air and groundwater, and the disposal of the waste soil and wastewater generated during system construction. Pertinent permit requirements and regulations that will be addressed in the final design include the following:

- 40 CFR Part 70 – Air Pollution Control
- U.S. Environmental Protection Agency (USEPA) National Pollutant Discharge Elimination System (NPDES) permit
- State of Illinois Title 35, Subtitle B, Part 200 Series – Air Pollution
- State of Illinois Title 35, Subtitle C, Part 300 Series – Water Pollution
- Illinois Environmental Protection Agency (IEPA) Air Discharge Construction and/or Operation permit requirements for discharge of treated soil vapor
- IEPA Water Discharge permit requirements for discharge of treated groundwater to local surface water drainage channels
- Licensed landfill approval for acceptance of waste soil generated during system installation (or requirements for on-site disposal at the Area 9 Repository)

- Local Soil Erosion and Sedimentation and/or Runoff Permits
- Local Construction and Electrical Permits for Treatment System Construction/Installation

7.6.1 Water Discharge

The treated water discharged from the groundwater remediation systems at Sites 32/33 must comply with surface water quality criteria that would be applicable under a NPDES discharge permit. Specific water quality criteria currently exist for the CONWR site (included in Appendix S). Treatment system process details, expected discharge quantities, and expected influent/effluent concentrations will be submitted to the USEPA and the IEPA to identify the appropriate water quality standards for final design.

7.6.2 Air Discharge

Based on discussions with the IEPA Bureau of Air, construction and operational air permits would not be required for treated air discharge from the SVE and MPE systems. Upon initiation of the final design, the USEPA and the IEPA will be contacted and requested to provide the appropriate discharge limits and monitoring criteria.

7.6.3 Waste Materials

Construction and operation of the remediation systems will generate waste materials that will require appropriate disposal. If waste materials are to be disposed off-site, a licensed, permitted waste disposal facility and transportation company will be used to provide these services. Proper disposal will include characterizing the generated waste, and, if disposing off-site, completing waste profile sheets provided by the disposal facility.

7.6.4 Miscellaneous Permits

Local permits that may be pertinent to the construction include building permits, electrical permits, and possibly soil erosion/storm water permits. The design of the remediation facilities will comply with the substantive requirements of all pertinent local codes and permits.

7.7 Waste Generation and Disposal Considerations

During the course of constructing and operating the remedial action, one-time and recurring waste materials will be generated. These wastes will consist of the following:

- Impacted and unimpacted soil from construction of buildings, well installations and utility trenching
- Potentially impacted wastewater from well development and decontamination
- Spent (used) granular activated carbon from the groundwater and air treatment processes
- Solids removed from the groundwater during treatment

Disposal considerations must be addressed for these waste materials.

Currently, it is anticipated that the wastewater produced during construction will be temporarily stored on-site and treated by the treatment system to be installed at the existing Wastewater Treatment Building. Prior to disposal of soil or other waste solids, characterization testing will be performed on the materials. The characterization results will be used to determine if the materials must be disposed at an off-site hazardous waste facility, or if off-site disposal as a nonhazardous waste is acceptable.

The spent carbon from the groundwater and air treatment vessels will be evaluated based on its loading (adsorbed contaminants) concentrations and constituents. The spent carbon will either be regenerated or disposed at an off-site location, depending on the initial loading evaluation and possible laboratory characterization testing results. Should off-site disposal for any waste stream be required, appropriate licensed transportation companies and licensed, permitted disposal facilities will be utilized.

Section 8
Design Criteria for Phytoremediation

8.1 Existing Conditions

8.1.1 Groundwater

Depth below ground surface, quality (i.e., pH, salinity), and contaminant concentrations are important groundwater considerations for any phytoremediation system. Based on historical (1995-2000) groundwater elevation data and observations from test pits excavated on September 13, 2000, the three proposed phytoremediation areas are characterized as follows:

East Swale Area

Since the nearest relevant monitoring well to the East Swale lies approximately 160 feet west of the swale, no historical depth-to-groundwater information exists for this area. A test pit dug on September 13, 2000, revealed groundwater at 6.2 feet bgs. This depth is greater than expected, since the surface grade at this location lies only 2-3 feet above the East Swale grade. Monitoring well 33MWC-39, which is just west of this test pit, has historical groundwater depths of 9 to 12 feet bgs, which is consistent with the water table elevation observed in the test pit, given the rise in topography at 33MWC-39. Groundwater and surface water quality for this area are suitable for vegetative uptake.

Center Swale Area

Depth to groundwater at the low point of this swale typically resides between 0.1 and 1 foot bgs. Monitoring well 33MWC-18, which is near the swale low point, has historical groundwater depths of 2 to 6 feet bgs. Groundwater and surface water quality for this area are suitable for vegetative uptake.

West Swale Area

As expected, depth to groundwater increases with distance from the lake. Groundwater typically fluctuates between 2 to 5 feet bgs at 200 feet south of the lake (33MWC-30 and 33MWC-31), and 5 to 11 feet bgs at 500 feet south of the lake (33MWC-08). Groundwater and surface water quality for this area are suitable for vegetative uptake.

8.1.2 Soil

Seven soil samples were composited from 21 Geoprobe® borings in October 2000; an eighth sample was collected using hand methods. The samples were taken from the East Swale, Center Swale, and West Swale areas as composite samples (0-4 feet bgs) and analyzed for 20 agronomic characteristics. The analytical results are provided in Table 8-1, Phytoremediation Soil Sample Results, and are summarized as follows:

- The soil pH is conducive for plant growth for four of the eight samples, ranging from 7.0 to 7.4. The other four samples have low (5.5-6.4) or very low (< 5.5) pH values. When taking into account the buffer pH, however, only two samples indicate a pH concern (West Swale area, southwest and northeast transects). Lime should be added to these areas shortly before tree planting to raise the pH to more acceptable levels.
- Based on particle size sieve analysis, the soil at the site is characterized as a silty loam. Silty loam soil has excellent water-holding capacity and is generally conducive to plant rooting.
- The soil organic matter content is low for seven of the eight samples, ranging from 1.1-1.3 percent. The addition of organic-rich biosolids or compost would increase the organic matter in the soil and thus improve soil fertility and further improve the water-holding capacity.
- The soil is deficient in the macro-nutrients nitrogen, phosphorus, and potassium. NPK fertilizer should be applied at the site at the loading rate of 120 lbs N, 150 lbs P_2O_5, and 300 lbs of K_2O per acre.
- The micronutrients chloride, zinc, copper, and boron are deficient. A chloride fertilizer application at a loading rate of 35 lbs/acre is recommended. Zinc, copper, and boron should be augmented by the application of biosolids or compost.
- Magnesium concentrations are very high for five samples, while sulfur concentrations are very high for six samples. Since the total soil salinity is low, however, these elements are not expected to adversely impact tree health.

8.2 Phytoremediation Remedial Objectives

The remedial objectives of the phytoremediation system are as follows:

- Reduce the mass of contaminated groundwater and chlorinated VOCs (CVOCs) discharged to the lake by slowing down or reversing shallow groundwater flow toward the swales and the lake.
- Accomplish the objective above while creating an ecosystem that complements the site's function as a wildlife preserve.

8.3 Preliminary Layout and Design

8.3.1 Design Overview

The design is expected to address three distinct areas: the East Swale, Center Swale, and West Swale areas. Tree planting should be performed in areas where groundwater is typically deep enough to support vegetative growth, but shallow enough to allow for groundwater interception by roots. Since the tree roots require oxygen and should grow to 2 feet in depth to prevent wind throw (tree toppling during wind storms), the trees should not be planted in areas where groundwater is consistently less than 2 feet bgs. However, trees can be planted in areas that experience periodic fluctuations to depths of less than 2 feet, including flooding conditions. Although specialized techniques, such as auguring, air injection, and deep trenchers can be employed to encourage rooting into deep (>10 feet) groundwater, these techniques are more expensive than traditional methods. An effective but less-expensive planting method is to use modified industrial trenchers to plant trees in trenches up to 6 feet deep. Thus, the phytoremediation system at Sites 32/33 should be (and can be) focused on areas where the groundwater table is typically 2 to 6 feet bgs.

Phreatophytic trees, including cottonwood, poplar, and willow, are the recommended phytoremediation tools for this site because of their high water uptake rates, rapid growth rates, deep rooting potential, ease of planting, regrowth from the cut stump, ability to uptake near-surface groundwater, and survival mechanisms for temporary flooding conditions. Native eastern cottonwoods (*Populus deltoides*) or the DN-34 (*deltoides x nigra*) hybrid poplar, which is a cross between an eastern cottonwood and a black cottonwood, are recommended as the primary plants for this site, depending on the availability of planting stock in the required sizes (expected to be 6 to 10 feet tall rooted stock). These species have a proven performance record for a number of TCE and other organic contaminant research and field sites (Burken and Schnoor, 1998 and Lee et al., 2000), have demonstrated rapid growth rates and drought/disease/pest resistance (Vose et al., 2000), are recommended by nursery and forestry professionals for poplar planting in the Midwest (Dickmann and Isebrands, 1999), and can have lifespans of over 50 years (Isebrands, 2000). A potential planting plan for the site could consist of 80% eastern cottonwood or poplar, 10% native willow, and 10% other (nut-bearing trees for wildlife diversity, birch, flowering crab, maple, etc.).

The following sections describe how phytoremediation will be implemented in each of three areas: the East Swale, Center Swale, and West Swale areas.

8.3.2 East Swale Area

This area is located between the East Swale and the Center Swale (Figure 8-1). Trees will be planted where groundwater normally occurs at 2 to 6 feet bgs. The north-south-oriented knoll that divides this area provides sufficient relief in the center, which limits planting to its lowest areas at the edges. At each of the two edges, up to four rows of trees (based on groundwater elevation data), approximately 570 feet long, will be planted. Trees will be planted 5 feet apart in each of eight total rows. The rows will be spaced 10 feet apart. Approximately 900 trees will be planted in the East Swale area.

8.3.3 Center Swale Area

This area is located at the toe of the eastern slope of the Area 9 Repository (Figure 8-1). The specific purpose of the trees in this area is to intercept water that may be seeping from beneath the Repository and into the Center Swale. The slope at the toe of the Repository is relatively steep, and the quickly increasing depth to groundwater limits the number of rows in this area to one or two. Also due to the slope, the trees may have to be planted using manual methods. The trees will be planted 5 feet apart in up to two 700 foot long rows that will be spaced 8 to 10 feet apart. Approximately 280 trees will be planted in the Center Swale area.

8.3.4 West Swale Area

This area is located generally in the area between monitoring wells 33MWC-08 and 33MWC-30 (Figure 8-1). It is bounded to the west by an existing tree line and to the east by existing trees and large aboveground tanks. The targeted area measures approximately 100 feet by 220 feet. Based on these dimensions, 10 rows of trees will be planted 5 feet apart in rows spaced 10 feet apart. Approximately 440 trees will be planted in the West Swale area.

Aerial topography data and historical groundwater elevation data will be used in the design phase to more accurately determine where the depth to groundwater normally ranges 2 to 6 feet below ground surface. Water balance calculations will be performed in one or more of the areas to predict water uptake potential by the trees. This additional information will be used to refine the design in each of the three areas.

Section 9
Schedule

An estimated schedule for key events and submittals from the present into the construction phase for the remedial action is presented in Table 9-1. An estimated schedule for completion of construction is not shown, since the construction duration will be affected by the time of year that site work commences, and several other factors that cannot currently be resolved.

Section 10
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TABLES

Table 3-1
Summary of Soil Borings Installed

BORING NUMBER	BORING DEPTH (ft, bgs)	TOTAL NUMBER OF LABORATORY SAMPLES
Building I-1-2 Area		
SB-100	24	4
SB-101	28	3
SB-102	30	7
SB-103	31	3
SB-104	29.5	4
SB-105	31	3
SB-106	29.5	6
SB-107	28	3
SB-108	27.5	4
SB-109	26	4
SB-120	31.5	4
SB-122	28.5	3
SB-123	29	4
SB-124	35.5	3
SB-125	37.5	4
SB-133	30	3
SB-134	30	4
Building I-1-3 Area		
SB-110	24	3
SB-111	24	3
SB-112	28	4
SB-113	28	4
SB-114	40	5
SB-115	47.5	7
SB-116	20	4
SB-117	28	3
SB-118	28	3
SB-119	37.5	5
SB-121	36	4
SB-126	47.5	5
SB-127	46.5	5
SB-128	48	4
SB-129	44	4
SB-130	47	5
SB-131	48	4
SB-132	43	4
Building I-1-23 Area		
SB-200	36	3
SB-201	47	6
SB-202	37	3
SB-203	37	4
SB-204	44	3
SB-205	37	3
SB-206	47	5
SB-207	37	3
SB-208	37	3
SB-209	37	3
SB-210	46	5
SB-211	37	3
SB-212	46	3
SB-213	46	3
SB-214	45	3
SB-215	44	4

Table 3-1 (Continued)
Summary of Soil Borings Installed

BORING NUMBER	BORING DEPTH (ft, bgs)	TOTAL NUMBER OF LABORATORY SAMPLES
SB-216	32	3
SB-217	45	4
SB-218	48	4
Building I-1-36A Area		
SB-300	44	3
SB-301	49	5
SB-302	49	4
SB-303	44	4
SB-304	48	4
SB-305	44	4
SB-306	48	4
SB-307	40	3
SB-308	36	4
Area 9 Repository		
SB-400	32	3
SB-401	32	3
SB-402	28	3
SB-403	44	3
SB-404	30	3
SB-405	48	3
SB-406	36	3
SB-407	48	3
SB-408	48	3
SB-409	60	5
SB-410	48	3
SB-411	52	4
SB-412	44	3
SB-413	44	3
SB-414	48	4
SB-415	52	4
SB-416	56	3
SB-417	44	4
SB-418	52	5
SB-419	52	4
SB-420	48	4
SB-421	48	3
SB-422	52	5
SB-423	52	4
South Side of Repository		
SB-500	32	4
SB-502	36	3
SB-503	36	3
SB-504	36	3
SB-505	36	4
SB-506	36	4

Table 3-2
Groundwater Monitoring Well and Staff Gauge Information

WELL NAME	WELL LOCATION	N	S	E	W	DATE ESTABLISHED	WELL CASING DIAM.	WELL CASING TYPE	ELEVATIONS TOP OF WELL CASING	ELEVATIONS GROUND SURFACE	REFERENCE M.S.L. (x)	REFERENCE SITE DATUM (x)	SCREEN LENGTH & TYPE (ft)	WELL DEPTH[1] (ft bgs)	TYPE OF WELL PZ	TYPE OF WELL OW	TYPE OF WELL OTHER	ABAN-DONED (Y/N)	INSTALLED BY
32-061	ORIG. ID =					Late 1983	2"	PVC	414.94	412.8	X		5'	30.5				Y	Ecology &
	"COW-3"																		Environment, Inc.
32-062	ORIG. ID =					Late 1983	2"	PVC	410.49	408.5	X		5'	35.5				Y	Ecology &
	"COW-2"																		Environment, Inc.
COW-01						Late 9183	2"	PVC					5'	29				Y	Ecology &
													316 SS						Environment, Inc.
32-063	373854.38	X				Unknown	2"	PVC	417.88	414.35	X		5'	15		X		N	O'Brien &
	787092.57			X									316 SS						Gere
32-109						Unknown	2"	PVC	411.01	407.8	X		5'	15		X		Y	O'Brien &
													316 SS						Gere
32-110						Unknown	2"	PVC	410.89	407.6	X		5'	82.5	X			Y	O'Brien &
													316 SS						Gere
33-340	373824.47	X				Unknown	2"	PVC	425.86	423.57	X		5'	15		X		N	O'Brien &
	786402.31			X									316 SS						Gere
33-341	371803.49	X				Unknown	2"	PVC	428.16	423.5	X		5'	14		X		N	O'Brien &
	787356.90			X									316 SS						Gere
33-342	371168.05	X				Unknown	2"	PVC	431.69	427.28	X		5'	20		X		N	O'Brien &
	787154.53			X									316 SS						Gere
33MWC-01	370581.41	X				01/19/95	2"	PVC	430.88	428.17	X		15'	19		X		N	IT Corp
	787786.35			X									SS	(20)					
33MWC-02	372015.19	X				01/21/95	2"	PVC	423.87	421.54	X		15'	19		X		N	IT Corp
	787849.98			X									SS	(20)					
33MWC-03	371558.32	X				01/20/95	2"	PVC	428.40	426.31	X		15'	20.5		X		N	IT Corp
	786495.65			X									SS	(23)					
33MWC-04	373897.67	X				01/22/95	2"	PVC	423.11	NA	X		15'	19		X		Y	IT Corp
	787557.74			X									SS	(23)					
33MWC-05	373306.96	X				01/20/95	2"	PVC	423.39	420.95	X		15'	19		X		N	IT Corp
	785512.47			X									SS	(22)					
33MWC-06	374547.19	X				01/21/95	2"	PVC	420.86	418.48	X		15'	19		X		N	IT Corp
	785837.75			X									SS	(20)					
33MWC-07	374000.18	X				08/25/97	2"	316 SS	424.00	421.21	X		15'	24.5		X		N	FDGTI
	786399.15			X									316 SS	(25)					
33MWC-08	374814.44	X				08/13/97	2"	316 SS	416.46	413.84	X		10'	20.8		X		N	FDGTI
	786151.51			X									316 SS	(24)					
33MWC-09	374284.51	X				08/23/97	2"	316 SS	434.29	431.72**	X		15'	42.2		X		N	FDGTI
	787249.81			X									316 SS	(45)					
33MWC-10	372585.02	X				08/14/97	2"	316 SS	425.40	422.73	X		15'	24.2		X		N	FDGTI
	787367.76			X									316 SS	(26)					
33MWC-11	370879.00	X				08/19/97	2"	316 SS	424.94	422.43	X		15'	19		X		N	FDGTI
	786550.57			X									316 SS	(21)					
33MWC-12	371711.42	X				08/18/97	2"	316 SS	428.86	426.33	X		15'	19.9		X		N	FDGTI
	786253.61			X									316 SS	(21)					

Table 3-2 (Continued)
Groundwater Monitoring Well and Staff Gauge Information

WELL NAME	WELL LOCATION	N	S	E	W	DATE ESTABLISHED	WELL CASING DIAM.	WELL CASING TYPE	ELEVATIONS TOP OF WELL CASING	ELEVATIONS GROUND SURFACE	REFERENCE M.S.L. (x)	REFERENCE SITE DATUM (x)	SCREEN LENGTH & TYPE (ft)	WELL DEPTH[1] (ft bgs)	TYPE OF WELL PZ	TYPE OF WELL OW	TYPE OF WELL OTHER	ABAN-DONED (Y/N)	INSTALLED BY
33MWC-13	371380.31	X				08/22/97	2"	316 SS	428.94	426.91	X		15'	19.9		X		N	FDGTI
	787485.95			X									316 SS	(21)					
33MWC-14	371603.59	X				08/21/97	2"	316 SS	428.74	426.11	X		15'	24.7		X		N	FDGTI
	787323.99			X									316 SS	(25.2)					
33MWC-15	373114.74	X				08/15/97	2"	316 SS	416.76	414.60	X		15'	28		X		N	FDGTI
	787897.86			X									316 SS	(29)					
33MWC-16	374096.51	X				08/25/97	2"	316 SS	423.38	421.37**	X		15'	24.5		X		N	FDGTI
	786264.33			X									316 SS	(25)					
33MWC-17	374288.08	X				09/10/97	2"	316 SS	417.67	414.87	X		15'	20.2		X		N	FDGTI
	787477.70			X									316 SS	(21)					
33MWC-18	374568.04	X				09/09/97	2"	316 SS	408.21	405.6	X		15'	20		X		N	FDGTI
	787313.83			X									316 SS	(21)					
33MWC-19	374772.80	X				09/09/97	2"	316 SS	408.59	405.72	X		15'	20		X		N	FDGTI
	787149.92			X									316 SS	(21)					
33MWC-20	374805.82	X				09/10/97	2"	316 SS	417.8	414.78	X		15'	20		X		N	FDGTI
	786824.51			X									316 SS	(21)					
33MWC-21	374011.46	X				06/09/98	2"	316 SS	424.04	421.41**	X		10'	38	X		Upper	N	FDGTI
	786377.84			X									316 SS	(39.5)			sand		
33MWC-22	374002.53	X				06/16/98	2"	316 SS	424.23	421.46**	X		5'	49	X		Lower	N	FDGTI
	786382.44			X									316 SS				clay		
33MWC-23	373994.46	X				06/12/98	2"	316 SS	423.52	420.71	X		10'	102	X		Lower	N	FDGTI
	786387.83			X									316 SS	(103)			sand		
33MWC-24	371398.21	X				06/04/98	2"	316 SS	428.72	426.62	X		5'	28	X		Upper	N	FDGTI
	787482.67			X									316 SS	(35)			sand		
33MWC-27	374304.20	X				06/17/98	2"	316 SS	433.29	430.28	X		5'	48	X		Upper	N	FDGTI
	787252.48			X									316 SS				sand		
33MWC-28	374296.27	X				06/18/98	2"	316 SS	433.44	430.38	X		5'	60.5	X		Lower	N	FDGTI
	787256.81			X									316 SS				clay		
33MWC-29	374287.31	X				06/04/98	2"	316 SS	433.11	431.22**	X		10'	104	X		Lower	N	FDGTI
	787261.56			X									316 SS				sand		
33MWC-30	375162.59	X				06/09/98	2"	316 SS	408.78	406.46**	X		10'	25.5	X		Upper	N	FDGTI
	786004.34			X									316 SS	(26.5)			sand		
33MWC-31	375161.53	X				06/16/98	2"	316 SS	408.69	405.34	X		10'	45	X		Lower	N	FDGTI
	785994.11			X									316 SS				clay		
33MWC-32	375160.31	X				06/15/98	2"	316 SS	408.79	405.54	X		10'	81	X		Lower	N	FDGTI
	785984.58			X									316 SS	(82)			sand		
33MWC-33	371754.44	X				06/10/98	2"	316 SS	428.5	425.57	X		10'	39.5	X		Upper	N	FDGTI
	786216.27			X									316 SS	(41)			sand		
33MWC-35	371741.16	X				06/17/98	2"	316 SS	428.76	425.64	X		5'	80	X		Lower	N	FDGTI
	786195.20			X									316 SS				sand		
33MWC-36	371966.88	X				06/16/98	2"	316 SS	423.05	419.91	X		5'	30	X		Upper	N	FDGTI
	787971.30			X									316 SS	(30.5)			sand		

Table 3-2 (Continued)
Groundwater Monitoring Well and Staff Gauge Information

WELL NAME	WELL LOCATION	N	S	E	W	DATE ESTABLISHED	WELL CASING DIAM.	WELL CASING TYPE	ELEVATIONS TOP OF WELL CASING	ELEVATIONS GROUND SURFACE	REFERENCE M.S.L. (x)	REFERENCE SITE DATUM (x)	SCREEN LENGTH & TYPE (ft)	WELL DEPTH[1] (ft bgs)	TYPE OF WELL PZ	TYPE OF WELL OW	TYPE OF WELL OTHER	ABAN-DONED (Y/N)	INSTALLED BY
33MWC-39	374525.06	X				06/11/98	2"	316 SS	416.02	413.28	X		10' 316 SS	31 (32)	X		Upper sand	N	FDGTI
	787542.05			X															
33MWC-41	374545.52	X				06/14/98	2"	316 SS	416.15	413.10	X		10' 316 SS	95	X		Lower sand	N	FDGTI
	787537.87			X															
33MWC-42	374372.25	X				10/12/00	2"	316 SS	412.99	410.05	X		10' 316 SS	14 (14.2)		X	Upper clay	N	RMT, Inc.
	787924.45			X															
33MWC-43	374370.37	X				10/11/00	2"	316 SS	412.54	409.97	X		5' 316 SS	22.8 (26)	X		Upper sand	N	RMT, Inc.
	787921.23			X															
33MWC-44	371682.48	X				10/11/00	2"	316 SS	414.67	411.82	X		15' 316 SS	20.2 (21)		X	Upper clay	N	RMT, Inc.
	785201.93			X															
33MWC-45	371677.82	X				10/10/00	2"	316 SS	413.95	411.47	X		5' 316 SS	37.8 (46)	X		Upper sand	N	RMT, Inc.
	785202.80			X															
33MWC-46	373608.70	X				10/13/00	2"	316 SS	419.84	417.65	X		15' 316 SS	20 (20.3)		X	Upper clay	N	RMT, Inc.
	787291.07			X															
33MWC-47	373606.29	X				10/13/00	2"	316 SS	419.78	417.69	X		5' 316 SS	33.8 (34.2)	X		Upper sand	N	RMT, Inc.
	787289.86			X															
33MWC-48	373531.85	X				10/14/00	2"	316 SS	423.55	420.5	X		15' 316 SS	20 (20.5)		X	Upper clay	N	RMT, Inc.
	786830.53			X															
33MWC-49	373535.48	X				10/14/00	2"	316 SS	423.48	420.44	X		5' 316 SS	34.1 (36)	X		Upper sand	N	RMT, Inc.
	786826.92			X															
33SG-01	373400.72	X				07/16/98	NA	NA	413.97***	NA	X		NA	NA			Staff Gauge	Y	FDGTI
	786980.31			X															
33SG-02	373884.01	X				07/16/98	NA	NA	411.01***	NA	X		NA	NA			Staff Gauge	Y	FDGTI
	787215.29			X															
33SG-03	375222.02	X				07/16/98	NA	NA	405.23***	NA	X		NA	NA			Staff Gauge	Y	FDGTI
	785991.26			X															
33SG-04	371559.91	X				07/16/98	NA	NA	407.89***	NA	X		NA	NA			Staff Gauge	Y	FDGTI
	784981.07			X															
SG-01	373399.80	X				10/16/00	NA	NA	413.07***	NA	X		NA	NA			Staff Gauge	N	RMT, Inc.
	786979.23			X															
SG-02	373906.62	X				10/16/00	NA	NA	410.01***	NA	X		NA	NA			Staff Gauge	N	RMT, Inc.
	787269.99			X															
SG-03	375259.23	X				10/16/00	NA	NA	403.83***	NA	X		NA	NA			Staff Gauge	N	RMT, Inc.
	785973.48			X															
SG-04	371561.34	X				10/16/00	NA	NA	407.32***	NA	X		NA	NA			Staff Gauge	N	RMT, Inc.
	784981.87			X															
SG-05	371442.20	X				10/16/00	NA	NA	412.87***	NA	X		NA	NA			Staff Gauge	N	RMT, Inc.
	786145.25			X															
SG-06	374547.34	X				10/16/00	NA	NA	405.36***	NA	X		NA	NA			Staff Gauge	N	RMT, Inc.
	787324.48			X															

Table 3-2 (Continued)
Groundwater Monitoring Well and Staff Gauge Information

WELL NAME	WELL LOCATION	N	S	E	W	DATE ESTABLISHED	WELL CASING DIAM.	WELL CASING TYPE	ELEVATIONS TOP OF WELL CASING	ELEVATIONS GROUND SURFACE	REFERENCE M.S.L. (x)	REFERENCE SITE DATUM (x)	SCREEN LENGTH & TYPE (ft)	WELL DEPTH[1] (ft bgs)	TYPE OF WELL PZ	TYPE OF WELL OW	TYPE OF WELL OTHER	ABAN-DONED (Y/N)	INSTALLED BY
SG-07	374344.80	X				10/16/00	NA	NA	404.78***	NA	X		NA	NA			Staff	N	RMT, Inc.
	787781.47			X													Gauge		
SG-08	373145.61	X				10/16/00	NA	NA	409.73***	NA	X		NA	NA			Staff	N	RMT, Inc.
	787842.46			X													Gauge		

Notes:

(1) Value in parentheses is the total boring depth.

* 33-340 was resurveyed in August 1998. 1st GS elevation listed is original survey. 2nd elevation is the elevation of the brass monument in the concrete pad.

** Elevation of brass monument in concrete pad.

*** Staff gauge reference elevations represent the elevation of the 0-foot mark on the staff gauge.

NA = not applicable.

Top-of-casing elevations for all site monitoring wells were resurveyed in October and November 2000. This table contains the most recent survey information available.

A total of 46 monitoring wells exist at sites 32/33 as of November 2000.

No entry indicates that information is not available or does not exist.

Prepared by: MLW 10/30/98
Checked by: PMC 1/27/99
Updated by: MLW 2/6/01

Table 3-3
Summary of Groundwater and Surface Water Elevation Data

WELL OR STAFF GAUGE	GROUND SURFACE ELEVATION (ft, M.S.L.)	REFERENCE ELEVATION (ft, M.S.L.)	DATE	DEPTH TO WATER[6] (ft)	GROUNDWATER ELEVATION (ft, M.S.L.)	UNIT SCREENED
Monitoring Wells						
32-063	415.9	415.9 [1]	17-Dec-86	2.9 [1]	413.0	Upper Clay(?)
			21-Jan-87	2.0 [1]	413.9	
		418.93	19-Jun-87	9.56	409.37	
			17-Sep-92	11.32	407.61	
			26-Mar-93	3.81	415.12	
			13-Jul-93	8.87	410.06	
			13-Sep-93	10.21	408.72	
			29-Jan-94	3.55	415.38	
			28-Feb-94	3.91	415.02	
			29-Mar-94	3.79	415.14	
			5-May-94	4.11	414.82	
			2-Jun-94	7.45	411.48	
			11-Jul-94	10.42	408.51	
			17-Aug-94	3.48	415.45	
			12-Sep-94	6.68	412.25	
			3-Oct-94	11.42	407.51	
			1-Nov-94	6.78	412.15	
			3-Jan-95	4.12	414.81	
			9-Feb-95	4.35	414.58	
			9-Apr-96	4.28	414.65	
			19-Apr-96	4.31	414.62	
			16-Sep-97	8.80	410.13	
			Aug-98	5.95	412.98	
			6-Dec-98	8.44	410.49	
			16-Jun-99	6.42	412.51	
			10-Jan-00	9.30	409.63	
	414.35	417.88	30-Oct-00	10.10	407.78	
33-340	424.9	424.9 [1]	17-Dec-86	6.9 [1]	418.0	Upper Clay(?)
			21-Jan-87	8.3 [1]	416.6	
		428.17	19-Jun-87	14.08	414.09	
			24-Mar-93	8.74	419.43	
			13-Jul-93	12.17	416.00	
			15-Sep-93	13.92	414.25	
			27-Jan-94	8.50	419.67	
			28-Feb-94	8.51	419.66	
			29-Mar-94	8.76	419.41	
			5-May-94	8.28	419.89	
			2-Jun-94	8.51	419.66	
			11-Jul-94	13.83	414.34	
			17-Aug-94	15.62	412.55	
			12-Sep-94	16.00	412.17	
			3-Oct-94	16.32	411.85	
			1-Nov-94	12.41	415.76	
			3-Jan-95	10.20	417.97	
			9-Feb-95	10.32	417.85	
			9-Apr-96	10.30[3]	417.99[3]	
			19-Apr-96	11.12	417.05	
			16-Sep-97	16.20	411.97	
		[2]	Aug-98	NM	NM	
		426.86 [2]	6-Dec-98	15.22	411.64	
			16-Jun-99	11.19	415.67	
			10-Jan-00	15.99	410.87	
	423.57	425.86	30-Oct-00	16.03	409.83	

Table 3-3 (Continued)
Summary of Groundwater and Surface Water Elevation Data

WELL OR STAFF GAUGE	GROUND SURFACE ELEVATION (ft, M.S.L.)	REFERENCE ELEVATION (ft, M.S.L.)	DATE	DEPTH TO WATER[6] (ft)	GROUNDWATER ELEVATION (ft, M.S.L.)	UNIT SCREENED
33-341	425.9	425.9 [1]	15-Dec-86	1.2 [1]	424.7	Upper Clay(?)
			21-Jan-87	0.8 [1]	425.1	
		429.31	19-Jun-87	6.23	423.08	
			24-Mar-93	3.15	426.16	
			13-Jul-93	5.30	424.01	
			15-Sep-93	7.02	422.29	
			27-Jan-94	3.41	425.90	
			28-Feb-94	3.51	425.80	
			29-Mar-94	3.47	425.84	
			5-May-94	3.47	425.84	
			2-Jun-94	4.49	424.82	
			11-Jul-94	6.70	422.61	
			17-Aug-94	6.64	422.67	
			12-Sep-94	6.12	423.19	
			3-Oct-94	9.64	419.67	
			1-Nov-94	5.54	423.77	
			3-Jan-95	3.64	425.67	
			9-Feb-95	3.69	425.62	
			9-Apr-96	3.88	425.43	
			19-Apr-96	3.88	425.43	
			16-Sep-97	10.10	419.21	
			Aug-98	7.90	421.41	
			6-Dec-98	11.32	417.99	
			16-Jun-99	7.14	422.17	
			10-Jan-00	14.09	415.22	
	423.50	428.16	30-Oct-00	12.55	415.61	
33-342	429.6	429.6 [1]	15-Dec-86	6.6 [1]	423.0	Upper Clay(?)
			21-Jan-87	6.4 [1]	423.2	
		432.81	19-Jun-87	12.42	420.39	
			24-Mar-93	8.59	424.22	
			13-Jul-93	7.78	425.03	
			15-Sep-93	11.74	421.07	
			27-Jan-94	7.79	425.02	
			28-Feb-94	8.38	424.43	
			29-Mar-94	8.36	424.45	
			5-May-94	8.27	424.54	
			2-Jun-94	11.00	421.81	
			11-Jul-94	13.27	419.54	
			17-Aug-94	14.96	417.85	
			12-Sep-94	15.90	416.91	
			3-Oct-94	16.28	416.53	
			1-Nov-94	10.42	422.39	
			3-Jan-95	9.03	423.78	
			9-Feb-95	9.15	423.66	
			9-Apr-96	9.17[3]	422.85[3]	
			19-Apr-96	9.22[3]	422.80[3]	
			16-Sep-97	14.25	418.56	
			Aug-98	11.70	421.11	
			6-Dec-98	14.15	418.66	
			16-Jun-99	10.42	422.39	
			10-Jan-00	14.92	417.89	
	427.28	431.69	30-Oct-00	16.91	414.78	

Table 3-3 (Continued)
Summary of Groundwater and Surface Water Elevation Data

WELL OR STAFF GAUGE	GROUND SURFACE ELEVATION (ft, M.S.L.)	REFERENCE ELEVATION (ft, M.S.L.)	DATE	DEPTH TO WATER[6] (ft)	GROUNDWATER ELEVATION (ft, M.S.L.)	UNIT SCREENED
33MWC-01	NA	432.02	3-Jan-95	8.41	423.61	Upper Clay
			9-Feb-95	8.40	423.62	
			9-Apr-96	6.54	425.48	
			19-Apr-96	8.15	423.87	
			16-Sep-97	13.20	418.82	
			Aug-98	10.16	421.86	
			6-Dec-98	13.10	418.92	
			16-Jun-99	8.32	423.70	
			10-Jan-00	14.74	417.28	
	428.17	430.88	30-Oct-00	NM	NM	
33MWC-02	NA	424.86	3-Jan-95	3.03	421.83	Upper Clay
			9-Feb-95	3.16	421.70	
			9-Apr-96	3.88	420.98	
			19-Apr-96	3.73	421.13	
			16-Sep-97	10.75	414.11	
			Aug-98	3.84	421.02	
			6-Dec-98	9.78	415.08	
			16-Jun-99	5.82	419.04	
			10-Jan-00	9.41	415.45	
	421.54	423.87	30-Oct-00	11.83	412.04	
33MWC-03	NA	429.50	3-Jan-95	10.32	419.18	Upper Clay/ Upper Sand
			9-Feb-95	10.37	419.13	
			9-Apr-96	9.61	419.89	
			19-Apr-96	9.64	419.86	
			16-Sep-97	15.30	414.20	
			Aug-98	12.30	417.20	
			6-Dec-98	15.58	413.92	
			16-Jun-99	10.85	418.65	
			10-Jan-00	16.44	413.06	
	426.31	428.40	30-Oct-00	17.63	410.77	
33MWC-05	NA	424.39	3-Jan-95	6.77	417.62	Upper Clay
			9-Feb-95	3.81	420.58	
			9-Apr-96	5.95	418.44	
			19-Apr-96	5.96	418.43	
			16-Sep-97	13.20	411.19	
			Aug-98	9.25	415.14	
			6-Dec-98	12.38	412.01	
			16-Jun-99	8.15	416.24	
			10-Jan-00	11.84	412.55	
	420.95	423.39	30-Oct-00	NM	NM	
33MWC-06	NA	421.70	3-Jan-95	7.96	413.74	Upper Clay
			9-Feb-95	8.16	413.54	
			9-Apr-96	8.48	413.22	
			19-Apr-96	8.76	412.94	
			16-Sep-97	14.80	406.90	
			Aug-98	12.49	409.21	
			6-Dec-98	13.03	408.67	
			16-Jun-99	10.98	410.72	
			10-Jan-00	13.35	408.35	
	418.48	420.86	30-Oct-00	15.51	405.35	

Table 3-3 (Continued)
Summary of Groundwater and Surface Water Elevation Data

WELL OR STAFF GAUGE	GROUND SURFACE ELEVATION (ft, M.S.L.)	REFERENCE ELEVATION (ft, M.S.L.)	DATE	DEPTH TO WATER[6] (ft)	GROUNDWATER ELEVATION (ft, M.S.L.)	UNIT SCREENED
33MWC-07	422.72	424.69	16-Sep-97	13.70	410.99	Upper Clay/ Upper Sand
			Aug-98	10.40	414.29	
			6-Dec-98	13.49	411.20	
			16-Jun-99	9.52	415.17	
			10-Jan-00	14.37	410.32	
	421.21	424.00	30-Oct-00	15.98	408.02	
33MWC-08	415.27	417.27	16-Sep-97	9.45	407.82	Upper Clay/ Upper Sand
			Aug-98	6.91	410.36	
			6-Dec-98	8.46	408.81	
			16-Jun-99	6.14	411.13	
			10-Jan-00	8.79	408.48	
	413.84	416.46	30-Oct-00	10.79	405.67	
33MWC-09	432.58	435.13	16-Sep-97	23.25	411.88	Upper Clay/ Upper Sand
			Aug-98	22.79	412.34	
			6-Dec-98	24.80	410.33	
			16-Jun-99	22.13	413.00	
			10-Jan-00	25.79	409.34	
	431.72	434.29	30-Oct-00	25.98	408.31	
33MWC-10	424.21	426.26	16-Sep-97	15.40	410.86	Upper Clay/ Upper Sand
			Aug-98	6.80	419.46	
			6-Dec-98	14.55	411.71	
			16-Jun-99	9.16	417.10	
			10-Jan-00	15.28	410.98	
	422.73	425.40	30-Oct-00	16.32	409.08	
33MWC-11	424.03	425.95	16-Sep-97	13.10	412.85	Upper Clay/ Upper Sand
			Aug-98	10.13	415.82	
			6-Dec-98	13.07	412.88	
			16-Jun-99	8.82	417.13	
			10-Jan-00	12.52	413.43	
	422.43	424.94	30-Oct-00	15.04	409.90	
33MWC-12	428.05	429.91	16-Sep-97	17.00	412.91	Upper Clay/ Upper Sand
			Aug-98	14.50	415.41	
			6-Dec-98	17.18	412.73	
			16-Jun-99	13.40	416.51	
			10-Jan-00	17.84	412.07	
	426.33	428.86	30-Oct-00	18.98	409.88	
33MWC-13	427.68	429.68	16-Sep-97	9.40	420.28	Upper Clay
			Aug-98	7.30	422.38	
			6-Dec-98	10.38	419.30	
			16-Jun-99	6.56	423.12	
			10-Jan-00	13.08	416.60	
	426.91	428.94	30-Oct-00	11.93	417.01	
33MWC-14	427.58	429.67	16-Sep-97	9.70	419.97	Upper Clay/ Upper Sand
			Aug-98	7.30	422.37	
			6-Dec-98	10.37	419.30	
			16-Jun-99	6.81	422.86	
			10-Jan-00	12.73	416.94	
	426.11	428.74	30-Oct-00	12.16	416.58	
33MWC-15	416.32	417.59	16-Sep-97	7.60	409.99	Upper Clay/ Upper Sand
			Aug-98	4.60[4]	412.89[4]	
			6-Dec-98	6.30	411.29	
			16-Jun-99	3.88	413.71	
			10-Jan-00	7.05	410.54	
	414.60	416.76	30-Oct-00	8.45	408.31	

Table 3-3 (Continued)
Summary of Groundwater and Surface Water Elevation Data

WELL OR STAFF GAUGE	GROUND SURFACE ELEVATION (ft, M.S.L.)	REFERENCE ELEVATION (ft, M.S.L.)	DATE	DEPTH TO WATER[6] (ft)	GROUNDWATER ELEVATION (ft, M.S.L.)	UNIT SCREENED
33MWC-16	422.14	424.12	16-Sep-97	13.85	410.27	Upper Clay/ Upper Sand
			Aug-98	10.50	413.62	
			6-Dec-98	13.39	410.73	
			16-Jun-99	9.79	414.33	
			10-Jan-00	14.04	410.08	
	421.37	423.38	30-Oct-00	15.73	407.65	
33MWC-17	416.39	418.43	16-Sep-97	12.15	406.28	Upper Clay
			Aug-98	10.10	408.33	
			6-Dec-98	7.55	410.88	
			16-Jun-99	9.75	408.68	
			10-Jan-00	11.37	407.06	
	414.87	417.67	30-Oct-00	12.28	405.39	
33MWC-18	406.91	408.96	16-Sep-97	4.58	404.38	Upper Clay/ Upper Sand
			Aug-98	1.51	407.45	
			6-Dec-98	4.05	404.91	
			16-Jun-99	3.35	405.61	
			10-Jan-00	4.20	404.76	
	405.55	408.21	30-Oct-00	6.31	401.90	
33MWC-19	407.38	409.43	16-Sep-97	2.75	406.68	Upper Clay
			Aug-98	1.33	408.10	
			6-Dec-98	4.80	404.63	
			16-Jun-99	3.34	406.09	
			10-Jan-00	3.81	405.62	
	405.72	408.59	30-Oct-00	6.52	402.07	
33MWC-20	416.45	418.55	16-Sep-97	9.70	408.85	Upper Clay/ Upper Sand
			Aug-98	7.61	410.94	
			6-Dec-98	12.81	405.74	
			16-Jun-99	9.44	409.11	
			10-Jan-00	13.42	405.13	
	414.78	417.80	30-Oct-00	13.11	404.69	
33MWC-21	422.51	425.11	Aug-98	10.70	414.41	Upper Sand
			6-Dec-98	13.53	411.58	
			16-Jun-99	9.74	415.37	
			10-Jan-00	14.48	410.63	
	421.41	424.04	30-Oct-00	15.98	408.06	
33MWC-22	422.56	425.26	Aug-98	10.80	414.46	Lower Clay
			6-Dec-98	13.90	411.36	
			16-Jun-99	9.97	415.29	
			10-Jan-00	14.59	410.67	
	421.46	424.23	30-Oct-00	16.14	408.09	
33MWC-23	422.51	424.68	Aug-98	13.50	411.18	Lower Sand
			6-Dec-98	15.04	409.64	
			16-Jun-99	15.36	409.32	
			10-Jan-00	17.59	407.09	
	420.71	423.52	30-Oct-00	16.98	406.54	
33MWC-24	427.56	429.65	Aug-98	7.10	422.55	Upper Sand
			6-Dec-98	10.21	419.44	
			16-Jun-99	6.24	423.41	
			10-Jan-00	12.95	416.70	
	426.62	428.72	30-Oct-00	11.74	416.98	
33MWC-27	432.00	434.45	Aug-98	22.20	412.25	Upper Sand
			6-Dec-98	24.15	410.30	
			16-Jun-99	21.35	413.10	
			10-Jan-00	25.02	409.43	
	430.28	433.29	30-Oct-00	25.35	407.94	

Table 3-3 (Continued)
Summary of Groundwater and Surface Water Elevation Data

WELL OR STAFF GAUGE	GROUND SURFACE ELEVATION (ft, M.S.L.)	REFERENCE ELEVATION (ft, M.S.L.)	DATE	DEPTH TO WATER[6] (ft)	GROUNDWATER ELEVATION (ft, M.S.L.)	UNIT SCREENED
33MWC-28	432.13	434.59	Aug-98	26.40	408.19	Lower Clay
			6-Dec-98	24.33	410.26	
			16-Jun-99	21.84	412.75	
			10-Jan-00	26.16	408.43	
	430.38	433.44	30-Oct-00	25.14	408.30	
33MWC-29	432.22	434.15	Aug-98	23.30	410.85	Lower Sand
			6-Dec-98	24.56	409.59	
			16-Jun-99	25.13	409.02	
			10-Jan-00	27.19	406.96	
	431.22	433.11	30-Oct-00	26.66	406.45	
33MWC-30	407.44	409.69	Aug-98	2.85	406.84	Upper Sand
			6-Dec-98	3.16	406.53	
			16-Jun-99	2.82	406.87	
			10-Jan-00	3.30	406.39	
	406.46	408.78	30-Oct-00	4.78	404.00	
33MWC-31	407.38	409.86	Aug-98	2.85	407.01	Lower Clay
			6-Dec-98	3.15	406.71	
			16-Jun-99	2.93	406.93	
			10-Jan-00	3.42	406.44	
	405.34	408.69	30-Oct-00	4.57	404.12	
33MWC-32	407.36	409.91	Aug-98	-0.50 (artesian)	410.41	Lower Sand
			6-Dec-98	0.36	409.55	
			16-Jun-99	0.79	409.12	
			10-Jan-00	2.83	407.08	
	405.54	408.79	30-Oct-00	2.38	406.41	
33MWC-33	427.41	429.55	Aug-98	14.10	415.45	Upper Sand
			6-Dec-98	16.85	412.70	
			16-Jun-99	13.10	416.45	
			10-Jan-00	17.57	411.98	
	425.57	428.50	30-Oct-00	18.71	409.79	
33MWC-35	427.25	429.78	Aug-98	17.40	412.38	Lower Sand
			6-Dec-98	19.22	410.56	
			16-Jun-99	18.37	411.41	
			10-Jan-00	21.74	408.04	
	425.64	428.76	30-Oct-00	20.97	407.79	
33MWC-36	421.79	424.13	Aug-98	6.85	417.28	Upper Sand
			6-Dec-98	9.09	415.04	
			16-Jun-99	5.30	418.83	
			10-Jan-00	9.81	414.32	
	419.91	423.05	30-Oct-00	11.19	411.86	
33MWC-39	414.77	417.12	Aug-98	10.40	406.72	Upper Sand
			6-Dec-98	10.39	406.73	
			16-Jun-99	10.24	406.88	
			10-Jan-00	10.66	406.46	
	413.28	416.02	30-Oct-00	11.75	404.27	
33MWC-41	414.61	417.24	Aug-98	6.20	411.04	Lower Sand
			6-Dec-98	7.86	409.38	
			16-Jun-99	8.33	408.91	
			10-Jan-00	10.42	406.82	
	413.10	416.15	30-Oct-00	9.98	406.17	
33MWC-42	410.05	412.99	30-Oct-00	9.12	403.87	Upper Clay
33MWC-43	409.97	412.54	30-Oct-00	8.62	403.92	Upper Sand
33MWC-44	411.82	414.67	30-Oct-00	10.90	403.77	Upper Clay

Table 3-3 (Continued)
Summary of Groundwater and Surface Water Elevation Data

WELL OR STAFF GAUGE	GROUND SURFACE ELEVATION (ft, M.S.L.)	REFERENCE ELEVATION (ft, M.S.L.)	DATE	DEPTH TO WATER[6] (ft)	GROUNDWATER ELEVATION (ft, M.S.L.)	UNIT SCREENED
33MWC-45	411.47	413.95	30-Oct-00	10.77	403.18	Upper Sand
33MWC-46	417.65	419.84	30-Oct-00	12.88	406.96	Upper Clay
33MWC-47	417.69	419.78	30-Oct-00	12.86	406.92	Upper Sand
33MWC-48	420.50	423.55	30-Oct-00	15.55	408.00	Upper Clay
33MWC-49	420.44	423.48	30-Oct-00	15.37	408.11	Upper Sand

Table 3-3 (Continued)
Summary of Groundwater and Surface Water Elevation Data

WELL OR STAFF GAUGE	GROUND SURFACE ELEVATION (ft, M.S.L.)	REFERENCE ELEVATION (ft, M.S.L.)	DATE	DEPTH TO WATER[6] (ft)	SURFACE WATER ELEVATION (ft, M.S.L.)	UNIT SCREENED
Surface Water						
SG-01	NA	413.97 [5]	Aug-98	DRY	DRY	NA
			6-Dec-98	0.38	414.35	
			16-Jun-99	0.79	414.76	
			10-Jan-00	0.15	414.12	
		413.07 [5]	30-Oct-00	DRY	DRY	
SG-02	NA	411.01 [5]	Aug-98	0.41	411.42	NA
			6-Dec-98	0.56	411.57	
			16-Jun-99	0.32	411.33	
			10-Jan-00	1.00	412.01	
		410.01 [5]	30-Oct-00	0.70	410.71	
SG-03	NA	405.23 [5]	Aug-98	0.07	405.30	NA
			6-Dec-98	0.23	405.46	
			16-Jun-99	DRY	DRY	
			10-Jan-00	0.39	405.62	
		403.83 [5]	30-Oct-00	0.19	404.02	
SG-04	NA	407.89 [5]	Aug-98	1.17	409.06	NA
			6-Dec-98	NM	NM	
			16-Jun-99	DRY	DRY	
			10-Jan-00	1.06	408.95	
		407.32 [5]	30-Oct-00	DRY	DRY	
SG-05	NA	412.87 [5]	30-Oct-00	DRY	DRY	NA
SG-06	NA	405.36 [5]	30-Oct-00	DRY	DRY	NA
SG-07	NA	404.78 [5]	30-Oct-00	DRY	DRY	NA
SG-08	NA	409.73 [5]	30-Oct-00	DRY	DRY	NA

Notes:

[1] Water levels were reported relative to the ground surface elevation.

[2] 33-340 was found damaged in August 1998. The well was repaired and resurveyed in August 1998.

[3] Depth to water and groundwater elevation are inconsistent, but are reprinted as reported by IT (September 1995).

[4] Depth to water and groundwater elevation are inconsistent, but are reprinted as reported to RMT by FDGTI (August 1998).

[5] The staff gauge reference elevation represents the 0-foot mark on the staff gauge. The "Depth to Water" measurement is the water level on the staff gauge.

[6] Measured from top of interior well casing.

The location, ground surface elevation, and reference (top of pipe) elevations for all site wells were resurveyed in October and November 2000. The "Ground Surface Elevation" reported for wells 33MWC-09, -16, -21, -22, -29, and -30 in the 2000 survey is the elevation of a benchmark set in the concrete surface seal (approximately 6" above ground surface).

NA = not applicable.

NM = no measurement.

Prepared by: PR 1/22/99
Checked by: MLW 1/25/99
Updated by: MLW 12/11/00
Checked by: LJB 12/15/00

Table 3-4
Summary of Vertical Gradient Calculations

WELL NUMBER	WELL TYPE	OCTOBER 2000 GROUNDWATER ELEVATION (h) (ft-MSL)	REFERENCE POINT (L) (ft-MSL)	DELTA h (ft)	DELTA L (ft)	VERTICAL GRADIENT (i) (ft/ft)
Building I-1-23						
Source Area						
33MWC-21	Upper Sand	408.06	389.76	-0.03	12.70	0.002
33MWC-22	Lower Clay	408.09	377.06			
33MWC-22	Lower Clay	408.09	377.06	1.55	51.05	-0.030
33MWC-23	Lower Sand	406.54	326.01			
33MWC-21	Upper Sand	408.06	389.76	1.52	63.75	-0.024
33MWC-23	Lower Sand	406.54	326.01			
Downgradient						
33MWC-30	Upper Sand	404.00	387.44	-0.12	19.06	0.006
33MWC-31	Lower Clay	404.12	368.38			
33MWC-31	Lower Clay	404.12	368.38	-2.29	36.52	0.063
33MWC-32	Lower Sand	406.41	331.86			
33MWC-30	Upper Sand	404.00	387.44	-2.41	55.58	0.043
33MWC-32	Lower Sand	406.41	331.86			
Area 9 Repository						
Source Area						
33MWC-27	Upper Sand	407.94	387.50	-0.36	12.37	0.029
33MWC-28	Lower Clay	408.30	375.13			
33MWC-28	Lower Clay	408.30	375.13	1.85	40.16	-0.046
33MWC-29	Lower Sand	406.45	334.97			
33MWC-27	Upper Sand	407.94	387.50	1.49	52.53	-0.028
33MWC-29	Lower Sand	406.45	334.97			
Downgradient						
33MWC-39	Upper Sand	404.27	389.27	-1.90	63.66	0.030
33MWC-41	Lower Sand	406.17	325.61			
33MWC-42	Upper Clay	404.72	404.72	0.80	15.75	-0.051
33MWC-43	Upper Sand	403.92	388.97			
Building I-1-2						
Downgradient						
33MWC-33	Upper Sand	409.79	393.91	2.00	43.16	-0.046
33MWC-35	Lower Sand	407.79	350.75			
33MWC-44	Upper Clay	404.27	404.27	1.09	31.30	-0.035
33MWC-45	Upper Sand	403.18	372.97			
Building I-1-36A						
Source Area						
33MWC-48	Upper Clay	408.00	408.00	-0.11	18.56	0.006
33MWC-49	Upper Sand	408.11	389.44			
South Side, Area 9 Repository						
Source Area						
33MWC-46	Upper Clay	406.96	406.96	0.04	19.87	-0.002
33MWC-47	Upper Sand	406.92	387.09			

Notes:
Vertical Gradient (i) = Delta h / Delta L; Positive values indicate upward groundwater flow.
Reference Point (L) for head measurements (h) is the water table for water table wells and the midpoint of the screened interval for piezometers including the sand filter pack.
Delta h = the distance between head measurements
Delta L = the distance between reference points

Prepared by: MLW, 2/1/01
Checked by: LJB, 2/22/01

Table 3-5
Summary of Slug Test Results

WELL I.D.	GEOLOGIC UNIT	K (cm/s)[1]
32-063[2]	Upper clay	7.2×10^{-5}
32-109[2]	Upper clay	1.2×10^{-4}
33-341[2]	Upper clay	2.9×10^{-5}
33-342[2]	Upper clay	7.7×10^{-4}
33MWC-02[3]	Upper clay	3.9×10^{-5}
32-061[2]	Upper clay??	1.9×10^{-4}
32-062[2]	Upper clay??	1.6×10^{-5}
33MWC-42[5]	Upper clay	3.2×10^{-5}
33MWC-44[5]	Upper clay	4.8×10^{-5}
33MWC-46[5]	Upper clay	1.2×10^{-4}
33MWC-48[5]	Upper clay	1.3×10^{-4}
MPE-UC (I-1-23)[5]	Upper clay	9.7×10^{-5}
MPE-UC1 (Rep)[5]	Upper clay	8.5×10^{-6}
MPE-UC2 (Rep)[5]	Upper clay	1.4×10^{-5}
SVE (I-1-2)[5]	Upper clay	1.4×10^{-6}
	GEOMETRIC MEAN =	**4.6×10^{-5}**
33MWC-21[4]	Upper sand	2.9×10^{-4}
33MWC-24[4]	Upper sand	7.1×10^{-4}
33MWC-27[4]	Upper sand	1.3×10^{-5}
33MWC-30[4]	Upper sand	4.4×10^{-3}
33MWC-33[4]	Upper sand	9.6×10^{-5}
33MWC-36[4]	Upper sand	4.5×10^{-5}
33MWC-39[4]	Upper sand	1.5×10^{-4}
33MWC-43[5]	Upper sand	1.2×10^{-3}
33MWC-45[5]	Upper sand	1.2×10^{-4}
33MWC-47[5]	Upper sand	1.4×10^{-3}
33MWC-49[5]	Upper sand	1.2×10^{-3}
	GEOMETRIC MEAN =	**3.0×10^{-4}**
33MWC-22[4]	Lower clay	1.1×10^{-6}
33MWC-28[4]	Lower clay	1.5×10^{-6}
33MWC-31[4]	Lower clay	5.0×10^{-6}
	GEOMETRIC MEAN =	**2.0×10^{-6}**
33MWC-23[4]	Lower sand	1.5×10^{-3}
33MWC-29[4]	Lower sand	9.4×10^{-4}
33MWC-32[4]	Lower sand	4.1×10^{-3}
33MWC-35[4]	Lower sand	6.3×10^{-6}
33MWC-41[4]	Lower sand	2.1×10^{-3}
	GEOMETRIC MEAN =	**1.9×10^{-3}[6]**

Notes:

(1) Reported hydraulic conductivity is geometric mean of available results.

(2) Hydraulic conductivity data taken from O'Brien and Gere RI report, July 1988.

(3) Hydraulic conductivity data taken from IT Corp. Final Supplemental Investigation Report, September 1995.

(4) Hydraulic conductivity data collected by FDGTI, summer 1998, analyzed by RMT, Inc.

(5) Hydraulic conductivity data collected and analyzed by RMT, Inc., fall 2000.

(6) The geometric mean for the lower sand does not include data from 33MWC-35, as this well may be influenced by cement grout.

Prepared by: MLW 12/29/98
Checked by: TSS 1/22/99
Uptdated: MLW 2/12/01

Table 3-6
Summary of AQTESOLV Data for MPE Pilot Tests in the Upper Sand Units

TEST LOCATION	OBSERVATION WELL	DISTANCE TO MPE-US (ft)	T (sq ft/min)	S	PUMPING RATE (cu ft/min)	SATURATED THICKNESS (ft)	COMMENTS	HYDRAULIC CONDUCTIVITY (cm/sec)
Building I-1-23	MP-1C	3.8	0.1554	0.1947	0.93	20		0.0039
	MP-2C	7.4	0.1672	0.06223	0.93	20		0.0042
	MP-3C	14.6	0.1543	0.01924	0.93	20		0.0039
	MWC-7	141	0.1982	0.002921	0.93	20		0.0050
	MWC-22	125	0.1107	0.01427	0.93	20		0.0028
	MWC-21	116	0.1863	0.003436	0.93	20		0.0047
	MWC-16	33.9	0.1413	0.002564	0.93	20		0.0036
		Average =	0.1591	0.04277				0.0040
Area 9 Repository	MP-1A	3.21	0.006113	0.0005405	0.0455	5	See Note 4	0.00062
	MP-2A	6.5	0.01288	0.002015	0.0455	2		0.0033
	MP-3A	12.42	0.02466	0.00001668	0.0455	2		0.0063
		Average =	0.01455	0.000857				0.0034

Notes:

1. The above tests were performed on the MPE-US extraction well screened in the Upper Sand layer.
2. Leaky aquifer with a Hantush solution were applied to each pumping test. Constant parameters include B = 0.0001 and anisotropy ratio = 0.1.
3. The extraction and observation wells were considered to be partially penetrating in the sand unit at Building I-1-23 and fully penetrating at Area 9 Repository.
4. The measured drawdown exceeded the saturated thickness of 2 ft. A thickness of 5 ft. was used instead.

Table 4-1
Laboratory and Data Validation Qualifiers—Definitions

Laboratory Qualifiers

INORGANIC DATA	
D	Analyte value is from a diluted analysis.
J	Reported value is less than the reporting limit, but greater than zero.
L	Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present.
N	Spiked sample recovery is not within control limits.
U	Analyte was tested for but was not detected; value indicates the detection limit.
ORGANIC DATA	
B	Analyte was present in the method blank, or during the on-site mobile laboratory analysis, baseline interference resulted in a spurious peak that contributed to the sample result.
D	Analyte value is from a diluted analysis.
DO	A surrogate compound was diluted out when a sample dilution was required due to a high concentration of a target constituent.
E	Reported concentration exceeded the calibration range of the instrument. The result is estimated.
F	Indicates that the analysis result is based on GC/FID analysis performed in the on-site mobile laboratory.
J	Reported value is less than the reporting limit, but greater than zero.
N	Indicates presumptive evidence of a tentatively identified compound (TIC). Identification is based on mass spectral library search.
Q	A compound that was reported as a TIC was quantitated against the response factor of a calibration standard.
U	The compound was analyzed for but not detected; the value indicates the detection limit.

Data Validation Qualifiers

b	Analyte was present in the trip blank.
s	Analyte was present in the laboratory holding/storage blank.
u	Analyte was present at less than 10 times the concentration in the associated method (B), trip (b), field (f), and/or laboratory storage blank for common laboratory contaminants, or at less than 5 times the blank concentration of other analytes, and is therefore qualified as nondetectable (u) according to USEPA data validation procedures (USEPA, 1994a and 1994b).
j	When specific QC criteria are outside the established control limits, the reported concentration or the Quantitation Limit is approximate.

Table 4-2
Volatile Organic Compound Concentrations in Soil[1]
Area 9 Repository

BORING NUMBER	DEPTH (feet)	SAMPLE DATE	Parameter															
			PID (ppm)	VINYL CHLORIDE (mg/kg)	1,1-DCE (mg/kg)	TRANS-1,2-DCE (mg/kg)	1,1-DCA (mg/kg)	CIS-1,2-DCE (mg/kg)	1,1,1-TCA (mg/kg)	1,2-DCA (mg/kg)	TCE (mg/kg)	PCE (mg/kg)	FREON 113	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL VOCs (mg/kg)
SB-400	4 - 6	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.035 JB**	<0.05	<0.05	<0.05	<0.05	<0.10	0.035
	10 - 12	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 - 18	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-401	4 - 6	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 - 18	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.46**	**0.034 JBu**	<0.05	<0.05	<0.05	<0.05	<0.10	0.46
	24 - 26	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-402	4 - 6	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	10 -12	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	24 - 26	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.038 JBu**	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-403	8 - 10	09/18/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.023 JB**	<0.05	<0.05	**0.031 J**	<0.05	<0.10	0.054
	18 - 20	09/18/00	31	<0.05	<0.05	<0.05	<0.05	**0.067**	<0.05	<0.05	**2.1 D**	**0.49 B**	<0.05	<0.05	<0.05	<0.05	<0.10	2.7
	28 - 30	09/18/00	88	<0.05	<0.05	<0.05	<0.05	**0.38**	<0.05	<0.05	**5.2 D**	**1.3 B**	<0.05	<0.05	<0.05	<0.05	<0.10	6.9
SB-404	4 - 6	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.022 JBu**	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	14 - 16	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	22 - 24	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.026 JBu**	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-405	8 - 10	09/18/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	28 - 30	09/18/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	40 - 42	09/18/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.27**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.27
SB-406	12 - 14	09/14/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	22 - 24	09/14/00	17	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.15**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.15
	26 - 28	09/14/00	6	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.56**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.56
SB-407	12 - 14	09/18/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.038 J**	<0.05	<0.05	<0.10	0.038
	28 - 30	09/18/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.035 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.035
	36 - 38	09/18/00	48	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**13**	**5.1 B**	<1.0	<1.0	<1.0	<1.0	<2.0	18
SB-408	8 - 10	09/17/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.031 J**	<0.05	<0.05	<0.10	0.031
	28 - 30	09/17/00	23	<0.05	<0.05	<0.05	<0.05	**0.084**	<0.05	<0.05	**0.95**	**0.053 JB**	<0.05	<0.05	<0.05	<0.05	<0.10	1.1
	36 - 38	09/17/00	<1	**0.13 J**	<0.25	<0.25	<0.25	**0.17 J**	<0.25	<0.25	**4.3**	**0.18 JB**	<0.25	<0.25	<0.25	<0.25	<0.50	4.8
SB-409	14 - 16	09/14/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.031 J**	<0.05	<0.05	<0.10	0.031
	34 - 36	09/14/00	143	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**8.8**	**0.49 J**	<0.50	<0.50	<0.50	<0.50	<1.0	9.3
	38 - 40	09/15/00	<1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**2.5**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	2.5
	42 - 44	09/14/00	<1	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	**6.6 Fj**	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	6.6
	46 - 48	09/14/00	<1	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	ND
SB-410	16 - 18	09/15/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	28 - 30	09/15/00	8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.55**	**0.024 J**	<0.05	<0.05	<0.05	<0.05	<0.10	0.57
	40 - 42	09/15/00	15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**17**	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	17
SB-411	16 - 18	09/17/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.028 J**	<0.05	<0.05	<0.10	0.028
	32 - 34	09/17/00	23	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	**1.9**	**0.074 JB**	<0.12	<0.12	<0.12	<0.12	<0.24	2.0
	36 - 38	09/17/00	1360	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**100**	**2.6 JB**	<5.0	<5.0	<5.0	<5.0	**3.0 J**	110
	46 - 48	09/17/00	58	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	**25 FEj**	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	25
SB-412	18 - 20	09/17/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	36 - 38	09/17/00	22	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**18**	**3.6 B**	<0.50	<0.50	<0.50	<0.50	<1.0	22
	38 - 40	09/17/00	28	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**12**	**1.3 B**	<0.50	<0.50	<0.50	<0.50	<1.0	13
SB-413	16 - 18	09/15/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	34 - 36	09/15/00	52	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**9.3**	**0.76 J**	<1.0	<1.0	<1.0	<1.0	<2.0	10
	38 - 40	09/15/00	<1	<0.05	<0.05	<0.05	<0.05	**0.32**	<0.05	<0.05	**0.086**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.41
SB-414	18 - 20	09/15/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	32 - 34	09/15/00	157	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**20**	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	20
	38 - 40	09/15/00	45	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**13**	**0.47 J**	<1.0	<1.0	<1.0	<1.0	<2.0	13
	40 - 42	09/15/00	67	<0.50 F	<0.50 F	<0.50 F	<0.50 F	**0.48 FJj**	<0.50 F	<0.50 F	**31 FEj**	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	31

Table 4-2 (Continued)
Volatile Organic Compound Concentrations in Soil[1]
Area 9 Repository

BORING NUMBER	DEPTH (feet)	SAMPLE DATE	Parameter: PID (ppm)	VINYL CHLORIDE (mg/kg)	1,1-DCE (mg/kg)	TRANS-1,2-DCE (mg/kg)	1,1-DCA (mg/kg)	CIS-1,2-DCE (mg/kg)	1,1,1-TCA (mg/kg)	1,2-DCA (mg/kg)	TCE (mg/kg)	PCE (mg/kg)	FREON 113	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL VOCs (mg/kg)
SB-415	12 - 14	09/16/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	30 - 32	09/16/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.032 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.032
	36 - 38	09/16/00	56	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**23 F**	**2.0**	<0.50	<0.50	<0.50	<0.50	<1.0	25
	40 - 42	09/16/00	8	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**15 F**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	15
SB-416	10 - 12	09/16/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	26 - 28	09/16/00	<1	<0.05	<0.05	<0.05	<0.05	**0.025 J**	<0.05	<0.05	**1.1**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	1.1
	38 - 40	09/16/00	38	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**14**	**0.51 J**	<1.0	<1.0	<1.0	<1.0	<2.0	15
SB-417	14 - 16	10/03/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	20 - 22	10/03/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	24 - 26	10/03/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	36 - 38	10/03/00	<2	<0.05	<0.05	<0.05	<0.05	**0.14**	<0.05	<0.05	**1.1**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	1.2
SB-418	12 - 14	10/03/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	28 - 30	10/03/00	14	<0.05	<0.05	<0.05	<0.05	**0.03 J**	<0.05	<0.05	**0.26**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.29
	34 - 36	10/03/00	32	<0.05	<0.05	<0.05	<0.05	**0.072 J**	<0.05	<0.05	**0.75**	**0.027 J**	<0.05	<0.05	<0.05	<0.05	<0.10	0.85
	38 - 40	10/03/00	21	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	**5.1**	**0.19 J**	<0.25	<0.25	<0.25	<0.25	<0.50	5.3
	48 - 50	10/03/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-419	12 - 14	10/02/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	20 - 22	10/02/00	<2	<0.05	<0.05	<0.05	<0.05	**0.12**	<0.05	<0.05	**0.037 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.16
	36 - 38	10/02/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.41**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.41
	46 - 48	10/02/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-420	16 - 18	10/02/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	22 - 24	10/02/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	32 - 34	10/02/00	18	<0.05	<0.05	<0.05	<0.05	**0.10**	<0.05	<0.05	**0.83**	**0.069**	<0.05	<0.05	<0.05	<0.05	<0.10	1.0
	38 - 40	10/02/00	3	<0.10	<0.10	<0.10	<0.10	**0.24**	<0.10	<0.10	**3.0**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	3.2
SB-421	12 - 14	10/03/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.029 J**	<0.05	<0.05	<0.10	0.029
	20 - 22	10/03/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.054**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.054
	40 - 42	10/03/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-422	10 - 12	10/03/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	20 - 22	10/04/00	<1	<0.05	<0.05	<0.05	<0.05	**0.041 J**	<0.05	<0.05	**0.052**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.093
	30 - 32	10/04/00	15	<0.25	<0.25	<0.25	<0.25	**0.24 Jj**	<0.25	<0.25	**3.5 Jj**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	3.7
	38 - 40	10/04/00	3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**1.8**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	1.8
	46 - 48	10/04/00	<1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	**8.9**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	8.9
SB-423	8 - 10	10/02/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	20 - 22	10/02/00	471	<2.5	<2.5	<2.5	<2.5	**4.8**	<2.5	<2.5	**52**	**1.0 J**	<2.5	<2.5	<2.5	<2.5	<5.0	58
	26 - 28	10/02/00	106	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**100**	<5.0	<5.0	<5.0	<5.0	<5.0	<10	100
	42 - 44	10/02/00	5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**10**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	10

Notes:

(1) The values summarized in this table were generated by on-site sample analysis by the ECCS mobile laboratory unless otherwise noted. The values have not been corrected for percent solids (dry weight) and are reported as "mg/kg as-is" by ECCS mobile laboratory, which is a wet weight basis.

See Table 4-1 for data qualifiers.

BOLD Values in bold are results above the instrument detection limit.

ND Not detected

Table 4-2 (Continued)
Volatile Organic Compound Concentrations in Soil[1]
Area South of Repository

BORING NUMBER	DEPTH (feet)	SAMPLE DATE	PARAMETER															
			PID (ppm)	VINYL CHLORIDE (mg/kg)	1,1-DCE (mg/kg)	TRANS-1,2-DCE (mg/kg)	1,1-DCA (mg/kg)	CIS-1,2-DCE (mg/kg)	1,1,1-TCA (mg/kg)	1,2-DCA (mg/kg)	TCE (mg/kg)	PCE (mg/kg)	FREON 113	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL VOCs (mg/kg)
SB-500	4 - 6	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	12 - 14	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	18 - 20	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	28 - 30	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-501																		
(BORING DELETED FROM PROGRAM)																		
SB-502	2 - 4	09/20/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.0131 JB**	<0.05	<0.05	<0.05	<0.05	<0.10	0.013
	12 - 14	09/20/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.36**	<0.05	<0.05	<0.05	<0.05	<0.10	0.36
	20 - 22	09/20/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.036 J**	<0.05	**0.18**	<0.05	<0.05	<0.05	<0.05	<0.10	0.22
SB-503	2 - 4	09/20/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	6 - 8	09/20/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	14 - 16	09/20/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-504	2 - 4	09/20/00	14	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.10**	<0.05	<0.05	<0.05	<0.05	<0.10	0.1
	12 - 14	09/20/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.32**	<0.05	<0.05	<0.05	<0.05	<0.10	0.32
	20 - 22	09/20/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.42**	<0.05	<0.05	<0.05	<0.05	<0.10	0.42
SB-505	6 - 8	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 - 18	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	22 - 24	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	32 - 34	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-506	2 - 4	10/12/00	<2	<0.36	<0.18	<0.18 t	<0.18	<0.18 t	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	ND
(STL)	12 - 14	10/12/00	<2	<0.35	<0.17	<0.17 t	<0.17	<0.17 t	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	ND
	22 - 24	10/12/00	<2	<0.34	<0.17	<0.17 t	<0.17	<0.17 t	<0.17	<0.17	<0.17	**0.050 J**	<0.17	<0.17	<0.17	<0.17	<0.17	0.05
	26 - 28	10/12/00	<2	<0.34	<0.18	<0.18 t	<0.18	<0.18 t	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	ND

Notes:

[1] The values summarized in this table were generated by on-site sample analysis by the ECCS mobile laboratory unless otherwise noted. The values have not been corrected for percent solids (dry weight) and are reported as "mg/kg as-is" by ECCS mobile laboratory, which is a wet weight basis.

See Table 4-1 for data qualifiers.

t The reported value is a total 1,2-DCE concentration (trans- plus cis-DCE)

STL The screening result is provided by Severn Trent Laboratories, North Canton, Ohio. The values in this table are reported on a wet weight basis, calculated by multiplying the dry weight value by the reported sample solids fraction. Acetone and methylene chloride were detected in each sample analyzed by STL in this table, but these analytes were detected in the method blank as well.

BOLD Values in bold are results above the instrument detection limit.

ND Not detected

Table 4-2 (Continued)
Volatile Organic Compound Concentrations in Soil[1]
Building 1-1-2 Area

BORING NUMBER	DEPTH (feet)	SAMPLE DATE	PARAMETER															
			PID (ppm)	VINYL CHLORIDE (mg/kg)	1,1-DCE (mg/kg)	TRANS-1,2-DCE (mg/kg)	1,1-DCA (mg/kg)	CIS-1,2-DCE (mg/kg)	1,1,1-TCA (mg/kg)	1,2-DCA (mg/kg)	TCE (mg/kg)	PCE (mg/kg)	FREON 113	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL VOCs (mg/kg)
SB-100	10 - 12	09/12/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 - 18	09/12/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.067	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.067
	20 - 22	09/12/00	12	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	1.7 Fj	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	1.7
	22 - 24	09/12/00	175	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	17	<0.50	4.7	<0.50	<0.50	<0.50	<1.0	22
SB-101	10 - 12	09/13/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	14 - 16	09/13/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 - 18	09/13/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-102	8 - 10	09/12/00	25	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	1.8 Fj	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	1.8
	10 - 12	09/12/00	38	<0.25	<0.25	<0.25	<0.25	0.31	<0.25	<0.25	11 F	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	11
	14 - 16	09/12/00	6	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	5.4 Fj	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	5.4
	18 - 20	09/12/00	30	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	ND
	20 - 22	09/12/00	54	<0.25	<0.25	<0.25	<0.25	0.21 J	<0.25	<0.25	9.3 F	<0.25	0.32	<0.25	<0.25	<0.25	<0.50	9.8
	26 - 28	09/12/00	14	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	3.0 Fj	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	3
	28 - 30	09/12/00	18	<0.05	<0.05	<0.05	<0.05	0.029 J	<0.05	<0.05	1.9 F	<0.05	0.89	<0.05	<0.05	<0.05	<0.10	2.8
SB-103	10 - 12	09/12/00	<1	<0.05	<0.05	<0.05	<0.05	0.089	<0.05	<0.05	0.34	<0.05	3.4 E	<0.05	<0.05	<0.05	<0.10	3.8
	16 - 18	09/12/00	<1	<0.05	<0.05	<0.05	<0.05	0.039 J	<0.05	<0.05	<0.05	<0.05	4.6 E	<0.05	<0.05	<0.05	<0.10	4.6
	22 - 24	09/12/00	<1	<0.05	<0.05	<0.05	<0.05	0.024 J	<0.05	<0.05	0.17	<0.05	5.5 E	<0.05	<0.05	<0.05	<0.10	5.7
SB-104	10 - 12	09/13/00	113	<0.50	<0.50	<0.50	<0.50	0.56	<0.50	<0.50	19 F	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	20
	14 - 16	09/13/00	74	<0.50 F	<0.50 F	<0.50 F	<0.50 F	0.33 FJj	<0.50 F	<0.50 F	4.0 Fj	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	4.3
	16 - 18	09/13/00	104	<0.25	<0.25	<0.25	<0.25	0.39	<0.25	<0.25	11 F	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	11
	18 - 20	09/13/00	65	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	2.4 Fj	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	2.4
	24 - 26	09/13/00	12	<0.05	<0.05	<0.05	<0.05	0.13	<0.05	<0.05	2.6 F	<0.05	0.36	<0.05	<0.05	<0.05	<0.10	3.1
	26 - 28	09/13/00	2	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	0.61 Fj	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	0.61
	28 - 30	09/13/00	11	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	1.2 Fj	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	1.2
SB-105	10 - 12	09/12/00	2.3	<0.05	<0.05	<0.05	<0.05	0.021 J	<0.05	<0.05	0.055	<0.05	0.51	<0.05	<0.05	<0.05	<0.10	0.59
	16 - 18	09/12/00	1.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	26 - 28	09/12/00	1.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.46	0.045 J	2.4 E	<0.05	<0.05	<0.05	<0.10	2.9
SB-106	10 - 12	09/13/00	5	<0.05	<0.05	<0.05	<0.05	0.18	<0.05	<0.05	0.62	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.80
	14 - 16	09/13/00	16	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	1.1 Fj	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	1.1
	18 - 20	09/13/00	95	<0.25	<0.25	<0.25	<0.25	0.37	<0.25	<0.25	7.9 F	<0.25	<0.25	<0.05	<0.05	<0.05	<0.10	8.3
	22 - 24	09/13/00	19	<0.10	<0.10	<0.10	<0.10	0.16	<0.10	<0.10	3.8 F	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	4.0
	24 - 26	09/13/00	<1	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	0.89 Fj	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	0.89
	26 - 28	09/13/00	<1	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	1.1 Fj	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	1.1
SB-107	10 - 12	09/14/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	14 - 16	09/14/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.022 J	0.022
	18 - 20	09/14/00	<1	<0.05	<0.05	<0.05	<0.05	0.041 J	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.041
SB-108	10 - 12	09/13/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.025 J	<0.05	<0.05	<0.05	<0.05	<0.10	0.025
	16 - 18	09/13/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	22 - 24	09/13/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.084	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.084
	26 - 28	09/13/00	<1	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	ND
SB-109	10 - 12	09/15/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 - 18	09/15/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	20 - 22	09/15/00	<1	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	1.9 Fj	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	1.9
	22 - 24	09/15/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND

Table 4-2 (Continued)
Volatile Organic Compound Concentrations in Soil[1]
Building I-1-2 Area

BORING NUMBER	DEPTH (feet)	SAMPLE DATE	PARAMETER															
			PID (ppm)	VINYL CHLORIDE (mg/kg)	1,1-DCE (mg/kg)	TRANS-1,2-DCE (mg/kg)	1,1-DCA (mg/kg)	CIS-1,2-DCE (mg/kg)	1,1,1-TCA (mg/kg)	1,2-DCA (mg/kg)	TCE (mg/kg)	PCE (mg/kg)	FREON 113	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL VOCs (mg/kg)
SB-110	6 - 8	09/13/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	12 -14	09/13/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 -18	09/13/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-111	6 - 8	09/13/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	12 -14	09/13/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 -18	09/13/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-112	6 - 8	09/16/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	14 - 16	09/16/00	7	<0.05	<0.05	<0.05	<0.05	**0.18**	<0.05	<0.05	**0.42**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.60
	20 - 22	09/16/00	30	<0.25	<0.25	<0.25	<0.25	**0.18**	<0.25	<0.25	**2.2**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	2.4
	26 - 28	09/16/00	33	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**9.9**	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	9.9
SB-113	6 - 8	09/14/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	14 -16	09/14/00	<1	<0.05	<0.05	<0.05	<0.05	**0.035 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.035
	16 -18	09/14/00	<1	<0.05	<0.05	<0.05	<0.05	**0.043 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.043
	18 -20	09/14/00	<1	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	ND
SB-114	6 - 8	09/16/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	12 - 14	09/16/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 -18	09/16/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	30 - 32	09/16/00	26	<0.25	<0.25	<0.25	<0.25	**0.15 J**	<0.25	<0.25	**2.0**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	2.2
	34 - 36	09/16/00	2	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	**1.7 Fj**	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	1.7
SB-115	6 - 8	09/16/00	3	<0.05	<0.05	<0.05	<0.05	**0.077**	<0.05	<0.05	**0.83**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.91
	16 - 18	09/16/00	96	<0.05	<0.05	<0.05	<0.05	**0.16**	<0.05	<0.05	**0.76**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.92
	24 - 26	09/16/00	376	<0.50	<0.50	<0.50	<0.50	**0.41 J**	<0.50	<0.50	**9.5**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	9.9
	26 - 28	09/16/00	235	<0.50	<0.50	<0.50	<0.50	**0.55**	<0.50	<0.50	**14**	**0.20 J**	<0.50	<0.50	<0.50	<0.50	<1.0	15
	30 - 32	09/16/00	153	<1.0	<1.0	<1.0	<1.0	**0.92 J**	<1.0	<1.0	**22**	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	23
	34 - 36	09/28/00	35	<0.50	<0.50	<0.50	<0.50	**0.24 J**	<0.50	<0.50	**11**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	11
	42 - 44	09/28/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-116	4 - 6	09/13/00	60	<0.25	<0.25	<0.25	<0.25	**1.7**	<0.25	<0.25	**1.7**	**0.21 J**	<0.25	<0.25	<0.25	<0.25	<0.50	3.6
	10 -12	09/13/00	89	**0.80**	<0.25	<0.25	<0.25	**3.2**	<0.25	<0.25	**8.1 F**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	12
	12 - 14	09/13/00	144	**0.75**	<0.05	**0.023 J**	<0.05	**3.9 F**	<0.05	<0.05	**11 F**	**0.28**	<0.05	<0.05	<0.05	<0.05	<0.10	16
	18 - 20	09/13/00	30	<0.50 F	<0.50 F	<0.50 F	<0.50 F	**0.41 FJj**	<0.50 F	<0.50 F	**1.4 Fj**	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.10 F	1.8
SB-117	4 - 6	09/17/00	48	**0.13 J**	<0.25	<0.25	<0.25	**1.1**	<0.25	<0.25	**1.7**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	2.9
	12 - 14	09/17/00	69	**0.049 J**	**2.1**	<0.05	**0.15**	**0.29**	**0.56**	**0.025 J**	**0.26**	**0.041 JB**	**1.1**	<0.05	<0.05	<0.05	<0.10	4.6
	18 - 20	09/17/00	25	**0.032 J**	**1.3 E**	<0.05	<0.05	**0.48**	**0.48**	<0.05	**0.29**	**0.020 JB**	**0.84**	<0.05	<0.05	<0.05	<0.10	3.4
SB-118	6 - 8	09/16/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	12 - 14	09/16/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	20 -22	09/16/00	8	<0.05	<0.05	<0.05	<0.05	**0.067**	<0.05	<0.05	**0.63**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.70
SB-119	6 - 8	09/15/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	12 - 14	09/15/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 - 18	09/15/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	28 - 30	09/29/00	4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.020 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.02
	36 - 38	09/29/00	<2	**0.033 JBu**	<0.05	<0.05	<0.05	**0.086**	<0.05	<0.05	**0.57**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.66
SB-120	8 - 10	09/14/00	41	<0.25	<0.25	<0.25	<0.25	**1.0**	<0.25	<0.25	**1.7**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	2.7
	12 - 14	09/14/00	21	<0.25	<0.25	<0.25	<0.25	**0.99**	<0.25	<0.25	**1.6**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	2.6
	16 - 18	09/14/00	72	<0.50	<0.50	<0.50	<0.50	**1.1**	<0.50	<0.50	**5.0**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	6.1
	22 - 24	09/14/00	4	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	**0.69 Fj**	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<1.0 F	0.69

Table 4-2 (Continued)
Volatile Organic Compound Concentrations in Soil[1]
Building I-1-2 Area

BORING NUMBER	DEPTH (feet)	SAMPLE DATE	PARAMETER															
			PID (ppm)	VINYL CHLORIDE (mg/kg)	1,1-DCE (mg/kg)	TRANS-1,2-DCE (mg/kg)	1,1-DCA (mg/kg)	CIS-1,2-DCE (mg/kg)	1,1,1-TCA (mg/kg)	1,2-DCA (mg/kg)	TCE (mg/kg)	PCE (mg/kg)	FREON 113	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL VOCs (mg/kg)
SB-121	4 - 6	09/15/00	3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	20 - 22	09/15/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	30 - 32	09/15/00	19	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	**6.3 Fj**	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.50 F	<0.10 F	6.3
	34 - 36	09/15/00	23	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**4.1**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	4.1
SB-122	10 - 12	09/27/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 - 18	09/27/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	22 - 24	09/27/00	<2	<0.05	<0.05	<0.05	<0.05	**0.022 J**	<0.05	<0.05	**0.34**	<0.05	**0.12**	<0.05	<0.05	<0.05	<0.10	0.48
SB-123	8 - 10	09/30/00	27	**0.22 JBu**	<0.25	<0.25	<0.25	**1.5**	<0.25	<0.25	**5.4**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	6.9
	12 - 14	09/30/00	65	**0.22 JBu**	<0.25	<0.25	<0.25	**1.5**	<0.25	<0.25	**7.8**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	9.3
	18 - 20	09/30/00	88	**0.16 JBu**	<0.25	<0.25	<0.25	**0.85**	<0.25	<0.25	**6.9**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	7.8
	28 - 30	09/30/00	41	<0.50	<0.50	<0.50	<0.50	**0.29 J**	<0.50	<0.50	**8.2**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	8.5
SB-124	6 - 8	09/27/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	24 - 26	09/27/00	4.9	<0.10	<0.10	<0.10	<0.10	**0.14**	<0.10	<0.10	**1.8**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	1.9
	32 - 34	09/27/00	2.5	<0.10	<0.10	<0.10	<0.10	**0.23**	<0.10	<0.10	**2.4**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	2.6
SB-125	6 - 8	09/30/00	<2	<0.05	<0.05	<0.05	<0.05	**0.066**	<0.05	<0.05	**0.024 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.090
	14 - 16	09/30/00	1	<0.10	<0.10	<0.10	<0.10	**0.62**	<0.10	<0.10	**2.4**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	3.0
	22 - 24	09/30/00	<2	<0.05	<0.05	<0.05	<0.05	**0.16**	<0.05	<0.05	**1.4**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	1.6
	36 - 38	09/30/00	9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.035 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.035
SB-126	2 - 4	09/27/00	49	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**82**	**4.9 J**	<5.0	<5.0	<5.0	<5.0	<10.0	87
	12 - 14	09/27/00	<2	<0.05	<0.05	<0.05	<0.05	**0.17**	<0.05	<0.05	**0.63**	**0.021 J**	<0.05	<0.05	<0.05	<0.05	<0.10	0.82
	26 - 28	09/27/00	<2	**0.34 JBu**	<0.50	<0.50	<0.50	**0.27**	<0.50	<0.50	**21 E**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	22
	40 - 42	09/27/00	<2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**150**	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	150
	44 - 46	09/27/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**1.1**	<0.05	<0.05	<0.05	<0.05	<0.05	**0.041 JB**	1.1
SB-127	6 - 8	09/27/00	114	<0.50	<0.50	<0.50	<0.50	**1.5**	<0.50	<0.50	**8.0**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	9.5
	14 - 16	09/27/00	342	**0.59 J**	<1.0	<1.0	<1.0	**5.9**	<1.0	<1.0	**26**	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	32
	18 - 20	09/27/00	236	**0.55 Jj**	<1.0	<1.0	<1.0	**4.0**	<1.0	<1.0	**19**	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	24
	40 - 42	09/28/00	2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	44 - 46	09/28/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-128	10 - 12	09/28/00	<2	**0.079 Bu**	<0.05	<0.05	<0.05	**0.63**	<0.05	<0.05	**0.14**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.77
	28 - 30	09/28/00	22	**0.58 JBu**	<1.0	<1.0	<1.0	**5.2**	<1.0	<1.0	**27**	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	32
	36 - 38	09/28/00	30	**0.24 JBu**	<0.05	<0.05	<0.05	**2.4**	<0.05	**3.9**	**0.14 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	6.4
	46 - 48	09/28/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.13 Bu**	ND
SB-129	6 - 8	09/29/00	<1	<0.05	<0.05	<0.05	<0.05	**0.024 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.024
	14 - 16	09/29/00	<1	**0.027 JBu**	<0.05	<0.05	<0.05	**0.088**	<0.05	<0.05	**0.027 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.11
	20 - 22	09/29/00	<1	<0.05	<0.05	<0.05	<0.05	**0.059**	<0.05	<0.05	**0.046 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.11
	40 - 42	09/29/00	3	<0.50	<0.50	<0.50	<0.50	**0.25 J**	<0.50	<0.50	**4.2**	<0.50	<0.50	<0.50	<0.50	<0.50	**0.39 BJ**	4.8
SB-130	6 - 8	09/27/00	<1	**0.025 JBu**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	18 - 20	09/27/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	28 - 30	09/27/00	42	<0.10	<0.10	<0.10	<0.10	**0.71**	<0.10	<0.10	**1.5**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	2.2
	41 - 43	09/28/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	45 - 47	09/28/00	<1	<0.05	<0.05	<0.05	<0.05	**0.020 J**	<0.05	<0.05	**0.032 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.052
SB-131	6 - 8	09/29/00	14	<0.05	<0.05	<0.05	<0.05	**0.095**	<0.05	<0.05	**1.2**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	1.3
	8 - 10	09/29/00	47	**0.060 JBu**	<0.10	<0.10	<0.10	**0.20**	<0.10	<0.10	**2.4**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	2.6
	30 - 32	09/29/00	7	**0.31 JBu**	<0.50	<0.50	<0.50	**0.83**	<0.50	<0.50	**14**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	15
	44 - 46	09/29/00	<2	**0.025 JBu**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.045 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.045

Table 4-2 (Continued)
Volatile Organic Compound Concentrations in Soil[1]
Building I-1-2 Area

BORING NUMBER	DEPTH (feet)	SAMPLE DATE	PARAMETER															
			PID (ppm)	VINYL CHLORIDE (mg/kg)	1,1-DCE (mg/kg)	TRANS-1,2-DCE (mg/kg)	1,1-DCA (mg/kg)	CIS-1,2-DCE (mg/kg)	1,1,1-TCA (mg/kg)	1,2-DCA (mg/kg)	TCE (mg/kg)	PCE (mg/kg)	FREON 113	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL VOCs (mg/kg)
SB-132	6 - 8	10/04/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	18 - 20	10/04/00	<1	<0.05	<0.05	<0.05	<0.05	**0.59**	<0.05	<0.05	**0.040 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.63
	32 - 34	10/04/00	3.1	<0.10	<0.10	<0.10	<0.10	**0.11**	<0.10	<0.10	**2.8**	**0.04 J**	<0.10	<0.10	<0.10	<0.10	<0.20	3.0
	42 - 44	10/04/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-133	8 - 10	10/03/00	7.9	<0.05	<0.05	<0.05	<0.05	**0.67**	<0.05	<0.05	**0.20**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.87
	22 - 24	10/03/00	85	<0.25	<0.25	<0.25	<0.25	**4.2**	<0.25	<0.25	**7.2**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	11
	26 - 28	10/03/00	12	<0.50	<0.50	<0.50	<0.50	**1.8**	<0.50	<0.50	**10**	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	12
SB-134	2 - 4	10/17/00	<2	<0.40	<0.20	<0.20 t	<0.20	<0.20 t	<0.20	<0.20	<0.20	<0.20	--	<0.20	<0.20	<0.20	<0.20	ND
(STL)	12 - 14	10/17/00	<2	<0.35	<0.17	**0.057 t**	<0.17	**0.057 t**	<0.17	<0.17	<0.17	<0.17	--	<0.17	<0.17	<0.17	<0.17	0.057
	20 - 22	10/17/00	2	<0.38	<0.19	**0.33 t**	<0.19	**0.33 t**	<0.19	<0.19	**0.16 J**	<0.19	--	<0.19	<0.19	<0.19	<0.19	0.49
	26 - 28	10/17/00	10	<0.33	<0.16	**0.58 t**	<0.16	**0.58 t**	<0.16	<0.16	**0.94**	<0.16	--	<0.16	<0.16	<0.16	<0.16	1.5

Notes:

(1) The values summarized in this table were generated by on-site sample analysis by the ECCS mobile laboratory unless otherwise noted. The values have not been corrected for percent solids (dry weight) and are reported as "mg/kg as-is" by ECCS mobile laboratory, which is a wet weight basis.

See Table 4-1 for data qualifiers.

t The reported value is a total 1,2-DCE concentration (trans- plus cis-DCE).

STL The screening result is provided by Severn Trent Laboratories, North Canton, Ohio. The values in this table are reported on a wet weight basis, calculated by multiplying the dry weight value by the reported sample solids fraction. Acetone and methylene chloride were detected in each sample analyzed by STL in this table, but these analytes were detected in the method blank as well.

BOLD Values in bold are results above the instrument detection limit.

ND Not detected

-- Not analyzed

Table 4-2 (Continued)
Volatile Organic Compound Concentrations in Soil[1]
Building I-1-23 Area

BORING NUMBER	DEPTH (feet)	SAMPLE DATE	PARAMETER																
			PID (ppm)	VINYL CHLORIDE (mg/kg)	1,1-DCE (mg/kg)	TRANS-1,2-DCE (mg/kg)	1,1-DCA (mg/kg)	CIS-1,2-DCE (mg/kg)	1,1,1-TCA (mg/kg)	1,2-DCA (mg/kg)	TCE (mg/kg)	PCE (mg/kg)	FREON 113	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL VOCs (mg/kg)
SB-200	8 - 10	09/18/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	14 - 16	09/18/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	20 - 22	09/18/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-201	6 - 8	09/18/00	404	**0.54 J**	<1.0	<1.0	<1.0	**6.9**	<1.0	<1.0	**15**	**7.8**	<1.0	<1.0	<1.0	<1.0	<2.0	30
	8 - 10	09/18/00	234	<1.0	<1.0	<1.0	<1.0	**3.5**	<1.0	<1.0	**8.0**	**1.7 B**	<1.0	<1.0	<1.0	<1.0	<2.0	13
	16 - 18	09/18/00	184	<0.25	<0.25	<0.25	<0.25	**0.90**	<0.25	<0.25	**4.1**	**0.33 B**	<0.25	<0.25	<0.25	<0.25	<0.50	5.3
	20 - 22	09/18/00	42	<0.25	<0.25	<0.25	<0.25	**0.42**	<0.25	<0.25	**2.0**	**0.22 JB**	<0.25	<0.25	<0.25	<0.25	<0.50	2.6
	38 - 40	10/02/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	44 - 46	10/02/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-202	10 - 12	09/18/00	628	<1.0	<1.0	<1.0	<1.0	**4.9**	<1.0	<1.0	**12**	<1.0	<1.0	<1.0	<1.0	**0.87 J**	<2.0	18
	12 - 14	09/18/00	520	<1.0	<1.0	<1.0	<1.0	**5.3**	<1.0	<1.0	**19**	<1.0	<1.0	<1.0	<1.0	**1.0**	<2.0	25
	18 - 20	09/18/00	173	<1.0	<1.0	<1.0	<1.0	**3.0**	<1.0	<1.0	**11**	**0.41 JB**	<1.0	<1.0	<1.0	**0.81 J**	<2.0	15
SB-203	6 - 8	09/17/00	226	<0.25	<0.25	<0.25	<0.25	**2.7**	<0.25	<0.25	**3.6**	**0.10 JB**	<0.25	**0.49**	<0.25	**8.7 E**	<0.50	16
	8 - 10	09/17/00	106	<0.25	<0.25	<0.25	<0.25	**2.4**	<0.25	<0.25	**4.3**	**0.12 JB**	<0.25	**0.49**	<0.25	**8.7**	<0.50	16
	14 - 16	09/17/00	169	<0.25	<0.25	<0.25	<0.25	**0.57**	<0.25	<0.25	**4.9**	**0.40 B**	<0.25	**0.23 J**	<0.25	**3.1**	<0.50	9.2
	18 - 20	09/17/00	94	<0.05	<0.05	<0.05	<0.05	**0.42**	<0.05	<0.05	**2.6 E**	**0.095**	<0.05	**0.032 J**	<0.05	**0.42**	<0.10	3.6
SB-204	8 - 10	09/26/00	<2	<0.05	<0.05	<0.05	<0.05	**0.17**	<0.05	<0.05	**0.099**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.27
	14 - 16	09/26/00	<2	<0.05	<0.05	<0.05	<0.05	**0.090**	<0.05	<0.05	**0.065**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.16
	20 - 22	09/26/00	<2	<0.25	<0.25	<0.25	<0.25	**0.29**	<0.25	<0.25	**1.7**	<0.25	<0.25	<0.25	<0.25	**0.55**	<0.50	2.5
SB-205	8 - 10	09/20/00	**4**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.37**	**0.051 Bu**	<0.05	<0.05	<0.05	<0.05	<0.10	0.37
	14 - 16	09/20/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.022 J**	**0.050 Bu**	<0.05	<0.05	<0.05	<0.05	<0.10	0.022
	20 - 22	09/20/00	3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.15**	**0.030 JBu**	<0.05	<0.05	<0.05	<0.05	<0.10	0.15
SB-206	8 - 10	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 - 18	09/19/00	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.22**	**0.020 JBu**	<0.05	<0.05	<0.05	<0.05	<0.10	0.22
	22 - 24	09/19/00	1	<0.05	<0.05	<0.05	<0.05	**0.041 J**	<0.05	<0.05	**0.47**	**0.043 JBu**	<0.05	<0.05	<0.05	<0.05	<0.10	0.51
	44 - 46	09/29/00	86	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**8.3**	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	8.3
	46 - 48	09/29/00	<1	**0.025 JBu**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-207	8 - 10	09/17/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	12 - 14	09/17/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.033 JB**	<0.05	<0.05	<0.05	<0.05	<0.10	0.033
	16 - 18	09/17/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-208	10 - 12	09/19/00	37	**0.031 J**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**6.1**	**0.39 JBu**	<0.50	<0.50	<0.50	<0.50	<1.0	6.1
	14 - 16	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	**0.068**	<0.05	<0.05	**0.19**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.26
	18 - 20	09/19/00	8	<0.05	<0.05	<0.05	<0.05	**0.023 J**	<0.05	<0.05	**0.57**	<0.05	**3.4 E**	<0.05	<0.05	<0.05	<0.10	4.0
SB-209	8 - 10	09/19/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.048 J**	**0.022 JBu**	<0.05	<0.05	<0.05	<0.05	<0.10	0.048
	14 - 16	09/19/00	3	**0.033 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.45**	**0.029 JBu**	<0.05	<0.05	<0.05	<0.05	<0.10	0.48
	18 - 20	09/19/00	22	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	**2.4**	**0.17 JBu**	<0.25	<0.25	<0.25	<0.25	<0.50	2.4
SB-210	8 - 10	09/17/00	<1	**0.05**	<0.05	<0.05	<0.05	**0.025 J**	<0.05	<0.05	**0.039 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.114
	12 - 14	09/17/00	2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.22**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.22
	16 - 18	09/17/00	7	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.86**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.86
	36 - 38	10/02/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	44 - 46	10/02/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND

Table 4-2 (Continued)
Volatile Organic Compound Concentrations in Soil[1]
Building I-1-23 Area

BORING NUMBER	DEPTH (feet)	SAMPLE DATE	PARAMETER															
			PID (ppm)	VINYL CHLORIDE (mg/kg)	1,1-DCE (mg/kg)	TRANS-1,2-DCE (mg/kg)	1,1-DCA (mg/kg)	CIS-1,2-DCE (mg/kg)	1,1,1-TCA (mg/kg)	1,2-DCA (mg/kg)	TCE (mg/kg)	PCE (mg/kg)	FREON 113	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL VOCs (mg/kg)
SB-211	8 - 10	09/20/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.45**	**0.061**	<0.05	<0.05	<0.05	<0.05	<0.10	0.51
	12 - 14	09/20/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.19**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.19
	18 - 20	09/20/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.31**	**0.022 J**	<0.05	<0.05	<0.05	<0.05	<0.10	0.33
SB-212	10 - 12	09/20/00	200	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**44 F**	**3.6 F**	<5.0	<5.0	<5.0	<5.0	<10	48
	16 - 18	09/20/00	267	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	**28 F**	**1.5 F**	<2.5	<2.5	<2.5	<2.5	<5.0	30
	18 - 20	09/20/00	63	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	**17 F**	<2.5	<2.5	<2.5	<2.5	<2.5	<5.0	17
SB-213	8 - 10	09/26/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	14 - 16	09/26/00	<1	<0.05	<0.05	<0.05	<0.05	**0.036 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.036
	20 - 22	09/26/00	<1	<0.05	<0.05	<0.05	<0.05	**0.030 J**	<0.05	<0.05	**0.79**	**0.13**	<0.05	<0.05	<0.05	**0.025 J**	<0.10	0.98
SB-214	8 - 10	09/26/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.023 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.023
	14 - 16	09/26/00	8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.24**	**0.028 J**	<0.05	<0.05	<0.05	<0.05	<0.10	0.27
	18 - 20	09/26/00	12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**1.7**	**0.28**	<0.05	<0.05	<0.05	<0.05	<0.10	2.0
SB-215	10 - 12	09/26/00	<2	<0.10	<0.10	<0.10	<0.10	**0.066 J**	<0.10	<0.10	**0.65**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	0.72
	16 - 18	09/26/00	<2	<0.05	<0.05	<0.05	<0.05	**0.041 J**	<0.05	<0.05	**0.32**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.36
	20 - 22	09/26/00	<2	<0.05	<0.05	<0.05	<0.05	**0.051**	<0.05	<0.05	**0.34**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.39
	22 - 24	09/26/00	<2	<0.05	<0.05	<0.05	<0.05	**0.047 J**	<0.05	<0.05	**0.25**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.30
SB-216	8 - 10	09/26/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	12 - 14	09/26/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	18 - 20	09/26/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-217	8 - 10	09/27/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	18 - 20	09/27/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.044 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.044
	38 - 40	09/27/00	39	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**28**	**24**	<1.0	<1.0	<1.0	<1.0	<2.0	52
	42 - 44	09/27/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-218	8 -10	10/04/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	20 -22	10/04/00	4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.20**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.2
	26 -28	10/04/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.057**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.057
	42 -44	10/04/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND

Notes:

(1) The values summarized in this table were generated by on-site sample analysis by the ECCS mobile laboratory unless otherwise noted. The values have not been corrected for percent solids (dry weight) and are reported as "mg/kg as-is" by ECCS mobile laboratory, which is a wet weight basis.

See Table 4-1 for data qualifiers.

BOLD Values in bold are results above the instrument detection limit.

ND Not detected

Table 4-2 (Continued)
Volatile Organic Compound Concentrations in Soil[1]
Building I-1-36A

BORING NUMBER	DEPTH (feet)	SAMPLE DATE	PARAMETER															
			PID (ppm)	VINYL CHLORIDE (mg/kg)	1,1-DCE (mg/kg)	TRANS-1,2-DCE (mg/kg)	1,1-DCA (mg/kg)	CIS-1,2-DCE (mg/kg)	1,1,1-TCA (mg/kg)	1,2-DCA (mg/kg)	TCE (mg/kg)	PCE (mg/kg)	FREON 113	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL VOCs (mg/kg)
SB-300	8 - 10	09/30/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	18 - 20	09/30/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	28 - 30	09/30/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-301	8 - 10	10/01/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	14 - 16	10/01/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	24 - 26	10/01/00	<1	<0.05	<0.05	<0.05	<0.05	**0.054**	<0.05	<0.05	<0.05	**0.028 J**	<0.05	<0.05	<0.05	<0.05	<0.10	0.082
	40 - 42	10/01/00	8	<0.05	<0.05	<0.05	<0.05	**0.16**	<0.05	<0.05	**0.15**	**1.3**	<0.05	<0.05	<0.05	<0.05	<0.10	1.6
	46 - 48	10/01/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-302	8 - 10	09/30/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.038 JBu**	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	12 - 14	09/30/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.025 JBu**	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	26 - 28	09/30/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	34 - 36	09/30/00	<1	**0.021 JBu**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-303	10 - 12	09/30/00	29	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.10**	<0.05	<0.05	<0.05	<0.05	<0.05	**0.045 J**	0.15
	14 -16	09/30/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	22 - 24	09/30/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	42 - 44	09/30/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-304	8 - 10	09/30/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	16 - 18	09/30/00	<2	**0.029 JBu**	<0.05	<0.05	<0.05	**0.026 J**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.026
	26 - 28	09/30/00	<2	**0.078 Bu**	<0.05	<0.05	<0.05	**0.32**	<0.05	<0.05	**0.075**	**0.35**	<0.05	<0.05	<0.05	<0.05	<0.10	0.75
	34 - 36	09/30/00	<2	**0.038 JBu**	<0.05	<0.05	<0.05	**0.31**	<0.05	<0.05	**0.084**	**0.30**	<0.05	<0.05	<0.05	<0.05	<0.10	0.69
SB-305	4 - 6	10/01/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	14 - 16	10/01/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	22 - 24	10/01/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	42 - 44	10/01/00	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-306	8 - 10	10/16/00	<2	<0.36	<0.18	<0.18 t	<0.18	<0.18 t	<0.18	<0.18	<0.18	<0.18	--	<0.18	<0.18	<0.18	<0.18	ND
(STL)	20 - 22	10/16/00	<2	<0.36	<0.18	<0.18 t	<0.18	<0.18 t	<0.18	<0.18	<0.18	<0.18	--	<0.18	<0.18	<0.18	<0.18	ND
	30 - 32	10/16/00	<2	<0.35	<0.17	<0.17 t	<0.17	<0.17 t	<0.17	<0.17	<0.17	<0.17	--	<0.17	<0.17	<0.17	<0.17	ND
	44 - 46	10/16/00	<2	<0.34	<0.17	<0.17 t	<0.17	<0.17 t	<0.17	<0.17	<0.17	<0.17	--	<0.17	<0.17	<0.17	<0.17	ND
SB-307	8 - 10	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	18 - 20	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	**0.057**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	0.057
	38 - 40	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
SB-308	4 - 6	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	12 - 14	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	18 - 20	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND
	32 - 34	10/01/00	<2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	ND

Notes:

[1] The values summarized in this table were generated by on-site sample analysis by the ECCS mobile laboratory unless otherwise noted. The values have not been corrected for percent solids (dry weight) and are reported as "mg/kg as-is" by ECCS mobile laboratory, which is a wet weight basis.

See Table 4-1 for data qualifiers.

t The reported value is a total 1,2-DCE concentration (trans- plus cis-DCE)

STL The screening result is provided by Severn Trent Laboratories, North Canton, Ohio. The values in this table are reported on a wet weight basis, calculated by *multiplying the dry weight value by the reported sample solids fraction. Acetone and methylene chloride were detected in each sample analyzed by STL in this table, but these analytes were* detected in the method blank as well.

BOLD Values in bold are results above the instrument detection limit.

-- Not analyzed

ND Not detected

Table 4-3
Comparison of Soil Volatile Organic Compound[1]
Results from On-Site Laboratory Analysis and Off-Site Laboratory Analysis (mg/kg)

BORING NUMBER	DEPTH (feet)	LABORATORY	PARAMETER												
			VINYL CHLORIDE	1,1-DCE	TRANS-1,2-DCE	1,1-DCA	CIS-1,2-DCE	1,1,1-TCA	1,2-DCA	TCE	PCE	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES
SB-101	16 - 18	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.34	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
SB-103	10 - 12	On-site	<0.050	<0.050	<0.050	<0.050	**0.089**	<0.050	<0.050	**0.34**	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.40	<0.20	**0.080 tJ**	<0.20	**0.080 tJ**	<0.20	<0.20	**0.30**	<0.20	<0.20	<0.20	<0.20	<0.20
SB-104	10 - 12	On-site	<0.50	<0.50	<0.50	<0.50	**0.56**	<0.50	<0.50	**19 F**	<0.50	<0.50	<0.50	<0.50	<1.0
		Off-site	<1.1	<0.57	**0.69 t**	<0.57	**0.69 t**	<0.57	<0.57	**16**	<0.57	<0.57	<0.57	<0.57	<0.57
SB-106	22 - 24	On-site	<0.10	<0.10	<0.10	<0.10	**0.16**	<0.10	<0.10	**3.8 F**	<0.10	<0.10	<0.10	<0.10	<0.20
		Off-site	<3.6	<1.8	**1.0 tJ**	<1.8	**1.0 tJ**	<1.8	<1.8	**42**	<1.8	<1.8	<1.8	<1.8	<1.8
SB-115	34 - 36	On-site	<0.50	<0.50	<0.50	<0.50	**0.24 J**	<0.50	<0.50	**11**	<0.50	<0.50	<0.50	<0.50	<1.0
		Off-site	<0.38	<0.19	**0.15 tJ**	<0.19	**0.15 tJ**	<0.19	<0.19	**6.2**	<0.19	<0.19	<0.19	<0.19	<0.19
SB-116	10 -12	On-site	**0.80**	<0.25	<0.25	<0.25	**3.2**	<0.25	<0.25	**8.1 F**	<0.25	<0.25	<0.25	<0.25	<0.50
		Off-site	**0.33 J**	<0.30	**3.0 t**	<0.30	**3.0 t**	<0.30	<0.30	**8.2**	**0.16 J**	<0.30	<0.30	<0.30	<0.30
SB-119	16 - 18	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.35	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18
SB-121	34 - 36	On-site	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**4.1**	<0.50	<0.50	<0.50	<0.50	<1.0
		Off-site	<0.36	<0.19	**0.13 tJ**	<0.19	**0.13 tJ**	<0.19	<0.19	**3.6**	<0.19	<0.19	<0.19	<0.19	<0.19
Duplicate		On-site	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**4.1**	<0.50	<0.50	<0.50	<0.50	<1.0
SB-127	40 - 42	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.35	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18
SB-128	28 - 30	On-site	**0.58 JBu**	<1.0	<1.0	<1.0	**5.2**	<1.0	<1.0	**27**	<1.0	<1.0	<1.0	<1.0	<2.0
		Off-site	<3.4	<1.6	**4.2 t**	<1.6	**4.2 t**	<1.6	<1.6	**25**	<1.6	<1.6	<1.6	<1.6	<1.6
SB-129	20 - 22	On-site	<0.050	<0.050	<0.050	<0.050	**0.059**	<0.050	<0.050	**0.046 J**	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.36	<0.18	**0.038 tJ**	<0.18	**0.038 tJ**	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18
SB-131	8 - 10	On-site	**0.060 JBu**	<0.10	<0.10	<0.10	**0.20**	<0.10	<0.10	**2.4**	<0.10	<0.10	<0.10	<0.10	<0.20
		Off-site	<0.35	<0.17	**0.15 tJ**	<0.17	**0.15 tJ**	<0.17	<0.17	**1.9**	<0.17	<0.17	<0.17	<0.17	<0.17
Duplicate		Off-site	<0.34	<0.17	**0.14 tJ**	<0.17	**0.14 tJ**	<0.17	<0.17	**1.6**	<0.17	<0.17	<0.17	<0.17	<0.17
SB-132	18 -20	On-site	<0.050	<0.050	<0.050	<0.050	**0.59**	<0.050	<0.050	**0.040 J**	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.38	<0.19	**0.090 tJ**	<0.19	**0.090 tJ**	<0.19	<0.19	**0.099 J**	<0.19	<0.19	<0.19	<0.19	<0.19
SB-133	8 - 10	On-site	<0.050	<0.050	<0.050	<0.050	**0.67**	<0.050	<0.050	**0.2**	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.34	<0.17	**0.59 t**	<0.17	**0.59 t**	<0.17	<0.17	**0.16 J**	<0.17	<0.17	<0.17	<0.17	<0.17
SB-133	22 - 24	On-site	<0.25	<0.25	<0.25	<0.25	**4.2**	<0.25	<0.25	**7.2**	<0.25	<0.25	<0.25	<0.25	<0.50
		Off-site	<0.35	<0.18	**2.9 t**	<0.18	**2.9 t**	<0.18	<0.18	**4.6**	<0.18	<0.18	<0.18	<0.18	<0.18

Table 4-3 (Continued)
Comparison of Soil Volatile Organic Compound[1]
Results from On-Site Laboratory Analysis and Off-Site Laboratory Analysis (mg/kg)

BORING NUMBER	DEPTH (feet)	LABORATORY	PARAMETER												
			VINYL CHLORIDE	1,1-DCE	TRANS-1,2-DCE	1,1-DCA	CIS-1,2-DCE	1,1,1-TCA	1,2-DCA	TCE	PCE	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES
SB-200	20 - 22	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.43	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21
SB-201	8 - 10	On-site	<1.0	<1.0	<1.0	<1.0	**3.5**	<1.0	<1.0	**8.0**	**1.7 B**	<1.0	<1.0	<1.0	<2.0
		Off-site	<0.71	<0.36	**4.5 t**	<0.36	**4.52 t**	<0.36	<0.36	**11**	**1.6**	<0.36	<0.36	<0.36	<0.36
SB-201	44 - 46	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.34	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
SB-202	10 - 12	On-site	<1.0	<1.0	<1.0	<1.0	**4.9**	<1.0	<1.0	**12**	<1.0	<1.0	<1.0	**0.87 J**	<2.0
		Off-site	<0.50	<0.50	**4.2 t**	<0.50	**4.2 t**	<0.50	<0.50	**14**	<0.50	<0.50	<0.50	<0.50	<0.50
Duplicate		Off-site	<0.49	<0.25	**2.6 t**	<0.25	**2.6 t**	<0.25	<0.25	**8.3**	<0.25	<0.25	<0.25	<0.25	<0.25
SB-210	44 - 46	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.34	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
SB-211	18 - 20	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	**0.31**	**0.022 J**	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.35	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	**0.26**	<0.17	<0.17	<0.17	<0.17	<0.17
SB-212	18 - 20	On-site	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	**17 F**	<2.5	<2.5	<2.5	<2.5	<5.0
		Off-site	<1.4	<0.69	**0.27 tJ**	<0.69	**0.27 tJ**	<0.69	<0.69	**7.2**	**0.27 J**	<0.69	<0.69	<0.69	<0.69
SB-217	38 - 40	On-site	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**28**	**24**	<1.0	<1.0	<1.0	<2.0
		Off-site	<58	<29	<29	<29	<29	<29	<29	**24 J**	**21 J**	<29	<29	<29	<29
SB-403	28 - 30	On-site	<0.050	<0.050	<0.050	<0.050	**0.38**	<0.050	<0.050	**5.2 D**	**1.3 B**	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.36	<0.17	**0.37 t**	<0.17	**0.37 t**	<0.17	<0.17	**5.5**	**0.99**	<0.17	<0.17	<0.17	<0.17
SB-407	36 - 38	On-site	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**13**	**5.1 B**	<1.0	<1.0	<1.0	<2.0
		Off-site	<0.72	<0.36	**0.21 tJ**	<0.36	**0.21 tJ**	<0.36	<0.36	**11**	**3.8**	<0.36	<0.36	<0.36	<0.36
SB-410	28 - 30	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	**0.55**	**0.024 J**	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.34	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	**0.58**	<0.17	<0.17	<0.17	<0.17	<0.17
SB-413	34 - 36	On-site	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**9.3**	**0.76 J**	<1.0	<1.0	<1.0	<2.0
		Off-site	<0.72	<0.36	**01.8 tj**	<0.36	**0.18 tJ**	<0.36	<0.36	**8.5**	**0.51**	<0.36	<0.36	<0.36	<0.36
Duplicate		On-site	<0.50	<0.50	<0.50	<0.50	**0.19 J**	<0.50	<0.50	**9.2**	**0.59**	<0.50	<0.50	<0.50	<1.0
		Off-site	<0.73	<0.37	**0.19 tJ**	<0.37	**0.19 tJ**	<0.37	<0.37	**9.3**	**0.56**	<0.37	<0.37	<0.37	<0.37
SB-417	20 - 22	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.34	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18
SB-417	24 - 26	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.38	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19
SB-418	28 - 30	On-site	<0.050	<0.050	<0.050	<0.050	**0.030 J**	<0.050	<0.050	**0.26**	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.34	<0.17	**0.029 tJ**	<0.17	**0.029 tJ**	<0.17	<0.17	**0.39**	<0.17	<0.17	<0.17	<0.17	<0.17

Table 4-3 (Continued)
Comparison of Soil Volatile Organic Compound[1]
Results from On-Site Laboratory Analysis and Off-Site Laboratory Analysis (mg/kg)

BORING NUMBER	DEPTH (feet)	LABORATORY	PARAMETER												
			VINYL CHLORIDE	1,1-DCE	TRANS-1,2-DCE	1,1-DCA	CIS-1,2-DCE	1,1,1-TCA	1,2-DCA	TCE	PCE	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES
SB-419	36 - 38	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	**0.41**	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.34	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	**0.099 J**	<0.17	<0.17	<0.17	<0.17	<0.17
SB-420	22 - 24	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.35	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
SB-420	32 - 34	On-site	<0.050	<0.050	<0.050	<0.050	**0.10**	<0.050	<0.050	**0.83**	**0.069**	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.34	<0.17	**0.049 tJ**	<0.17	**0.049 tJ**	<0.17	<0.17	**0.41**	**0.036 J**	<0.17	<0.17	<0.17	<0.17
SB-421	20 - 22	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	**0.054**	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.35	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	**0.091 J**	<0.17	<0.17	<0.17	<0.17	<0.17
SB-422	30 -32	On-site	<0.25	<0.25	<0.25	<0.25	**0.24 Jj**	<0.25	<0.25	**3.5 Jj**	<0.25	<0.25	<0.25	<0.25	<0.50
		Off-site	<0.35	<0.17	**0.14 tJ**	<0.17	**0.14 tJ**	<0.17	<0.17	**2.1**	<0.17	<0.17	<0.17	<0.17	<0.17
SB-423	20 - 22	On-site	<2.5	<2.5	<2.5	<2.5	**4.8**	<2.5	<2.5	**52**	**1.0 J**	<2.5	<2.5	<2.5	<5.0
		Off-site	<3.6	<1.8	**2.8 t**	<1.8	**2.8 t**	<1.8	<1.8	**40**	0.40 J	<1.8	**0.35 J**	<1.8	<1.8
Duplicate		On-site	<5.0	<5.0	<5.0	<5.0	**5.0**	<5.0	<5.0	**50**	<5.0	<5.0	<5.0	<5.0	<1.0
		Off-site	<3.5	<1.7	**2.1 t**	<1.7	**2.1 t**	<1.7	<1.7	**33**	**<1.7**	<1.7	**0.29 J**	<1.7	<1.7
SB-503	6 - 8	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.35	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
Duplicate		On-site	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10
SB-504	2 - 4	On-site	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	**0.10**	<0.050	<0.050	<0.050	<0.10
		Off-site	<0.45	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23
Duplicate		On-site	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.034 J**	<0.05	<0.05	<0.05	<0.10

Notes:

Prepared by: KLB, 12/12/2000
Checked by: PMP, 2/21/2001

(1) On-site sample analysis was performed by the ECCS mobile laboratory. Fixed base sample analysis was performed by Severn Trent Laboratory in Canton, Ohio. All of the results in this table are reported on a wet weight basis, that is, the results have not been adjusted for solids fraction. The results in the table are reported in mg/kg to 2 significant figures.

< The concentration of the analyte is below the instrument detection limit

See Table 4-1 for data qualifiers.

t The reported value is a total 1,2-DCE concentration (trans- plus cis-DCE).

STL The screening result is provided by Severn Trent Laboratories, North Canton, Ohio. The values in this table are reported on a wet weight basis, calculated by multiplying the dry weight value by the reported sample solids fraction. Acetone and methylene chloride were detected in each sample analyzed by STL in this table, but these analytes were detected in the method blank as well.

BOLD Values in bold are results above the instrument detection limit.

Table 5-1
Summary of Detected VOCs and PCBs in Groundwater - Fall 2000

VOCs (µg/L)	SAMPLE LOCATION												
	33MWC-07	33MWC-08	33MWC-09	33MWC-13	33MWC-21	33MWC-24	33MWC-27	33MWC-30	33MWC-42	33MWC-43	33MWC-44	33MWC-45	33MWC-46
1,1,1-Trichloroethane	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
1,1,2,2-Tetrachloroethane	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
1,1,2-Trichloroethane	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
1,1-Dichloroethane	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
1,1-Dichloroethene	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
1,2-Dichlorobenzene	< 3,100	< 100	< 1,700	< 1,700	< 330	41 J	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
1,2-Dichloroethane	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
1,2-Dichloroethene, total	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
1,4-Dichlorobenzene	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
2-Butanone	< 16,000	< 500	< 8,300	< 8,300	< 1,700	< 420	< 5,000	< 620	< 5	< 5	< 5	< 5	< 12
Acetone	< 16,000	< 500	< 8,300	< 8,300	< 1,700	< 420	< 5,000	< 620	< 5	< 5	< 5	< 5	< 12
Benzene	1,100 J	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
Bromodichloromethane	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
Bromoform	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
Carbon disulfide	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
Carbon tetrachloride	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	4.2
Chlorobenzene	18,000	< 100	< 1,700	< 1,700	380	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
Chlorodibromomethane	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
Chloroform	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	0.1 J	0.28 J	2.3 J
cis-1,2-Dichloroethene	9,800	1,300	2,200	1,900	380	120	1,700	920	< 1	< 1	< 1	< 1	2.2 J
Cyclotetrasiloxane, octamethyl-	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethane	1.4	0.81	< 0.5	< 0.5	< 0.5	0.59	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethane, 1,1,2-trichloro-1,2,2-trifluoro	--	--	--	--	--	22,000 JN	--	--	--	--	--	--	--
Ethene	1.5	< 0.5	< 0.5	< 0.5	< 0.5	0.52	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Methane	28	< 0.5	660 D	22	3.2	210 D	310 D	25	3.8	1.6	4.2	390 D	5.3
Methylene chloride	< 6,200	< 200	< 3,300	< 3,300	< 670	< 170	< 2,000	< 250	0.58 Jbsu	0.6 Jbsu	0.54 Jbsu	0.44 Jbsu	< 5
Tetrachloroethene	< 3,100	< 100	190 Bju	< 1,700	400	25 Bju	< 1,000	< 120	< 1	< 1	< 1	< 1	18 B
Toluene	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
trans-1,2-Dichloroethene	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	35 J	< 1	< 1	< 1	< 1	< 2.5
trans-1,3-Dichloropropene	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	< 2.5
Trichloroethene	52,000	1,200	24,000	29,000	4,200	1,100	9,400	1,900	0.12 J	< 1	0.12 J	< 1	19
Vinyl chloride	< 3,100	< 100	< 1,700	< 1,700	< 330	< 83	< 1,000	< 120	< 1	< 1	< 1	< 1	0.57 J
PCBs (µg/L)													
Aroclor-1016	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes
-- = not analyzed
See Table 4-1 for data qualifiers

The sample location GW-301 is a groundwater grab sample collected from Geoprobe® soil boring of the same I.D. number

The sample location MP-US-I-1-23 is a groundwater grab sample collected from multi-phase extraction pilot test well screened in Upper Sand at Building I-1-23 VOC source area

Prepared by: KB, 2/16/01
Checked by: MLW, 2/21/01

Table 5-1 (Continued)
Summary of Detected VOCs and PCBs in Groundwater - Fall 2000

VOCs (µg/L)	SAMPLE LOCATION										
	33MWC-47	33MWC-48	33MWC-49	GW-128	GW-301	GW-302	GW-303	GW-502	GW-503	GW-504	MPE-US-I-1-23
1,1,1-Trichloroethane	< 50	< 1	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	8.2 J
1,1,2,2-Tetrachloroethane	< 50	< 1	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	11 J
1,1,2-Trichloroethane	< 50	< 1	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	7.8 J
1,1-Dichloroethane	< 50	< 1	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	8.2 J
1,1-Dichloroethene	< 50	0.12 J	< 33	< 8,300	< 100	1.3 J	< 420	< 33	< 1	< 31	< 33
1,2-Dichlorobenzene	< 50	0.21 J	< 33	< 8,300	< 100	3.8 J	< 420	< 33	< 1	< 31	--
1,2-Dichloroethane	< 50	< 1	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	10 J
1,2-Dichloroethene, total	--	--	--	--	--	--	--	--	--	--	29 J
1,3-Dichlorobenzene	< 50	0.35 J	< 33	< 8,300	< 100	5.1 J	< 420	< 33	< 1	< 31	--
1,4-Dichlorobenzene	< 50	0.81 BJu	4.6 BJu	< 8,300	< 100	12	< 420	< 33	< 1	< 31	--
2-Butanone	< 250	< 5	< 170	< 42,000	< 500	< 62	< 2,100	< 170	< 5	< 160	390
Acetone	< 250	< 5	< 170	< 42,000	< 500	< 62	< 2,100	< 170	< 5	< 160	170 JBu
Benzene	< 50	< 1	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	8.5 J
Bromodichloromethane	< 50	< 1	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	8.2 J
Bromoform	< 50	< 1	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	7.1 J
Carbon disulfide	< 50	< 1	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	8 J
Carbon tetrachloride	120	0.18 J	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	9.5 J
Chlorobenzene	< 50	0.73 J	< 33	< 8,300	< 100	6.5 J	< 420	< 33	< 1	< 31	24 J
Chlorodibromomethane	< 50	< 1	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	7.4 J
Chloroform	89	< 1	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	12 J
cis-1,2-Dichloroethene	18 J	18	470	19,000	1,300	110	5,700	230	0.65 J	40	--
Cyclotetrasiloxane, octamethyl-	--	2.9 JN	--		--	--	--	--	--	--	--
Ethane	< 0.5	0.53	7.2	9.3	9.5	6.8	23	< 0.5	< 0.5	< 0.5	--
Ethane, 1,1,2-trichloro-1,2,2-trifluoro	--	--	--	--	--	--	--	--	--	--	--
Ethene	< 0.5	< 0.5	2.4	22	2.6	1.4	20	< 0.5	< 0.5	< 0.5	--
Methane	12	14	400 D	440	440 D	94 D	1,200 D	6.5	31	39	--
Methylene chloride	< 100	0.71 Jbsu	< 67	< 17,000	23 BJsu	< 25	< 830	< 67	< 2	< 62	13 JBu
Tetrachloroethene	900 B	3.6 B	130 B	< 8,300	630	3.2 J	2,000	490	4.1	420	55
Toluene	< 50	< 1	< 33	< 8,300	< 100	3.9 J	< 420	< 33	< 1	< 31	7.6 J
trans-1,2-Dichloroethene	< 50	0.12 J	< 33	< 8,300	44 J	< 12	< 420	< 33	< 1	< 31	--
trans-1,3-Dichloropropene	< 50	< 1	< 33	< 8,300	< 100	< 12	< 420	< 33	< 1	< 31	5.2 J
Trichloroethene	57	3.8	62	110,000	1,000	30	510	400	2.2	660	870
Vinyl chloride	< 50	10	200	< 8,300	280	82	2,100	< 33	< 1	< 31	< 67
PCBs (µg/L)											
Aroclor-1016	--	--	--	--	--	--	--	--	--	--	21

Notes
-- = not analyzed
See Table 4-1 for data qualifiers

The sample location GW-301 is a groundwater grab sample collected from Geoprobe® soil boring of the same ID number

The sample location MP-US-I-1-23 is a groundwater grab sample collected from multi-phase extraction pilot test well screened in Upper Sand at Building I-1-23 VOC source area

Prepared by KB, 2/16/01
Checked by MLW, 2/21/01

Table 5-2
Field and Wet Chemistry Parameter Groundwater Results Summary - Fall 2000

FIELD PARAMETERS	UNITS	SAMPLE LOCATION					
		33MWC-07	33MWC-08	33MWC-09	33MWC-13	33MWC-21	33MWC-24
Color, field	None	CLEAR	CLEAR	TAN	CLEAR	CLEAR	CLEAR
Conductance, specific	µmhos/cm	1,958	--	--	1,174	2,410	1,304
Depth to water	feet	15.98	10.79	25.98	11.93	15.98	11.74
E_H, field	mV	--	120	215	--	--	-24
Odor, field	None	SOLVENT	NONE	NONE	NONE	SOLVENT	NONE
Oxygen, dissolved	ppm	1.1	5.1	5.2	0.98	0.4	0.44
pH, field	pH units	6.9	7.4	6.9	7.0	7.3	7.2
Temperature	°C	20.1	18.9	17.0	20.1	17.9	19.5
Turbidity, field	None	NONE	NONE	SLIGHT	NONE	NONE	NONE
Water elevation	feet	408.02	405.67	408.31	417.01	408.06	416.98
WET CHEMISTRY PARAMETERS							
Alkalinity as $CaCO_3$	mg/L	480	300	410	400	350	430
Chloride	mg/L	54	117	335	27	111	39.8
Nitrogen, ammonia	mg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Nitrogen, nitrate + nitrite	mg/L	0.1	< 0.1	0.3	< 0.1	0.3	< 0.1
Solids, total dissolved	mg/L	1,200	990	1,200	740	1,800	770
Sulfate	mg/L	481	413	196	190	939	195
Total organic carbon as NPOC	mg/L	4	2	4	3	2	2

Notes:
-- = not analyzed.
See Table 4-1 for data qualifiers.
The sample location GW-301 is a groundwater grab sample collected from Geoprobe® soil boring of the same I.D. number.

Prepared by: KLB, 12/12/2000
Checked by: PMP, 2/21/2001

Table 5-2 (Continued)
Field and Wet Chemistry Parameter Groundwater Results Summary - Fall 2000

FIELD PARAMETERS	UNITS	SAMPLE LOCATION					
		33MWC-27	33MWC-30	33MWC-42	33MWC-43	33MWC-44	33MWC-45
Color, field	None	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR
Conductance, specific	µmhos/cm	1,897	1,937	1,891	2,170	1,856	1,504
Depth to water	feet	25.35	4.78	8.27	8.62	10.40	10.77
E_H, field	mV	--	9	--	--	170	-101
Odor, field	None	NONE	NONE	NONE	NONE	NONE	NONE
Oxygen, dissolved	ppm	--	0.10	2.5	0.44	2.7	0.2
pH, field	pH units	7.0	6.9	6.6	6.64	6.9	7.1
Temperature	°C	18.5	17.2	18.4	15.6	16.4	15.9
Turbidity, field	None	NONE	NONE	NONE	NONE	NONE	NONE
Water elevation	feet	407.94	404.00	404.72	403.92	404.27	403.18
WET CHEMISTRY PARAMETERS							
Alkalinity as $CaCO_3$	mg/L	510	330	230	330	430	480
Chloride	mg/L	191	144	182	219	196	202
Nitrogen, ammonia	mg/L	0.4	< 0.2	< 0.2	< 0.2	< 0.2	1.2
Nitrogen, nitrate + nitrite	mg/L	< 0.1	< 0.1	< 0.1	0.2	< 0.1	< 0.1
Solids, total dissolved	mg/L	1,200	1,300	1,200	900	1,400	790
Sulfate	mg/L	294	544	487	544	498	22.7
Total organic carbon as NPOC	mg/L	3	2	2	1	2	3

Notes:
-- = not analyzed.
See Table 4-1 for data qualifiers.
The sample location GW-301 is a groundwater grab sample collected from Geoprobe® soil boring of the same I.D. number.

Prepared by: KLB, 12/12/2000
Checked by: PMP, 2/21/2001

Table 5-2 (Continued)
Field and Wet Chemistry Parameter Groundwater Results Summary - Fall 2000

FIELD PARAMETERS	UNITS	SAMPLE LOCATION					
		33MWC-46	33MWC-47	33MWC-48	33MWC-49	GW-128	GW-301
Color, field	None	CLEAR	CLEAR	CLEAR	CLEAR	--	--
Conductance, specific	μmhos/cm	414	1,691	614	675	--	--
Depth to water	feet	12.88	12.86	15.55	15.37	--	--
E_H, field	mV	--	--	1.88	153	--	--
Odor, field	None	NONE	NONE	NONE	NONE	--	--
Oxygen, dissolved	ppm	--	--	1.1	0.25	--	--
pH, field	pH units	7.6	7.1	7.5	7.2	--	--
Temperature	°C	18.9	17.1	16.2	19.1	--	--
Turbidity, field	None	NONE	NONE	NONE	NONE	--	--
Water elevation	feet	406.96	406.92	408.00	408.11	--	--
WET CHEMISTRY PARAMETERS							
Alkalinity as $CaCO_3$	mg/L	150	340	310	350	570	280
Chloride	mg/L	10.5	50.9	11.2	10.2	760	12.2
Nitrogen, ammonia	mg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.2
Nitrogen, nitrate + nitrite	mg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Solids, total dissolved	mg/L	240	1,200	350	390	4,500	720
Sulfate	mg/L	38.4	613	13.7	16	2,260	34.3
Total organic carbon as NPOC	mg/L	< 1	2	3	2	4	2

Notes:
-- = not analyzed.
See Table 4-1 for data qualifiers.
The sample location GW-301 is a groundwater grab sample collected from Geoprobe® soil boring of the same I.D. number.

Prepared by: KLB, 12/12/2000
Checked by: PMP, 2/21/2001

Table 5-2 (Continued)
Field and Wet Chemistry Parameter Groundwater Results Summary - Fall 2000

FIELD PARAMETERS	UNITS	SAMPLE LOCATION				
		GW-302	GW-303	GW-502	GW-503	GW-504
Color, field	None	--	--	--	--	--
Conductance, specific	µmhos/cm	--	--	--	--	--
Depth to water	feet	--	--	--	--	--
E_H, field	mV	--	--	--	--	--
Odor, field	None	--	--	--	--	--
Oxygen, dissolved	ppm	--	--	--	--	--
pH, field	pH units	--	--	--	--	--
Temperature	°C	--	--	--	--	--
Turbidity, field	None	--	--	--	--	--
Water elevation	feet	--	--	--	--	--
WET CHEMISTRY PARAMETERS						
Alkalinity as $CaCO_3$	mg/L	570	290	280	300	280
Chloride	mg/L	13.4	25.4	48.8 j	36.9	55.3
Nitrogen, ammonia	mg/L	< 0.2	< 0.2	< 0.2	< 0.2	0.4
Nitrogen, nitrate + nitrite	mg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Solids, total dissolved	mg/L	520	370	2,200	1,000	1,400
Sulfate	mg/L	26.1	26	667 j	199	605
Total organic carbon as NPOC	mg/L	3	2	2	2	2

Notes:
-- = not analyzed.
See Table 4-1 for data qualifiers.
The sample location GW-301 is a groundwater grab sample collected from Geoprobe® soil boring of the same I.D. number.

Prepared by: KLB, 12/12/2000
Checked by: PMP, 2/21/2001

Table 6-1
Summary of Pilot Test Groundwater Sampling Data

SAMPLE IDENTIFICATION	SAMPLE DATE	PCE	TCE	1,2-DICHLORO-BENZENE	1,2,4-TRICHLORO-BENZENE	1,4-DICHLORO-BENZENE	2-BUTANONE	CIS-1,2-DCE	ACETONE	CHLORO-BENZENE	TETRA-HYDROFURAN	METHYLENE CHLORIDE	STYRENE	TOLUENE	TOTAL VOCs
Repos. US	10/17/2000	2.4 J	29	<20	NA	<20	1,600	<20	<100	<20	54 J	<40	<20	<20	1,685
Repos. US+UC1	10/18/2000	<10	88	<10	NA	<10	760	5 J	42 J	<10	NA	2.9 BJ	<10	<10	927
Repos. Test End	10/21/2000	<10	140	<10	11	<10	100	2.8 J	<50	<10	NA	<20	12	1.5 J	267
I-1-23 MPE Hr. 1	10/22/2000	2.4 J	37	<17	51	<17	900	<17	56 J	<17	NA	<33	<17	<17	1,046
I-1-23 MPE 24 Hr. UC	10/23/2000	4.2 J	88	2.6 J	120	2.4 J	<31	4.7 J	<31	4.8 J	NA	<12	<6.2	<6.2	227
I-1-23 Test End	10/25/2000	73	230	28 J	1,200	29 J	<310	7.1 J	<310	7.6 J	NA	<120	<62	<62	1,575

Notes:
All values are expressed in µg/L.
Only the detected compounds from the VOCs analyses are shown.
NA = not analyzed.
J = the analyte was detected at a concentration above the Instrument Detection Limit, but below the practical Limit of Quantitation.
B = the analyte was present in the method blank.
US = pumping from MPE-US in the Upper Sand
US+UC1 = pumping from both MPE-US and MPE-UC1 (Lower Clay).
UC = pumping from MPE-UC in the Upper Clay.

Prepared by: DJH
Checked by: BSS

Table 6-2
Summary of Pilot Test Air Sampling Data

SAMPLE IDENTIFICATION	SAMPLE DATE	SAMPLE TIME	SAMPLE LOCATION	SAMPLE DESCRIPTION[1]	PID READING	SELECTED VOCs[2]								ADDITIONAL VOCs[3]					MINIMUM TOTAL VOCs	AVERAGE TOTAL VOCs	MAXIMUM TOTAL VOCs
						PCE	TCE	CIS-1,2-DCE	FREON 113	CHLORO-BENZENE	TOLUENE	ACETONE	MEK	TETRA-HYDROFURAN	STYRENE	1,2,4-TRICHLORO-BENZENE	1,4-DICHLORO-BENZENE	1,2-DICHLORO-BENZENE			
Repos. US	10/17/00	15:45	Repository	Inlet	8.6	150	24,000	470	<120	<76	<62	<160	2,100	1,200	<70	<120	<99	<99	27,920	28,164	28,408
Repos. US	10/17/00	16:25	Repository	Inlet	4.7	110	16,000	360	<120	<76	<57	2,400	1,100	NA	NA	NA	NA	NA	19,970	20,097	20,223
Repos. US+UC1	10/18/00	14:10	Repository	Inlet	16.2	<510	84,000	1,900	<580	<350	<280	<720	2,100	NA	NA	NA	NA	NA	88,000	89,220	90,440
Repos. US+UC1+UC2	10/19/00	13:15	Repository	Inlet	45.2	<650	110,000	790	<740	<440	550	<920	<1,100	NA	NA	NA	NA	NA	111,340	113,265	115,190
Repos. US+UC1+UC2	10/20/00	18:00	Repository	Inlet	40.4	<820	120,000	1,000	<930	<560	830	<1,100	<1,400	NA	NA	NA	NA	NA	121,830	124,235	126,640
Repos. Test End	10/21/00	8:15	Repository	Inlet	67.5	<800	110,000	980	<910	<540	810	<1,100	<1,400	<1,400	2,800	<880	<710	<710	114,590	117,665	120,740
Repos. Test End	10/21/00	8:25	Repository	Exhaust	<1	<30	100	<17	<34	<20	<16	<42	<52	NA	NA	NA	NA	NA	100	206	311
MPE I-1-23 UC	10/22/00	9:50	I-1-23	Inlet	6.7	270	16,000	440	<120	<73	<60	<150	1,500	1,200	<68	680	<96	<96	20,090	20,388	20,685
MPE I-1-23 UC	10/22/00	10:00	I-1-23	Exhaust	<1	<36	<29	<21	<41	<25	<20	<51	<64	NA	NA	NA	NA	NA	0	144	287
MPE I-1-23 UC+US	10/23/00	9:00	I-1-23	Inlet	23.5	4,300	78,000	1,900	<440	1,500	<220	<540	<680	NA	NA	NA	NA	NA	85,700	86,640	87,580
MPE I-1-23 UC+US	10/24/00	7:45	I-1-23	Inlet	29.4	4,200	72,000	2,200	<310	1,900	<150	<380	<470	NA	NA	NA	NA	NA	80,300	80,955	81,610
MPE I-1-23 UC+US	10/25/00	10:10	I-1-23	Inlet	25.3	6,000	99,000	3,100	<790	2,200	<390	<980	<1,200	NA	NA	NA	NA	NA	110,300	111,980	113,660
MPE I-1-23 Test End	10/25/00	15:00	I-1-23	Exhaust	<1	<62	260	<36	<70	<42	<34	<87	<110	NA	NA	NA	NA	NA	260	481	701
MPE I-1-23 Test End	10/25/00	15:00	I-1-23	Inlet	23.6	9,300	120,000	3,800	<1,000	2,700	<520	<1,300	<1,600	<1,600	<580	36,000	1,400	1,200	174,400	177,576	180,751
SVE I-1-23	10/19/00	11:34	I-1-23	Inlet	NM	86	14,000	69	<68	<41	<34	<85	380	NA	NA	NA	NA	NA	14,535	14,649	14,763
SVE I-1-23 Test End	10/21/00	7:50	I-1-23	Inlet	3.6	80	12,000	74	<60	<36	<30	<75	<93	NA	NA	NA	NA	NA	12,154	12,301	12,448
I-1-2	10/21/00	16:22	I-1-2	Inlet	<1	<46	590	<27	560	<32	<26	<65	<81	NA	NA	NA	NA	NA	1,150	1,289	1,427
I-1-2	10/21/00	16:25	I-1-2	Exhaust	<1	<54	<43	<31	<61	<36	<30	<75	<94	<94	<34	<59	<48	<48	0	289	577
I-1-2	10/24/00	9:40	I-1-2	Inlet	<1	<62	890	<36	880	<42	<34	<87	<110	NA	NA	NA	NA	NA	1,770	1,956	2,141
I-1-2	10/25/00	10:45	I-1-2	Inlet	<1	<44	1,400	48	1,200	<30	<24	67	<77	NA	NA	NA	NA	NA	2,715	2,803	2,890
I-1-2 Test End	10/25/00	17:10	I-1-2	Inlet	<1	<48	1,000	54	1,100	<32	<26	100	<83	85	<30	57	<42	<42	2,396	2,491	2,585
I-1-2 Test End	10/25/00	17:10	I-1-2	Exhaust	<1	<44	<35	<26	<50	<30	<24	<62	<77	NA	NA	NA	NA	NA	0	174	348

Notes

(1) Inlet air samples collected between the vacuum pump and activated carbon canisters. Exhaust air samples collected after the activated carbon canisters

(2) Selected VOCs as described in the Predesign Workplan

(3) Additional VOCs include compounds that were detected in air samples from the VOCs TO-14 analysis

NA = not analyzed.

NM = not measured

PID = photoionization detector

US = pumping from MPE-US in the Upper Sand

US+UC1 = pumping from both MPE-US and from MPE-UC1

US+UC1+UC2 = pumping from all three MPE wells (US, UC1, and UC2)

UC = pumping from MPE-UC in the Upper Clay

UC+US = pumping from both MPE-UC and MPE-US

UC1 = pumping from MPE-UC1 in the Lower Clay

UC2 = pumping from MPE-UC2 in the Lower Clay

All values are expressed in $\mu g/m^3$

Values shown as "less than" (<) are the method detection limit concentration

Prepared by: DJH

Checked by: BSS

Table 6-3
Summary of Pilot Test Data

PARAMETER	BUILDING I-1-23	AREA 9 REPOSITORY	BUILDING I-1-2
Multi-Phase Extraction (MPE) Test	October 22, 2000, to October 25, 2000 77 hr test	October 17, 2000, to October 21, 2000 89 hr test	N/A
Pumping rate - MPE	UC: 0.2 gpm (0.15 - 0.23 gpm) US + UC: 7.3 gpm (limited by pumping equipment)	US: 0.4 gpm (0.23 - 0.56 gpm) LC + US: 0.3 gpm	
Drawdown notes	UC: up to 0.8 ft. (limited drawdown in UC) US: up to 3.8 ft.	US: up to 4.9 ft. LC: up to 8.1 ft.	
Vacuum response notes	Slight vacuum response in MP-1B, MP-2B, & MP-3A (UC). Other monitoring points under water.	All monitoring points under water during the test.	
Wellhead vacuum and airflow	UC: 14.6" Hg, 22 scfm US: 0.026" Hg (submerged screen), 19 scfm from both US & UC	US: 13.8" Hg, 28 scfm LC: 14.9" Hg, 27 scfm from both US & LC	
Water sample analysis	VOCs: 227 - 1575 μg/L PCE: 2.4 - 73 μg/L TCE: 37 - 230 μg/L cis-1,2-DCE: BDL - 7.1 μg/L VC: BDL	VOCs: 267 - 1685 μg/L PCE: BQL TCE: 29 - 140 μg/L cis-1,2-DCE: BQL VC: BDL	
Air sample analysis	VOCs: up to 181,000 μg/m^3 TCE: up to 120,000 μg/m^3	VOCs: up to 127,000 μg/m^3 TCE: up to 120,000 μg/m^3	
Soil Vapor Extraction (SVE) Test	October 18, 2000, to October 19, 2000 44 hr test	N/A	October 21, 22, 24, and 25, 2000 46 hr test
SVE extraction well vacuum and airflow	13.3" Hg, 39 scfm		20.7" Hg, 39 scfm (includes bleed air) and short-circuiting from base of well
Radius of influence - SVE	Monitoring points under water during the test.		<4.1 ft.; limited vacuum influence
Air sample analysis	VOCs: up to 15,000 μg/m^3 TCE: up to 14,000 μg/m^3		VOCs: up to 2,900 μg/m^3 Freon 113: up to 1,200 μg/m^3 TCE: up to 1,400 μg/m^3
Notes for SVE test	--		Short circuiting at SVE well was repaired with bentonite seal.

Notes:
BDL = below Detection Limit.
BQL = below Quantitation Limit.
LC = Lower Clay.
UC = Upper Clay.
US = Upper Sand.

Prepared by: DJH
Checked by: JWA

Table 6-4
Mass Removal via Groundwater Extracted During MPE Pilot Tests

DATE	TIME	EXTRACTION RATE (gpm)	TOTAL VOCs (µg/L)	TOTAL VOCs RECOVERY (lb/day)
Repository				
10/17/2000	16:25	0.41	1,685.4	0.00831
10/18/2000	14:10	0.36	926.9	0.00401
10/21/2000	7:30	0.27	267.3	0.00088
Average		**0.35***	**959.9**	**0.00440**
Building I-1-23				
10/22/2000	9:45	0.2	1,046.4	0.00277
10/23/2000	9:00	7.1	226.7	0.01935
10/25/2000	14:00	8.3	1,574.7	0.15715
Average		**6.27****	**949.3**	**0.07157**

Note:

* Based on a total of 5,340 gallons extracted during the 89-hour test.

** Based on a total of 29,750 gallons extracted during the 77-hour test.

Prepared by: DH
Checked by: BS

Table 6-5
Mass Removal via Vapor Extraction During MPE Pilot Test at Building I-1-23

DATE	TIME	EXHAUST AIR FLOW (scfm)	MINIMUM TOTAL VOCs ($\mu g/m^3$)	MINIMUM TOTAL VOCs RECOVERY (lb/day)	AVERAGE TOTAL VOCs ($\mu g/m^3$)	AVERAGE TOTAL VOCs RECOVERY (lb/day)	MAXIMUM TOTAL VOCs ($\mu g/m^3$)	MAXIMUM TOTAL VOCs RECOVERY (lb/day)	MPE WELLS ONLINE
10/22/00	9:45	19.9	20,090	0.0359	20,388	0.0365	20,685	0.0370	UC
10/23/00	9:00	11.3	85,700	0.0868	86,640	0.0877	87,580	0.0887	UC & US
10/24/00	7:15	19.6	80,300	0.1411	80,955	0.1423	81,610	0.1434	UC & US
10/25/00	11:10	19.4	110,300	0.1927	111,980	0.1956	113,660	0.1986	UC & US
10/25/00	14:00	19.5	174,400	0.3060	177,576	0.3116	180,751	0.3172	UC & US
Average		**17.9**			**95,508**	**0.1540**			

Notes:
UC = pumping from MPE-UC in the Upper Clay.
US = pumping from MPE-US in the Upper Sand.

Prepared by: DH
Checked by: BS

Table 6-6
Mass Removal via Vapor Extraction During MPE Pilot Test at Repository

DATE	TIME	EXHAUST AIR FLOW (scfm)	MINIMUM TOTAL VOCs ($\mu g/m^3$)	MINIMUM TOTAL VOCs RECOVERY (lb/day)	AVERAGE TOTAL VOCs ($\mu g/m^3$)	AVERAGE TOTAL VOCs RECOVERY (lb/day)	MAXIMUM TOTAL VOCs ($\mu g/m^3$)	MAXIMUM TOTAL VOCs RECOVERY (lb/day)	MPE WELLS OPERATING
10/17/00	16:00	18.0	27,920	0.0451	28,164	0.0455	28,408	0.0459	US
10/17/00	16:25	37.9	19,970	0.0679	20,097	0.0684	20,223	0.0688	US
10/18/00	14:10	29.7	88,000	0.2352	89,220	0.2384	90,440	0.2417	US & UC1
10/19/00	13:15	31.9	111,340	0.3186	113,265	0.3241	115,190	0.3296	US, UC1, & UC2
10/20/00	18:15	6.1 (1)	121,830	0.0670	124,235	0.0683	126,640	0.0696	US, UC1, & UC2
10/21/00	7:30	5.1 (1)	114,590	0.0520	117,665	0.0534	120,740	0.0548	US, UC1, & UC2
Average		**29.4**			**82,108**	**0.2169**			

Notes:

(1) The flow differential pressure readings were potentially influenced by water entering the magnehelic gauge and are not considered in the average exhaust air flow.

US = pumping from MPE-US in the Upper Sand.

UC1 = pumping from MPE-UC1 in the Lower Clay.

UC2 = pumping from MPE-UC2 in the Lower Clay.

Prepared by: DH

Checked by: BS

Table 6-7
Mass Removal via Vapor Extraction During SVE Pilot Test at Building I-1-23

DATE	TIME	EXHAUST AIR FLOW (scfm)	MINIMUM		AVERAGE		MAXIMUM	
			TOTAL VOCs ($\mu g/m^3$)	TOTAL VOCs RECOVERY (lb/day)	TOTAL VOCs ($\mu g/m^3$)	TOTAL VOCs RECOVERY (lb/day)	TOTAL VOCs ($\mu g/m^3$)	TOTAL VOCs RECOVERY (lb/day)
10/19/00	13:20	41.1	14,535	0.0537	14,649	0.0541	14,763	0.0546
10/21/00	7:35	37.0	12,154	0.0404	12,301	0.0409	12,448	0.0414
Average		**39.0**			**13,475**	**0.0475**		

Prepared by: DH
Checked by: BS

Table 6-8
Mass Removal via Vapor Extraction During SVE at Building I-1-2

DATE	TIME	EXHAUST AIR FLOW (scfm)	MINIMUM		AVERAGE		MAXIMUM	
			TOTAL VOCs ($\mu g/m^3$)	TOTAL VOCs RECOVERY (lb/day)	TOTAL VOCs ($\mu g/m^3$)	TOTAL VOCs RECOVERY (lb/day)	TOTAL VOCs ($\mu g/m^3$)	TOTAL VOCs RECOVERY (lb/day)
10/21/00	15:55	49.2	1,150	0.0051	1,289	0.0057	1,427	0.0063
10/24/00	9:30	60.8	1,770	0.0097	1,956	0.0107	2,141	0.0117
10/25/00	11:00	65.7	2,715	0.0160	2,803	0.0166	2,890	0.0171
10/25/00	17:00	65.1	2,396	0.0140	2,491	0.0146	2,585	0.0151
Average		**60.2**			**2,135**	**0.0119**		

Prepared by: DH
Checked by: BS

Table 6-9
Summary of Contaminant Mass Removal Rates During MPE and SVE Pilot Tests

AREA	TREATMENT TECHNOLOGY	LITHOLOGICAL UNIT TREATED	AVERAGE WELLHEAD VACUUM (in Hg)	AVERAGE GROUNDWATER EXTRACTION RATE (gpm)	AVERAGE VAPOR EXHAUST RATE (scfm)	AVERAGE GROUNDWATER VOC CONCENTRATION (µg/L)	AVERAGE VAPOR VOC CONCENTRATION (µg/m3)	AVERAGE GROUNDWATER VOC RECOVERY (lb/day)	AVERAGE VAPOR VOC RECOVERY (lb/day)	TOTAL AVERAGE VOC RECOVERY (lb/day)
Repository	MPE	US	13.8	0.37	27.8	1,685.4	111,096*	0.0075	0.28	**0.28**
		US and LC	14.9	0.33	26.8	597.1	111,096	0.0024	0.27	**0.27**
I-1-23	MPE	UC	14.6	0.21	22.3	1,046.4	20,388	0.0026	0.04	**0.04**
		UC and US	0.026	7.32**	19.1	900.7	114,288	0.0793	0.20	**0.28**
I-1-23	SVE	UC	13.3	-	39.1	-	13,475	-	0.05	**0.05**
I-1-2	SVE	UC	20.7	-	60.1	-	2,135	-	0.01	**0.01**

Notes:
-- = not applicable to treatment technology.
* = assumed to be the same vapor concentration as US and LC tests combined.
** = limited by capacity of the pumping equipment, not the aquifer.
US = Upper Sand.
UC = Upper Clay.
LC = Lower Clay.
The average vapor exhaust rate includes aspiration and bleed air.

Prepared by: BS
Checked by: DH

Table 7-1
Estimated Full-scale MPE Well Systems
Operating Conditions

AREA	UPPER SAND WELLS					UPPER CLAY/LOWER CLAY WELLS						TOTAL WATER REMOVAL RATE (gpm)
	NUMBER OF US WELLS	VAPOR REMOVAL RATE/WELL (cfm)	ASSUMED AVERAGE VAPOR CONC. (mg/m^3)	WATER REMOVAL RATE/WELL (gpm)	ASSUMED AVERAGE WATER CONC. (mg/L)	NUMBER OF UC/LC WELLS	VAPOR REMOVAL RATE/WELL (cfm)	ASSUMED AVERAGE VAPOR CONC. (mg/m^3)	WATER REMOVAL RATE/WELL (gpm)	ASSUMED AVERAGE WATER CONC. (mg/L)	TOTAL VAPOR REMOVAL RATE (cfm)	
Repository	0	-	-	-	-	25	30	111	0.4	1	750	10
I-1-23	2/4[1]	75	120	50	1	18	25	21	0.25	1	750	104.5
I-1-2	0	-	-	-	-	27	20	100	0.5	1	540	13.5
I-1-3	0	-	-	-	-	24	20	100	0.5	1	480	12
TOTALS	**2/4[1]**					**94**					**2,520**	**140.0**

Notes:
US = Upper Sand.
UC = Upper Clay.
LC = Lower Clay.
[1] The Upper Sand wells at Building I-1-23 will be two horizontal groundwater extraction wells and four vertical vapor-only extraction wells.

Prepared by: BS
Checked by: DH

Table 7-2
Summary of Soil Physical Parameter Testing

PHYSICAL PARAMETER	TEST METHOD	NUMBER OF SAMPLES
Moisture content	ASTM D2216	15
Specific gravity	ASTM D854	15
Porosity	ISRM Pt 1	15
Wet density	ASTM D2937	15
Dry density	ASTM D2937	15
Permeability	ASTM D5084	15
Total organic content	SW 846-9060	15
Particle size analysis	ASTM D422	15
Capillary-moisture relationships	ASTM D3152	13

Notes:
ASTM = American Society for Testing and Materials.
ISRM = International Society for Rock Mechanics.
SW 846 = from EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods."

Prepared by: BS
Checked by: RW

Table 7-3
Summary of Soil Physical Parameter Results

PHYSICAL PARAMETERS	SAMPLE LOCATION AND DEPTH INTERVAL														
	I-1-23 SVE	I-1-23 UC	I-1-23 US	I-1-2 SVE	REP MPE US	REP MPE UC1	REP MPE UC2	33MWC-43		33MWC-45		33MWC-47		33MWC-49	
	5.25'-7.25'	14'-16'	32'-34.5'	6'-8'	30.5'-32.5'	39'-40.5'	45'-47.5'	10'-12.5'	26'-28.5'	10'-12.5'	46'-48.5'	12'-14'	34'-36.5'	18'-20.5'	34'-36.5'
Lithological unit	UC	UC	US	UC	US	LC	LC	UC	LC	UC	LC	UC	LC	UC	LC
Moisture content (%)	25.9	21.9	22.2	19.7	20.0	22.1	21.2	23.1	30.8	21.7	19.0	21.4	20.2	22.9	23.7
Specific gravity	2.73	2.78	2.68	2.68	2.68	2.74	2.73	2.74	2.71	2.68	2.72	2.76	2.71	2.71	2.76
Porosity (%)	41.54	39.30	35.62	35.82	35.41	36.39	35.71	38.08	44.34	35.61	32.90	36.79	33.82	37.87	37.09
Wet density (pcf)	123.9	129.0	125.4	131.4	129.6	130.8	131.9	127.2	122.2	129.8	132.8	129.1	132.4	127.5	129.0
Dry density (pcf)	98.4	105.8	102.7	109.8	108.0	107.1	108.9	103.3	93.5	106.6	111.6	106.3	110.1	103.7	104.3
Hydraulic conductivity (cm/s)	1.2E-08	1.1E-08	1.9E-03	1.2E-08	5.9E-05	3.0E-08	1.3E-08	3.1E-07	1.3E-08	1.7E-08	6.3E-09	4E-09	1.3E-08	3.7E-08	5.8E-08
Total organic carbon (%)	0.19	0.13	0.07	0.17	0.10	0.42	0.49	0.10	0.44	0.14	0.18	0.12	0.76	0.08	0.74
% Passing 200 sieve	94.1	94.1	6.9	75.2	32.5	78.9	83.7	75.1	87.1	81.0	77.3	89.4	82.2	93.4	83.6
% Saturated at 29.92" Hg vacuum	81.6	80.1	31.2	84.4	53.9	87.1	90.0	78.5	87.3	-	45.2	85.6	84.8	86.3	-

Notes:
UC = Upper Clay.
US = Upper Sand.
LC = Lower Clay.

Prepared by: BS
Checked by: RW

Table 7-4
Lithological Unit Soil Physical Parameter Averages

PHYSICAL PARAMETER	LITHOLOGICAL UNIT		
	UPPER CLAY	UPPER SAND	LOWER CLAY
Moisture content (%)	22.4	21.1	22.8
Specific gravity	2.73	2.68	2.73
Porosity (%)	37.86	35.52	36.71
Wet density (pcf)	128.3	127.5	129.9
Dry density (pcf)	104.8	105.4	105.9
Hydraulic conductivity (cm/s)	5.8E-08	9.8E-04	2.2E-08
Total organic carbon (%)	0.13	0.09	0.51
% Passing 200 sieve	86.0	19.7	82.1
% Saturated at 29.92" Hg vacuum	82.8	42.6	78.9

Prepared by: BS
Checked by: RW

Table 7-5
Summary of Remediation Systems for Final Design

	MULTI-PHASE EXTRACTION						PHYTOREMEDIATION	
	WELLS	WATER FLOW RATE	AIR FLOW RATE	INITIAL VOC RECOVERY	EXTRACTION AND TREATMENT EQUIPMENT LOCATIONS	TREATMENT EQUIPMENT APPLIED	TREES	AREA PLANTED
Building I-1-23	12 MPE wells screened 3′ - 13′; 6 MPE wells screened 10′ - 18′; 2 horizontal wells in Upper Sand 4 vapor-only extraction wells in Upper Sand	104.5 gpm	750 cfm	5.3 lb/day	North MPE & Wastewater Treatment Buildings	Vapor & Liquid Phase GAC, sand filters	N/A	N/A
Area 9 Repository	9 MPE wells screened 20′ - 35′; 16 MPE wells screened 35′ - 40′	10 gpm	750 cfm	7.6 lb/day	Repository MPE & Wastewater Treatment Buildings	Vapor & Liquid Phase GAC, sand filters	N/A	N/A
Building I-1-2	6 MPE wells screened 20′ - 28′; 21 MPE wells screened 9′ - 14′	13.5 gpm	540 cfm	5.0 lb/day	South MPE Building	Vapor & Liquid Phase GAC	N/A	N/A
Building I-1-3	6 MPE wells screened 27′ - 42′; 6 MPE wells screened 10′ - 25′; 12 MPE wells screened 2′ - 7′	12 gpm	480 cfm	4.5 lb/day	South MPE Building	Vapor & Liquid Phase GAC	N/A	N/A
East Swale	N/A	N/A	N/A	N/A	N/A	N/A	900 trees	2 x 0.4 acre = 0.8 acre
Center Swale	N/A	N/A	N/A	N/A	N/A	N/A	280 trees	0.2 acre
West Swale	N/A	N/A	N/A	N/A	N/A	N/A	440 trees	0.5 acre

Prepared by: JWA
Checked by: DJH

Table 8-1
Agronomic Results for On-Site Soil[1]

Site: Crab Orchard National Wildlife Refuge, Marion, Illinois
Sampling date: September 2000
Analysis date: January 11, 2001
Sampled by: Meredith Westover, RMT, Inc.

ANALYTE									
SAMPLE NUMBER		1	3	5	7	2	4	6	8
SAMPLE DESCRIPTION	UNITS	EAST SWALE, SOUTHWEST TRANSECT	EAST SWALE, NORTHWEST TRANSECT	EAST SWALE, NORTHEAST TRANSECT	EAST SWALE, SOUTHEAST TRANSECT	WEST SWALE, SOUTHWEST TRANSECT	WEST SWALE, NORTHWEST TRANSECT	WEST SWALE, NORTHEAST TRANSECT	WEST SWALE, SOUTHEAST TRANSECT
Soil pH		**6.4**	7.0	*7.4*	**7.3**	**5.5**	**5.8**	**5.1**	**7.2**
Buffer pH		7.1	7.2	7.2	7.3	6.8	7.0	**6.4**	7.2
Texture		Silty Loam	Silty Loam	Silty Loam	Silty Loam	Silty Loam	Silty Loam	Silty Loam	Silty Loam
Salts	dS/m	**0.08**	**0.24**	**0.17**	**0.38**	**0.24**	**0.43**	**0.20**	**0.09**
Cation exchange capacity	meq/100 g soil	11.1	12.8	7.7	8.8	13.9	10.6	12.9	11.9
Organic matter	%	**1.2**	**1.3**	**1.2**	**1.1**	**1.2**	**1.1**	1.7	**1.1**
Nitrate nitrogen	mg/kg	**4.17**	**5.05**	**4.47**	**3.62**	**7.64**	**6.88**	**9.51**	**6.64**
Ammonium nitrogen	mg/kg	**9.4**	13.9	**6.3**	25.1	26.0	18.8	*39.0*	10.3
Phosphorus	mg/kg	**1**	**2**	**7**	**5**	**2**	**3**	**4**	**1**
Potassium	mg/kg	**72**	**71**	**36**	**39**	**68**	**52**	**55**	**60**
Calcium	mg/kg	**1,128**	1,443	**840**	**945**	1,260	**969**	**599**	1,276
Magnesium	mg/kg	*571*	*556*	**319**	**313**	*578*	*500*	**270**	*556*
Sodium	mg/kg	**112**	170	164	304	162	226	127	169
Chloride	mg/kg	**8**	**13**	**8**	**13**	**13**	**13**	**12**	**13**
Zinc	mg/kg	**0.2**	**0.8**	**0.6**	**0.6**	**0.2**	**0.2**	**0.3**	**0.2**
Iron	mg/kg	29	55	*66*	*44*	42	34	129	19
Manganese	mg/kg	21	18	*26*	*33*	16	22	40	19
Copper	mg/kg	**0.7**	1.1	**0.9**	**0.8**	**0.8**	**0.7**	**0.8**	**0.6**
Sulfur	mg/kg	10	*25*	*20*	*55*	*39*	*84*	*38*	10
Boron	mg/kg	**0.2**	**0.2**	**0.5**	**0.6**	**0.2**	**0.1**	**0.2**	**0.2**

Legend:
Bold = low/very low.
Italic = very high.
Normal = sufficient.

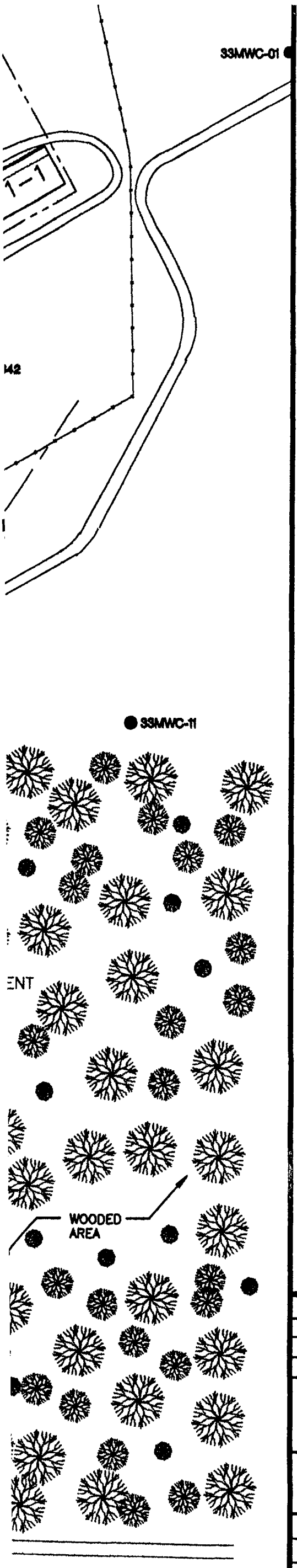
Prepared by: EA (Ecolotree)
Checked by: RW

Note:
[1] Table provided by Ecolotree, Inc., using soil data obtained by RMT, Inc.

Table 9-1
Estimated Schedule

EVENT/OUTPUT	ESTIMATED SCHEDULE
Submit Preliminary Design Report	(This submittal)
Submit 100 percent Design Documents	Within 120 calendar days after approval of Preliminary Design Report
Complete final construction Bid Documents	Within 40 calendar days after approval of 100 percent Design Documents
Complete construction contracts Bid Period	Within 25 calendar days after completion of construction Bid Documents
Execute construction contracts	Within 25 calendar days after completion of Bid Period
Submit Construction Quality Assurance (CQA) Plan and Safety, Health, & Emergency Response (SHER) Plan	Submit with 100 percent Design Documents
Start construction	Within 20 calendar days after execution of construction contracts and approval of CQA Plan and SHER Plan
Submit Operation & Maintenance (O&M) Plan revision and Quality Assurance Project Plan/ Field Sampling Plan (QAPP/FSP) revision	Within 40 calendar days after start of construction

FIGURES



NOTES

1. SOURCE: BASE MAP FROM "1998 TCE INVESTIGATION, WORKPLAN AND PILOT STUDY FOR THE PCB OPERABLE UNIT AT THE CRAB ORCHARD NATIONAL WILDLIFE REFUGE SUPERFUND SITE, MARION, ILLINOIS" REV. 1, MAY 1998, PREPARED BY FLUOR DANIEL GTI.

0 200' 400'

SCALE: 1"=200'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

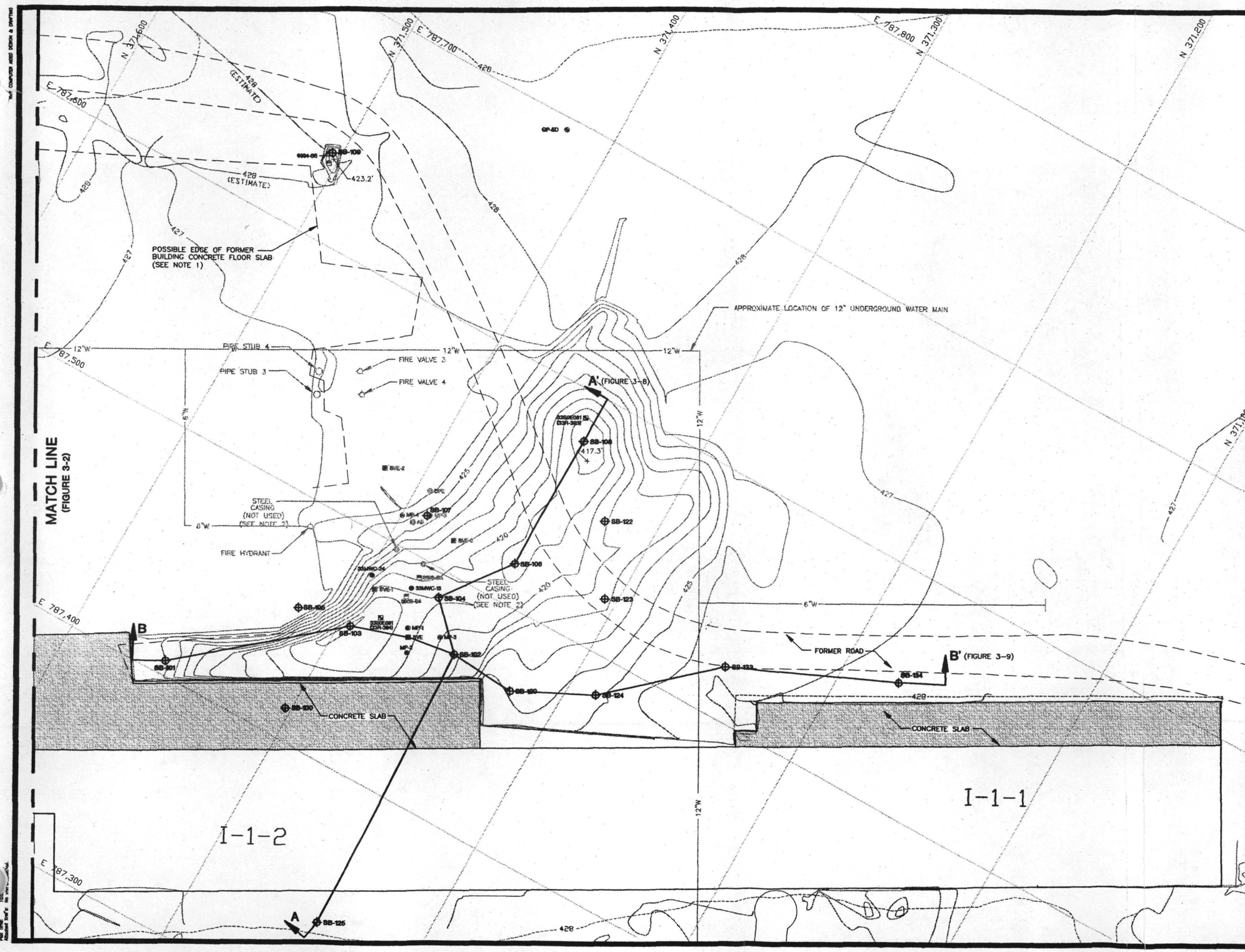
PROJECT: **CRAB ORCHARD NWR PCB O.U. MARION, ILLINOIS PRELIMINARY DESIGN REPORT**

SHEET TITLE: **SITE PLAN**

DRAWN BY: SIEWERTD	SCALE: 1"=200'	PROJ. NO. 4781.07
CHECKED BY: TEG		FILE NO. 47810769.DWG
APPROVED BY: TEG	DATE PRINTED: MAY 08 2001	FIGURE 2-1
DATE: MAY 2001		

RMT.
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-107	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-24	GROUNDWATER MONITORING WELL (2")
MP-2	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
SVE	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY RMT IN 2000)
GP-1E	GEOPROBE BORING LOCATION (1998)
33R-384	SOIL SAMPLE (IT CORP.)
0035-B6	SOIL SAMPLE (FDGTI)(1997)
MP-3	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
———	EXISTING BUILDING
------ 422 ------	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
——— 422 ———	PCB EXCAVATION CONTOURS (FDGTI) (1997)
——— W ———	UNDERGROUND 12" WATER MAIN LOCATION (APPROXIMATE)
B B'	GEOLOGIC CROSS SECTION LOCATOR

NOTES

1. CONCRETE SLAB BELIEVED TO HAVE BEEN DEMOLISHED AND REMOVED DURING PCB REMEDIAL ACTION IN 1996. HOWEVER, DOCUMENTATION FOR THIS WORK DOES NOT EXIST.
2. STEEL CASING CUT-OFF APPROXIMATELY 1 FOOT ABOVE GROUND, FILLED WITH GROUT, AND COVER PLATE WELDED TO OPENING. CASINGS WERE INSTALLED DURING THE SUMMER OF 1998. GROUNDWATER INVESTIGATION, BUT WERE NOT COMPLETED AS MONITORING WELLS.
3. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
4. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

FIGURE 3-1

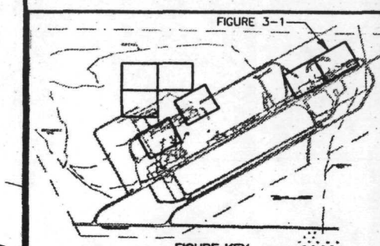


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: SOIL BORING AND GEOLOGIC CROSS SECTION LOCATOR MAP - BUILDING I-1-2

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810704.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 3-1
DATE: MAY 2001		

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744 Heartland Trail
Madison, WI 53717-1934
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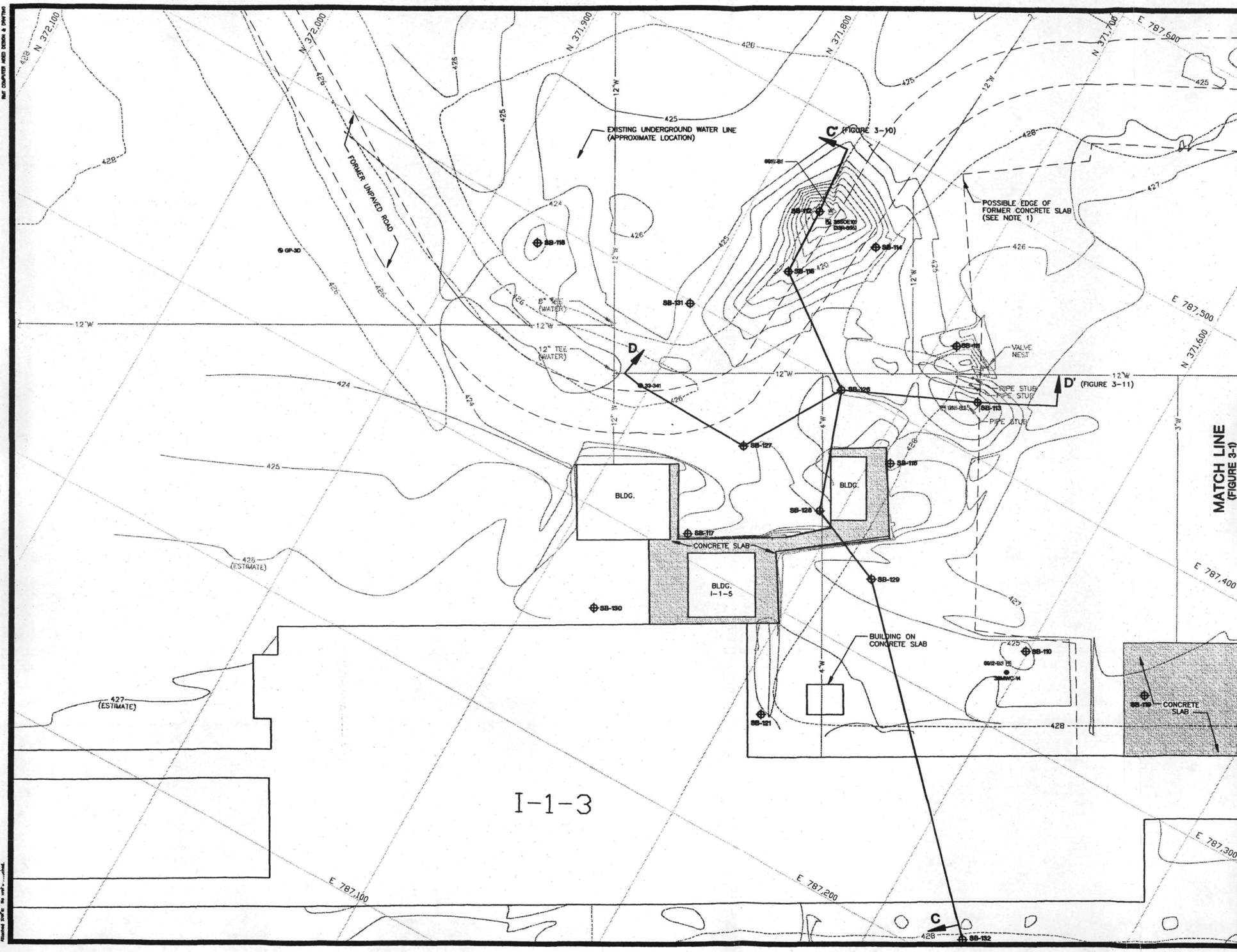
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-113	PROPOSED GEOPROBE BORING LOCATION INSTALLED BY RMT IN 2000
33MWC-14	GROUNDWATER MONITORING WELL (2")
GP-1E	GEOPROBE BORING LOCATION (1998)
33SOE101	SOIL SAMPLE (IT CORP.)
0012-S3	SOIL SAMPLE (FDGTI)(1997)
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	PCB EXCAVATION CONTOURS (FDGTI) (1997)
W	EXISTING UNDERGROUND WATER LINE (APPROXIMATE LOCATION)
D D'	GEOLOGIC CROSS SECTION LOCATOR

NOTES

1. CONCRETE SLAB BELIEVED TO HAVE BEEN DEMOLISHED AND REMOVED DURING PCB REMEDIAL ACTION IN 1996. HOWEVER, DOCUMENTATION FOR THIS WORK DOES NOT EXIST.
2. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
3. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT C. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

FIGURE 3-2

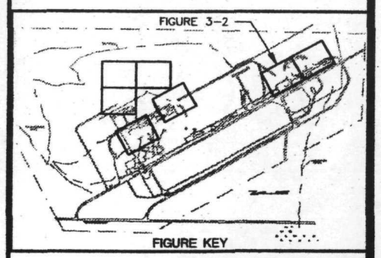


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: SOIL BORING & GEOLOGIC CROSS SECTION LOCATOR MAP - BUILDING I-1-3

DRAWN BY: SIEWERTD	SCALE:	PROJ. NO. 4781.07
CHECKED BY: SLM	1"=40'	FILE NO. 47810713.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 3-2
DATE: MAY 2001		

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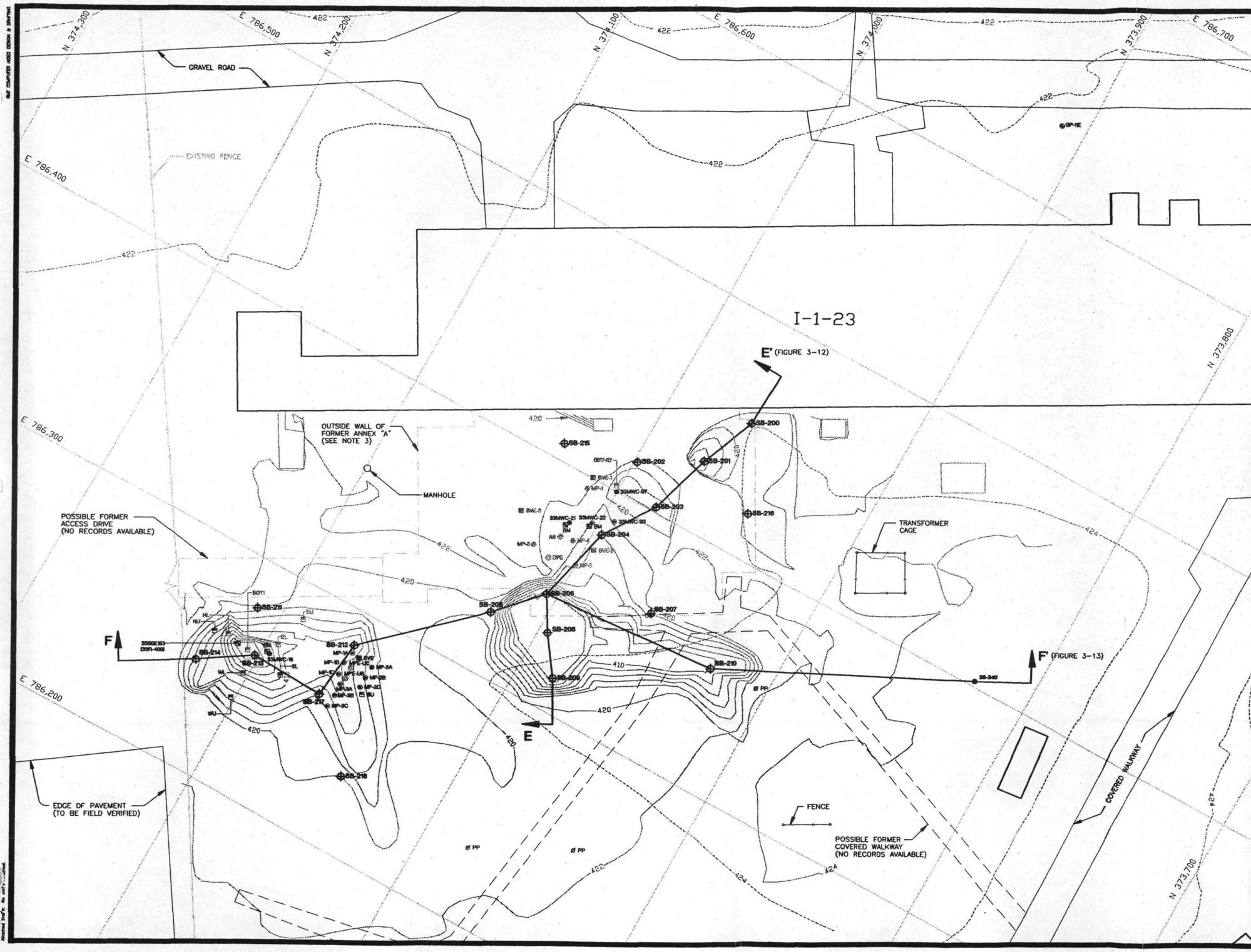
Phone: 608/831-4444

Revision Level



LEGEND

SB-100	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-23	GROUNDWATER MONITORING WELL (2")
MP-3	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
SVE	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY RMT IN 2000)
DPE-UC	MULTI PHASE EXTRACTION WELL (4") (UPPER CLAY) (INSTALLED BY RMT IN 2000)
DPE-US	MULTI PHASE EXTRACTION WELL (4") (UPPER SAND) (INSTALLED BY RMT IN 2000)
GP-1E	GEOPROBE BORING LOCATION (1998)
33R-393	SOIL SAMPLE (IT CORP.)
0502-01	SOIL SAMPLE (FDGTI)(1997)
MP-3	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
BM	BENCH MARK
PP	POWER POLE
	EXISTING FENCE
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	PCB EXCAVATION CONTOURS (FDGTI) (1997)
F F'	GEOLOGIC CROSS SECTION LOCATOR

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.
3. ANNEX "A" WAS DECONTAMINATED AND DEMOLISHED DURING THE PCB REMEDIAL ACTION IN 1996/1997.

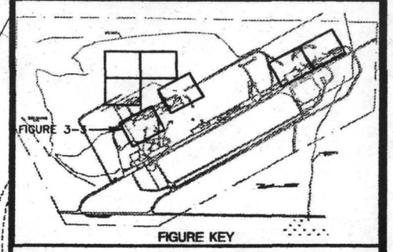


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE:
SOIL BORING AND GEOLOGIC CROSS SECTION LOCATOR MAP - BUILDING I-1-23

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810703.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 3-3
DATE: MAY 2001		

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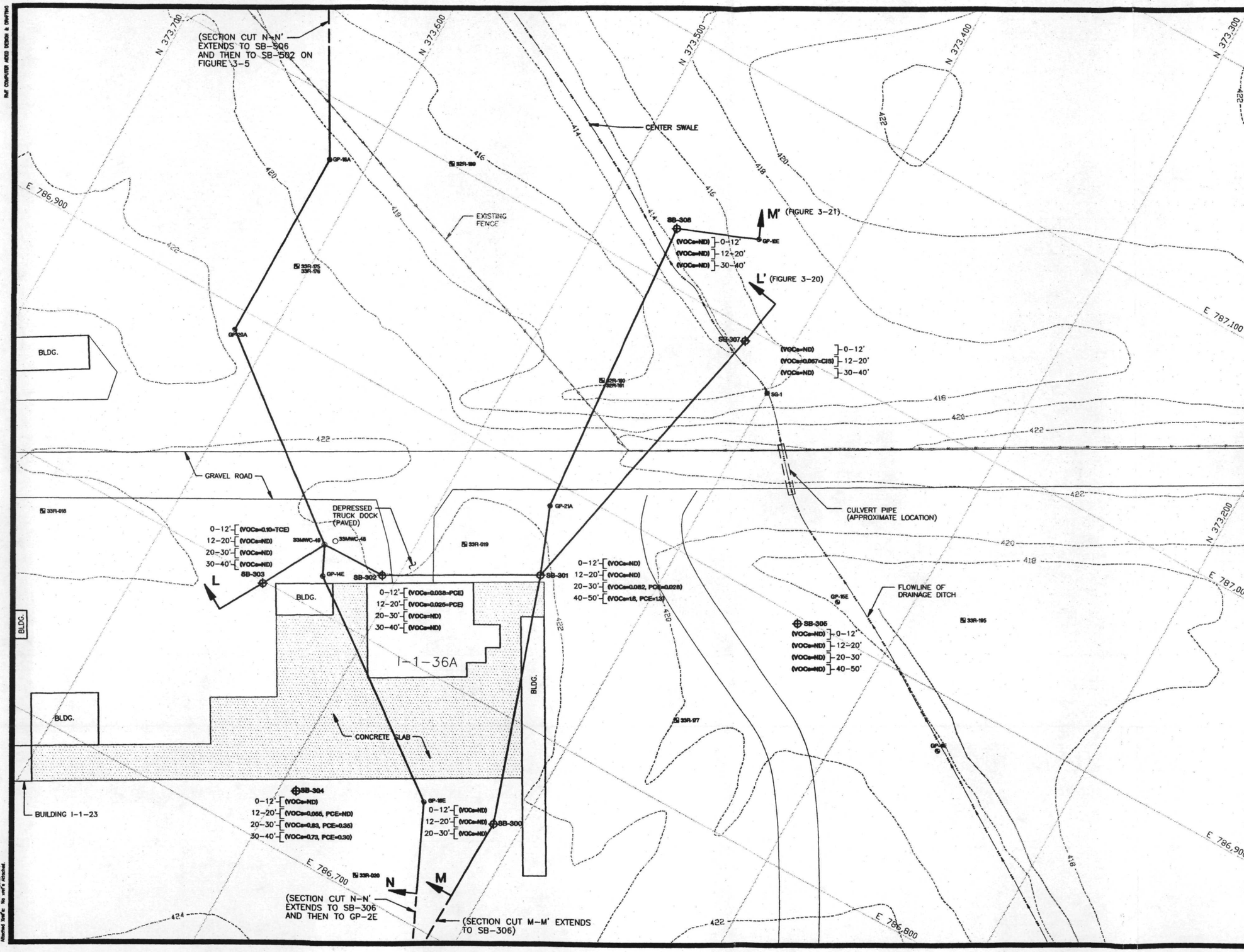
Revision Level



LEGEND

SB-300	PROPOSED GEOPROBE BORING LOCATION
33MWC-46	APPROXIMATE LOCATION OF PROPOSED SHALLOW MONITORING WELL (UPPER CLAY)
33MWC-47	APPROXIMATE LOCATION OF PROPOSED SHALLOW MONITORING WELL (UPPER SAND)
33MWC-23	GROUNDWATER MONITORING WELL (2")
MP-3	MONITORING POINT (2")
SVE-2	SOIL VAPOR EXTRACTION WELL (2")
DPE	DUAL PHASE EXTRACTION WELL (4")
AS	AIR SPARGING WELL (4")
GP-20A	GEOPROBE BORING LOCATION (1998)
33R-038	SOIL SAMPLE (IT)
SG-1	STAFF GAUGE
	EXISTING FENCE
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
	DRAINAGE FLOWLINE
(VOCs=0.73)	TOTAL VOCs (mg/kg)
M M'	GEOLOGIC CROSS SECTION LOCATOR

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. LOCATION OF PROPOSED MONITORING WELLS IS PRELIMINARY, BASED ON 1998 GEOPROBE GROUNDWATER SAMPLING RESULTS. THE LOCATION MAY BE ADJUSTED IN THE FIELD BASED ON SOIL SAMPLING AND FIELD SCREENING ANALYSIS RESULTS.

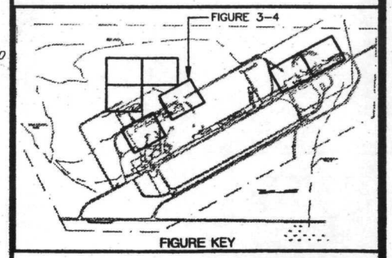


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
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0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE:
SOIL BORING AND GEOLOGIC CROSS SECTION LOCATOR MAP - BUILDING I-1-36A

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810706.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 3-4
DATE: MAY 2001		

RMT
744 Heartland Trail
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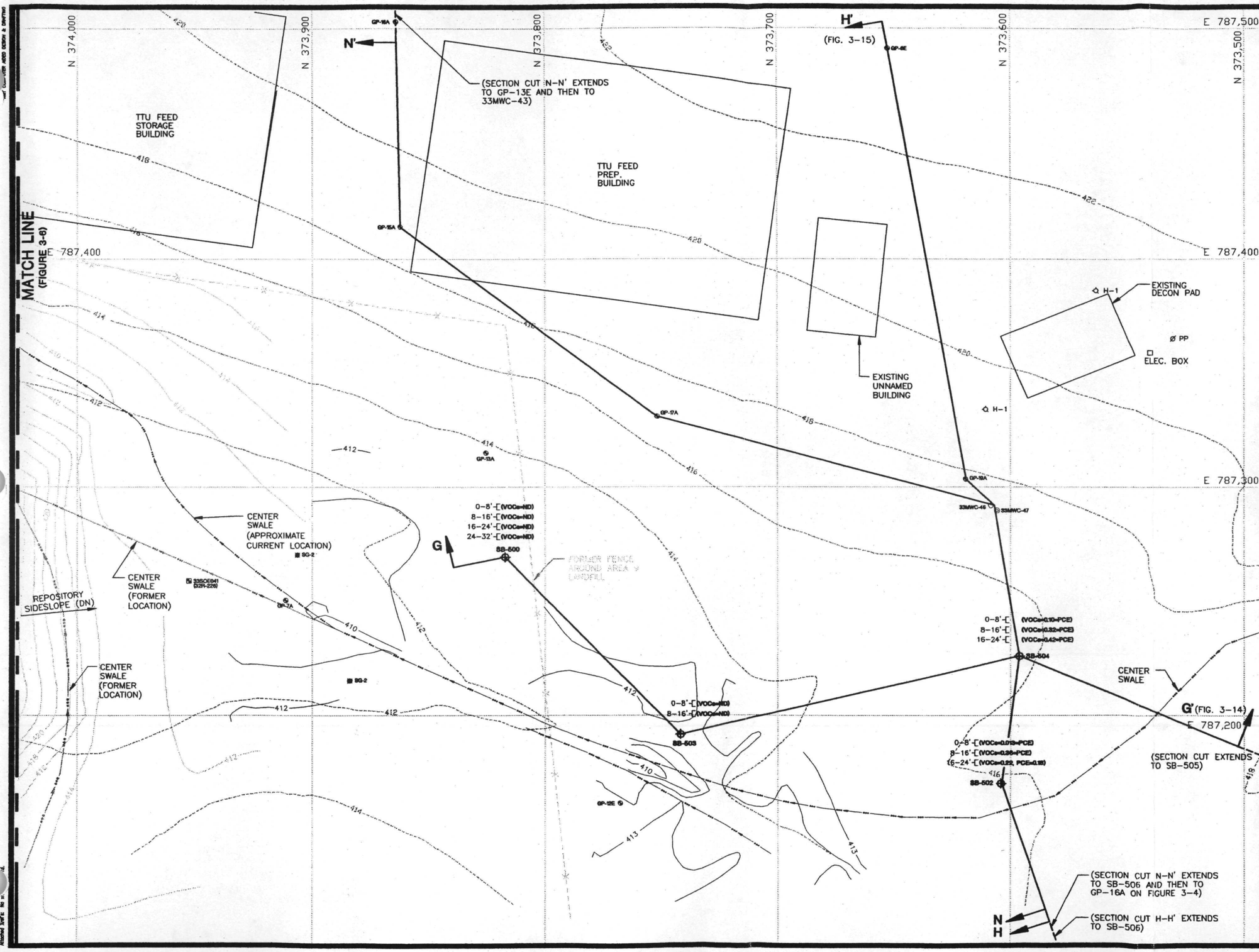
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

33MWC-46	APPROXIMATE LOCATION OF PROPOSED SHALLOW MONITORING WELL (UPPER CLAY)
33MWC-47	APPROXIMATE LOCATION OF PROPOSED SHALLOW MONITORING WELL (UPPER SAND)
SB-500	PROPOSED GEOPROBE BORING
GP-12E	GEOPROBE BORING LOCATION (1998)
33R-150	SOIL SAMPLE (IT CORP.)
SG-2	STAFF GAUGE
	FORMER FENCE LOCATION
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	EXISTING CONDITIONS CONTOURS
	PCB EXCAVATION CONTOURS (FDGTI) (1997)
	DRAINAGE FLOWLINE
(VOCs=0.49)	TOTAL VOCs (mg/kg)
H H'	GEOLOGIC CROSS SECTION LOCATOR

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. LOCATION OF PROPOSED MONITORING WELLS IS PRELIMINARY, BASED ON 1998 GEOPROBE GROUNDWATER SAMPLING RESULTS. THE LOCATION MAY BE ADJUSTED IN THE FIELD BASED ON SOIL SAMPLING AND FIELD SCREENING ANALYSIS RESULTS.

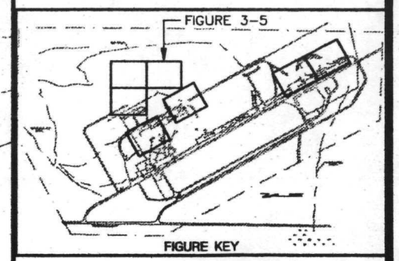


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE:
SOIL BORING AND GEOLOGIC CROSS SECTION LOCATOR MAP - SOUTH SIDE AREA 9 REPOSITORY

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810710.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 3-5
DATE: MAY 2001		

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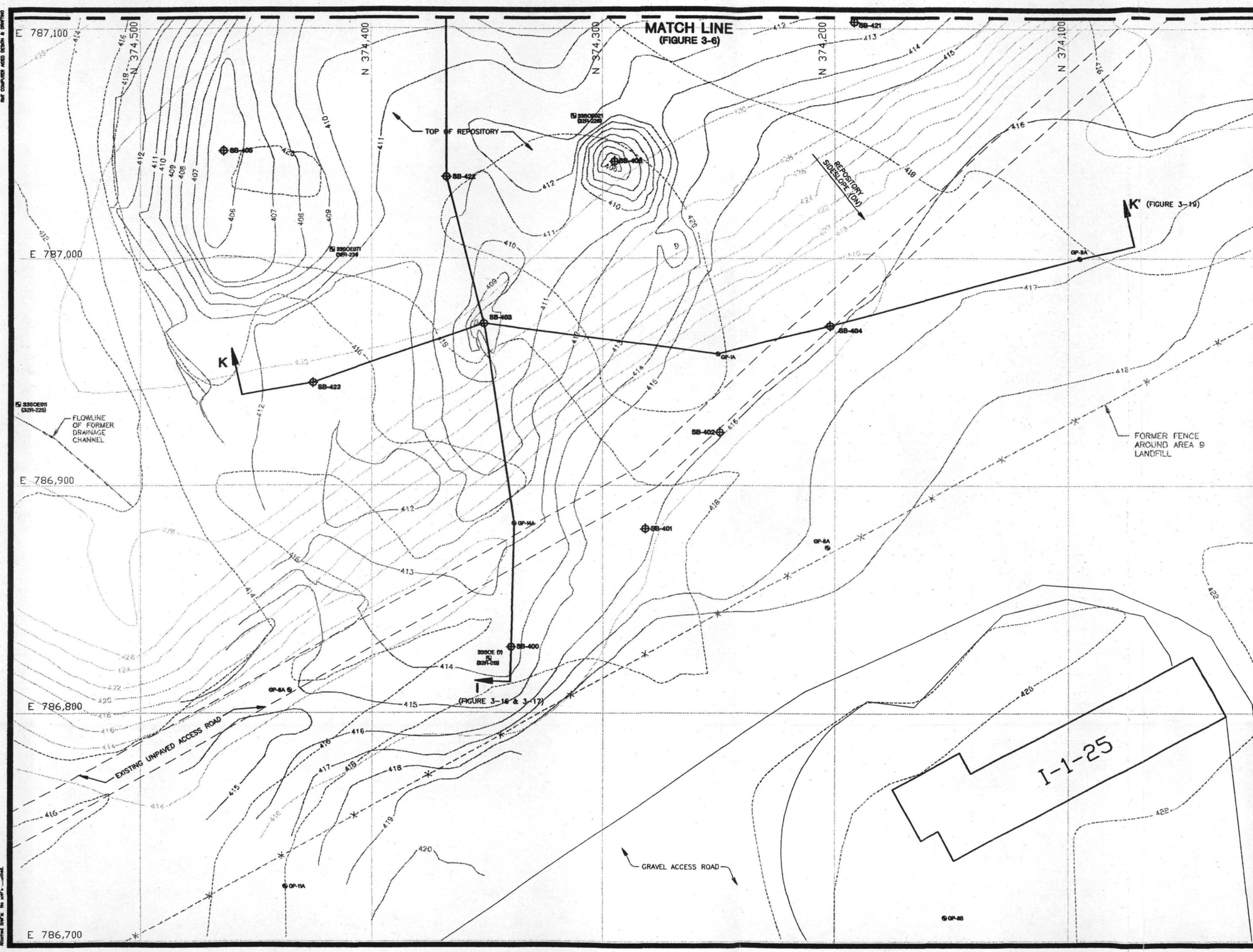
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-400	PROPOSED GEOPROBE BORING LOCATION
GP-9A	GEOPROBE BORING LOCATION (1998)
S2R-225	SOIL SAMPLE (IT CORP.)
—X—X—	FORMER FENCE LOCATION
———	EXISTING BUILDING
----422----	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
····422····	EXISTING CONDITIONS CONTOURS
—417—	PCB EXCAVATION CONTOURS (FDGTI) (1997)
———	DRAINAGE FLOWLINE
K K'	GEOLOGIC CROSS SECTION LOCATOR

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

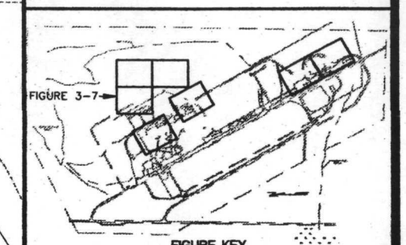


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: SOIL BORING AND GEOLOGIC CROSS SECTION LOCATOR MAP-AREA 9 REPOSITORY

DRAWN BY: SIEWERTD	SCALE:	PROJ. NO. 4781.07
CHECKED BY: SLM	1"=40'	FILE NO. 47810708.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 3-7
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
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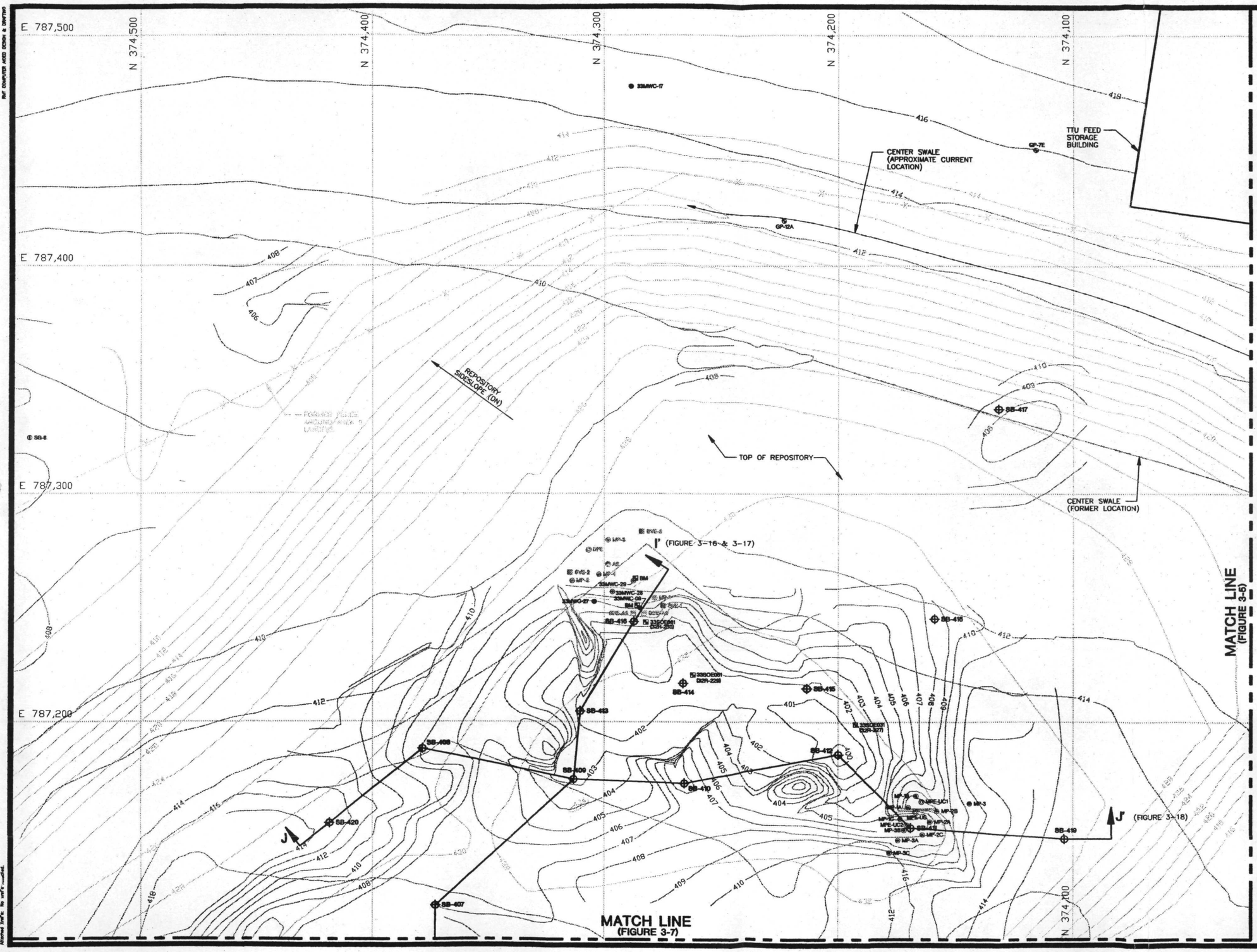
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-416	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-17	GROUNDWATER MONITORING WELL (2")
MP-3A	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
MPE-UC	MULTI PHASE EXTRACTION WELL (4") (UPPER CLAY) (INSTALLED BY RMT IN 2000)
MPE-US	MULTI PHASE EXTRACTION WELL (4") (UPPER SAND) (INSTALLED BY RMT IN 2000)
GP-12A	GEOPROBE BORING LOCATION (1998)
33R-230	SOIL SAMPLE (IT CORP.)
0016-A9	SOIL SAMPLE (FDGTI)(1997)
MP-3	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-3	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
BM	BENCH MARK
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
412	EXISTING CONDITIONS CONTOURS
410	PCB EXCAVATION CONTOURS (FDGTI) (1997)
	DRAINAGE FLOWLINE
J J'	GEOLOGIC CROSS SECTION LOCATOR

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

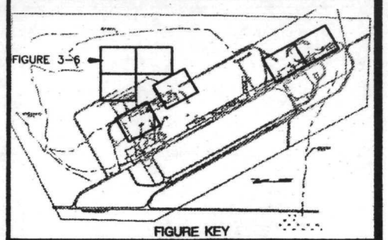


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: SOIL BORING AND GEOLOGIC CROSS-SECTION LOCATOR MAP - AREA 9 REPOSITORY

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810725.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 3-6
DATE: MAY 2001		

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744 Heartland Trail
Madison, WI 53717-1934
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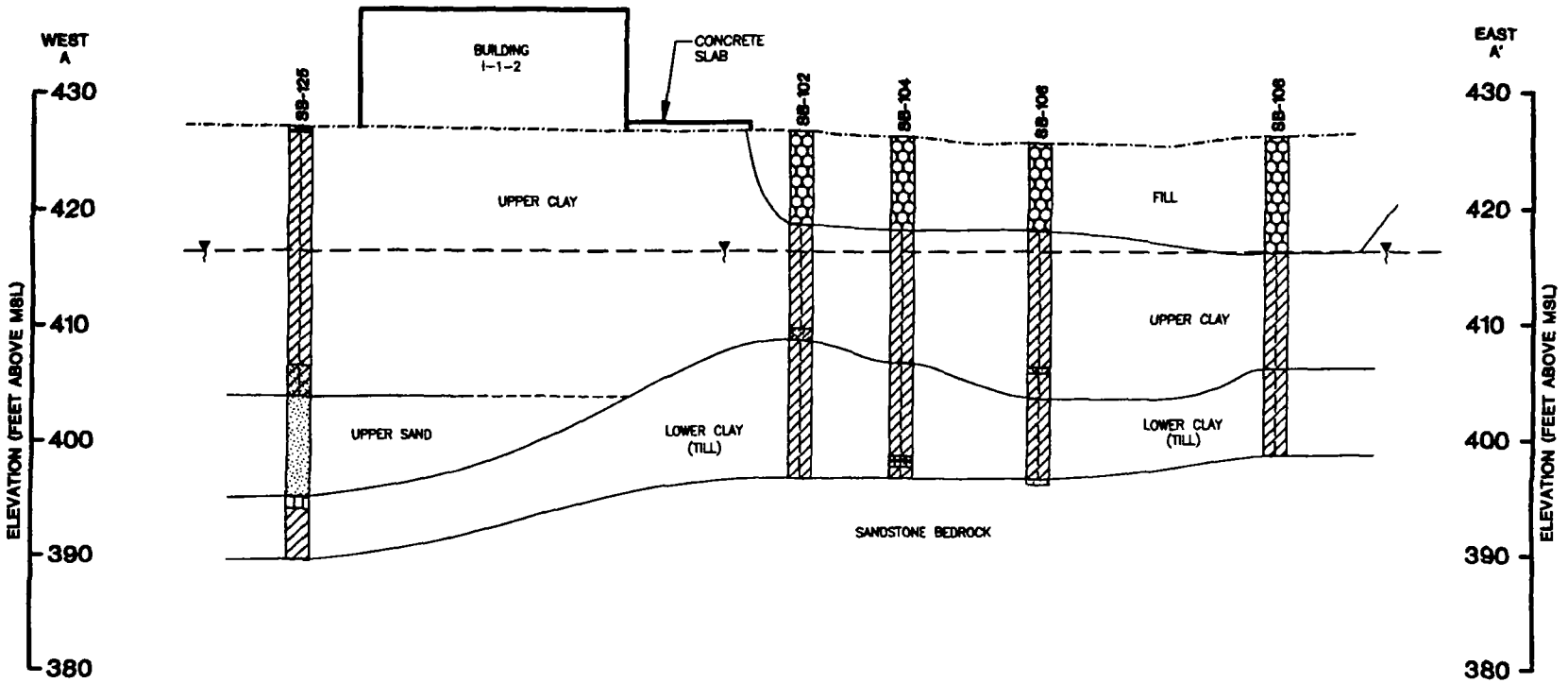
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.
2. (VOC=0.03) REPRESENTS TOTAL VOC CONCENTRATION IN SOIL, mg/kg

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

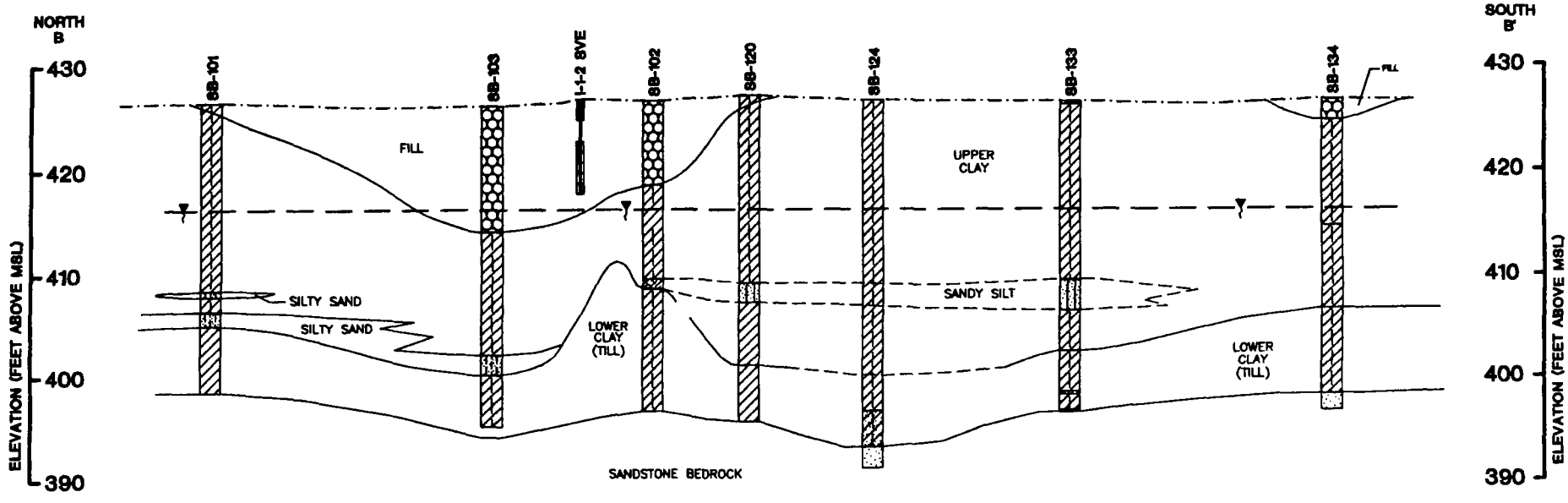
GEOLOGIC CROSS SECTION A-A'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTO
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810765.DWG

FIGURE 3-8

RMT DATA
Drawing Name: J:\04781\07\4781 0765.dwg
Operator Name: SIEWERTO
Scale: 1"=20'
Dwg Size: 514428 Bytes
Plot Date: Tuesday, May 1, 2001
Plot Time: 12:06:16:87 PM
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

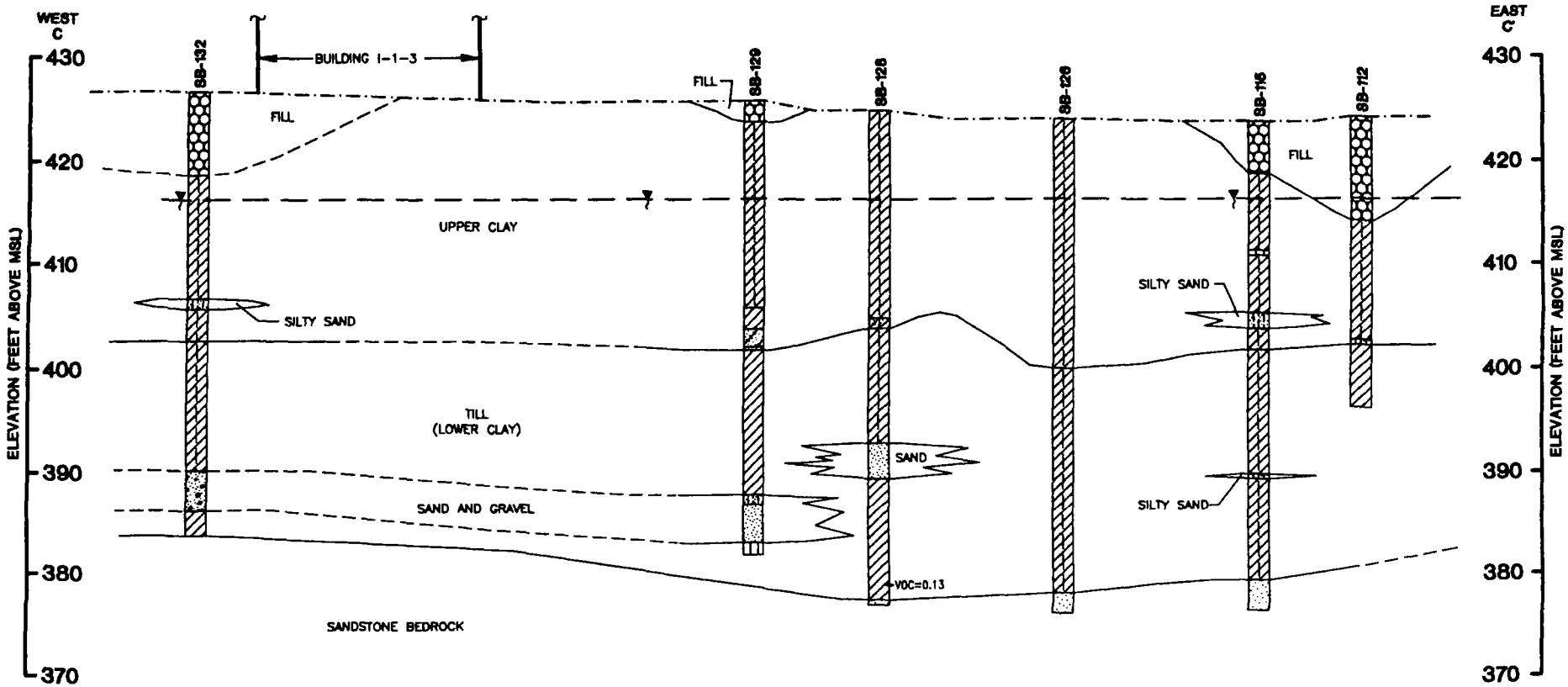
GEOLOGIC CROSS SECTION B-B'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810766.DWG

FIGURE 3-9

PLOT DATA
Drawing Name: J:\04781\07\4781076B.dwg
Operator Name: SIEWERTD
Scale: 1"=30'
Dwg Size: 209078 Bytes
Plot Date: Thursday, April 5, 2001
Plot Time: 11:22:46a AM
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

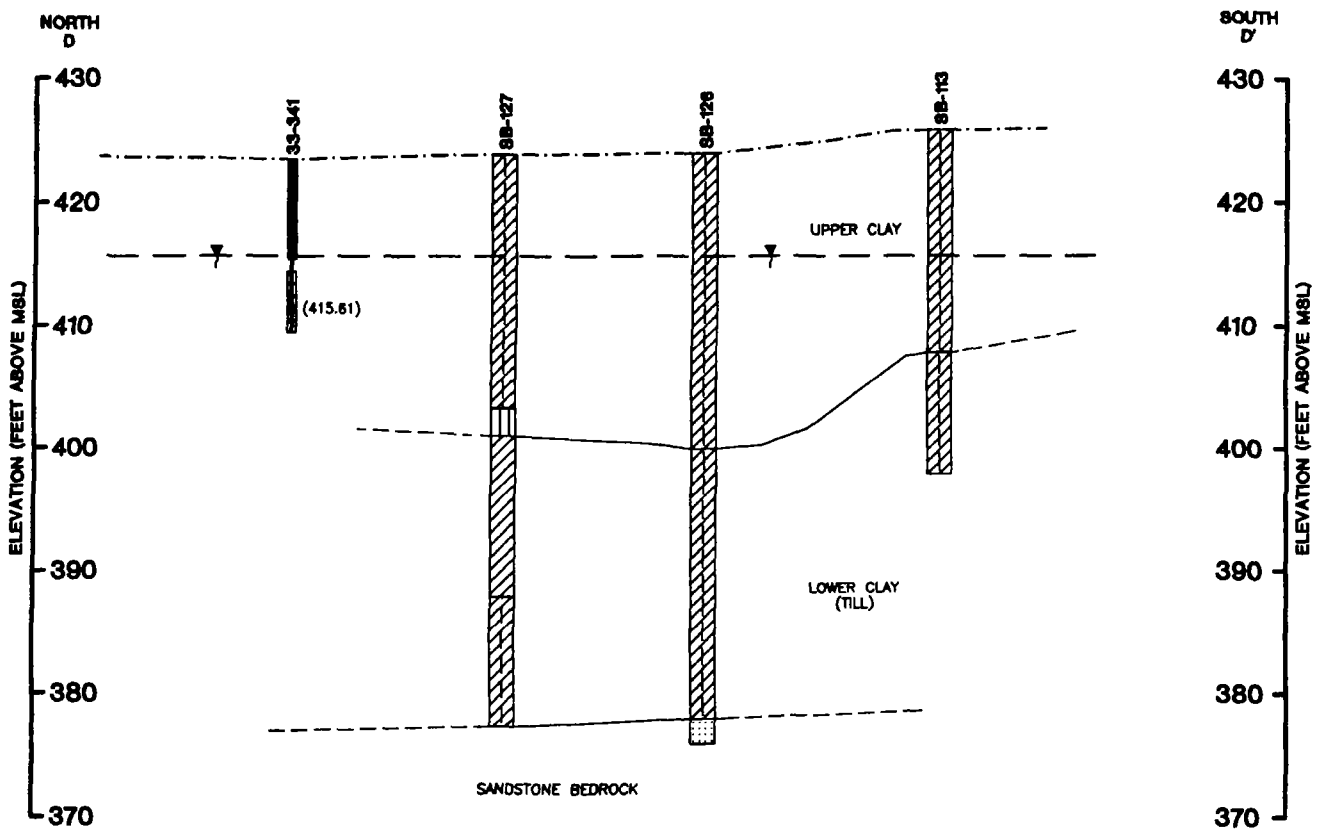
GEOLOGIC CROSS SECTION C-C'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810763.DWG

FIGURE 3-10

PLOT DATA
Drawing Name: J:\04781\07\47810763.dwg
Operator Name: SIEWERTD
Scale: 1"=30'
Dwg Size: 172037 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:29:37a3 AM
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (415.61) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

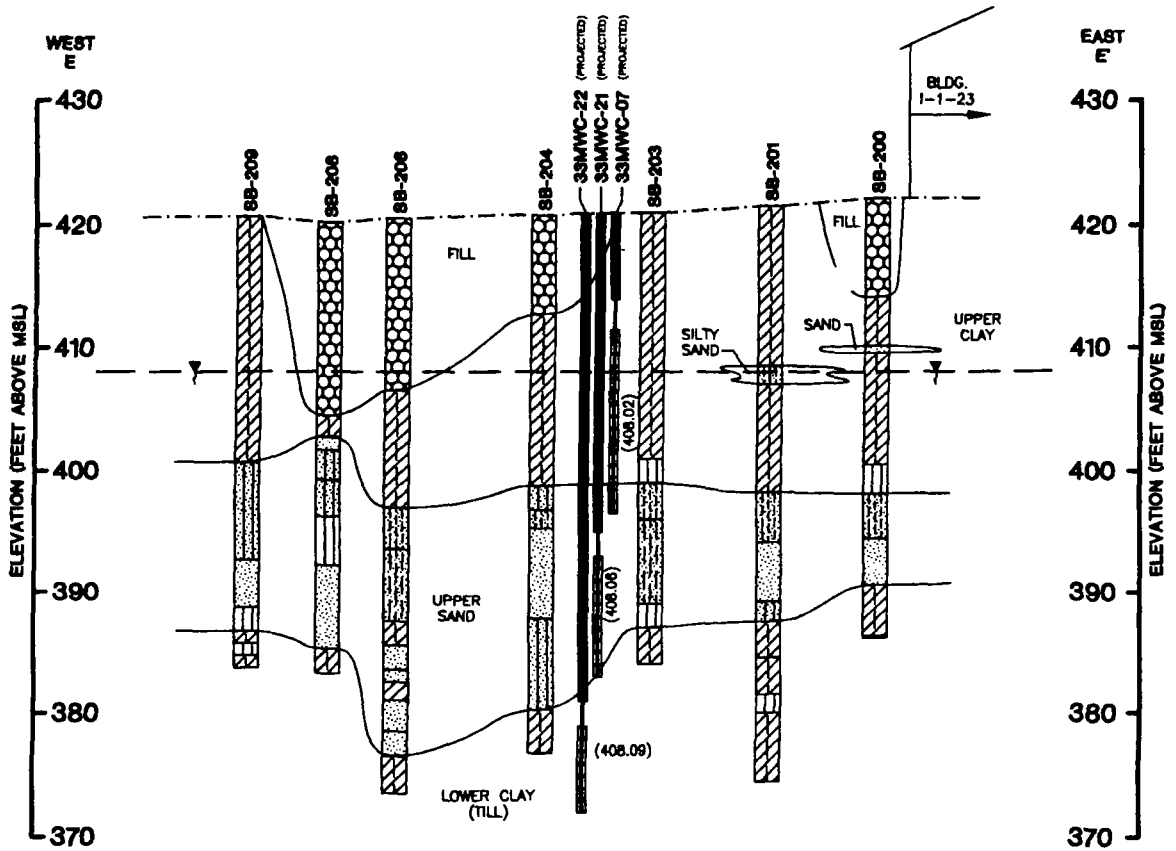
GEOLOGIC CROSS SECTION D-D'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810764.DWG

FIGURE 3-11

PLOT DATA
Drawing Name: J:\047811\07\47810764.dwg
Operator Name: SIEWERTD
Scale: 1"=20'
Dwg Size: 335357 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:30:28 AM
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (408.09) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

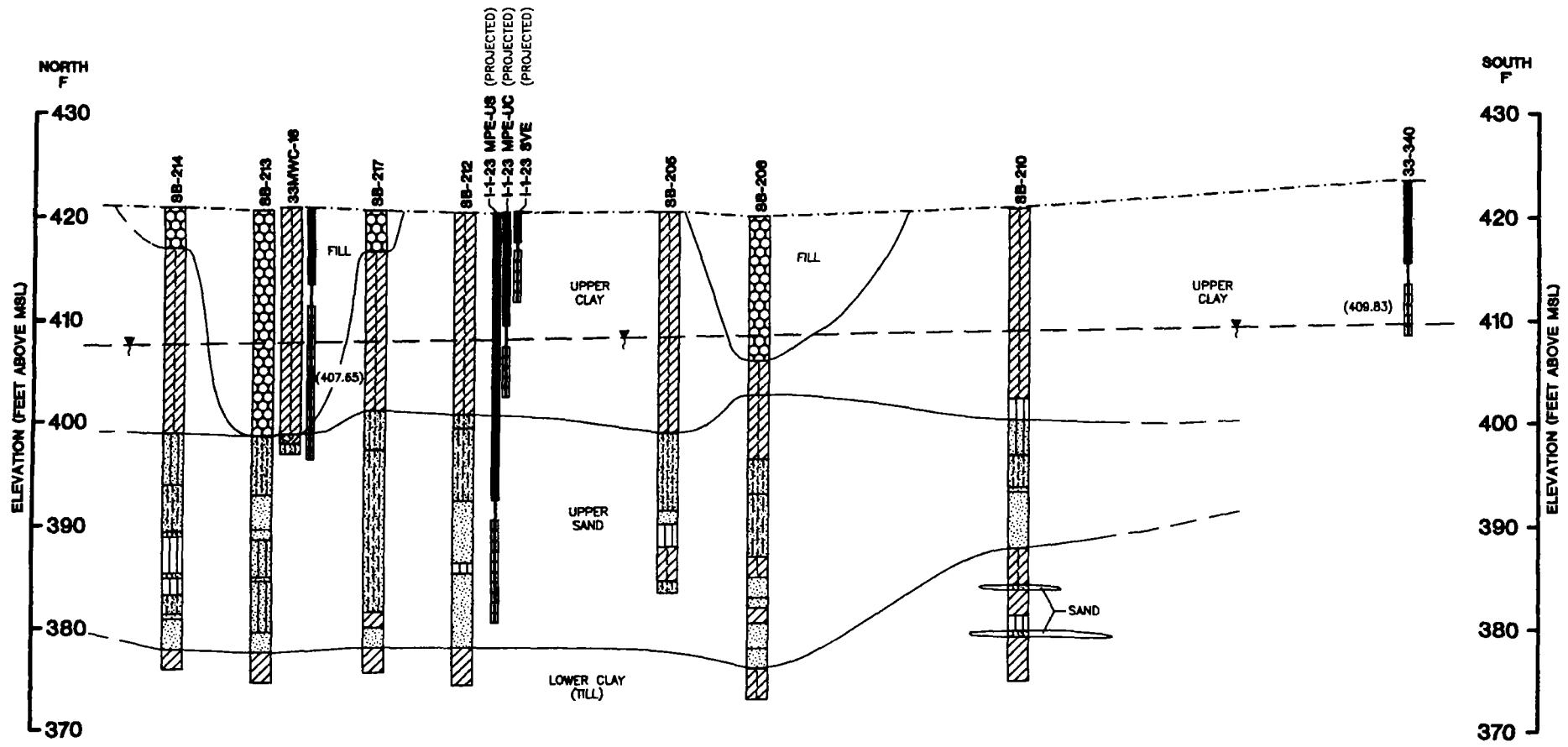
GEOLOGIC CROSS SECTION E-E'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810767.DWG

FIGURE 3-12

PLOT DATA
Drawing Name: J:\04781\07\47810767.dwg
Operator Name: SIEWERTD
Scale: 1"=20'
Dwg Size: 315498 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:30:43.40 AM
Attached Xref's: No xref's Attached.



LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (407.65) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

0 30 60
HORIZONTAL SCALE

VERTICAL SCALE EXAGGERATED 5X

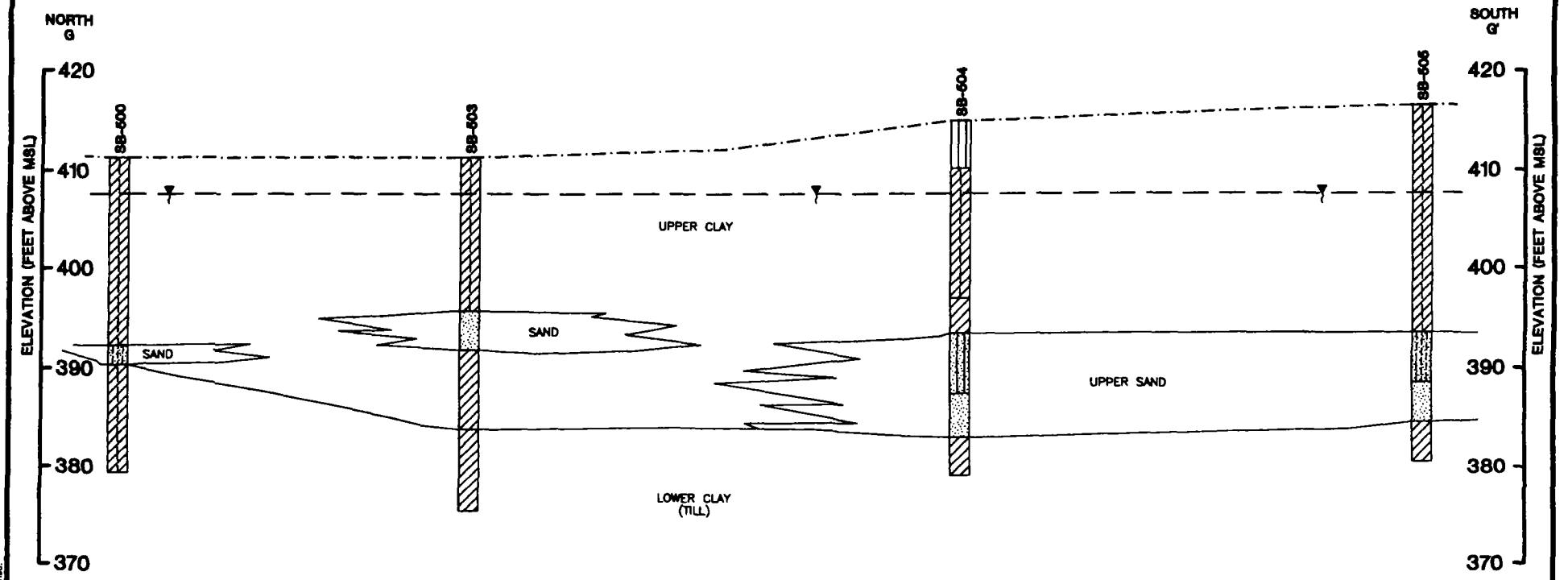
GEOLOGIC CROSS SECTION F-F'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810768.DWG

FIGURE 3-13

PLOT DATA
Drawing Name: J:\04781\07\47810768.dwg
Operator Name: SIEWERTD
Scale: 1"=20'
Dwg Size: 328372 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:31:18 AM
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

0 30 60
HORIZONTAL SCALE

VERTICAL SCALE EXAGGERATED 3X

GEOLOGIC CROSS SECTION G-G'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

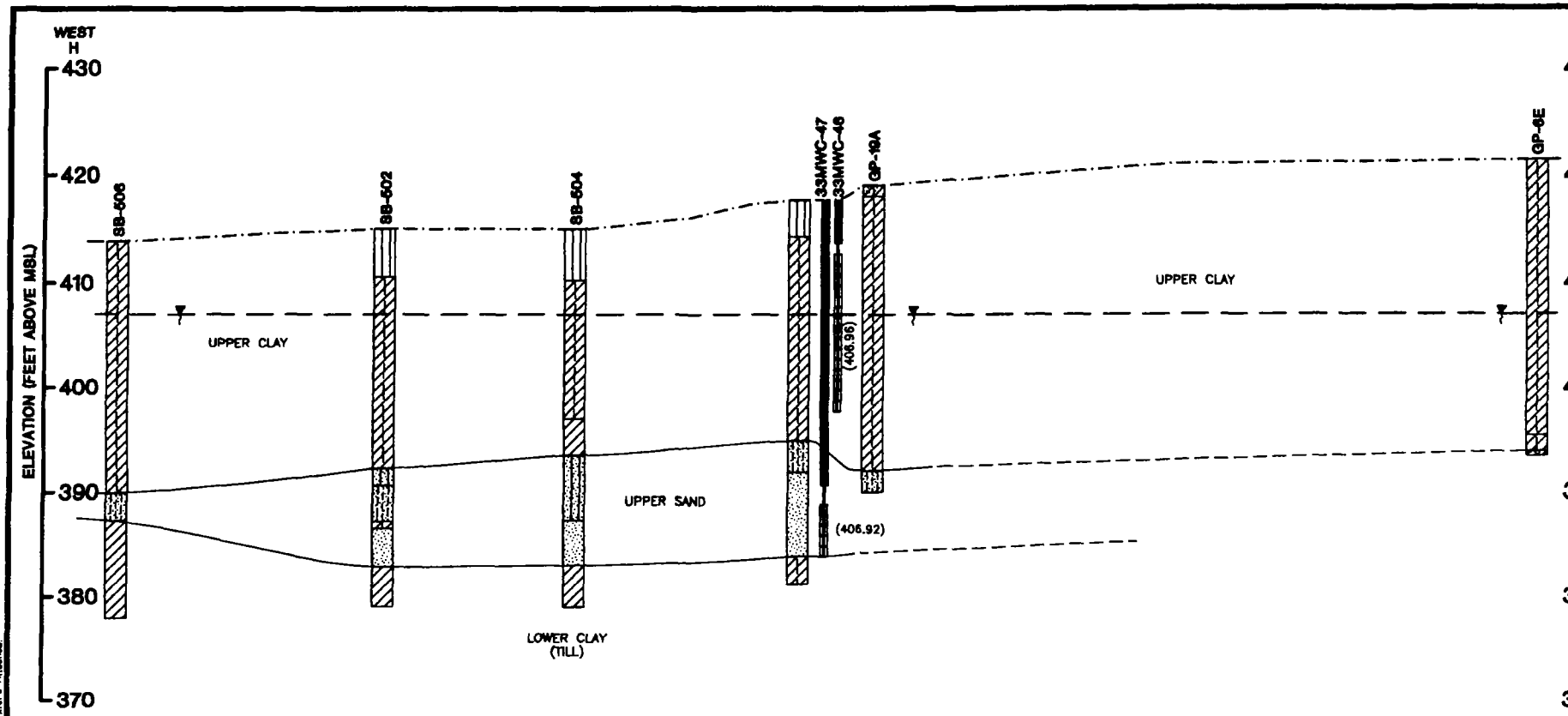
DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810760.DWG

FIGURE 3-14

Dwg Size: 121786 Bytes
Date Rev'd: Tuesday, April 3, 2001
Plot Date: 08:32:01 AM
Attached Xref's: No xref's Attached.

Drawing Name: A:\04781\07\47810760.dwg
Operator Name: SIEWERTD
Scale: 1"=30'

PLOT DATE



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (406.96) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

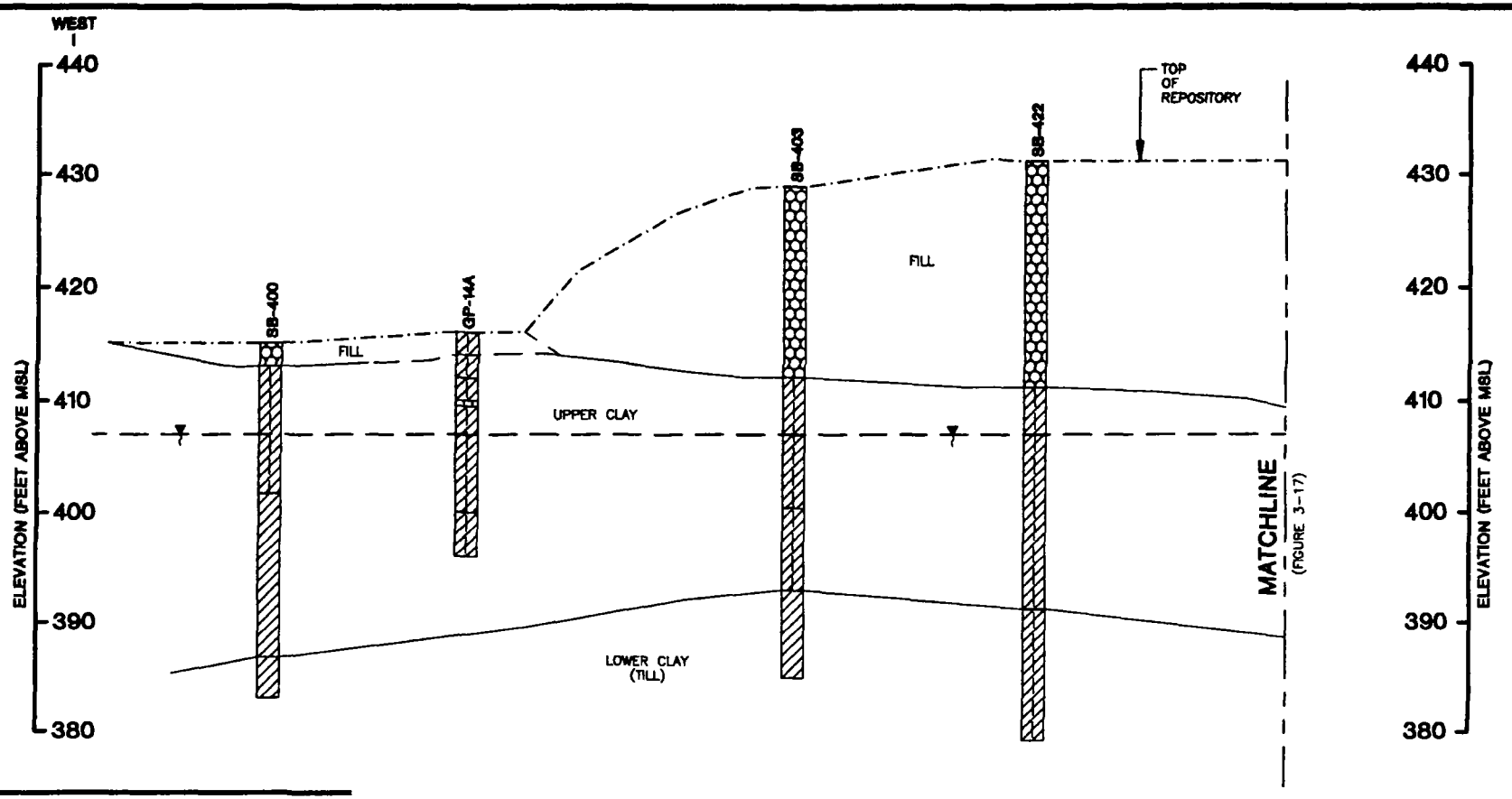
GEOLOGIC CROSS SECTION H-H'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810759.DWG

FIGURE 3-15

PLOT DATA
Drawing Name: J:\04781\07\4781\0759.dwg
Operator Name: SIEWERTD
Scale: 1"=30'
Dwg Size: 182348 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:33:42a7 AM
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

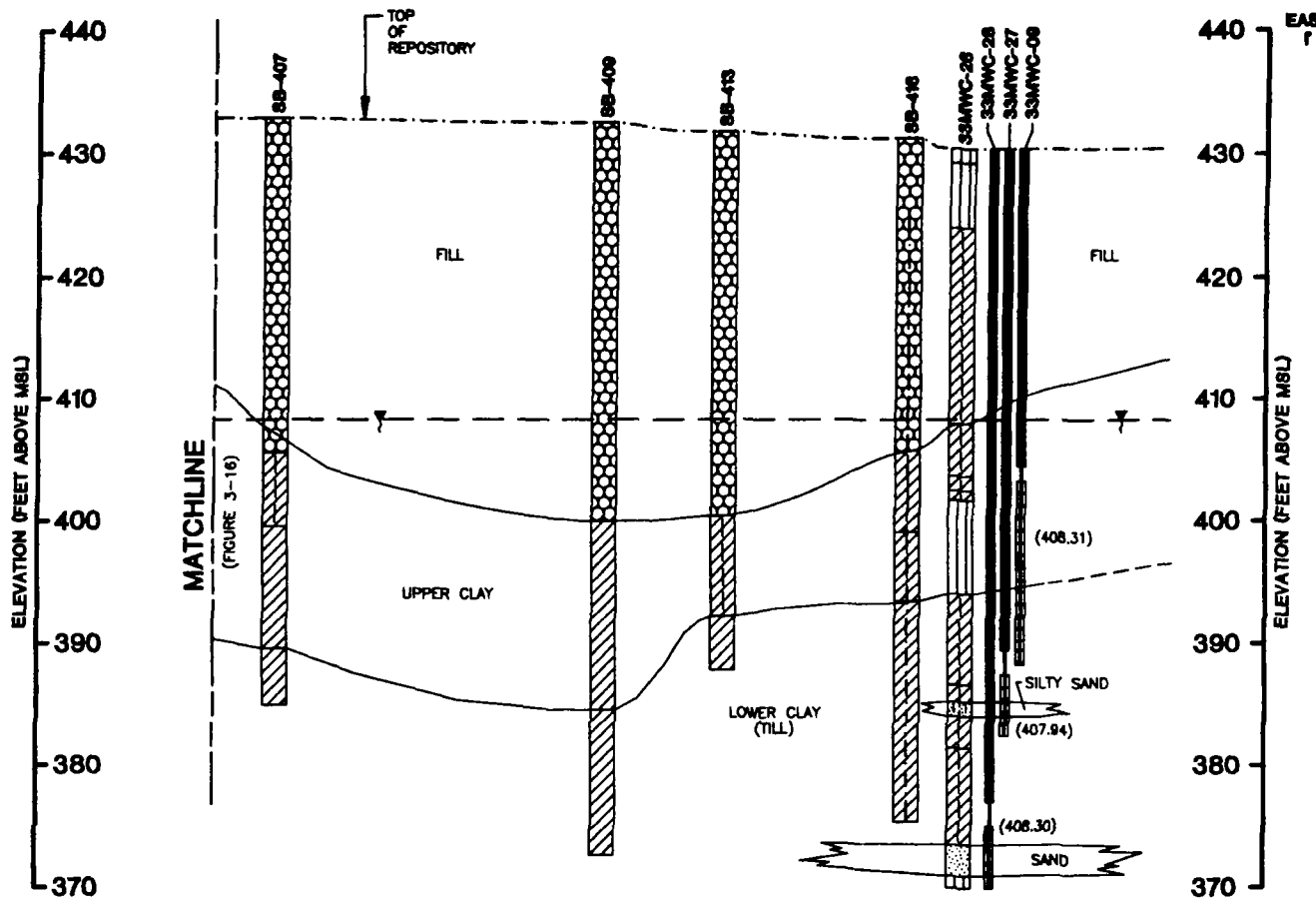
GEOLOGIC CROSS SECTION I-I'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810755.DWG

FIGURE 3-16

PLOT DATA
Drawing Name: J:\0478\07\47810755.dwg
Operator Name: SIEWERTD
Scale: 1"=30'
Dwg Size: 364502 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:34:54:28 AM
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (408.31) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

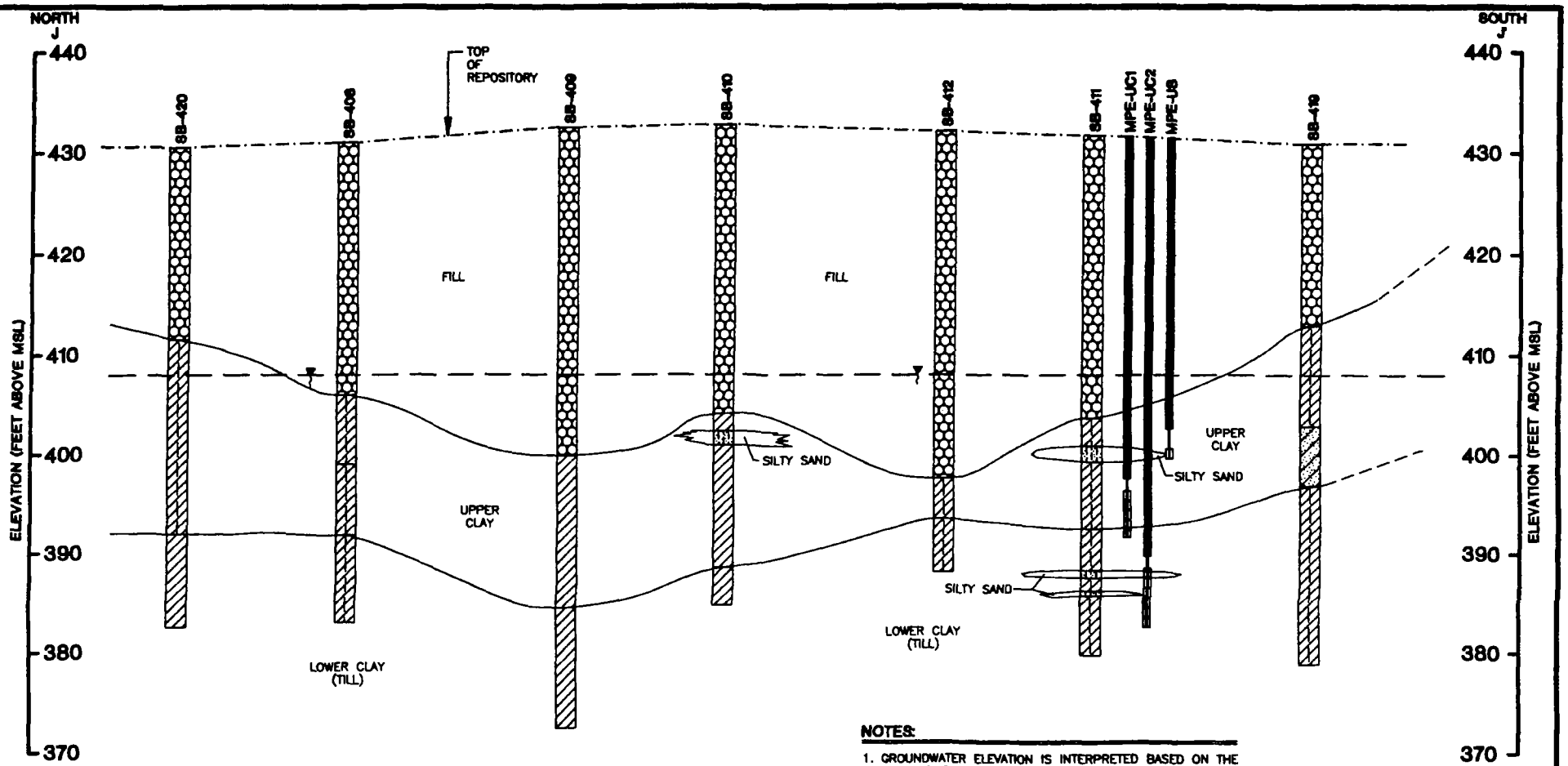
GEOLOGIC CROSS SECTION I-I'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810756.DWG

FIGURE 3-17

PLOT DATA
Drawing Name: J:\04781\07\47810756.dwg
Operator Name: SIEWERTD
Scale: 1"=30'
Dwg Size: 249303 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:35:49 AM
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

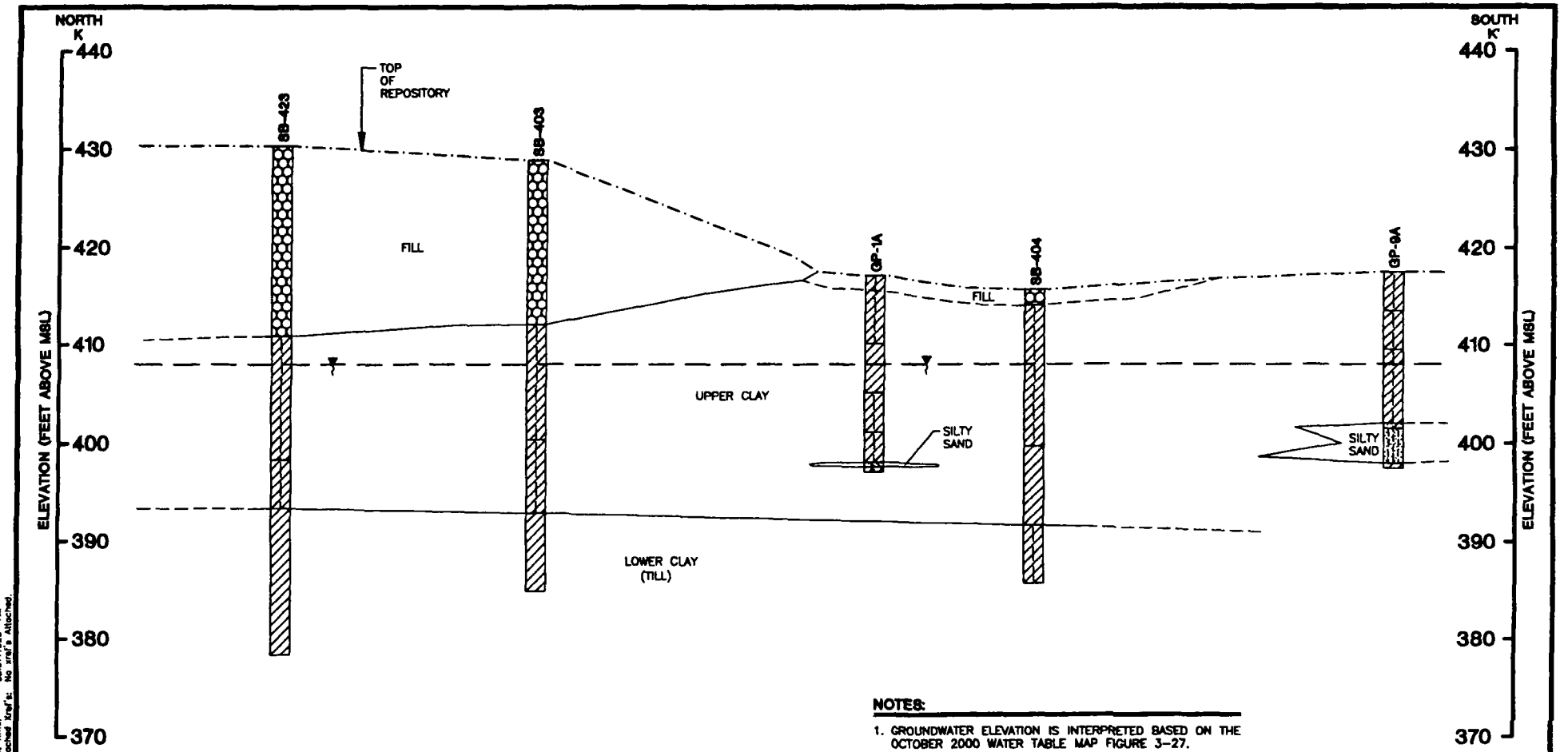
GEOLOGIC CROSS SECTION J-J
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT.

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810757.DWG

FIGURE 3-18

PLOT DATA
Drawing Name: J:\047811\07\47810757.dwg
Operator Name: SIEWERTD
Scale: 1"=30'
Dwg Size: 355203 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:38:40:36
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

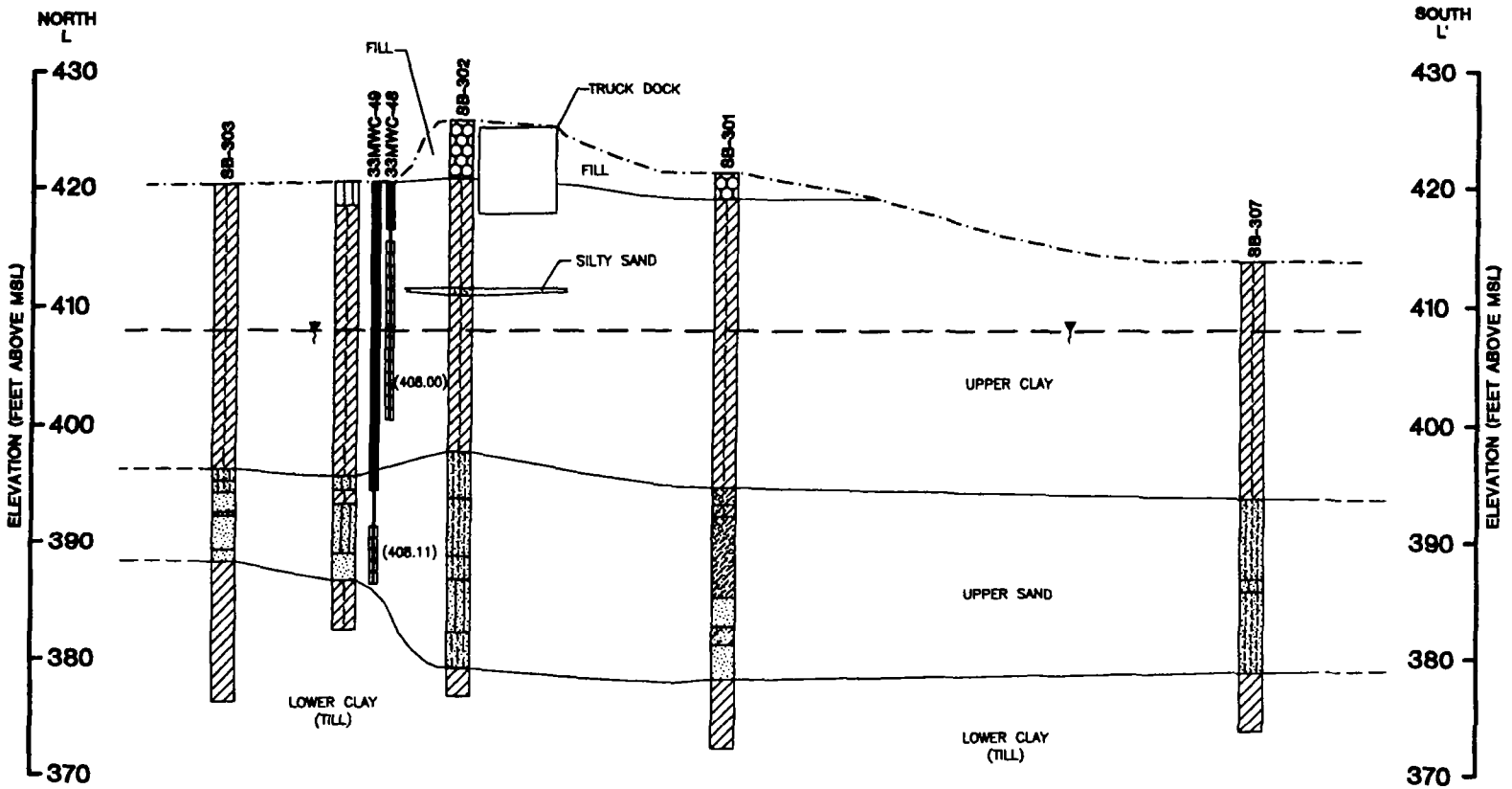
GEOLOGIC CROSS SECTION K-K'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT.

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810758.DWG

FIGURE 3-19

Dwg Size: 158823 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:37:10.23 AM
Attached Xref's: No xref's Attached.
Drawing Name: J:\04781\07\47810758.dwg
Operator Name: SIEWERTD
Scale: 1" = 30'



LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (408.00) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

VERTICAL SCALE EXAGGERATED 5X

HORIZONTAL SCALE: 0, 30, 60

NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

GEOLOGIC CROSS SECTION L-L'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810761.DWG

FIGURE 3-20

PLOT DATA
Drawing Name: J:\0478\07\4781 0761.dwg
Operator Name: SIEWERTD
Scale: 1"=30'
Dwg Size: 179484 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:38:16 AM
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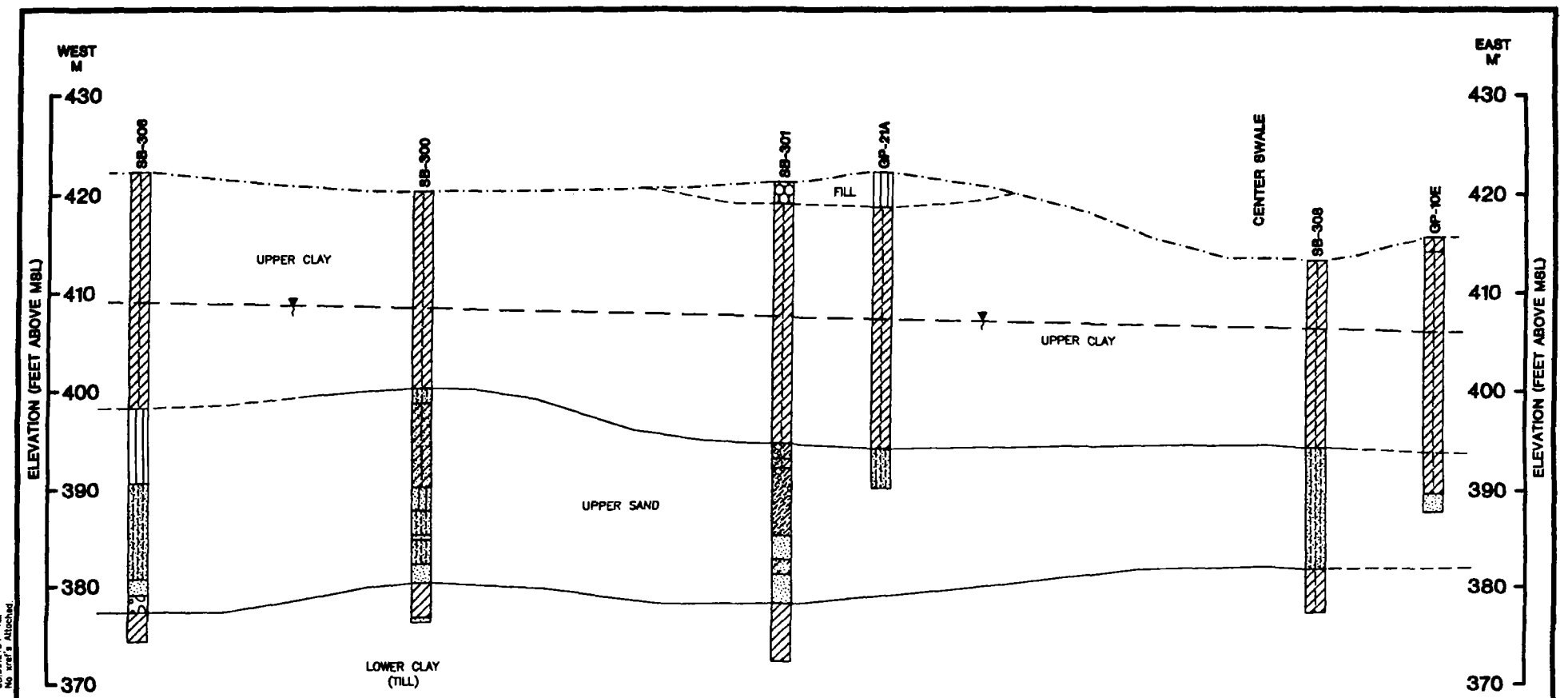


LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

VERTICAL SCALE: 0, 10, 20

NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.

0 30 60
HORIZONTAL SCALE

VERTICAL SCALE EXAGGERATED 8X

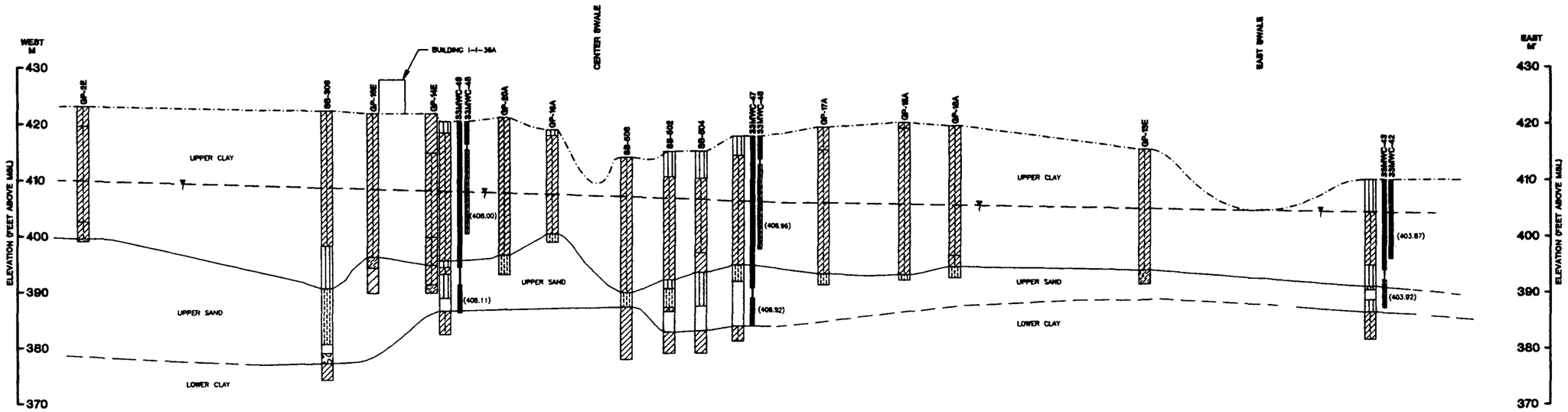
GEOLOGIC CROSS SECTION M-M'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810762.DWG

FIGURE 3-21

PLOT DATA
Drawing Name: J:\04781\07\47810762.dwg
Operator Name: SIEWERTD
Scale: 1"=30'
Dwg Size:
Plot Date:
Plot Time:
Attached Xref's: No xref's Attached
173597 Bytes
Tuesday, April 3, 2001
08:39:21.34 AM



LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (406.96) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN
- VOC=0.08 VOC CONCENTRATIONS (ug/L)

VERTICAL SCALE: 0, 10, 20

NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.
2. SEE FIGURES 3-4 & 3-5 FOR CROSS SECTION LOCATION.

0 100 200
HORIZONTAL SCALE

VERTICAL SCALE EXAGGERATED 10X

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: GEOLOGIC CROSS SECTION N-N'

DRAWN BY: SHEWERTD	SCALE: AS SHOWN	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810788
APPROVED BY: TEG	DATE PRINTED:	FIGURE 3-22
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level

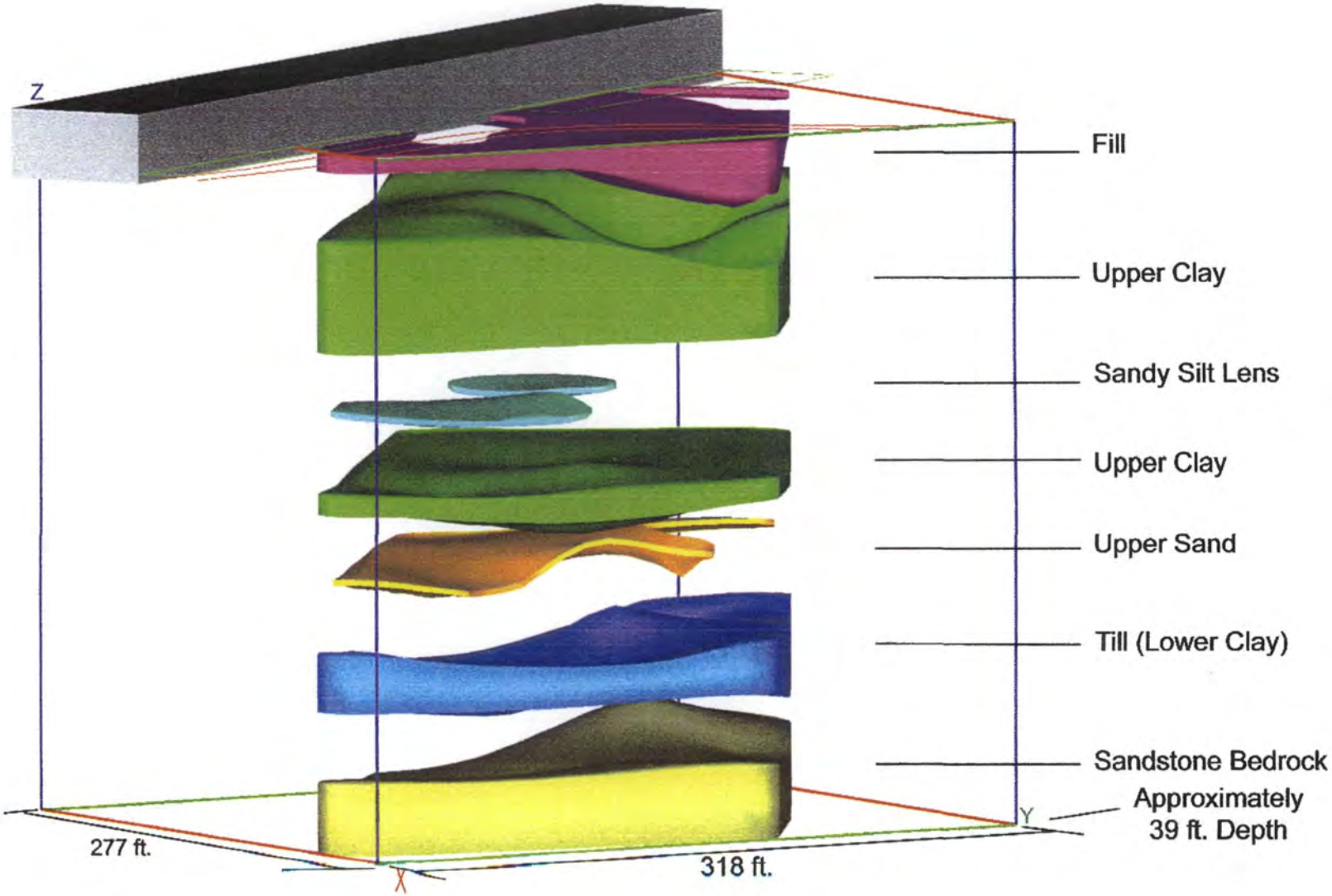


Figure 3-23
3D Depiction Of Geology
Building I-1-2

3X Vertical Exaggeration
Looking Northwest

G:/DATA/HYDRO/4781/PHOTOSHOPFILES/I112SITE/I112GEO.PSD

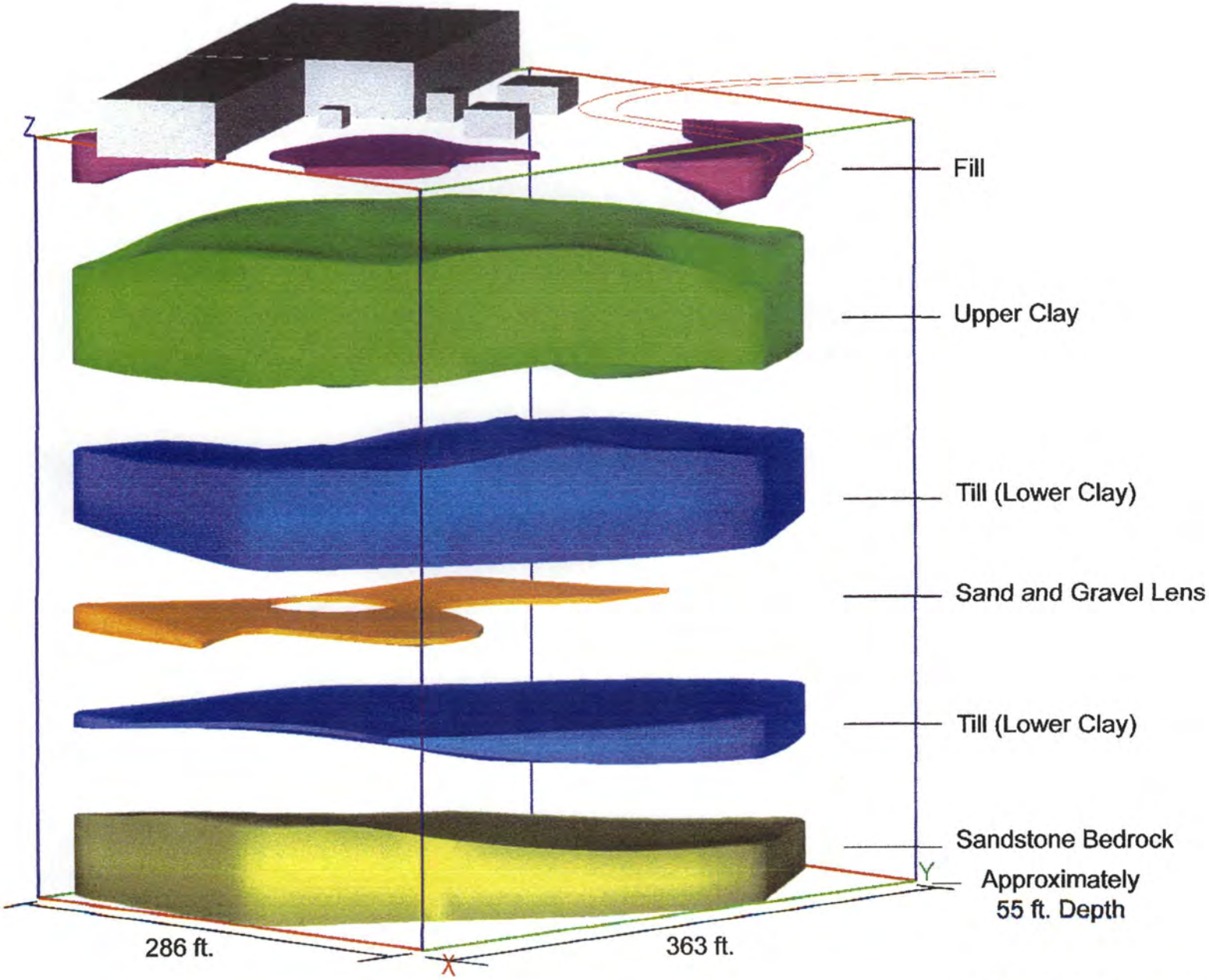


Figure 3-24
3D Depiction of Geology
Building I-1-3 Area

3X Vertical Exaggeration
Looking Northwest

G://DATA/HYDRO/4781/PHOTOSHOPFILES/I113SITE/I113GEO.PSD

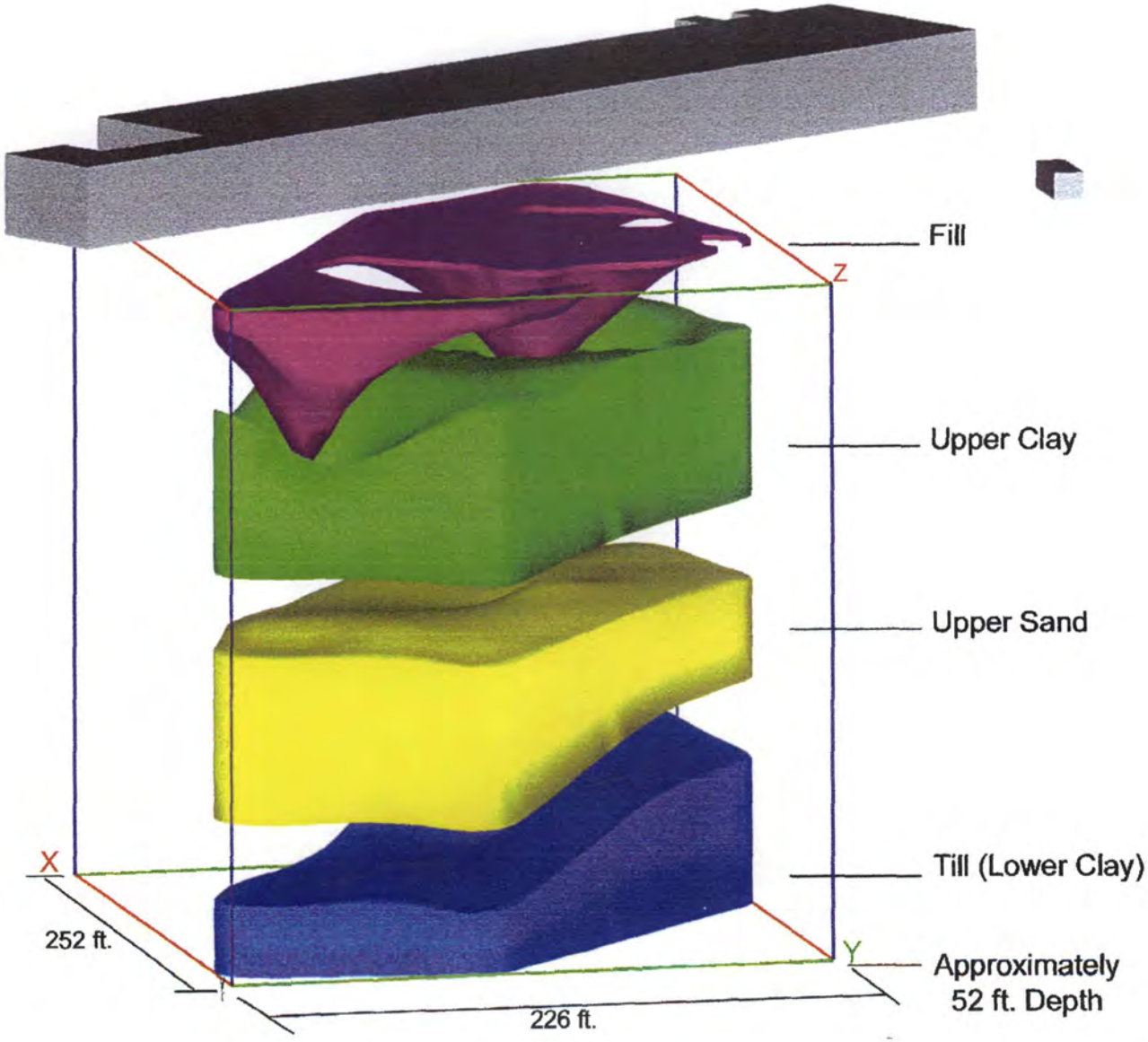


Figure 3-25
3D Depiction Of Geology
Building I-1-23 Area

3X Vertical Exaggeration
Looking East

G://DATA/HYDRO/4781/PHOTOSHOPFILES/I123SITE/I123GEO.PSD

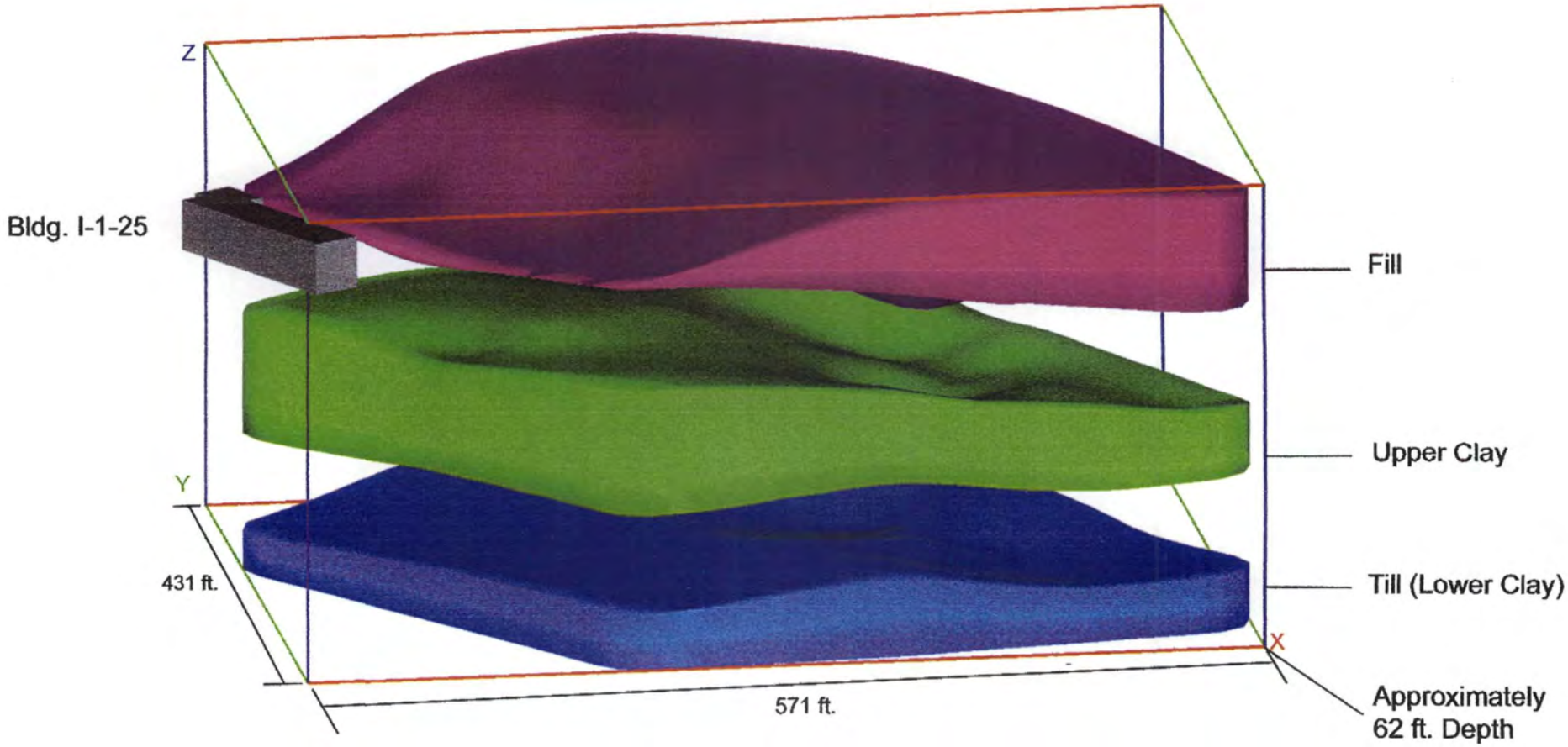
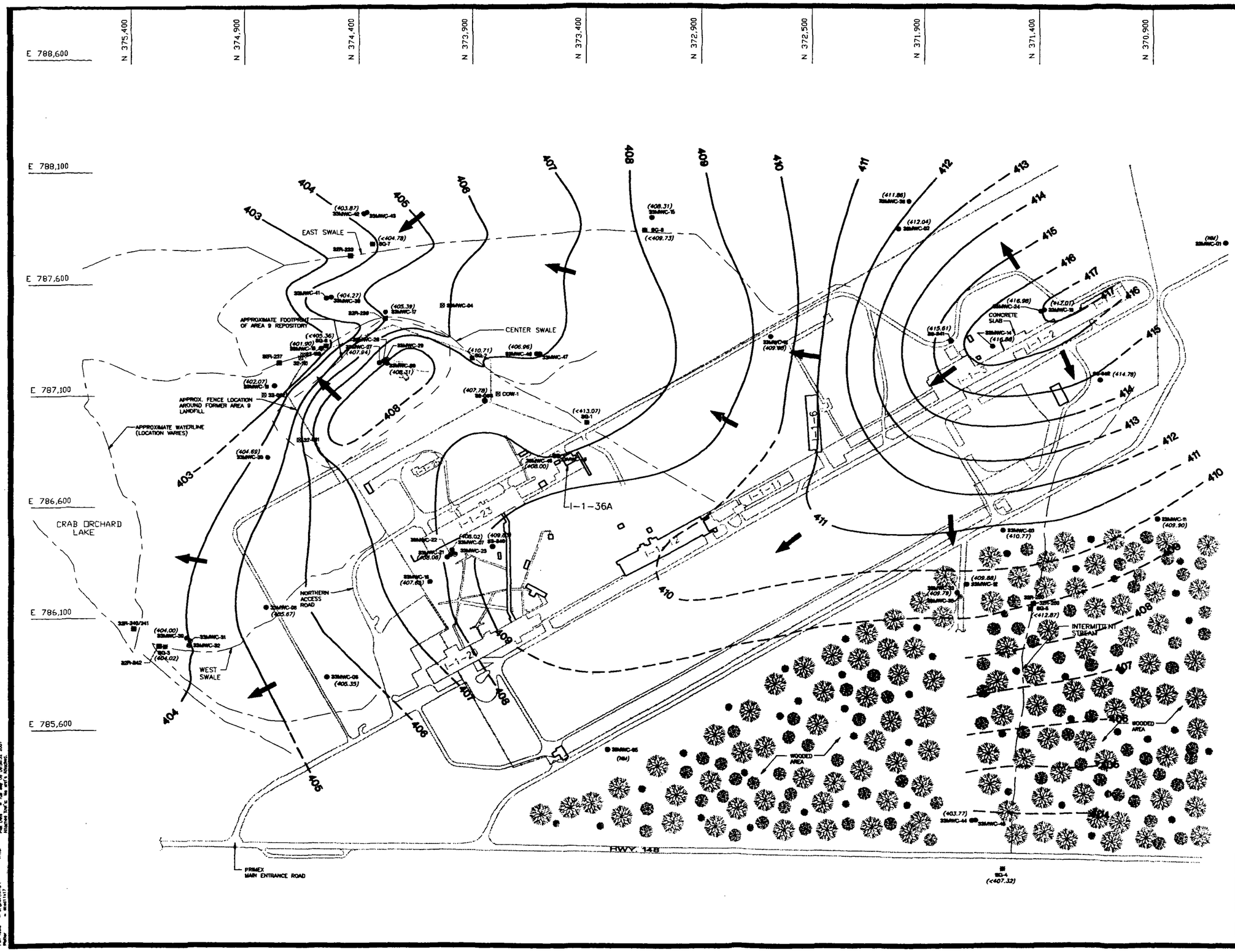


Figure 3-26
3D Depiction Of Geology
Beneath Area 9 Repository

3X Vertical Exaggeration
Looking North

G:\DATA\HYDRO\4781\PHOTOSHOP\FILES\SITES\AREA9GEO.PSD



LEGEND

- SBMWC-01 — SHALLOW MONITORING WELL
- SBMWC-02 — PIEZOMETER
- SG-4 — STAFF GAUGE
- SSR-242 — SURFACE WATER SAMPLING LOCATION
- SS-881 — MONITORING WELL, ABANDONED (APPROXIMATE LOCATION)
- APPROXIMATE CENTERLINE OF SURFACE DRAINAGE CHANNEL/SWALE
- FENCE
- APPROXIMATE FOOTPRINT OF AREA 9 REPOSITORY
- WOODED AREA
- 408 — WATER TABLE CONTOUR (FEET MSL) (DASHED WHERE INFERRED)
- (409.90) — WATER TABLE ELEVATION (FEET MSL)
- (NM) — NO MEASUREMENT
- DIRECTION OF GROUNDWATER FLOW

NOTES

1. THE SURFACE WATER ELEVATION AT STAFF GAUGE SG-02 REFLECTS PONDED WATER FROM RECENT RAINFALL EVENTS, AND IS THEREFORE NOT USED IN THE INTERPRETATION OF THE WATER TABLE MAP.
2. SOURCE: BASE MAP FROM "1998 TCE INVESTIGATION, WORKPLAN AND PILOT STUDY FOR THE PCB OPERABLE UNIT AT THE CRAB ORCHARD NATIONAL WILDLIFE REFUGE SUPERFUND SITE, MARION, ILLINOIS" REV. 1, MAY 1998, PREPARED BY FLUOR DANIEL GTI.

0 200' 400'

NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

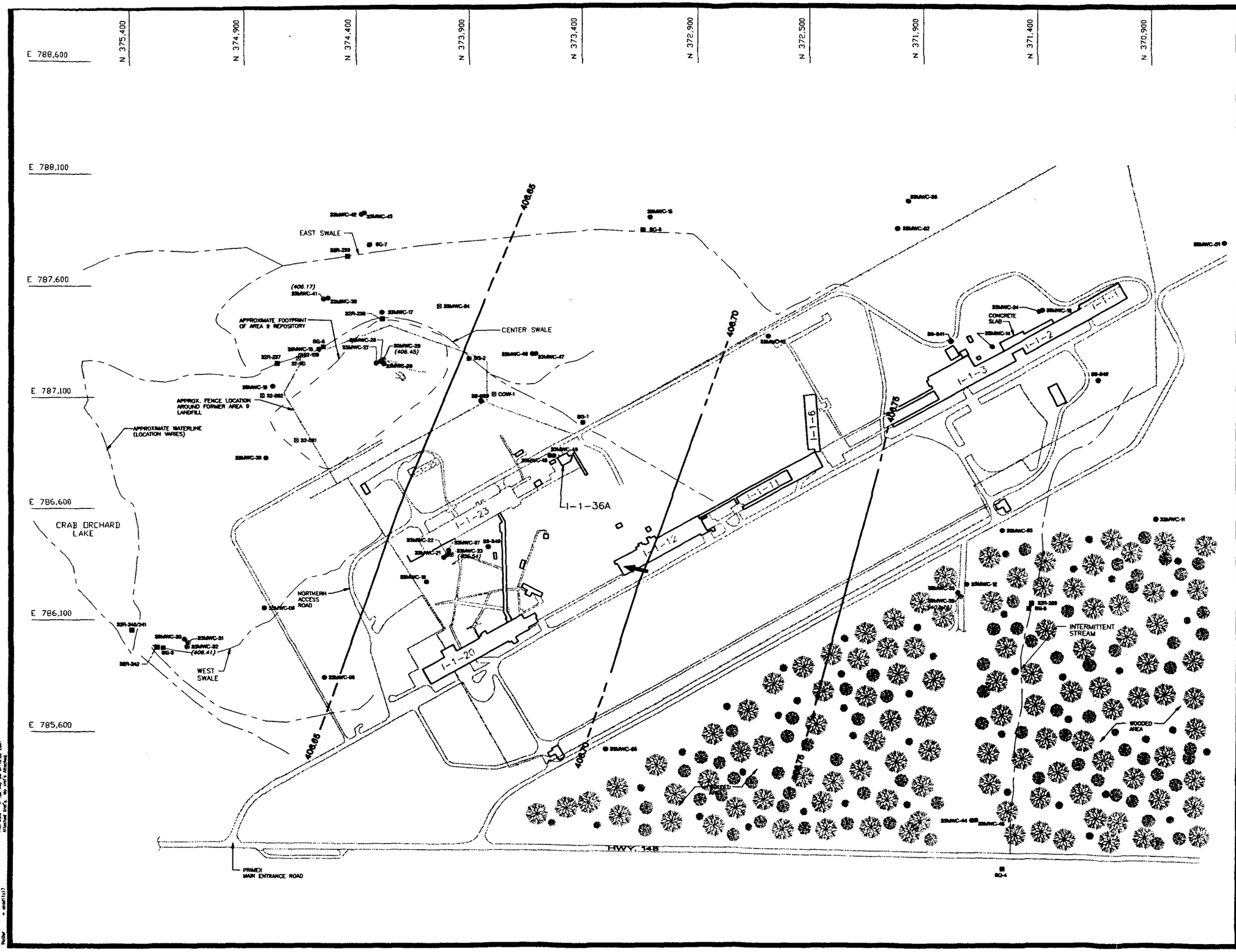
PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: WATER TABLE MAP OCTOBER 2000

DRAWN BY: SHEWERTO	SCALE: 1"=400'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810770.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 3-27
DATE: MAY 2001		

RMT.

744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444



LEGEND

33MWC-30	SHALLOW MONITORING WELL
33MWC-22	PIEZOMETER
SG-4	STAFF GAUGE
32R-242	SURFACE WATER SAMPLING LOCATION
32-661	MONITORING WELL, ABANDONED (APPROXIMATE LOCATION)
	APPROXIMATE CENTERLINE OF SURFACE DRAINAGE CHANNEL/SWALE
	FENCE
	APPROXIMATE FOOTPRINT OF AREA 9 REPOSITORY
	MARSH/WETLAND
	APPROXIMATE LOCATION OF WOODED AREAS WEST OF SITE 32/33
408.65	POTENTIOMETRIC SURFACE CONTOUR (FEET MSL) (DASHED WHERE INFERRED)
(409.90)	POTENTIOMETRIC SURFACE ELEVATION (FEET MSL)
	DIRECTION OF GROUNDWATER FLOW

NOTES

1. SOURCE: BASE MAP FROM "1998 TCE INVESTIGATION, WORKPLAN AND PILOT STUDY FOR THE PCB OPERABLE UNIT AT THE CRAB ORCHARD NATIONAL WILDLIFE REFUGE SUPERFUND SITE, MARION, ILLINOIS" REV. 1, MAY 1998, PREPARED BY FLUOR DANIEL GTI.

NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE:
POTENTIOMETRIC SURFACE MAP
OCTOBER 2000

DRAWN BY: SIEWERTD	SCALE: 1"=400'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810789.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 3-28
DATE: MAY 2001		

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Madison, WI 53717-1934
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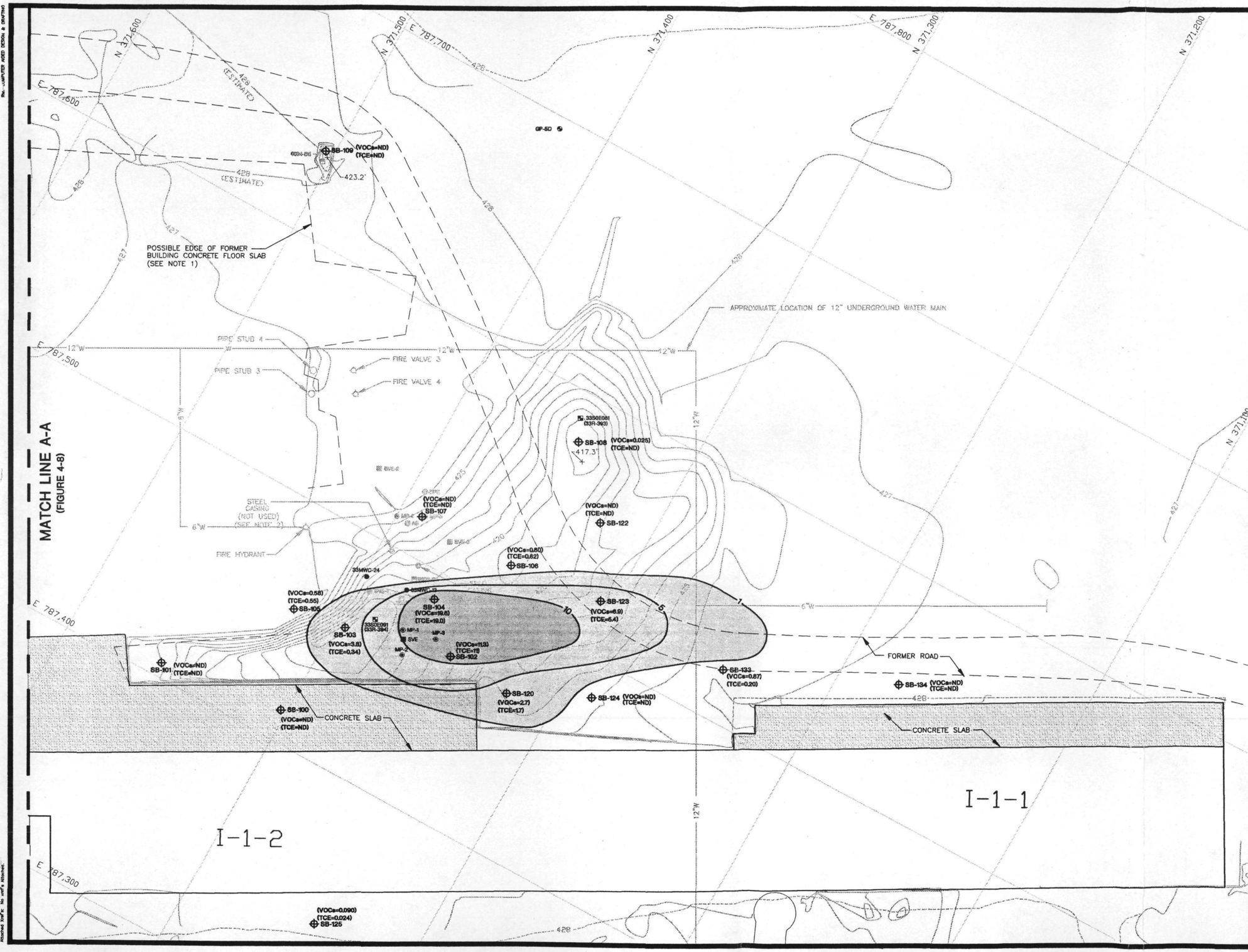
Madison, WI 53708-8923
Phone: 608/831-4444



LEGEND

SB-107	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-24	GROUNDWATER MONITORING WELL (2")
MP-2	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
SVE	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY RMT IN 2000)
GP-1E	GEOPROBE BORING LOCATION (1998)
33R-394	SOIL SAMPLE (IT CORP.)
6024-B6	SOIL SAMPLE (FDGTI)(1997)
MP-5	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
A6	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
———	EXISTING BUILDING
- - - 422 - - -	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
····· 422 ·····	PCB EXCAVATION CONTOURS (FDGTI) (1997)
····· W ·····	UNDERGROUND 12" WATER MAIN LOCATION (APPROXIMATE)
(VOCs=8.3)	TOTAL VOCs (mg/kg)
(TCE=7.9)	TRICHLOROETHENE (mg/kg)
—— 1 ——	ISOCONCENTRATION CONTOUR

NOTES

1. CONCRETE SLAB BELIEVED TO HAVE BEEN DEMOLISHED AND REMOVED DURING PCB REMEDIAL ACTION IN 1996. HOWEVER, DOCUMENTATION FOR THIS WORK DOES NOT EXIST.
2. STEEL CASING CUT-OFF APPROXIMATELY 1 FOOT ABOVE GROUND, FILLED WITH GROUT, AND COVER PLATE WELDED TO OPENING. CASINGS WERE INSTALLED DURING THE SUMMER OF 1998 GROUNDWATER INVESTIGATION, BUT WERE NOT COMPLETED AS MONITORING WELLS.
3. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
4. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

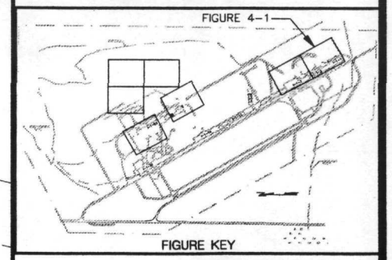


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
BUILDING I-1-2
0 TO 12 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810749.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-1
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
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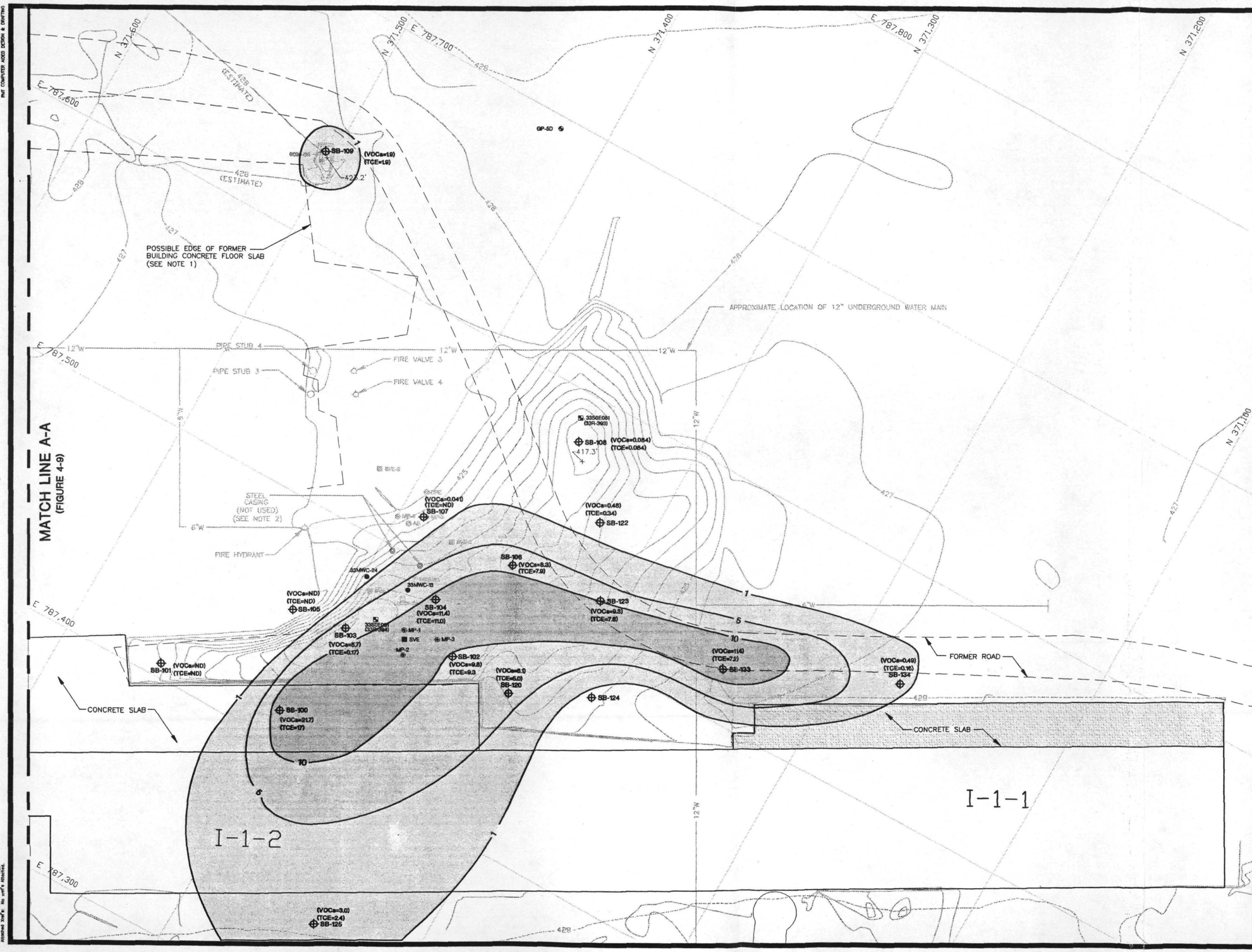
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-107	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-24	GROUNDWATER MONITORING WELL (2")
MP-2	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
SVE	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY RMT IN 2000)
GP-1E	GEOPROBE BORING LOCATION (1998)
33R-394	SOIL SAMPLE (IT CORP.)
0002-E6	SOIL SAMPLE (FDGTI)(1997)
MP-3	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
———	EXISTING BUILDING
---- 422 ----	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
---- 422 ----	PCB EXCAVATION CONTOURS (FDGTI) (1997)
---- W ----	UNDERGROUND 12" WATER MAIN LOCATION (APPROXIMATE)
(VOCs=8.3)	TOTAL VOCs (mg/kg)
(TCE=7.9)	TRICHLOROETHENE (mg/kg)
—— 1 ——	ISOCONCENTRATION CONTOUR

NOTES

1. CONCRETE SLAB BELIEVED TO HAVE BEEN DEMOLISHED AND REMOVED DURING PCB REMEDIAL ACTION IN 1996. HOWEVER, DOCUMENTATION FOR THIS WORK DOES NOT EXIST.
2. STEEL CASING CUT-OFF APPROXIMATELY 1 FOOT ABOVE GROUND, FILLED WITH GROUT, AND COVER PLATE WELDED TO OPENING. CASINGS WERE INSTALLED DURING THE SUMMER OF 1998 GROUNDWATER INVESTIGATION, BUT WERE NOT COMPLETED AS MONITORING WELLS.
3. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
4. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

FIGURE 4-2

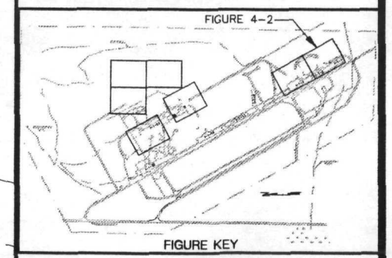


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
BUILDING I-1-2
12-24 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE:	PROJ. NO. 4781.07
CHECKED BY: SLM	1"=40'	FILE NO. 47810714.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-2
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
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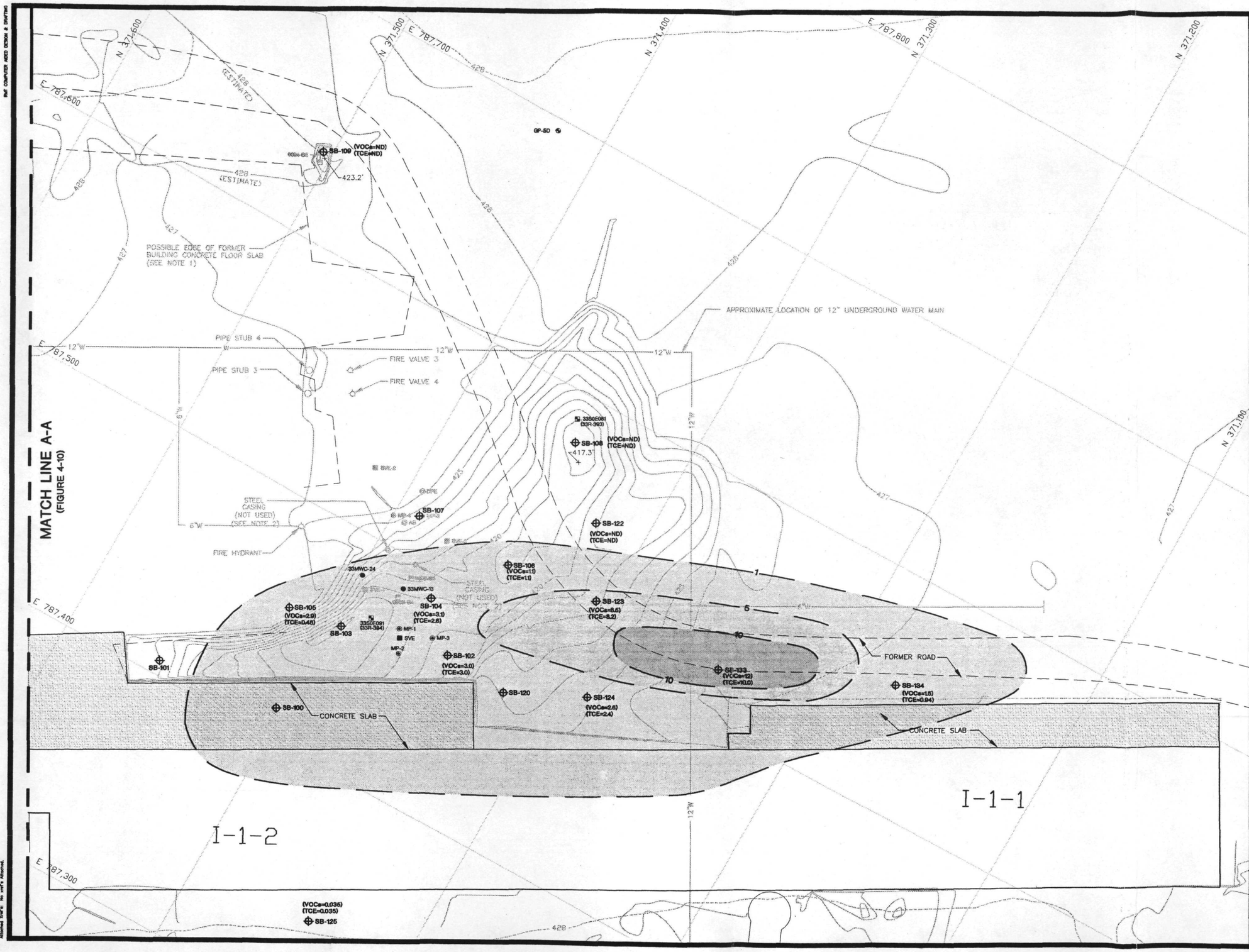
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-107	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-24	GROUNDWATER MONITORING WELL (2")
MP-2	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
SVE	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY RMT IN 2000)
GP-1E	GEOPROBE BORING LOCATION (1998)
33R-394	SOIL SAMPLE (IT CORP.)
0008-E06	SOIL SAMPLE (FDGTI)(1997)
MP-3	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	PCB EXCAVATION CONTOURS (FDGTI) (1997)
W	UNDERGROUND 12" WATER MAIN LOCATION (APPROXIMATE)
(VOCs=8.5)	TOTAL VOCs (mg/kg)
(TCE=8.2)	TRICHLOROETHENE (mg/kg)
5	ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

NOTES

1. CONCRETE SLAB BELIEVED TO HAVE BEEN DEMOLISHED AND REMOVED DURING PCB REMEDIAL ACTION IN 1996. HOWEVER, DOCUMENTATION FOR THIS WORK DOES NOT EXIST.
2. STEEL CASING CUT-OFF APPROXIMATELY 1 FOOT ABOVE GROUND, FILLED WITH GROUT, AND COVER PLATE WELDED TO OPENING. CASINGS WERE INSTALLED DURING THE SUMMER OF 1998 GROUNDWATER INVESTIGATION, BUT WERE NOT COMPLETED AS MONITORING WELLS.
3. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
4. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

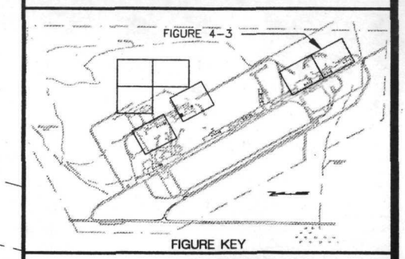


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
BUILDING I-1-2
24-36 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810734.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-3
DATE: MAY 2001		

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744 Heartland Trail
Madison, WI 53717-1934
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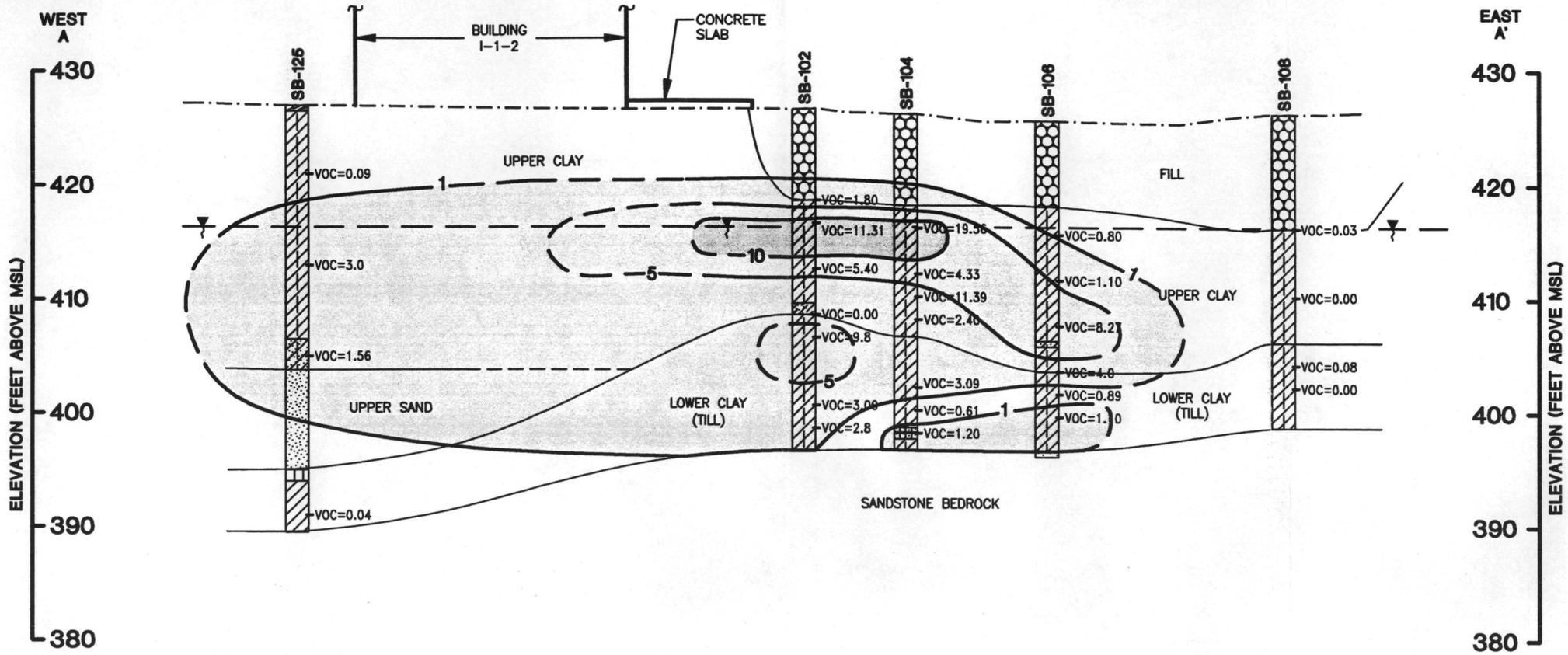
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.
2. (VOC=0.03) REPRESENTS TOTAL VOC CONCENTRATION IN SOIL, mg/kg

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN
- —1— TOTAL VOC CONCENTRATIONS (mg/kg)
- VOC=0.08 TOTAL VOC CONCENTRATIONS (mg/kg)

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VOC CONCENTRATION CROSS SECTION A-A'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810771.DWG

FIGURE 4-4

PLOT DATA
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Operator: SIEWERTD
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Dwg Size: 6399.39 Bytes
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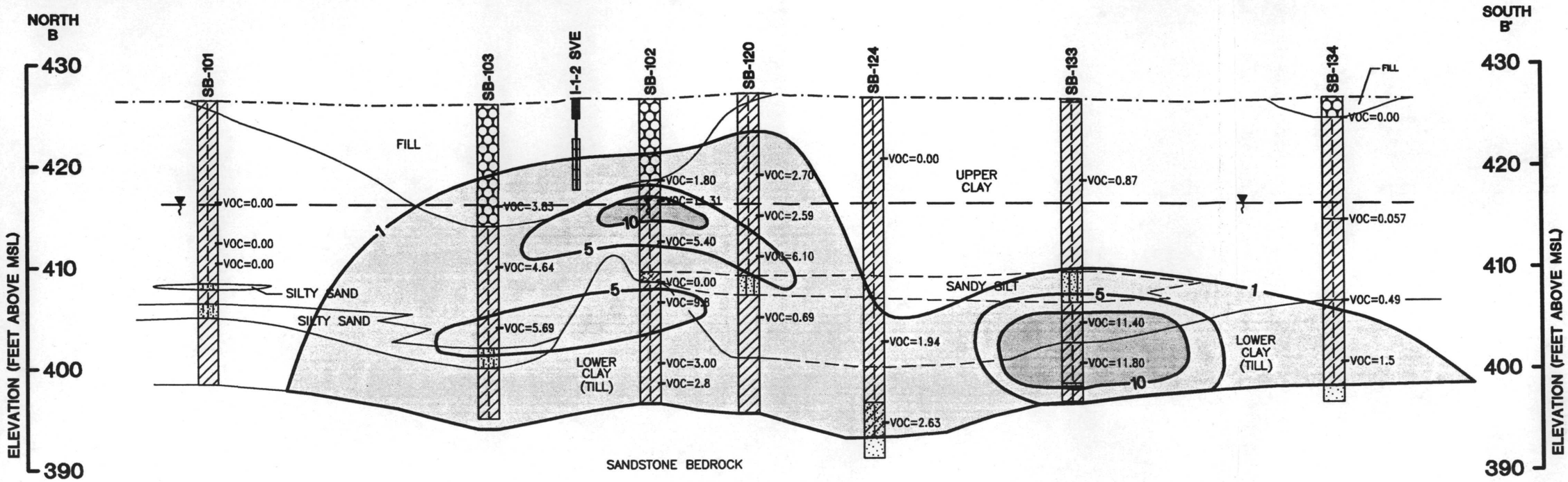
Plot Time: 08:45:14.35 AM
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.
2. (VOC=0.03) REPRESENTS TOTAL VOC CONCENTRATION IN SOIL, mg/kg

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN
- 1 — TOTAL VOC CONCENTRATIONS (mg/kg)
- VOC=0.08 — TOTAL VOC CONCENTRATIONS (mg/kg)

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

VOC CONCENTRATION CROSS SECTION B-B'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810772.DWG

FIGURE 4-5

PLOT DA
Drawing: J:\04781\07\47810772.dwg
Operator: SIEWERTD
Scale: 1"=30'
Dwg Size: 267940 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:45:47.12 AM
Attached Xref's: No xref's Attached.

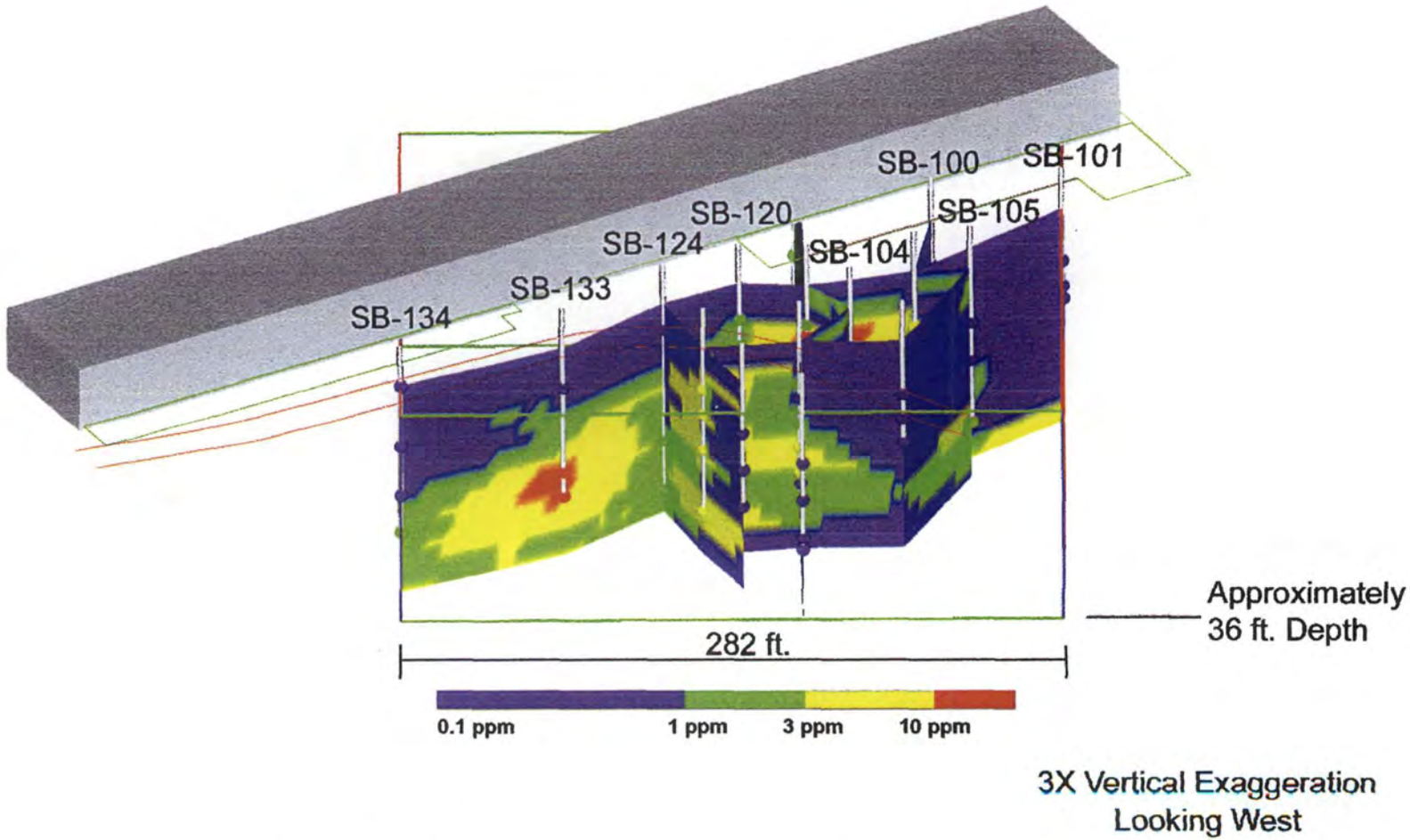


Figure 4-6
3D Fence Diagram Showing Total VOC Concentrations In Soil
Building I-1-2 Area

G:/DATA/HYDRO/4781/PHOTOSHOPFILES/I12SITE/I12FEN.PSD

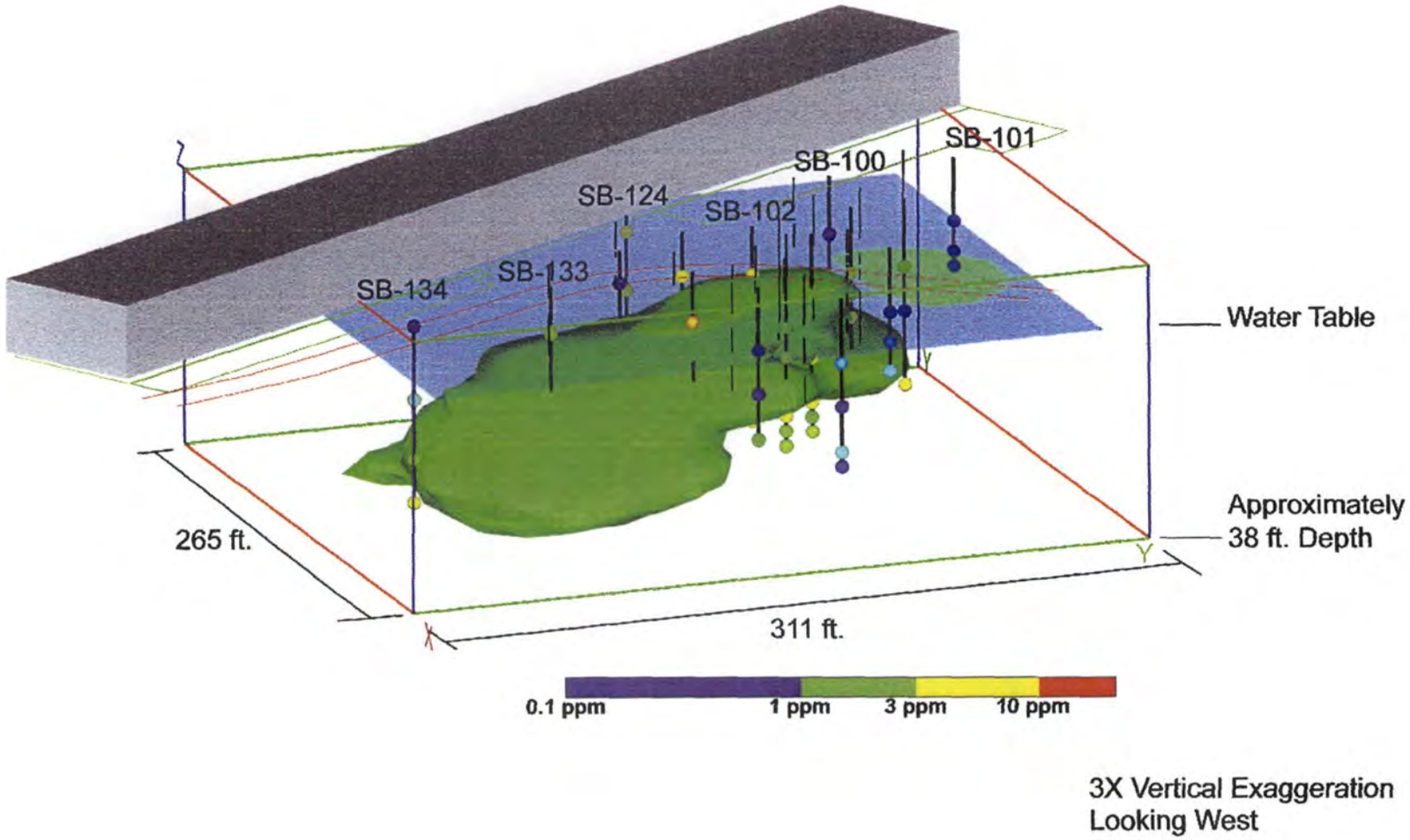
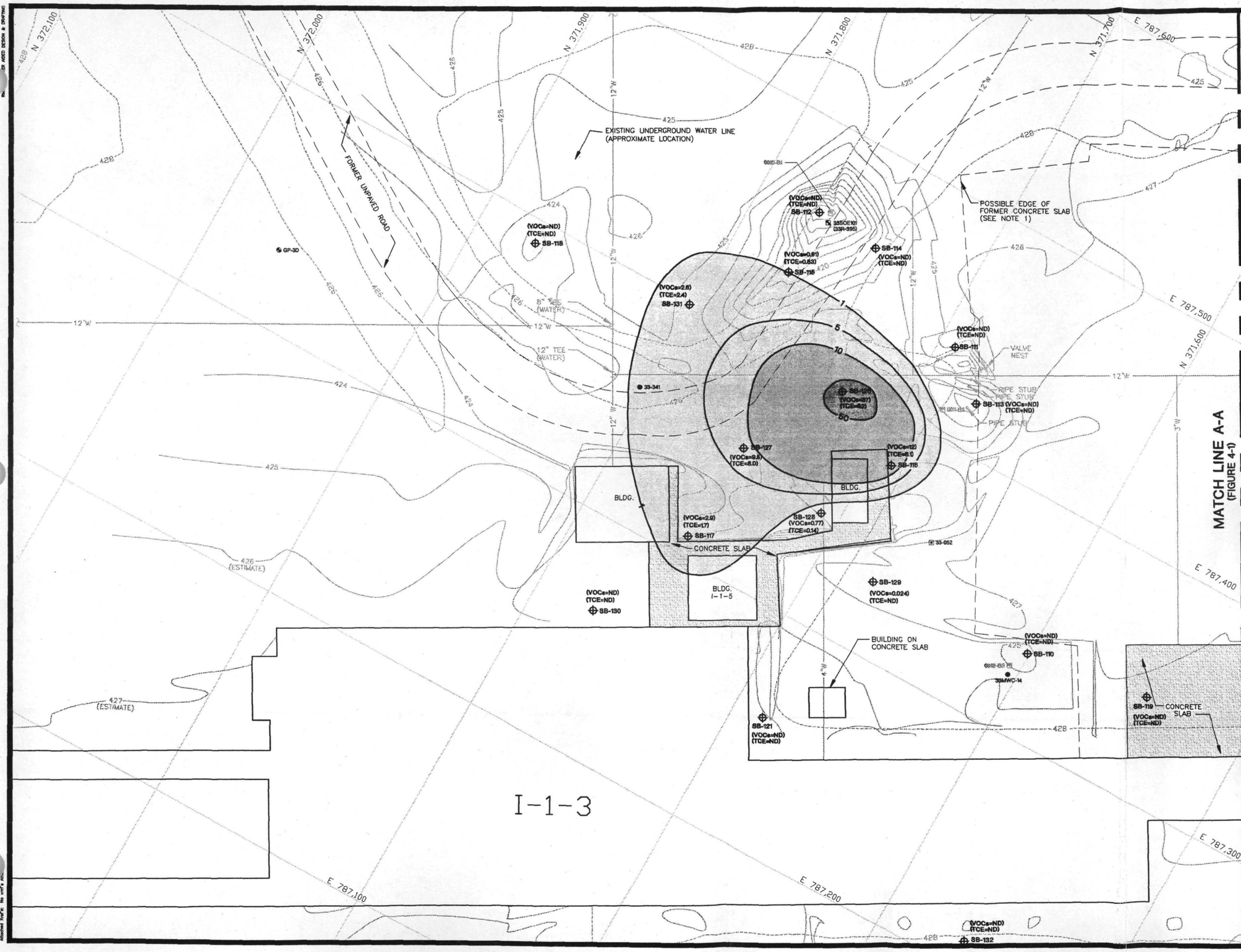


Figure 4-7
3D Diagram Showing Total VOC Concentrations In Soil
At or Above 3 mg/kg (ppm)
Building I-1-2 Area

G:\\DATA\HYDRO\4781\PHOTOSHOPFILES\I112SITE\I112Chm.PSD



LEGEND

SB-114	PROPOSED GEOPROBE BORING LOCATION
33MWC-14	GROUNDWATER MONITORING WELL (2")
GP-11E	GEOPROBE BORING LOCATION (1998)
33SOE101	SOIL SAMPLE (IT CORP.)
33R-395	SOIL SAMPLE (FDGTI)(1997)
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	PCB EXCAVATION CONTOURS (FDGTI) (1997)
W	EXISTING UNDERGROUND WATER LINE (APPROXIMATE LOCATION)
(VOCs=0.86)	TOTAL VOCs (mg/kg)
(TCE=0.14)	TRICHLOROETHENE (mg/kg)
1	ISOCONCENTRATION CONTOUR

NOTES

1. CONCRETE SLAB BELIEVED TO HAVE BEEN DEMOLISHED AND REMOVED DURING PCB REMEDIAL ACTION IN 1996. HOWEVER, DOCUMENTATION FOR THIS WORK DOES NOT EXIST.
2. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
3. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

FIGURE 4-8

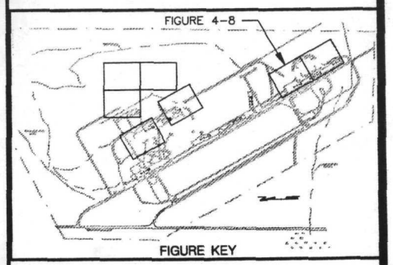


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

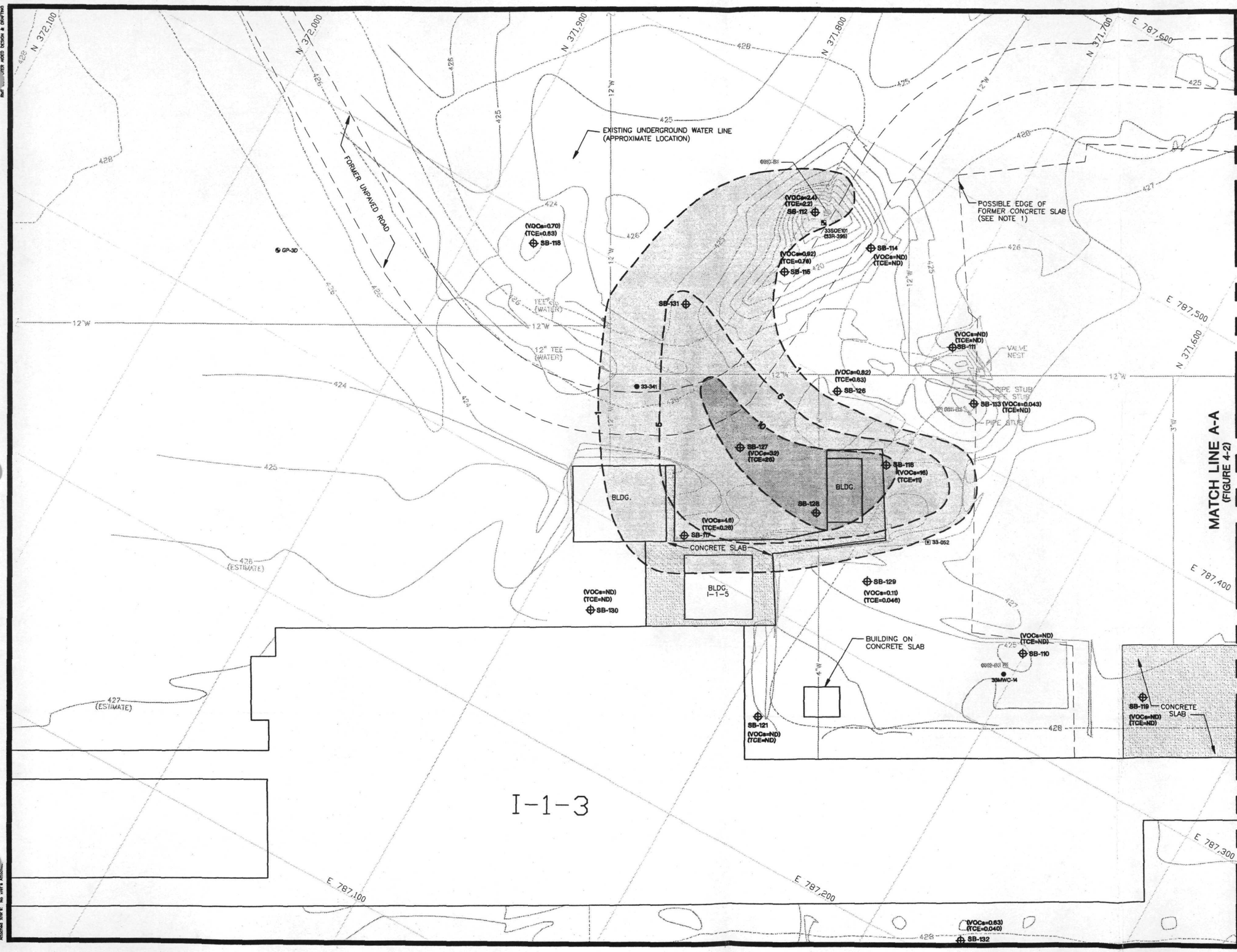
PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
BUILDING I-1-3
0-12 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 47810.07
CHECKED BY: SLM		FILE NO. 47810705.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-8
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-114	PROPOSED GEOPROBE BORING LOCATION
33MWC-14	GROUNDWATER MONITORING WELL (2")
GP-11E	GEOPROBE BORING LOCATION (1998)
33SOE101	SOIL SAMPLE (IT CORP.)
33-052	SOIL SAMPLE (FDGTI)(1997)
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	PCB EXCAVATION CONTOURS (FDGTI) (1997)
W	EXISTING UNDERGROUND WATER LINE (APPROXIMATE LOCATION)
(VOCs=0.85)	TOTAL VOCs (mg/kg)
(TCE=0.14)	TRICHLOROETHENE (mg/kg)
1	ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

NOTES

1. CONCRETE SLAB BELIEVED TO HAVE BEEN DEMOLISHED AND REMOVED DURING PCB REMEDIAL ACTION IN 1996. HOWEVER, DOCUMENTATION FOR THIS WORK DOES NOT EXIST.
2. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
3. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

FIGURE 4-9

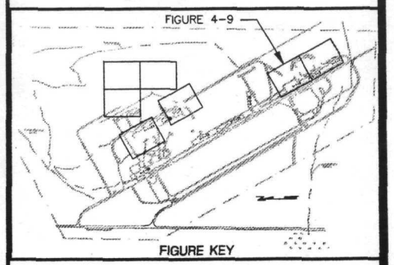


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

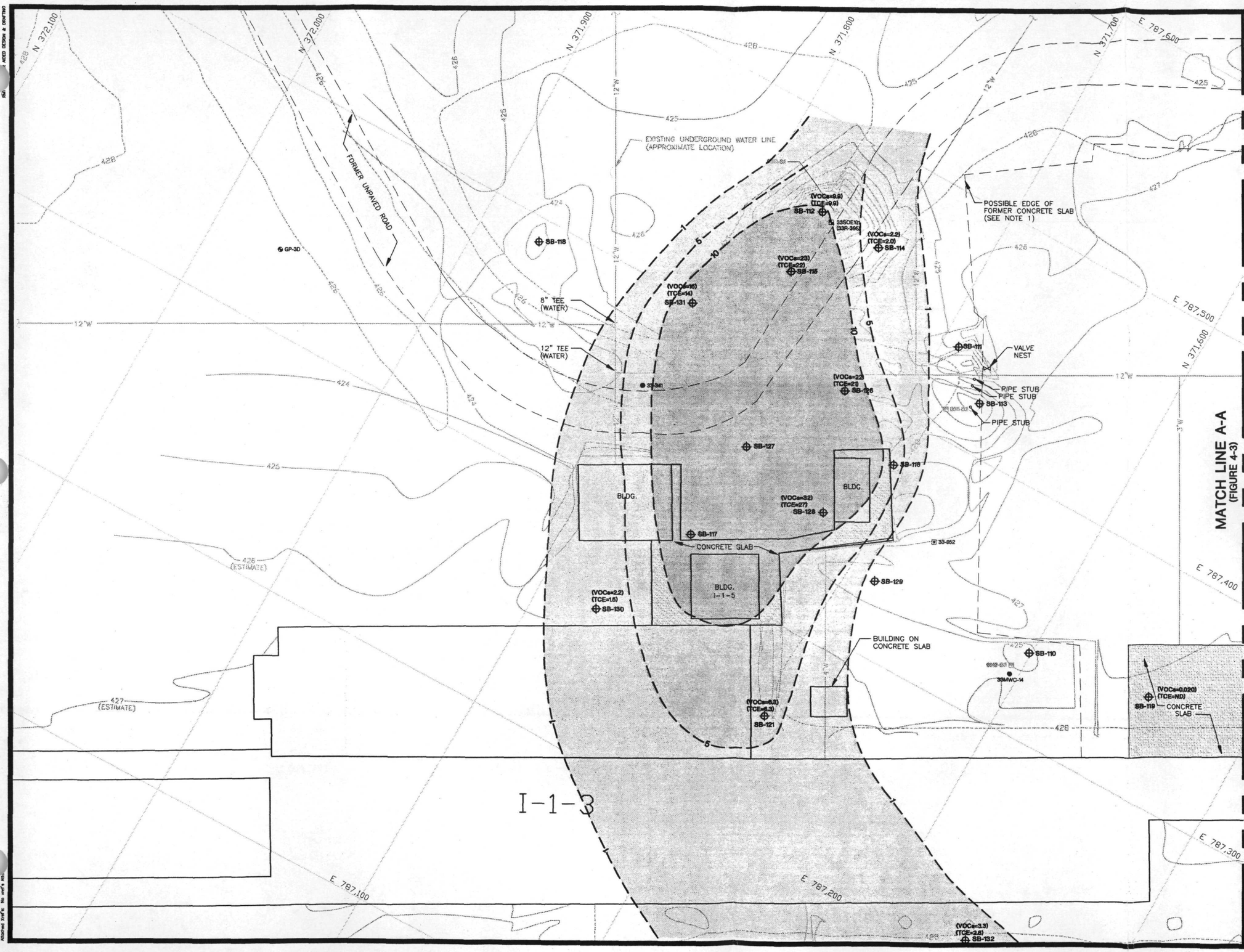
PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
BUILDING I-1-3
12-24 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810738.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-9
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-113	PROPOSED GEOPROBE BORING LOCATION
33MWC-14	GROUNDWATER MONITORING WELL (2")
GP-11E	GEOPROBE BORING LOCATION (1998)
33SOE101	SOIL SAMPLE (IT CORP.)
6012-123	SOIL SAMPLE (FDGTI)(1997)
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	PCB EXCAVATION CONTOURS (FDGTI) (1997)
W	EXISTING UNDERGROUND WATER LINE (APPROXIMATE LOCATION)
(VOCs=0.41)	TOTAL VOCs (mg/kg)
(TCE=0.41)	TRICHLOROETHENE (mg/kg)
1	ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

NOTES

1. CONCRETE SLAB BELIEVED TO HAVE BEEN DEMOLISHED AND REMOVED DURING PCB REMEDIAL ACTION IN 1996. HOWEVER, DOCUMENTATION FOR THIS WORK DOES NOT EXIST.
2. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN *PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994*. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
3. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

FIGURE 4-10

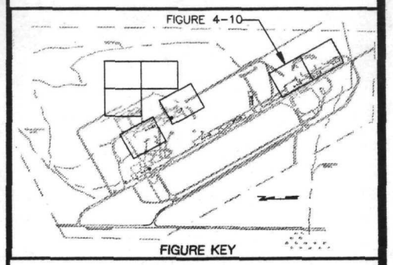


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

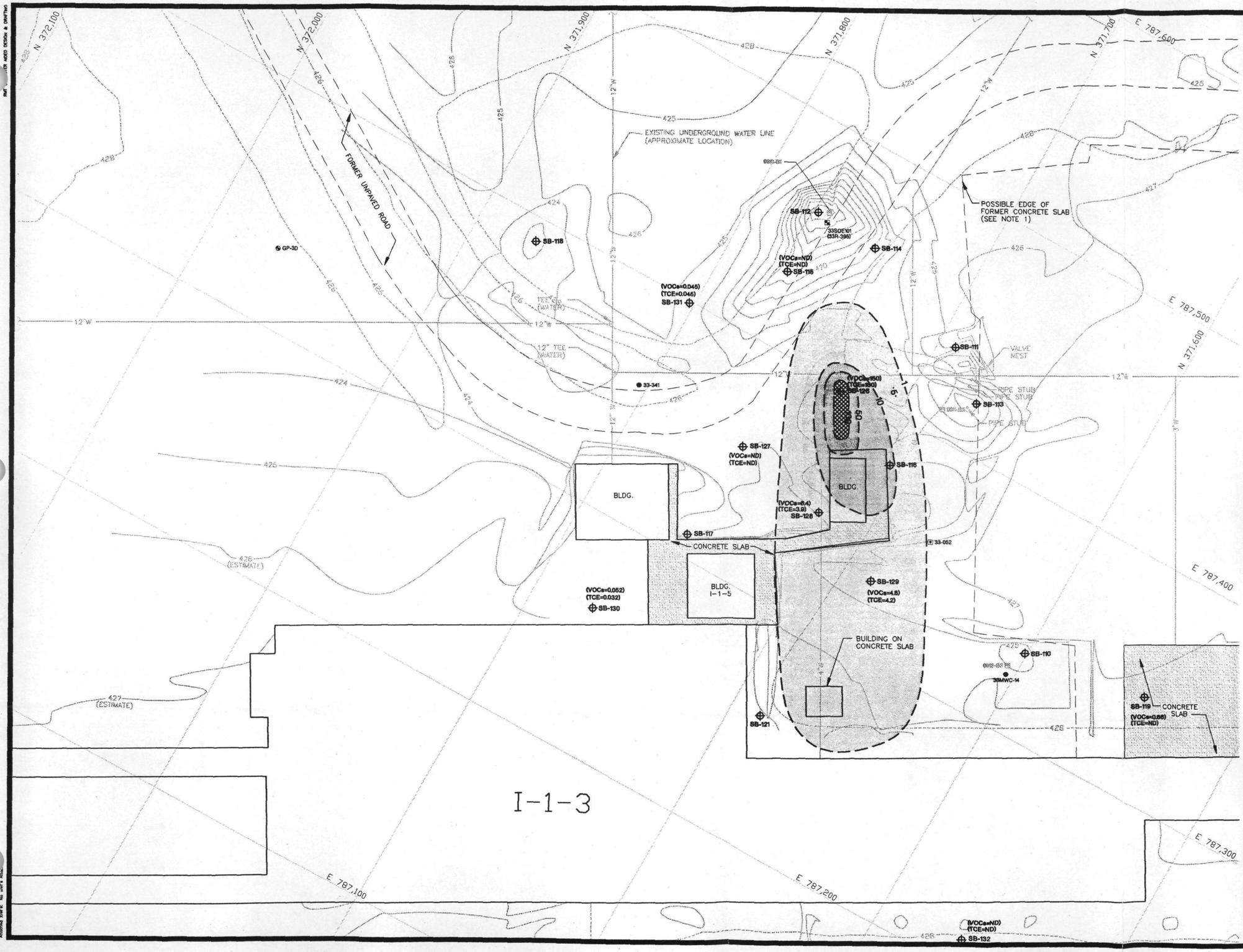
PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
BUILDING I-1-3
24 TO 36 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE:	PROJ. NO. 4781.07
CHECKED BY: SLM	1"=40'	FILE NO. 47810748.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-10
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-114	PROPOSED GEOPROBE BORING LOCATION
33MWC-14	GROUNDWATER MONITORING WELL (2")
GP-11E	GEOPROBE BORING LOCATION (1998)
33SOE101	SOIL SAMPLE (IT CORP.)
33R-395	SOIL SAMPLE (FDGTI)(1997)
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	PCB EXCAVATION CONTOURS (FDGTI) (1997)
W	EXISTING UNDERGROUND WATER LINE (APPROXIMATE LOCATION)
(VOCs=0.85)	TOTAL VOCs (mg/kg)
(TCE=0.14)	TRICHLOROETHENE (mg/kg)
1	ISOCONCENTRATION CONTOUR

NOTES

1. CONCRETE SLAB BELIEVED TO HAVE BEEN DEMOLISHED AND REMOVED DURING PCB REMEDIAL ACTION IN 1996. HOWEVER, DOCUMENTATION FOR THIS WORK DOES NOT EXIST.
2. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
3. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

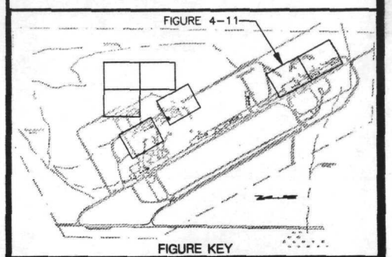


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

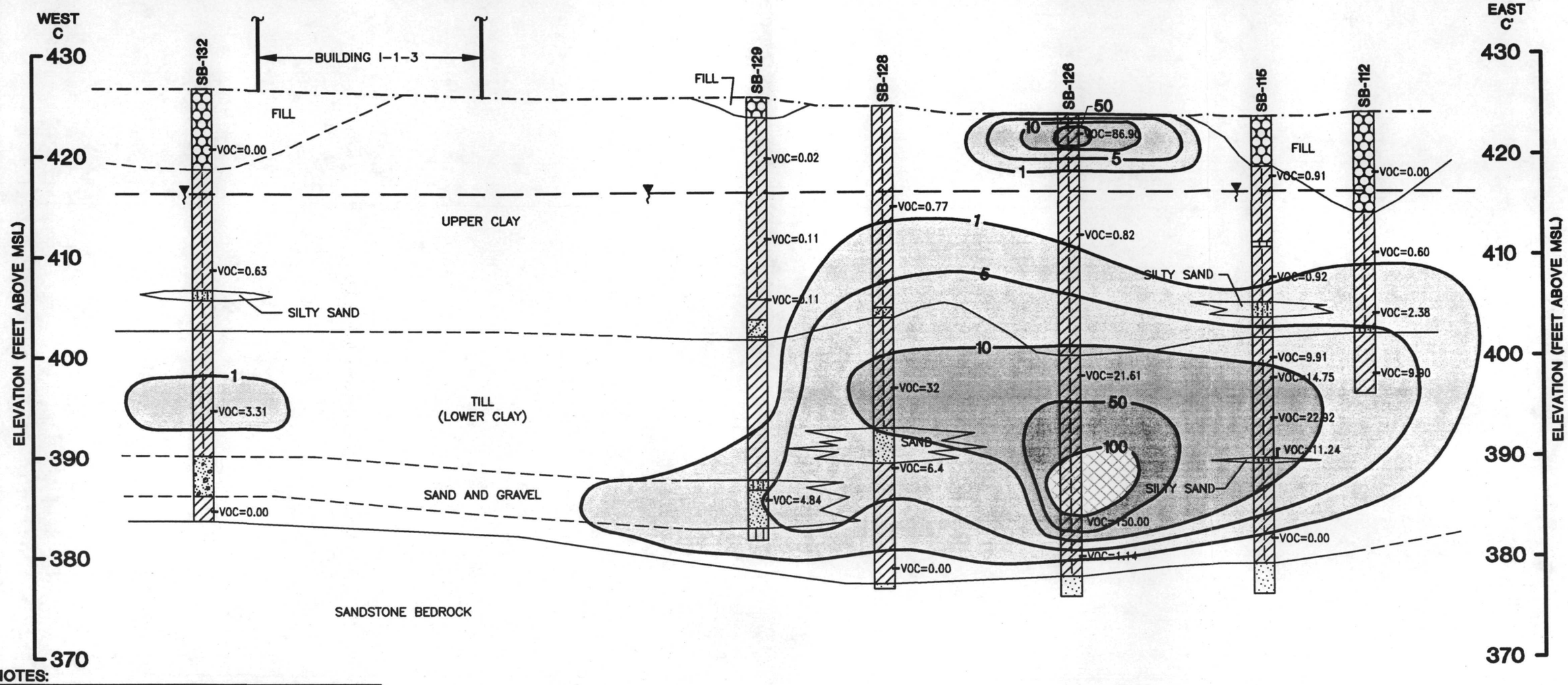
PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
BUILDING I-1-3
36 TO 48 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810739.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-11
DATE: MAY 2001		

RMT.
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.
2. (VOC=0.03) REPRESENTS TOTAL VOC CONCENTRATION IN SOIL, mg/kg

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN
- —1— TOTAL VOC CONCENTRATIONS (mg/kg)
- VOC=0.08 TOTAL VOC CONCENTRATIONS (mg/kg)

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

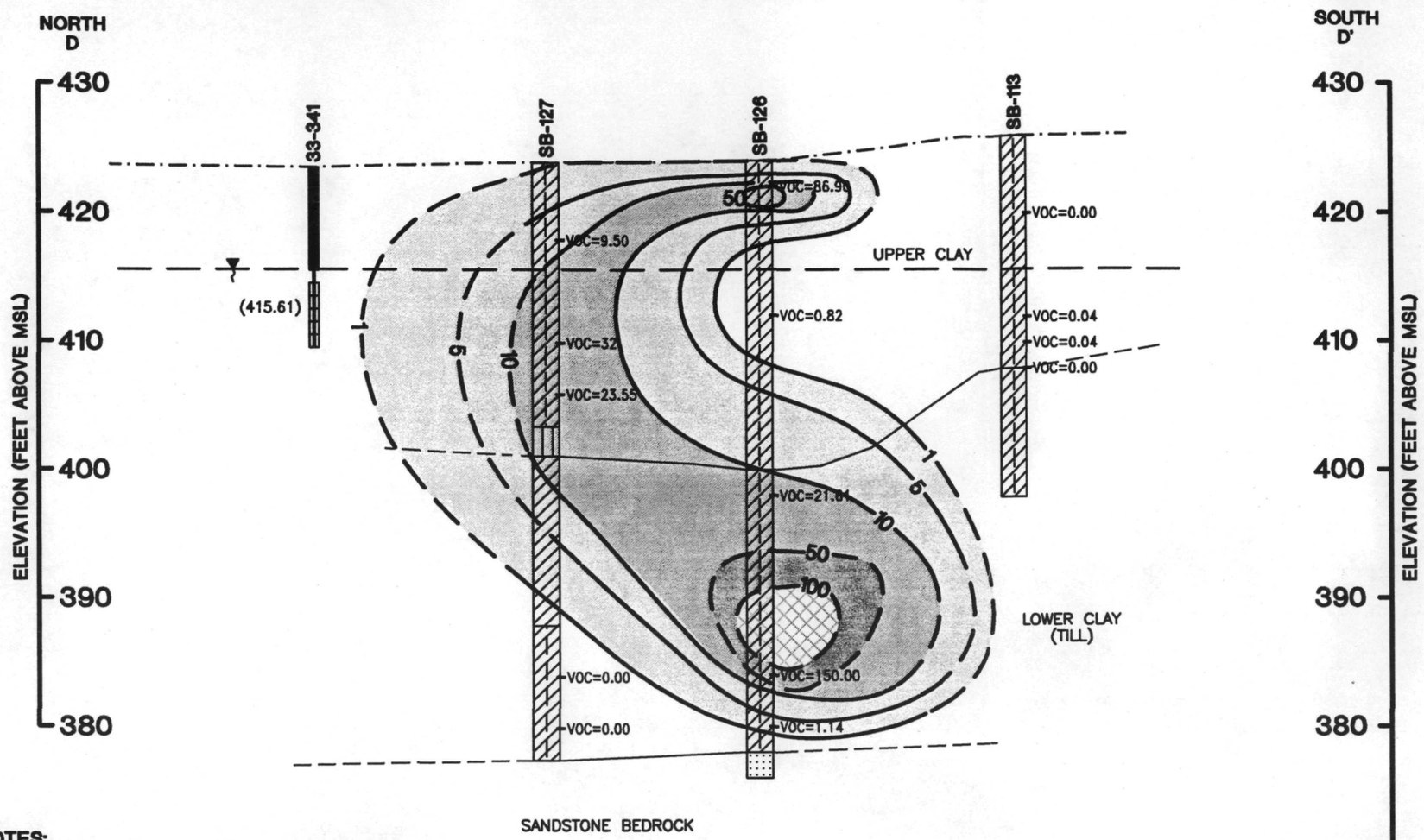
VOC CONCENTRATION CROSS SECTION C-C'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810773.DWG

FIGURE 4-12

PLOT DATA
Drawing No: J:\04781\07\47810773.dwg
Operator No: SIEWERTD
Scale: 1"=30'
Dwg Size: 231523 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:46:14:17 AM
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.
2. (VOC=0.03) REPRESENTS TOTAL VOC CONCENTRATION IN SOIL, mg/kg

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (415.61) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN
- 1 TOTAL VOC CONCENTRATIONS (mg/kg)
- VOC=0.08 TOTAL VOC CONCENTRATIONS (mg/kg)

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

VOC CONCENTRATION CROSS SECTION D-D'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810774.DWG

FIGURE 4-13

Dwg Size: 157652 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:46:52 10 AM
Attached Xref's: No xref's Attached.
J:\04781\07\47810774.dwg
Drawing: SIEWERTD
Operator:
Scale: 1"=30'
PLOT D

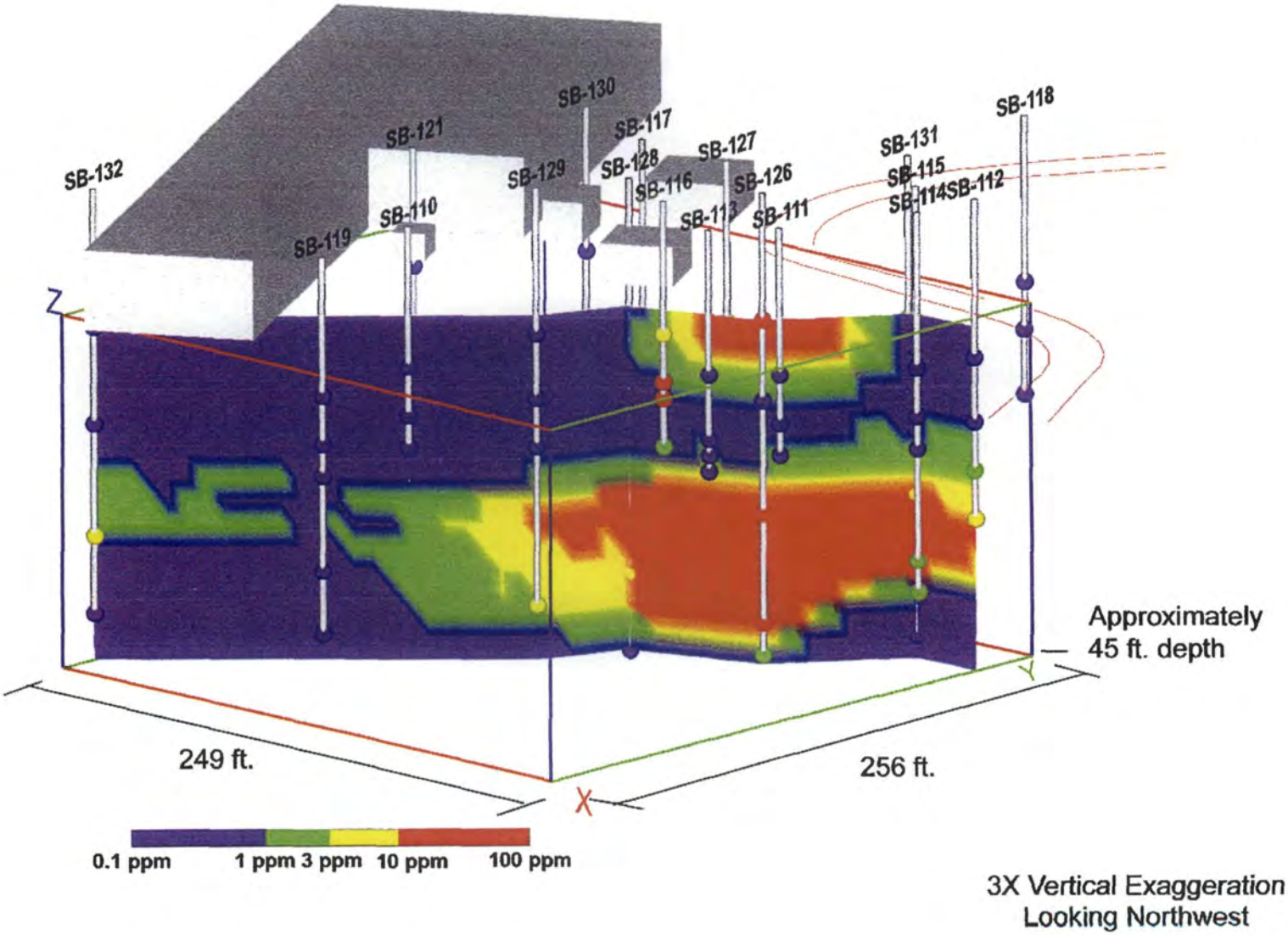


Figure 4-14
3D Fence Diagram Showing Total VOC Concentrations in Soil
Building I-1-3 Area

G:\DATA\HYDRO\4781\PHOTOSHOPFILES\I113SITE\I113FENCE.PSD

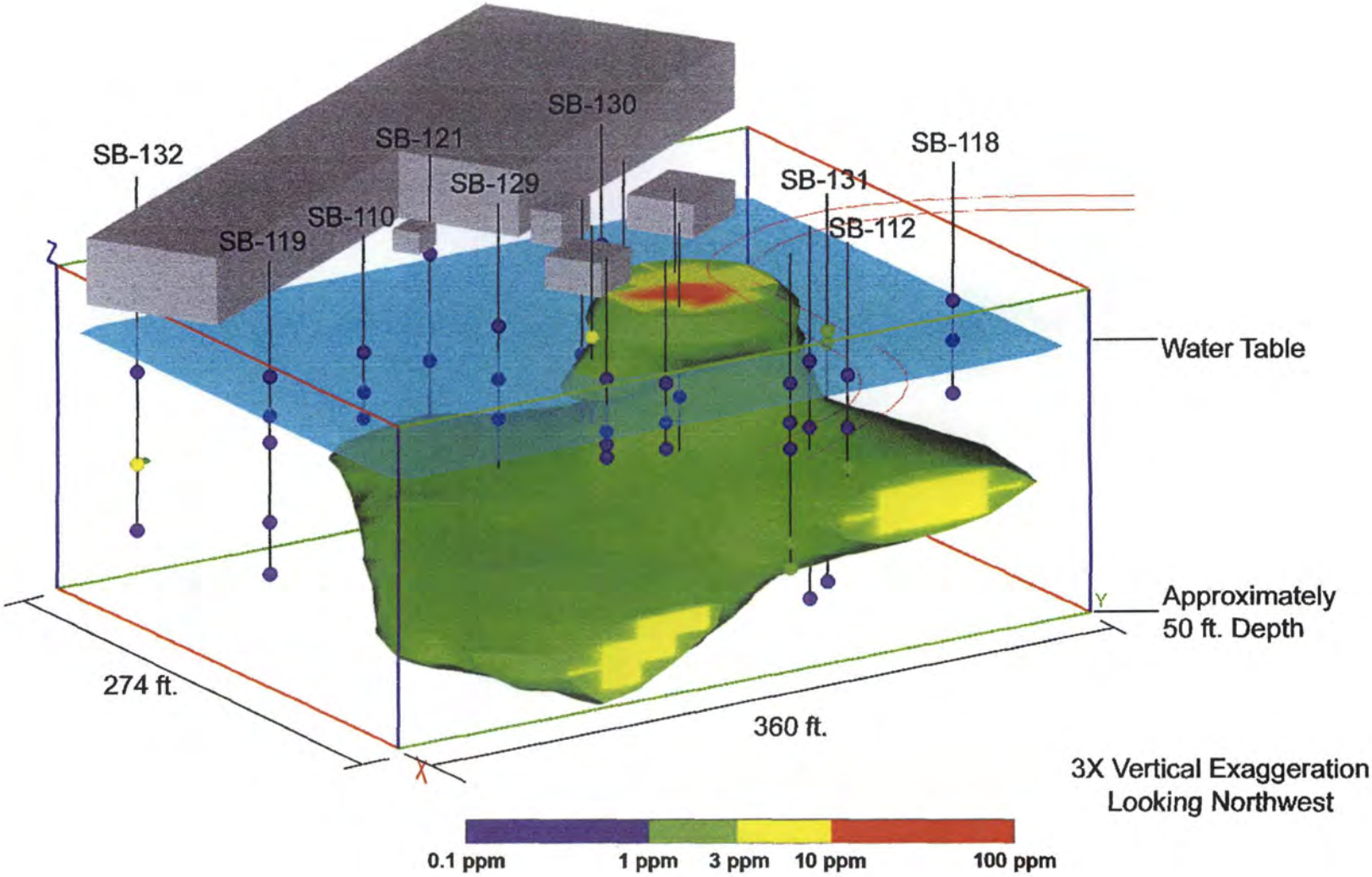
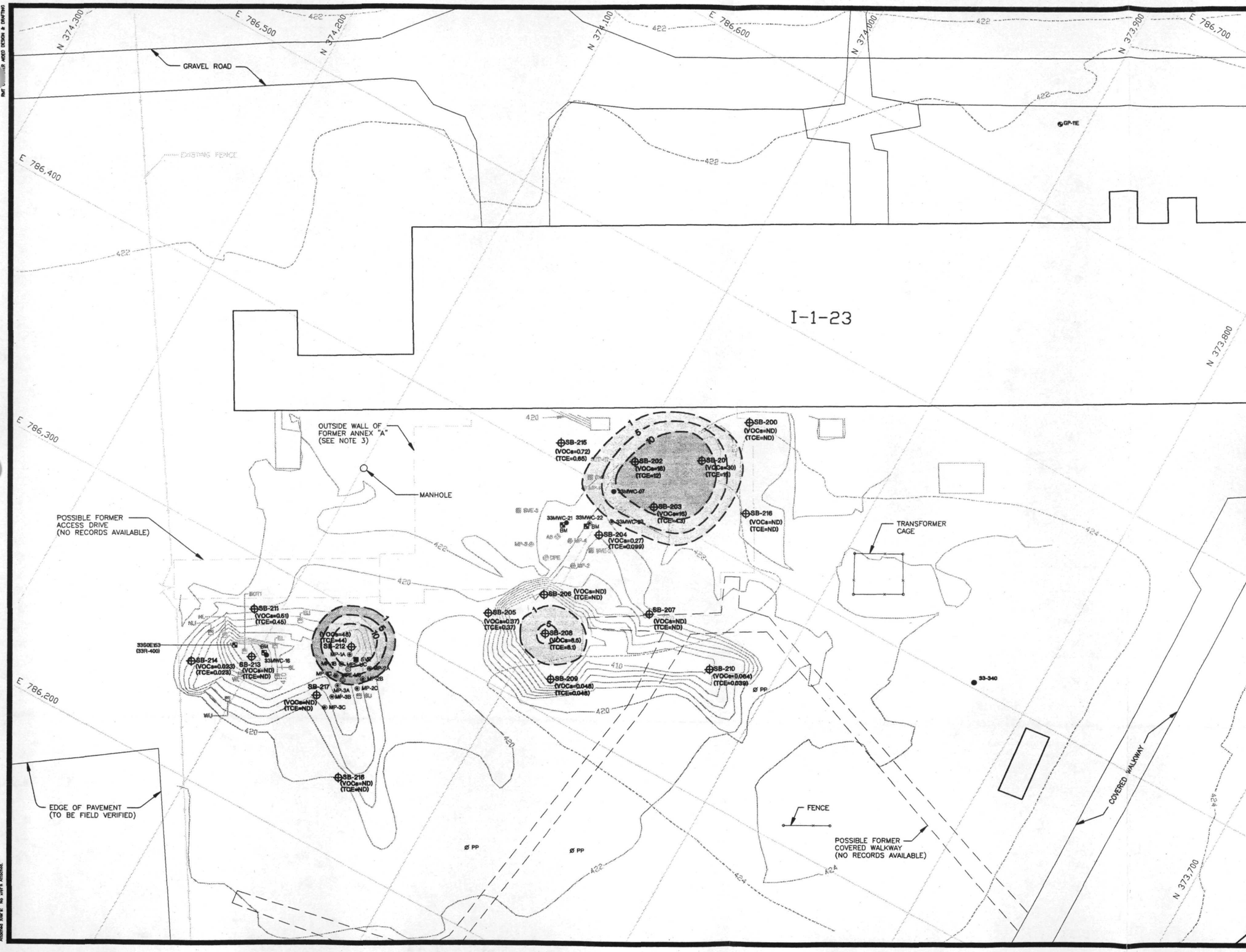


Figure 4-15
3D Diagram Showing Total VOC Concentrations In Soil
At or Above 3 mg/kg (ppm)
Building I-1-3 Area

G://DATA/HYDRO/4781/PHOTOSHOPFILES/I113SITE/I113CHM.PSD



LEGEND

SB-200	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-23	GROUNDWATER MONITORING WELL (2")
MP-3	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
SVE	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY RMT IN 2000)
DPE-UC	MULTI PHASE EXTRACTION WELL (4") (UPPER CLAY) (INSTALLED BY RMT IN 2000)
MPE-US	MULTI PHASE EXTRACTION WELL (4") (UPPER SAND) (INSTALLED BY RMT IN 2000)
GP-11E	GEOPROBE BORING LOCATION (1998)
33R-393	SOIL SAMPLE (IT CORP.)
03SB-04	SOIL SAMPLE (FDGTI)(1997)
MP-2	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
BM	BENCH MARK
Ø PP	POWER POLE
	EXISTING FENCE
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	PCB EXCAVATION CONTOURS (FDGTI) (1997)
1	ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)
(VOCs=0.41)	TOTAL VOCs (mg/kg)
(TCE=0.41)	TRICHLOROETHENE (mg/kg)

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.
3. ANNEX "A" WAS DECONTAMINATED AND DEMOLISHED DURING THE PCB REMEDIAL ACTION IN 1997.

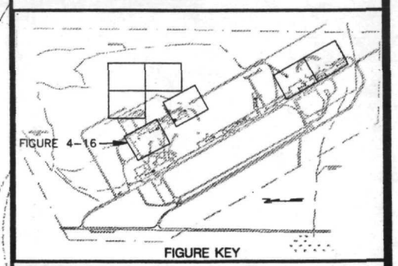


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

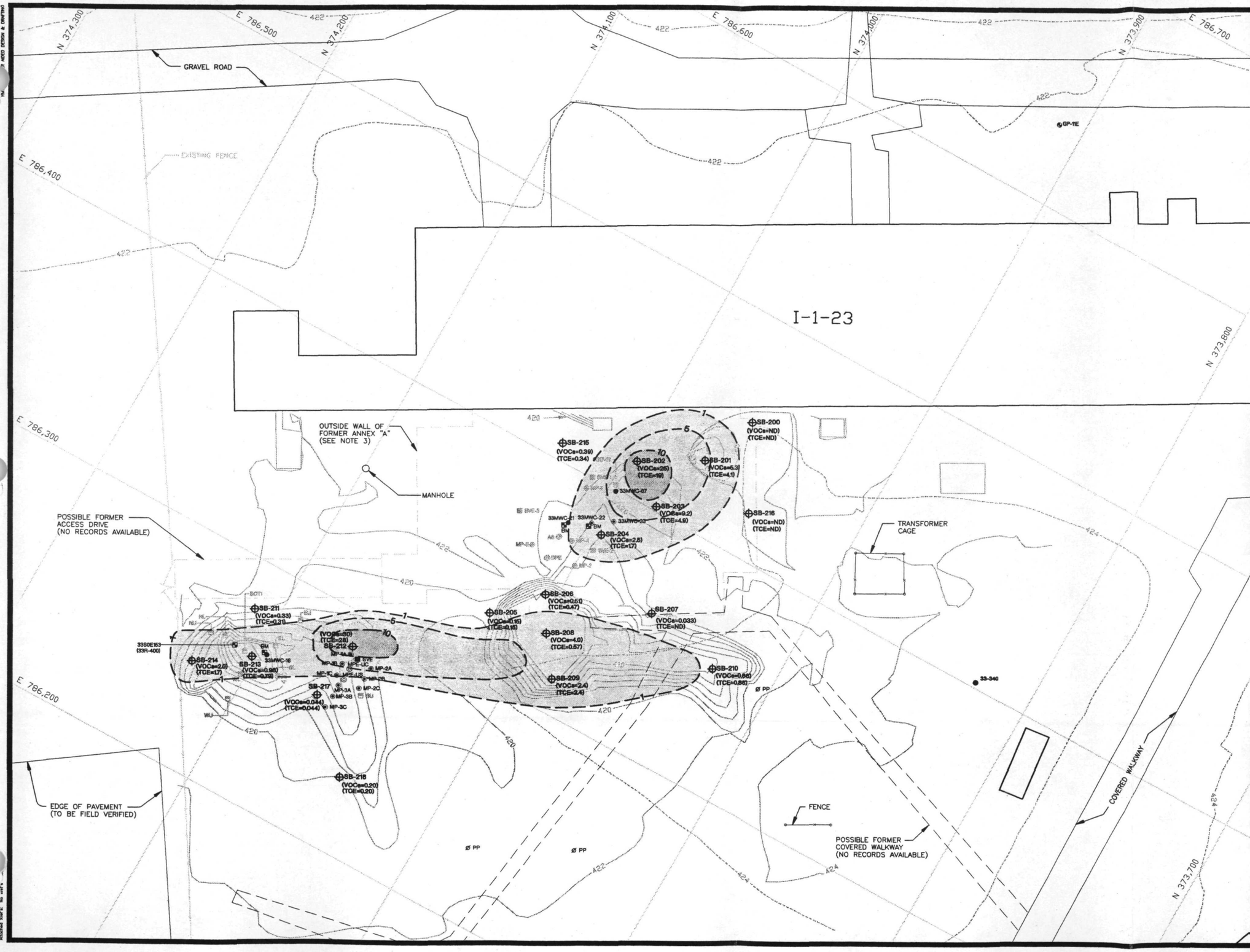
PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
BUILDING I-1-23
0 TO 12 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810743.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-16
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-100	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-23	GROUNDWATER MONITORING WELL (2")
MP-3	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
SVE	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY RMT IN 2000)
DPE-UC	MULTI PHASE EXTRACTION WELL (4") (UPPER CLAY) (INSTALLED BY RMT IN 2000)
DPE-US	MULTI PHASE EXTRACTION WELL (4") (UPPER SAND) (INSTALLED BY RMT IN 2000)
GP-11E	GEOPROBE BORING LOCATION (1998)
33R-393	SOIL SAMPLE (IT CORP.)
33SB-04	SOIL SAMPLE (FDGTI)(1997)
MP-3	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
BM	BENCH MARK
Ø PP	POWER POLE
	EXISTING FENCE
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	PCB EXCAVATION CONTOURS (FDGTI) (1997)
1	ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)
(VOCs=0.41)	TOTAL VOCs (mg/kg)
(TCE=0.41)	TRICHLOROETHENE (mg/kg)

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.
3. ANNEX "A" WAS DECONTAMINATED AND DEMOLISHED DURING THE PCB REMEDIAL ACTION IN 1997.

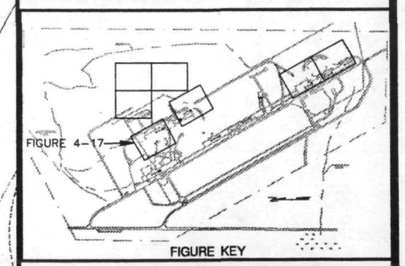


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
BUILDING I-1-23
12 TO 24 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810742.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-17
DATE: MAY 2001		

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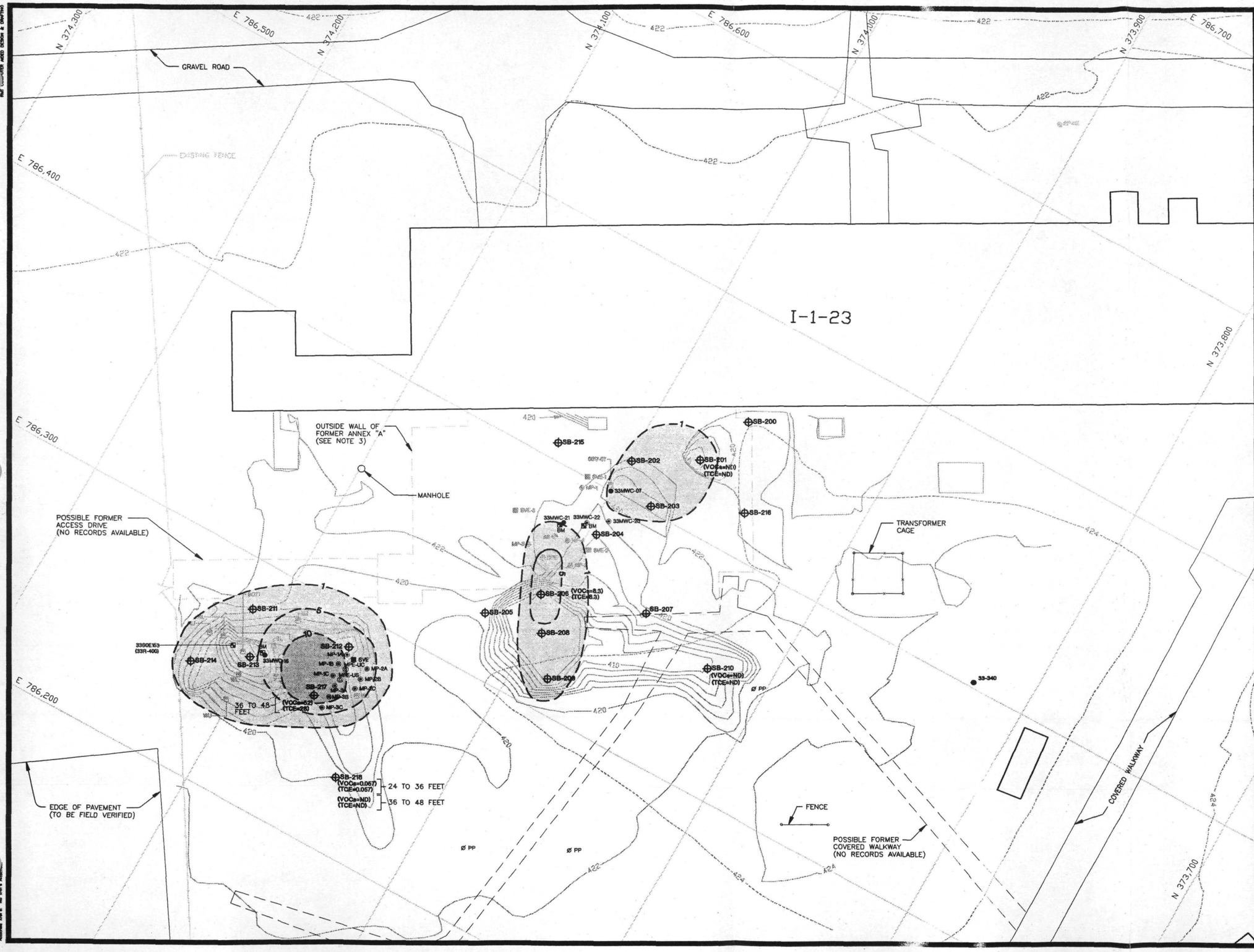
Revision Level



LEGEND

SB-200	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-23	GROUNDWATER MONITORING WELL (2")
MP-3	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
SVE	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY RMT IN 2000)
DPE-UC	MULTI PHASE EXTRACTION WELL (4") (UPPER CLAY) (INSTALLED BY RMT IN 2000)
MPE-US	MULTI PHASE EXTRACTION WELL (4") (UPPER SAND) (INSTALLED BY RMT IN 2000)
GP-36	GEOPROBE BORING LOCATION (1998)
33R-393	SOIL SAMPLE (IT CORP.)
00DB-64	SOIL SAMPLE (FDGTI)(1997)
MP-3	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
BM	BENCH MARK
Ø PP	POWER POLE
	EXISTING FENCE
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	PCB EXCAVATION CONTOURS (FDGTI) (1997)
1	ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)
(VOCs=0.41)	TOTAL VOCs (mg/kg)
(TCE=0.41)	TRICHLOROETHENE (mg/kg)

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.
3. ANNEX "A" WAS DECONTAMINATED AND DEMOLISHED DURING THE PCB REMEDIAL ACTION IN 1997.

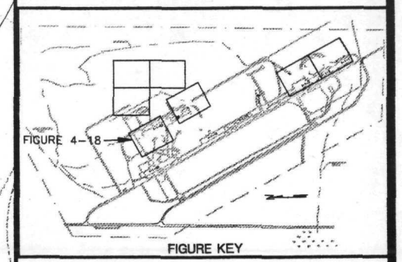


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: **CRAB ORCHARD NWR - PCB O.U.**
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: **VOC CONCENTRATIONS IN SOIL**
BUILDING I-1-23
DEEPER THAN 24 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810744.DWG
APPROVED BY: TEG	DATE PRINTED:	**FIGURE 4-18**
DATE: MAY 2001		

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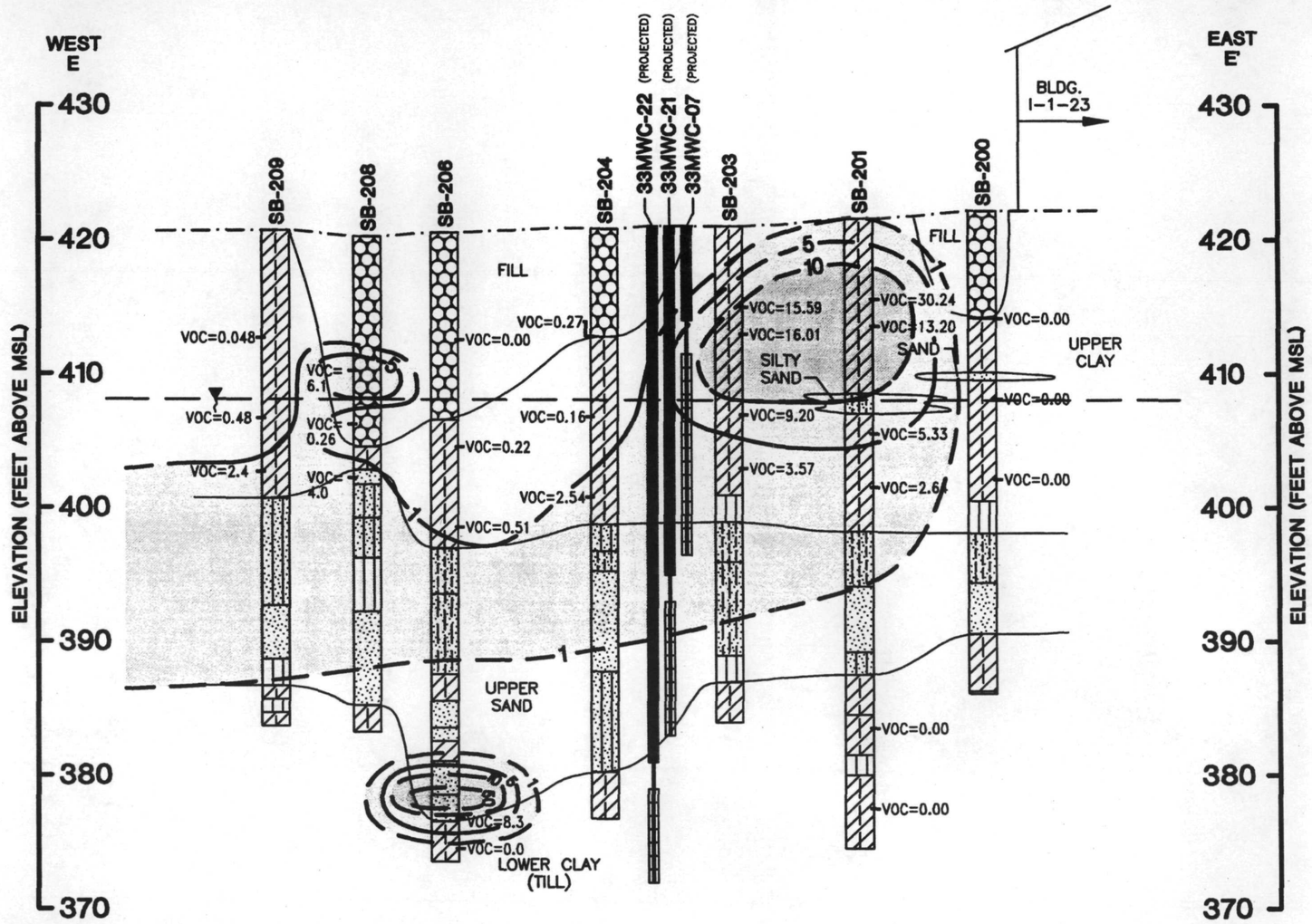
Phone: 608/831-4444

Revision Level



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.
2. (VOC=0.03) REPRESENTS TOTAL VOC CONCENTRATION IN SOIL, mg/kg

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN
- 1 — TOTAL VOC CONCENTRATIONS (mg/kg)
- VOC=0.08 — TOTAL VOC CONCENTRATIONS (mg/kg)

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

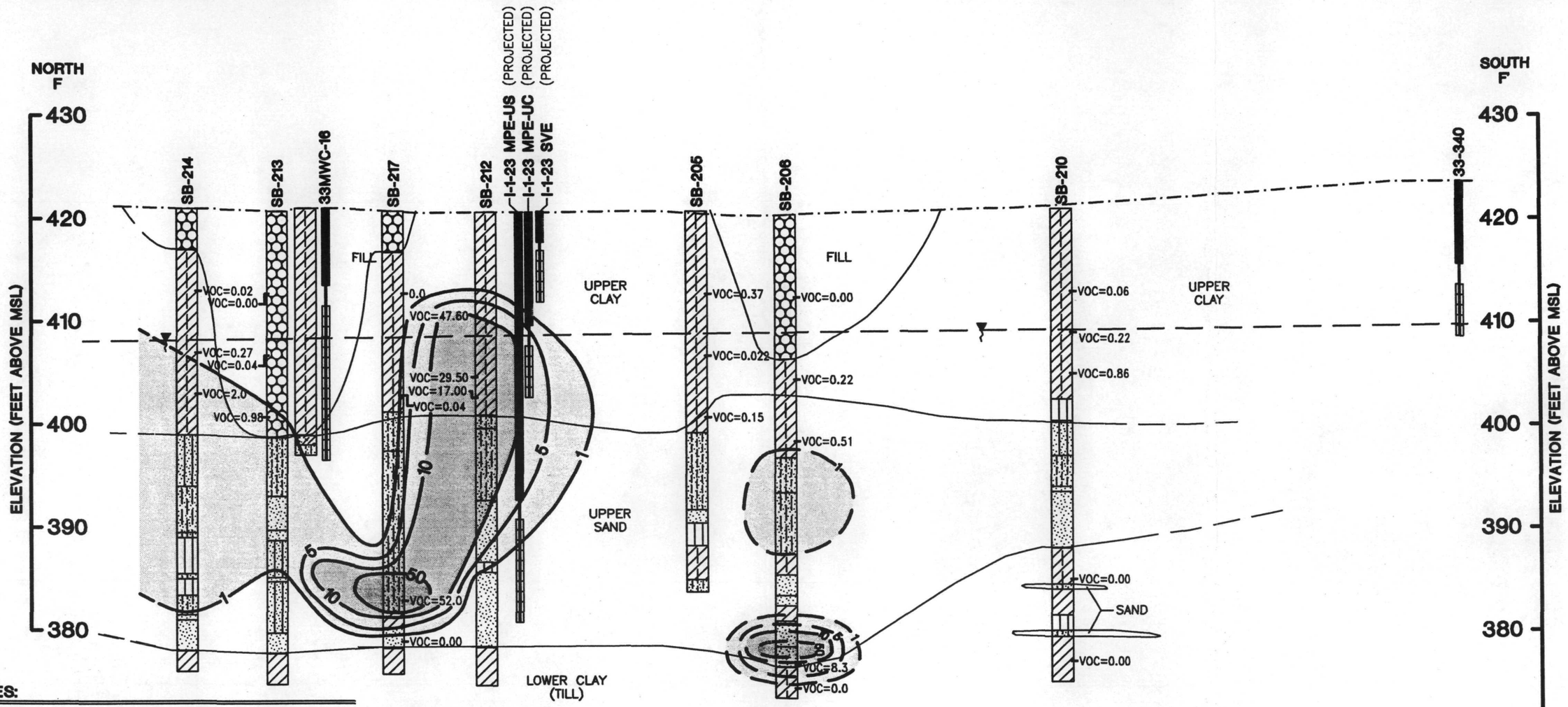
VOC CONCENTRATION CROSS SECTION E-E'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810775.DWG

FIGURE 4-19

PLOT DATA
Drawing Name: 04781\07\47810775.dwg
Operator Name: WERTD
Scale: =30'
Dwg Size: 461255 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:47:54 AM
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.
2. (VOC=0.03) REPRESENTS TOTAL VOC CONCENTRATION IN SOIL, mg/kg

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN
- —1— TOTAL VOC CONCENTRATIONS (mg/kg)
- VOC=0.08 TOTAL VOC CONCENTRATIONS (mg/kg)

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

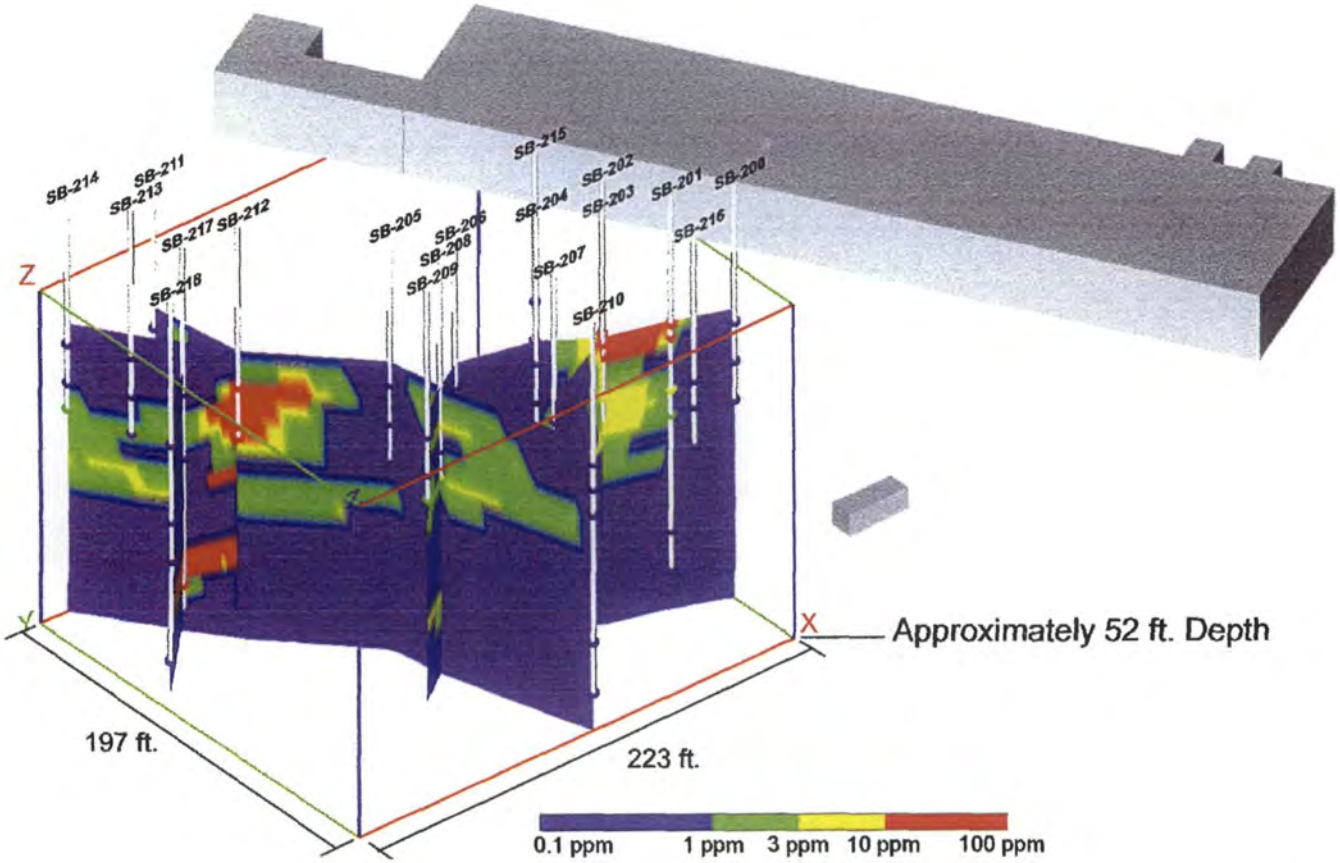
VOC CONCENTRATION CROSS SECTION F-F'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810776A.DWG

FIGURE 4-20

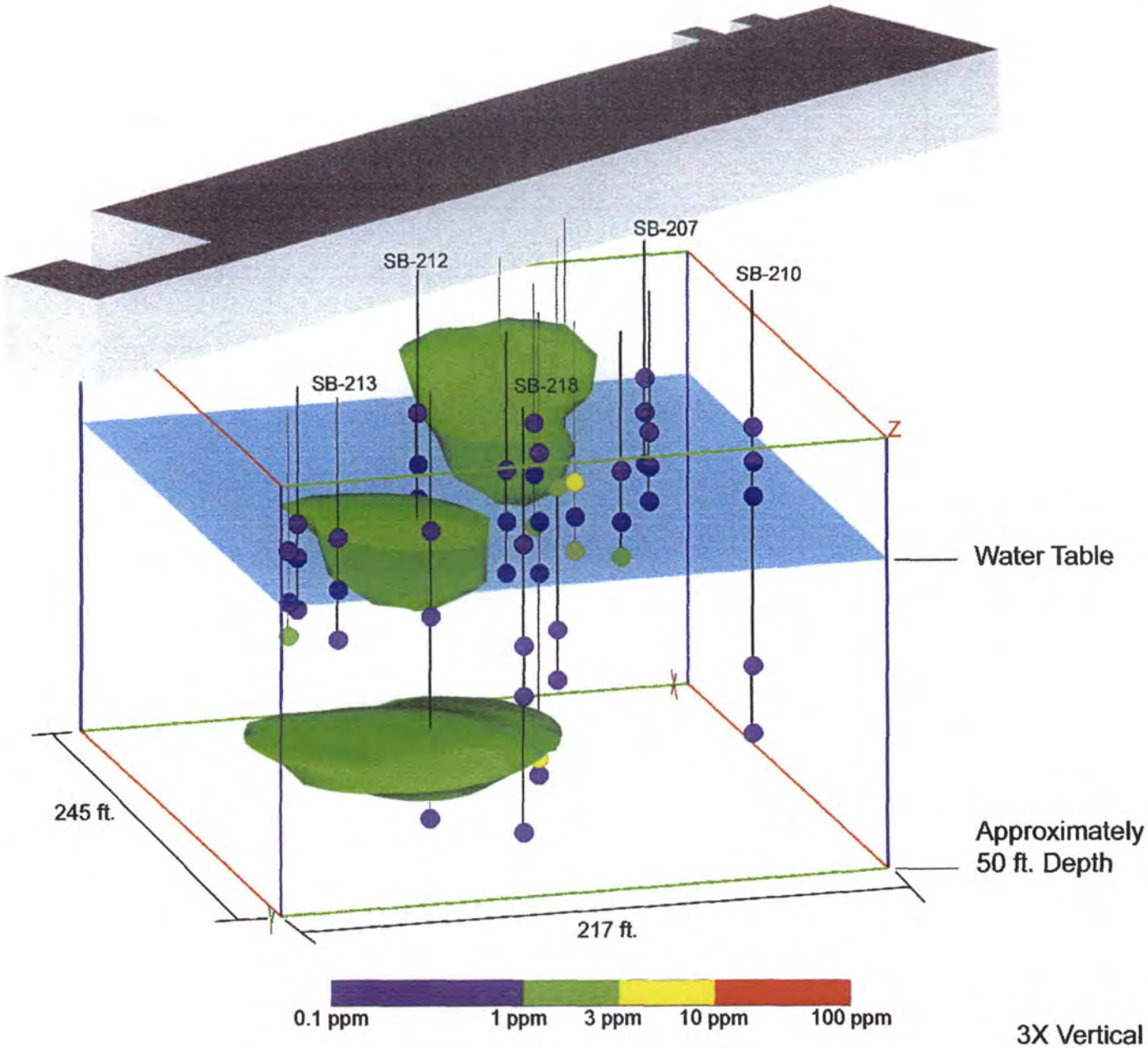
PLOT DATA
Drawing N \04781\07\47810776A.dwg
Operator N EWERTD
Scale: =20'
Dwg Size: 768109 Bytes
Plot Date: Tuesday, April 3, 2001
Plot Time: 08:48:25 22 AM
Attached Xref's: No xref's Attached.



3X Vertical Exaggeration
Looking Northeast

Figure 4-21
3D Fence Diagram Showing Total VOC Conventrations In Soil
Building I-1-23 Area

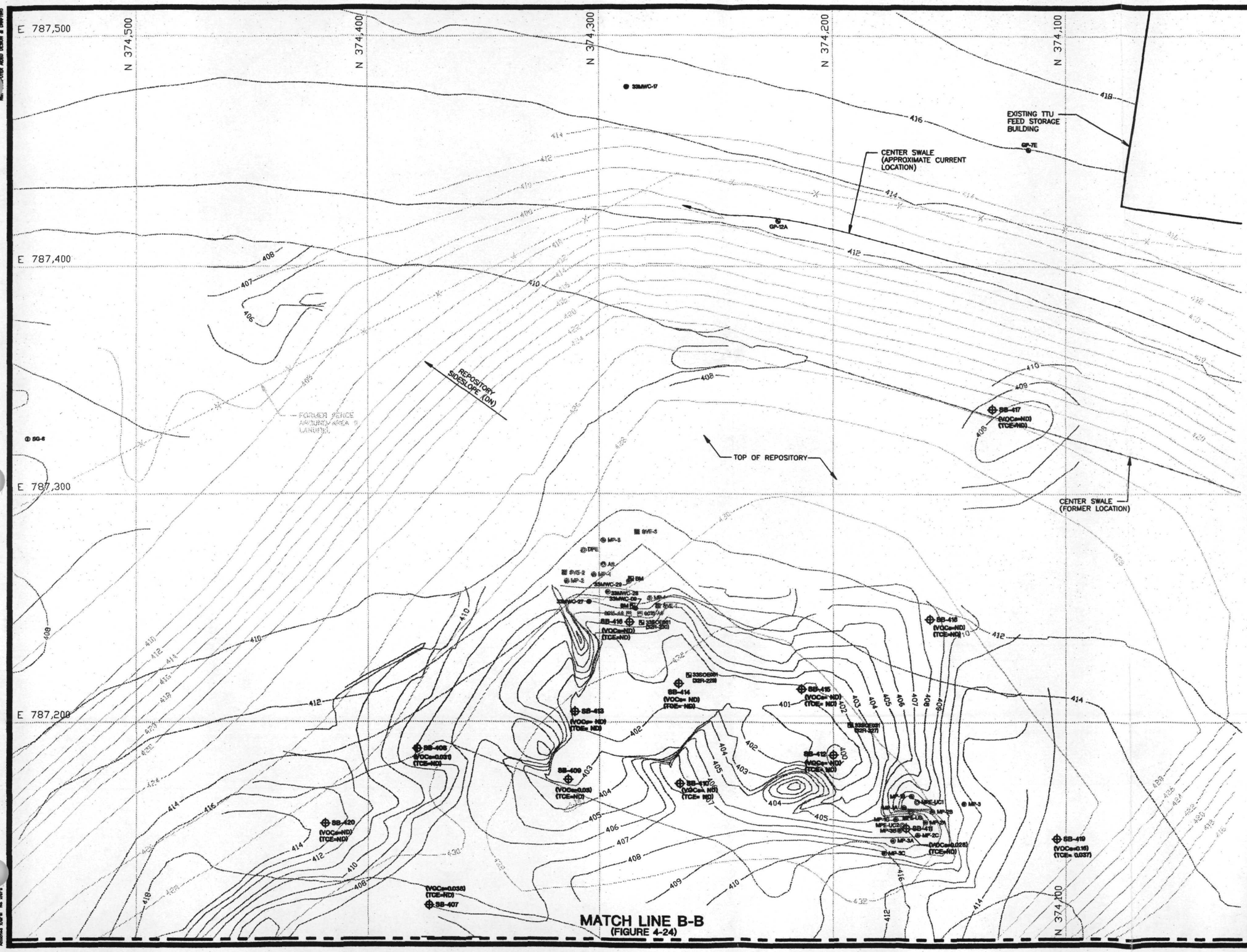
G:/DATA/HYDRO/4781/PHOTOSHOPFILES/I1123SITE/I1123FEN.PSD



3X Vertical Exaggeration
Looking East

Figure 4-22
3D Diagram Showing Total VOC Concentrations In Soil
At or Above 3 mg/kg (ppm)
Building I-1-23

G:/DATA/HYDRO/4781/PHOTOSHOPFILES/I1123SITE/I1123CHM.PSD



LEGEND

SB-418	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-17	GROUNDWATER MONITORING WELL (2")
MP-3A	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
MPE-UC	MULTI PHASE EXTRACTION WELL (4") (UPPER CLAY) (INSTALLED BY RMT IN 2000)
MPE-US	MULTI PHASE EXTRACTION WELL (4") (UPPER SAND) (INSTALLED BY RMT IN 2000)
GP-12A	GEOPROBE BORING LOCATION (1998)
33PI-230	SOIL SAMPLE (IT CORP.)
0015-A9	SOIL SAMPLE (FDGTI)(1997)
MP-2	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
BM	BENCH MARK
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
412	EXISTING CONDITIONS CONTOURS
410	PCB EXCAVATION CONTOURS (FDGTI) (1997)
	DRAINAGE FLOWLINE
(VOCs=0.41)	TOTAL VOCs (mg/kg)
(TCE=0.41)	TRICHLOROETHENE (mg/kg)
SG-6	STAFF GAUGE

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

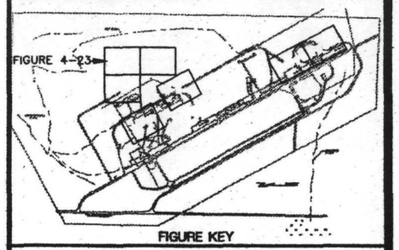


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
AREA 9 REPOSITORY
0 TO 26 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810745.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-23
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level

(FIGURE 4-23)

MATCH LINE B-B

E 787,100
E 787,000
E 786,900
E 786,800
E 786,700

N 374,500
N 374,400
N 374,300
N 374,200
N 374,100

TOP OF REPOSITORY

REPOSITORY SIDESLOPE (DN)

FLOWLINE OF FORMER DRAINAGE CHANNEL

FORMER FENCE AROUND AREA 9 LANDFILL

EXISTING UNPAVED ACCESS ROAD

GRAVEL ACCESS ROAD

I-1-25

SB-405 (VOCs=ND) (TCE=ND)

SB-422 (VOCs=ND) (TCE=ND)

SB-408 (VOCs=ND) (TCE=ND)

SB-421 (VOCs=0.029) (TCE=ND)

SB-403 (VOCs=0.054) (TCE=ND)

SB-404 (VOCs=ND) (TCE=ND)

SB-423 (VOCs=ND) (TCE=ND)

SB-402 (VOCs=ND) (TCE=ND)

SB-401 (VOCs=0.46) (TCE=ND)

SB-400 (VOCs=0.035) (TCE=ND)

GP-9A

GP-14A

GP-11A

GP-8B

LEGEND

SB-421	PROPOSED GEOPROBE BORING LOCATION
GP-9A	GEOPROBE BORING LOCATION (1998)
33R-225	SOIL SAMPLE (IT CORP.)
—*—*—	FORMER FENCE LOCATION
———	EXISTING BUILDING
----422----	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
----422----	EXISTING CONDITIONS CONTOURS
—— 417 ——	PCB EXCAVATION CONTOURS (FDGTI) (1997)
—·—·—	DRAINAGE FLOWLINE
(VOCs=0.46)	TOTAL VOCs (mg/kg)
(TCE=0.46)	TRICHLOROETHENE (mg/kg)

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
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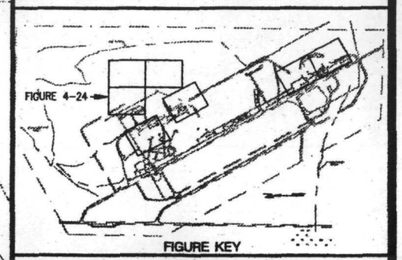

FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
AREA 9 REPOSITORY
0 TO 18 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 47810.07
CHECKED BY: SLM		FILE NO. 47810723.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-24
DATE: MAY 2001		

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744 Heartland Trail
Madison, WI 53717-1934
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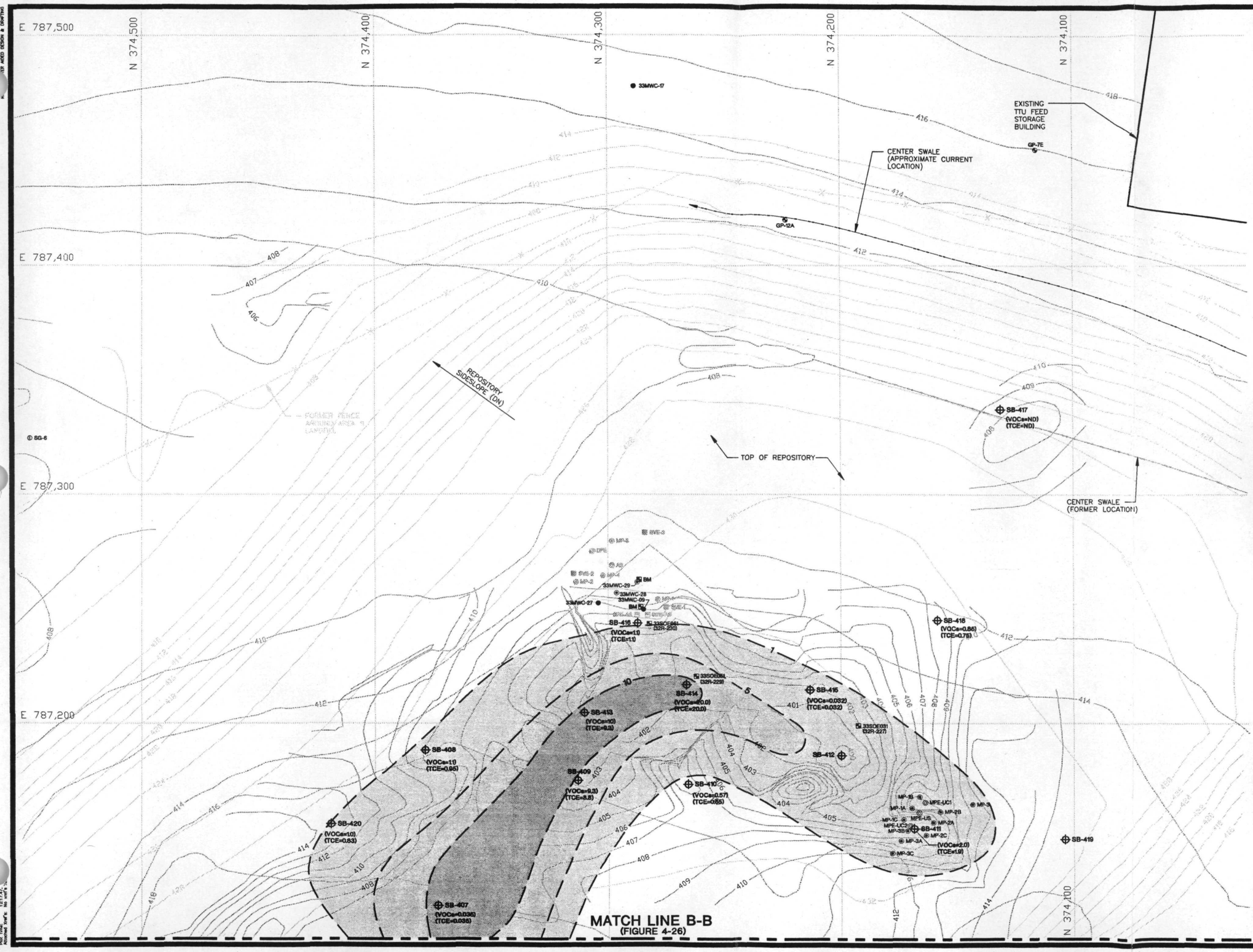
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-418	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-17	GROUNDWATER MONITORING WELL (2")
MP-3A	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
MPE-UC	MULTI PHASE EXTRACTION WELL (4") (UPPER CLAY) (INSTALLED BY RMT IN 2000)
MPE-US	MULTI PHASE EXTRACTION WELL (4") (UPPER SAND) (INSTALLED BY RMT IN 2000)
GP-12A	GEOPROBE BORING LOCATION (1998)
33R-230	SOIL SAMPLE (IT CORP.)
02R5-A9	SOIL SAMPLE (FDGTI)(1997)
MP-2	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-3	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
BM	BENCH MARK
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
420	EXISTING CONDITIONS CONTOURS
410	PCB EXCAVATION CONTOURS (FDGTI) (1997)
	DRAINAGE FLOWLINE
(VOCs=0.41)	VOLATILE ORGANIC COMPOUNDS (mg/kg)
(TCE=0.41)	TRICHLOROETHENE (mg/kg)
1	ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
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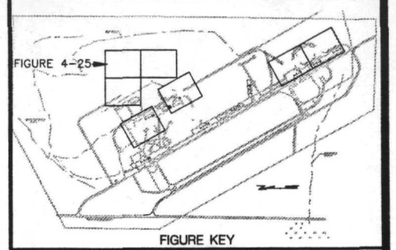

FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
AREA 9 REPOSITORY
26 TO 36 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810746.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-25
DATE: MAY 2001		

RMT.
744 Heartland Trail
Madison, WI 53717-1934
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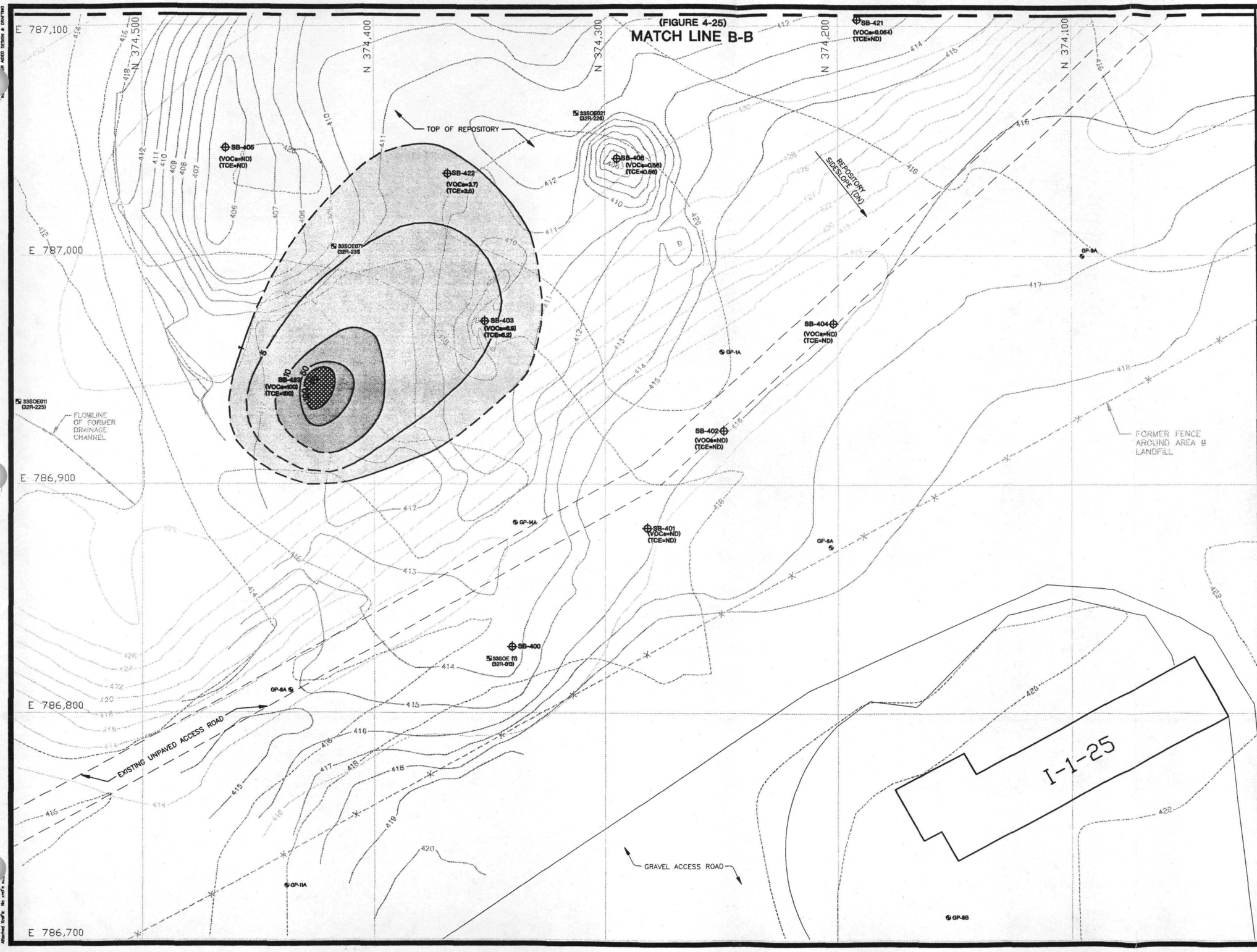
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-421	PROPOSED GEOPROBE BORING LOCATION
GP-9A	GEOPROBE BORING LOCATION (1998)
32R-225	SOIL SAMPLE (IT CORP.)
	FORMER FENCE LOCATION
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	EXISTING CONDITIONS CONTOURS
417	PCB EXCAVATION CONTOURS (FDGTI) (1997)
	DRAINAGE FLOWLINE
(VOCs=0.41)	TOTAL VOCs (mg/kg)
(TCE=0.41)	TRICHLOROETHENE (mg/kg)
1	ISOCONCENTRATION CONTOUR

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

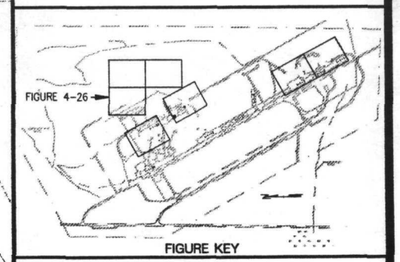


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
AREA 9 REPOSITORY
18 TO 36 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810722.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-26
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level

LEGEND

SB-418	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-17	GROUNDWATER MONITORING WELL (2")
MP-3A	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
MPE-UC	MULTI PHASE EXTRACTION WELL (4") (UPPER CLAY) (INSTALLED BY RMT IN 2000)
MPE-US	MULTI PHASE EXTRACTION WELL (4") (UPPER SAND) (INSTALLED BY RMT IN 2000)
GP-12A	GEOPROBE BORING LOCATION (1998)
33R-230	SOIL SAMPLE (IT CORP.)
SB-16	SOIL SAMPLE (FDGTI)(1997)
MP-3	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
BM	BENCH MARK
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
422	EXISTING CONDITIONS CONTOURS
410	PCB EXCAVATION CONTOURS (FDGTI) (1997)
	DRAINAGE FLOWLINE
(VOCs=0.41)	TOTAL VOCs (mg/kg)
(TCE=0.41)	TRICHLOROETHENE (mg/kg)
1	ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

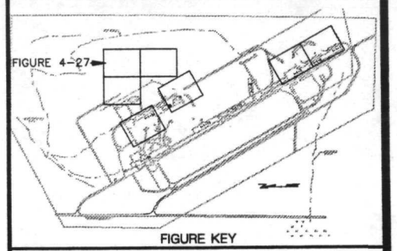


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATION IN SOIL
AREA 9 REPOSITORY
36 TO 46 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810747.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-27
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level

(FIGURE 4-27)
MATCH LINE

E 787,100
E 787,000
E 786,900
E 786,800
E 786,700
N 374,500
N 374,400
N 374,300
N 374,200
N 374,100

TOP OF REPOSITORY
REPOSITORY SIDESLOPE (DN)
SB-405 (VOCs=0.27) (TCE=0.27)
SB-422 (VOCs=8.9) (TCE=8.9)
SB-423 (VOCs=10) (TCE=10)
SB-403
SB-406
SB-421 (VOCs=ND) (TCE=ND)
SB-404
SB-402
SB-401
SB-400
33SOE071 (32R-236)
33SOE021 (32R-226)
33SOE011 (32R-225)
33SOE (?) (32R-013)
GP-1A
GP-9A
GP-8A
GP-8B
GP-14A
GP-11A
FLOWLINE OF FORMER DRAINAGE CHANNEL
FORMER FENCE AROUND AREA 9 LANDFILL
EXISTING UNPAVED ACCESS ROAD
GRAVEL ACCESS ROAD
I-1-25

LEGEND

SB-421	PROPOSED GEOPROBE BORING LOCATION
GP-9A	GEOPROBE BORING LOCATION (1998)
32R-225	SOIL SAMPLE (IT CORP.)
	FORMER FENCE LOCATION
	EXISTING BUILDING
422	PRE-PCB EXCAVATION CONTOURS (IT CORP.) (1994)
420	EXISTING CONDITIONS CONTOURS
417	PCB EXCAVATION CONTOURS (FDGTI) (1997)
	DRAINAGE FLOWLINE
(VOCs=0.41)	TOTAL VOCs (mg/kg)
(TCE=0.41)	TRICHLOROETHENE (mg/kg)
1	ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

FIGURE 4-28

FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

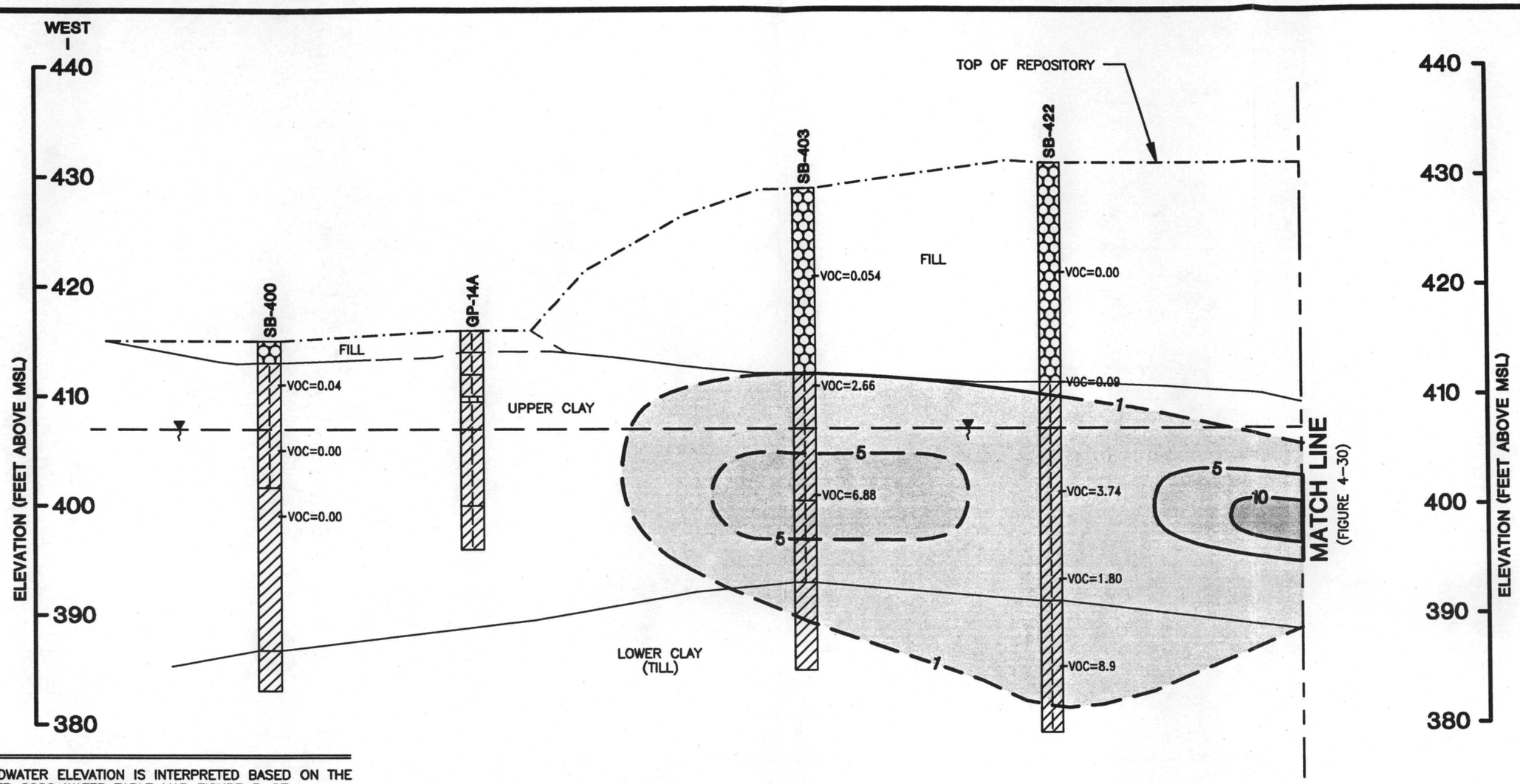
PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: VOC CONCENTRATIONS IN SOIL
AREA 9 REPOSITORY
36 TO 46 FOOT INTERVAL

DRAWN BY: SIEWERTD	SCALE:	PROJ. NO. 4781.07
CHECKED BY: SLM	1"=40'	FILE NO. 47810724.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 4-28
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.
2. (VOC=0.03) REPRESENTS TOTAL VOC CONCENTRATION IN SOIL, mg/kg

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN
- 1 — TOTAL VOC CONCENTRATIONS (mg/kg)
- VOC=0.08 TOTAL VOC CONCENTRATIONS (mg/kg)

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

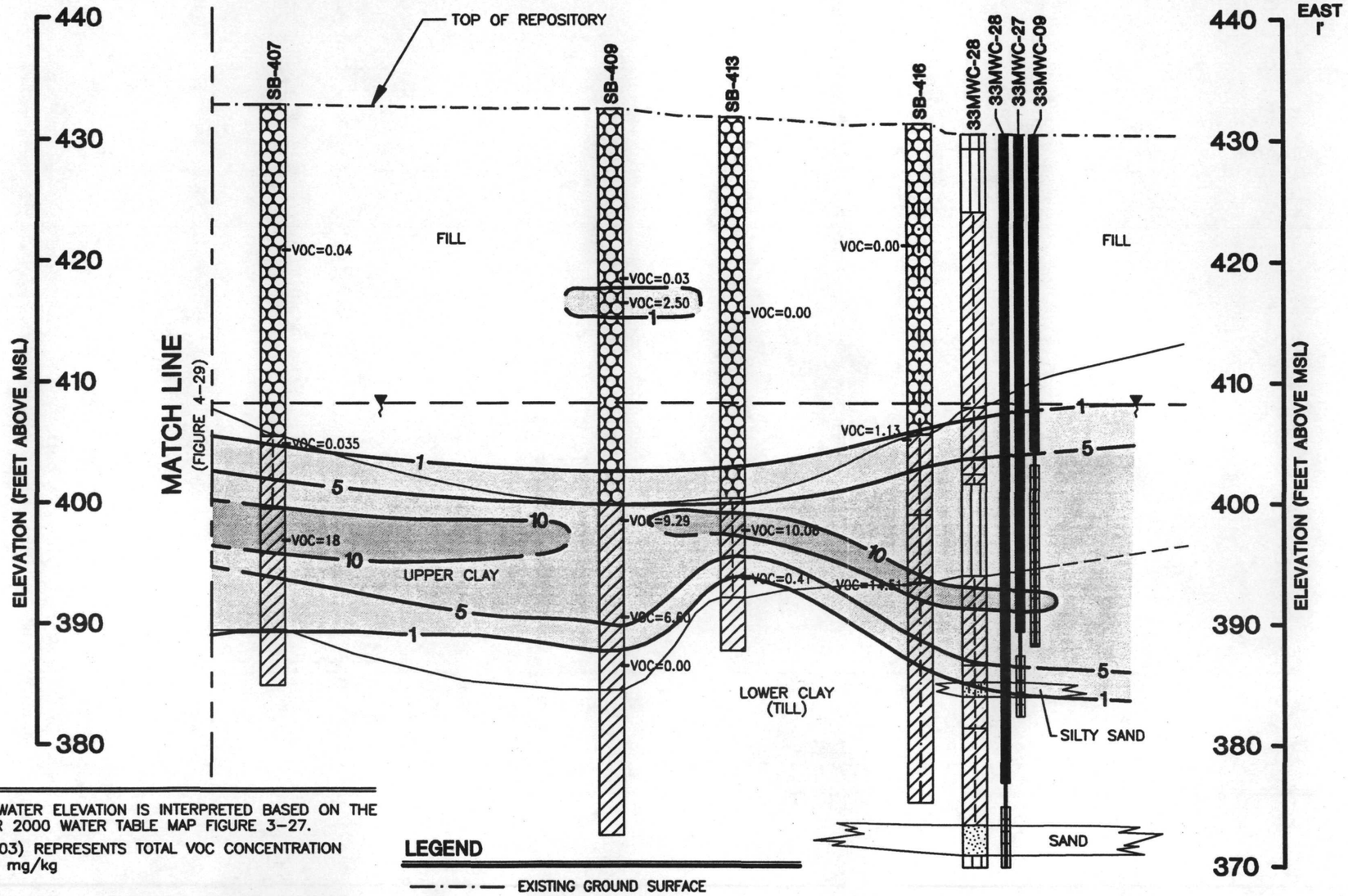
VOC CONCENTRATION CROSS SECTION I-I'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810779.DWG

FIGURE 4-29

PLOT DATA
Drawing: I:\04781\07\47810779.dwg
Operator: SIEWERTD
Scale: 1"=30'
Dwg Size: 204217 Bytes
Plot Date: Thursday, April 5, 2001
Plot Time: 1:33:32 PM
Attached Xref's: No xref's Attached.



NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.
2. (VOC=0.03) REPRESENTS TOTAL VOC CONCENTRATION IN SOIL, mg/kg

LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN
- 1 — TOTAL VOC CONCENTRATIONS (mg/kg)
- VOC=0.08 — TOTAL VOC CONCENTRATIONS (mg/kg)

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

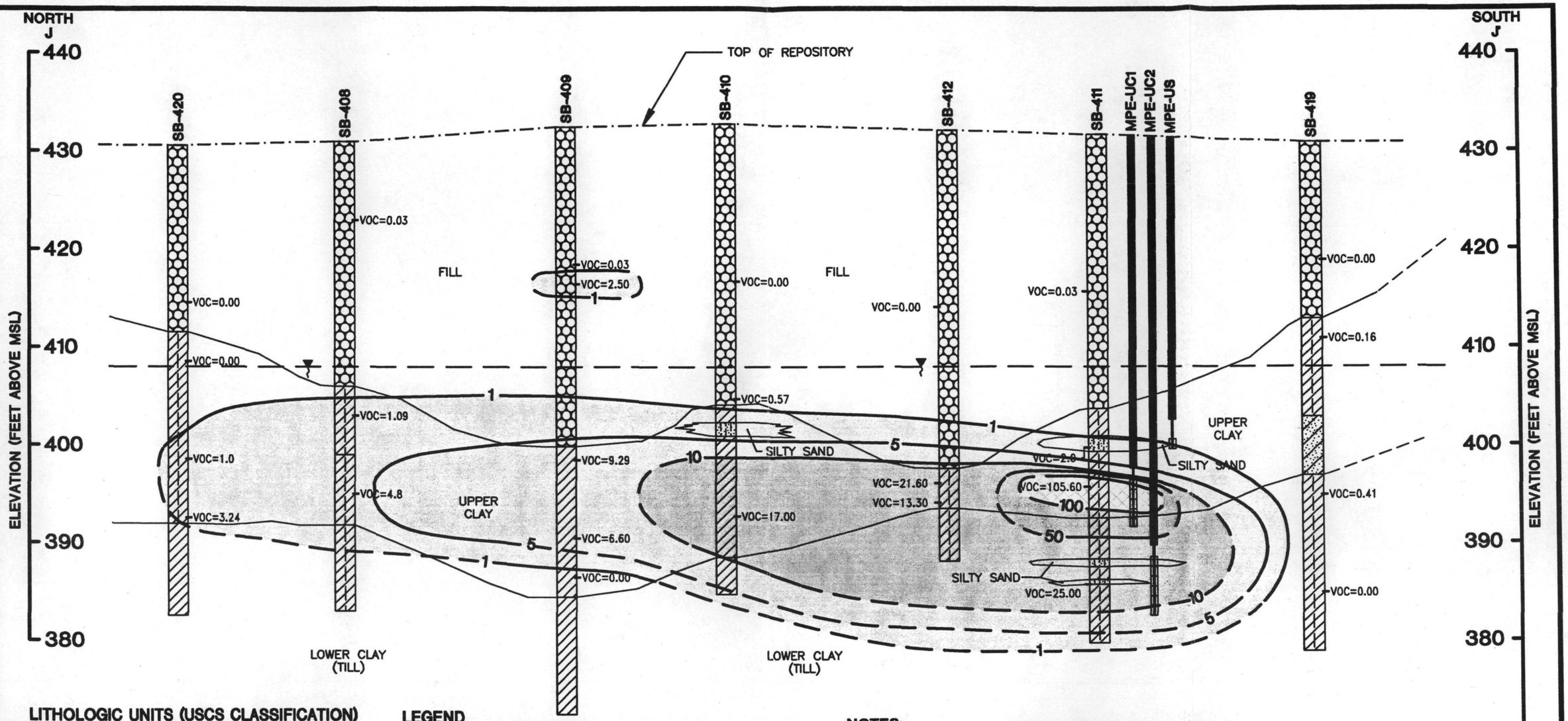
VOC CONCENTRATION CROSS SECTION I-I'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810780.DWG

FIGURE 4-30

PLOT DATA
Drawing No. 04781\07\47810780.dwg
Operator Name: SIEWERTD
Scale: 1"=30'
Dwg Size: 328747 Bytes
Plot Date: Thursday, April 5, 2001
Plot Time: 1:40.2668 PM
Attached Xref's: No xref's Attached.



LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN
- 1 — TOTAL VOC CONCENTRATIONS (mg/kg)
- VOC=0.08 TOTAL VOC CONCENTRATIONS (mg/kg)

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VERTICAL SCALE EXAGGERATED 3X

NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.
2. (VOC=0.03) REPRESENTS TOTAL VOC CONCENTRATION IN SOIL, mg/kg

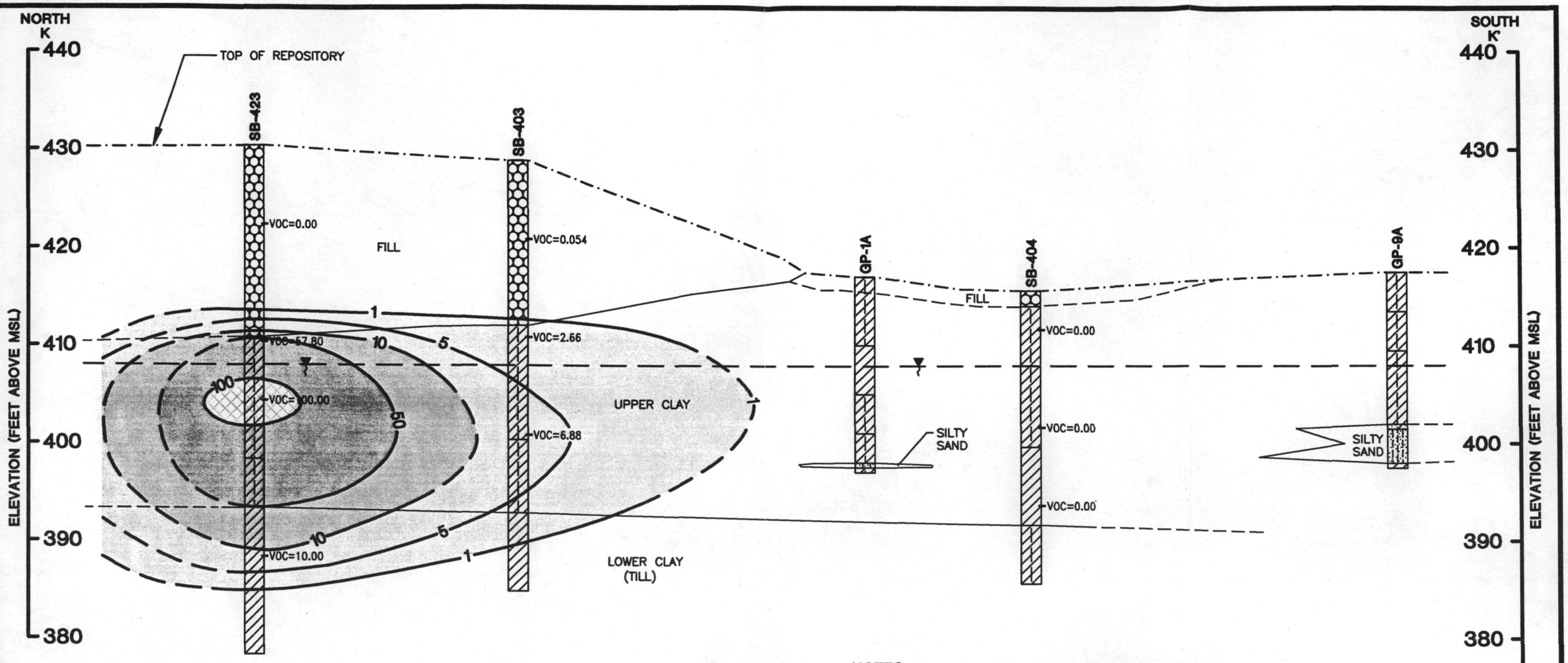
VOC CONCENTRATION CROSS SECTION J-J'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT.

DWN. BY: SIEWERTD
APPROVED BY: TEG
DATE: MAY 2001
PROJ. # 4781.07
FILE # 47810781.DWG

FIGURE 4-31

PLOT DATA
Drawing / Operator: J:\04781\07\47810781.dwg SIEWERTD
Scale: 1"=30'
Dwg Size: 332127 Bytes
Plot Date: Friday, January 19, 2001
Plot Time: 12:46:03 PM
Attached Xref's: No xref's Attached.



LITHOLOGIC UNITS (USCS CLASSIFICATION)

- TOPSOIL
- FILL
- SILT (ML)
- SILTY CLAY (CL)
- CLAY (CL)
- CLAYEY SILT (ML)
- SAND (SP)
- POORLY GRADED GRAVEL
- SILTY GRAVEL WITH SAND (GM)
- SILTY SAND WITH GRAVEL (SM)
- SILTY SAND (SM)
- SANDSTONE
- DOLOMITE
- SANDY SILT

LEGEND

- EXISTING GROUND SURFACE
- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- WATER TABLE SURFACE
- (813.05) GROUNDWATER HEAD ELEVATION (FEET, MSL)

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN
- —1— TOTAL VOC CONCENTRATIONS (mg/kg)
- VOC=0.08 TOTAL VOC CONCENTRATIONS (mg/kg)

NOTES:

1. GROUNDWATER ELEVATION IS INTERPRETED BASED ON THE OCTOBER 2000 WATER TABLE MAP FIGURE 3-27.
2. (VOC=0.03) REPRESENTS TOTAL VOC CONCENTRATION IN SOIL, mg/kg

VERTICAL SCALE: 0, 10, 20

HORIZONTAL SCALE: 0, 30, 60

VOC CONCENTRATION CROSS SECTION K-K'
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810782.DWG

FIGURE 4-32

PLOT DATA
Drawing N: :\04781\07\47810782.dwg
Operator K: SIEWERTD
Scale: 1"=30'
Dwg Size: 239500 Bytes
Plot Date: Thursday, February 22, 2001
Plot Time: 12:02:4152 PM
Attached Xref's: No xref's Attached.

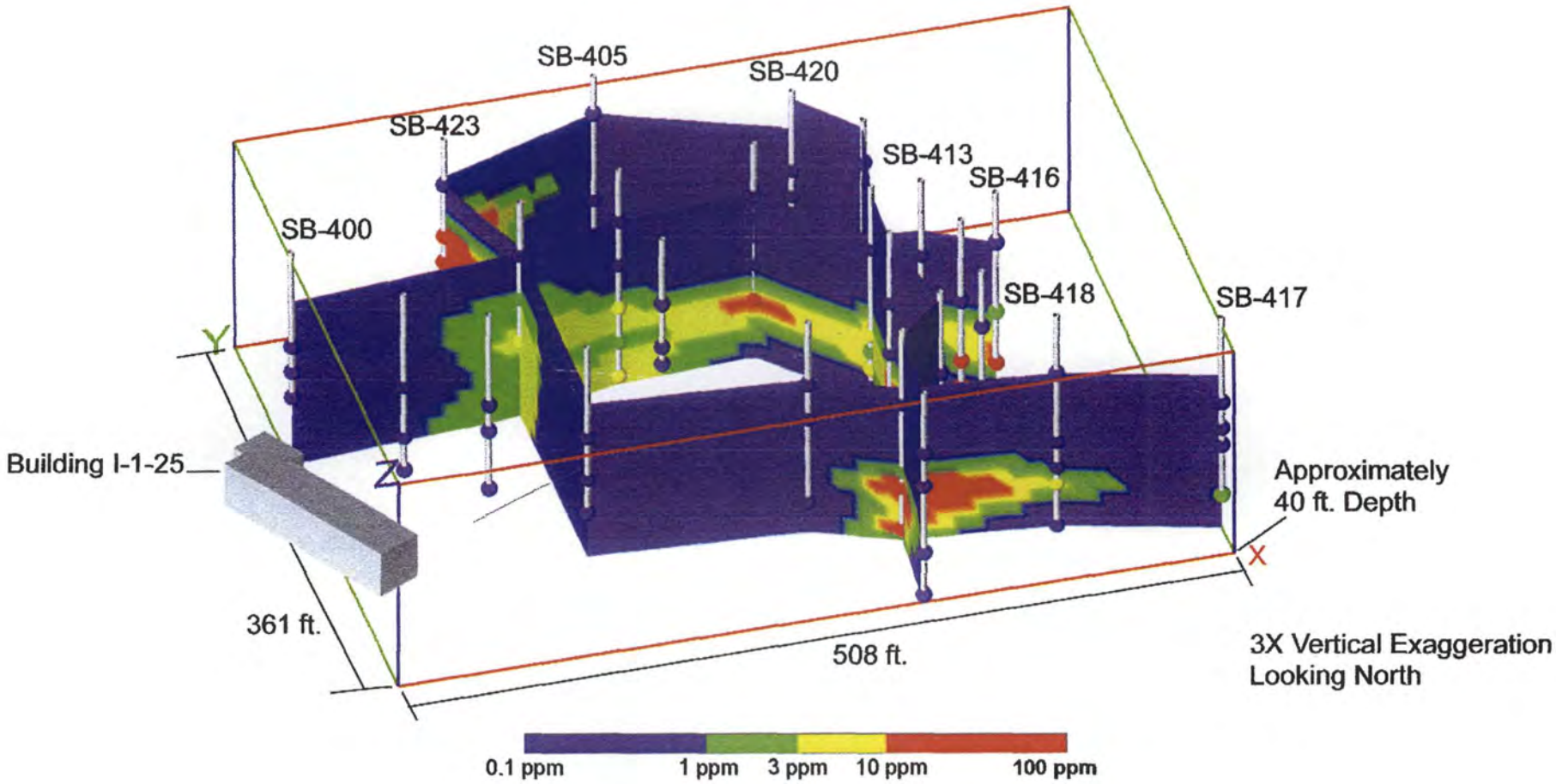
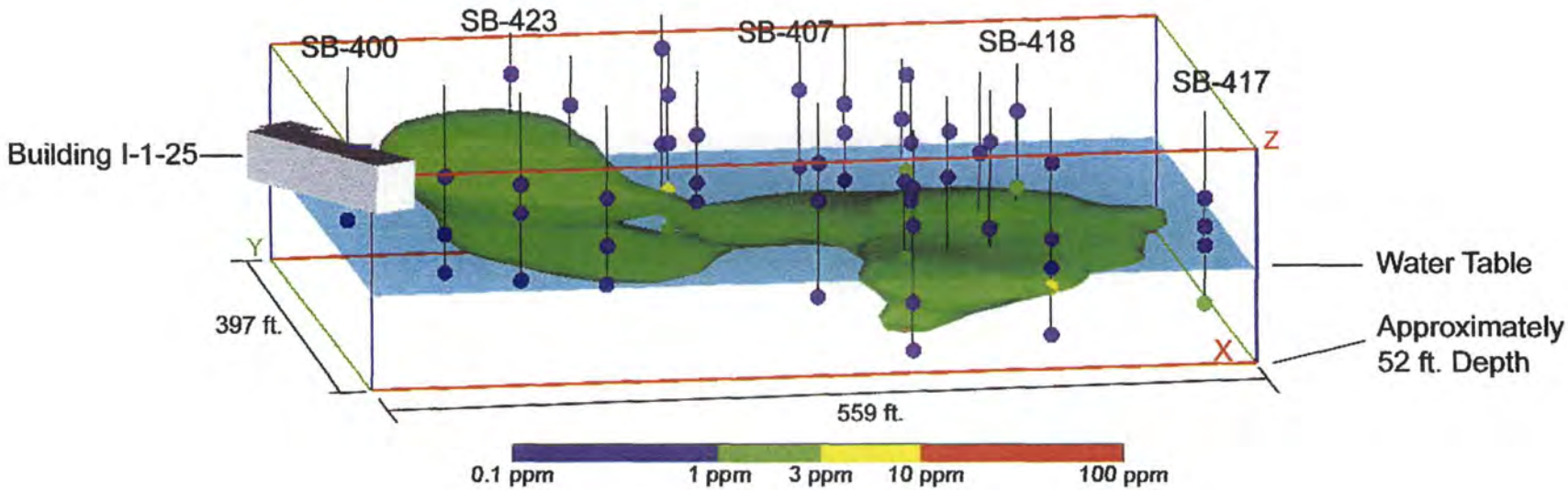


Figure 4-33
3D Fence Diagram Showing Total VOC Concentrations In Soil
Beneath Area 9 Repository

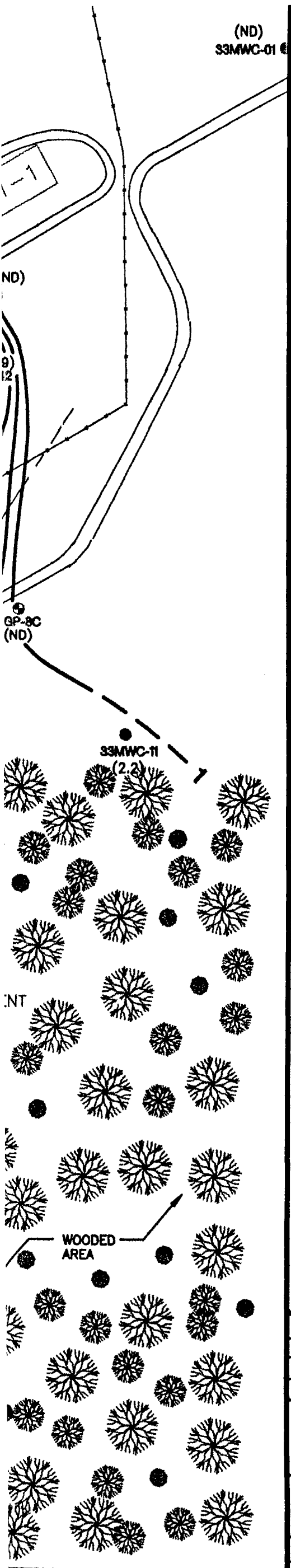
G:\/DATA/HYDRO/4781/PHOTOSHOPFILES/AREA9SITE/AREA9FEN.PSD



3X Vertical Exaggeration
Looking North

Figure 4-34
3D Diagram Showing Total VOC Concentrations In Soil
At or Above 3 mg/kg (ppm)
Beneath Area 9 Repository

G:/DATA/HYDRO/4781/PHOTOSHOPFILES/AREA9SITE/AREA9CHM.PSD



OF AREA 9 REPOSITORY

—10— TOTAL CVOC ISOCONCENTRATION CONTOUR, LOGARITHMIC CONTOUR INTERVAL (ug/L) (DASHED WHERE INFERRED)

(393) TOTAL CONCENTRATION OF CHLORINATED VOLATILE ORGANIC COMPOUNDS (CVOCs) DETECTED IN GROUNDWATER (ug/L).

ND NOT DETECTED

WOODED AREA

⊕ SB-128 GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)

NOTES

1. SOURCE: BASE MAP FROM "1998 TCE INVESTIGATION, WORKPLAN AND PILOT STUDY FOR THE PCB OPERABLE UNIT AT THE CRAB ORCHARD NATIONAL WILDLIFE REFUGE SUPERFUND SITE, MARION, ILLINOIS" REV. 1, MAY 1998, PREPARED BY FLUOR DANIEL GTI.
2. * INDICATES WELL IS SCREENED ACROSS THE UPPER SAND UNIT. OTHER BORINGS AND MONITORING WELLS ARE COMPLETED IN THE UPPER CLAY AND/OR THE UPPERMOST PORTION OF THE UPPER SAND UNIT.
3. CVOC DATA FOR MONOITORING WELLS 33MWC-07, 33MWC-08, 33MWC-09, 33MWC-13, 33MWC-21, 33MWC-24, 33MWC-27, 33MWC-30, AND 33MWC-42 THROUGH 33MWC-49, AND FROM ALL "SB-" DESIGNATED BORINGS ARE FROM THE FALL 2000 INVESTIGATION. CVOC DATA FOR THE REMAINING WELLS ARE FROM THE DECEMBER 1998 SAMPLING EVENT. CVOC DATA FROM THE "GP-" DESIGNATED GEOPROBE LOCATIONS ARE FROM MAY THROUGH JULY 1998.
4. TOTAL CVOC VALUE REPORTED AT 33MWC-24 INCLUDES 22,000 ug/L OF TENTATIVELY IDENTIFIED COMPOUND, 1,1,2-TRICHLORO-1,2,2-ETHANE.
5. LOCATION OF ALL WOODED AREAS NOT SHOWN.

0 200' 400'
SCALE: 1"=200'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

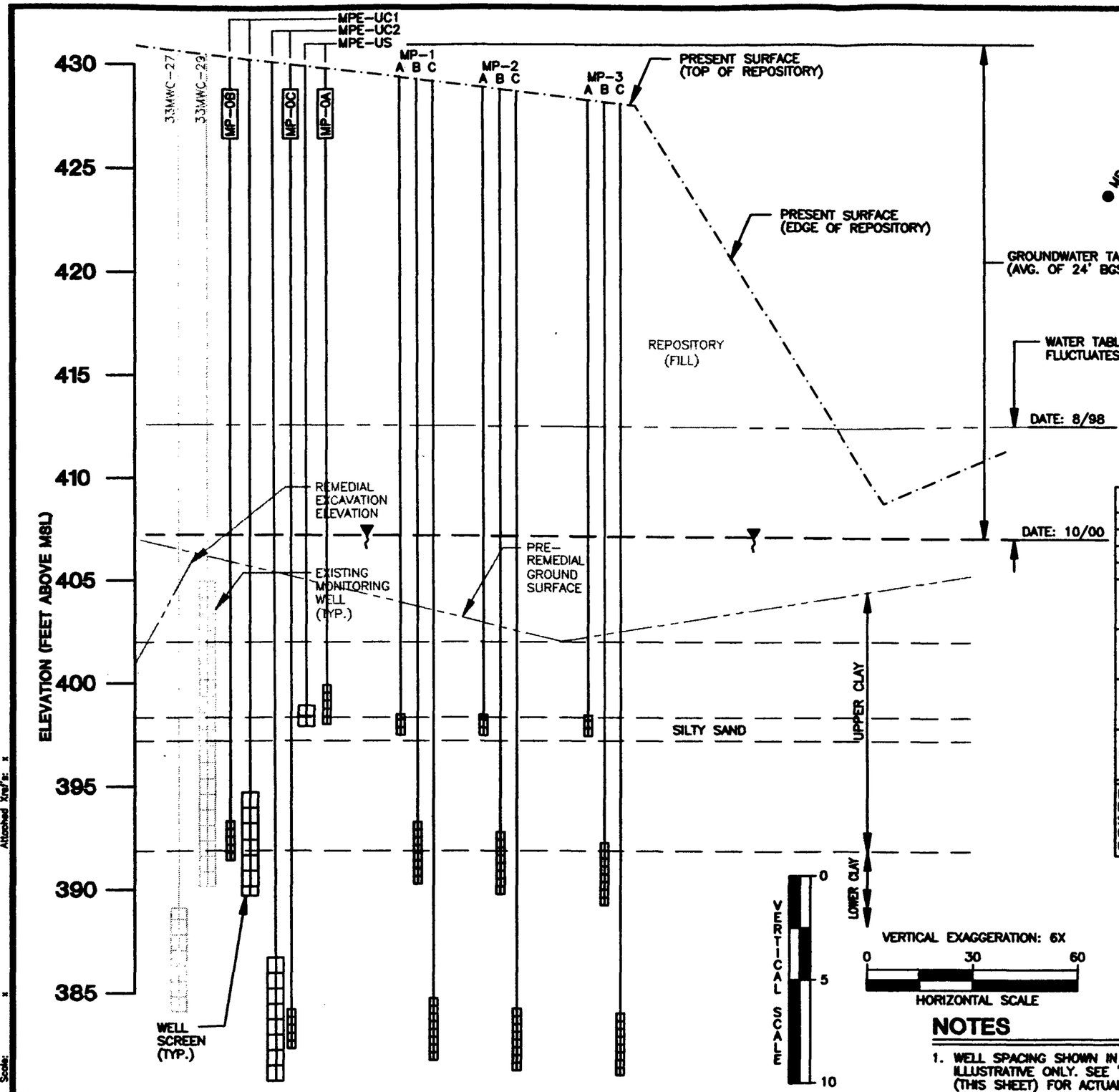
PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

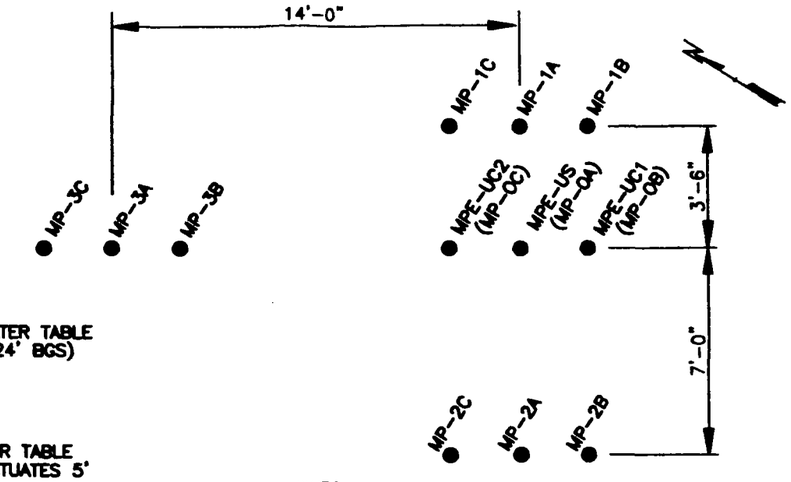
SHEET TITLE: TOTAL CVOC ISOPLETH MAP
UPPER CLAY & UPPER SAND UNITS-SITES 32/33

DRAWN BY: SIEWERTD	SCALE: 1"=200'	PROJ. NO. 4781.07
CHECKED BY: SLM		FILE NO. 47810727.DWG
APPROVED BY: TEG	DATE PRINTED: MAY 08 2001	FIGURE 5-1
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level





NOTE
MP-OA, MP-OB, AND MP-OC ARE LOCATED IN THE WELL CASING OF MPE-US, MPE-UC1, AND MPE-UC2 RESPECTIVELY.

GENERAL PILOT TEST WELL CLUSTER LAYOUT

AREA 9 REPOSITORY PILOT TEST WELL CONSTRUCTION

		WELL DEPTH	SCREEN INTERVAL	WELL DIA. AND MATERIAL
MPE-UC1		40 FT. BGS	5 FT.	4" DIA. PVC
MPE-UC2		49 FT. BGS	6 FT.	4" DIA. PVC
MPE-US		31.8 FT. BGS	1 FT.	4" DIA. PVC
MP-0	A	31.8 FT. BGS	1 FT.	1/2" DIA. PVC
	B	39 FT. BGS	3 FT.	1/2" DIA. PVC
	C	47.5 FT. BGS	3 FT.	1/2" DIA. PVC
MP-1	A	31.8 FT. BGS	1 FT.	1/2" DIA. PVC
	B	39 FT. BGS	3 FT.	1/2" DIA. PVC
	C	47.5 FT. BGS	3 FT.	1/2" DIA. PVC
MP-2	A	31.8 FT. BGS	1 FT.	1/2" DIA. PVC
	B	39 FT. BGS	3 FT.	1/2" DIA. PVC
	C	47.5 FT. BGS	3 FT.	1/2" DIA. PVC
MP-3	A	31.6 FT. BGS	1 FT.	1/2" DIA. PVC
	B	39 FT. BGS	3 FT.	1/2" DIA. PVC
	C	47.2 FT. BGS	3 FT.	1/2" DIA. PVC

MPE = MULTI-PHASE EXTRACTION WELL
MP = SOIL VAPOR PRESSURE MONITORING POINT
SVE = SOIL VAPOR EXTRACTION WELL
UC = UPPER CLAY
US = UPPER SAND

NOTES

1. WELL SPACING SHOWN IN CROSS SECTION IS ILLUSTRATIVE ONLY. SEE "WELL CLUSTER LAYOUT" (THIS SHEET) FOR ACTUAL SPACING AND ORIENTATION.

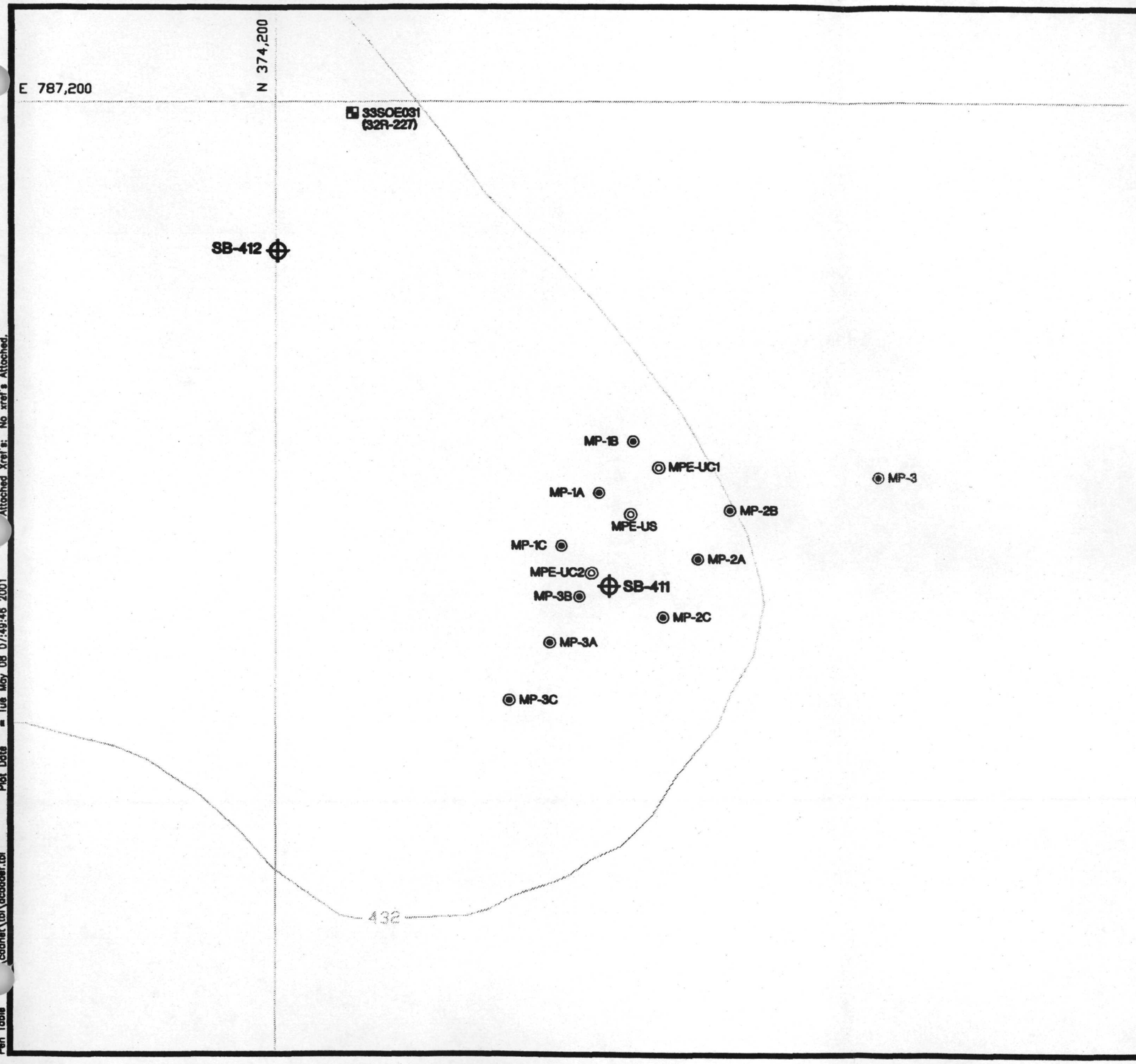
SITE STRATIGRAPHY AND PILOT TEST WELL LOCATIONS
AREA 9 REPOSITORY
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY: SIEWERTD
APPROVED BY: TEG
DATE: MAY 2001
PROJ. # 4781.07
FILE # 47810794

FIGURE 6-1

PLOT DATA
Drawing Nam:
Operator Name:
Scale:
Dwg Size:
Plot Date:
Plot Time:
Attached Xref's:



LEGEND

SB-412	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
MP-3A	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
MPE-UC	MULTI PHASE EXTRACTION WELL (4") (UPPER CLAY) (INSTALLED BY RMT IN 2000)
MPE-US	MULTI PHASE EXTRACTION WELL (4") (UPPER SAND) (INSTALLED BY RMT IN 2000)
33R-227	SOIL SAMPLE (IT CORP.)
MP-3	MONITORING POINT (2") (INSTALLED BY FDGTI)
432	EXISTING CONDITIONS CONTOURS

0 10' 20'

SCALE: 1" = 10'

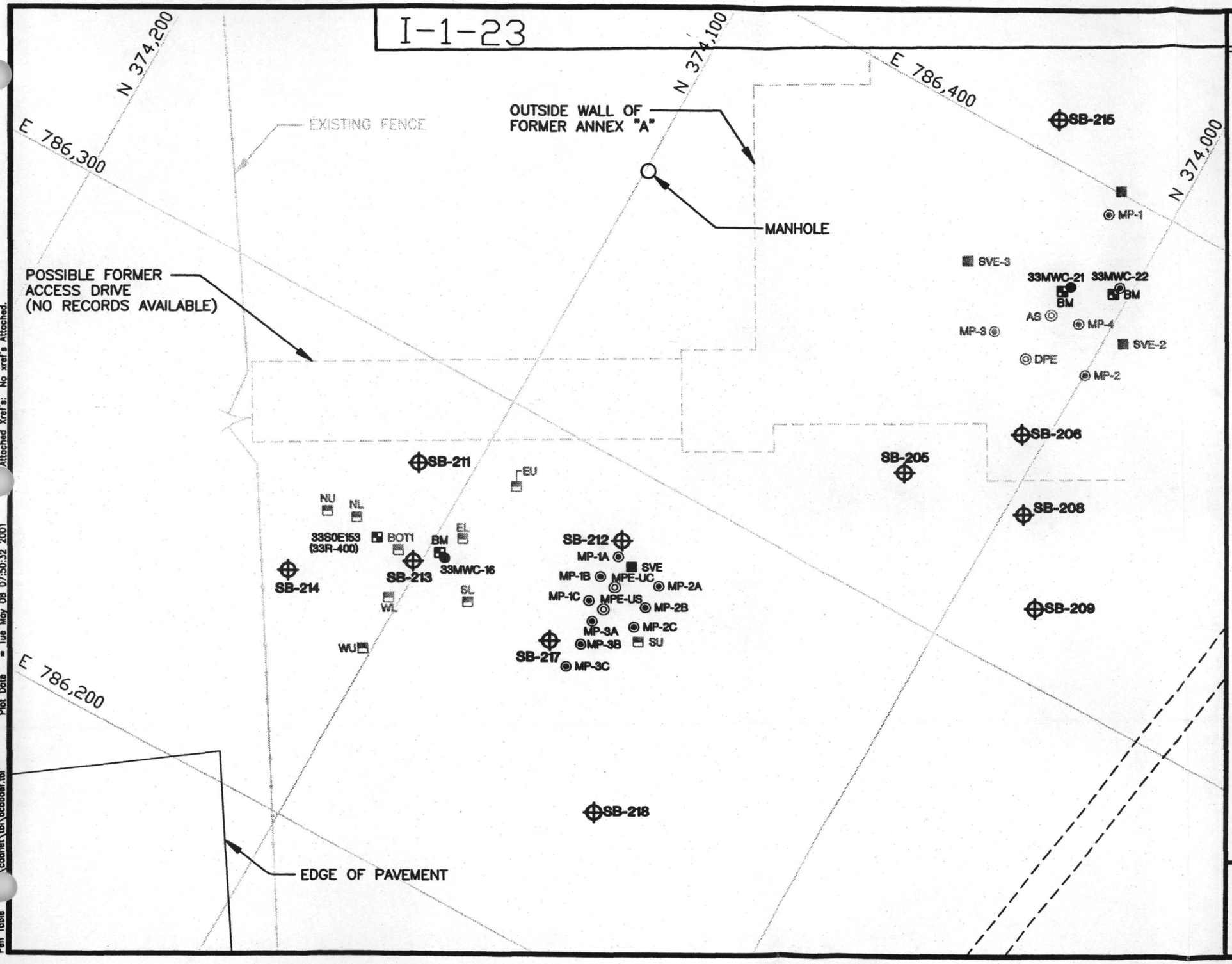
PILOT TEST WELL LOCATIONS
AREA 9 REPOSITORY
CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810721.DWG

FIGURE 6-2

Drawing File = G:\5781\07\47810721.dwg
User ID = DEFOEJ
Plot File = plot\temp\000\47810721.prf
Pen Table = cadnet\tb\acaddef.tbl
Plotter = acad11x17
Scale = 1:10.000000
Rotation = 90.000000
Plot Date = Tue May 08 07:49:46 2001
Attached Xref's: No xref's Attached.



LEGEND

SB-100	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-16	GROUNDWATER MONITORING WELL (2")
MP-3	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
SVE	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY RMT IN 2000)
MPE-UC	MULTI PHASE EXTRACTION WELL (4") (UPPER CLAY) (INSTALLED BY RMT IN 2000)
MPE-US	MULTI PHASE EXTRACTION WELL (4") (UPPER SAND) (INSTALLED BY RMT IN 2000)
EL	SOIL SAMPLE (FDGTI)(1997)
BM	BENCH MARK
	EXISTING FENCE

0 20' 40'

SCALE: 1"=20'

PILOT TEST WELL LOCATIONS
BUILDING I-1-23
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810720.DWG

FIGURE 6-3

User ID = DEFOEJ
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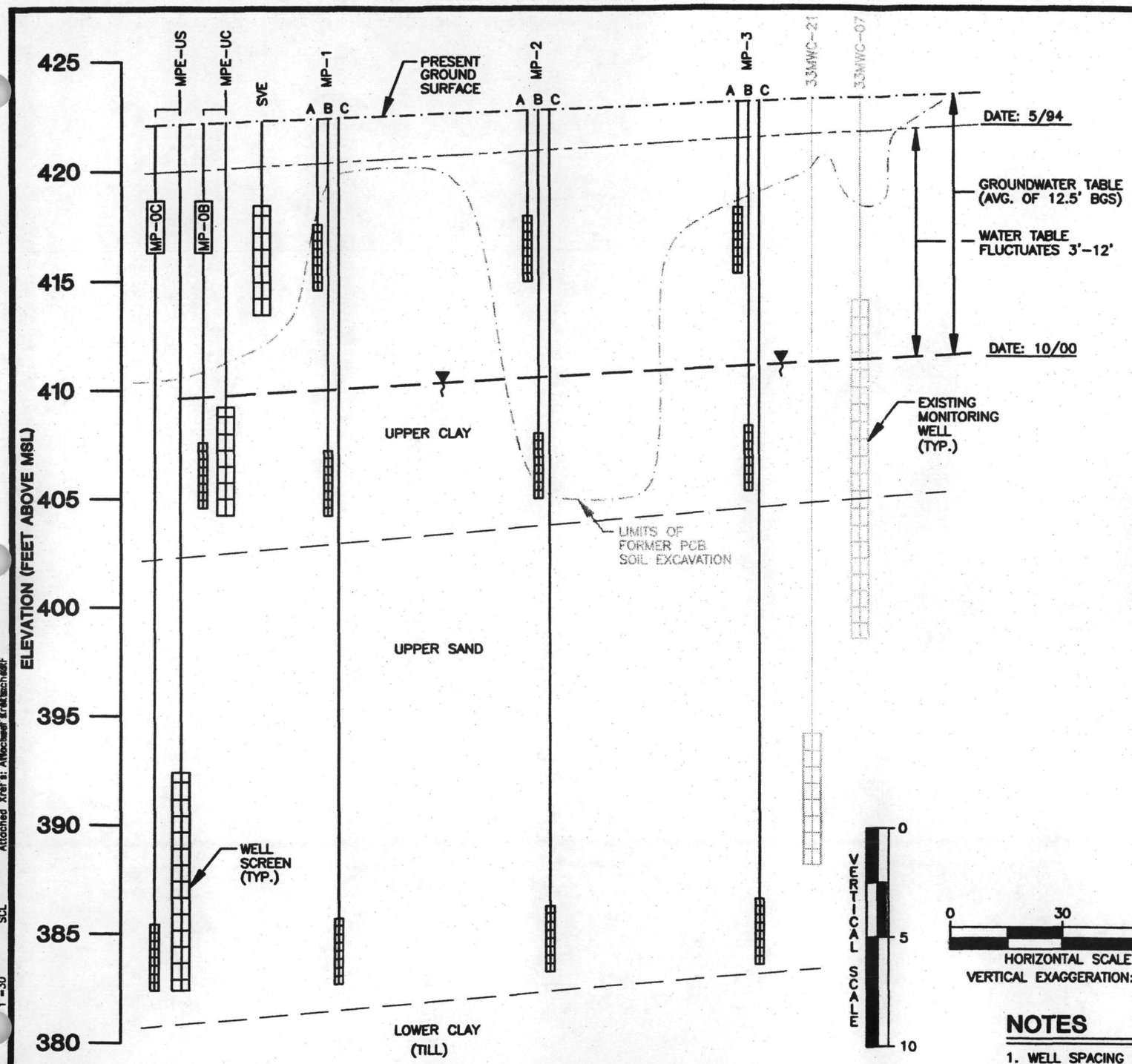
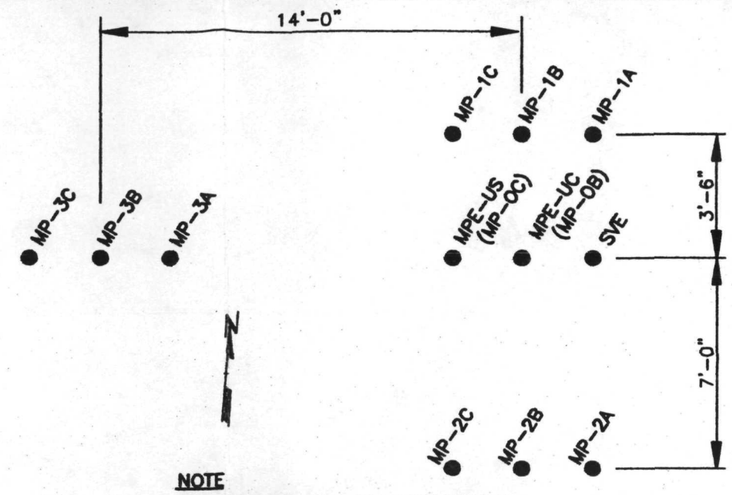
Pen Table = ...\cadnet\tbl\ecaddef.tbl
Scale = 1:20.000000
Rotation = 90.000000
Plot Date = Tue May 08 07:50:32 2001
Attached Xref's: No xref's Attached.





NOTE
MP-0B, AND MP-0C ARE LOCATED IN THE WELL CASING OF MPE-UC, MPE-US, RESPECTIVELY.

GENERAL PILOT TEST WELL CLUSTER LAYOUT

BUILDING I-1-23 PILOT TEST WELL CONSTRUCTION

		WELL DEPTH	SCREEN INTERVAL	COMMENTS
MPE-UC		18 FT. BGS	5 FT.	4" DIA. PVC
MPE-US		39.75 FT. BGS	10 FT.	4" DIA. PVC
SVE		8.8 FT. BGS	5 FT.	2" DIA. PVC
MP-0	B	17.75 FT. BGS	3 FT.	1/2" DIA. PVC
	C	39.75 FT. BGS	3 FT.	1/2" DIA. PVC
MP-1	A	7.8 FT. BGS	3 FT.	1/2" DIA. PVC
	B	18.2 FT. BGS	3 FT.	1/2" DIA. PVC
	C	39.75 FT. BGS	3 FT.	1/2" DIA. PVC
MP-2	A	7.8 FT. BGS	3 FT.	1/2" DIA. PVC
	B	17.8 FT. BGS	3 FT.	1/2" DIA. PVC
	C	39.6 FT. BGS	3 FT.	1/2" DIA. PVC
MP-3	A	7.8 FT. BGS	3 FT.	1/2" DIA. PVC
	B	17.8 FT. BGS	3 FT.	1/2" DIA. PVC
	C	39.6 FT. BGS	3 FT.	1/2" DIA. PVC

MPE = MULTI-PHASE EXTRACTION WELL
MP = SOIL VAPOR PRESSURE MONITORING POINT
SVE = SOIL VAPOR EXTRACTION WELL
UC = UPPER CLAY
US = UPPER SAND

0 30 60
HORIZONTAL SCALE
VERTICAL EXAGGERATION: 6X

NOTES

1. WELL SPACING SHOWN IN CROSS SECTION IS ILLUSTRATIVE ONLY. SEE "WELL CLUSTER LAYOUT" (THIS SHEET) FOR ACTUAL SPACING AND ORIENTATION.

SITE STRATIGRAPHY AND PILOT TEST WELL SCREEN LOCATIONS
BUILDING I-1-23
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810790.DWG

FIGURE 6-4

PLOT DATA
Drawing No: J:\04781\07\4781MW90.dwg
Operator: SIEWERTD POPR
Scale: 1"=30' SCL
Dwg Size: D
Plot Date: February 2, 2001
Plot Time: 4:26 PM
Attached Xref's: Attached Xref's: MWF

Figure 6-5
Drawdown and Pumping Flowrate vs. Time
MPE Pilot Test, Building I-1-23
Crab Orchard NWR

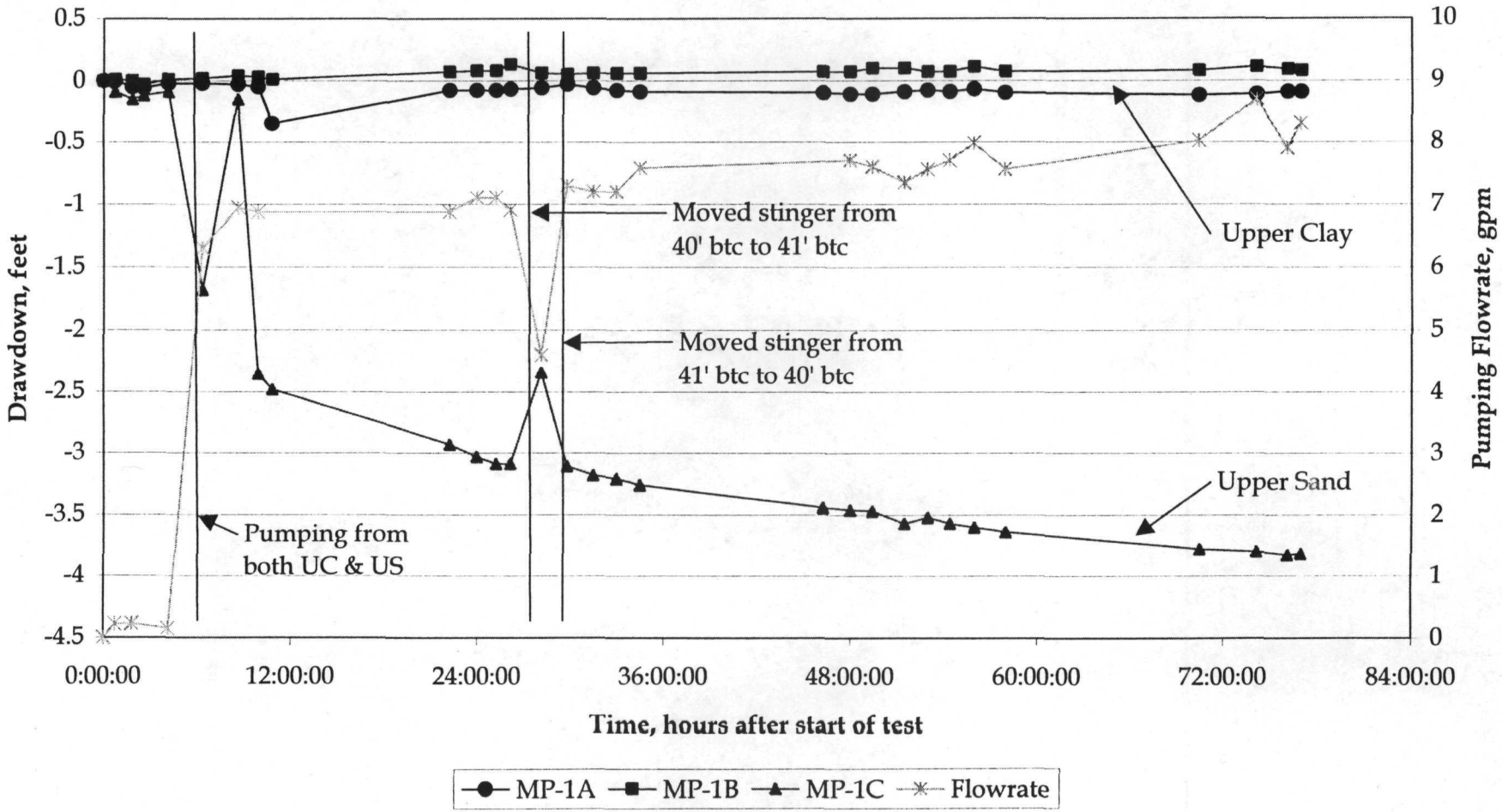


Figure 6-6
Drawdown and Pumping Flowrate vs. Time
MPE Pilot Test, Area 9 Repository
Crab Orchard NWR

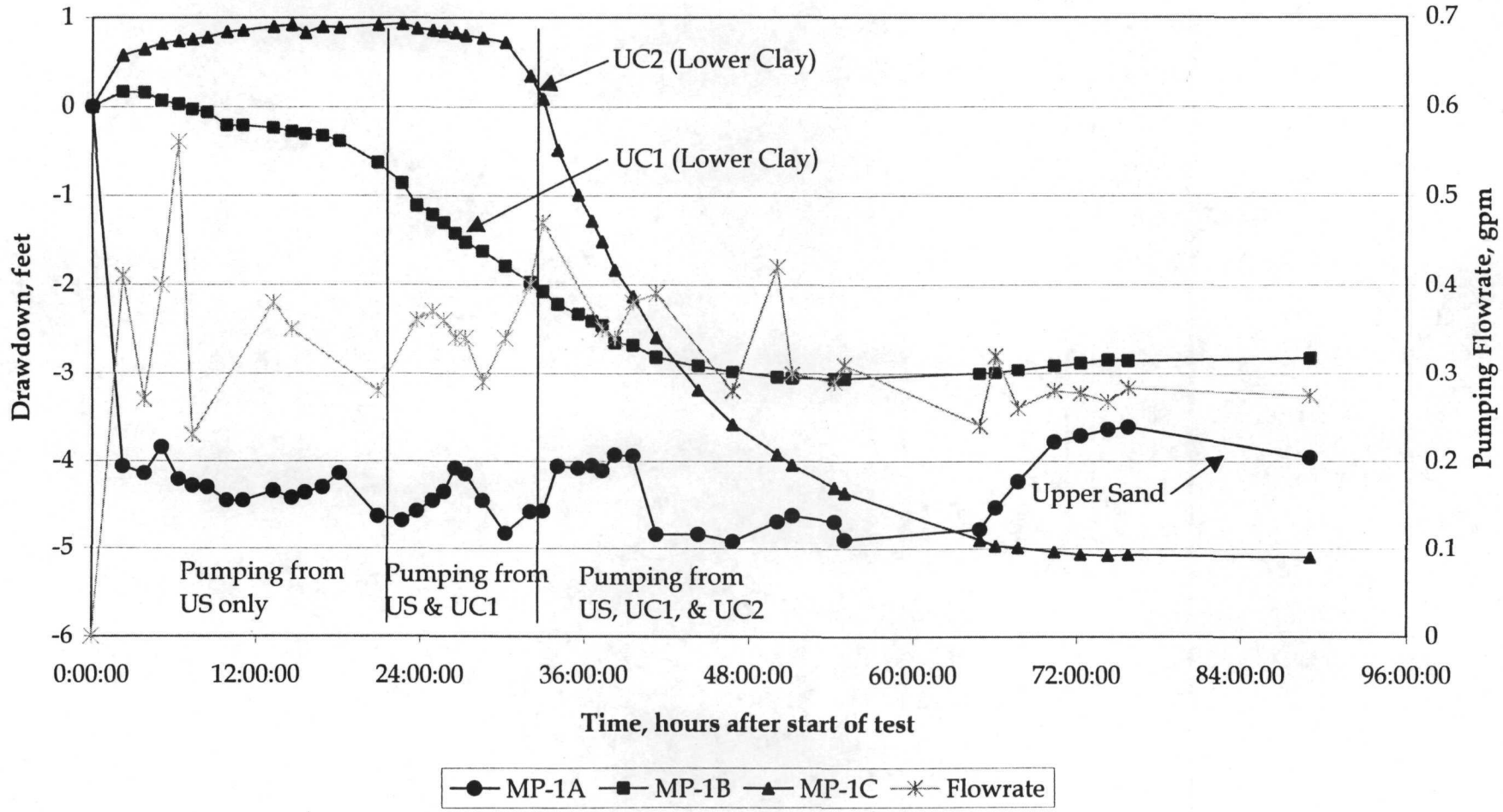
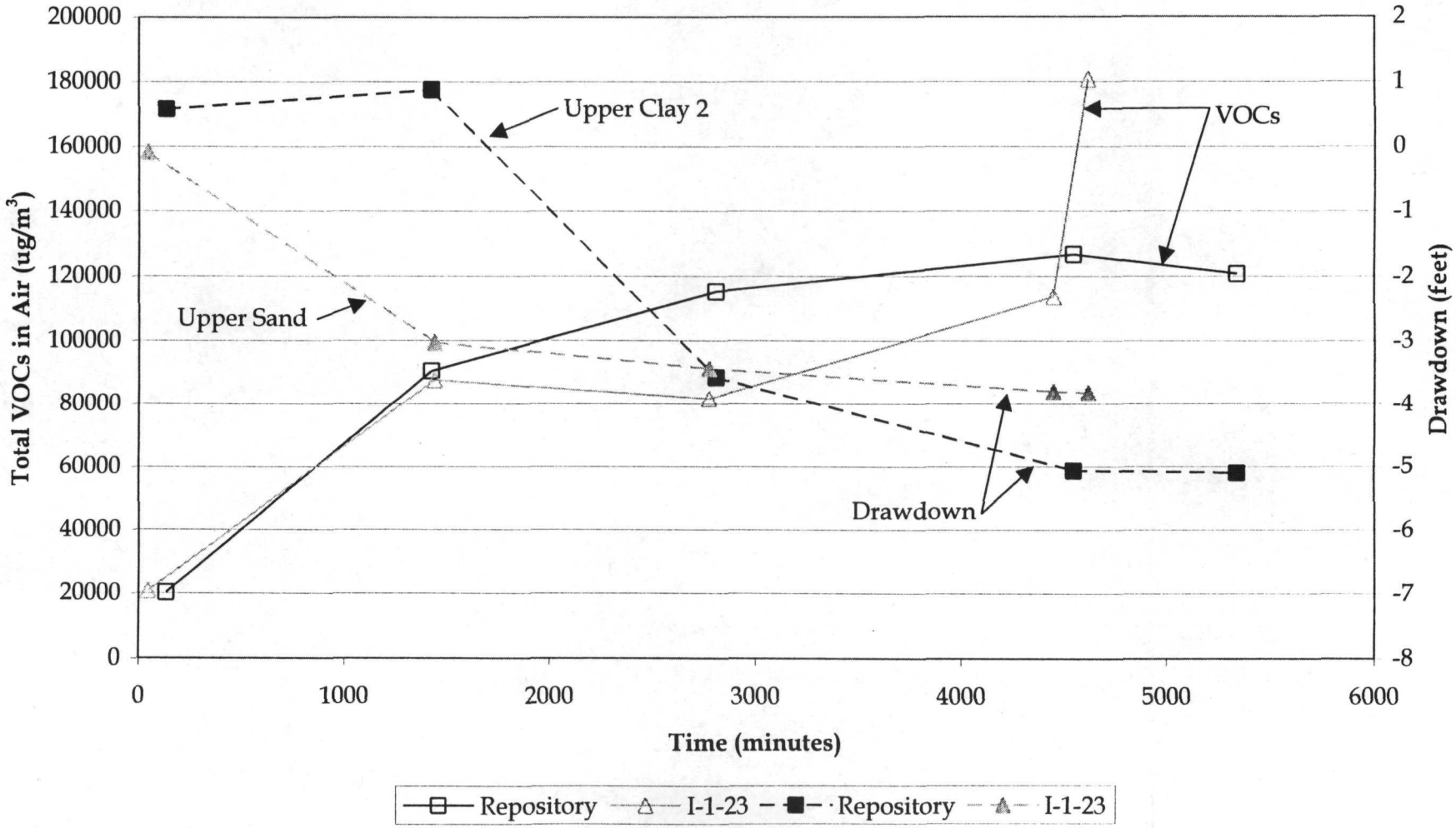
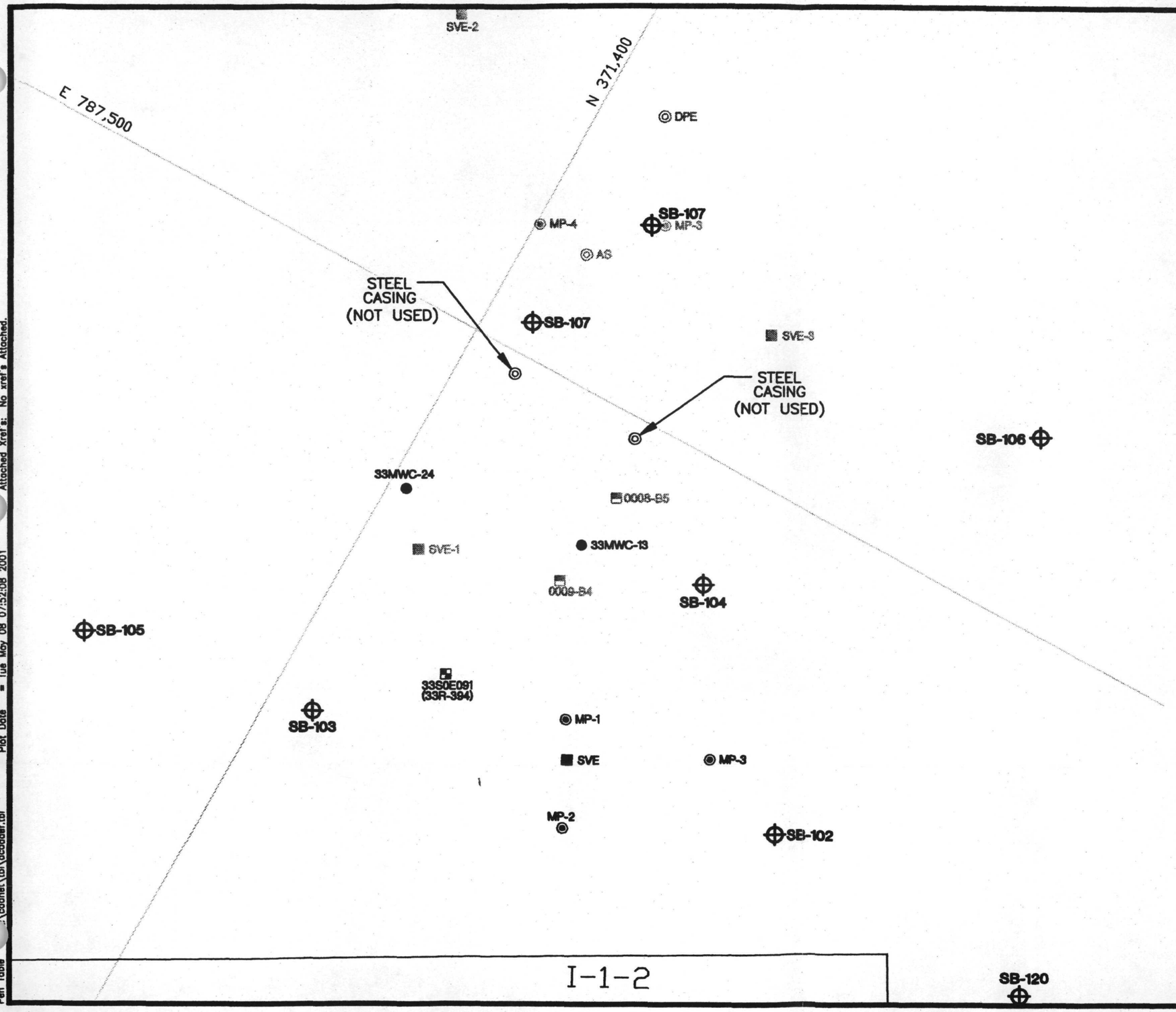


Figure 6-7
Drawdown and Total VOCs vs. Time for MPE MP-1C (3.5' away), at Repository and I-1-23





LEGEND

SB-107	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-24	GROUNDWATER MONITORING WELL (2")
MP-2	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
SVE	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY RMT IN 2000)
33R-394	SOIL SAMPLE (IT CORP.)
0008-B5	SOIL SAMPLE (FDGTI)(1997)
MP-3	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
	EXISTING FIRE HYDRANT

0 10' 20'

SCALE: 1"=10'

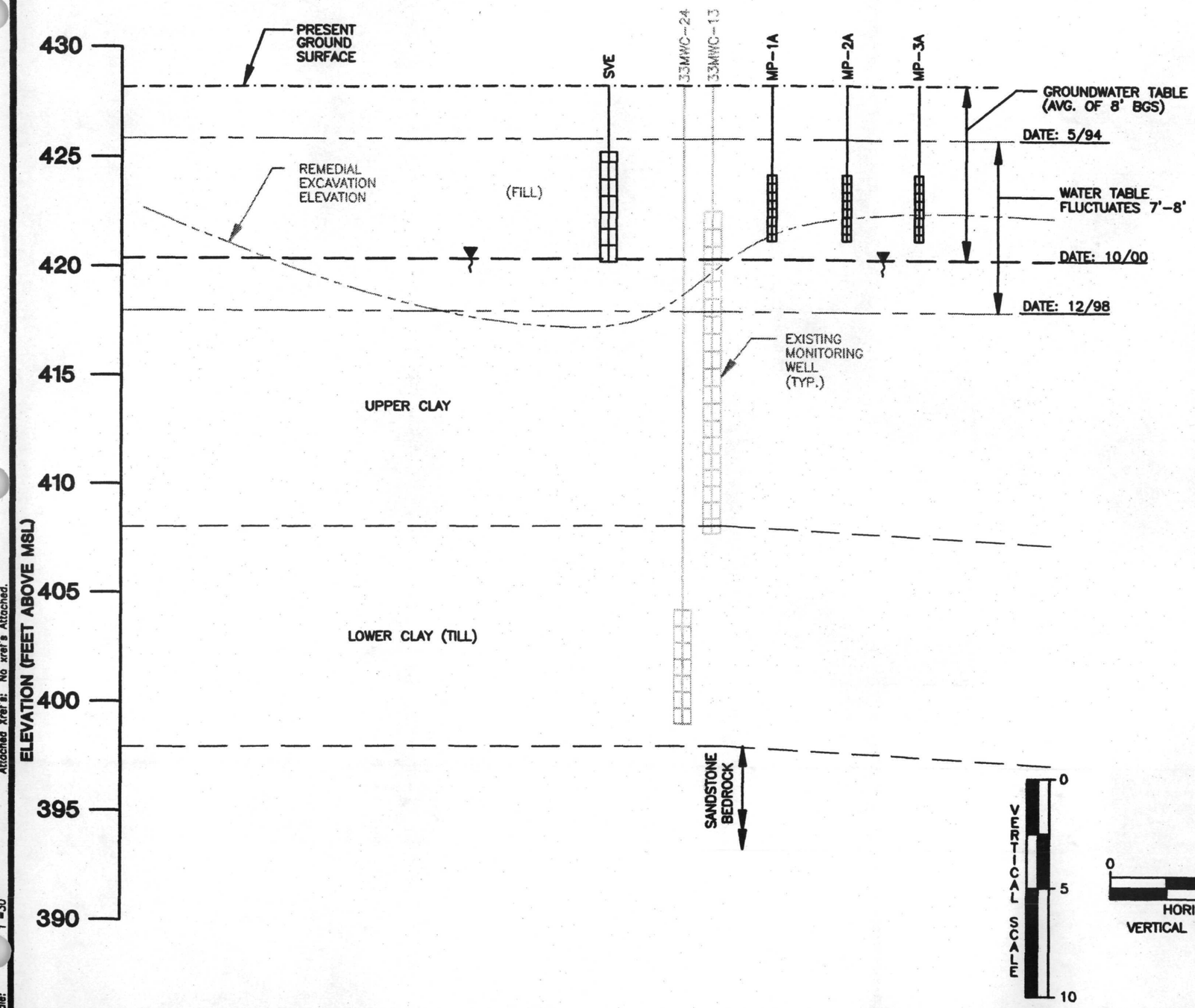
PILOT TEST WELL LOCATIONS
BUILDING I-1-2
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

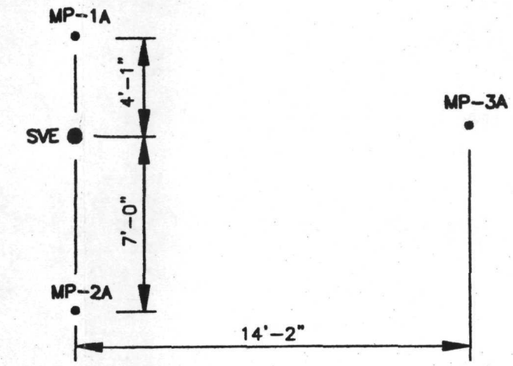
RMT.

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810719.DWG

FIGURE 6-8

Drawing File = J:\04781\07\47810719.dwg
User ID = SEFOEJ
Plot File = \plot\temp\000\47810719.prf
Pen Table = \cadnet\tb\acddef.tbl
Plotter = acad11x17
Scale = 1:10.000000
Rotation = 90.000000
Plot Date = Tue May 08 07:52:08 2001
Attached Xref's: No xref's Attached.





GENERAL PILOT TEST WELL CLUSTER LAYOUT

BUILDING I-1-2 PILOT TEST WELL CONSTRUCTION			
	WELL DEPTH	SCREEN INTERVAL	WELL DIA. AND MATERIAL
SVE	9 FT. BGS	5 FT.	2" DIA. PVC
MP-1	7.1 FT. BGS	3 FT.	1/2" DIA. PVC
MP-2	7 FT. BGS	3 FT.	1/2" DIA. PVC
MP-3	7 FT. BGS	3 FT.	1/2" DIA. PVC
MP = SOIL VAPOR PRESSURE MONITORING POINT SVE = SOIL VAPOR EXTRACTION WELL			

NOTES

1. WELL SPACING SHOWN IN CROSS SECTION IS ILLUSTRATIVE ONLY. SEE "WELL CLUSTER LAYOUT" (THIS SHEET) FOR ACTUAL SPACING AND ORIENTATION.

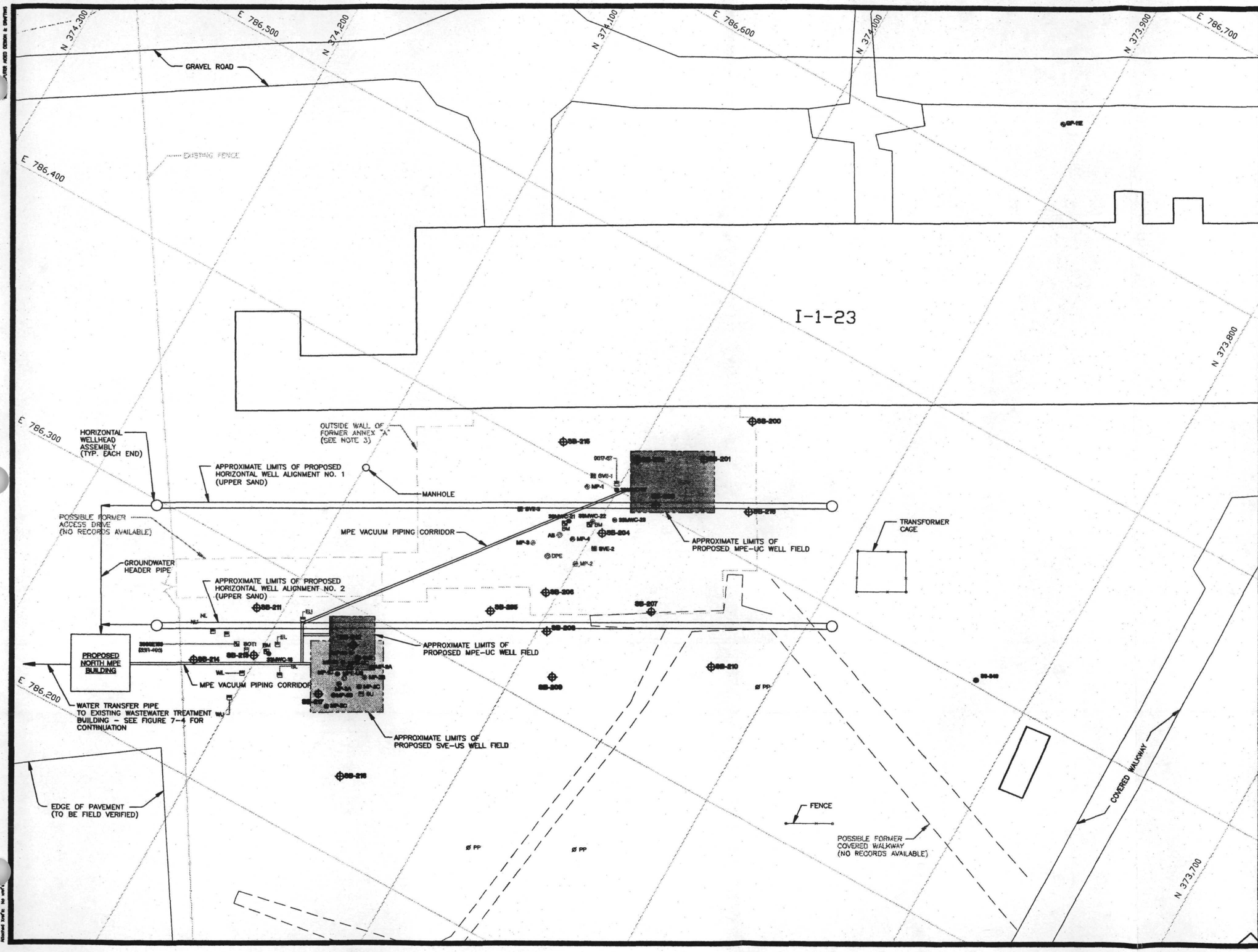
SITE STRATIGRAPHY AND PILOT TEST WELL SCREEN LOCATIONS
BUILDING I-1-2
CRAB ORCHARD NWR PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810787.DWG

FIGURE 6-9

PLOT DATA
Drawing N: J:\04781\07\47810787.dwg
Operator: SIEWERTD
Scale: 1"=30'
Dwg Size: 75203 Bytes
Plot Date: Monday, January 29, 2001
Plot Time: 11:34:52 AM
Attached Xref's: No xref's Attached.



LEGEND

SB-100	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
SBMWC-23	GROUNDWATER MONITORING WELL (2")
MP-3	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
SVE	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY RMT IN 2000)
MPE-UC	MULTI PHASE EXTRACTION WELL (4") (UPPER CLAY) (INSTALLED BY RMT IN 2000)
MPE-US	MULTI PHASE EXTRACTION WELL (4") (UPPER SAND) (INSTALLED BY RMT IN 2000)
GP-1E	GEOPROBE BORING LOCATION (1998)
SBR-303	SOIL SAMPLE (IT CORP.)
0003-04	SOIL SAMPLE (FDGTI)(1997)
MP-3	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
BM	BENCH MARK
PP	POWER POLE
	EXISTING FENCE
	EXISTING BUILDING

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT C. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.
3. ANNEX "A" WAS DECONTAMINATED AND DEMOLISHED DURING THE PCB REMEDIAL ACTION IN 1997.

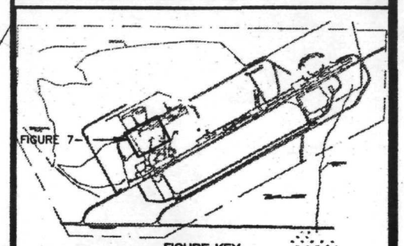


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

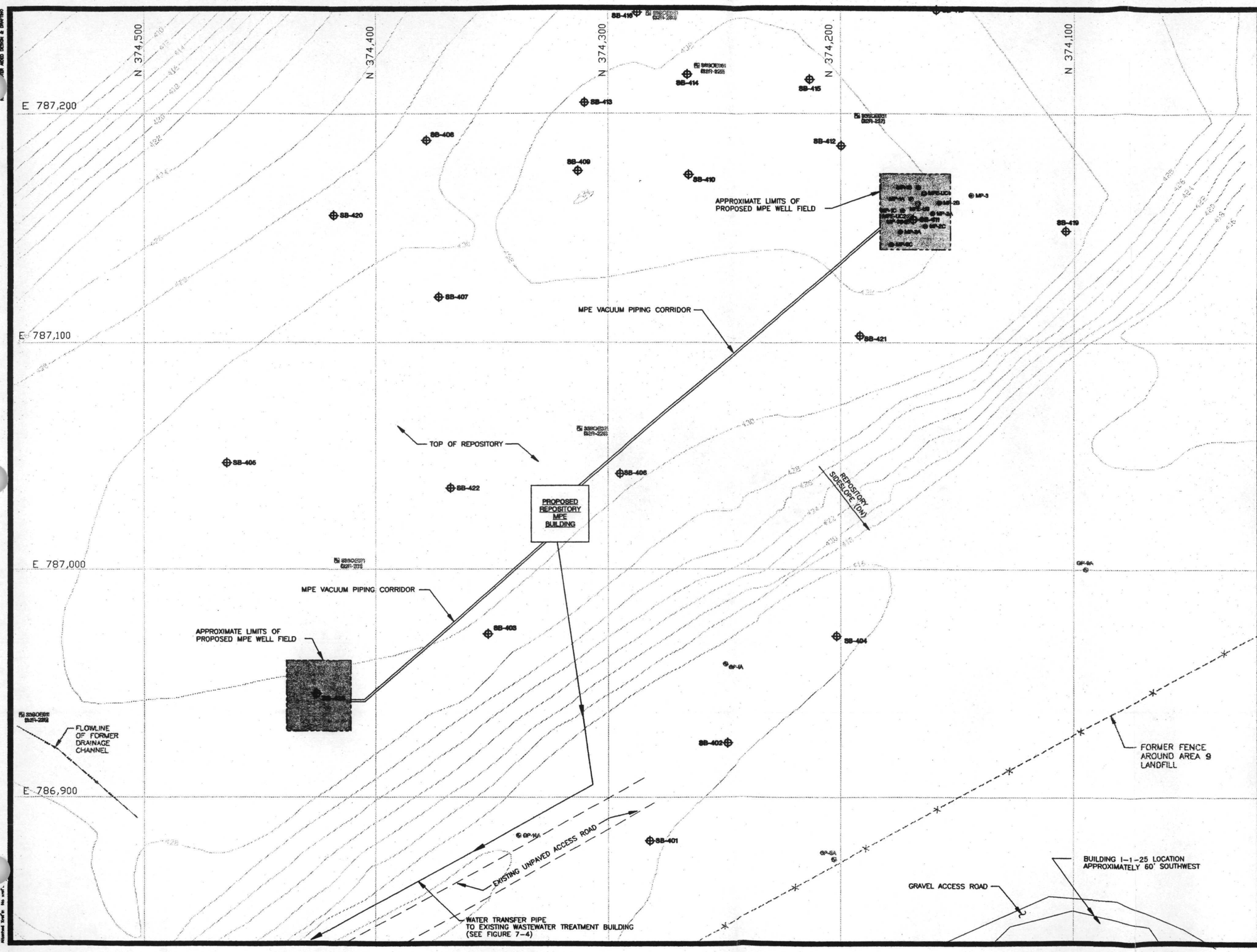
PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: PRELIMINARY DESIGN LAYOUT
MPE SYSTEMS - BUILDING I-1-23

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: JWA		FILE NO. 47810793.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 7-1
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-400	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
GP-9A	GEOPROBE BORING LOCATION (1998)
2251-2236	SOIL SAMPLE (IT CORP.)
—X—X—	FORMER FENCE LOCATION
———	EXISTING BUILDING
420	EXISTING CONDITIONS CONTOURS
—FL—	DRAINAGE FLOWLINE

NOTES

1. CONTOURS OF PRE-PCB EXCAVATION CONDITIONS ARE FROM DRAWINGS PREPARED BY IT CORPORATION CONTAINED IN PRE-FINAL DESIGN DOCUMENTS DATED JULY 27, 1994. ELECTRONIC COPIES OF THESE DRAWINGS WERE PROVIDED TO RMT, INC. BY U.S. FISH & WILDLIFE SERVICE.
2. CONTOURS OF PCB EXCAVATIONS ARE FROM THE DRAWINGS PREPARED BY ROBERT G. SEWELL, PROFESSIONAL LAND SURVEYOR, MARION, ILLINOIS, FOR FLUOR DANIEL, INC. THE DRAWINGS ARE CONTAINED IN A REPORT TITLED FINAL CLOSEOUT REPORT FOR THE PCB OPERABLE UNIT, REV. 0, MARCH 1998, PREPARED BY FLUOR DANIEL GTI.

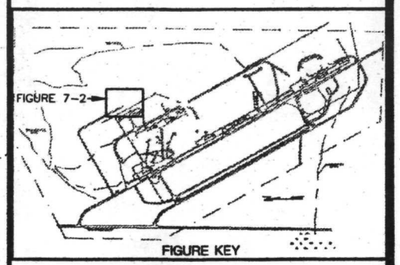


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

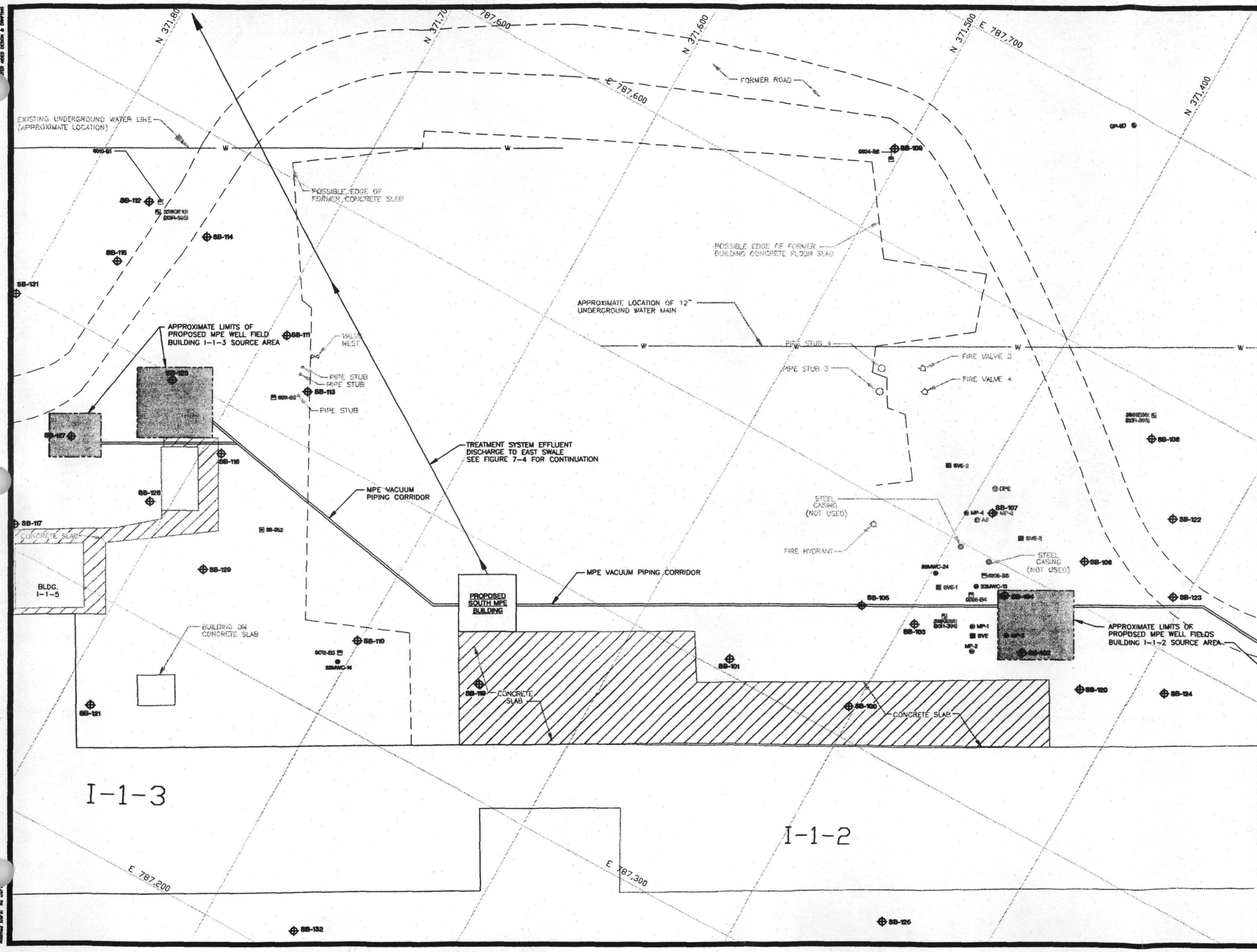
PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE:
PRELIMINARY DESIGN LAYOUT
MPE SYSTEMS - AREA 9 REPOSITORY

DRAWN BY: SIEWERTD	SCALE: 1"=40'	PROJ. NO. 4781.07
CHECKED BY: JWA		FILE NO. 47810792.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 7-2
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level



LEGEND

SB-107	GEOPROBE BORING LOCATION (INSTALLED BY RMT IN 2000)
33MWC-24	GROUNDWATER MONITORING WELL (2")
MP-2	MONITORING POINT (2") (INSTALLED BY RMT IN 2000)
SVE	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY RMT IN 2000)
GP-12E	GEOPROBE BORING LOCATION (1998)
33SR-S04	SOIL SAMPLE (IT CORP.)
0006-S05	SOIL SAMPLE (FDGTI)(1997)
MP-3	MONITORING POINT (2") (INSTALLED BY FDGTI)
SVE-2	SOIL VAPOR EXTRACTION WELL (2") (INSTALLED BY FDGTI)
DPE	DUAL PHASE EXTRACTION WELL (4") (INSTALLED BY FDGTI)
AS	AIR SPARGING WELL (4") (INSTALLED BY FDGTI)
————	EXISTING BUILDING
—W—	UNDERGROUND 12" WATER MAIN LOCATION (APPROXIMATE)

FIGURE 7-3

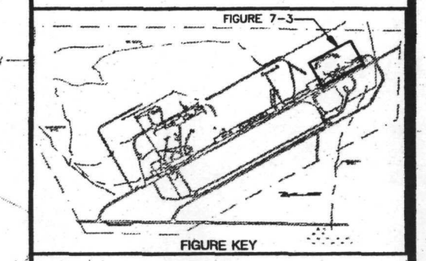


FIGURE KEY

0 20' 40'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

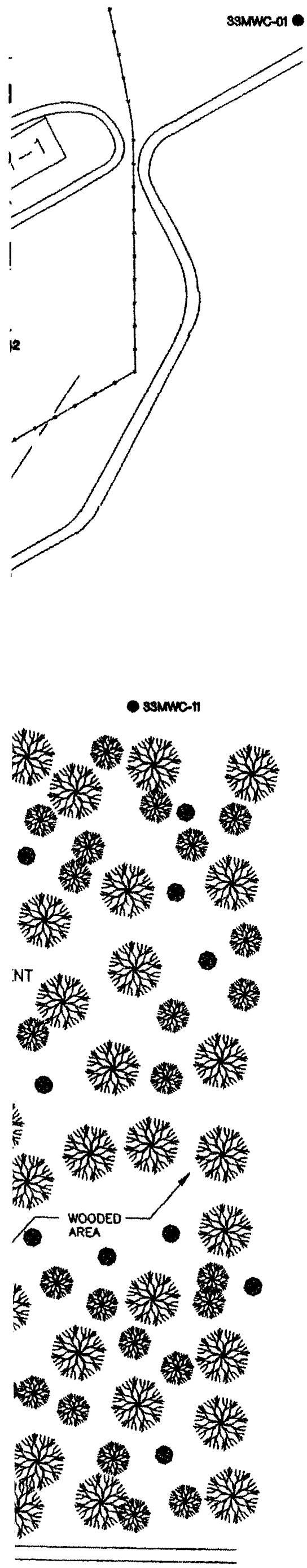
PROJECT: CRAB ORCHARD NWR - PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

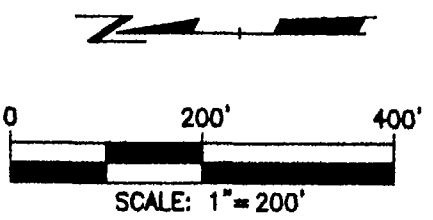
SHEET TITLE: PRELIMINARY DESIGN LAYOUT
MPE SYSTEMS - BUILDING I-1-2 & I-1-3

DRAWN BY: SIEWERTD	SCALE:	PROJ. NO. 4781.07
CHECKED BY: JWA	1"=40'	FILE NO. 47810791.DWG
APPROVED BY: TEG	DATE PRINTED:	FIGURE 7-3
DATE: MAY 2001		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Revision Level





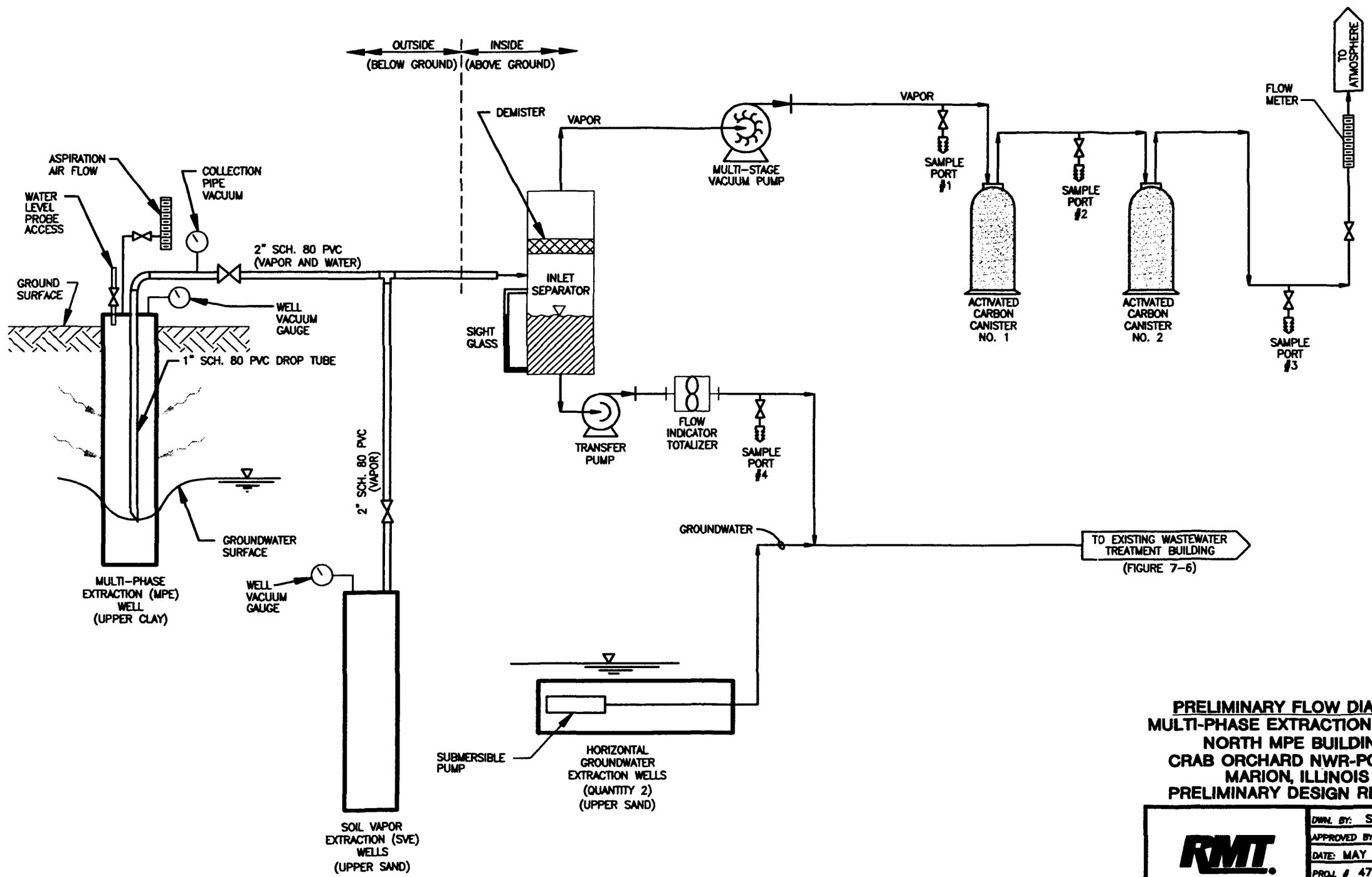
NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

PROJECT: **CRAB ORCHARD NWR - PCB O.U.**
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE:
PRELIMINARY DESIGN LAYOUT
SITE PLAN

DRAWN BY: SIEWERTD	SCALE:	PROJ. NO. 4781.07
CHECKED BY: JWA	1"=200'	FILE NO. 47810796.DWG
APPROVED BY: TEG	DATE PRINTED: MAY 08 2001	**FIGURE 7-4**
DATE: MAY 2001		

RMT.
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444



PRELIMINARY FLOW DIAGRAM
MULTI-PHASE EXTRACTION SYSTEM
NORTH MPE BUILDING
CRAB ORCHARD NWR-PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

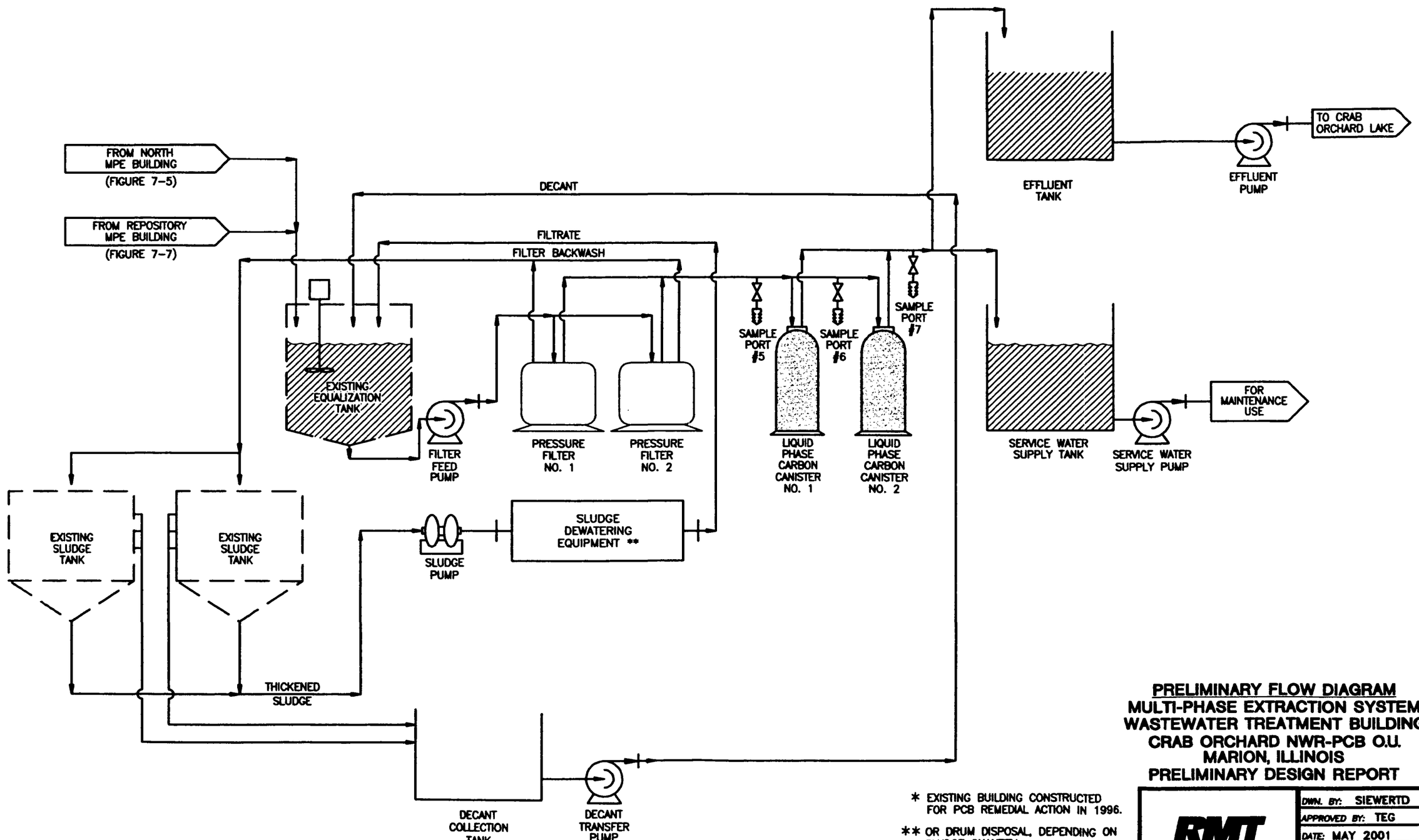
DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810797.DWG

FIGURE 7-5

Attached Xref's: No xref's Attached.

Plotter = acad11x17
Scale = 1:1.000000
Rotation = 90.000000
Plot Date = Tue May 08 07:58:09 2001

User ID = DEFOEJ
Plot File = ::\plot\temp\000\47810797.prf
Pen Table = c:\cadnet\tbl\acaddef.tbl



* EXISTING BUILDING CONSTRUCTED FOR PCB REMEDIAL ACTION IN 1996.

** OR DRUM DISPOSAL, DEPENDING ON SLUDGE QUANTITY

PRELIMINARY FLOW DIAGRAM
MULTI-PHASE EXTRACTION SYSTEM
WASTEWATER TREATMENT BUILDING*
CRAB ORCHARD NWR-PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810799.DWG

FIGURE 7-6

Drawing File = J:\04781\0/\4781D799.dwg Platter = acad11x17
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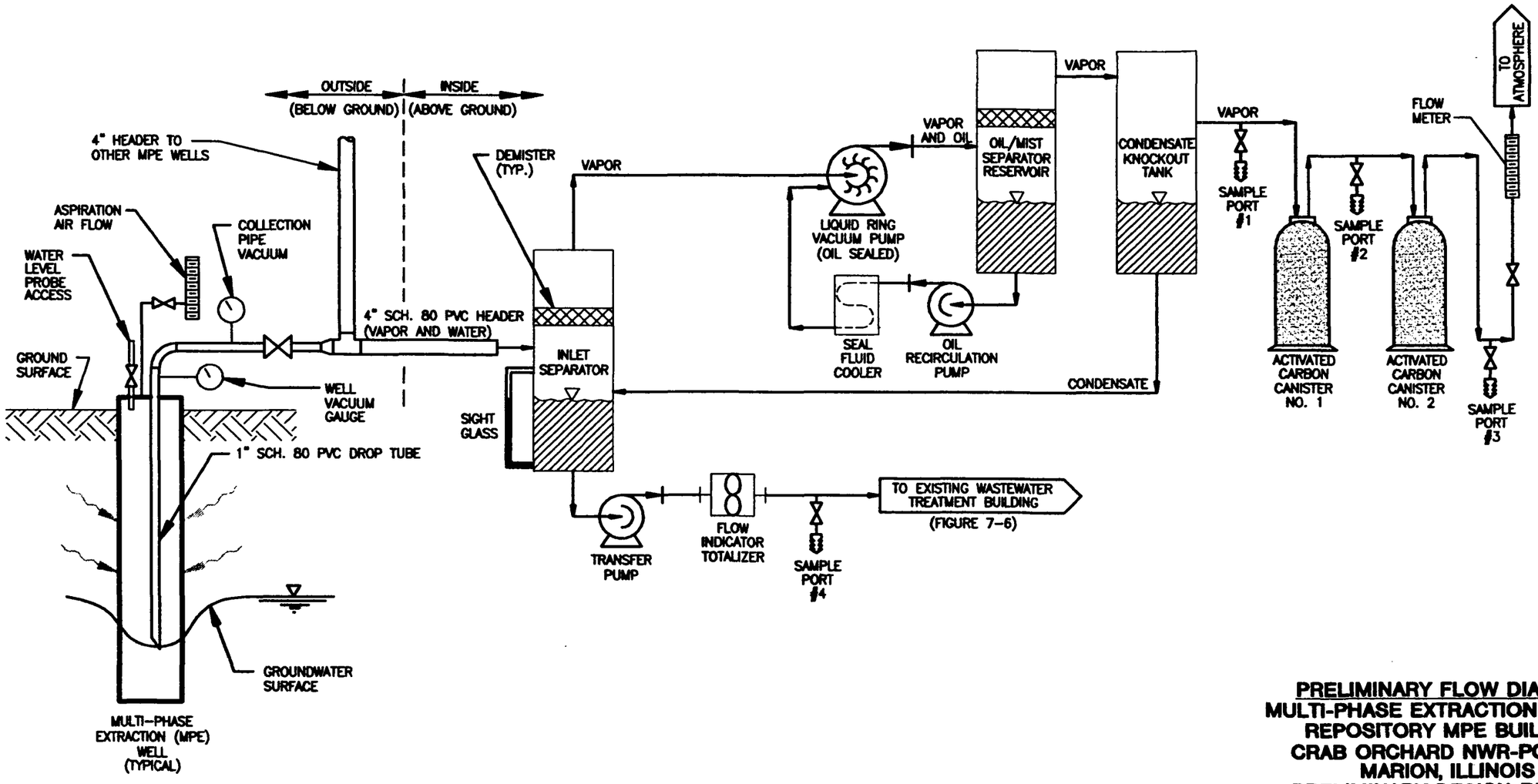
Attached Xref's: No xref's Attached.



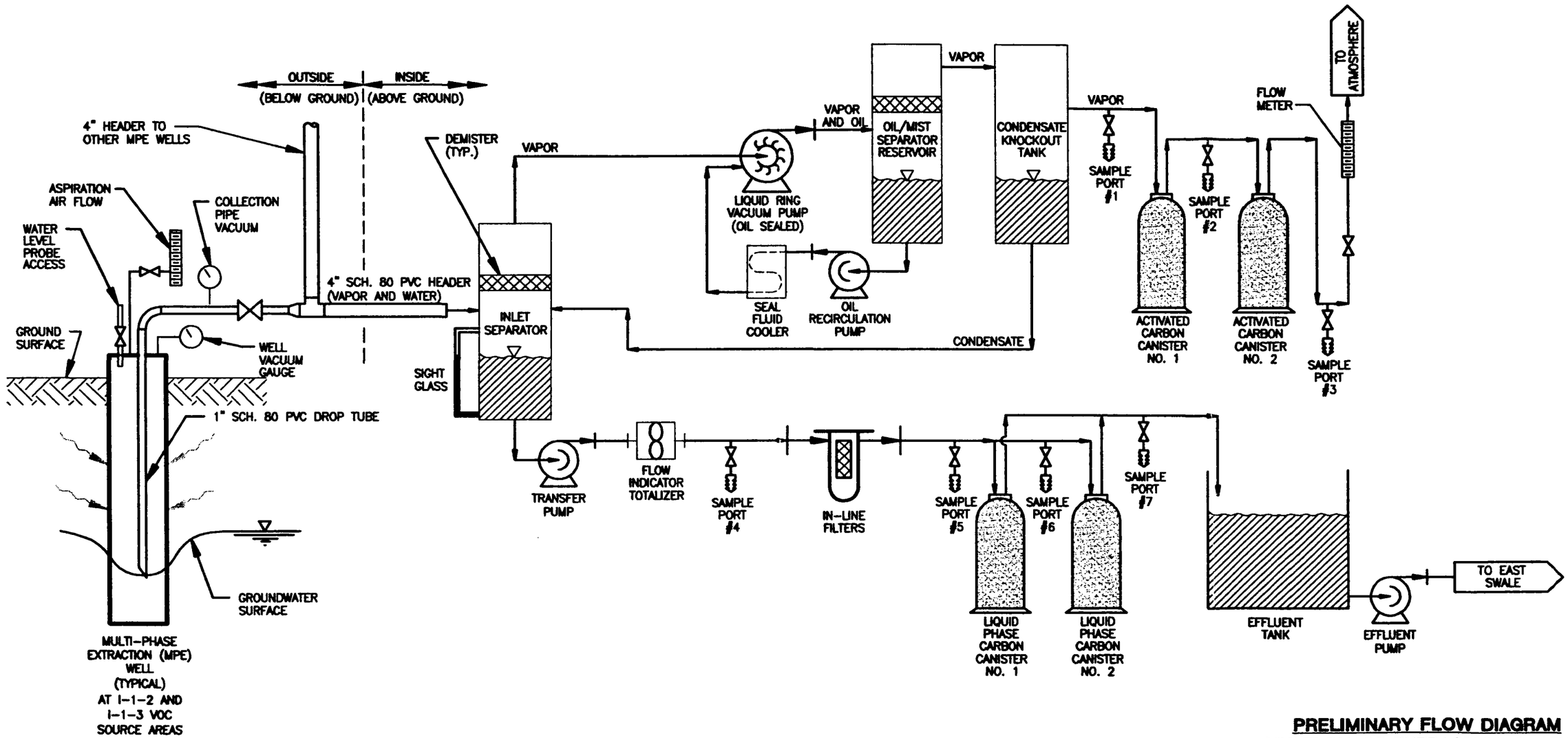
PRELIMINARY FLOW DIAGRAM
MULTI-PHASE EXTRACTION SYSTEM
REPOSITORY MPE BUILDING
CRAB ORCHARD NWR-PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT.

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810786.DWG

FIGURE 7-7

Drawing File = J:\D4781\D/V4781D786.dwg Plotter = acad11x17
User ID = rmFOEJ Scale = 1:1.000000
Plot File plot\temp\000\47810786.prf Rotation = 90.000000
Pen Table codnet\tbl\acadcf.tbl Plot Date = Tue May 08 08:04:40 2001 Attached Xref's: No xref's Attached.



PRELIMINARY FLOW DIAGRAM
MULTI-PHASE EXTRACTION SYSTEM
SOUTH MPE BUILDING
CRAB ORCHARD NWR-PCB O.U.
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

RMT.

DWN. BY:	SIEWERTD
APPROVED BY:	TEG
DATE:	MAY 2001
PROJ. #	4781.07
FILE #	47810798.DWG

FIGURE 7-8

Drawing File = J:\04781\D/\4781D798.dwg
User ID = ~TOEJ
Plot File = plot\temp\000\47810798.prf
Pen Table = cadnet\tb\acaddef.tbl
Plotter = acad11x17
Scale = 1:1.000000
Rotation = 90.000000
Plot Date = Tue May 08 08:05:39 2001
Attached Xref's: No xref's Attached.

EAST SWALE
PHYTOREMEDIATION
AREA NO. 2
(30'x570')
(~450 TREES)

3

EAST SWALE

33MWC-42

33MWC-43

SG-7

3

ESE2

SE1

N

0 100' 200'

SCALE: 1" = 100'

NO.	BY	DATE	REVISION	APP'D.
2.				
1.				
0.				

PROJECT: **CRAB ORCHARD NWR PCB O.U.**
MARION, ILLINOIS
PRELIMINARY DESIGN REPORT

SHEET TITLE: **PRELIMINARY DESIGN LAYOUT**
PHYTOREMEDIATION PLAN

DRAWN BY: SIEWERTD	SCALE:	PROJ. NO. 4781.07
CHECKED BY: JWA	AS SHOWN	FILE NO. 478107100.DWG
APPROVED BY: TEG	DATE PRINTED: MAY 08 2001	**FIGURE 8-1**
DATE: MAY 2001		

RMT.
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Revision Level