



**Shaw**<sup>®</sup> Shaw Environmental & Infrastructure, Inc.

Project  
Ma

**Final Report**

# **Corrective Measures Implementation**

**PPG Oak Creek Facility  
Oak Creek, Wisconsin**

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March 31, 2006

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Subject: **Transmittal**  
**Final Corrective Measures Implementation Report**  
**PPG Oak Creek Facility**  
**Oak Creek, Wisconsin**  
**EPA ID# WID059972935**  
**Wisconsin FID# 241014620**

Dear Mr. Nemani:

On behalf of PPG Industries (PPG), Shaw Environmental, Inc. (Shaw) is transmitting 3 copies of the above-referenced Final Report.

Upon your acceptance, PPG is prepared to implement the recommendations discussed in the report. We look forward to working with you to obtain Final Closure of the Former Tank Farm Area.

Sincerely,

A handwritten signature in black ink that reads "Paul W. Lambert". The signature is written in a cursive style. Below the signature, the word "for" is written in a smaller, lowercase font.

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March 31, 2006

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C	Operations and Maintenance Checklists



## List of Acronyms

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<i>Acronym</i>	<i>Title</i>
AS	air sparging
ASTs	above ground storage tanks
BTEX	benzene, toluene, ethylbenzene, and xylene
°C	degrees Celsius
cfm	cubic feet per minute
CMI	Corrective Measures Implementation
COIs	constituents of interest
CR	cancer risks
EPCs	exposure point concentrations
ES	Enforcement Standards
HQ	hazard quotients
iw	inches of water
MCLs	Maximum Contaminant Levels
MEK	2-butanone
MIBK	4-methyl-2-pentanone
O&M	operation and maintenance
PCE	tetrachloroethene
PID	photoionization detector
PPG	PPG Industries, Inc.
PRGs	Preliminary Remediation Goals
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RE	Risk Evaluation
RFI	RCRA Facility Investigation
SSLs	soil screening levels
SVE	soil vapor extraction
SWMUs	solid waste management units
TFA	Tank Farm Area
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOCs	volatile organic compounds
WAC	Wisconsin Administrative Code
WDNR	Wisconsin Department of Natural Resources

## 1.0 INTRODUCTION

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This document presents the *Corrective Measures Implementation (CMI) Report* for the PPG Industries, Inc. (PPG), Oak Creek Facility located in Oak Creek, Wisconsin.

Until June 2004, PPG held a Resource Conservation and Recovery Act (RCRA) operating permit at the Company's Oak Creek, Wisconsin facility. The facility was constructed between 1973 and 1975, and construction was completed in December 1975. The RCRA permit was issued to PPG on March 31, 1992 with an effective date of May 4, 1992 (USEPA ID WID 059972935). Corrective action provisions of the Federal permit require PPG to implement corrective measures at identified solid waste management units (SWMUs), where necessary. In August 1997, PPG submitted a comprehensive *RCRA Facility Investigation (RFI) Report* (ICF Kaiser, 1997) that presented the results of the investigation and assessment of human health and ecological risks that identified three of ten SWMUs that required further action. One SWMU (SWMU 17, secondary containment for the above-ground tanks in the Former Tank Farm Area [TFA]) was removed in 1996 in order to install new aboveground storage tanks. Two remaining SWMUs (SWMU 8 - three 15,000-gallon above-ground DCS accumulation tanks and SWMU 18 - a 3,770-gallon concrete underdrain sump) within the Former TFA were addressed in the RFI Risk Assessment, but required further action that included underground storage tank (UST) closure.

In July 1998, the United States Environmental Protection Agency (USEPA) granted conditional approval of the RFI Report. The condition of the approval was that PPG initiate corrective measures by proceeding with the closure of the Former TFA in accordance with applicable Wisconsin UST closure guidance and implement a presumptive soil vapor extraction (SVE) remedy. In February/March 1999, PPG removed 23 of the 40 USTs and closed the remaining 17 USTs in place with Wisconsin Department of Commerce approval.

PPG implemented a presumptive remedy of SVE combined with air sparging (AS) of groundwater to reduce the levels of soil and groundwater contamination thereby stabilizing the Former TFA. PPG prepared and submitted a *CMS Presumptive Remedy Implementation Report* (IT Corp, 1999b) in November, 1999 where a process for integrating the SVE Interim Measure to a site Corrective Measure was specified. The process consisted of setting Preliminary Remediation Goals (PRGs) and developing a contingency plan should the PRGs not be achieved by the Interim Measure. Going forward in this report, target cleanup goals (TCG) will be used to refer to PRGs. The contingency plan outlined in the *CMS Presumptive Remedy Implementation Report* (IT Corp, 1999b) involved a risk assessment of residual concentrations.

At the end of the 18-month interim measure, a target compliance/confirmatory sample event was conducted (in January 2001) to confirm results of the presumptive SVE remedy. Only three of

the constituents, measured during the January 2001 confirmatory sampling event, had maximum concentrations that exceeded clean-up criteria (identified as the Federal Maximum Contaminant Levels [MCLs] in the CSM).

## **1.1 REPORT PURPOSE**

Consistent with the Corrective action provisions of the facility's closed RCRA permit, the purpose of this report is to document that the project was completed according to design specifications and requirements detailed in the *CMS Presumptive Remedy Implementation Report* (IT Corp, 1999b). This report presents details on construction and implementation of the presumptive remedy and its performance with respect to achieving the specified cleanup goals.

## **1.2 REPORT ORGANIZATION**

This report is organized into the following sections:

- Section 1.0 Introduction
- Section 2.0 Background
- Section 3.0 Corrective Measures
- Section 4.0 Recent Facility Monitoring
- Section 5.0 Conclusions
- Section 6.0 Recommendations
- Section 7.0 References

## **2.0 BACKGROUND**

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This section of the report provides a physical description of the Former TFA, a discussion of the applicable regulatory framework, a summary of previous investigations and information regarding the impacted media.

### **2.1 SITE AND TANK FARM AREA DESCRIPTION**

The Oak Creek Facility is located at 10800 South 13th Street in Oak Creek, Wisconsin approximately five miles west of Lake Michigan (see Figure 2-1). The facility covers approximately 51 acres. The major components of the PPG Oak Creek Facility include a resin plant, a paint production plant, a Former TFA, and a former impoundment basin. Administrative buildings, laboratories, raw materials and finished goods warehouses are also located at the site. A railroad spur is present in the southeast quadrant of the site and leading to the Raw Material Warehouse.

The Former TFA is located in the southeastern portion of the site. The historical use of this area was for bulk solvent, organic acid and raw material storage. The Former TFA contained both USTs and above ground storage tanks (ASTs), all of which have been closed in accordance with WDNR regulations. A railroad spur runs along the north side of the Former TFA and is used for limited resin plant loading operations. Two SWMUs are currently associated with the Former TFA—SWMUs 8 and 18. These SWMUs are summarized below:

- SWMU 8 contains three 15,000-gallon ASTs. Two of these ASTs are used to contain spent paint-related solvents and the third is used to contain spent resin solvent. The ASTs are surrounded by concrete secondary containment, and releases and some staining have been reported in the past from these ASTs.
- SWMU 18 consists of a 3,770-gallon concrete underdrain sump for the Former TFA. The sump collects groundwater and surface water infiltration from the area around the former USTs.

### **2.2 REGULATORY FRAMEWORK**

The PPG Oak Creek Facility is subject to the regulations promulgated under RCRA. On March 31, 1992 the USEPA issued a RCRA Permit (EPA ID WID 059972935) to the Oak Creek Facility. This permit contained a requirement for conducting a RFI at 10 SWMUs. With USEPA's approval of the RFI Report, all corrective action requirements were met for 8 of the 10 SWMUs. The two remaining SWMUs, listed above (Nos. 8 and 18), represent the Former TFA and were the focus of the presumptive remedy implementation.

The Former TFA was also subject to federal and state regulations regarding USTs. In order to meet the UST regulations, PPG elected to take the USTs out of service and either remove or close them in place. This work was completed in the spring of 1999. The facility RCRA permit was closed on June 30, 2004 (see discussion in Section 2.4).

### **2.3 PREVIOUS INVESTIGATIONS AT THE TANK FARM AREA**

Sixteen investigations have been conducted at the Oak Creek Facility. All of these investigations have provided information on the Former TFA. Table 2-1 summarizes each of the previous investigations. A detailed account of most of these investigations is included in the RFI Report (ICF Kaiser, 1997). These investigations have indicated that former operations impacted soil and groundwater in the Former TFA.

### **2.4 CURRENT SITE CONDITONS**

Air sparging wells and associated piping have remained in place at the Former TFA since completion of the 18 month interim measure period. PPG has monitored ground water quality in the area semi-annually since the beginning of 2004. Results of that monitoring will be discussed in subsequent sections of this report.

As a result of facility operational changes, PPG did not renew the RCRA permit for the facility and received closure notice for the permit on June 30, 2004. However, regulatory authority over the corrective action in the Former TFA is maintained by USEPA pending acceptance of final documentation of its success.

Other site conditions remain as previously described in reports and documents previously submitted.

**Table 2-1**

**Summary of Previous Investigations  
PPG Industries, Inc., Oak Creek, Wisconsin**

<b>Company</b>	<b>Date</b>	<b>Description</b>
Layne Western Company, Inc.	1973	Construction Geotechnical Borings
Warzyn Engineering, Inc.	October, 1981	Soil Borings and Samples
Geraghty and Miller	June, 1986	Soil Vapor Survey
OHM	October, 1987	Soil Boring Study
Geraghty and Miller	December, 1987	Groundwater Study
PPG Industries, Inc.	December, 1988 through December, 1991	Tank Farm Sump Analysis
Geraghty and Miller	August 1998 through December 1991	Quarterly Groundwater Sampling
Warzyn Engineering, Inc.	June, 1992	Soil and Groundwater Assessment Report
PPG Industries, Inc.	1992	UST Leak Detection Program
Warzyn Engineering, Inc.	January, 1994	RFI Project Management Plan
Warzyn Engineering, Inc.	1995	Test Borings
ICF Kaiser Engineers, Inc.	July 31, 1997	RFI Report
IT Corporation	January, 1999	Conceptual Design, Groundwater and Soil Remediation System, Tank Farm Area
IT Corporation	November, 1999	CMS Presumptive Remedy Implementation Report
IT Corporation	May 9, 2001	Risk Evaluation Work Plan
Shaw Environmental & Infrastructure	March 28, 2003	Risk Evaluation of Tank Farm Area

## **3.0 CORRECTIVE MEASURES**

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### **3.1 PRESUMPTIVE REMEDY – SOIL VAPOR EXTRACTION/AIR SPARGING**

PPG implemented a presumptive remedy of SVE combined with AS of groundwater as an interim remedy to reduce levels of soil and groundwater impacts, thereby stabilizing the Former TFA. PPG prepared and submitted a CMS Presumptive Remedy Implementation Report in November, 1999 where a process for integrating the SVE Interim Measure to a site Corrective Measure was specified. The process consisted of setting PRGs and developing a contingency plan should the PRGs not be achieved by the Interim Measure. The contingency plan outlined in the CMS Presumptive Remedy Implementation Report involved a risk assessment of residual concentrations, if any.

#### **3.1.1 Target Cleanup Goals**

As discussed in the *CMS Presumptive Remedy Implementation Report*, Corrective Action Indicators CA 725 (Current Human Health Exposures Under Control) and CA 750 (Migration of Contaminated Groundwater Under Control), established as milestones for this site by USEPA, have already been met. PPG's long-term objective is to ensure that constituents in the Former TFA are at levels that are protective of human health and the environment under future, as well as current land use scenarios (i.e., with or without the tank farm under drain system in operation). To optimize the potential to achieve this objective, PPG established TCGs for the presumptive remedy interim measure. The target goals were conservative and, if met, would ensure that potential future risks were within an acceptable range. In the event that the target goals were not met, PPG was prepared to assess the risks based on residual concentrations achieved, and if necessary, evaluate contingency measures to address unacceptable risks. This analysis forms the basis of incorporating the interim measure into the overall corrective measures implementation process which is further discussed in Section 5.0.

The RFI Report (ICF Kaiser, 1997) identified the following seven volatile organic compounds (VOCs) for which at least one sample exceeded initial screening levels (USEPA soil screening levels or Region V Data Quality Levels): xylenes, toluene, ethylbenzene, styrene, methylene chloride, 1,1,2,2-tetrachloroethane, and tetrachloroethylene. However, the vast majority of exceedances involved xylenes, toluene, and ethylbenzene, consistent with the storage tank inventory. Accordingly, PPG set target soil cleanup goals for these three compounds recognizing that the other more sporadically detected compounds will be reduced along with the three compounds targeted. Table 3-1 presents the TCGs which are based on Wisconsin generic residual soil contaminant levels (Wisconsin Administrative Code (WAC) NR 720.09).

**Table 3-1  
Soil Target Cleanup Goals**

Constituent	mg/kg
Xylenes	4.1
Toluene	1.5
Ethylbenzene	2.9

NOTE: Soil TCGs Derived from Table 1 Baseline Concentrations, Dilution Attenuation Factors, and Residual Contaminant Levels based on Protection of Groundwater, WAC, Chapter NR720.09.

The TCGs for groundwater were conservatively based on Federal MCLs. Similar to the soil target levels, achieving MCLs would ensure acceptable risks under future land use scenarios. Contingency measures would be considered should a post-presumptive remedy risk assessment suggest they are warranted if the target levels are not met. Table 3-2 presents the TCGs for groundwater.

**Table 3-2  
Groundwater Target Cleanup Goals**

Constituent	mg/L
Benzene	0.005
Ethylbenzene	0.7
Toluene	1.0
Xylene	10.0
Styrene	0.1
Methylene chloride	0.005
1,1,2,2-tetrachloroethane	0.0005
Tetrachloroethylene	0.005

NOTE: TCGs Based on Federal MCLs.

### **3.1.2 System Operations**

#### **3.1.2.1 SVE Pilot Test**

The pilot test was conducted in February 1999. A 5-horsepower blower was utilized to draw vapor from 40 feet of slotted polyvinyl chloride (PVC) pipe buried to a depth of approximately 6 feet. The recovered vapors were treated in a carbon adsorber. The test was initially conducted without a surface covering. Data collected periodically included: Recovered vapor VOC concentration and flowrate, vacuum readings at the SVE blower and recovery trench, and



vacuum readings at piezometers located approximately 10, 20, and 30 feet from the extraction trench.

The area around the recovery trench was then covered with polyethylene sheeting to simulate the use of a non-permeable surface covering. However, various surface structures not yet removed from the area, such as vent pipes and concrete pump blocks, impeded efforts at obtaining an adequate air seal.

The pilot test report was previously submitted and is included in Appendix A of the *Corrective Measures Study (CMS) Presumptive Remedy Implementation Report* (IT Corporation, 1999) for this site. The following conclusions and recommendations were obtained from the pilot test:

- At a depth of approximately 6 feet, the slotted vapor recovery piping was installed in soil observed to contain significant VOC impact. This was observed in the trench excavated for the pilot test as well as soil excavated during UST removal activities.
- The soil on site is very homogenous and permeable from the surface to a depth of at least 12 feet.
- Based on the soil type and nature and location of VOC impact (as well as photoionization detector [PID] readings recorded during testing), it appeared that the SVE system would be very effective in recovering VOCs from the subsurface.
- The placement of a polyethylene liner (which, as explained above, did not provide an adequate seal) increased the vacuum at the blower by 10 percent and doubled the vacuum influence at the piezometer located 20 feet from the recovery trench.
- Significant short-circuiting of air from the surface was expected based on visual inspection of the soil and was observed during the testing. Very high air flowrates and relatively low vacuums at the blower (in conjunction with relatively low vacuums at the vapor monitoring points) indicate that air from the surface was influencing the test. Additionally, the relatively fast decrease in the PID readings indicates that air from the surface may have been diluting the recovered air stream. Another factor indicating that short-circuiting was occurring was the rapid rise in the vacuum at the end of the screen and at the closest piezometer and then the reduction or leveling off of these values during the second phase of the pilot test. This seems to indicate that the surface cover had an effect initially, but that effect was reduced as surface air from around the perimeter of the liner was pulled into the subsurface. Based on the visual observations and test data, an impermeable surface covering was recommended.

### **3.1.2.2 SVE System**

Based on data obtained from the pilot test, the design of the full-scale SVE system was finalized. The system consisted of approximately 600 feet of slotted, 2-inch diameter PVC pipe buried to a depth of 6 feet. The locations of the slotted pipe were based on an area of influence of approximately 30 feet on each side of the pipes and taking into account site surface and

underground obstructions. Due to the potential for loss of vacuum along a run of slotted pipe, the maximum length of a run of slotted pipe was 50 feet. Each run of slotted pipe was connected to solid, 2-inch diameter PVC pipe. The solid pipe was manifolded together into four branches—SVE-1, SVE-2, SVE-3, and SVE-4, which were run to the remediation building as illustrated in Figure 3-1.

A 10 horsepower, Roots Series 59 positive displacement blower (part of the Carbonair Environmental System, Inc. integrated SVE system) was utilized to draw vapors from the subsurface via the underground piping network. The blower was operated to recover approximately 250 cubic feet per minute (cfm) of vapors at a vacuum of 25 inches of water (iw).

From the underground piping, the vapor stream was transferred into a pipe manifold inside the remediation building. The vacuum on each of the 4 legs (SVE-1, SVE-2, SVE-3, and SVE-4) of the manifold and header pipe were measured; valves located on each branch controlled air flow. From the manifold, the vapor passed through a 100-gallon knockout tank. There, any water recovered with the vapor was separated from the vapor stream and stored. The SVE blower would shut down when the water level in the knockout tank reached a preset high level. A differential pressure indicator measured drop in the vacuum across the knock out tank. If this value was observed to be increasing it would indicate a block in the mist eliminator installed near the tank outlet.

After passing through the knockout tank, vapor entered the blower and was discharged. A meter at the blower discharge indicated vapor flow rate. The air then entered a catalytic oxidizer for destruction of VOCs. This was accomplished by passing vapors across a heated catalyst. When VOC concentrations were high, the heat created by destruction of VOCs was sufficient to maintain catalyst temperature. As VOC concentrations decreased, an electric heater was utilized to maintain catalyst temperature. Three thermocouples measured temperature at various locations in the oxidizer. If the temperatures were below the set point, the heater was automatically started; if the temperatures were above the set point, an automatic dilution valve (installed on the suction side of the SVE blower) was opened. This allowed ambient air to be drawn into the oxidizer, reducing VOC concentration of the inlet stream, thereby cooling the catalyst bed. If temperatures reached a high or low alarm condition, the oxidizer and SVE blower were automatically shut down. Temperature set points on the oxidizer were as follows:

- Vapor temperature entering catalyst: Set point – 330 degrees Celsius (°C), Low alarm – 270 °C, High alarm – 505
- Vapor temperature exiting catalyst: Set point – 600°C, Low alarm – 305°C, High alarm – 620°C  
Vapor temperature in catalyst: Set point – 580°C, High alarm - 600°C.

After being treated in the oxidizer, the vapor was discharged to the atmosphere. A process flow diagram of the SVE system is presented in Figure 3-3.

### **3.1.2.3 Air Sparging System**

Groundwater and saturated soils were remediated via an air sparging system. This system was designed to volatilize VOCs from groundwater as well as promote increased biodegradation of VOCs via introduction of oxygen to the subsurface. To maximize the radius of influence of the air sparging wells and to increase the saturated zone in which biodegradation is effective, groundwater in the Former TFA was allowed to rise. The groundwater level was controlled by the existing underdrain system to maintain the groundwater at the highest level which does not induce a groundwater gradient radially outward from the Former TFA or jeopardize the performance of the SVE system.

Based on the coarse nature and thickness of the Former TFA backfill, a radius of influence of approximately 20 feet was estimated for the sparging wells; therefore, 25 sparging wells were required. Wells were 2 inches in diameter and were installed to the bottom of the Former TFA backfill with 2 feet of slotted PVC screen. A total of approximately 1,250 feet of air sparging piping was installed. At each wellhead, a pressure indicator and ball valve were installed in a 2-foot by 2-foot steel manway.

Sparging of the site groundwater was accomplished by injecting pressurized air into the sparging wells. A 15-horsepower rotary vane compressor transferred pressurized air through an air-to-air heat exchanger (the air at the compressor discharge was too hot for the downstream PVC piping and the microorganisms present in the subsurface) to the sparging wells. The sparging wells were divided into three groups—Sparge I, Sparge II, and Sparge III. Wells were grouped as follows:

- Sparge I – AS-1 through AS-5, AS-10, and AS-15
- Sparge II – AS-6 through AS-9 and AS-11 through AS-14
- Sparge III – AS-16 through AS-23.

Well locations are shown in Figure 3-2. Air was injected into each group of wells for 4 to 6 hours out of every day. Solenoid valves, operated by timers, on the header pipes to each group of wells controlled the direction of the air flow.

During injection to a particular group of wells, the primary remedial mechanism was volatilization. During periods between injections, the primary remedial mechanism was biodegradation. As more volatile compounds were removed, the primary purpose of the air

sparging system was to provide oxygen for additional biodegradation. The intermittent injection also allowed new flowpaths to be created when injection to a particular group of wells was restarted. Optimum injection pressures, flowrates, and cycles were established during start-up activities. Figure 3-2 presents the layout of the air sparging wells and piping. A process flow diagram, showing major equipment and controls is presented in Figure 3-3.

#### **3.1.2.4 Controls**

One control panel was utilized to operate both the SVE and air sparging systems. The catalytic oxidizer was provided with its own control panel. Because the environment inside the remediation building was considered to be Class I, Division I, the panel was mounted on the outside of the building. The control panel contained the following:

- Hand/Off/Auto switches, run lights, and hour meters for the SVE blower, air compressor, and solenoid valves.
- Relays and/or software required for the following interlocks: Shut the air sparge system down for high temperature at the heat exchanger discharge, low pressure at the air compressor discharge, shut down of the SVE system, or shut down of the catalytic oxidizer; shut down of the SVE system for low or high vacuum at the blower inlet, high liquid level in the knock-out tank, or shut down of the catalytic oxidizer.
- An autodialer to notify IT/Shaw office locations of a system shut down.

#### **3.1.2.5 Site Preparation and SVE System Startup**

A permanent underdrain system was in place in the Former TFA during the corrective measures implementation period, and remains in place to this date. The underdrain system consists of a network of 6-inch diameter perforated and non-perforated tile pipes. The pipes are located on the north and south ends of each UST foundation pad at the depth of the pads. The sump in which the water is collected is constructed of concrete. Its interior dimensions are 4 feet-by-6 feet and the total depth is approximately 21 feet. The top of the sump is at an elevation approximately equal to the elevation of the ground surface of the Former TFA.

After completion of the SVE/AS underground piping and wellhead installation, soil on the east side of the secondary containment was graded to drain to the catch basin in the southeast corner of the Former TFA. Soil on the west side was graded to drain to the far west end of the Former TFA where rainwater would percolate into the soil.

The impermeable surface liner system was then placed over the Former TFA. The system consisted of a 16-mil layer of polyethylene, which was protected from tearing by a layer of geotextile fabric and a layer of 1-inch bank run stone approximately 4 inches thick. Edges of the

liner system were not sealed along the secondary containment, the boundaries of the Former TFA, and the sparging well manways. This was done to allow a limited amount of moisture and air to enter the soil to promote air movement in the subsurface and to enhance biodegradation of VOCs in the soil.

The remediation system components, with the exception of the underground piping and the catalytic oxidizer, were installed inside a remediation building. The wooden building, on a steel base, was 8 feet wide and 14 feet long. All electrical components inside the building, including lighting, heating and ventilation fans, were suitable for use in a Class 1, Division 1 environment.

During the week of May 15, 1999, the remediation building and catalytic oxidizer were received on site and set in place near the southeast corner of the Former TFA. Connections from the underground piping to the system inlet manifolds were completed. The catalytic oxidizer was also piped to the SVE blower discharge. After piping was completed, it was observed that not all equipment within the treatment building was certified for use in a Class 1, Division 1 environment.

During the week of June 22, 1999, after upgrading all equipment to meet Class 1, Division 1 criteria, the SVE/AS system was started. The SVE system was operated initially with the air sparge system off to prevent system shutdowns caused by high VOC content vapor (caused by volatilization via sparging) entering the oxidizer.

#### **3.1.2.6 Operation and Maintenance**

Site monitoring during SVE operations included inspection of the SVE system and measurement of soil gas composition. An operation and maintenance (O&M) data sheet was completed during each site visit. The following readings were recorded on the checklist: overall vacuum created by the SVE system and the vacuum created at each leg of the SVE manifold (SVE-1, SVE-2, SVE-3, SVE-4); PID readings of the overall influent, effluent, and the influent from each SVE branch; SVE flowrate; temperature readings in the oxidizer; pressure, flowrate, temperature and operational hours of the air sparge system; and pressure at each sparge well. The field screening data of soil gas collected during SVE operations are summarized in Table 3-3. These data are shown graphically in Figure 3-5.

Site O&M visits were conducted every two weeks for the first three months of operation and monthly thereafter. Additional site visits were conducted upon notification of system alarm conditions. During O&M visits, Shaw personnel ensured proper system operation, performed scheduled maintenance on the remediation equipment, recorded system data such as air flow,

**Table 3-3**

**Soil Gas Field Screening Data  
PPG Industries, Inc., Oak Creek, Wisconsin  
(all results in ppm)**

Date	Influent	Effluent	SVE-1	SVE-2	SVE-3	SVE-4
7/8/1999	260					
7/12/1999	260					
7/23/1999	240					
8/4/1999	195					
8/20/1999	132					
8/29/1999	170					
9/17/1999	130					
9/24/1999	160					
10/1/1999	110					
10/5/1999	118		121	130	118	128
10/21/1999	150		165	170	140	150
11/2/1999	135					
11/12/1999	145					
11/29/1999	150					
12/7/1999	84					
12/21/1999	75					
1/11/2000	105	4	30	85	65	60
2/11/2000	104					
2/25/2000	110					
3/10/2000	96					
4/11/2000	72		35	54	48	50
4/24/2000	78					
5/10/2000	84					
5/15/2000	55					
5/22/2000	57					
6/7/2000	48					
7/5/2000	34					
7/10/2000	57					
8/22/2000	45					
8/24/2000	51					
9/1/2000	7					
9/11/2000	51					
9/27/2000	37					
10/6/2000	15	0	18	13	9	16
10/13/2000	13					
11/10/2000	11					
12/4/2000	8					
12/8/2000	10.5	0	13.5	11.2	6	10
1/9/2001	7					

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VOC concentration, vacuum, and pressure readings, recorded water levels in the site monitoring wells and the sump, and made any necessary repairs. Data obtained during O&M visits were utilized to optimize system operation and to estimate VOC removal rates.

Routine maintenance was also performed during the O&M visits in accordance with the manufacturer's data sheets for each piece of equipment. Additionally, system piping was periodically inspected for leaks and debris in the Former TFA was periodically removed.

### **3.1.2.7 Baseline, Progress Monitoring, and Post-Remediation Sampling**

A sampling plan was developed to establish baseline conditions in soil and groundwater in the TFA, and to gauge the progress of the remediation system operations. The sampling plan established a protocol for soil, groundwater, and air sample analysis. Sampling and analysis requirements for soil, groundwater, and air samples are summarized in Table 3-4.

Prior to start-up of the remediation system, groundwater samples were collected from the four monitoring wells in the Former TFA (TF- 1 through TF-4) as well as from the drainage system sump, and laboratory-analyzed for VOCs by USEPA Method 8260. These data served as baseline values for determination of remedial progress. After system start-up, samples from the four monitoring wells and sump were collected on October 5, 1999; January 11, 2000; April 11, 2000; October 6, 2000; and December 8, 2000. The samples were analyzed for VOCs utilizing the same method to evaluate remedial progress. Table 3-5 presents a summary of the analytical results collected from TFA monitoring wells prior to and during the operation of the remediation system. Appendix B contains the analytical laboratory reports.

Also, at system start-up, a minimum of one set of influent and effluent air stream samples was collected and laboratory-analyzed for VOCs by USEPA Method TO-14. During system operation, influent and effluent air samples were collected concurrent with groundwater samples and analyzed for VOCs by the same method. Additionally, as part of each O&M visit, the VOC concentrations of the influent and effluent streams were measured using a PID. The VOC concentration data were utilized to determine VOC removal rates and treatment system efficiency. Table 3-6 presents a summary of the air analytical results collected from the TFA prior to and during operations of the remediation system. Appendix B contains the analytical laboratory reports.

When it was determined, based on VOC removal rates and groundwater sampling results, that remediation was essentially complete, confirmatory soil and groundwater samples were

Table 3-4

**Summary of Sampling and Analysis Requirements  
PPG Industries, Inc., Oak Creek, Wisconsin**

Sample Location	Analytical Parameter	Method	Container	Preservative	Comments
<b>Groundwater Samples</b>					
1,2,3, 4,5, 6,7,8	TF-1, TF-2, TF-3, TF-4, SUMP, SB-10, SB-11, SB-12	VOCs	SW-846 8260	2 x 40ml voa	HCl, ice
9	TB (for VOCs only)	VOCs	SW-846 8260	2 x 40ml voa	HCl, ice
<b>Soil Samples</b>					
7, 8, 9, 10, 11, 12, 13	SB-6, SB-7, SB-8, SB-9, SB-10, SB-11, SB-12, SB-13, SB-14 SB-14 (dup)	VOCs	SW-846 8260B/ 5030B	3 x Encore® Purge and Trap Samplers, 1 x 4 oz. jar	ice
14	TB (for VOCs only)	VOCs	SW-846 8260	2 x 40 ml voa	HCl, ice
<b>Soil Gas Samples</b>					
16	SVE-1, SVE-2, SVE-3, SVE-4, Overall Influent Effluent	VOCs	TO-14	1 L Summa	None

*Notes:* Groundwater from wells will be purged and sampled using polyethylene bailers.

Sample will be collected only if a sufficient volume can be retrieved due to limited well recharge.



Table 3-5

**Summary of Groundwater Analytical Results for TFA Monitoring Wells During SVE/AS Operation**  
**PPG Industries, Inc., Oak Creek, Wisconsin**  
 (analytical results in mg/L)

Sample Location	Date	Benzene	Ethyl-benzene	Toluene	Total Xylenes	MIBK (a)	Methylene Chloride	MEK (b)	Styrene	1,1,2,2-Tetra-chloroethane	Tetra-chloroethene
TF-1	12/08/00	ND 0.005	ND 0.005	ND 0.005	ND 0.005	0.01	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	10/6/2000	ND 0.005	0.05	ND 0.005	0.042	ND 0.01	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	4/11/2000	ND 0.005 (c)	ND 0.005	ND 0.005	ND 0.005	ND 0.01	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	01/11/00	ND 0.005	ND 0.005	ND 0.005	ND 0.005	ND 0.01	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	10/05/99	ND 0.005	0.016	ND 0.005	0.013	0.013	ND 0.005	ND 0.10	ND 0.005	ND 0.005	ND 0.005
	05/18/99	0.0064	0.11	0.029	0.33	0.57	ND 0.005	ND 0.10	ND 0.10	ND 0.001	ND 0.005
TF-2	12/08/00	ND 0.005	0.43	ND 0.005	0.063	ND 0.01	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	10/06/00	ND 0.005	2.3	ND 0.005	6.8	ND 0.01	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	4/11/2000	ND 0.005	0.7	ND 0.005	0.719	0.008	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	01/11/00	ND 0.005	3.6	0.006	7.9	0.041	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	10/05/99	ND 0.50	4.5	ND 0.50	16	1.8	ND 0.50	1.8	ND 0.50	ND 0.50	ND 0.50
	05/18/99	ND 0.50	7.1	1.9	32	5.0	ND 0.05	1.1	ND 1.0	ND 0.01	ND 0.05
TF-3	12/08/00	ND 0.005	ND 0.005	0.021	0.178	ND 0.01	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	10/06/00	ND 0.005	0.009	ND 0.005	ND 0.005	ND 0.01	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	4/11/2000	ND 0.005	0.620	0.180	3.76	0.068	ND 0.005	0.017	ND 0.005	ND 0.0005	ND 0.0005
	01/11/00	ND 0.005	0.058	0.036	0.216	0.031	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	10/05/99	ND 0.005	0.028	0.009	0.12	0.18	ND 0.005	ND 0.10	ND 0.005	ND 0.005	ND 0.005
	05/18/99	0.0058	0.34	0.73	4.6	2.3	ND 0.005	0.22	ND 0.10	ND 0.001	ND 0.005
TF-4	12/08/00	ND 0.005	0.15	ND 0.005	0.032	ND 0.01	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	10/06/00	ND 0.005	0.400	ND 0.005	0.138	ND 0.01	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	4/11/2000	ND 0.005	0.23	ND 0.005	0.010	ND 0.01	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	01/11/00	ND 0.005	0.55	ND 0.005	0.172	ND 0.01	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	10/05/99	ND 0.50	9.8	ND 0.50	5.0	ND 1.0	ND 0.50	ND 1.0	ND 0.50	ND 0.50	ND 0.50
	05/18/99	ND 0.50	9.6	ND 0.50	5.4	ND 10	ND 0.50	ND 10	ND 10	ND 0.10	ND 0.50
Sump	12/08/00	ND 0.005	0.032	0.01	0.112	0.049	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	10/06/00	ND 0.005	0.092	0.028	0.350	0.48	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	4/11/2000	ND 0.005	0.130	0.053	0.840	1.3	ND 0.50	ND 1.0	ND 0.05	ND 0.005	ND 0.005
	01/11/00	ND 0.005	0.035	0.044	0.287	0.10	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
	10/05/99	ND 0.50	1.7	2.5	6.1	49	ND 0.50	ND 10	ND 0.50	ND 0.50	ND 0.50
	05/18/99	ND 0.50	5.8	2.1	6.3	38	ND 0.50	ND 10	ND 10	ND 0.10	ND 0.50
PRG (d)		<b>0.005</b>	<b>0.7</b>	<b>1.0</b>	<b>10.0</b>	<b>1.8</b>	<b>0.005</b>	<b>2.5</b>	<b>0.1</b>	<b>0.0005</b>	<b>0.005</b>

## Notes:

Data above PRGs are in bold type.

(a) MIBK - 4-Methyl-2-pentanone.

(b) MEK - Methyl ethyl ketone.

(c) NDXXX - Parameter not detected at indicated reporting limit.

(d) Preliminary Remediation Goals (Table 4-3 of the CMS).

Table 3-6

Summary of Air Analytical Results  
 PPG Industries, Inc., Oak Creek, Wisconsin  
 (analytical results in ppm (v/v))

Sample Location	Date	Toluene	Ethylbenzene	m-Xylene/p-Xylene	o-Xylene	Styrene	Methylene Chloride	Chloromethane	1,2,4-Tri methylbenzene	1,3,5-Tri methylbenzene	Dichloro difluoromethane	Trichloroethene	Total VOCs
SVE-1	12/08/00	0.9	2.4	3.3	1.1	4.9	ND .046	ND .12	0.14	0.25	ND .046	0.51	13.5
	10/06/00	1.4	3.0	7.5	3.1	7.6	ND 0.077	ND 0.190	0.25	0.38	ND 0.077		23.2
	04/11/00	7.1	6.0	19	5.7	14	ND 0.45 (a)	ND 1.1	ND 0.45	ND 0.45	ND 0.45		51.8
	01/11/00	12	6.7	29	7.6	10	ND 0.21	ND 0.53	ND 0.42	ND 0.31	ND 0.21		65.3
	10/05/99	28	40	150	45	51	ND 2.0	ND 5.0	2.1	ND 2.0	ND 2.0		316.1
	06/23/99	320	150	990	170	16	ND 7.9	ND 20	ND 7.9	ND 7.9	ND 7.9		1646.0
SVE-2	12/08/00	1.3	1.4	5.5	2.2	1.8	ND .052	ND .130	0.21	0.29	ND .052	ND .052	12.7
	10/06/00	2.4	1.6	9.3	4	0.97	ND 0.11	ND 0.28	0.26	0.41	ND 0.11		18.9
	04/11/00	14	7.9	47	14	ND 0.69	ND 0.69	ND 1.7	0.88	0.75	ND 0.69		84.5
	01/11/00	51	14	89	24	ND 0.69	ND 0.69	ND 1.7	1.1	0.9	ND 0.69		180.0
	10/05/99	68	29	140	43	2.7	ND 1.9	ND 4.9	2.7	2.4	ND 1.9		287.8
	06/23/99	72	39	210	36	2.2	2.3	ND 3.9	2.1	ND 1.6	ND 1.6		363.6
SVE-3	12/08/00	0.16	0.34	2.4	0.74	0.32	ND .045	ND .110	0.21	0.29	ND .045	ND .045	4.5
	10/06/00	1.3	1.7	5.2	1.7	2.2	ND 0.039	ND 0.096	0.19	0.27	ND 0.039		12.6
	04/11/00	1.2	2.2	10	3.0	0.62	ND 0.35	ND 0.87	0.77	0.58	ND 0.35		18.4
	01/11/00	2.9	4.3	21	5.6	0.56	ND 0.35	ND 0.87	1.1	0.9	ND 0.35		36.4
	10/05/99	19	28	120	29	2.7	ND 1.9	ND 4.9	3.4	4.1	ND 1.9		206.2
	06/23/99	170	98	380	62	ND 6.6	ND 6.6	ND 16	ND 6.6	ND 6.6	ND 6.6		710.0
SVE-4	12/08/00	0.39	0.95	2.4	1	2.6	ND .038	ND .094	0.39	0.56	ND .038	ND .038	8.3
	10/06/00	2.3	1.2	8.9	2.8	2.3	ND 0.079	ND 0.2	0.71	1	ND 0.079		19.2
	04/11/00	9.2	3.0	28	4.8	ND 0.67	ND 0.67	ND 1.7	1.2	1.4	ND 0.67		47.6
	01/11/00	5.9	2.1	13	2.5	ND 0.15	ND 0.15	ND 0.39	1.3	2.0	ND 0.15		26.8
	10/05/99	9.7	5.4	36	6.7	ND 0.5	ND 0.5	ND 1.3	2.1	3.6	ND 0.5		63.5
	06/23/99	130	69	140	25	ND 1.7	ND 1.7	ND 4.2	3.1	2.2	2.2		371.5
Overall Influent	12/08/00	0.79	1.3	4.1	1.6	2.5	ND 0.046	ND 0.12	0.26	0.36	ND 0.046	ND .046	10.9
	10/06/00	1.6	1.4	6.4	2.4	2.6	0.12	ND 0.20	0.37	0.54	ND 0.08		15.4
	04/11/00	8.5	5.0	28	8.8	4.0	ND 0.68	ND 1.7	1.0	1.0	ND 0.68		56.3
	01/11/00	26	8.2	51	15	3.7	ND 0.35	ND 0.87	1.4	1.5	ND 0.35		106.8
	10/05/99	32	23	120	34	12	ND 2.0	ND 4.9	2.8	2.9	ND 2.0		226.7
	06/23/99	110	22	63	8.6	ND 1.7	ND 1.7	ND 4.4	ND 1.7	ND 1.7	ND 1.7		203.6
Overall Effluent	12/08/00	0.00056	0.00053	0.0012	0.00042	0.00048	ND .00039	ND .00098	ND .00039	ND .00039	0.00044	ND .00039	0.0036
	10/06/00	0.0004	0.00043	0.0021	0.0008	0.0011	ND .00038	ND .00094	ND .00038	ND .00038	ND .00038		0.005
	04/11/00	0.002	0.003	0.018	0.007	0.005	0.0007	ND 0.0009	0.002	0.002	ND 0.0004		0.040
	01/11/00	0.003	0.002	0.011	0.003	0.001	0.0007	ND 0.0004	0.0007	0.0008	ND 0.0004		0.022
	10/05/99	0.002	0.001	0.007	0.002	0.002	0.001	ND 0.0004	0.0006	ND 0.0004	ND 0.0004		0.016
	06/23/99	0.013	0.007	0.033	0.006	0.001	0.004	0.013	ND 0.0005	ND 0.0005	0.001		0.078

Notes:

Only parameters which were detected in at least one sample are reported in this table.

(a) NDXX - Parameter not detected at indicated reporting limit.

collected. Approximately 30 confirmatory soil samples were collected from 10 locations at multiple depths utilizing direct push sampling techniques. Twelve confirmatory groundwater samples were also collected. The samples collected were laboratory-analyzed for VOCs by USEPA Method 8260. Soil analytical and groundwater analytical sampling results were compared to the listed soil and groundwater TCGs to determine if remediation was complete. Confirmatory soil and groundwater sample results are summarized in Table 3-7 and Table 3-8, respectively. Figure 3-4 shows the locations of the confirmatory soil and groundwater samples. Appendix B contains the analytical laboratory reports for the confirmation samples.

### **3.1.3 VOCs Treated**

As expected, the type of soil in the Former TFA and the constituents of interest appeared to be well suited for remediation via soil vapor extraction and air sparging.

Design calculations showed that there was an estimated total of 8,226 pounds of VOCs in the Former TFA soils and 76 pounds of VOCs in groundwater contained within the area. Based on the operating parameters of the AS/SVE system, it was predicted that 18 months would be required to achieve the TCGs. In addition to volatilization, hydrocarbons were also likely biologically degraded *in-situ*.

Based on the influent VOC concentrations from each quarter's Summa canister results, biweekly system run time, and the biweekly flow rate of site gas to the catalytic oxidizer, approximately 6,900 pounds of VOCs were extracted from the site and destroyed during the corrective measures implementation period. VOC mass removal rates and totals are summarized in Table 3-9. Figure 3-6 graphically illustrates the total mass of VOCs removed during the operational period of the SVE/AS system.

### **3.1.4 SVE Operation and Performance**

Performance checks were conducted on June 23, 1999; October 5, 1999; January 11, 2000; April 11, 2000; October 6, 2000; and December 14, 2000 by collecting Summa canister samples of the overall influent and overall effluent and analyzing the gas for VOCs. VOC destruction efficiency was greater than 99.93 percent for all quarters, and greater than 99.96 percent during the final quarter.

All routine maintenance was performed without shutting down the SVE system. Routine maintenance of the SVE system during the operation period included lubrication of blower bearings and draining the knockout tank.

Tab. 7

**Summary of Confirmatory Soil Sample Analytical Results**  
**PPG Industries, Inc., Oak Creek, Wisconsin**  
(analytical results in mg/kg [ppm])

Sample Location	Date	Depth (feet bgs)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Styrene	Methylene Chloride	1,1,2,2-Tetrachloroethane	Tetrachloroethylene	MEK (a)	MIBK (b)
SB-1	June 2000	0 - 4	0.0011	0.029	5.7	66	ND 0.004 (a)	0.0012	ND 0.0009	0.0035	0.019	0.016
		4 - 8	ND 0.46	0.24	2.8	75	ND 0.46	ND 0.46	ND 0.09	ND 0.09	1.4	ND 0.91
SB-2	June 2000	0 - 4	0.0009	0.53	0.18	0.58	ND 0.004	ND 0.004	ND 0.0009	ND 0.0009	ND 0.089	0.014
		4 - 8	0.0007	0.0009	0.0007	0.0028	ND 0.004	ND 0.004	ND 0.0009	ND 0.0009	ND 0.091	ND 0.009
SB-3	June 2000	0 - 4	0.002	0.022	0.003	0.101	ND 0.005	0.0007	ND 0.0009	ND 0.0009	0.005	ND 0.009
		8 - 12	ND 0.004	ND 0.027	1.1	74	ND 0.004	0.002	ND 0.0009	ND 0.0009	0.048	5.2
SB-4	June 2000	0 - 4	ND 0.004	0.001	0.008	5.96	ND 0.004	0.001	ND 0.0008	ND 0.0008	ND 0.079	0.32
		4 - 8	ND 0.004	0.003	0.006	0.031	ND 0.004	ND 0.004	ND 0.0009	ND 0.0009	0.009	0.006
SB-5	June 2000	0 - 4	0.0006	0.001	0.0004	0.002	ND 0.004	0.0007	ND 0.0009	ND 0.0009	ND 0.088	ND 0.009
		8 - 12	0.001	0.002	ND 0.005	0.006	ND 0.005	0.001	0.0009	0.0009	0.004	ND 0.009
SB-6	January 2001	0 - 4	ND 0.004	0.005	ND 0.004	1.05	ND 0.004	ND 0.004	ND 0.0009	0.0082	ND 0.085	0.013
		4 - 8	ND 0.45	ND 0.45	0.89	308	ND 0.45	ND 0.45	ND 0.09	ND 0.09	ND 9.0	ND 0.9
SB-7	January 2001	0 - 4	ND 0.004	0.029	0.028	11.4	ND 0.004	ND 0.004	ND 0.0009	0.064	ND 0.086	0.019
		4 - 8	ND 0.49	68	78	730	ND 0.49	ND 0.49	ND 0.098	0.2	ND 9.8	ND 0.980
SB-8	January 2001	0 - 4	ND 0.004	ND 0.004	ND 0.004	ND 0.004	ND 0.004	ND 0.004	ND 0.0007	ND 0.0007	ND 0.074	ND 0.007
		8 - 12	ND 0.004	ND 0.004	ND 0.004	ND 0.004	ND 0.004	ND 0.004	ND 0.0008	ND 0.0008	ND 0.079	ND 0.008
SB-9	January 2001	0 - 4	ND 0.004	ND 0.004	0.029	ND 0.004	ND 0.004	ND 0.004	ND 0.0009	ND 0.0009	ND 0.087	ND 0.009
		4 - 8	ND 0.004	0.006	ND 0.004	ND 0.004	ND 0.004	ND 0.004	ND 0.0009	ND 0.0009	ND 0.087	ND 0.009
SB-10	January 2001	0 - 4	ND 0.004	ND 0.004	ND 0.004	ND 0.004	ND 0.004	ND 0.004	ND 0.0009	ND 0.0009	ND 0.086	ND 0.009
		8 - 12	ND 0.006	ND 0.006	ND 0.006	ND 0.006	ND 0.006	ND 0.006	ND 0.001	ND 0.001	ND 0.12	ND 0.012
SB-11	January 2001	0 - 4	ND 0.005	ND 0.005	ND 0.005	ND 0.005	ND 0.005	ND 0.005	ND 0.0009	ND 0.0009	ND 0.093	ND 0.009
		4 - 8	ND 0.006	ND 0.006	ND 0.006	ND 0.006	ND 0.006	ND 0.006	ND 0.001	ND 0.001	ND 0.120	ND 0.012
		4 - 8 (DUP)	ND 0.006	ND 0.006	ND 0.006	ND 0.006	ND 0.006	ND 0.006	ND 0.001	ND 0.001	ND 0.120	ND 0.012
SB-12	January 2001	0 - 4	ND 0.004	ND 0.004	0.0091	0.0568	ND 0.004	ND 0.004	ND 0.0009	ND 0.0009	ND 0.087	ND 0.009
		4 - 8	ND 0.005	ND 0.005	ND 0.005	ND 0.005	ND 0.005	ND 0.005	ND 0.0009	ND 0.0009	ND 0.092	ND 0.009
SB-13	January 2001	0 - 4	ND 0.005	0.0073	ND 0.005	0.0179	ND 0.005	ND 0.005	ND 0.001	ND 0.001	ND 0.098	ND 0.009
		8 - 12	ND 5.2	ND 5.2	1.6	490	5.2	ND 5.2	ND 1.0	ND 1.0	ND 100.0	ND 10.0
SB-14	January 2001	0-4	ND 0.0051	0.014	0.13	1.573	3.8	ND 0.005	ND 0.001	ND 0.001	ND 0.096	ND 0.010
		8-12	ND 0.46	ND 0.46	1.0	2.8	ND 0.46	ND 0.46	ND 0.092	ND 0.092	ND 9.2	ND 0.92
		8-12 (DUP)	ND 0.005	0.013	0.057	3.576	ND 0.005	ND 0.005	ND 0.001	ND 0.001	ND 0.1	ND 0.01
Cleanup Goals (d)			NA (e)	1.5	2.9	4.1	NA	NA	NA	NA	NA	

## Notes:

Data above Soil Target Cleanup Goals are in bold print.

(a) MEK - Methyl ethyl ketone or 2-butanone.

(b) MIBK - Methyl isobutyl ketone or 4-methyl-2-pentanone.

(c) NDXX - Parameter not detected at indicated reporting limit.

(d) Soil Target Cleanup Goals from Table 3-1 of the CMS.

(e) NA - Not applicable.

Table 3-8

**Summary of Confirmatory Groundwater Sample Analytical Results**  
**PPG Industries, Inc., Oak Creek, Wisconsin**  
(analytical results in mg/L [ppm])

Sample Location	Date	Benzene	Ethyl-benzene	Toluene	Total Xylenes	MIBK (a)	Methylene Chloride	MEK (b)	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene
<b>SB-1</b>	June 2000	NC (c)	NC	NC	NC	NC	NC	NC	NC	NC	NC
<b>SB-2</b>	June 2000	0.0002	0.580	0.004	0.357	ND 0.010 (d)	ND 0.005	0.510	ND 0.005	ND 0.0005	ND 0.0005
<b>SB-3</b>	June 2000	<b>0.009</b>	0.160	0.120	1.81	0.180	ND 0.005	0.011	ND 0.005	ND 0.0005	ND 0.0005
<b>SB-4</b>	June 2000	NR (e)	NR	NR	NR	NR	NR	NR	NR	NR	NR
<b>SB-5</b>	June 2000	ND 0.005	0.006	ND 0.005	0.013	0.026	ND 0.005	ND 0.100	ND 0.005	ND 0.0005	ND 0.0005
<b>SB-6</b>	January 2001	ND 0.005	0.58	0.008	2.27	ND 0.01	ND 0.005	ND 0.1	ND 0.005	ND 0.0005	ND 0.0005
<b>SB-7</b>	January 2001	ND 0.005	<b>3.000</b>	0.079	4.63	ND 0.01	ND 0.005	ND 0.1	ND 0.005	ND 0.0005	ND 0.0005
<b>SB-8</b>	January 2001	ND 0.005	0.079	ND 0.005	ND 0.005	ND 0.01	ND 0.005	ND 0.1	ND 0.005	ND 0.0005	ND 0.0005
<b>SB-9</b>	January 2001	ND 0.005	0.59	ND 0.005	0.075	ND 0.01	ND 0.005	ND 0.1	ND 0.005	ND 0.0005	ND 0.0005
<b>SB-10</b>	January 2001	ND 0.005	ND 0.005	ND 0.005	ND 0.005	ND 0.010	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
<b>SB-11</b>	January 2001	ND 0.005	0.097	ND 0.005	0.247	ND 0.010	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
<b>SB-12</b>	January 2001	ND 0.005	ND 0.005	ND 0.005	ND 0.005	ND 0.010	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
<b>SB-12 (DUP)</b>	January 2001	ND 0.005	ND 0.005	ND 0.005	ND 0.005	ND 0.010	ND 0.005	ND 0.10	ND 0.005	ND 0.0005	ND 0.0005
<b>SB-13</b>	January 2001	<b>0.013</b>	0.011	0.006	0.034	ND 0.01	ND 0.005	ND 0.1	ND 0.005	ND 0.0005	ND 0.0005
<b>SB-14</b>	January 2001	0.047	<b>6.400</b>	ND 0.005	0.068	ND 0.01	ND 0.005	ND 0.100	ND 0.005	ND 0.0005	ND 0.0005
<b>PRG/Cleanup Goals (f)</b>		<b>0.005</b>	<b>0.7</b>	<b>1.0</b>	<b>10.0</b>	<b>1.8</b>	<b>0.005</b>	<b>2.5</b>	<b>0.1</b>	<b>0.0005</b>	<b>0.005</b>

## Notes:

Data above PRGs/Cleanup Goals are in bold type.

(a) MIBK - Methyl isobutyl ketone or 4-Methyl-2-pentanone.

(b) MEK - Methyl ethyl ketone or 2-butanone.

(c) NC - Not collected.

(d) NDXX - Parameter not detected at indicated reporting limit.

(e) NR - Not reported.

(f) Preliminary Remediation Goals/Groundwater Target Cleanup Goals (Table 3-2 of the CMS).

Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

Date	Operating Hours	Flow (cfm)	VOC Estimate ppm	Rate (lb/hr)	Total Mass (lb/day)	Cumulative Mass (lb)
23-Jun-99	24	250	203	1.06086063	25	25
24-Jun-99	24	250	203	1.06086063	25	51
25-Jun-99	24	250	203	1.06086063	25	76
26-Jun-99	24	250	203	1.06086063	25	102
27-Jun-99	24	250	203	1.06086063	25	127
28-Jun-99	24	250	203	1.06086063	25	153
29-Jun-99	24	250	203	1.06086063	25	178
30-Jun-99	24	250	203	1.06086063	25	204
1-Jul-99	24	250	203	1.06086063	25	229
2-Jul-99	24	250	203	1.06086063	25	255
3-Jul-99	24	250	203	1.06086063	25	280
4-Jul-99	24	250	203	1.06086063	25	306
5-Jul-99	24	250	203	1.06086063	25	331
6-Jul-99	24	250	203	1.06086063	25	356
7-Jul-99	24	250	203	1.06086063	25	382
8-Jul-99	24	250	203	1.06086063	25	407
9-Jul-99	0	250	203	1.06086063	0	407
10-Jul-99	0	250	203	1.06086063	0	407
11-Jul-99	0	250	203	1.06086063	0	407
12-Jul-99	0	250	203	1.06086063	0	407
13-Jul-99	24	250	203	1.06086063	25	433
14-Jul-99	24	250	203	1.06086063	25	458
15-Jul-99	24	250	203	1.06086063	25	484
16-Jul-99	24	250	203	1.06086063	25	509
17-Jul-99	0	250	203	1.06086063	0	509
18-Jul-99	0	250	203	1.06086063	0	509
19-Jul-99	0	250	203	1.06086063	0	509
20-Jul-99	0	250	203	1.06086063	0	509
21-Jul-99	0	250	203	1.06086063	0	509
22-Jul-99	0	250	203	1.06086063	0	509
23-Jul-99	24	250	203	1.06086063	25	535
24-Jul-99	24	250	203	1.06086063	25	560
25-Jul-99	24	250	203	1.06086063	25	586
26-Jul-99	24	250	203	1.06086063	25	611
27-Jul-99	24	250	203	1.06086063	25	637
28-Jul-99	24	250	203	1.06086063	25	662
29-Jul-99	24	250	203	1.06086063	25	687
30-Jul-99	24	250	203	1.06086063	25	713
31-Jul-99	24	250	203	1.06086063	25	738

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Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

Date	Operating Hours	Flow (cfm)	VOC Estimate ppm	Rate (lb/hr)	Total Mass (lb/day)	Cumulative Mass (lb)
1-Aug-99	24	250	203	1.06086063	25	764
2-Aug-99	24	250	203	1.06086063	25	789
3-Aug-99	24	250	203	1.06086063	25	815
4-Aug-99	24	250	203	1.06086063	25	840
5-Aug-99	24	250	203	1.06086063	25	866
6-Aug-99	24	250	203	1.06086063	25	891
7-Aug-99	24	250	203	1.06086063	25	917
8-Aug-99	24	250	203	1.06086063	25	942
9-Aug-99	24	250	203	1.06086063	25	968
10-Aug-99	24	250	203	1.06086063	25	993
11-Aug-99	24	250	203	1.06086063	25	1,018
12-Aug-99	24	250	203	1.06086063	25	1,044
13-Aug-99	24	250	203	1.06086063	25	1,069
14-Aug-99	24	250	203	1.06086063	25	1,095
15-Aug-99	24	250	203	1.06086063	25	1,120
16-Aug-99	24	250	203	1.06086063	25	1,146
17-Aug-99	24	250	203	1.06086063	25	1,171
18-Aug-99	24	250	203	1.06086063	25	1,197
19-Aug-99	24	250	203	1.06086063	25	1,222
20-Aug-99	24	250	203	1.06086063	25	1,248
21-Aug-99	24	250	203	1.06086063	25	1,273
22-Aug-99	24	250	203	1.06086063	25	1,298
23-Aug-99	24	250	203	1.06086063	25	1,324
24-Aug-99	24	250	203	1.06086063	25	1,349
25-Aug-99	0	250	203	1.06086063	0	1,349
26-Aug-99	0	250	203	1.06086063	0	1,349
27-Aug-99	0	250	203	1.06086063	0	1,349
28-Aug-99	0	250	203	1.06086063	0	1,349
29-Aug-99	12	250	203	1.06086063	13	1,362
30-Aug-99	24	250	203	1.06086063	25	1,388
31-Aug-99	24	250	203	1.06086063	25	1,413
1-Sep-99	24	250	203	1.06086063	25	1,439
2-Sep-99	24	250	203	1.06086063	25	1,464
3-Sep-99	24	250	203	1.06086063	25	1,489
4-Sep-99	24	250	203	1.06086063	25	1,515
5-Sep-99	24	250	203	1.06086063	25	1,540
6-Sep-99	24	250	203	1.06086063	25	1,566
7-Sep-99	24	250	203	1.06086063	25	1,591
8-Sep-99	24	250	203	1.06086063	25	1,617

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Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

<b>Date</b>	<b>Operating Hours</b>	<b>Flow (cfm)</b>	<b>VOC Estimate ppm</b>	<b>Rate (lb/hr)</b>	<b>Total Mass (lb/day)</b>	<b>Cumulative Mass (lb)</b>
9-Sep-99	24	250	203	1.06086063	25	1,642
10-Sep-99	24	250	203	1.06086063	25	1,668
11-Sep-99	24	250	203	1.06086063	25	1,693
12-Sep-99	24	250	203	1.06086063	25	1,719
13-Sep-99	24	250	203	1.06086063	25	1,744
14-Sep-99	24	250	203	1.06086063	25	1,770
15-Sep-99	24	250	203	1.06086063	25	1,795
16-Sep-99	24	250	203	1.06086063	25	1,820
17-Sep-99	24	250	203	1.06086063	25	1,846
18-Sep-99	24	250	203	1.06086063	25	1,871
19-Sep-99	12	250	203	1.06086063	13	1,884
20-Sep-99	0	250	203	1.06086063	0	1,884
21-Sep-99	0	250	203	1.06086063	0	1,884
22-Sep-99	0	250	203	1.06086063	0	1,884
23-Sep-99	0	250	203	1.06086063	0	1,884
24-Sep-99	12	250	203	1.06086063	13	1,897
25-Sep-99	24	250	203	1.06086063	25	1,922
26-Sep-99	24	250	203	1.06086063	25	1,948
27-Sep-99	24	250	203	1.06086063	25	1,973
28-Sep-99	24	250	203	1.06086063	25	1,999
29-Sep-99	12	250	203	1.06086063	13	2,011
30-Sep-99	0	250	203	1.06086063	0	2,011
1-Oct-99	12	250	203	1.06086063	13	2,024
2-Oct-99	24	250	203	1.06086063	25	2,050
3-Oct-99	24	250	203	1.06086063	25	2,075
4-Oct-99	24	250	203	1.06086063	25	2,101
5-Oct-99	24	250	226.7	1.18471481	28	2,129
6-Oct-99	24	250	226.7	1.18471481	28	2,157
7-Oct-99	24	250	226.7	1.18471481	28	2,186
8-Oct-99	24	250	226.7	1.18471481	28	2,214
9-Oct-99	24	250	226.7	1.18471481	28	2,243
10-Oct-99	24	250	226.7	1.18471481	28	2,271
11-Oct-99	24	250	226.7	1.18471481	28	2,300
12-Oct-99	24	250	226.7	1.18471481	28	2,328
13-Oct-99	24	250	226.7	1.18471481	28	2,356
14-Oct-99	24	250	226.7	1.18471481	28	2,385
15-Oct-99	24	250	226.7	1.18471481	28	2,413
16-Oct-99	24	250	226.7	1.18471481	28	2,442
17-Oct-99	24	250	226.7	1.18471481	28	2,470

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Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

Date	Operating Hours	Flow (cfm)	VOC Estimate ppm	Rate (lb/hr)	Total Mass (lb/day)	Cumulative Mass (lb)
18-Oct-99	24	250	226.7	1.18471481	28	2,499
19-Oct-99	24	250	226.7	1.18471481	28	2,527
20-Oct-99	24	250	226.7	1.18471481	28	2,555
21-Oct-99	24	250	226.7	1.18471481	28	2,584
22-Oct-99	24	250	226.7	1.18471481	28	2,612
23-Oct-99	24	250	226.7	1.18471481	28	2,641
24-Oct-99	24	250	226.7	1.18471481	28	2,669
25-Oct-99	24	250	226.7	1.18471481	28	2,698
26-Oct-99	24	250	226.7	1.18471481	28	2,726
27-Oct-99	24	250	226.7	1.18471481	28	2,754
28-Oct-99	24	250	226.7	1.18471481	28	2,783
29-Oct-99	24	250	226.7	1.18471481	28	2,811
30-Oct-99	24	250	226.7	1.18471481	28	2,840
31-Oct-99	24	250	226.7	1.18471481	28	2,868
1-Nov-99	12	250	226.7	1.18471481	14	2,882
2-Nov-99	12	250	226.7	1.18471481	14	2,897
3-Nov-99	24	250	226.7	1.18471481	28	2,925
4-Nov-99	24	250	226.7	1.18471481	28	2,953
5-Nov-99	24	250	226.7	1.18471481	28	2,982
6-Nov-99	24	250	226.7	1.18471481	28	3,010
7-Nov-99	24	250	226.7	1.18471481	28	3,039
8-Nov-99	24	250	226.7	1.18471481	28	3,067
9-Nov-99	24	250	226.7	1.18471481	28	3,096
10-Nov-99	20	250	226.7	1.18471481	24	3,119
11-Nov-99	0	250	226.7	1.18471481	0	3,119
12-Nov-99	12	250	226.7	1.18471481	14	3,134
13-Nov-99	24	250	226.7	1.18471481	28	3,162
14-Nov-99	24	250	226.7	1.18471481	28	3,190
15-Nov-99	24	250	226.7	1.18471481	28	3,219
16-Nov-99	24	250	226.7	1.18471481	28	3,247
17-Nov-99	24	250	226.7	1.18471481	28	3,276
18-Nov-99	24	250	226.7	1.18471481	28	3,304
19-Nov-99	24	250	226.7	1.18471481	28	3,333
20-Nov-99	24	250	226.7	1.18471481	28	3,361
21-Nov-99	24	250	226.7	1.18471481	28	3,389
22-Nov-99	24	250	226.7	1.18471481	28	3,418
23-Nov-99	24	250	226.7	1.18471481	28	3,446
24-Nov-99	24	250	226.7	1.18471481	28	3,475
25-Nov-99	24	250	226.7	1.18471481	28	3,503

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Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

<b>Date</b>	<b>Operating Hours</b>	<b>Flow (cfm)</b>	<b>VOC Estimate ppm</b>	<b>Rate (lb/hr)</b>	<b>Total Mass (lb/day)</b>	<b>Cumulative Mass (lb)</b>
26-Nov-99	12	250	226.7	1.18471481	14	3,517
27-Nov-99	0	250	226.7	1.18471481	0	3,517
28-Nov-99	0	250	226.7	1.18471481	0	3,517
29-Nov-99	12	250	226.7	1.18471481	14	3,532
30-Nov-99	24	250	226.7	1.18471481	28	3,560
1-Dec-99	24	250	226.7	1.18471481	28	3,589
2-Dec-99	24	250	226.7	1.18471481	28	3,617
3-Dec-99	24	250	226.7	1.18471481	28	3,645
4-Dec-99	12	250	226.7	1.18471481	14	3,660
5-Dec-99	0	250	226.7	1.18471481	0	3,660
6-Dec-99	0	250	226.7	1.18471481	0	3,660
7-Dec-99	12	250	226.7	1.18471481	14	3,674
8-Dec-99	24	250	226.7	1.18471481	28	3,702
9-Dec-99	24	250	226.7	1.18471481	28	3,731
10-Dec-99	24	250	226.7	1.18471481	28	3,759
11-Dec-99	24	250	226.7	1.18471481	28	3,788
12-Dec-99	24	250	226.7	1.18471481	28	3,816
13-Dec-99	24	250	226.7	1.18471481	28	3,844
14-Dec-99	24	250	226.7	1.18471481	28	3,873
15-Dec-99	24	250	226.7	1.18471481	28	3,901
16-Dec-99	24	250	226.7	1.18471481	28	3,930
17-Dec-99	24	250	226.7	1.18471481	28	3,958
18-Dec-99	24	250	226.7	1.18471481	28	3,987
19-Dec-99	12	250	226.7	1.18471481	14	4,001
20-Dec-99	0	250	226.7	1.18471481	0	4,001
21-Dec-99	12	250	226.7	1.18471481	14	4,015
22-Dec-99	24	250	226.7	1.18471481	28	4,043
23-Dec-99	24	250	226.7	1.18471481	28	4,072
24-Dec-99	24	250	226.7	1.18471481	28	4,100
25-Dec-99	24	250	226.7	1.18471481	28	4,129
26-Dec-99	24	250	226.7	1.18471481	28	4,157
27-Dec-99	24	250	226.7	1.18471481	28	4,186
28-Dec-99	24	250	226.7	1.18471481	28	4,214
29-Dec-99	24	250	226.7	1.18471481	28	4,242
30-Dec-99	24	250	226.7	1.18471481	28	4,271
31-Dec-99	24	250	226.7	1.18471481	28	4,299
1-Jan-00	24	250	226.7	1.18471481	28	4,328
2-Jan-00	24	250	226.7	1.18471481	28	4,356
3-Jan-00	24	250	226.7	1.18471481	28	4,385

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Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

Date	Operating Hours	Flow (cfm)	VOC Estimate ppm	Rate (lb/hr)	Total Mass (lb/day)	Cumulative Mass (lb)
4-Jan-00	24	250	226.7	1.18471481	28	4,413
5-Jan-00	24	250	226.7	1.18471481	28	4,442
6-Jan-00	24	250	226.7	1.18471481	28	4,470
7-Jan-00	24	250	226.7	1.18471481	28	4,498
8-Jan-00	24	250	226.7	1.18471481	28	4,527
9-Jan-00	24	250	226.7	1.18471481	28	4,555
10-Jan-00	24	250	226.7	1.18471481	28	4,584
11-Jan-00	24	250	106.8	0.55812766	13	4,597
12-Jan-00	24	250	106.8	0.55812766	13	4,610
13-Jan-00	24	250	106.8	0.55812766	13	4,624
14-Jan-00	24	250	106.8	0.55812766	13	4,637
15-Jan-00	24	250	106.8	0.55812766	13	4,651
16-Jan-00	24	250	106.8	0.55812766	13	4,664
17-Jan-00	24	250	106.8	0.55812766	13	4,677
18-Jan-00	24	250	106.8	0.55812766	13	4,691
19-Jan-00	24	250	106.8	0.55812766	13	4,704
20-Jan-00	24	250	106.8	0.55812766	13	4,718
21-Jan-00	24	250	106.8	0.55812766	13	4,731
22-Jan-00	24	250	106.8	0.55812766	13	4,744
23-Jan-00	24	250	106.8	0.55812766	13	4,758
24-Jan-00	24	250	106.8	0.55812766	13	4,771
25-Jan-00	24	250	106.8	0.55812766	13	4,785
26-Jan-00	24	250	106.8	0.55812766	13	4,798
27-Jan-00	24	250	106.8	0.55812766	13	4,811
28-Jan-00	24	250	106.8	0.55812766	13	4,825
29-Jan-00	24	250	106.8	0.55812766	13	4,838
30-Jan-00	24	250	106.8	0.55812766	13	4,852
31-Jan-00	24	250	106.8	0.55812766	13	4,865
1-Feb-00	12	250	106.8	0.55812766	7	4,872
2-Feb-00	0	250	106.8	0.55812766	0	4,872
3-Feb-00	0	250	106.8	0.55812766	0	4,872
4-Feb-00	12	250	106.8	0.55812766	7	4,878
5-Feb-00	24	250	106.8	0.55812766	13	4,892
6-Feb-00	24	250	106.8	0.55812766	13	4,905
7-Feb-00	24	250	106.8	0.55812766	13	4,919
8-Feb-00	24	250	106.8	0.55812766	13	4,932
9-Feb-00	24	250	106.8	0.55812766	13	4,945
10-Feb-00	24	250	106.8	0.55812766	13	4,959
11-Feb-00	24	250	106.8	0.55812766	13	4,972

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Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

<b>Date</b>	<b>Operating Hours</b>	<b>Flow (cfm)</b>	<b>VOC Estimate ppm</b>	<b>Rate (lb/hr)</b>	<b>Total Mass (lb/day)</b>	<b>Cumulative Mass (lb)</b>
12-Feb-00	24	250	106.8	0.55812766	13	4,986
13-Feb-00	24	250	106.8	0.55812766	13	4,999
14-Feb-00	24	250	106.8	0.55812766	13	5,012
15-Feb-00	24	250	106.8	0.55812766	13	5,026
16-Feb-00	24	250	106.8	0.55812766	13	5,039
17-Feb-00	24	250	106.8	0.55812766	13	5,052
18-Feb-00	24	250	106.8	0.55812766	13	5,066
19-Feb-00	24	250	106.8	0.55812766	13	5,079
20-Feb-00	24	250	106.8	0.55812766	13	5,093
21-Feb-00	24	250	106.8	0.55812766	13	5,106
22-Feb-00	12	250	106.8	0.55812766	7	5,113
23-Feb-00	0	250	106.8	0.55812766	0	5,113
24-Feb-00	0	250	106.8	0.55812766	0	5,113
25-Feb-00	12	250	106.8	0.55812766	7	5,119
26-Feb-00	24	250	106.8	0.55812766	13	5,133
27-Feb-00	24	250	106.8	0.55812766	13	5,146
28-Feb-00	24	250	106.8	0.55812766	13	5,160
29-Feb-00	24	250	106.8	0.55812766	13	5,173
1-Mar-00	24	250	106.8	0.55812766	13	5,186
2-Mar-00	24	250	106.8	0.55812766	13	5,200
3-Mar-00	24	250	106.8	0.55812766	13	5,213
4-Mar-00	24	250	106.8	0.55812766	13	5,227
5-Mar-00	24	250	106.8	0.55812766	13	5,240
6-Mar-00	24	250	106.8	0.55812766	13	5,253
7-Mar-00	24	250	106.8	0.55812766	13	5,267
8-Mar-00	24	250	106.8	0.55812766	13	5,280
9-Mar-00	24	250	106.8	0.55812766	13	5,294
10-Mar-00	24	250	106.8	0.55812766	13	5,307
11-Mar-00	24	250	106.8	0.55812766	13	5,320
12-Mar-00	24	250	106.8	0.55812766	13	5,334
13-Mar-00	24	250	106.8	0.55812766	13	5,347
14-Mar-00	24	250	106.8	0.55812766	13	5,361
15-Mar-00	24	250	106.8	0.55812766	13	5,374
16-Mar-00	24	250	106.8	0.55812766	13	5,387
17-Mar-00	24	250	106.8	0.55812766	13	5,401
18-Mar-00	24	250	106.8	0.55812766	13	5,414
19-Mar-00	24	250	106.8	0.55812766	13	5,428
20-Mar-00	24	250	106.8	0.55812766	13	5,441
21-Mar-00	24	250	106.8	0.55812766	13	5,454

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Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

<b>Date</b>	<b>Operating Hours</b>	<b>Flow (cfm)</b>	<b>VOC Estimate ppm</b>	<b>Rate (lb/hr)</b>	<b>Total Mass (lb/day)</b>	<b>Cumulative Mass (lb)</b>
22-Mar-00	24	250	106.8	0.55812766	13	5,468
23-Mar-00	24	250	106.8	0.55812766	13	5,481
24-Mar-00	24	250	106.8	0.55812766	13	5,495
25-Mar-00	24	250	106.8	0.55812766	13	5,508
26-Mar-00	24	250	106.8	0.55812766	13	5,521
27-Mar-00	24	250	106.8	0.55812766	13	5,535
28-Mar-00	24	250	106.8	0.55812766	13	5,548
29-Mar-00	24	250	106.8	0.55812766	13	5,562
30-Mar-00	24	250	106.8	0.55812766	13	5,575
31-Mar-00	24	250	106.8	0.55812766	13	5,588
1-Apr-00	24	250	106.8	0.55812766	13	5,602
2-Apr-00	24	250	106.8	0.55812766	13	5,615
3-Apr-00	24	250	106.8	0.55812766	13	5,628
4-Apr-00	24	250	56.3	0.29421898	7	5,636
5-Apr-00	24	250	56.3	0.29421898	7	5,643
6-Apr-00	24	250	56.3	0.29421898	7	5,650
7-Apr-00	24	250	56.3	0.29421898	7	5,657
8-Apr-00	24	250	56.3	0.29421898	7	5,664
9-Apr-00	24	250	56.3	0.29421898	7	5,671
10-Apr-00	24	250	56.3	0.29421898	7	5,678
11-Apr-00	24	250	56.3	0.29421898	7	5,685
12-Apr-00	24	250	56.3	0.29421898	7	5,692
13-Apr-00	24	250	56.3	0.29421898	7	5,699
14-Apr-00	24	250	56.3	0.29421898	7	5,706
15-Apr-00	24	250	56.3	0.29421898	7	5,713
16-Apr-00	24	250	56.3	0.29421898	7	5,720
17-Apr-00	24	250	56.3	0.29421898	7	5,727
18-Apr-00	24	250	56.3	0.29421898	7	5,734
19-Apr-00	24	250	56.3	0.29421898	7	5,741
20-Apr-00	24	250	56.3	0.29421898	7	5,749
21-Apr-00	12	250	56.3	0.29421898	4	5,752
22-Apr-00	0	250	56.3	0.29421898	0	5,752
23-Apr-00	0	250	56.3	0.29421898	0	5,752
24-Apr-00	12	250	56.3	0.29421898	4	5,756
25-Apr-00	24	250	56.3	0.29421898	7	5,763
26-Apr-00	24	250	56.3	0.29421898	7	5,770
27-Apr-00	24	250	56.3	0.29421898	7	5,777
28-Apr-00	24	250	56.3	0.29421898	7	5,784
29-Apr-00	24	250	56.3	0.29421898	7	5,791

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Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

<b>Date</b>	<b>Operating Hours</b>	<b>Flow (cfm)</b>	<b>VOC Estimate ppm</b>	<b>Rate (lb/hr)</b>	<b>Total Mass (lb/day)</b>	<b>Cumulative Mass (lb)</b>
30-Apr-00	24	250	56.3	0.29421898	7	5,798
1-May-00	24	250	56.3	0.29421898	7	5,805
2-May-00	24	250	56.3	0.29421898	7	5,812
3-May-00	24	250	56.3	0.29421898	7	5,819
4-May-00	24	250	56.3	0.29421898	7	5,826
5-May-00	24	250	56.3	0.29421898	7	5,833
6-May-00	24	250	56.3	0.29421898	7	5,840
7-May-00	24	250	56.3	0.29421898	7	5,847
8-May-00	19	250	56.3	0.29421898	6	5,853
9-May-00	0	250	56.3	0.29421898	0	5,853
10-May-00	12	250	56.3	0.29421898	4	5,857
11-May-00	24	250	56.3	0.29421898	7	5,864
12-May-00	24	250	56.3	0.29421898	7	5,871
13-May-00	24	250	56.3	0.29421898	7	5,878
14-May-00	8	250	56.3	0.29421898	2	5,880
15-May-00	12	250	56.3	0.29421898	4	5,884
16-May-00	24	250	56.3	0.29421898	7	5,891
17-May-00	24	250	56.3	0.29421898	7	5,898
18-May-00	12	250	56.3	0.29421898	4	5,901
19-May-00	0	250	56.3	0.29421898	0	5,901
20-May-00	0	250	56.3	0.29421898	0	5,901
21-May-00	0	250	56.3	0.29421898	0	5,901
22-May-00	12	250	56.3	0.29421898	4	5,905
23-May-00	24	250	56.3	0.29421898	7	5,912
24-May-00	24	250	56.3	0.29421898	7	5,919
25-May-00	24	250	56.3	0.29421898	7	5,926
26-May-00	24	250	56.3	0.29421898	7	5,933
27-May-00	24	250	56.3	0.29421898	7	5,940
28-May-00	24	250	56.3	0.29421898	7	5,947
29-May-00	24	250	56.3	0.29421898	7	5,954
30-May-00	24	250	56.3	0.29421898	7	5,961
31-May-00	24	250	56.3	0.29421898	7	5,968
1-Jun-00	24	250	56.3	0.29421898	7	5,975
2-Jun-00	24	250	56.3	0.29421898	7	5,982
3-Jun-00	24	250	56.3	0.29421898	7	5,989
4-Jun-00	24	250	56.3	0.29421898	7	5,997
5-Jun-00	24	250	56.3	0.29421898	7	6,004
6-Jun-00	24	250	56.3	0.29421898	7	6,011
7-Jun-00	24	250	56.3	0.29421898	7	6,018

PPG Oak Creek

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Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

Date	Operating Hours	Flow (cfm)	VOC Estimate ppm	Rate (lb/hr)	Total Mass (lb/day)	Cumulative Mass (lb)
8-Jun-00	24	250	56.3	0.29421898	7	6,025
9-Jun-00	24	250	56.3	0.29421898	7	6,032
10-Jun-00	24	250	56.3	0.29421898	7	6,039
11-Jun-00	24	250	56.3	0.29421898	7	6,046
12-Jun-00	24	250	56.3	0.29421898	7	6,053
13-Jun-00	24	250	56.3	0.29421898	7	6,060
14-Jun-00	24	250	56.3	0.29421898	7	6,067
15-Jun-00	24	250	56.3	0.29421898	7	6,074
16-Jun-00	24	250	56.3	0.29421898	7	6,081
17-Jun-00	24	250	56.3	0.29421898	7	6,088
18-Jun-00	24	250	56.3	0.29421898	7	6,095
19-Jun-00	24	250	56.3	0.29421898	7	6,102
20-Jun-00	24	250	56.3	0.29421898	7	6,110
21-Jun-00	24	250	56.3	0.29421898	7	6,117
22-Jun-00	24	250	56.3	0.29421898	7	6,124
23-Jun-00	24	250	56.3	0.29421898	7	6,131
24-Jun-00	24	250	56.3	0.29421898	7	6,138
25-Jun-00	24	250	56.3	0.29421898	7	6,145
26-Jun-00	24	250	56.3	0.29421898	7	6,152
27-Jun-00	24	250	56.3	0.29421898	7	6,159
28-Jun-00	24	250	56.3	0.29421898	7	6,166
29-Jun-00	24	250	56.3	0.29421898	7	6,173
30-Jun-00	24	250	56.3	0.29421898	7	6,180
1-Jul-00	24	250	56.3	0.29421898	7	6,187
2-Jul-00	12	250	56.3	0.29421898	4	6,191
3-Jul-00	0	250	56.3	0.29421898	0	6,191
4-Jul-00	0	250	56.3	0.29421898	0	6,191
5-Jul-00	12	250	56.3	0.29421898	4	6,194
6-Jul-00	24	250	56.3	0.29421898	7	6,201
7-Jul-00	24	250	56.3	0.29421898	7	6,208
8-Jul-00	8	250	56.3	0.29421898	2	6,211
9-Jul-00	0	250	56.3	0.29421898	0	6,211
10-Jul-00	12	250	56.3	0.29421898	4	6,214
11-Jul-00	24	250	56.3	0.29421898	7	6,221
12-Jul-00	24	250	56.3	0.29421898	7	6,228
13-Jul-00	24	250	56.3	0.29421898	7	6,235
14-Jul-00	24	250	56.3	0.29421898	7	6,243
15-Jul-00	24	250	56.3	0.29421898	7	6,250
16-Jul-00	24	250	56.3	0.29421898	7	6,257

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Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

<b>Date</b>	<b>Operating Hours</b>	<b>Flow (cfm)</b>	<b>VOC Estimate ppm</b>	<b>Rate (lb/hr)</b>	<b>Total Mass (lb/day)</b>	<b>Cumulative Mass (lb)</b>
17-Jul-00	24	250	56.3	0.29421898	7	6,264
18-Jul-00	24	250	56.3	0.29421898	7	6,271
19-Jul-00	24	250	56.3	0.29421898	7	6,278
20-Jul-00	24	250	56.3	0.29421898	7	6,285
21-Jul-00	24	250	56.3	0.29421898	7	6,292
22-Jul-00	24	250	56.3	0.29421898	7	6,299
23-Jul-00	24	250	56.3	0.29421898	7	6,306
24-Jul-00	24	250	56.3	0.29421898	7	6,313
25-Jul-00	24	250	56.3	0.29421898	7	6,320
26-Jul-00	24	250	56.3	0.29421898	7	6,327
27-Jul-00	24	250	56.3	0.29421898	7	6,334
28-Jul-00	24	250	56.3	0.29421898	7	6,341
29-Jul-00	24	250	56.3	0.29421898	7	6,348
30-Jul-00	24	250	56.3	0.29421898	7	6,355
31-Jul-00	24	250	56.3	0.29421898	7	6,363
1-Aug-00	24	250	56.3	0.29421898	7	6,370
2-Aug-00	24	250	56.3	0.29421898	7	6,377
3-Aug-00	24	250	56.3	0.29421898	7	6,384
4-Aug-00	24	250	56.3	0.29421898	7	6,391
5-Aug-00	24	250	56.3	0.29421898	7	6,398
6-Aug-00	24	250	56.3	0.29421898	7	6,405
7-Aug-00	24	250	56.3	0.29421898	7	6,412
8-Aug-00	24	250	56.3	0.29421898	7	6,419
9-Aug-00	24	250	56.3	0.29421898	7	6,426
10-Aug-00	24	250	56.3	0.29421898	7	6,433
11-Aug-00	24	250	56.3	0.29421898	7	6,440
12-Aug-00	24	250	56.3	0.29421898	7	6,447
13-Aug-00	24	250	56.3	0.29421898	7	6,454
14-Aug-00	12	250	56.3	0.29421898	4	6,458
15-Aug-00	0	250	56.3	0.29421898	0	6,458
16-Aug-00	12	250	56.3	0.29421898	4	6,461
17-Aug-00	12	250	56.3	0.29421898	4	6,465
18-Aug-00	0	250	56.3	0.29421898	0	6,465
19-Aug-00	0	250	56.3	0.29421898	0	6,465
20-Aug-00	0	250	56.3	0.29421898	0	6,465
21-Aug-00	0	250	56.3	0.29421898	0	6,465
22-Aug-00	12	250	56.3	0.29421898	4	6,468
23-Aug-00	0	250	56.3	0.29421898	0	6,468
24-Aug-00	10	250	56.3	0.29421898	3	6,471

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Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

Date	Operating Hours	Flow (cfm)	VOC Estimate ppm	Rate (lb/hr)	Total Mass (lb/day)	Cumulative Mass (lb)
25-Aug-00	24	250	56.3	0.29421898	7	6,478
26-Aug-00	24	250	56.3	0.29421898	7	6,486
27-Aug-00	24	250	56.3	0.29421898	7	6,493
28-Aug-00	24	250	56.3	0.29421898	7	6,500
29-Aug-00	24	250	56.3	0.29421898	7	6,507
30-Aug-00	12	250	56.3	0.29421898	4	6,510
31-Aug-00	0	250	56.3	0.29421898	0	6,510
1-Sep-00	12	250	56.3	0.29421898	4	6,514
2-Sep-00	24	250	56.3	0.29421898	7	6,521
3-Sep-00	24	250	56.3	0.29421898	7	6,528
4-Sep-00	24	250	56.3	0.29421898	7	6,535
5-Sep-00	24	250	56.3	0.29421898	7	6,542
6-Sep-00	24	250	56.3	0.29421898	7	6,549
7-Sep-00	16	250	56.3	0.29421898	5	6,554
8-Sep-00	0	250	56.3	0.29421898	0	6,554
9-Sep-00	0	250	56.3	0.29421898	0	6,554
10-Sep-00	0	250	56.3	0.29421898	0	6,554
11-Sep-00	12	250	56.3	0.29421898	4	6,557
12-Sep-00	24	250	56.3	0.29421898	7	6,564
13-Sep-00	24	250	56.3	0.29421898	7	6,571
14-Sep-00	24	250	56.3	0.29421898	7	6,579
15-Sep-00	24	250	56.3	0.29421898	7	6,586
16-Sep-00	24	250	56.3	0.29421898	7	6,593
17-Sep-00	24	250	56.3	0.29421898	7	6,600
18-Sep-00	24	250	56.3	0.29421898	7	6,607
19-Sep-00	24	250	56.3	0.29421898	7	6,614
20-Sep-00	24	250	56.3	0.29421898	7	6,621
21-Sep-00	24	250	56.3	0.29421898	7	6,628
22-Sep-00	24	250	56.3	0.29421898	7	6,635
23-Sep-00	2	250	56.3	0.29421898	1	6,636
24-Sep-00	0	250	56.3	0.29421898	0	6,636
25-Sep-00	0	250	56.3	0.29421898	0	6,636
26-Sep-00	0	250	56.3	0.29421898	0	6,636
27-Sep-00	15	250	56.3	0.29421898	4	6,640
28-Sep-00	24	250	56.3	0.29421898	7	6,647
29-Sep-00	24	250	56.3	0.29421898	7	6,654
30-Sep-00	24	250	56.3	0.29421898	7	6,661
1-Oct-00	24	250	56.3	0.29421898	7	6,668
2-Oct-00	24	250	56.3	0.29421898	7	6,675

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Table 3-9

Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin

Date	Operating Hours	Flow (cfm)	VOC Estimate ppm	Rate (lb/hr)	Total Mass (lb/day)	Cumulative Mass (lb)
3-Oct-00	24	250	56.3	0.29421898	7	6,682
4-Oct-00	24	250	56.3	0.29421898	7	6,689
5-Oct-00	24	250	56.3	0.29421898	7	6,696
6-Oct-00	24	250	15.4	0.08047908	2	6,698
7-Oct-00	24	250	15.4	0.08047908	2	6,700
8-Oct-00	24	250	15.4	0.08047908	2	6,702
9-Oct-00	15	250	15.4	0.08047908	1	6,703
10-Oct-00	0	250	15.4	0.08047908	0	6,703
11-Oct-00	0	250	15.4	0.08047908	0	6,703
12-Oct-00	0	250	15.4	0.08047908	0	6,703
13-Oct-00	14	250	15.4	0.08047908	1	6,705
14-Oct-00	24	250	15.4	0.08047908	2	6,707
15-Oct-00	24	250	15.4	0.08047908	2	6,708
16-Oct-00	24	250	15.4	0.08047908	2	6,710
17-Oct-00	24	250	15.4	0.08047908	2	6,712
18-Oct-00	24	250	15.4	0.08047908	2	6,714
19-Oct-00	24	250	15.4	0.08047908	2	6,716
20-Oct-00	24	250	15.4	0.08047908	2	6,718
21-Oct-00	24	250	15.4	0.08047908	2	6,720
22-Oct-00	24	250	15.4	0.08047908	2	6,722
23-Oct-00	24	250	15.4	0.08047908	2	6,724
24-Oct-00	24	250	15.4	0.08047908	2	6,726
25-Oct-00	24	250	15.4	0.08047908	2	6,728
26-Oct-00	24	250	15.4	0.08047908	2	6,730
27-Oct-00	24	250	15.4	0.08047908	2	6,732
28-Oct-00	24	250	15.4	0.08047908	2	6,734
29-Oct-00	24	250	15.4	0.08047908	2	6,736
30-Oct-00	24	250	15.4	0.08047908	2	6,737
31-Oct-00	24	250	15.4	0.08047908	2	6,739
1-Nov-00	24	250	15.4	0.08047908	2	6,741
2-Nov-00	24	250	15.4	0.08047908	2	6,743
3-Nov-00	24	250	15.4	0.08047908	2	6,745
4-Nov-00	24	250	15.4	0.08047908	2	6,747
5-Nov-00	24	250	15.4	0.08047908	2	6,749
6-Nov-00	24	250	15.4	0.08047908	2	6,751
7-Nov-00	24	250	15.4	0.08047908	2	6,753
8-Nov-00	24	250	15.4	0.08047908	2	6,755
9-Nov-00	24	250	15.4	0.08047908	2	6,757
10-Nov-00	24	250	15.4	0.08047908	2	6,759

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Table 3-9

**Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin**

Date	Operating Hours	Flow (cfm)	VOC Estimate ppm	Rate (lb/hr)	Total Mass (lb/day)	Cumulative Mass (lb)
11-Nov-00	24	250	15.4	0.08047908	2	6,761
12-Nov-00	24	250	15.4	0.08047908	2	6,763
13-Nov-00	24	250	15.4	0.08047908	2	6,765
14-Nov-00	24	250	15.4	0.08047908	2	6,766
15-Nov-00	24	250	15.4	0.08047908	2	6,768
16-Nov-00	24	250	15.4	0.08047908	2	6,770
17-Nov-00	24	250	15.4	0.08047908	2	6,772
18-Nov-00	24	250	15.4	0.08047908	2	6,774
19-Nov-00	24	250	15.4	0.08047908	2	6,776
20-Nov-00	24	250	15.4	0.08047908	2	6,778
21-Nov-00	24	250	15.4	0.08047908	2	6,780
22-Nov-00	24	250	15.4	0.08047908	2	6,782
23-Nov-00	24	250	15.4	0.08047908	2	6,784
24-Nov-00	24	250	15.4	0.08047908	2	6,786
25-Nov-00	24	250	15.4	0.08047908	2	6,788
26-Nov-00	24	250	15.4	0.08047908	2	6,790
27-Nov-00	24	250	15.4	0.08047908	2	6,792
28-Nov-00	24	250	15.4	0.08047908	2	6,793
29-Nov-00	24	250	15.4	0.08047908	2	6,795
30-Nov-00	24	250	15.4	0.08047908	2	6,797
1-Dec-00	16	250	15.4	0.08047908	1	6,799
2-Dec-00	0	250	15.4	0.08047908	0	6,799
3-Dec-00	0	250	15.4	0.08047908	0	6,799
4-Dec-00	15	250	15.4	0.08047908	1	6,800
5-Dec-00	24	250	15.4	0.08047908	2	6,802
6-Dec-00	24	250	15.4	0.08047908	2	6,804
7-Dec-00	24	250	15.4	0.08047908	2	6,806
8-Dec-00	24	250	15.4	0.08047908	2	6,808
9-Dec-00	24	250	15.4	0.08047908	2	6,809
10-Dec-00	24	250	15.4	0.08047908	2	6,811
11-Dec-00	24	250	15.4	0.08047908	2	6,813
12-Dec-00	24	250	15.4	0.08047908	2	6,815
13-Dec-00	24	250	15.4	0.08047908	2	6,817
14-Dec-00	24	250	10.9	0.05696247	1	6,819
15-Dec-00	24	250	10.9	0.05696247	1	6,820
16-Dec-00	24	250	10.9	0.05696247	1	6,821
17-Dec-00	24	250	10.9	0.05696247	1	6,823
18-Dec-00	24	250	10.9	0.05696247	1	6,824
19-Dec-00	24	250	10.9	0.05696247	1	6,825

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Table 3-9

Estimated VOC Mass Removal Rates and Totals  
PPG Industries, Inc., Oak Creek, Wisconsin

Date	Operating Hours	Flow (cfm)	VOC Estimate ppm	Rate (lb/hr)	Total Mass (lb/day)	Cumulative Mass (lb)
20-Dec-00	24	250	10.9	0.05696247	1	6,827
21-Dec-00	24	250	10.9	0.05696247	1	6,828
22-Dec-00	24	250	10.9	0.05696247	1	6,830
23-Dec-00	24	250	10.9	0.05696247	1	6,831
24-Dec-00	24	250	10.9	0.05696247	1	6,832
25-Dec-00	24	250	10.9	0.05696247	1	6,834
26-Dec-00	24	250	10.9	0.05696247	1	6,835
27-Dec-00	24	250	10.9	0.05696247	1	6,836
28-Dec-00	24	250	10.9	0.05696247	1	6,838
29-Dec-00	24	250	10.9	0.05696247	1	6,839
30-Dec-00	24	250	10.9	0.05696247	1	6,840
31-Dec-00	24	250	10.9	0.05696247	1	6,842
1-Jan-01	24	250	10.9	0.05696247	1	6,843
2-Jan-01	24	250	10.9	0.05696247	1	6,845
3-Jan-01	24	250	10.9	0.05696247	1	6,846
4-Jan-01	24	250	10.9	0.05696247	1	6,847
5-Jan-01	24	250	10.9	0.05696247	1	6,849
6-Jan-01	24	250	10.9	0.05696247	1	6,850
7-Jan-01	24	250	10.9	0.05696247	1	6,851
8-Jan-01	24	250	10.9	0.05696247	1	6,853
9-Jan-01	24	250	10.9	0.05696247	1	6,854
10-Jan-01	24	250	10.9	0.05696247	1	6,855
11-Jan-01	24	250	10.9	0.05696247	1	6,857
12-Jan-01	24	250	10.9	0.05696247	1	6,858
13-Jan-01	24	250	10.9	0.05696247	1	6,860
14-Jan-01	24	250	10.9	0.05696247	1	6,861
15-Jan-01	24	250	10.9	0.05696247	1	6,862
16-Jan-01	24	250	10.9	0.05696247	1	6,864
17-Jan-01	24	250	10.9	0.05696247	1	6,865

Notes: VOC estimate derived from quarterly Summa Canister results

#### **3.1.4.1 System Shutdowns**

The SVE/AS system operated between July 8, 1999 and January 17, 2001 with occasional scheduled shutdowns occurring for non-routine system maintenance. The system operated 86 percent of the time during implementation of the interim remedy. Several unscheduled system shutdowns occurred because of power outages and entry of rainwater into the SVE building. In all instances, the SVE/AS system was restarted without incident. The Operations and Maintenance checklists included in **Appendix C** contain descriptions of all system outages.

#### **3.1.4.2 Operation and System Monitoring Results**

##### ***Soil Gas Monitoring***

As discussed in Sections 3.1.2.7 and 3.1.4, quarterly monitoring was performed of the soil gas extracted from the site and effluent gas from the catalytic oxidizer. These gas samples were collected to determine the continuing effectiveness of the remedy and to verify the complete destruction of contaminants of concern prior to discharge from the oxidizer. Soil gas monitoring results are presented in Table 3-6. Based on influent VOC concentrations from each reporting period, weekly system run time, and weekly flow rate of site gas to the catalytic oxidizer, it has been calculated that approximately 6,900 pounds of VOCs were extracted from the site and destroyed during the SVE/AS system operational period (Figure 3-6).

Results for implementation of the interim measures indicate that VOC loading beneath the site was significantly reduced after the initiating SVE/AS operations in 1999. The remediation progress of the SVE/AS system can be quantified by tracking the mass of VOCs that has been extracted from the site. The VOC mass removal rate decreased substantially in the final six months of operation as depicted in Figure 3-6. The average final quarter mass removal rate of 1 pound per day of total VOCs was 28 times lower than the average removal rate during the peak of system operation that occurred three months after startup, indicating that remediation was complete.

In addition to volatilization, hydrocarbons were also biologically degraded *in-situ*. Existing microbes can aerobically digest hydrocarbons and produce carbon dioxide as a by-product when sufficient levels of oxygen and nutrients are available. *In-situ* aerobic biodegradation often occurs at sites until oxygen levels are depleted. The SVE system enhanced this process by removing the oxygen depleted air and introducing oxygen rich air in its place.

### **3.1.5 Results of System Evaluation Soil and Groundwater Sampling**

As required, PPG collected a total of 30 soil and 15 groundwater samples from the Former TFA to evaluate system performance. Soil samples were collected using a Geoprobe<sup>®</sup>. Groundwater samples were collected from existing wells and/or directly from the Geoprobe<sup>®</sup> boring used for soil sampling. All sampling and analytical methodology, including data validation, was performed in accordance with the methods described in the QAPP prepared for this project.

A GeoProbe<sup>®</sup> was used to collect multi-depth soil samples and groundwater samples from selected locations around the Former TFA. Typically, two soil samples and one groundwater sample were collected from each sample location. In designing the SVE/AS system, it was anticipated that the majority of volatile organic compounds (VOCs) would be removed from the affected media following 12 months of system operation. As such, the first round of samples were collected on June 7, 2000, with a total of fifteen samples (ten soil and five groundwater) being collected from five locations. A second round of sample-collection was completed on January 18, 2001, at the completion of the 18 month operational period discussed in the CMS. Nine sample locations were chosen for the second round of sampling. A total of 20 soil samples and ten groundwater samples, including two duplicate soil samples and one duplicate groundwater sample, were collected during the sampling event.

Analytical results from the collected samples were evaluated by comparing reported values to the applicable Target Cleanup Goals (TCG) presented in Table 3-1 and Table 3-2 for soil and groundwater, respectively.

This comparison revealed that for the first round of samples, there were a total of six instances where contaminant concentrations in the collected samples exceeded the applicable TCGs (five for soil, one for groundwater). By comparison, a total of 150 data points (15 samples times 10 analytes) were generated by the sample event. Of the 100 data points generated from the 10 collected soil samples, five were reported at concentrations that exceeded the applicable TCGs, and 46 were reported as non-detect. Ethylbenzene and total xylenes were the only soil contaminants with reported concentrations that exceeded the applicable TCGs. A review of the reported data for the three collected groundwater samples shows one instance (benzene in SB-3) where a contaminant concentration exceeded the applicable TCG, and 16 instances where the reported contaminant concentration was reported at a non-detect level. The six soil and groundwater values that exceeded the applicable TCGs resulted from three sample locations (SB-1, SB-3 and SB-4).

The evaluation of the data from the second round of sampling revealed that in nine of a possible 300 instances (30 samples times 10 analytes) reported contaminant levels exceeded the

applicable TCGs. A total of 20 soil samples, including two duplicates, were collected and analyzed. Six of a possible 200 data points were found to exceed the applicable TCGs, with the elevated values being limited to three sample locations (SB-6, SB-7 and SB-13). Detectable levels of contaminants were only reported in 33 instances, including the six previously mentioned. Toluene, ethyl benzene and total xylenes were the soil contaminants with reportable concentrations above the applicable TCGs. The ten collected groundwater samples generated 100 data points, of which three were reported at concentrations above the applicable TCGs, while in 82 instances the analyte concentration was reported as non-detectable. Sample locations SB-7 (ethylbenzene), SB-13 (benzene) and SB-14 (ethylbenzene) each generated a single instance where the applicable PRG was exceeded. As shown, only four of the nine sample locations (SB-6, SB-7, SB-13 and SB-14) contributed to these elevated contaminant levels. Three of these samples locations (SB-6, SB-13, and SB-14) are essentially repeats of sample locations from the first sampling round (SB-1, SB-3 and SB-4).

Figure 3-4 shows the sample locations from both sample events and summary tables present the reported analytical results for the confirmatory soil and groundwater samples (Tables 3-7 and 3-8). Appendix B contains the laboratory analytical results.

### **3.1.6 Current Status of the System**

The SVE/AS system has been shut down since January 2001. All piping, blowers, and enclosures remain in place. The groundwater underdrain system remains in operation.

## **3.2 RISK EVALUATION SUMMARY**

The following section summarizes the conservative risk evaluation at PPG's Oak Creek Facility Former TFA. The risk evaluation was based on the residual and historic concentrations of constituents in soil and residual concentrations of constituents in groundwater present in the Former TFA. The evaluation closely adheres to methodology, assumptions, and approach outlined in the previously USEPA-approved RFI risk assessment (ICF Kaiser, 1997). The following summarizes the risk evaluation which assessed soil and groundwater data collected at SWMUs within the Former TFA. The Risk Evaluation of the TFA (Shaw, 2003) was completed in March 2003.

### **3.2.1 Identification of Constituents of Interest**

#### ***Soil and Groundwater Screening Criteria***

Based on a preliminary screening of available data, constituents of interest (COIs) with detected concentrations were identified for soil, soil-to-groundwater, and groundwater pathways. The

COIs were compared against USEPA Region IX PRGs for soil, USEPA soil screening levels (SSLs) for soil-to-groundwater, and the lower of either the USEPA Region IX tap water PRGs or the WDNR Enforcement Standards (ES) for groundwater.

### ***Data Evaluation***

For the evaluation of soil, post-remedial soil sample data were supplemented with pre-remedial data in an effort to compile a database with sufficient samples to yield a valid statistical evaluation for the site exposure point concentrations (EPCs) (ICF Kaiser, 1997). The soil data were segregated by depth zone as follows: 1) Surface Soil (0 to 2 feet) to assess exposure for the industrial/maintenance worker; 2) Soil (0 to 6 feet) to assess exposure for the construction/utility worker; and 3) Soil (0 to 12 feet) to assess the potential for leaching and subsequent migration to groundwater of constituents in soil. All soil samples used in the risk assessment were collected prior to 2003.

For the evaluation of groundwater, laboratory analytical data were utilized from Geoprobe<sup>®</sup> groundwater samples collected in January 2001 and groundwater samples collected in May 2002.

### ***Risk Screening Results for Soil***

Ethylbenzene, toluene, and xylenes were detected in soil at concentrations above the risk-based PRGs and are therefore identified as COIs for evaluation in the quantitative risk evaluation.

The following constituents exceeded USEPA Region IX SSLs and site-specific SSLs for the evaluation of the soil-to-groundwater pathway: acetone; benzene; ethylbenzene; methylene chloride; styrene; 1,1,2,2-tetrachloroethane; tetrachloroethene (PCE); toluene; and xylene.

### ***Risk Screening Results for Groundwater***

For the evaluation of VOCs in groundwater to indoor air, benzene, ethylbenzene, xylenes, 1,2,4-trimethylbenzene, 2-butanone (MEK), 4-methyl-2-pentanone (MIBK), acetone, and naphthalene were detected at concentrations above the screening criteria (the lower of the Region IX tap water PRG or the WDNR ES) and were identified as COIs in groundwater for the quantitative risk evaluation (Shaw, 2003).

## **3.2.2 Exposure Assessment**

Exposure assessment characterizes potential exposure scenarios and identifies potential exposure pathways. For potential exposure pathways, constituent concentrations in all relevant media are



estimated, and the extent of receptors' constituent intake and absorption are quantitatively evaluated.

**General Assumptions.** PPG is planning to record a restrictive covenant on the deed applicable to the potentially impacted portion of the property that will prohibit the use of underlying groundwater for a potable source and limit the land use to an industrial/commercial use scenario. Therefore, industrial PRGs for screening provide the necessary level of protection for the potential receptors at the site. The trespassing youth pathway was not considered in the RE due to the limited exposure duration and frequency of this receptor and direct contact with constituents in soil is evaluated through the on-site utility worker/construction worker.

Even though there is little potential for off-site groundwater use in the vicinity of the site, exposure of off-site receptors to COIs in groundwater was addressed qualitatively.

***Potential Pathways and Receptors***

The following table summarizes the exposure pathways considering the Former TFA as the exposure source.

**Table 3-10  
Summary of Major Complete Exposure Pathways**

<b>Exposure Medium</b>	<b>Receptor</b>	<b>Exposure Route</b>	<b>Timeframe Scenario</b>
Soil (0-2')	Industrial/Research Worker	Incidental Ingestion, Inhalation, Dermal	Current/Future
Soil (0-6')	Utility/Construction Worker	Incidental Ingestion, Inhalation, Dermal	Future
Soil (0-12')	Indoor Worker	Inhalation	Future
Groundwater	Utility/Construction Worker	Dermal	Future
Groundwater	Indoor Worker	Inhalation (VOCs only)	Future

***Quantification of Exposure Point Concentrations (EPCs)***

The 95 percent UCL of the mean concentration or maximum concentration when appropriate, of the COIs was the EPC used for the potential receptors in each exposure media. A summary of the statistics and EPC selection for soil and groundwater are provided below.

**Table 3-11**  
**Summary of Surface Soil and Groundwater Statistics and EPC Selection**

Medium	COI	Distribution Type	95% UCL (µg/kg)	EPC (µg/kg)	EPC Basis
Soil (0-2')	Ethylbenzene	Undefined	26	26	95% UCL
	Toluene	Undefined	10	10	95% UCL
	Xylenes (total)	Undefined	210	210	95% UCL
Soil (0-6')	Ethylbenzene	Undefined	20	20	95% UCL
	Toluene	Undefined	6	6	95% UCL
	Xylenes (total)	Undefined	260	260	95% UCL
Soil (0-12')	Ethylbenzene	Undefined	26.9	26.9	95% UCL
	Toluene	Undefined	9.6	9.6	95% UCL
	Xylenes (total)	Undefined	503	503	95% UCL
Groundwater	Benzene	Lognormal	22	22	95% UCL
	Ethylbenzene	Lognormal	490,000	6,400	Maximum
	Xylenes (total)	Lognormal	202,000	4,630	Maximum
	1,2,4-Trimethylbenzene	Undefined	19	19	Maximum
	2-Butanone (MEK)	Undefined	9,800	9,800	Maximum
	4-Methyl-2-pentanone	Undefined	22,000	22,000	Maximum
	Acetone	Undefined	1,100	1,100	Maximum
	Naphthalene	Undefined	47	47	Maximum

### ***Fate and Transport Modeling***

The Johnson and Ettinger Model, ([www.epa.gov/superfund/programs/risk/airmodel/johnson\\_ettinger.htm](http://www.epa.gov/superfund/programs/risk/airmodel/johnson_ettinger.htm)), was used to determine potential risks due to vapor intrusion into buildings from both soil and groundwater. To avoid potential institutional controls and land use restrictions, both slab-on-grade and basement scenarios were addressed to ensure acceptable risks to human health regardless of future construction types. For more information pertaining to this model, refer to the aforementioned website.

Vaporization of contaminants into indoor air from direct uses of groundwater was not assessed in the RE because on and off-site water is supplied by municipal sources and groundwater directly below the site is generally contained in a zone above clay till that would not yield sufficient water to support any type of direct use (ICF Kaiser, 1997).

A groundwater fate and transport evaluation was completed utilizing the Domenico Model (ASTM, 1995) based on the conclusions in the RFI report (ICF Kaiser, 1997) and the assumption

that the underdrain system was inoperable. The groundwater model is further discussed in the Risk Evaluation of the TFA (Shaw, 2003).

### *Exposure Assumptions*

The following table summarizes the major exposure assumptions utilized in the risk evaluation.

**Table 3-12  
Summary of Receptor Exposure Assumptions**

Exposure Parameter	Industrial Worker	Construction Worker	Indoor Worker
<b><u>Receptor Specific Parameters</u></b>			
Body weight (BW)	70 kg	70 kg	70 kg
Exposure Frequency (EF)	250 days/year	250 days/year	250 days/year
Exposure Duration (ED)	25 years	1 year	25 years
Averaging Time (AT) (carcinogenic effects)	25,550 days	25,550 days	25,550 days
Averaging Time (AT) (noncarcinogenic effects)	9,125 days	365 days	9,125 days
Ingestion Rate – soil (IR)	50 mg/day	480 mg/day	NA
Inhalation Rate – Indoor Air	NA	NA	20 cubic meters/day
Exposure Time (ET)– (dermal contact with groundwater)	NA	4 hours/day	NA
Skin Surface Area (soil and groundwater)	NA	2,000 cm <sup>2</sup>	NA

### **3.2.3 Risk Characterization**

#### *Risk and Hazard Results*

The 95 percent UCL EPCs were utilized to estimate potential risks and hazards for each complete exposure pathway for soil and groundwater. The incremental cancer risks (CR) and

hazard quotients (HQ) are calculated for each COI and then summed for the current and future industrial worker receptor, the future construction worker receptor, and the future indoor worker receptor at the Former TFA. Summation of the hazard quotients yields a hazard index (HI). Risks and hazards are summarized in Table 3-13.

### ***Soil to Groundwater Pathway***

The constituents 1,1,2,2-tetrachloroethane, acetone, benzene, ethylbenzene, methylene chloride, styrene, PCE, toluene, and xylene were detected at concentrations above both the Region IX SSL concentrations and the site-specific SSLs, and were, therefore, identified as COIs for the soil-to-groundwater pathway. Sample results used in the RA were collected in May 2002 or earlier. Although these constituents were identified as potential COIs in the leaching to groundwater pathway, acetone, benzene, ethylbenzene, and xylenes (total) were further evaluated quantitatively as COIs in groundwater. Toluene was detected in May 2002 groundwater samples below the screening criteria. The remaining constituents, 1,1,2,2- tetrachloroethane, methylene chloride, styrene, and PCE were not detected in the recent groundwater sampling. Since the site has been active for approximately 30 years, and both soil and groundwater have undergone remediation, it is expected that the recent groundwater data reflect the current constituent concentrations in groundwater; and therefore, no additional groundwater risks should occur as a result of soil constituents leaching to groundwater.

### **Groundwater Migration**

The off-Site residential receptor is evaluated qualitatively via the Domenico fate and transport model which estimated concentrations of benzene and ethylbenzene would be 9.5 µg/L and 33 µg/L, respectively at the eastern property boundary (the direction of groundwater flow). For benzene this concentration is above the USEPA Region IX tap water PRG; however, the concentration for ethylbenzene is well below its PRG of 1,300 µg/L. It should be noted that the surrounding land use is also industrial and the tap water RBCs are protective of potable groundwater use which does not occur at the site. Current and historical groundwater data have consistently demonstrated that groundwater from monitoring wells at the property boundary have not been impacted from site activities. This suggests the Domenico model overestimates the concentrations in groundwater at the property boundary, and there is no evidence in the groundwater data that indicates constituents in on-site groundwater are migrating off-site.

**Table 3-13 Summary of Cancer Risks and Noncarcinogenic Hazards**

COI / Pathway	Industrial Worker		Construction/Utility Worker		Indoor Worker	
	CR	HQ	CR	HQ	CR	HQ
<b>Ingestion of Soil</b>						
Ethylbenzene	NA	0.00000013	NA	0.00000094	NA	NA
Toluene	NA	0.000000025	NA	0.00000014	NA	NA
Xylenes	NA	0.000000051	NA	0.00000061	NA	NA
<b>Dermal Contact with Soil</b>						
Ethylbenzene	NA	0.000000011	NA	0.000000082	NA	NA
Toluene	NA	0.0000000021	NA	0.000000012	NA	NA
Xylenes	NA	0.0000000043	NA	0.0000000053	NA	NA
<b>Dermal Contact with Groundwater</b>						
Benzene	NA	NA	2.0 E-08	0.0086	NA	NA
Ethylbenzene	NA	NA	NA	0.24	NA	NA
Xylenes	NA	NA	NA	0.0096	NA	NA
1,2,4-Trimethylbenzene	NA	NA	NA	0.0018	NA	NA
2-Butanone (MEK)	NA	NA	NA	0.0012	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	0.058	NA	NA
Acetone	NA	NA	NA	0.00045	NA	NA
Naphthalene	NA	NA	NA	0.0087	NA	NA
<b>Migration of VOCs in Soil to Indoor Air followed by Inhalation</b>						
Ethylbenzene	NA	NA	NA	NA	NA	0.00011
Toluene	NA	NA	NA	NA	NA	0.00015
Xylenes	NA	NA	NA	NA	NA	0.00019
<b>Migration of VOCs in Groundwater to Indoor Air followed by Inhalation</b>						
Ethylbenzene	NA	NA	NA	NA	NA	0.076
Toluene	NA	NA	NA	NA	NA	NA
Xylenes	NA	NA	NA	NA	NA	0.00054
Acetone	NA	NA	NA	NA	NA	0.000032
Benzene	NA	NA	NA	NA	6.5 E-08	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	0.00027
Naphthalene	NA	NA	NA	NA	NA	0.00094
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	0.002
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	0.018
<b>Total Risks and Hazards:</b>	<b>NA</b>	<b>0.0000002</b>	<b>2 E-08</b>	<b>0.3</b>	<b>7 E-08</b>	<b>0.1</b>

### 3.2.4 Risk Evaluation Conclusions

Both soil and groundwater were evaluated for the former Tank Farm Area of the PPG Oak Creek facility.

For exposure to constituents in soil, the current and future industrial/maintenance worker, the future construction/utility worker, and the future on-site worker were defined and associated risks were calculated. Adverse carcinogenic health effects for the industrial/maintenance worker

do not occur because the COIs did not screen in. Non-carcinogenic health effects from soil for this receptor were also acceptable (**0.0000002**). Current and future cancer risks (**2E-08**) and hazards (**0.3**) for the construction/utility worker do not currently occur and are estimated to not occur in the future. Risks (**7E-08**) and hazards (**0.1**) for the future indoor worker were acceptable for this receptor.

Although COIs for the evaluation of the soil-to-groundwater pathway were detected at concentrations above the USEPA Region IX SSLs and the site-specific SSL criteria, they were either not detected in recent groundwater samples or they were selected as COIs in groundwater and further evaluated in the RE.

For groundwater, COI concentrations were modeled from the point of their maximum concentration locations to the property boundary (point-of-compliance). For benzene, it was estimated that modeled concentrations would reach the property boundary at levels above the USEPA Region IX tap water PRG. However, current and historical groundwater data for the monitoring wells along the eastern property boundary show that constituents in groundwater are not migrating off-site. Additionally, risks to a potential future on-site indoor worker as a result of volatile COIs in soil and groundwater volatilizing into indoor air were evaluated and are within acceptable ranges.

In summary, there are no adverse risks or hazards to any current on-site or future on- or off-site receptors at the site.

## **4.0 RECENT FACILITY MONITORING**

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Upon completion of the Risk Evaluation (RE), the USEPA requested continued monitoring to further assess residual concentrations in groundwater. Accordingly, PPG developed a two-year, semi-annual groundwater monitoring plan (Letter to U.S. EPA dated May 27, 2004) to further monitor site concentrations of benzene, toluene, ethylbenzene, and xylene (BTEX) constituents in groundwater. The proposed plan outlined the collection of groundwater samples from nine existing site monitoring wells every six months for two years.

### **4.1 MONITORING WELL RE-SURVEY**

At the time that the RE for the Former TFA was conducted, it was recognized that some site monitoring wells were surveyed to site coordinates and some were surveyed relative to mean sea level. Therefore, in an effort to coordinate all site monitoring wells onto one uniform system, on January 23, 2006, concurrent with the groundwater sampling event, wells having only survey information relative to site coordinates were re-surveyed relative to mean sea level. Top of casing elevations were re-surveyed for monitoring wells LP-2, LP-3, LW-2, and LW-3, and ground elevations and top of casing elevations were re-surveyed for monitoring wells LW-5, LW-6, TF-1, TF-2, TF-3, and TF-4. Existing well survey information was used as the benchmark for the surveying monitoring wells. Table 4-1 provides a summary of the survey data for all monitoring wells in the Former TFA. Field notes with the actual data recorded during the survey activities are provided in Appendix A.

### **4.2 GROUNDWATER ELEVATIONS**

Groundwater levels were gauged during each groundwater sampling event. Groundwater elevations for the May 23, 2002 sampling event were recalculated based on the results of new survey data. The May 2002 water elevations are summarized in Table 4-2. The groundwater elevation map for May 2002 is provided in Figure 4-1. Groundwater elevations for each of the sampling events between July 2004 and January 2006 are summarized in Table 4-3. The groundwater elevation map for January 2006 is provided in Figure 4-2. Field Activity Logs are contained in Appendix A.

Both the May 2002 and January 2006 groundwater elevation maps show similar flow patterns for shallow groundwater. Groundwater in the Former TFA and the immediate areas surrounding the Tank Farm is controlled by the active Underdrain System, and groundwater flows radially toward the collection system. Moving eastward away from the Tank Farm, groundwater flow directions are to the east and northeast, in the general direction of MW-12 (refer to Figures 4-1 and 4-2).

Table 4-1

Survey Data for Site Monitoring Wells  
PPG Industries, Inc., Oak Creek, Wisconsin

WELL	Ground Elevation (msl)	TOC (msl)	Status
LP-2	696.83	<b>697.79</b>	
LP-3	695.84	<b>696.18</b>	
LW-2	697.34	<b>698.62</b>	(1)
LW-3	695.76	<b>696.39</b>	
LW-5	<b>695.79</b>	<b>698.40</b>	(1)
LW-6	<b>695.61</b>	<b>698.19</b>	(1)
MW-10	693.20	695.91	(1) Damaged
MW-11	689.20	691.60	(1)
MW-12	685.60	687.92	(1)
MW-13	683.80	686.35	
MW-14	694.30	693.70	
MW-15	696.30	698.97	
MW-16	696.30	698.36	
TF-1	<b>697.53</b>	<b>699.31</b>	(1)
TF-2	<b>696.82</b>	<b>698.00</b>	(1)
TF-3	<b>697.61</b>	<b>699.64</b>	(1)
TF-4	<b>697.52</b>	<b>699.18</b>	

TOC = top of casing

(1) Well is sampled as part of semi-annual monitoring program.

Elevations in **bold italic print** are based on the most recent survey conducted on January 23, 2006. All other elevations are from previous investigations.



**Table 4-2**

**Revised Groundwater Elevations for May 23, 2002  
Based on January 2006 Re-Survey  
PPG Industries, Inc., Oak Creek, Wisconsin**

<b>Monitoring Well ID</b>	<b>Ground Elevation (msl)</b>	<b>TOC Elevation (msl)</b>	<b>Depth to Water (TOC)</b>	<b>Groundwater Elevation</b>
LP-2**	696.83	697.79	14.6	683.19
LP-3	695.84	696.18	12.83	683.35
LW-2	697.34	698.62	12.55	686.07
LW-3	695.76	696.39	12.96	683.43
LW-5	695.79	698.40	15.27	683.13
LW-6	695.61	698.19	14.23	683.96
MW-10	693.20	695.91	9.63	686.28
MW-11	689.20	691.60	6.89	684.71
MW-12	685.60	687.92	6.37	681.55
MW-13	683.80	686.35	Not Measured	---
MW-14	694.30	693.70	7.00	686.70
MW-15**	696.30	698.97	12.96	686.01
MW-16	696.30	698.36	7.62	690.74
TF-1	697.53	699.31	15.76	683.55
TF-2	696.82	698.00	Not Measured	---
TF-3	697.61	699.64	18.13	681.51
TF-4	697.52	699.18	Not Measured	---

TOC = top of casing

msl = Mean Sea Level

\*\* = Deep Monitoring Well - not used for groundwater contours.

Table 4-3

**Groundwater Elevations July 2004 through January 2006**  
**Based on January 2006 Re-Survey**  
**PPG Industries, Inc., Oak Creek, Wisconsin**

Monitoring Well ID	Ground Elevation (msl)	TOC Elevation (msl)	July 2004		January 2005		July 2005		January 2006	
			Depth to Water (TOC)	Ground-water Elevation	Depth to Water (TOC)	Ground-water Elevation	Depth to Water (TOC)	Ground-water Elevation	Depth to Water (TOC)	Ground-water Elevation
LP-2**	696.83	697.79	NM	---	NM	---	NM	---	14.55	683.24
LP-3	695.84	696.18	NM	---	NM	---	NM	---	12.77	683.41
LW-2	697.34	698.62	12.75	685.87	13.76	684.86	14.33	684.29	12.87	685.75
LW-3	695.76	696.39	NM	---	NM	---	NM	---	12.7	683.69
LW-5	695.79	698.40	15.54	682.86	15.49	682.91	15.62	682.78	15.75	682.65
LW-6	695.61	698.19	14.06	684.13	14.49	683.7	14.13	684.06	14.26	683.93
MW-10	693.20	695.91	Well Damaged; Not Measured							
MW-11	689.20	691.60	6.47	685.13	6.87	684.73	8.0	683.6	5.4	686.2
MW-12	685.60	687.92	7.03	680.89	6.41	681.51	9.74	678.18	5.44	682.48
MW-13	683.80	686.35	NM	---	NM	---	NM	---	NM	---
MW-14	694.30	693.70	NM	---	NM	---	NM	---	NM	---
MW-15**	696.30	698.97	NM	---	NM	---	NM	---	13.05	685.92
MW-16	696.30	698.36	NM	---	NM	---	NM	---	NM	---
TF-1	697.53	699.31	15.84	683.47	15.98	683.33	15.9	683.41	15.97	683.34
TF-2	696.82	698.00	17.05	680.95	17.14	680.86	17.05	680.95	17.07	680.93
TF-3	697.61	699.64	18.00	681.64	18.13	681.51	18.01	681.63	18.10	681.54
TF-4	697.52	699.18	NM	---	NM	---	NM	---	16.12	683.06

TOC = top of casing

BOW = bottom of well

NM = not measured

\*\* = Deep Monitoring Well - not used for groundwater contours.

### **4.3 GROUNDWATER SAMPLING**

In July 2004, groundwater samples were collected from eight monitoring wells located within, and immediately surrounding, the Former TFA. Monitoring wells sampled include LW-2, LW-5, LW-6, MW-11, MW-12, TF-1, TF-2 and TF-3. A field duplicate sample was collected and submitted for analysis, along with a trip blank. Monitoring Well locations are shown on Figure 4-3. One monitoring well, MW-10, could not be sampled because the well was damaged. Samples were analyzed for BTEX constituents. Additional groundwater sampling events were conducted in January and July 2005, and January 2006.

All groundwater samples collected were submitted to Kemron Environmental Services in Marietta, Ohio for analysis. The groundwater samples, field duplicate samples, and trip blanks were analyzed for BTEX by method SW-846 5030B/8260B. Results of the analytical for the groundwater samples are summarized in Table 4-4. Box plots showing the distribution of the detected constituents in groundwater for the May 2002 sampling event were provided in the RE (Shaw, 2003). The groundwater data from July 2004 through January 2006 are shown graphically on Figure 4-3. Appendix A contains the Field Activity Logs. Complete copies of the Lab Reports are provided in Appendix B.

### **4.4 SITE TRENDS AND CONCENTRATIONS**

Trends in concentrations of BTEX constituents in groundwater have fluctuated between May 2002 and January 2006. Results of the chemical analysis of the groundwater samples determined that three monitoring wells, LW-2, WM-11, and MW-12, never had detectable levels of BTEX constituents. Another monitoring well, LW-6, had one detection each of ethylbenzene and xylenes in May 2002; benzene and toluene have always been non-detected in this well. Samples from monitoring well TF-1 confirmed the presence of ethylbenzene and xylenes in May 2002. Benzene was also detected in samples from TF-1 in May 2002 and July 2004. All other BTEX concentrations in groundwater at TF-1 were nondetect (refer to Table 4-4).

Trend plots for BTEX constituents are provided in Figures 4-4 through 4-7, respectively for three monitoring wells, LW-5, TF-2, and TF-3. From July 2004 through July 2005, BTEX concentrations generally increased. However, concentrations decreased in January 2006.

Detected benzene concentrations in groundwater (Table 4-4 and Figure 4-4) are generally stable below 1 µg/L except for one monitoring well (TF-3). At TF-3, concentrations steadily increased from 2.39 µg/L in July 2004 to 6.13 µg/L in July 2005, when the benzene concentration rose above the MCL of 5.0 µg/L. In January 2006, the benzene concentration in TF-3 declined to 2.5 µg/L, below the MCL for benzene.

Table 4-4

**BTEX Analytical Results in Groundwater  
May 2002 through January 2006  
PPG Industries, Inc., Oak Creek, Wisconsin**

Well ID	Sample Date	Constituent (ug/L)			
		Benzene	Ethylbenzene	Toluene	Xylenes (Tot)
MCL		5.0	700	1,000	10,000
LW-2	5/2/02	ND (0.4)	ND (5)	ND (5)	ND (5)
	7/26/04	ND (5)	ND (5)	ND (5)	ND (5)
	1/31/05	ND (5)	ND (5)	ND (5)	ND (5)
	7/5/05	ND (5)	ND (5)	ND (5)	ND (5)
	1/23/06	ND (0.4)	ND (5)	ND (5)	ND (5)
LW-6	5/1/02	ND (0.4)	0.44	ND (5)	0.74
	7/26/04	ND (5)	ND (5)	ND (5)	ND (5)
	1/31/05	ND (5)	ND (5)	ND (5)	ND (5)
	7/5/05	ND (5)	ND (5)	ND (5)	ND (5)
	1/23/06	ND (0.4)	ND (5)	ND (5)	ND (5)
LW-5	5/1/02	0.48	160	ND (5)	180
	7/26/04	0.49	99.7	ND (5)	6.27
	1/31/05	0.54	36.8	ND (5)	0.878
	7/5/05	0.314	13.8	ND (5)	1.52
	1/23/06	0.390	0.51	ND (5)	ND (5)
TF-1	5/1/02	0.5	0.82	ND (5)	1.2
	7/26/04	0.37	ND (5)	ND (5)	ND (5)
	1/31/05	ND (5)	ND (5)	ND (5)	ND (5)
	7/5/05	ND (5)	ND (5)	ND (5)	ND (5)
	1/23/06	ND (0.4)	ND (5)	ND (5)	ND (5)
TF-2	5/1/02	NS	NS	NS	NS
	7/26/04	0.876	647	ND (5)	2,160
	1/31/05	0.589	74	ND (5)	ND (5)
	7/5/05	0.805	1.45	ND (5)	ND (5)
	1/23/06	0.950	37	ND (5)	0.58
TF-3	5/1/02	2	190	280	1,300
	7/26/04	2.39	207	190	2,190
	1/31/05	4.62	178	256	3,890
	7/5/05	<b>6.13</b>	227	384	3,680
	1/23/06	1.6	99	32	570
MW-11	5/1/02	ND (0.4)	ND (5)	ND (5)	ND (5)
	7/26/04	ND (5)	ND (5)	ND (5)	ND (5)
	1/31/05	ND (5)	ND (5)	ND (5)	ND (5)
	7/5/05	ND (5)	ND (5)	ND (5)	ND (5)
	1/23/06	ND (0.4)	ND (5)	ND (5)	ND (5)
MW-12	5/1/02	ND (0.4)	ND (5)	ND (5)	ND (5)
	7/26/04	ND (5)	ND (5)	ND (5)	ND (5)
	1/31/05	ND (5)	ND (5)	ND (5)	ND (5)
	7/5/05	ND (5)	ND (5)	ND (5)	ND (5)
	1/23/06	ND (0.4)	ND (5)	ND (5)	ND (5)

MCL = Maximum Contaminant Level

ND (5) = Not detected at the detection Limit in parenthesis.

NS = Not sampled

PPG Oak Creek  
Corrective Measures Implementation Report

Monitoring well TF-3 was the only well with detectable levels of toluene (Table 4-4). The plot of toluene concentrations in groundwater over time (Figure 4-5) shows that concentrations in monitoring well TF-3 fluctuate between 32 and 384 µg/L. Recent detected concentrations of toluene have always been significantly below the MCL of 1,000 µg/L.

A plot of the ethylbenzene concentrations in groundwater over time is provided in Figure 4-6 for monitoring wells LW-5, TF-2 and TF-3. With one exception, detected concentrations of ethylbenzene have been slightly higher than 200 µg/L or below. One detection of ethylbenzene in monitoring well TF-2 was significantly elevated (647 µg/L) in July 2004 compared to other detected ethylbenzene concentrations. All detected concentrations of ethylbenzene were below the MCL of 700 µg/L.

A plot of the total xylenes concentrations in groundwater over time is provided in Figure 4-7. Concentrations of total xylenes in these wells ranged from nondetect in monitoring wells LW-5 and TF-2 to 3,890 µg/L in monitoring well TF-3. The total xylene concentration in each well fluctuated over time with an overall decrease in the concentration trend. Recent detected total xylenes concentrations were always below the MCL of 10,000 µg/L.

## **5.0 CONCLUSIONS**

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PPG constructed the Oak Creek Facility between 1973 and 1975, completing construction at the facility in December 1975. Several SWMUs have been identified at the facility, including the Former TFA. During operation of the plant between 1975 and 1999, releases of chemicals stored in the Former TFA were documented. An Underdrain System was installed at the time that Former TFA was constructed to manage and control potential releases from the Former TFA to soil and groundwater. The Underdrain System has been active at the site since it was installed and made operational. In 1999, PPG removed 23 of the 40 USTs, and closed the remaining 17 USTs in place with Wisconsin Department of Commerce approval. As part of the approval of the RFI report (ICF Kaiser, 1997), a presumptive remedy of SVE combined with AS was developed and subsequently implemented.

### **5.1 SVE/AS SYSTEM OPERATON**

Design calculations developed during the planning of the SVE/AS system estimated that a total of 8,226 pounds of VOCs were present in soil below the Former TFA and 76 pounds of VOCs were present in groundwater below the Former TFA. An SVE pilot test was conducted in February 1999, and by June 1999, construction of the SVE/AS system was completed. On June 22, 1999 the SVE/AS system was activated. System operation continued until January 17, 2001.

In June 2000, approximately 12 months after the SVE/AS operations began, ten soil samples and five groundwater samples were collected to evaluate the system performance. Confirmatory soil and groundwater samples were analyzed for 1,1,2,2-tetrachloroethane; 2-butanone (MEK); 4-methyl-2-pentanone (MIBK); benzene; ethylbenzene; methylene chloride; styrene; tetrachloroethene (TCE); toluene; and xylenes (total). In soil, ten percent of the samples analyzed for ethylbenzene exceeded the TCG, and 40 percent of the samples analyzed for xylenes (total) exceeded the TCG. In groundwater, 33 percent of the samples analyzed for benzene exceeded the TCG.

The SVE/AS system continued to operate through January 2001. At that time it was concluded, based on VOC removal rates, that remediation was essentially complete. Subsequently, a second round of soil and groundwater samples was collected to further evaluate the system performance. Twenty soil samples and ten groundwater samples were collected and analyzed for the same list of constituents previously discussed. In soil, five percent of the samples analyzed for ethylbenzene exceeded the TCG, 20 percent of the samples analyzed for xylenes (total) exceeded the TCG, and 5 percent of the sample analyzed for toluene exceeded the TCG. In groundwater,

10 percent of the samples analyzed for benzene exceeded the TCG, and 20 percent of the samples analyzed for ethylbenzene exceeded the TCG.

Based on calculations from influent VOC concentrations and system flow rates, approximately 6,900 pounds of VOCs were extracted from soil and groundwater in the Former TFA during the SVE/AS system's operational period.

## **5.2 RISK EVALUATION**

After the SVE/AS activities ended, a risk evaluation was conducted to assess the potential risks and hazards of the residual soil and groundwater constituent concentrations in the Former TFA. Historic and recent soil data were used in the evaluation. An additional round of groundwater samples was collected in May 2002 from the existing monitoring well network. These data, along with the Geoprobe® groundwater samples collected in January 2001, were used to represent groundwater concentrations at the site.

The risk evaluation assessed risk and hazards for the plausible receptor population at the site. Receptors evaluated included current and future on-site industrial/research workers, future on-site utility/construction workers, and future on-site indoor workers. Estimated cancer risks for all receptors were one or two orders of magnitude below USEPA's target risk range of  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$ . Hazard indices for the evaluated receptors were below 1.0. The USEPA considers noncarcinogenic hazard indices less than one (1.0) to be acceptable.

A groundwater fate and transport model was developed to address the potential for migration of constituents in groundwater off-site. The model was executed under the assumption that the Underdrain System was inactive at the site, a conservative, worse-case scenario. The groundwater fate and transport model estimated that the maximum concentrations of benzene and ethylbenzene in groundwater at the property boundary would be 0.0095 mg/L and 0.033 mg/L, respectively. While the 0.0095 mg/L modeled concentration of benzene at the eastern property line is higher than the groundwater TCG for benzene (0.005 mg/L), actual groundwater results from samples collected from monitoring wells near the eastern property line (MW-10, MW-11, and MW-12) have never detected benzene at levels above the analytical detection limits. The underdrain system appears to have prevented the off-site migration of constituents in groundwater and constituent concentrations in the source area have trended lower over time, further reducing the likelihood of future impacts exceeding TCGs at the property line.

## **5.3 RECENT FACILITY MONITORING**

To further monitor and assess groundwater constituent concentrations, PPG implemented a semi-annual groundwater sampling plan in July 2004. Eight existing site monitoring wells were

sampled in July 2004, January 2005, July 2005, and January 2006. Groundwater analyses were conducted for BTEX constituents.

Groundwater elevations collected at the time of sampling confirm that the groundwater flow in the Former TFA continues to be controlled by the Underdrain System, and concentrations of constituents in groundwater are decreasing over time. Detectable levels of BTEX constituents remain limited to the Former TFA proper, and BTEX concentrations in the monitoring wells near the eastern property boundary (MW-11 and MW-12) are below detectable limits.

While concentrations of BTEX have been fluctuating at wells in the Former TFA, the general trend in BTEX concentrations has been downward from May 2002 through January 2006. Benzene was detected above the TCG in the groundwater sample collected from monitoring well TF-3 (0.00613 mg/L) in July 2005, but the benzene concentration in this well dropped back below the TCG in January 2006 (0.0016 mg/L). This demonstrates that there are times when the site groundwater concentration for benzene is above the TCG for groundwater; however, the concentration trends for BTEX are generally downward over time. Monitoring well TF-3 is approximately 450 feet west of the eastern property boundary. Since concentrations that are only slightly and intermittently above the TCG do not pose significant adverse health risks or hazards to potential receptors at the site, further treatment to reduce BTEX concentrations in groundwater is not warranted at this time



## **6.0 RECOMMENDATIONS**

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BTEX concentrations observed in groundwater within the TFA are only slightly and intermittently above the TCG. Based on the results of the risk evaluation, these concentrations do not pose a significant adverse health risks or hazards to potential receptors at the site, and as a result, further treatment to reduce BTEX concentrations in groundwater is not warranted at this time.

Based on the low levels of BTEX constituents in recent groundwater samples and the distance from the point of maximum concentration to the downgradient property line (approximately 450 feet), it is considered unlikely that these constituents will migrate off-site at concentrations above the respective TCGs. Therefore, PPG proposes to deactivate the Underdrain System and monitor groundwater concentrations and flow directions to either prove or disprove this conclusion. PPG will develop a plan to reassess the direction of groundwater flow and the concentrations of BTEX constituents in groundwater without the influence of the Underdrain System. Since there is a potential for groundwater to flow southeastward from the TFA, monitoring well MW-10 will become a key monitoring well. MW-10 has been damaged and cannot currently be used for gauging groundwater elevations or collecting samples. It is recommended that this well be repaired or if necessary, replaced, so that data can be collected from this monitoring point

## 7.0 REFERENCES

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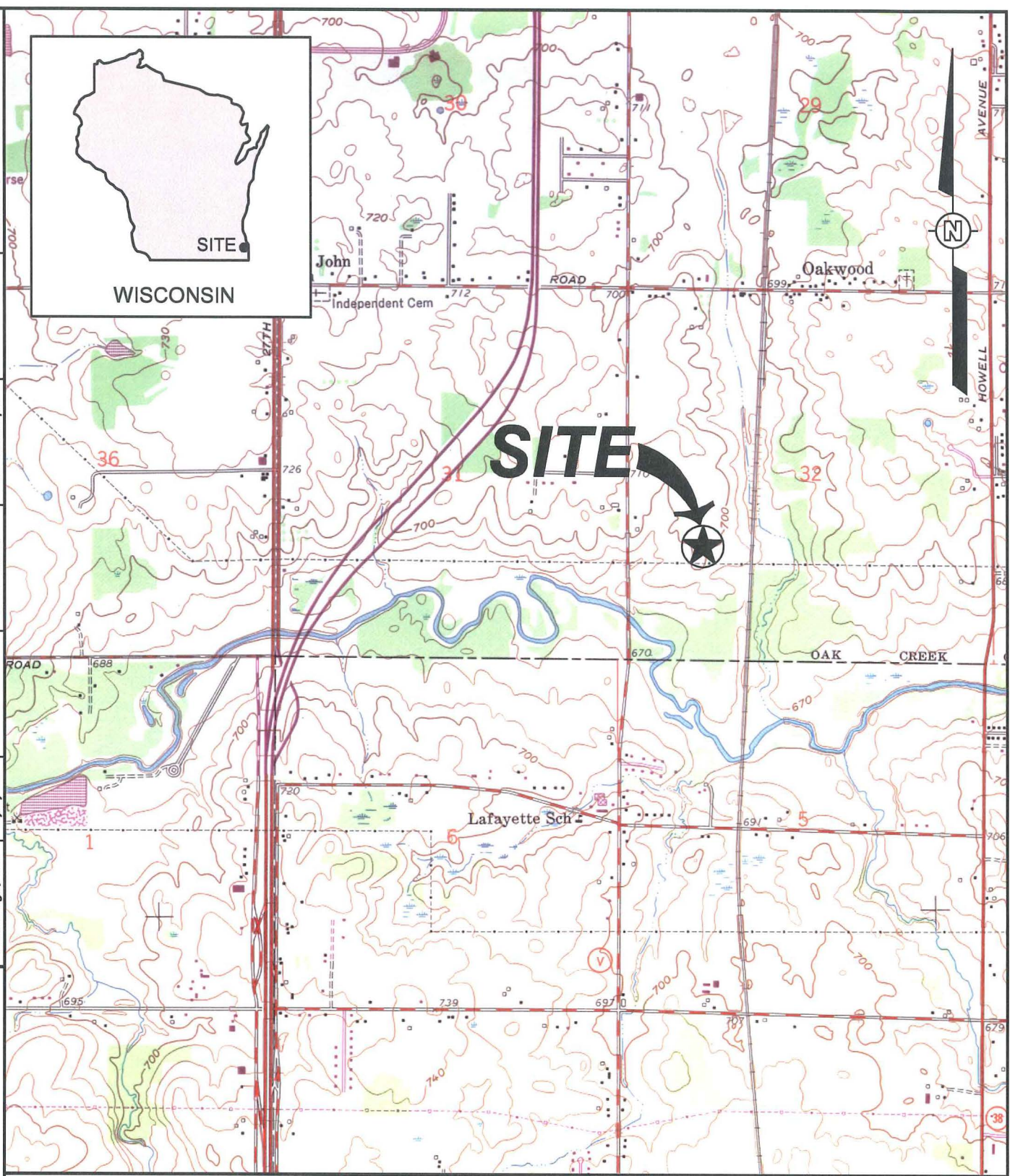
- American Society for Testing & Materials (ASTM), 1995. *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites*. Domenico Model. Designation: E1739-95.
- ICF Kaiser Engineers, Inc. 1997. *RCRA Facility Investigation Report, PPG Industries, Inc., Oak Creek Facility*, Permit No. EPA ID WID 059972935. July 31.
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- Shaw Environmental & Infrastructure, Inc. (Shaw, 2003). *Risk Evaluation of the Tank Farm Area, PPG Industries, Inc., Oak Creek, Wisconsin*. March 28.

***FIGURES***

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 Plotted By: bernadette.oconnor

Xref:  
 Image: Image-1.TIF

OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
Pittsburgh, PA	2/9/06	---	B.Faison	W. Starhlope	---	119637-A1



**REFERENCE:**  
 BASE MAP PREPARED FROM THE U.S.G.S. FRANKSVILLE,  
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 MINOR REVISION 1994, SCALE: 1"=2000'.

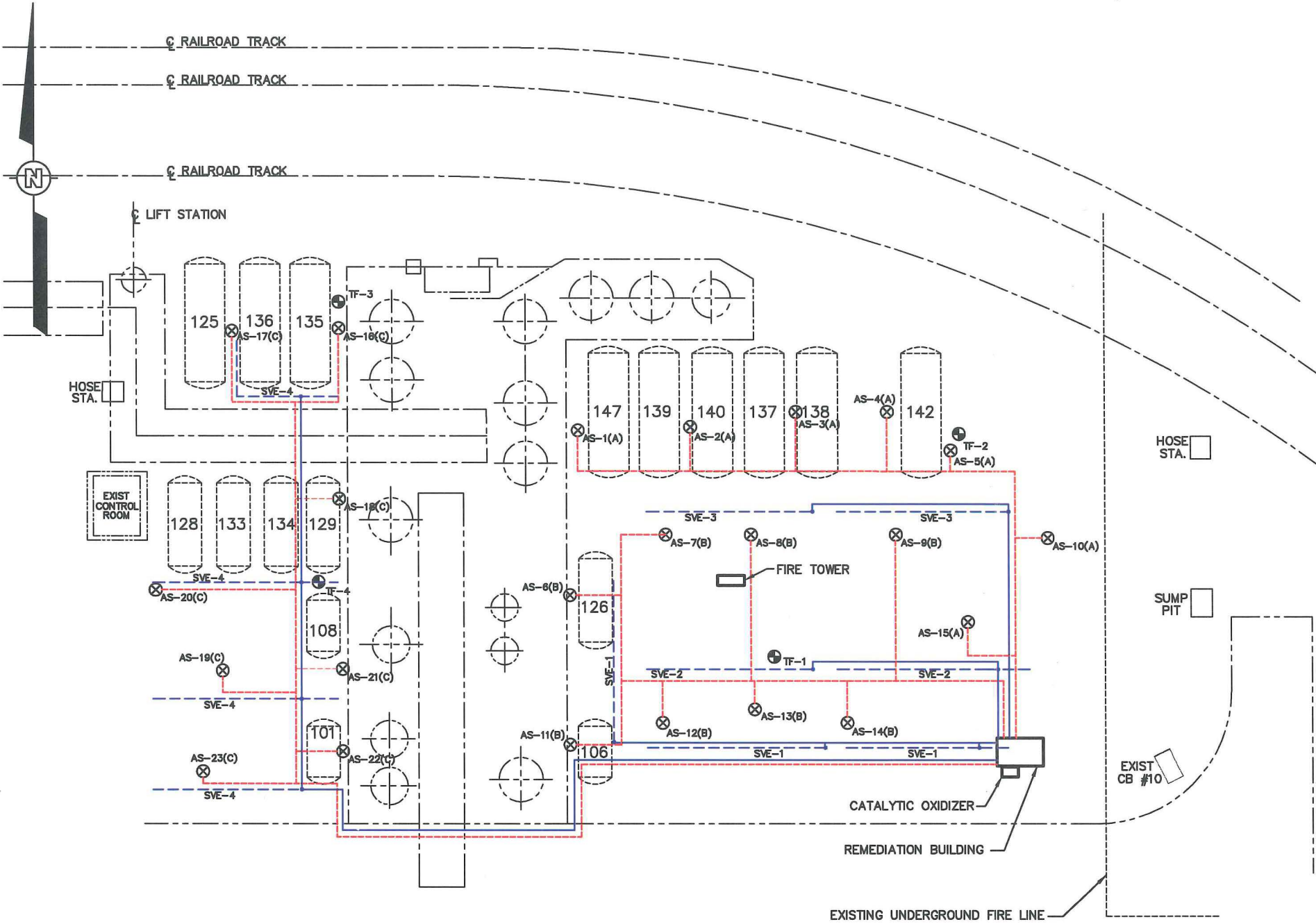
**Shaw** Shaw Environmental, Inc.

PPG INDUSTRIES, INC.  
 OAK CREEK, WISCONSIN

FIGURE 2-1  
 SITE LOCATION MAP

CORRECTIVE MEASURES IMPLEMENTATION REPORT  
 OAK CREEK, WISCONSIN

OFFICE: Pittsburgh, PA  
 DATE: 2/9/06  
 DESIGNED BY: JS/BBF  
 CHECKED BY: W. Stanhope  
 DRAWN BY: JS/BBF  
 APPROVED BY: ---  
 DRAWING NUMBER: 119637-B4

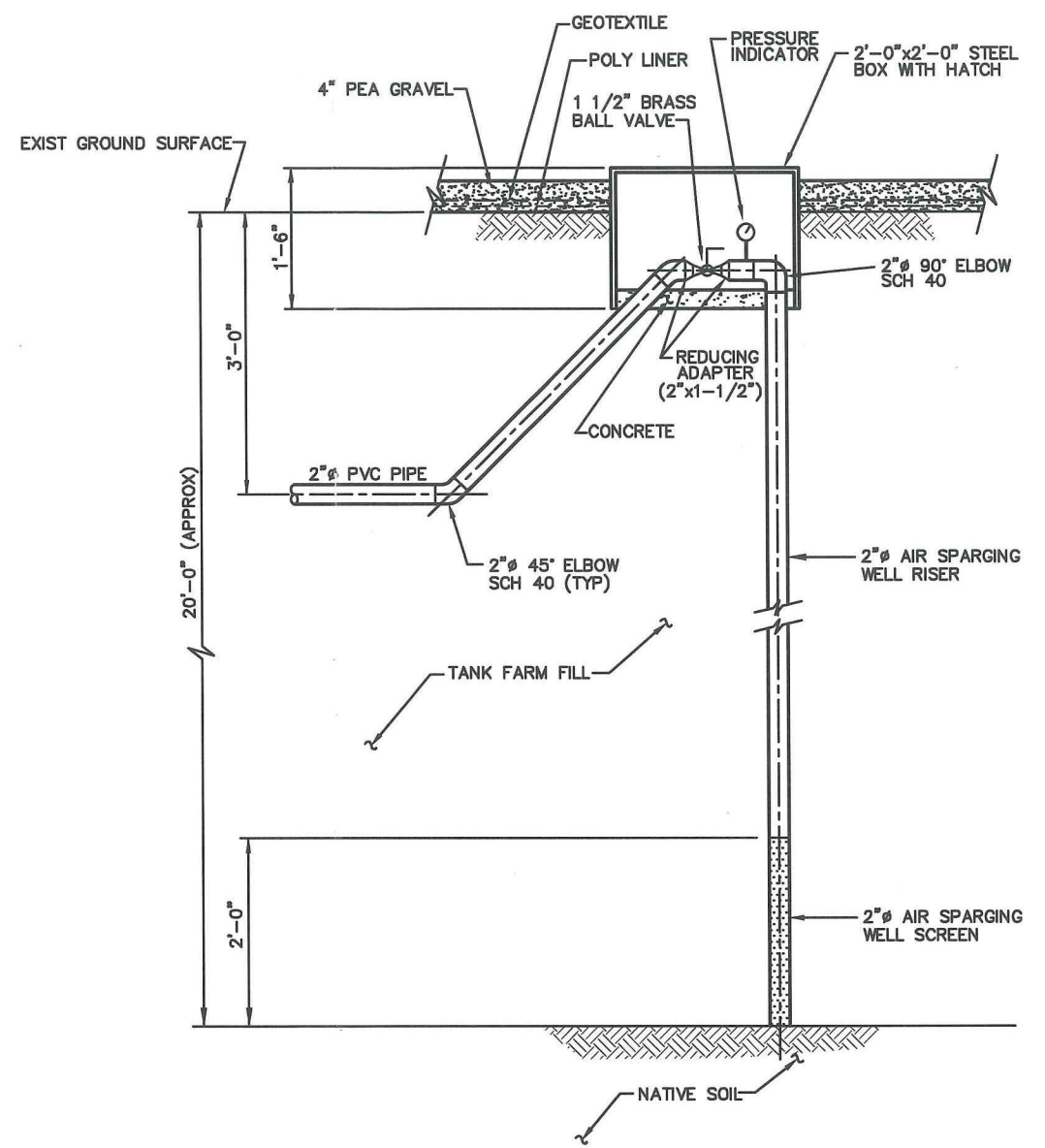


**PLAN**

**LEGEND:**

- ⊕ TF-1 MONITORING WELL (APPROXIMATE LOCATION)
- ⊗ AS-7(A) AIR SPARGING WELL—WELL GROUP A
- SOLID 2" PVC AIR SPARGING PIPE (UNDERGROUND)
- SOLID 2" PVC SVE SYSTEM PIPE (UNDERGROUND)
- - - SLOTTED 2" PVC SVE SYSTEM PIPE (UNDERGROUND)


- NOTES:**
- TRENCH WIDTHS EXAGGERATED FOR CLARITY.
  - UNDERGROUND TANK LOCATIONS ARE APPROXIMATE.



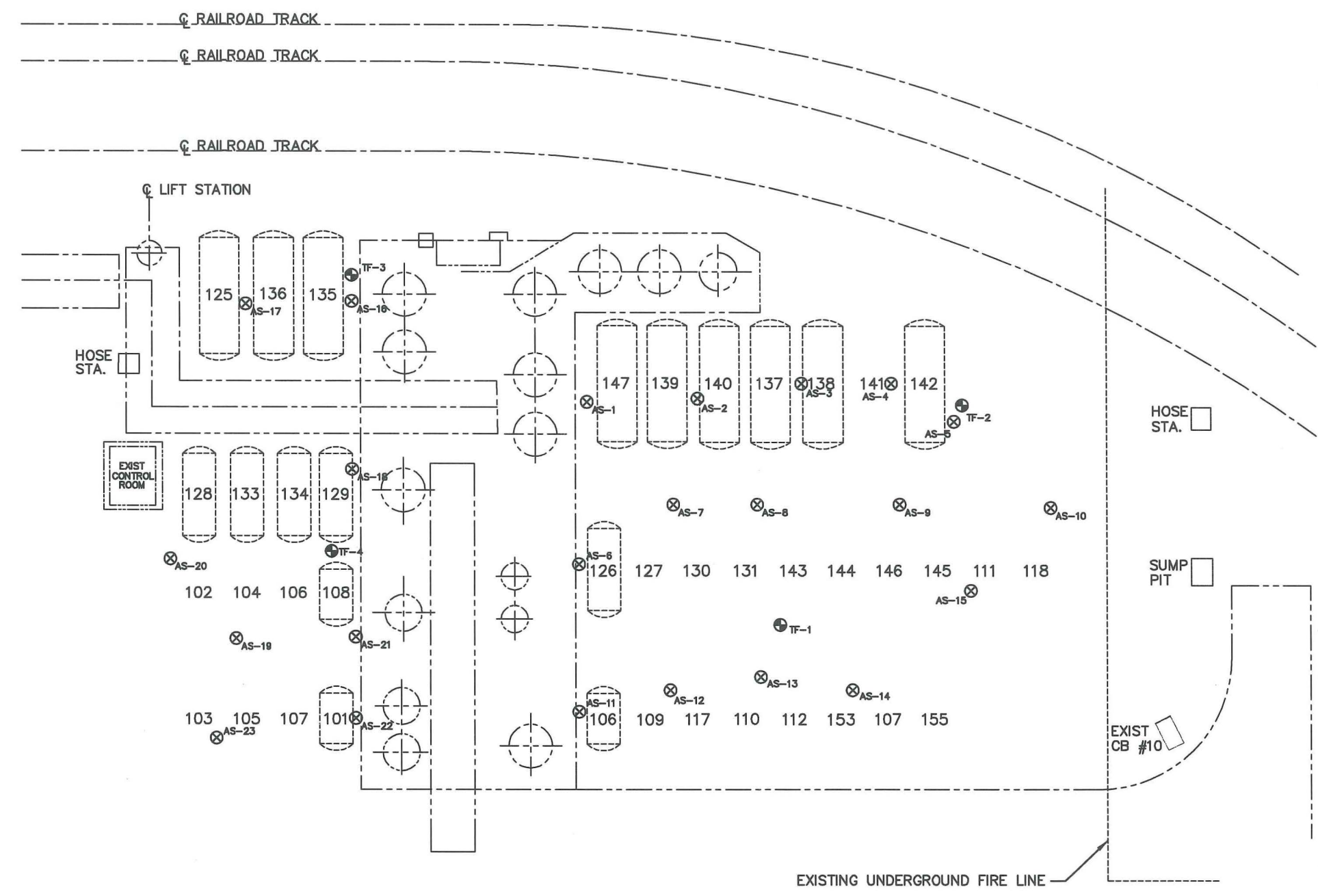
**TYPICAL AIR SPARGING WELL**

NOT TO SCALE




**Shaw Environmental, Inc.**  
 PPG INDUSTRIES, INC.  
 OAK CREEK, WISCONSIN  
**FIGURE 3-1**  
 SITE PIPING PLAN SVE  
 AND AIR SPARGING SYSTEM  
 CORRECTIVE MEASURES IMPLEMENTATION REPORT  
 OAK CREEK, WISCONSIN


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 Plotted By: bernadette.ocannon



**LEGEND:**

- ⊕ TF-1 MONITORING WELL
- ⊗ AS-7(A) AIR SPARGING WELL

NOTE: UNDERGROUND TANK LOCATIONS ARE APPROXIMATE.

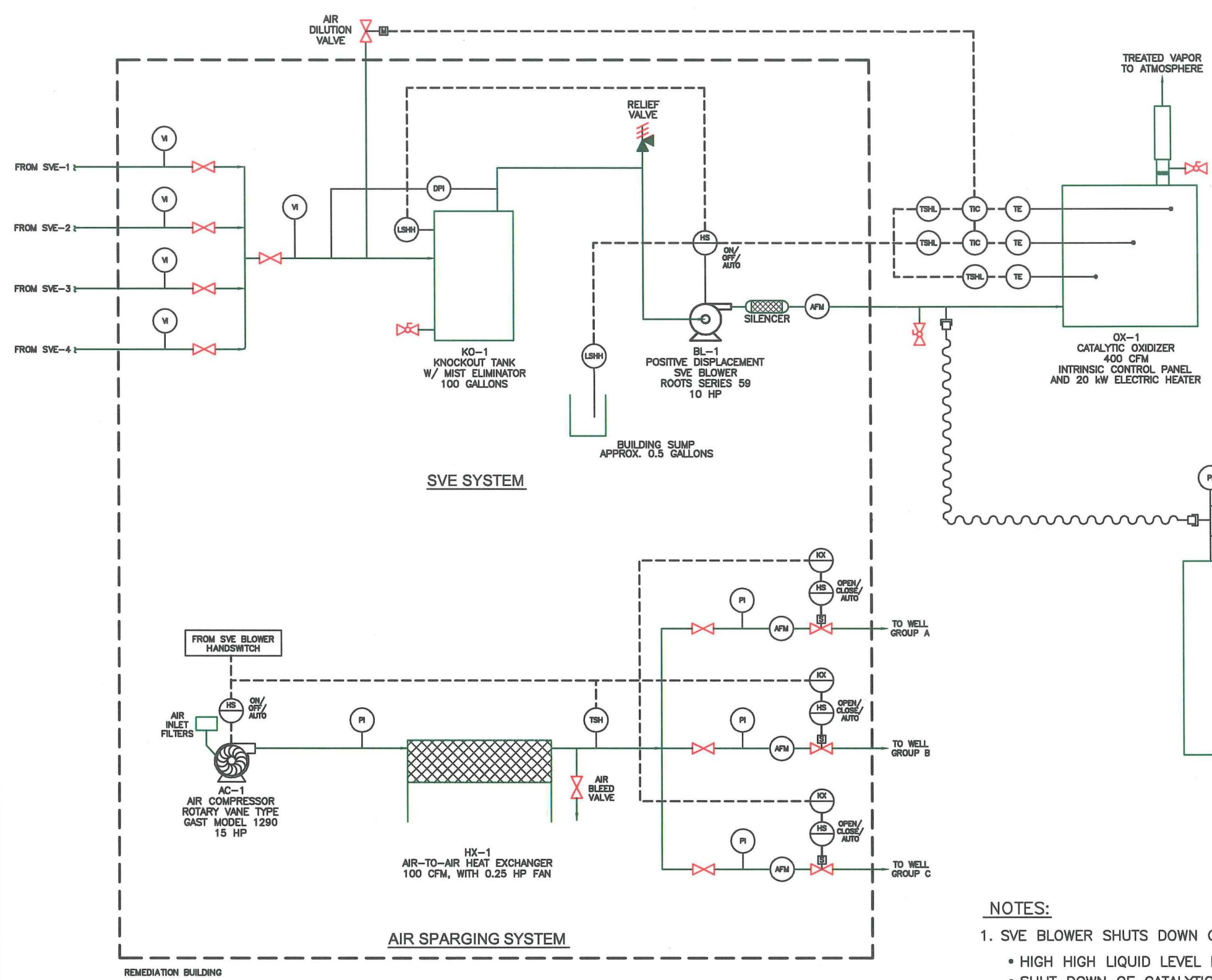



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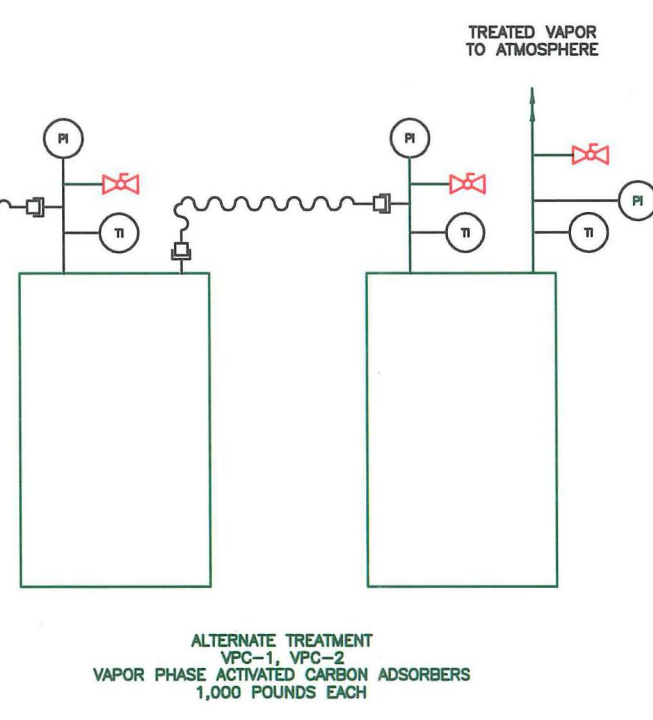
FIGURE 3-2  
 AS-BUILT SPARGE WELL LOCATIONS  
 CORRECTIVE MEASURES IMPLEMENTATION REPORT  
 OAK CREEK, WISCONSIN

DRAWING NUMBER 119637-B4  
 APPROVED BY  
 CHECKED BY W. Stanhope  
 DESIGNED BY  
 DATE 2/9/06  
 OFFICE Pittsburgh, PA  
 DRAWN BY JS/BBF  
 Xref: Image:



**LEGEND:**

	GATE VALVE	VSH	VACUUM SWITCH (HIGH)
	BALL VALVE	LSHH	LEVEL SWITCH (HIGH HIGH)
	MOTORIZED BALL VALVE	TE	TEMPERATURE ELEMENT
	SOLENOID VALVE	TI	TEMPERATURE INDICATOR
	AIR FLOW METER	TIC	TEMPERATURE INDICATING CONTROLLER
	DIFFERENTIAL PRESSURE INDICATOR	TSHL	TEMPERATURE SWITCH (HIGH/LOW)
	HAND SWITCH (ON CONTROL PANEL)	IKX	ADJUSTABLE TIMER (ON CONTROL PANEL)
	VACUUM INDICATOR	PI	PRESSURE INDICATOR
	VACUUM SWITCH (LOW)	TSH	TEMPERATURE SWITCH (HIGH)



- NOTES:**
- SVE BLOWER SHUTS DOWN ON:
    - HIGH HIGH LIQUID LEVEL IN KNOCKOUT TANK
    - SHUT DOWN OF CATALYTIC OXIDIZER
    - HIGH HIGH LIQUID LEVEL IN BUILDING SUMP
  - AIR COMPRESSOR SHUTS DOWN ON:
    - HIGH TEMPERATURE AT HEAT EXCHANGER DISCHARGE
    - SHUT DOWN OF THE SVE BLOWER
    - NO SOLENOID VALVES OPEN
  - THE CATALYTIC OXIDIZER WILL BE REPLACED BY THE VAPOR PHASE CARBON ADSORBERS WHEN VOC CONCENTRATIONS ARE REDUCED TO APPROXIMATELY 25 PPM.

THIS DRAWING NOT TO SCALE



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OAK CREEK, WISCONSIN

**FIGURE 3-3**  
**SVE AND AIR SPARGING SYSTEM**  
**PROCESS FLOW DIAGRAM**  
 CORRECTIVE MEASURES IMPLEMENTATION REPORT  
 OAK CREEK, WISCONSIN

File: O:\Project\PPG 37\119637B4.dwg  
 Plot Date/Time: Apr 06 - 9:56am  
 Plotted By: bernadette.oconnor

File: O:\Project\PPG 37\119637B4.dwg  
 Plot Date/Time: Apr 0 06 9:59am  
 Plotted By: bernadette.oconnor

OFFICE  
 Pittsburgh, PA

DATE  
 2/9/06

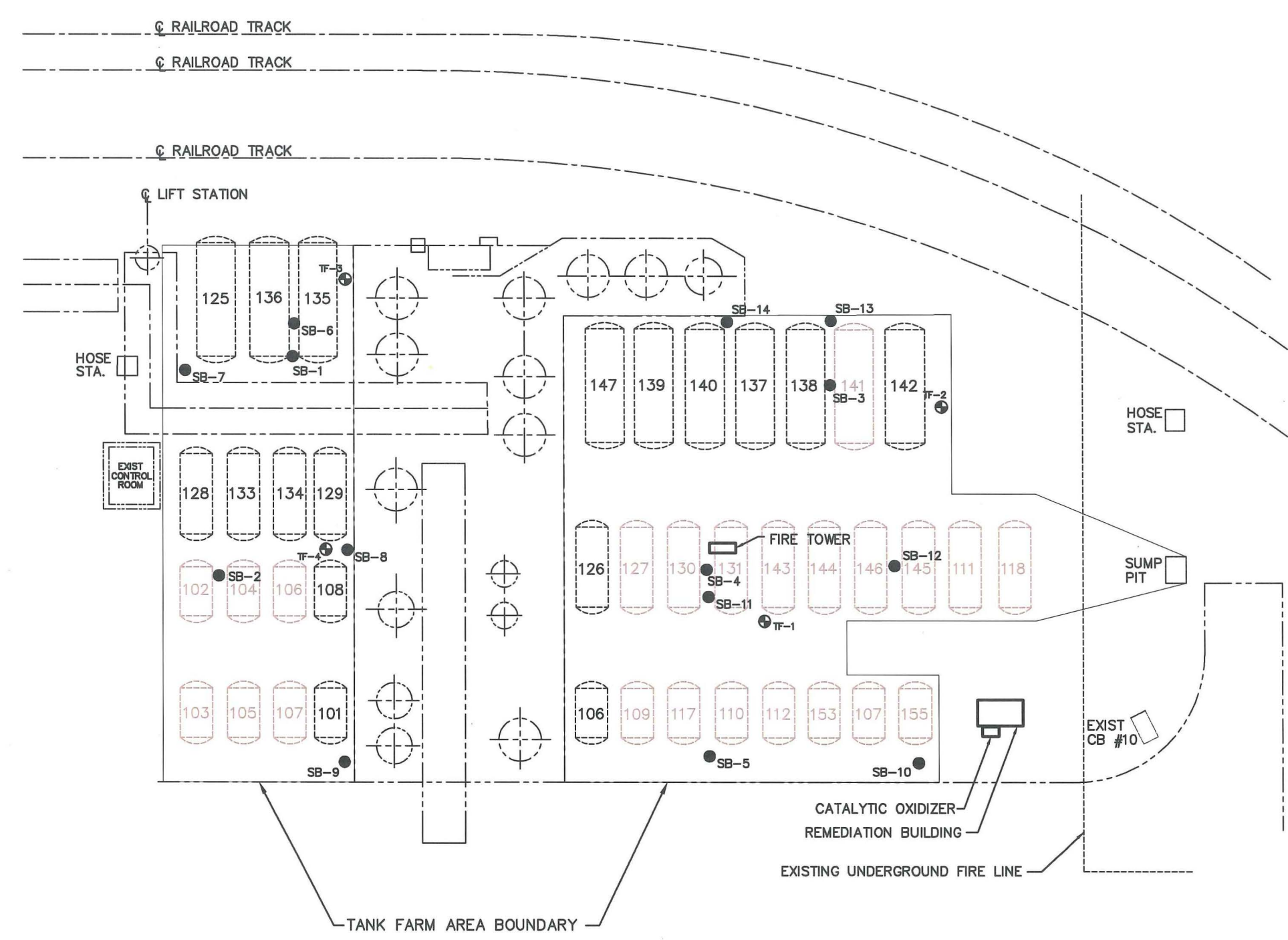
DESIGNED BY  
 ---

DRAWN BY  
 JS/BBF

CHECKED BY  
 W. Stanhope

APPROVED BY  
 ---

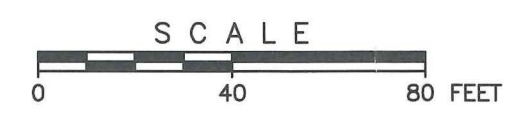

DRAWING NUMBER  
 119637-B4



**LEGEND:**

- TF-1 MONITORING WELL (APPROXIMATE LOCATION)
- SB-5 SOIL SAMPLING LOCATIONS
- 106 UNDERGROUND STORAGE TANK (CLOSED-IN-PLACED)
- 109 UNDERGROUND STORAGE TANK (REMOVED)

NOTE: UNDERGROUND TANK LOCATIONS ARE APPROXIMATE.

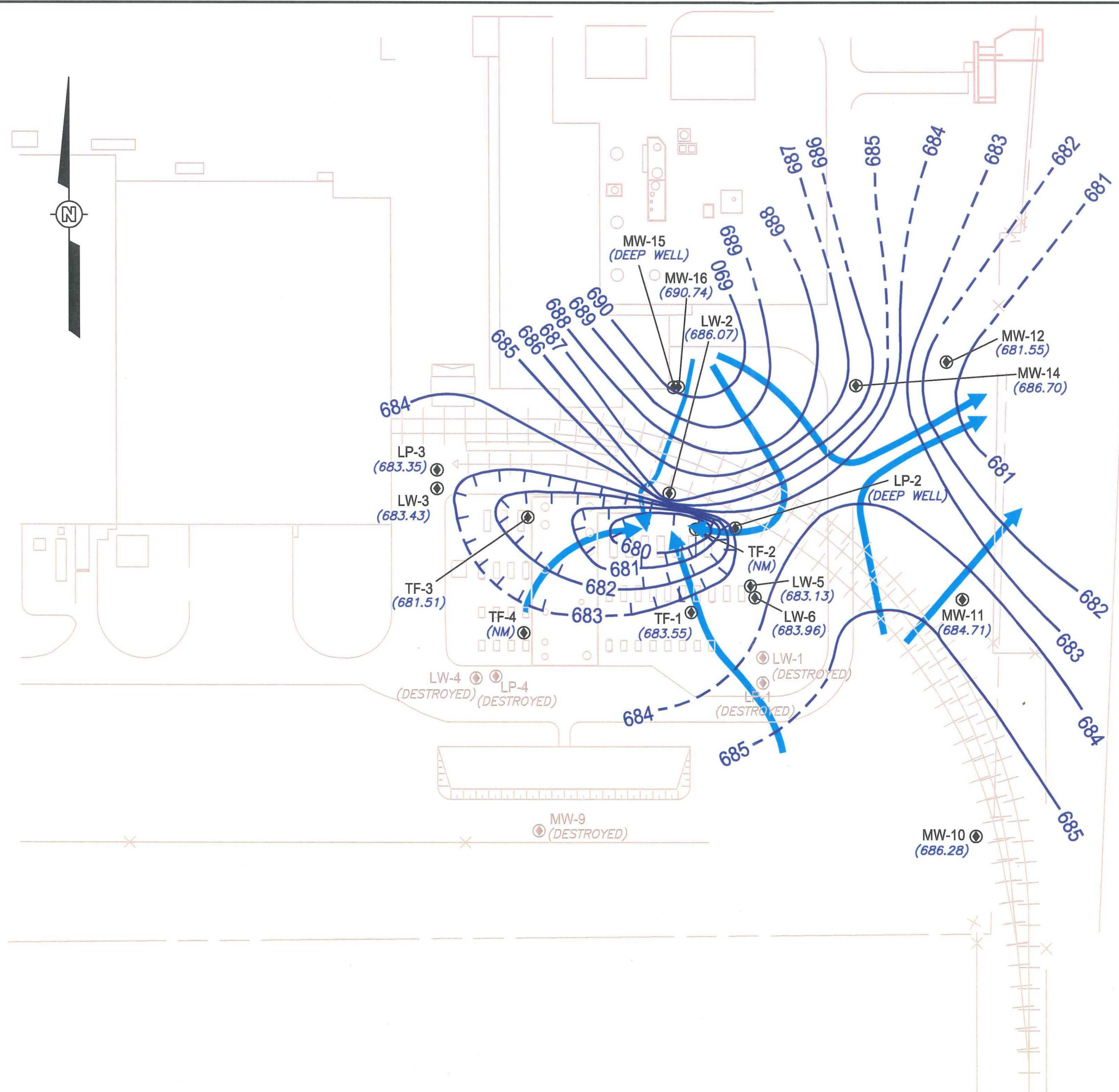



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**FIGURE 3-4**  
 SOIL SAMPLING LOCATIONS  
 CORRECTIVE MEASURES IMPLEMENTATION REPORT  
 OAK CREEK, WISCONSIN





**LEGEND:**

- MONITORING WELL LOCATIONS
- GROUNDWATER ELEVATION (MSL)
- NOT MEASURED
- GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
- DIRECTION OF GROUNDWATER FLOW

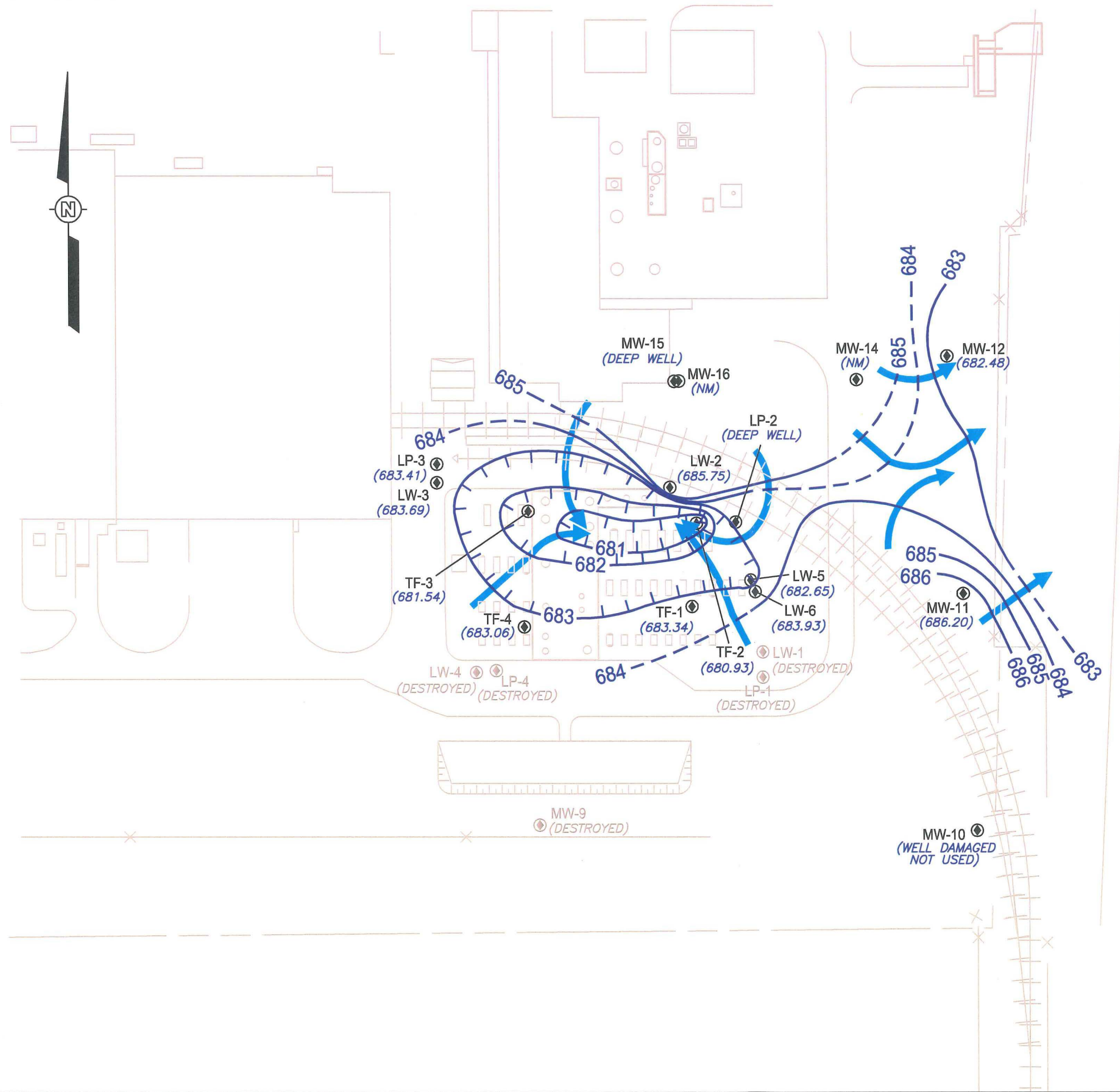
- NOTES:**
1. WATER ELEVATIONS WERE GAUGED AT DEEP WELLS BUT THE ELEVATIONS ARE NOT PROVIDED ON THE MAP BECAUSE THESE DATA ARE NOT USED FOR CONTOURING.
  2. BASED ON WATER LEVELS MEASURED MAY 23, 2002.



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**FIGURE 4-1**  
**GROUNDWATER ELEVATION MAP**  
MAY 23, 2002  
CORRECTIVE MEASURES IMPLEMENTATION REPORT  
OAK CREEK, WISCONSIN



**LEGEND:**

- MONITORING WELL LOCATIONS
- (683.35)** GROUNDWATER ELEVATION (MSL)
- (NM)** NOT MEASURED
- GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
- DIRECTION OF GROUNDWATER FLOW

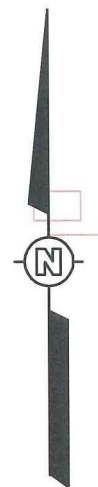
- NOTES:**
1. WATER ELEVATIONS WERE GAUGED AT SOME DEEP WELLS BUT THE GROUND-WATER ELEVATIONS ARE NOT PROVIDED ON THE MAP BECAUSE THESE DATA ARE NOT USED FOR CONTOURING.
  2. BASED ON WATER LEVELS MEASURED JANUARY 23, 2006.



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**FIGURE 4-2**  
**GROUNDWATER ELEVATION MAP**  
JANUARY 23, 2006  
CORRECTIVE MEASURES IMPLEMENTATION REPORT  
OAK CREEK, WISCONSIN



**LEGEND:**  
 ● MONITORING WELL LOCATIONS  
 ND (5) NOT DETECTED AT THE DETECTION LIMIT IN THE PARENTESIS.

**NOTE:**  
 ALL RESULTS REPORTED IN µg/L.

LW-2	JUL 04	JAN 05	JUL 05	JAN 06
BENZENE	ND (5)	ND (5)	ND (5)	ND (0.4)
TOLUENE	ND (5)	ND (5)	ND (5)	ND (5)
ETHYLBENZENE	ND (5)	ND (5)	ND (5)	ND (5)
XYLENES	ND (5)	ND (5)	ND (5)	ND (5)

TF-2	JUL 04	JAN 05	JUL 05	JAN 06
BENZENE	0.876	0.589	0.805	0.95
TOLUENE	ND (5)	ND (5)	ND (5)	ND (5)
ETHYLBENZENE	647	74	1.45	37
XYLENES	2160	ND (5)	ND (5)	0.58

MW-12	JUL 04	JAN 05	JUL 05	JAN 06
BENZENE	ND (5)	ND (5)	ND (5)	ND (0.4)
TOLUENE	ND (5)	ND (5)	ND (5)	ND (5)
ETHYLBENZENE	ND (5)	ND (5)	ND (5)	ND (5)
XYLENES	ND (5)	ND (5)	ND (5)	ND (5)

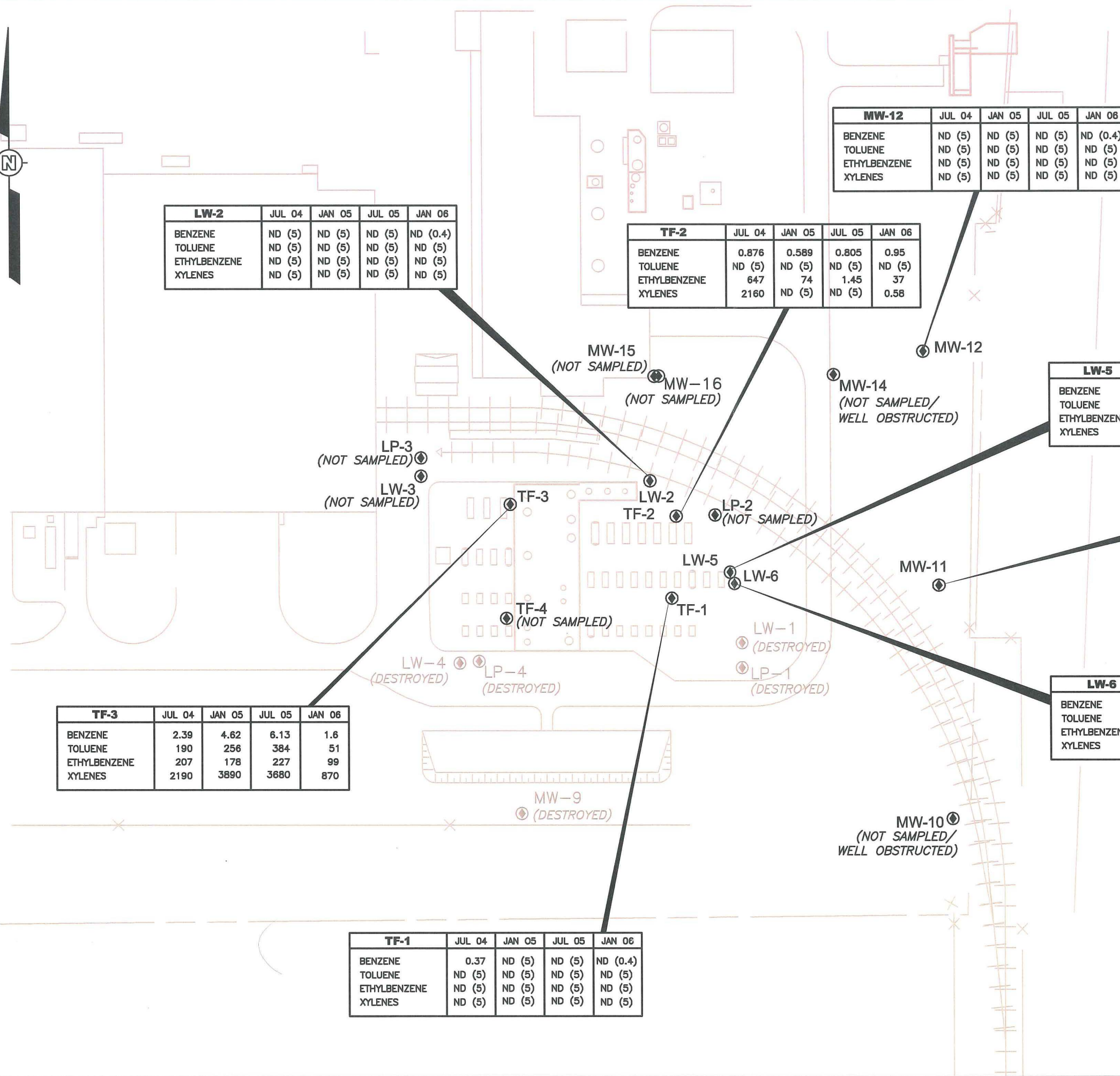
LW-5	JUL 04	JAN 05	JUL 05	JAN 06
BENZENE	0.49	0.54	0.314	0.49
TOLUENE	ND (5)	ND (5)	ND (5)	ND (5)
ETHYLBENZENE	99.7	36.8	13.8	0.51
XYLENES	6.27	0.878	1.52	ND (5)

MW-11	JUL 04	JAN 05	JUL 05	JAN 06
BENZENE	ND (5)	ND (5)	ND (5)	ND (0.4)
TOLUENE	ND (5)	ND (5)	ND (5)	ND (5)
ETHYLBENZENE	ND (5)	ND (5)	ND (5)	ND (5)
XYLENES	ND (5)	ND (5)	ND (5)	ND (5)

LW-6	JUL 04	JAN 05	JUL 05	JAN 06
BENZENE	ND (5)	ND (5)	ND (5)	ND (0.4)
TOLUENE	ND (5)	ND (5)	ND (5)	ND (5)
ETHYLBENZENE	ND (5)	ND (5)	ND (5)	ND (5)
XYLENES	ND (5)	ND (5)	ND (5)	ND (5)

TF-3	JUL 04	JAN 05	JUL 05	JAN 06
BENZENE	2.39	4.62	6.13	1.6
TOLUENE	190	256	384	51
ETHYLBENZENE	207	178	227	99
XYLENES	2190	3890	3680	870

TF-1	JUL 04	JAN 05	JUL 05	JAN 06
BENZENE	0.37	ND (5)	ND (5)	ND (0.4)
TOLUENE	ND (5)	ND (5)	ND (5)	ND (5)
ETHYLBENZENE	ND (5)	ND (5)	ND (5)	ND (5)
XYLENES	ND (5)	ND (5)	ND (5)	ND (5)



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**FIGURE 4-3**  
 CONSTITUENTS IN GROUNDWATER  
 JULY 2004 THROUGH JANUARY 2006  
 CORRECTIVE MEASURES IMPLEMENTATION REPORT  
 OAK CREEK, WISCONSIN

Figure 4-4  
Benzene Concentrations in Groundwater

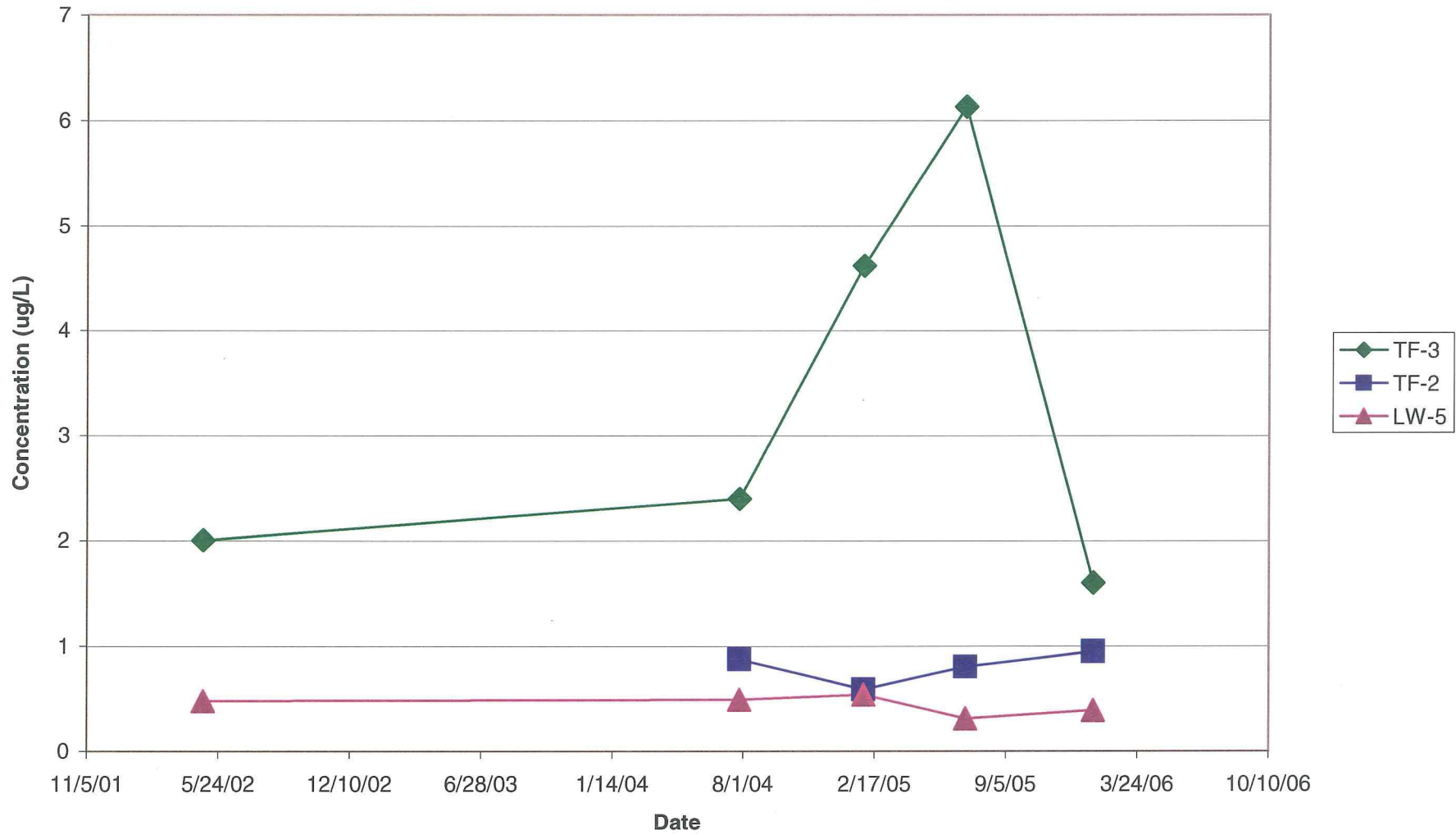


Figure 4-5  
Toluene Concentrations in Groundwater

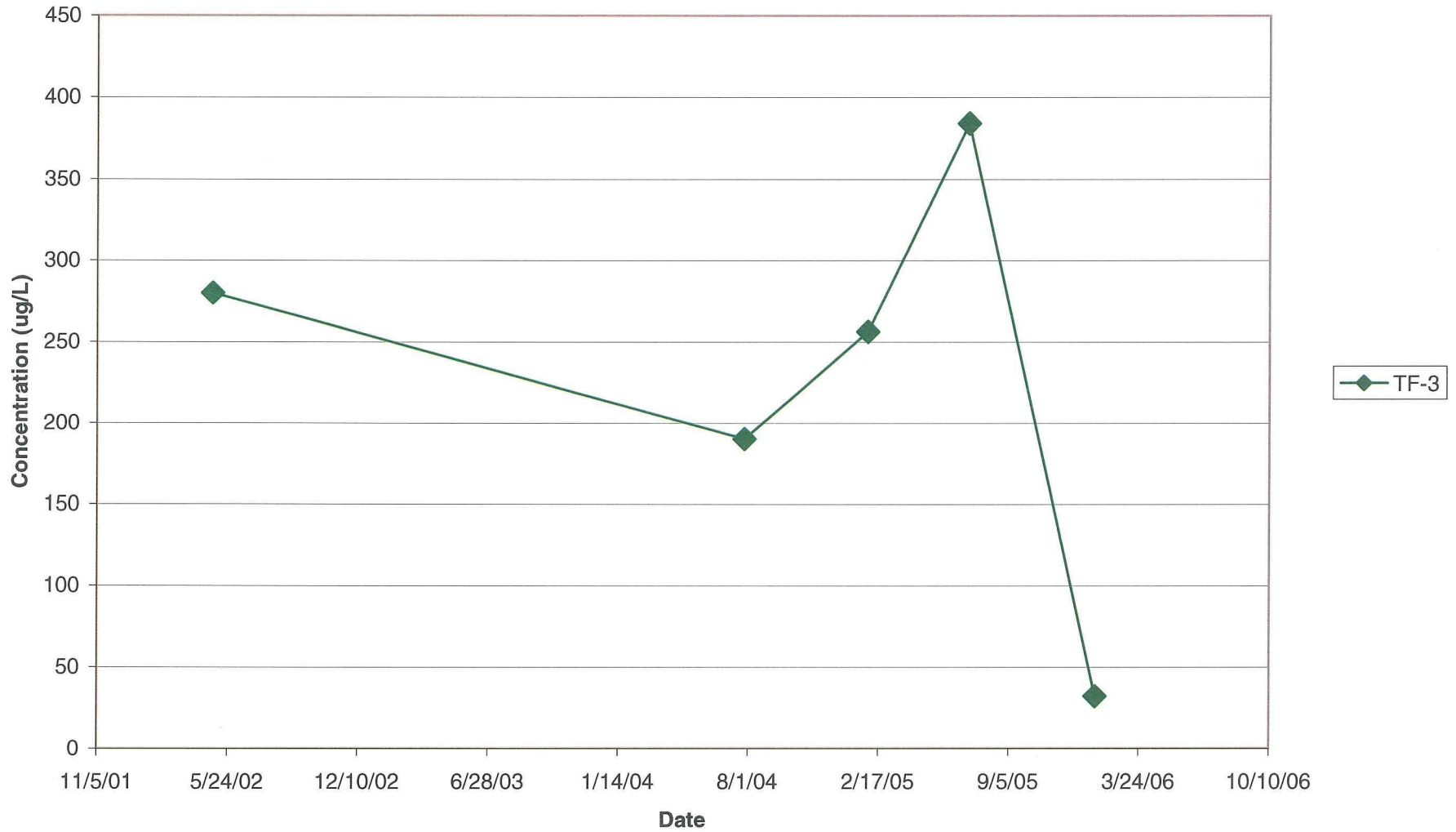


Figure 4-6  
Ethylbenzene Concentrations in Groundwater

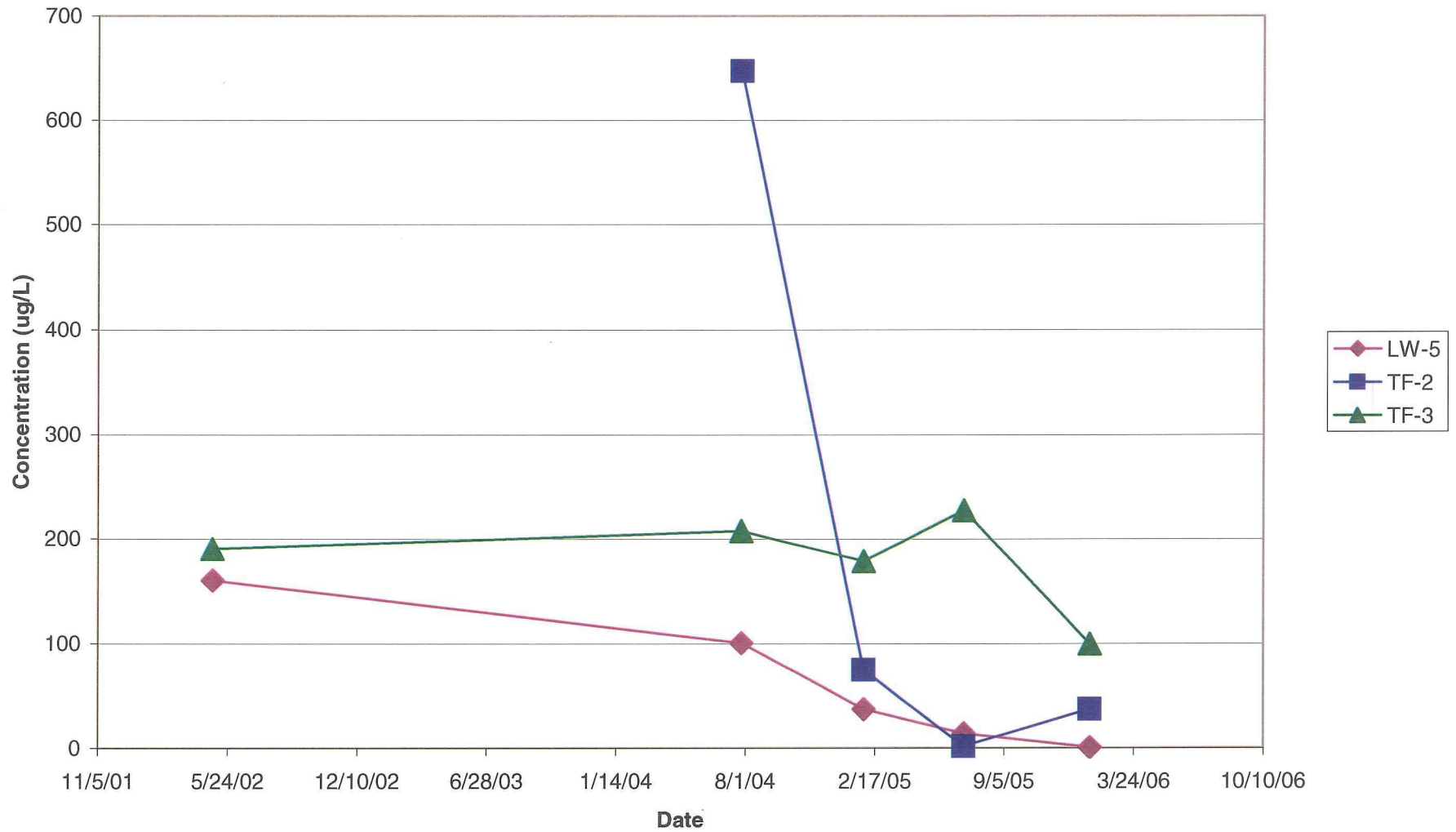
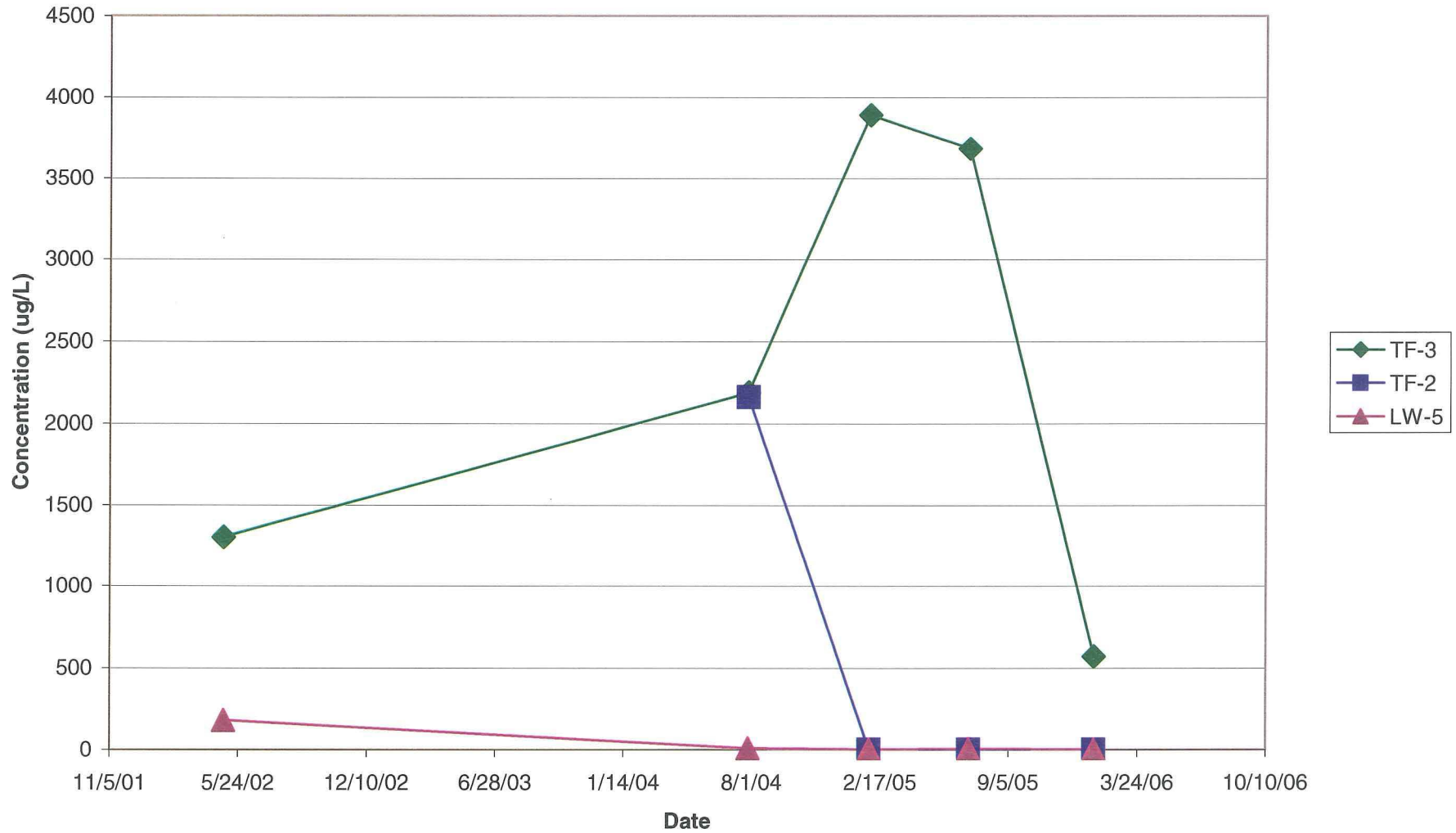


Figure 4-7  
Xylene (total) Concentrations in Groundwater



## ***APPENDICES***



***APPENDICES***  
***(ON ATTACHED COMPACT DISK)***

- A           Field Activity Logs
- SVE/AS Daily Activity Logs
  - Recent Facility Monitoring Daily Activity Logs
- B           Laboratory Analytical Reports
- Groundwater Analytical Reports for TFA Monitoring Wells
  - Influent and Effluent Air Analytical Reports
  - Confirmatory Soil and Groundwater Analytical Reports
  - Recent Groundwater Analytical Reports (2002 through 2006)
- C           Operations and Maintenance Checklists