RCRA FACILITY INVESTIGATION REPORT

for the:

PPG Industries, Inc.
Oak Creek Facility
Permit No. - EPA ID WID 059972935

Prepared on Behalf of:

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July 31, 1997

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1. INTRODUCTION

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report presents the results of the investigation and data analysis conducted at the PPG Industries, Inc. (PPG) facility located in Oak Creek, Wisconsin (Site). This RFI report documents the completion of Tasks IV and V (Facility Investigation and Investigation Analysis) of the RFI Scope of Work in PPG's RCRA Hazardous Waste Management Permit for the Site. The purpose of the RFI was to provide data to determine whether identified site-specific target compounds are present at concentrations exceeding Region V Data Quality Levels (DQLs) and to verify and define the nature and extent of these compounds. The DQLs are concentrations that represent a point of departure for remedial decision making within Region V. During the development of the RFI Work Plan, 41 solid waste management units (SWMUs) identified by the United States Environmental Protection Agency (USEPA) and the Wisconsin Department of Natural Resources (WDNR), were evaluated. Based on the evaluation, 31 of the 41 SWMUs were determined to require no further action and the 10 remaining SWMUs, listed below, were investigated during the RFI.

Description	Permit SWMU No.	Common PPG Name
Container Accumulation Area	3	WTC Accumulation Area
Container Accumulation Area	4	Resin Plant Large Accumulation Area
Container Accumulation Area	9	Lab Accumulation Area
Interceptor Basin Outfall	20	Interceptor Basin Outfall
Tank Farm Sump	18	Tank Farm Underdrain Sump
Impoundment Basin	17	Impoundment Basin
Used Solvent Tank	8	DCS Tank RFA#11
Used Solvent Tank	8	DCS Tank RFA#12
Used Solvent Tank	8	DCS Tank RFA#13
Used Solvent Tank	8	Resin Plant MIBK Distillate Accumulation Tank RFA#14

More details on the regulatory framework, facility location and description, previous investigations, RFI objectives and the report outline are provided in the following subsections.

1.1 REGULATORY FRAMEWORK

The RCRA permit was issued to PPG on March 31, 1992 with an effective date of May 4, 1992 (EPA ID WID 059972935). Condition III.F.1 of the Permit requires an RFI to be conducted to evaluate the nature and extent of the release of hazardous wastes and hazardous constituents (if present) from certain solid

waste management units (SWMUs) which were identified in Condition III.C of the permit. An RFI Work Plan was developed to facilitate the investigation. The RFI Work Plan dated May 23, 1995, consists of six project plans (in three volumes). Volume I contained the Project Management Plan (PMP), the Data Management Plan (DMP) and the Community Relations Plan. Volume II comprised the Quality Assurance Project Plan (QAPP) and the Field Sampling Plan (FSP), and Volume III the Health and Safety Plan. Minor revisions were made to the QAPP and FSP in August 1996 prior to the field work. The original and revised documents collectively represent the approved Work Plan.

An evaluation of all the SWMUs listed in Condition III.C of the permit was performed and presented in the PMP. Based on that evaluation, the 10 SWMUs previously listed were identified for further investigation. SWMUs 3, 4, 8 (RFA 14), 9 and 20 were identified for investigation because data in these SWMUs were needed to determine if a release had occurred and if further action was warranted.

The remaining areas, SWMUs 8 (RFA 11, 12, and 13), 17 and 18, which were grouped together based on geographic and process relations and are collectively referred to as the Tank Farm Area, were identified for further investigation to determine the nature and extent of potential impact.

In addition to RCRA Corrective Action requirements, the Tank Farm Area is also subject to RCRA Underground Storage Tank requirements. The state regulations will also be considered when addressing issues in the tank farm area.

1.2 RFI OBJECTIVES

The project objectives for the RFI, as specified in the approved Work Plan, are to:

1. determine whether site specific target compounds are present at concentrations exceeding Region V DQLs within SWMUs 3, 4, 8 (RFA 14), 9 and 20 which were previously identified as potential concerns but had not been investigated, and to verify and define the nature and extent of potential impact of the target compounds at these five SWMUs; and,

2. verify and define the nature and extent of potential impacts at the Tank Farm Area [SWMUs 8 (RFA 11, 12, and 13), 17, and 18] and evaluate possible remedial alternatives for the Tank Farm Area.

These objectives were accomplished by the implementation of the following scope of work.

- Shallow soil samples were collected utilizing standard hand auger sampling techniques at predetermined locations at the three container accumulation areas (SWMUs 3, 4, and 9). This work was done to determine whether site specific target compounds were present at concentrations exceeding Region V DQLs.

- Shallow soil samples were collected utilizing standard hand auger sampling techniques at predetermined locations in a drainage ditch adjacent to the Waste Treatment Center (WTC) accumulation area (SWMU 3). The purpose of the sampling was to determine if the drainage ditch served as a migration pathway, following a previous release.

- Shallow soil samples were collected utilizing standard hand auger sampling techniques at a predetermined location at the Resin Plant MIBK tank (SWMU 8, RFA 14) to determine whether site specific target compounds are present at concentrations exceeding Region V DQLs.

- Sediment samples were collected at predetermined locations in the channel leading from the Interceptor Basin Outfall (SWMU 20) to determine whether site specific target compounds are present at concentrations exceeding Region V DQLs.

- Subsurface soil samples were collected utilizing standard split-spoon sampling techniques at predetermined locations to establish background conditions.

- Monitoring wells were installed and groundwater sampling conducted to further characterize groundwater quality within and surrounding the Tank Farm Area [SWMU 8 (RFAs 11, 12, and 13), 17 and 18].

- Subsurface soil samples were collected and logged in conjunction with the well installations to determine the extent of the sand and gravel layer/lenses outside the Tank Farm Area.

- Subsurface soil samples were collected from selected borings in the Tank Farm Area to provide physical soil characteristics data (i.e., grain size distribution, organic carbon content, moisture content). Sample selection was based on soil stratigraphy with the purpose of characterizing the geologic units encountered at the site, as necessary. This information was collected to evaluate transport potential and corrective action alternatives.

- Aquifer testing was conducted at selected well locations in the Tank Farm Area to characterize groundwater flow. Water level measurements and slug tests were conducted to provide data needed to assess vertical and horizontal hydraulic gradients, flow directions and seasonal variations in groundwater levels.

PPG's overall site management approach is to address contamination identified at any SWMU that represents an unacceptable risk to human health or the environment under realistic current and future land use and exposure scenarios. Consistent with this approach, a site-specific risk assessment was performed to evaluate constituents detected at the SWMUs investigated.

1.3 REPORT ORGANIZATION

The remainder of the report is divided into the following nine sections:

Section 2.0 provides information on the environmental setting including facility location, topography, physical setting, geology, soils, surface water and sediment, hydrogeology and meteorological data. This information was excerpted primarily from the Description of Current Conditions Report prepared for PPG by Warzyn dated September 1992.

Section 3.0 contains summaries of historic site operations, waste management, and previous investigations.

Section 4.0 summarizes the RFI tasks, procedures and methods used..

Section 5.0 presents the RFI soil, sediment, and groundwater investigation results.

Section 6.0 presents the human health risk assessment.

Section 7.0 presents the ecological risk assessment.

Section 8.0 details the nature and extent of impact as defined by an evaluation of all data (historical and RFI) and the risk assessments.

Section 9.0 presents a summary of the RFI and conclusions.

Attachment I to PPG's RCRA permit provides a generic scope of work for the RFI and the specific tasks to be performed. Some of these generic scope activities or data requirements are not applicable to the PPG Oak Creek RFI due to the physical setting of the plant, the nature of operations, the types of wastes generated and/or the way they are managed. However, most of the requirements have been addressed either in this report or in the previously submitted and Agency approved Description of Current Conditions (DOCC). The following table is intended to assist the reader in locating the permit-required information.

TABLE 1-1

LOCATION OF PERMIT - REQUIRED INFORMATION

Permit Item	Location
Task IV Facility Space Investigation	
A. Environmental Setting	
1. Hydrogeology	DOCC Task I (A.1)(B.2), RFI Report Section 2
2. Soils	DOCC Task I (A.1)(B.2), RFI Report Section 2
3. Surface Water and Sediment	DOCC Task I (A.1), RFI Report Section 2
4. Air	DOCC Task I (A.4)
B. Source Characterization	
1. Unit/Disposal Area Characteristics	DOCC Task I (A.2)(B.1), RFI Report Section 3
2. Waste Characteristics	DOCC Task I (A.2), RFI Report Section 3
C. Contamination Characterization	
1. Groundwater Contamination	DOCC Task I (B.2), RFI Report Section 5 and 8
2. Soil Contamination	DOCC Task I (B.2), RFI Report Section 5 and 8
3. Surface Water/Sediment Contamination	RFI Report Section 5
4. Air Contamination	Not Applicable
5. Subsurface Gas Contamination	Not Applicable
D. Potential Receptors	
1. Local uses/possible future uses of groundwater	RFI Report Section 6
2. Local uses/possible future uses of surface waters	RFI Report Sections 6 and 7
3. Human use or access to facility and adjacent property	RFI Report Section 6
Task V Investigation Analysis	
A. Data Analysis	DOCC Task I (B.1)(B.2), RFI Report Section 8
B. Protection Standards	
1. Groundwater Protection Standards	RFI Report Sections 8 and 9

2. ENVIRONMENTAL SETTING

2.1 FACILITY LOCATION/DESCRIPTION

The Site is located at 10800 South 13th Street, Oak Creek, Wisconsin (Figure 2-1). The area surrounding the Site is classified as agricultural, industrial and residential land.

PPG's property is comprised of approximately 200 acres of land with the plant site occupying approximately 51 acres. The Site layout is provided in Figure 2-2. A resin and paint production plants are the predominant plant features. The paint production plant also contains the finished product warehouse and the raw material storage area. Approximately 100 feet south of the resin plant is the Tank Farm Area and former impoundment basin. The Site also contains technical and administrative offices, waste treatment, laboratory facilities, a boiler, and buildings. A railroad spur enters the Site via the southeast corner of the property and continues west as it passes the Tank Farm Area and enters the paint production area.

2.2 TOPOGRAPHY

The Site topography slopes slightly from west to east. The general elevation on the western portion of the Site is 710 feet above mean sea level (ft msl) and 680 ft msl on the east. Lake Michigan, resting at an elevation of 580 ft msl, is located approximately 5 miles to the east of the Site. The Site's surface drainage is controlled by topography and a storm water conveyance system.

2.3 REGIONAL GEOLOGY AND SOILS

The local geology of the Site and the surrounding properties consist of post-glacial and glacial deposits underlain by bedrock. The surface soils are primarily glacial and post-glacial deposits of the Morley and Boyer series. The Morley series soils are characterized as well to moderately well drained silty soils that are deposited over calcareous silty clay loam. The Boyer series is characterized as well drained, sandy loam overlying sandy glacial outwash. In addition, a United States Department of Agriculture (USDA) Soil Survey lists Blount, Drummer and Askum soils, covering 10%, 5% and 1% of the Site respectively.

Fill materials comprised of lean clay, sand, and gravel are present at ground surface where development has disturbed the native soils.

Beneath the surface soils of the Site are calcareous glacial till deposits of the Oak Creek Formation. The Oak Creek Formation consists of fine grained glacial till, lacustrine clay, silt, sand and glaciofluvial sand and gravel. Beneath the Oak Creek deposits are sandy deposits of the New Berlin Formation. The New Berlin Formation is more permeable than the overlying Oak Creek.

The uppermost regional bedrock unit is comprised of the eastward dipping, Silurian-age Niagara Dolomite. Depth to the top of bedrock is more than 100 feet. The Niagara Dolomite is underlain by a dense layer of Maquoketa shale. The Maquoketa shale acts as a regional aquitard and caps a deep sandstone aquifer which rests on Precambrian crystalline rock.

2.4 SURFACE WATER

The eastern portion of the Site drains towards a small, unnamed tributary. The tributary flows southward into the Root River, approximately 700 to 800 feet southwest of the Site. Wetlands are present within 100 feet of the eastern Site boundary and within 700 feet of the Site's southern boundary. Lake Michigan is the largest body of surface water in the area.

Surface water flow at the Site is mainly controlled by topography and a stormwater conveyance system. The Site's north yard area, roof drains from the paint and resin plants, and employee parking lot drain through a portion of the stormwater collection system to an interceptor basin. Once checked, the contents of the interceptor basin are released into the unnamed tributary that flows along the eastern boarder of the Site.

The northeast and southeast corners of the Site also drain into the unnamed tributary. Runoff from the southern area of the Site containing the raw materials unloading and finished goods loading areas, a grassy area west of the Site, the trailer and tank wagon parking areas, the roof drains of technical/administrative building and finished product warehouse is directed through underground piping to a drainage ditch along South 13th Street. The ditch eventually discharges into the Root River.

Drainage around the Tank Farm Area is controlled by a series of concrete trenches, with the discharge directed to the impoundment basin. The remaining runoff from the resin plant roof drains and paint plant raw materials building roof drains is pumped from a lift station to the sanitary sewer. Drainage around the Tank Farm Area is controlled by a series of concrete trenches. Water from the trenches is transferred to the sanitary sewer. The tank farm's underground storage area is equipped with an underdrain system that channels stormwater flow to a concrete sump. The sump then discharges to the sanitary sewer.

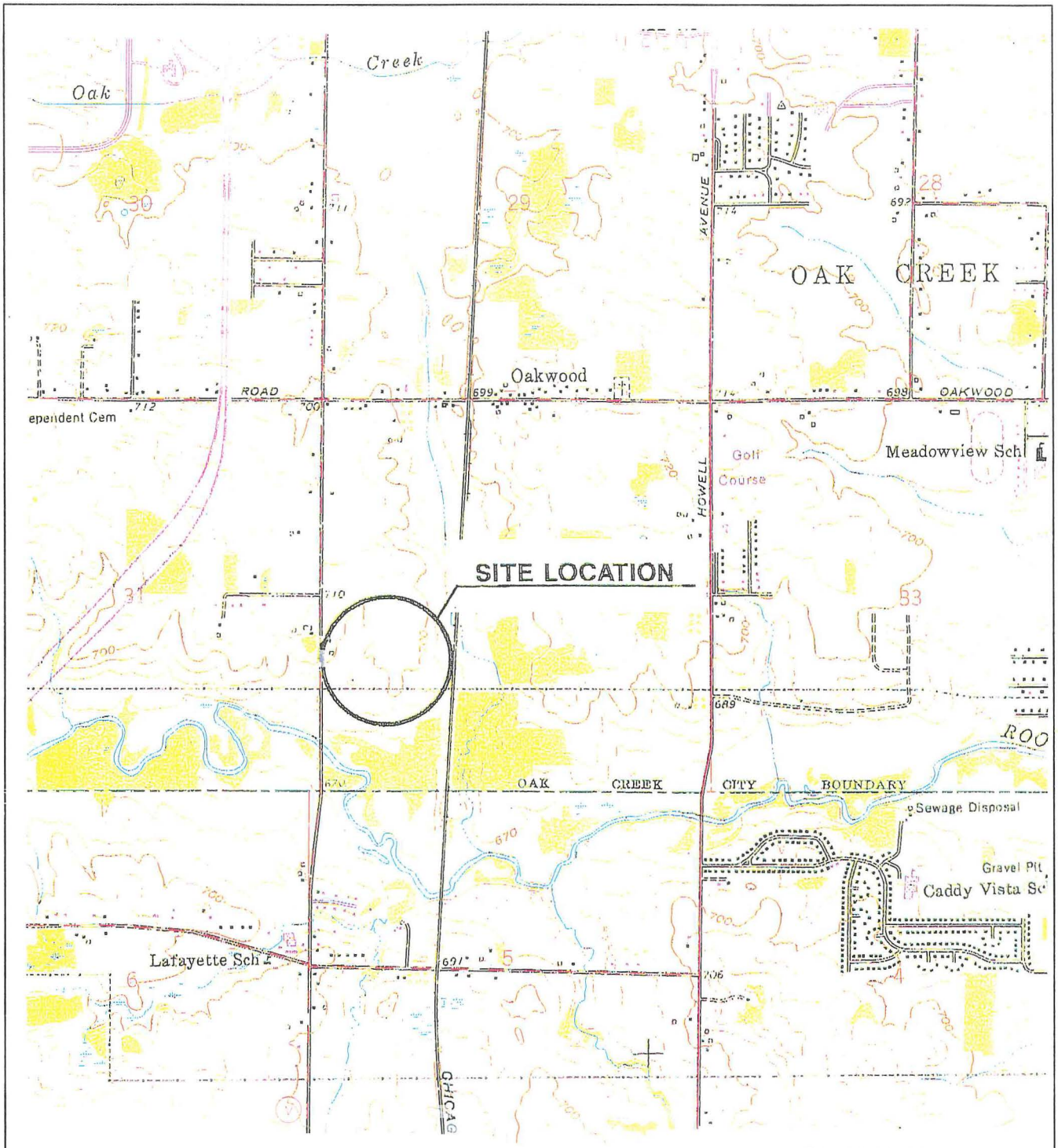
Stormwater runoff from the two hazardous waste storage areas; the former container accumulation area by the waste treatment center and the 3,000, 55-gallon drum container storage area, are also directed to the interceptor basin outfall. Collected runoff is discharged to the sanitary sewer and interceptor basin, respectively.

2.5 REGIONAL HYDROGEOLOGY

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) in their publication, *A Solid Waste Management Plan for Milwaukee County, Wisconsin* (July, 1987), describes the main sources of groundwater for the Site and the surrounding region. The first source of groundwater is a shallow, unconsolidated sand and gravel aquifer that occurs over much of Milwaukee County. The shallow groundwater beneath the Site and the surrounding region flows from west to east, towards Lake Michigan. The Root River is responsible for a localized deviation in groundwater flow. This deviation is confined to the southern portion of the Site and results in a southeastern groundwater flow.

Below the upper sand and gravel aquifer is the dolomite Niagara aquifer. Although it is situated below the upper sand and gravel aquifer, the Niagara aquifer is commonly referred to as the Milwaukee area's "shallow aquifer." This aquifer flows from west to east and does not encounter any localized variations in flow direction. The Niagara is bounded along its base by the Maquoketa shale , which acts as an aquitard.

The third aquifer of the region is referred to by the SEWRPC as a sandstone aquifer and includes all sedimentary bedrock below the Maquoketa shale. In general, this deep aquifer is referred to as the "deep aquifer" of the Milwaukee area. It is bound along its top layer by the Maquoketa aquitard, which restricts vertical water movement. The sandstone aquifer is bound along its base by deeper Precambrian units. The deep sedimentary rock aquifer regional flow direction is west to east.

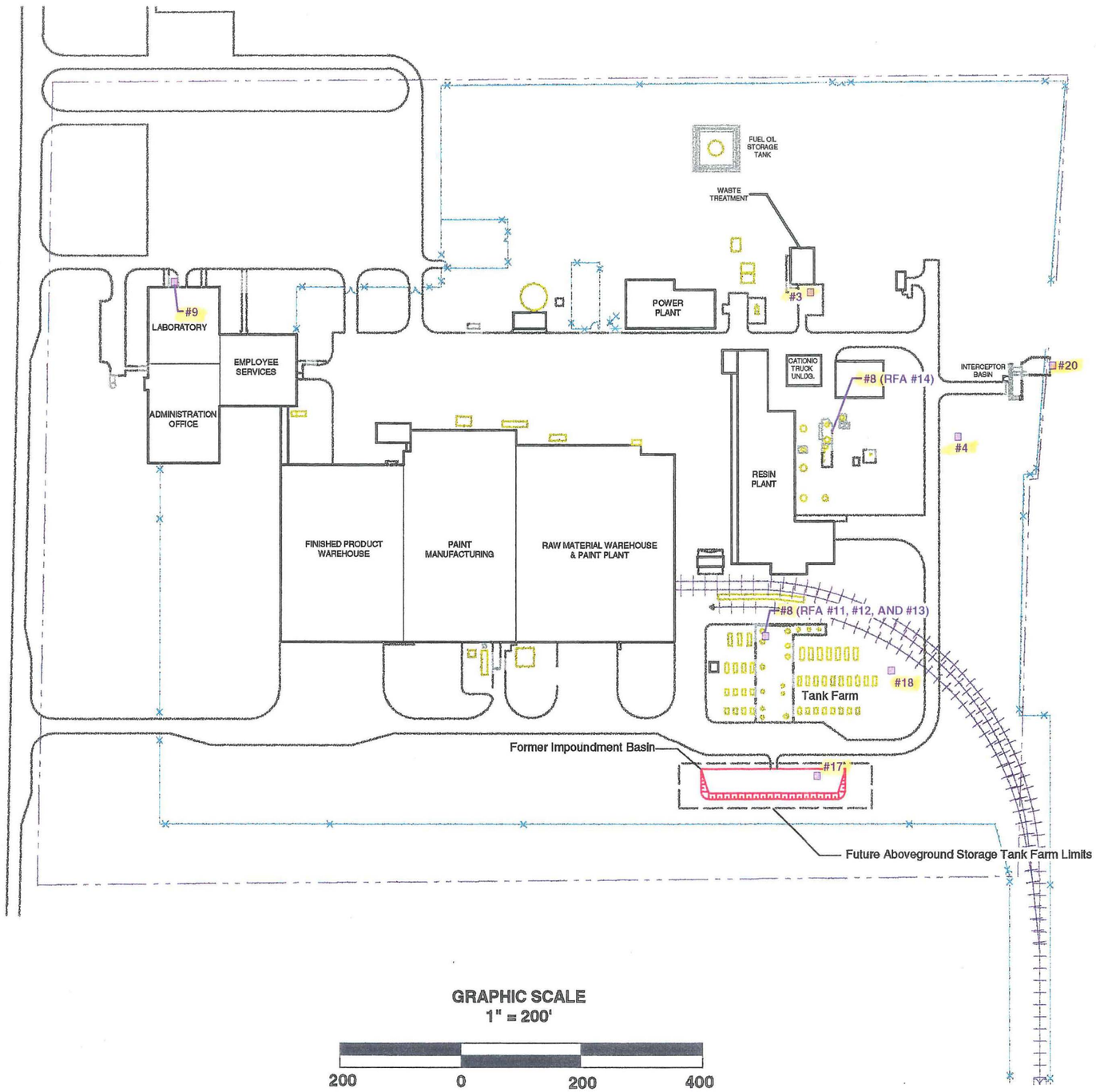


NOTE:

BASEMAP DEVELOPED FROM THE FRANKSVILLE, WISCONSIN 7.5 MINUTE USGS TOPOGRAPHIC QUADRANGLE MAP, DATED 1958, PHOTOREVISED 1971.

FIGURE 2-1

PPG INDUSTRIES, INC. OAK CREEK, WISCONSIN	SITE LOCATION MAP RCRA FACILITY INVESTIGATION	
ICF KAISER ENGINEERS PITTSBURGH, PA	DATE: 7/31/97	DR.: T. BLAIR
	SCALE: AS SHOWN	DWG. NO.: FIG1_1



LEGEND

- #8 — Solid Waste Management Unit Location and Reference Number Designated in Federal Permit
- Property Boundary
- Railroad Tracks
- Road
- Building
- Fence
- Storage Tank

GRAPHIC SCALE
1" = 200'

200 0 200 400

FIGURE 2-2

PPG INDUSTRIES INC. OAK CREEK, WISCONSIN	SITE LAYOUT RCRA FACILITY INVESTIGATION	
ICF KAISER ENGINEERS, INC. PITTSBURGH, PA	7/31/97	T. BLAIR
	1" = 200'	FIG2-2.WOR

3. HISTORICAL SITE OPERATIONS AND WASTE MANAGEMENT

3.1 GENERAL

In 1973, PPG began construction of the Site manufacturing facility on a parcel of former farmland. Construction was completed in December 1975. The Site produces both solvent and water-based coatings for automotive and industrial use. Details on the process, site operations and waste management are discussed below.

3.2 PROCESS DESCRIPTION/LOCATIONS

Three types of products are manufactured at the PPG Oak Creek facility, including paints, high temperature resins (i.e., alkyd) and low temperature resins (i.e., acrylic, epoxy). Raw materials used in the manufacturing process of these products are received in bags, cans, drums (fiber, plastic or metal), or tank wagons. Roughly 85% of the solvents and reactants are transported to the Site by truck tank wagons, which off-load into the bulk storage tanks located in the southeast corner of the Site. Box trailer deliveries (pigments, extenders, and miscellaneous raw materials) are off-loaded on the south side of the paint plant's raw materials warehouse. A summary of the major processes, raw materials, and major waste streams are presented in Table 3-1.

Paint manufacturing activities occur on two floors and a mezzanine in the paint plant with the north side dedicated to industrial coatings and the south side to automotive coatings. In general, paint is manufactured by combining resin (a polymer solution), solvent, pigments, extenders and a small amount of additives in a tank equipped with a high intensity mixer. The resultant paste is pumped through a "dispersion" mill into a holding tank where adjustments to viscosity and color are made (i.e., thinning and tinting). From the holding tank, the batch is pumped through strainers and filters into various size containers and shipped to customers.

Synthetic resins (alkyd, epoxy, acrylic) are also manufactured at the facility for use in on-site paint production, shipment to other PPG facilities for use, or occasionally sold as finished goods. Resin manufacturing is a batch polymerization process that can be generally divided into two categories; high and low temperature processes. In the high temperature process, natural oils (e.g. soybean oil), monobasic and dibasic acids (e.g. phthalic anhydride) and solvents (e.g. mineral spirits) are "cooked" in a reactor resulting

dibasic acids (e.g. phthalic anhydride) and solvents (e.g. mineral spirits) are "cooked" in a reactor resulting in a condensation reaction. This resin solution is then dropped into fixed thin tanks where additional solvent is added. After filtering, the resin solution is pumped to storage tanks, filled into drums or filled into bulk tank wagons.

Acrylic and epoxy polymers are produced in the low temperature process. Acrylic polymers are produced by rate feeding acrylic monomers (e.g. methyl methacrylate) and initiators (e.g. peroxide based initiator) into reactors containing solvent, resulting in an addition reaction. Epoxy resins are also produced by an addition reaction between epoxy-based raw materials (e.g., EPON 828) and bisphenol A. As with the high temperature resins, these low temperature resin solutions are dropped into fixed thin tanks where additional water or solvent (e.g. MEK) is added. The product is then filtered and transferred to storage or filled into drums or tank wagons.

The finished products are packaged into five gallon pails, various size drums and/or tank wagons for distribution. Finished product is stored in, and shipped from, the finished product warehouse. Resin products are transferred via pipeline to storage tanks and/or drums for use in production or for shipping.

3.3 PROCESS WASTE GENERATION AND MANAGEMENT

Records are available at the site detailing the types of waste that have historically been generated. Table 3-2 provides a summary of the waste streams generated at the site and a listing of the applicable hazardous waste codes. Supporting analytical results were provided in Appendix B of the DOCC Report, which is part of the approved RFI Work Plan.

The 26 waste streams listed in Table 3-2 can be grouped into eight general classes, including: 1) solvents from the resin making process; 2) solvents from the paint making process; 3) dirty wash water from the resin making process; 4) dirty wash water from the paint making process; 5) distillation still bottoms and other sludges; 6) filter waste; 7) air pollution control dust and floor sweepings; and 8) off-specification and obsolete products and materials.

As indicated by the Waste Codes in Table 3-2, the majority of hazardous constituents in the waste streams have included a primary core of organic solvents as well as certain metals.

Hazardous waste at the site is managed through the following five general types of process activities:

- Container accumulation
- Bulk accumulation and treatment tanks
- Spill containment/runoff control
- Air pollution control devices
- Solid waste trash compactors

A general description of each of these waste handling activities/areas is contained in the paragraphs which follow. This section does not include identification of any specific SWMUs that were investigated as part of the RFI. The identification, description, and evaluation of the SWMUs is provided in Section 3.4, Summary of Solid Waste Management Units.

Container Accumulation Areas - Container accumulation areas have been historically used to accumulate containers of hazardous waste kept at the point of generation (primarily 55-gallon drums) until they are full. Container Accumulation Areas are all located indoors except for one, and they are all located on concrete. The minimal waste handling activities which occur at these units significantly reduce the potential for a release. Container accumulation areas have secondary spill containment, which also minimizes the potential for impact to the environment.

Bulk Accumulation and Treatment Tanks - A majority of the waste treatment and/or accumulation tanks are located indoors and are either used for temporary storage or minor treatment (i.e., mixing or flocculation) of waste. The indoor tanks are located on concrete floors and a majority of these tanks which are within the waste treatment center, have secondary spill containment. There are four tanks located outdoors which have secondary spill containment. Wastes are transferred to and from the tanks via permanent aboveground pipeline systems, or hose connections.

Spill Containment/Runoff Control - Two spill containment/runoff control structures are located at the facility and include the tank farm sump and interceptor basin.

Air Pollution Control Devices - Five dust collector systems are used to control dust emissions from a variety of point sources within both the resin and paint plants. Dust is generated when solids from bags or

super sacks are added to closed containers. "Elephant trunks" located at the vessel's openings pull dust away from operating personnel to the dust collector. The dust collectors are enclosed units on concrete floors that channel the dust into 55-gallon drums. Once filled, the drums are closed, labeled and transferred to a container accumulation area. Minor amounts of residual dust may accumulate within the unit, but are collected and transferred to drums for disposal.

A water scrubber system and fume incinerator are also used to control volatile organic compounds emissions from resin plant reactors and tank vents. The scrubber system is an enclosed unit set on a concrete base with a concrete dike providing secondary containment.

Solid Waste Trash Compactors - Four trash compactors located outdoors on concrete are used to compact and store solid, nonhazardous waste. Once full, the compactors are secured and transported to a municipal solid waste landfill.

Table 3-3 summarizes the history of reported releases from SWMUs to the environment. Releases have occurred from the interceptor basin, the three DCS accumulation tanks in the Tank Farm Area, the DCS accumulation tank in the resin plant, and the concrete collection trench associated with the waste treatment center container accumulation area. Each of these areas were investigated during the RFI.

3.4 SWMUs SUMMARY

3.4.1 SWMU Evaluation Criteria

Several general factors at the Site and other SWMU-specific features minimize the potential for a release from a SWMU and were used to determine if additional investigation was required as part of the RFI. A discussion on each of these follows.

General factors include the age of the facility, appropriate in-place engineering controls, previous Site use, physical nature of the waste, and stringent management of raw products and waste.PPG began operation in 1975 on previously undeveloped farmland. Operations began at a time of increased awareness of the consequences of hazardous releases, which was reflected in improvements in the technology for bulk transfer of raw materials and waste. Since the beginning of operation, the Site has maintained standard operating procedures (SOPs) which promote the identification of releases and timely cleanup.

Since its construction, the majority of the active portion of the Site has been paved with concrete or asphalt. This pavement has minimized the potential for subsurface impacts by preventing infiltration and directing releases to spill containment structures.

The physical nature of certain wastes managed at the site do not lend themselves to significant migration in site soils. Site soils are primarily silty clays and clayey silts. These types of soils would tend to chemically absorb or physically limit metals migration. When paint is exposed to the air, the solvent portion evaporates and leaves behind a cohesive residue which is generally insoluble in water. Resins employed in the manufacturing process are typically very viscous in nature and when exposed to the air, form a hardened polymer with a low potential for migration.

In addition to these general factors, other SWMU specific features integral in the active management of raw materials and wastes mitigate the potential for a release. These include:

Location - A SWMU located indoors is situated on a concrete floor protected from the weather. The concrete mitigates the migration spills to subsurface soils. Protection from the weather prevents migration of a release of spilled material via surface water runoff. The presence of the concrete floor allows for ready observation of any spill. Indoor areas tend to be active and any spills are identified and cleaned up quickly.

Amount of Waste Present - Due to the limited number and size of containers stored at certain SWMUs, there is a low probability of a release. In addition, any spill would be small in size and easily cleaned up in accordance with site SOPs.

Waste Accumulation Areas- SWMUs where waste is strictly accumulated in drums or aboveground tanks have a low probability of an unobserved release.

Secondary Containment - Competent secondary containment at a SWMU prevents a spill from migrating to the environment. The presence of the secondary containment allows for early detection of spills.

Visual Inspections - SWMUs at the Site are routinely inspected for evidence of releases. In addition, the competency of secondary containment is also inspected and condition of the SWMU base noted. SWMUs with competent concrete (i.e., no major cracks or flaws) pose a low potential for subsurface impact.

Spill Reports - Previous releases have been documented to evaluate the potential for impact from SWMUs.

Previous Analytical Data - Soil and groundwater data from prior investigations has been used to evaluate the potential for impact from a SWMU.

3.4.2 Previous Investigations

Prior to the RFI, nine investigations were performed at the Site. These studies focused primarily on the area around the Tank Farm Area where bulk materials are stored. Figure 3-1 presents the locations of samples collected during the previous investigations. These investigations are briefly reviewed in the following sections, however, more detail is presented in the facility Description of Current Conditions (DOCC) Report (Warzyn, Inc, 1992). The results of the previous investigations in conjunction with data collected during the RFI are used to assess the nature and extent of impact at the Site. Data with the appropriate quality control will be used quantitatively in the risk assessments as well as the delineation. All other data is used qualitatively. A comprehensive discussion of the nature and extent of constituents is presented in Section 8.0.

1973 - Layne - Western Company, Inc. - Seventeen (17) geotechnical soil borings (B11 to B15, B17 to B24, B27 to B30) were drilled to provide information for construction of the facility to depths ranging from 15 to 30 feet below ground surface. Borings indicated site subsoils consisted primarily of silty clay and clayey silt.

October 1981 - Warzyn Engineering Inc. - Eight (8) soil borings were installed to depths ranging from 13 to 25 feet below ground surface. Soil samples were collected at 2.5-foot intervals continuously to 10 feet, and then, at five foot intervals thereafter. Select samples were analyzed for grain size and Atterberg limits both of which indicated samples consist primarily of silty clay or clayey silt. Each boring was completed with a water table monitoring well (TW1 to TW8). Six rounds of water samples from five

of the wells and three rounds from the remaining three wells were analyzed for pH, specific conductance, chemical oxygen demand (COD), total organic carbon, and mercury (a former constituent of some paints). Original laboratory data are available but corresponding field or laboratory QA/QC results are not available.

The significant conclusions from this October 1981 report include: 1) The area between the resin plant and tank farm indicated impact. 2) Impact was not indicated adjacent to the impoundment basin. 3) Releases from plant operations were not indicated. 4) Impact to groundwater downgradient of the tank farm was also not indicated. 5) Samples from one well (TW7) contained detectable levels of mercury (0.002 mg/l to 0.003 mg/l).

June 1986 - Geraghty and Miller Soil Vapor Survey - This study consisted of a shallow (<1.5 ft) soil vapor survey at 86 locations around the impoundment basin and along the southeastern fence line. A "Petrex" analytical method was used to provide qualitative soil vapor data. The results inferred that organics may have existed around the impoundment basin, however, subsequent confirmation studies did not substantiate these results.

October 1987 - OHM Soil Boring Study - Seven (7) 25-foot deep soil borings (A1 to A7) were installed within the boundaries of the Tank Farm Area and nine (9) 10-foot deep soil borings (B1 to B9) were installed outside the Tank Farm Area limits. Soil samples were collected every 5 feet and field-screened for total volatile organic compounds (VOCs) with a photoionization detector (PID). Selected samples were analyzed for VOCs by Method 8020. Three borings within the Tank Farm Area indicated the presence of toluene, ethylbenzene, and xylenes at concentrations ranging from 746 to 15,550 mg/kg. With the exception of n-hexane (16.1 mg/kg) at one location, no other VOCs were detected in samples from within the tank farm

Borings located outside the Tank Farm Area generally did not appear to be impacted based on field screening results (PID readings between 0 and 1 ppm), although sand layers/lenses were encountered in several of borings. Original laboratory data reports are available; however, there are no corresponding field or laboratory QA/QC results.

December 1987 - Geraghty and Miller Groundwater Study - Eight monitoring wells were installed (MW9 to MW16) in the eastern portion of the Site. During well installation, soil samples were collected at 2 1/2 ft intervals and field screened for total VOCs using a PID analyzer. Selected soil samples were analyzed for VOCs using Method 8240. A number of additional analyses for other compounds were also completed. Xylene (<3 ppm) was detected in soil samples from borings MW15 and MW9. No other VOCs were detected. Groundwater samples analyzed by Method 8240 indicated detectable concentrations of methyl isobutyl ketone (5.4 to 6.1 µg/l), m-xylenes (3.1 to 7.2 µg/l), acetone (800 to 900 µg/l), total xylenes (4,200 to 7,800 µg/l), benzene (29.0 to 33.5 µg/l), and ethylbenzene (500 to 2,100 µg/l) in MW16. Other VOCs were not detected in any of the groundwater samples. Original laboratory data are available, but corresponding field or laboratory QA/QC results are not available.

December 1988 to December 1991 - Tank Farm Sump Analysis - PPG conducted monthly monitoring of water collected in the tank farm sump. The results consistently indicated the presence of toluene (98 to 20,400 µg/l), ethylbenzene (132 to 12,400 µg/l), methyl ethyl ketone (MEK) (160 to 589,000 µg/l), and (MIBK) (210 to 294,000 µg/l). The sump analytical results consistently contained acetone (ND to 21,600 µg/l), and methylene chloride (ND to 1,980 µg/l), which are believed to represent lab artifacts. Benzene (ND to 300 µg/l) was detected on several occasions, but only in samples collected prior to February 1989. Field and laboratory QA/QC results are generally not available for pre-1992 data. Beginning in January 1992, samples were collected from the tank farm sump and analyzed as part of the UST leak detection program.

August 1988 to December 1991 - Quarterly Groundwater Sampling - Sixteen (16) monitoring wells (TW1 to TW8 and MW9 to MW16) were sampled quarterly since August 1988 by Geraghty & Miller for various parameters. Analysis primarily included VOCs by Methods 8240 and 501/502, base/neutral and acid extractables by Method 8270, acid extractables with a library search by Method 625, base/neutral extractables with a library search by Method 625, and dissolved lead (method unspecified). Original laboratory reports and partial laboratory QA/QC results are available.

Only two base/neutral and acid extractable compounds were detected during groundwater sampling. These included one time occurrences of 2,4-dimethylphenol (35 µg/l) and (46 µg/l) and di-n-butyphthalate (9 µg/l) and (5 µg/l) in three different wells. Lead was reported as a onetime occurrence (35 µg/l) in one well.

VOCs are the predominantly detected constituents in groundwater. These included benzene (3 to 18 µg/l) in four different samples, MEK (29 µg/l) in one sample, ethylbenzene (1,413 to 2,200 µg/l) in three different samples, toluene (1 to 3,600 µg/l) in six different samples, xylenes (1,900 to 10,678 µg/l) in seven different samples, and dibromochloromethane (40 µg/l) in one sample. Dibromochloromethane was never used at the facility and its presence is suspect.

Eight of the 16 wells sampled did not contain detectable VOCs. Three wells had one time occurrences of a single detectable VOC, with this compound never reported during other sampling rounds. Three wells contained two occurrences of detectable VOCs including one time occurrences of both xylene and toluene at TW7 and MW12 and toluene.

June 1992 - Warzyn Soil and Groundwater Assessment Report - The report summarizes the investigative results of 54 shallow hand borings (0 to 2 ft), 22 deep borings (15 to 35 ft) and six groundwater monitoring wells (LW1 to LW4, LP1, and LP3) installed in the vicinity of the Tank Farm Area and resin plant. A total of 95 soil samples were analyzed for VOCs using Method 8240. Nine water samples were analyzed for VOCs using Method 8240 and ASTM Method D-3328-78 for complex hydrocarbon mixtures. Both field QA/QC and laboratory QA/QC results are available.

The results of the investigation indicated that the collection of groundwater by the tank farm sump captures impacted groundwater. Soil impact was found within the Tank Farm Area with the highest concentrations from the deeper backfill material (near the base of the tank farm). Several isolated surface areas under UST vents also were impacted. The sand and gravel layer/lense to the northeast and southwest of the Tank Farm Area was also impacted. The extent of the layer/lense however, appears limited to between the 10 to 20 foot depths. Soil impact under the impoundment basin was observed coincident with the Tank Farm Area sand and gravel layer/lense which extends along the west edge of the basin at a depth of 10 to 12 feet. Some impact in the vicinity of the resin plant was also reported.

1992 - UST Leak Detection Program - From January 1992 to 1995, seven groundwater monitoring wells (LW1 to LW4, LP1, LP3, and TW3) and the tank farm sump were monitored on a monthly basis as part of an approved UST leak detection program. Analysis was conducted using Method 8240 for VOCs and an ASTM D-3328-78 methodology for complex hydrocarbon mixtures (e.g., VM&P naphtha). Indicator

analysis for total organic nitrogen was also completed. Final QA/QC consisted of one trip blank and one method blank. Laboratory QA/QC consisted of standard SW-846 protocols.

The following compounds were detected: ethylbenzene, MEK, MIBK, Solvesso 100, toluene, VM&P naphtha acetate, VM&P naphthalite, and xylene.

1995 - Warzyn Test Borings - In 1995 Warzyn installed 28 Geoprobe borings and 12 hand auger borings in and around the Tank Farm Area and Former Impoundment Basin. The purpose of the test borings was to further define the distribution of organic constituents in the Tank Farm Area.

3.4.3 RFI SWMUs

Based on the above discussed evaluation criteria and previous investigations, each SWMU was individually evaluated during the development of the RFI Work Plan. The observations and recommendations made by the WDNR in their Preliminary Investigation Report form were used in evaluating the need for further investigation. As presented in the PMP, 31 of 41 SWMUs evaluated by the WDNR were recommended for no further action. The results of the evaluation are presented in Table 3-4. Since then, site waste handling procedures have not changed and no new SWMUs have been identified.

Further investigation was not required for areas with no historical documentation of a release, where observations indicated a release had not occurred, and the potential for impact to health and the environment is low. Further investigation in the RFI was conducted for SWMUs where insufficient information existed to perform a complete impact assessment, where documented spills were reported, or previous investigative data indicated the presence of soil/groundwater impact. Only the 10 SWMUs requiring further investigation are discussed in detail below. Detailed information on the 31 SWMUs requiring no further action is included in the Project Management Plan of the RFI Work Plan Documents, 1995.

Interceptor Basin Outfall - (SWMU 20)

Stormwater from the northern portion of the plant is discharged through Outfall 001 (SWMU 20) to an unnamed tributary of the Root River. Prior to discharge through the outfall, runoff enters a 41,295-gallon stormwater interceptor basin. The outfall consists of a concrete basin and baffled spillway. The basin is

equipped with a total carbon analyzer which sounds an alarm and automatically closes a sluice gate if elevated total carbon levels are detected. From the basin, water flows through a baffled spillway, then through a small channel that extends under the railroad tracks, and to the unnamed tributary along the eastern property boundary. This SWMU required investigation in the RFI due to reported releases to the environment.

Tank Farm Area - SWMUs 8 (RFAs 11, 12, 13), 17 and 18

The Tank Farm Area consists of both underground and aboveground storage tanks, and is used for raw material storage. These raw materials along with water represent the major raw materials used in paint and resin manufacturing. Tank wagon unloading and rail loading operations also take place in the vicinity of the Tank Farm Area.

The three 15,000-gallon aboveground DCS accumulation tanks comprise SWMU 8 (RFA 11, 12, and 13). Two tanks accumulate used paint-related solvent (PPG tank Nos. 122 and 123) and one accumulates used resin-related solvent (PPG tank No. 124). The used solvent is generated from cleaning operations and is transferred to the tanks prior to on-site reclamation. Concrete secondary containment around the tanks. Past observations indicated staining was evident in the vicinity of these tanks. This SWMU required investigation in the RFI due to reported releases to the environment.

A 210,188-gallon concrete impoundment basin that previously served as the secondary containment for the aboveground tanks in the Tank Farm Area comprised SWMU 17. The impoundment basin collected stormwater runoff or spills related to both the tank wagon loading/unloading area and the above ground tanks in the Tank Farm Area. As part of a recent above ground storage tank project, separate containment was installed for the above ground tanks and the impoundment basin was removed.

SWMU 18 is a 3,770-gallon concrete underdrain sump for the Tank Farm Area, which functions primarily to collect groundwater and rainwater infiltration from the underground storage tank basin. The basin consists of an excavation within the natural clay to a depth of approximately 20 feet. Drainage tile is located at the bottom of the excavation to remove groundwater from around the underground storage tank. The excavation is backfilled with high permeability sand and gravel.

Resin Plant [SWMU 4 and 8 (RFA 14)]

The resin plant has six reactor systems with operations that take place on three floors and a mezzanine. The solvent recovery stills that serve both the paint and resin plants are located on the first floor of the resin plant. Two SWMUs located in this area required investigation [SWMU 4 and SWMU 8 (RFA 14)].

SWMU 4 is a 100 feet by 140 feet, approximately 3,000 drum container accumulation area used to store paint and resin waste, required investigation to determine whether site specific target compounds were present at concentrations exceeding Region V DQLs.

SWMU 8 (RFA 14) is a 15,000-gallon aboveground solvent accumulation tank located outdoors east of the resin plant. The aboveground tank is used to store MIBK distillate from the cationic resin manufacturing process. The MIBK distillate is accumulated prior to off-site reclamation. The SWMU required investigation to determine whether site specific target compounds were present at concentrations exceeding Region V DQLs.

Waste Treatment Center -(SWMU 3)

Bulk wastewater is transferred through permanent aboveground piping from the paint and resin plants to bulk tanks located inside the waste treatment center. SWMU 3 is the former 40.5 feet x 50 feet, 300 drum equivalent WTC accumulation area that was previously used to accumulate paint and resin waste. This SWMU required investigation to determine whether site specific target compounds are present at concentrations exceeding Region V DQLs. Associated with this area is a concrete collection trench which provides secondary containment.

Technical/Administrative Area - (SWMU 9)

The administrative wing includes a cafeteria and office areas. The technical wing contains quality assurance/quality control laboratories for product testing. Small batches of paint are prepared in pint, quart, and gallon-sized containers and undergo various physical and chemical tests. The wastes that are generated are similar to those generated in the paint plant but on a smaller scale. All wastes are consolidated in drums. The lab accumulation area (SWMU 9) was used to accumulate (<90 days)

laboratory generated paint and resin wastes required investigation. Staining was observed in this SWMU and an investigation was required to determine whether site specific target compounds are present at concentrations exceeding Region V DQLs.

TABLE 3-1
PROCESS DESCRIPTION,
RAW MATERIALS AND MAJOR WASTE STREAMS
PPG INDUSTRIES, INC.
OAK CREEK, WISCONSIN

Process	Raw Materials	Major Waste Streams
Paint	- Water - Aromatic Solvents (e.g., xylene, toluene, ethyl benzene, mineral spirits, VM&P naphtha) - Ketones (e.g., MEK, MIBK) - Glycol Ethers (e.g., butyl cellosolve) - Ether Acetates (e.g., cellosolve acetate) - Alcohols (e.g., butanol, isopropanol and isobutanol) - Solids (predominantly titanium dioxide, also included are large amounts of iron and zinc oxide and carbon black) - Additives (hydroxyethyl cellulose) - Extenders (e.g., calcium carbonate, silica, talc, bentonite, aluminum silicates, clay)	-Used Solvents -Vessel and Equipment Washwater -Used Filter Media -QA/QC Sample Waste -Off-Specification Batches - Solid Dust
High Temperature Resin	- Natural Oils (e.g., soybean, safflower, castor, linseed) - Glycerin - Phthalic Anhydride - Benzoic Acid - Tall Oil Fatty Acids - Aromatic and Aliphatic Mineral Spirits - Aromatic and Aliphatic Naphthas - Xylene - Ethyl Benzene - Toluene	- Condensation (decanter) Water - Used Cleaning Solvent - QA/QC Sample Waste - Off-Specification Batches - Filters - Empty Drums and Bags
Low Temperature Resin	- Acrylates - Epoxy Resins - Styrene - Bisphenol A - Methyl Ethyl Ketone - Methyl Isobutyl Ketone - Butanol - Isopropanol - Hexanol - Isophorone - Minor Amounts of Aromatics and Naphtha Solvents	- Used Washwater and Equipment Cleaning Solvent - QA/QC Sample Waste - Off-Specification Batches

TABLE 3-2
SUMMARY OF WASTE STREAMS
RFI REPORT

Waste Name	Historic EPA Waste Codes	General Description
Paint Plant, Dirty Solvent	D001, D018, D035, D005, D006, D007, D008, F003, F005	Used to clean process equipment in paint manufacturing. This waste is a single-phase organic liquid with resin and pigment solids. On occasion, the waste may be shipped offsite for recovery when it cannot be handled onsite.
Resin Plant, Dirty Solvent	D001, D007, D018, D035, D008, F003, F005	Used to clean process equipment in resin manufacturing. This waste is a single-phase organic liquid with resin solids. Waste may be shipped offsite.
Solvent Recovery Still Sludge	D001, D005, D006, D007, D008, D018, D035, D038, F003, F005	Residues removed from the solvent recovery distillation systems are blended with other compatible wastes, after which waste is shipped offsite for disposal.
Water-Based and Water-Reducible Paint Waste	D001, D005, D006, D007, D008	Discarded, spilled defective or obsolete paint residues from industrial paint manufacturing with water as the main solvent. Offsite disposal of waste.
Solvent-Based Paint Waste	D001, D005, D007, D008, D035	Discarded, spilled, defective or obsolete paint or paint residues from industrial and automotive paint manufacturing.
Resin Waste	D001, D003, D007, D008, D035	Discarded, spilled, defective or obsolete resin or resin residues from resin manufacturing.
Cationic Distillate-MIBK	F003	By-product of a resin manufacturing process. The waste is accumulated in a tank prior to shipment to an offsite reclaimer.
Paint Plant, Filter Cartridges and Bags	D005, D006, D007, D008	Filter cartridge, bag and/or paper straining media that is contaminated with paint, resins, solvent or water and pigments. Waste product shipped offsite.
Resin Plant, Filter Cartridges and Bags	Various Organic Constituents	Filter cartridge, bag or paper straining media contaminated with resins. Waste product shipped offsite.
Paint Plant, Baghouse Dust	D005, D006, D007, D008	Solid waste generated from air pollution dust collection systems which are located within the Paint Manufacturing Plant. Waste product shipped offsite.
Resin Plant Baghouse Dust	Various Organic Constituents	Solid waste generated from air pollution dust collection system within the Resin Manufacturing Plant. Waste product shipped offsite.
Paint Plant, Trade Washwaters	See Note (2)	Washwater from cleaning latex paint production equipment. Waste treated onsite, with supernatant discharged to POTW.
Paint Plant, Industrial Washwater	D001, D002, D005, D006, D007, D008	Washwater from cleaning industry paint production equipment. Waste treated onsite, with supernatant discharged to POTW.
Paint Plant, Caustic Cleaning Water	D001, D002, D005, D006, D007, D008	Spent recycled caustic washwater from cleaning portable tanks that are used in paint production. Waste treated onsite, with supernatant discharged to POTW.

TABLE 3-2 (Continued)
SUMMARY OF WASTE STREAMS
RFI REPORT

Waste Name	Historic EPA Waste Code	General Description
Resin Plant Caustic Cleaning Water	D001, D002	Used caustic washwater from cleaning resin production equipment. Waste is shipped offsite for disposal.
Resin Plant, Wastewaters	D001, F003, F005	Waste consist of mostly water with a small amount of soluble and insoluble organic solvents and/or other hydrocarbons. Organic phase is returned for solvent reuse, with the water phase shipped offsite for disposal.
Cationic Washwater	D001, D007, D008, D035	Washwater from cleaning process equipment and product tankwagons, with water being ultrafiltered onsite and permeate discharged to the POTW. Concentrate is shipped offsite for disposal.
Wastewater Treatment Supernatant	D001, D007, D008	Treated water from all process wastewaters which is discharged to a POTW.
Wastewater Treatment Sludges	D005, D006, D007, D008	Waste consists of solids that are physically/chemically separated form process wastewaters. Sludge is dewatered and shipped offsite for disposal, with sludge water being discharged to the POTW.
Paint Plant, Caustic Sludges	D001, D005, D006, D007 D008	Residues removed form the caustic cleaning recycling system. Waste is shipped offsite for disposal.
Floor Sweepings	D005, D006, D007, D008	Solid floor sweeping compound contaminated with dry raw pigment and resin residues.
Floor Cleaning Solution	D001, D005, D006, D007, D008, or F003, F005	Solvent or water floor cleaning wastes that contain pigments or raw materials.
Discarded or Spilled Raw Materials	Various Pand U Codes	Spilled or discarded waste that have been listed as hazardous waste. Waste shipped offsite for disposal.
Offsite Waste	D001, D005, D006, D007, D008, D018, D035, D038, F003, F005	Defective or obsolete products that have been returned to PPG-Oak Creek. Also covers wastes generated at offsite PPG production distribution centers.
Off-Specification Products	D001, D005, D006, D007, D008, D018, D035, D038	Onsite off-spec. or obsolete products, consisting of either paint or resin.
Laboratory Paint and Resin Waste	D001, D002, D003, D004, D005, D006, D007, D008, D018, D035, D038	Quality control samples taken from the production processes and are discarded after lab analysis.

Notes:

1. Information taken from: Baker. TSA, Inc. Feasibility Report for Storage and Treatment of Hazardous Waste Generated at the PPG Industries Inc., Oak Creek, Wisconsin Coating and Resins Facility. (October 1986, as revised).

2. Analytical data for individual waste streams can be found in Appendix B of the Task 1: Description of Current Conditions Report, September 1992. Historically, ppm levels of phenylmercuric acetate were added to latex paints to extend the shelf life. As of 1991, the use of mercury was eliminated. For this reason, the D009 waste code has been removed (reference to Waste Code for Paint Plant, Trade Washwaters) and this table has been updated from the Task 1: Description of Current Conditions

TABLE 3-3
SUMMARY OF KNOWN RELEASES FROM SWMUs
RFI WORK PLAN
PPG INDUSTRIES, INC.
OAK CREEK, WISCONSIN

DATE	SUBSTANCE	DESTINATION	QUANTITY (gal)	RESPONSE	LOCATION	SWMU	
						RFA	PERMIT
6/10/79	Titanium Dioxide	Unnamed Creek & Interceptor Basin	400 (+)	Cleanup	Tank Car Un-loading Area	#35	#20
8/23/84	Dirty Cleaning Solvent	Tank Farm Basin	40	Pumped Into Drums	Tank Farm	#11, #12, #13	#8
9/17/84	Dirty Cleaning Solvent	Drain and Impoundment Basin	300	Cleanup Containment Area	Solvent Recovery Still	#11, #12, #13	#8
5/16/85	Cationic Resin	Interceptor Basin and Storm Sewer	200-300	Containment & Cleanup	Plant Yard Area	#35	#20
4/30/87	Dirty Cleaning Solvent	Containment Area	100	Contained, Drummed	Tank Farm	#11, #12, #13	#8
7/30/87	Solvent Recovery Still Bottoms	Waste Treatment Containment Trench	2500	Mostly Contained, (2450 gal) in trench. 50 gal released from trench to ditch with liquid vacuumed up.	Waste Treatment Containment Trench	#4	#3
8/15/88	Dirty Cleaning Solvent	Soil	30-40	Clean Diked Area	Tank Farm	#11, #12, #13	#8
4/10/89	Reclaimed Solvent	Soil	300	Excavated	Tank Farm	#11, #12, #13	#8
8/24/92	Dirty Cleaning Solvent	Soil	3900 lb.	Excavated Soils	Tank Farm	#11, #12, #13	#8

Notes: Table includes only those releases which originated from a SWMU and were released to the environment. Table does not include raw material or product spills that are unrelated to a SWMU. Table does include spills to containment-type SWMUs (i.e. interceptor basin, impoundment basin, or tank farm sump) which did not result in a release to the environment but rather were captured in whole.

TABLE 3-4
SUMMARY OF SOLID WASTE MANAGEMENT UNITS
PPG INDUSTRIES, INC.
OAK CREEK, WISCONSIN

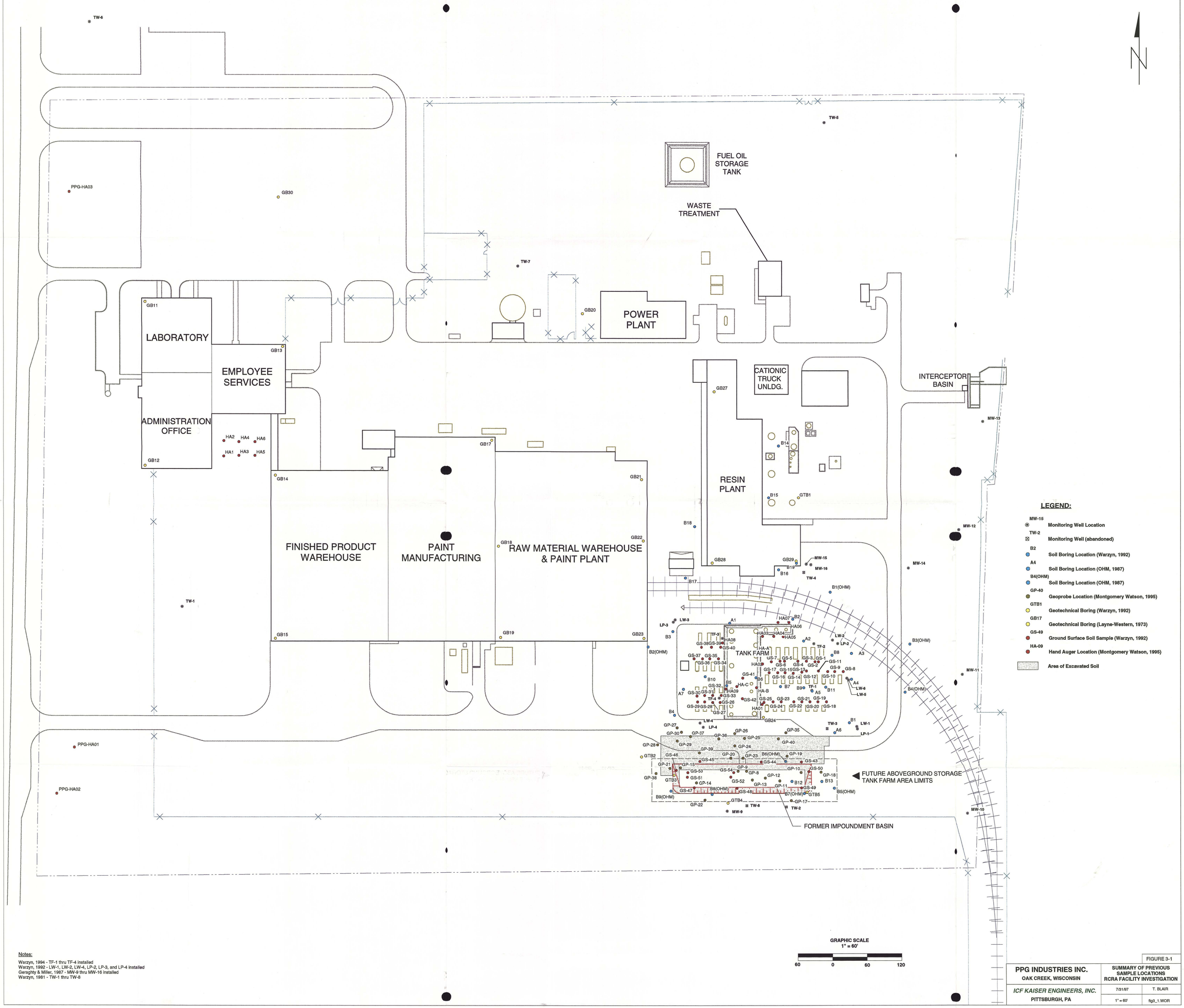
SWMU IDENTIFICATION									
RFI Permit Number	RFA Number	Description	Location	Maximum Capacity	Base	Activity	Time Present	Releases	Recommendations
Paint Plant-North Yard									
10	16	Container Accumulation Area (6' x 6')	Outdoors	20 drums	Concrete	Storage	< 3 days	No	No Further Action
11	17,37*,38*,39*,40*	Container Accumulation Area (6' x 16')	Outdoors	60 drums	Concrete	Storage	< 3 days	No	No Further Action
13	22	Air Pollution Control Dust Collector	Outdoors	8 drums	Concrete	Storage	> 3 days	No	No Further Action
14	24	Air Pollution Control Dust Collector	Outdoors	7 drums	Concrete	Storage	> 3 days	No	No Further Action
19	32	Solid Waste Trash Compactor	Outdoors	NA	Concrete	Storage	> 3 days	No	No Further Action
Paint Plant-South Yard									
11	20	Drum Accumulation Area (6' x 16')	Outdoors	60 drums	Concrete	Storage	< 3 days	No	No Further Action
13	23	Air Pollution Control Dust Collector	Outdoors	8 drums	Concrete	Storage	> 3 days	No	No Further Action
14	25	Air Pollution Control Dust Collector	Outdoors	7 drums	Concrete	Storage	> 3 days	No	No Further Action
19	33	Solid Waste Trash Compactor	Outdoors	NA	Concrete	Storage	> 3 days	No	No Further Action
Waste Treatment Center									
1	1	Water-Based Sludge Treatment Tank	Indoors	10,000 gal	Concrete	Process related	> 3 days	No	No Further Action
2	2, 3	Organic Waste Treatment Tanks (2)	Indoors	6,000 gal	Concrete	Process related	> 3 days	No	No Further Action
6	7	Wastewater Decanter	Indoors	2,500 gal	Concrete	Process related	> 3 days	No	No Further Action
7	8, 9, 10, 41*	Wastewater Treatment/ Accumulation Tanks (4)	Indoors	6,000 gal	Concrete	Storage	> 3 days	No	No Further Action
3	4	Container Accumulation Area (40.5' x 50')	Outdoors	300 drums	Concrete	Storage	> 3 days	Yes**	Additional Investigation***

Notes:
* = Indicates RFA number arbitrarily assigned by Warzyn
** = Indicates spill from containment trench to the environment
*** = Indicates investigation of containment trench area only
NA = Not Applicable

TABLE 3-4 (Continued)
SUMMARY OF SOLID WASTE MANAGEMENT UNITS

SWMU IDENTIFICATION									
RFI Permit Number	RFA Number	Description	Location	Maximum Capacity	Base	Activity	Time Present	Releases	Recommendations
Technical/Administrative Area									
9	15	Container Accumulation Area (15' x 30')	Outdoors	16 drums	Concrete	Storage	> 3 days	No	Additional Investigation
19	31	Solid Waste Compactor	Outdoors	NA	Concrete	Storage	> 3 days	No	No Further Action
Resin Plant									
4	5	Container Accumulation Area (100' x 140')	Outdoors	3,000 drums	Concrete	Storage	> 3 days	No	Additional Investigation
5	6	Organic Waste Treatment Tank	Indoors	6,000 gal	Concrete	Process related	> 3 days	No	No Further Action
8	14	Waste Solvent Accumulation Tank (1)	Outdoors	15,000 gal	Concrete	Storage	> 3 days	No	No Further Action
10	18	Container Accumulation Area (6' x 8')	Outdoors	20 drums	Concrete	Storage	< 3 days	No	Additional Investigation
10	19	Container Accumulation Area (6' x 8')	Outdoors	20 drums	Concrete	Storage	< 3 days	No	No Further Action
12	21	Former Container Accum. Area (20' x 40')	Outdoors	1,000 drums	Concrete	Storage	< 3 days	No	No Further Action
15	26	Air Pollution Control Dust Collector	Indoors	1 drum	Concrete	Storage	> 3 days	No	No Further Action
16	27,28	Solvent Recovery Stills (2)	Indoors	5,200 gal	Concrete	Process related	> 3 days	No	No Further Action
19	34	Solid Waste Trash Compactor	Outdoors	NA	Concrete	Storage	> 3 days	No	No Further Action
21	36	Wet Scrubber System	Outdoors	NA	Concrete	Process related	> 3 days	No	No Further Action
Outfall									
20	35	Stormwater Interceptor Basin	Outdoors	41,295 gal	Soil	Storage	> 3 days	Yes	Additional Investigation
Tank Farm									
8	11, 12, 13	Solvent Accumulation Tanks (3)	Outdoors	15,000 gal	Concrete	Storage	> 3 days	Yes	Additional Investigation
17	29	Impoundment Basin	Outdoors	210,188 gal	Soil	Storage	> 3 days	No	Additional Investigation
18	30	Tank Farm Underdrain Sump	Outdoors	3,770 gal	Soil	Storage	> 3 days	No	Additional Investigation

Notes:
* = Indicates RFA number arbitrarily assigned by Warzyn
** = Indicates spill from containment trench to the environment
*** = Indicates investigation of containment trench area only
NA = Not Applicable



LEGEND:

- MW-15 — Monitoring Well Location
- TW-2 — Monitoring Well (abandoned)
- B2 — Soil Boring Location (Warzyn, 1992)
- A4 — Soil Boring Location (OHM, 1987)
- B4(OHM) — Soil Boring Location (OHM, 1987)
- GP-40 — Geoprobe Location (Montgomery Watson, 1995)
- GTB1 — Geotechnical Boring (Warzyn, 1992)
- GB17 — Geotechnical Boring (Layne-Western, 1973)
- GS-49 — Ground Surface Soil Sample (Warzyn, 1992)
- HA-09 — Hand Auger Location (Montgomery Watson, 1995)
- Area of Excavated Soil

GRAPHIC SCALE
1" = 60'
60 0 60 120

Notes:

Warzyn, 1994 - TF-1 thru TF-4 installed
Warzyn, 1992 - LW-1, LW-2, LW-4, LP-2, LP-3, and LP-4 installed
Geraghty & Miller, 1987 - MW-9 thru MW-16 installed
Warzyn, 1981 - TW-1 thru TW-8

FIGURE 3-1

PPG INDUSTRIES INC. OAK CREEK, WISCONSIN	**SUMMARY OF PREVIOUS SAMPLE LOCATIONS RCRA FACILITY INVESTIGATION**
ICF KAISER ENGINEERS, INC. PITTSBURGH, PA	7/31/97 | T. BLAIR 1" = 60' | fig3_1.WOR

4. RFI TASKS, PROCEDURES AND METHODS

Soil, sediment, and groundwater sampling activities were performed at the Site in September and October of 1996. The investigation activities are summarized in Table 4-1 and the analytical testing program summary is presented in Table 4-2. All sampling and analysis activities were performed in accordance with the approved RFI Work Plan documents. Sampling results are presented in Section 5.0.

4.1 SOIL SAMPLING INVESTIGATION ACTIVITIES

Subsurface samples were collected using both hand auger and rotary drilling methods. Samples were submitted for various physical and chemical analyses.

4.1.1 Hand Auger Samples

A total of 27 hand auger borings were completed at the Site. Schleede Hampton Associates were subcontracted by ICF Kaiser to core the concrete/asphalt for advancement of the hand auger where needed. Samples were collected using a 3.25-inch diameter stainless steel hand auger. The depth interval and number of samples collected varied according to the area of investigation. The samples were screened using the photoionization detector (PID) headspace method. Information on soil type, moisture content, physical characteristics, and Unified Soil Classification System (USCS) identification were recorded in a field log book for each sample. Chain-of-custody procedures were followed during the sampling activities. The stainless steel hand auger was decontaminated between boreholes using an Alconox detergent wash followed by a distilled water rinse. The soil cuttings and decontamination water were collected and placed in 55 gallon drums upon the completion of each boring.

4.1.1.1 Background Sampling

A total of seven background samples including one duplicate were collected on September 26, 1996. The shallow soil samples were collected from grass covered areas in the northwest and southwest corners of the Site. The samples were collected from 0.5 to 2.5 feet below ground surface (ft-bgs) and 3.0 to 5.0 ft-bgs depth intervals at three locations. Samples were then transferred to glass jars and labeled for submittal to Quanterra Laboratory (Quanterra) for metals analysis. One duplicate soil sample was collected from this area for metals analysis.

4.1.1.2 WTC Accumulation Area - SWMU 3

The former WTC accumulation area (SWMU 3) is located near the waste treatment center. Soil samples were collected on October 1, 1996 from four hand auger borings located adjacent to the trench and two borings in the small drainage ditch to the southeast. In the area adjacent to the trench, one soil sample was collected from each boring at a depth of 1.0 to 3.0 ft-bgs. The two samples collected in the ditch to the east of the WTC Accumulation Area were taken from a depth of 1.5 to 3.5 ft-bgs. The ditch was covered with crushed limestone and the sample was collected between the surface limestone gravel and the underlying soft brown silty clay soils. Each sample was submitted to Quanterra for metals, VOCs, SVOCs, and alcohol analysis. A matrix spike and matrix spike duplicate (MS/MSD) sample was collected in association with these samples. A field blank sample was prepared by pouring distilled water over the decontaminated hand auger.

4.1.1.3 Large Accumulation Area - SWMU 4

The large accumulation area (SWMU 4) is the 3,000-drum-equivalent, greater-than-90-day, storage area located to the east of the resin plant. A total of nine soil samples were collected on September 30, 1996. One soil sample was collected from each boring for laboratory analysis. The samples were collected at starting depths ranging from 1 to 2 feet below either the top of pavement or the top of ground surface. A duplicate soil sample was collected and a field blank sample was prepared by pouring distilled water over the decontaminated hand auger. In addition, one sample was prepared for MS/MSD analysis. All soil samples were submitted to Quanterra for VOCs and metals analysis.

4.1.1.4 Lab Accumulation Area - SWMU 9

The lab accumulation area (SWMU 9) is a less-than-90-day storage area located north of the technical/administrative area. A total of five soil samples were collected on October 1, 1996. One duplicate soil sample and one field blank sample were also collected. Four locations were sampled surrounding the pad and one sample was collected within the concrete pad area. The samples were collected at depths ranging from 1 to 2 feet below either the top of pavement or the top of ground surface. One soil sample was collected from each boring for laboratory analysis. The collected soil samples were submitted to Quanterra for VOCs and metals analysis.

4.1.1.5 Resin Plant MIBK Accumulation Tank - SWMU 8 (RFA 14)

The resin plant accumulation tank, SWMU 8 (RFA 14) is a 15,000 gallon aboveground solvent accumulation tank surrounded by concrete containment which is used to store MIBK distillate. One soil sample was collected from a hand auger boring located in a gravel covered area adjacent to the concrete containment area. The sample was collected from a depth of 1.5 to 3.5 ft-bgs and submitted to Quanterra for metals, VOCs, SVOCs, and alcohol analysis.

4.2 SUBSURFACE SOIL SAMPLES

As part of the investigation of SWMUs 8 (RFA 11, 12 and 13), 17 (former impoundment basin), and 18 (tank farm sump), soil samples for physical characterization analysis were collected to supplement existing data regarding the Site environmental and physical setting. Fox Exploration of Itasca, Illinois was contracted by to perform the drilling activities required for the completion of soil borings.

The soil borings were advanced using 4.25-inch inside diameter (ID) hollow-stem-augers and soil samples were collected using standard penetration test methods at 2.5-foot intervals using a 2-inch diameter split-barrel sampler. Each collected soil sample was field screened using a PID and penetrometer readings were obtained. Information on soil type, moisture content, physical characteristics, and USCS identification were recorded in a field log for each sample. A total of six soil samples from three borings were collected for analysis. The soil samples were submitted to Quanterra for organic matter content, organic matter fraction, grain size distribution, and moisture content.

All drill cuttings produced during the installation of the wells were placed in fiber board drums for disposal by PPG. All PVC and stainless steel well materials were pressure washed prior to installation and all drilling auger and tools were pressure washed between boreholes. The wash water was placed in steel 55-gallon steel drums for proper disposal by PPG.

4.3 SEDIMENT SAMPLE INVESTIGATION ACTIVITIES

The interceptor basin outfall (SWMU 20) is located along the eastern boundary of the Site. Water flows from the basin through a baffled spillway, then through a small channel which extends under the railroad

tracks and into an unnamed tributary of the Root River. Sediment samples were collected from three locations along the bottom of the channel adjacent to the interceptor basin outfall (SWMU 20). One duplicate sample was collected. A field blank sample was taken during the sediment sampling by collecting distilled water poured through a decontaminated Shelby Tube. The first sediment sample was collected immediately adjacent to the spillway and the remaining two samples were collected approximately 10 and 40 feet downstream, respectively.

The sediment samples were collected in Shelby Tubes from ground surface to a depth of approximately 1 ft-bgs. The samples were screened using a PID and the Shelby Tubes were sealed. The samples were submitted to Quanterra for VOCs and metals analysis.

4.4 GROUNDWATER INVESTIGATION ACTIVITIES

Groundwater investigation activities included monitoring well installation, well development, well sampling, well abandonment, well surveying, collection of groundwater elevations, and hydraulic conductivity testing.

4.4.1 Monitoring Well Installation

The Work Plan documents indicated that five monitoring wells were to be installed within and outside the Tank Farm Area (2 inside and 3 outside). The Work Plan also indicated that four wells had previously been installed within the Tank Farm Area negating the need for the installation of the two aforementioned wells inside the Tank Farm Area. Consequently, only the three outside wells (LW-5, LP-2, LP-4) were installed for the RFI. Data collected from the installation of the four existing wells within the Tank Farm Area were incorporated into the nature and extent evaluation discussed in Section 8.

Fox Exploration of Itasca, Illinois performed the well installation activities during the RFI under the supervision of ICF Kaiser. While advancing the boreholes with 4.25-inch ID hollow-stem auger, soil samples were collected at 2.5 foot intervals using a split-barrel sampler. Boring/well installation logs for the three newly installed wells are presented in Appendix B.

Shallow well LW-5 was installed to the east of the Tank Farm Area to provide information on the horizontal extent of impact. The well was installed approximately 25 feet west of the tank farm sump.

This well, which was to intersect the water table, was constructed using Schedule 40 polyvinyl chloride (PVC) well materials with a 2-inch ID and a 10-foot well screen (0.010 slot size). The well was completed with a locking protective steel aboveground well cover which was protected by two 4-inch by 6-inch treated lumber bumper posts. Well LW-5 was installed at a total depth of 15 feet below ground surface. Due to the drawdown of water within the Tank Farm Area, well LW-5 did not intersect the water table and therefore, was dry. The well was supplemented with a deeper monitoring well (LW-6), adjacent to the location of LW-5 at a depth of 22-feet below ground surface.

Wells LP-2 and LP-4 were installed in the vicinity of wells LW-2 and LW-4, respectively, to assist in determining the vertical extent of impact. Both wells were constructed to a depth of approximately 30 ft-bgs. The wells, screened beneath the water table, were constructed of Schedule 40 polyvinyl chloride (PVC) well materials with a 2-inch ID and 5-foot long well screen (0.010 slot size). Well LP-2 was completed with a locking protective steel aboveground well cover and LP-4 was completed with a flush mount cover. Two 4-inch by 6-inch treated lumber bumper posts were installed to protect well LP-2.

In addition to the wells required by the RFI, a replacement well for monitoring well MW-9 was installed. The well was not proposed for replacement as part of the RFI, but was moved due to the construction of the aboveground tank farm area. The well was installed 30 feet south of its original location, inside the southern property boundary and fenceline. The replacement well (MW-9) was constructed with 10 feet of stainless steel screen and riser, and is protected by two 4-inch by 6-inch treated lumber bumper posts.

Drill cuttings produced during the installation of the wells were placed in fiber board drums for proper disposal by PPG. PVC and stainless steel well materials were pressure washed prior to installation and all drilling auger and tools were pressure washed between boreholes. The wash water was placed in steel 55-gallon drums for proper disposal by PPG. Boring and well installation logs and well abandonment logs were submitted prior to use and to the Wisconsin Department of Natural Resources (WDNR) as required.

4.4.2 Monitoring Well Development

The newly installed monitoring wells were developed by alternatively surging and purging the wells for a minimum of 30 minutes using a bailer. After the surge and purge cycles were completed, the well was pumped until 10 well volumes were removed, the pH, temperature, and specific conductance of water from

the well had stabilized, or until the well was purged dry. Well development logs are presented in Appendix B.

4.4.3 Groundwater Sampling Summary

Ten monitoring wells were sampled included six existing wells (TW-6, MW-10, MW-11, MW-14, MW-15, and MW-16), and four wells installed during the RFI (MW-9, LW-6, LP-2, and LP-4). The groundwater samples were analyzed for VOCs, SVOCs, alcohols, and metals. Metals analyses were performed on filtered samples from all wells. In addition, metals were analyzed on unfiltered samples from three wells located downgradient from the Tank Farm Area per the Work Plan documents.

Groundwater was sampled using either a Grunfos Rediflow-2 groundwater pump or a Teflon bailer (the FSP called for the use of a pump to purge the ten wells, however, the pump was inappropriate in some wells due to insufficient water and slow groundwater recharge). Temperature, pH, conductivity, and turbidity measurements were collected while the wells were purged and sampled. EPA Region V tags were placed on each of the samples. A duplicate groundwater sample and an MS/MSD sample were collected during sampling. In addition, two field blank samples were collected during the groundwater sampling activities. One sample was prepared by collecting distilled water that was poured over the Rediflow-2 pump and the second was prepared by collecting distilled water over the decontaminated Teflon bailer used to collect the groundwater samples.

4.4.4 Monitoring Well Abandonment

Four monitoring wells (TW-2, TW-3, TW-4, and TW-8) were abandoned at the Site. The wells, which all had 5-foot stainless steel screens and galvanized steel risers, were abandoned due to duplicity of data. In addition to these four wells, the original well (MW-9) was abandoned due to its relocation and replacement by new MW-9. The new MW-9 is located approximately 30 feet south of its original location.

Once the well materials were removed from the ground, the well location was overdrilled using a hollow stem auger. A tremie pipe was then used to grout the hole with a cement bentonite mixture. All stainless and galvanized steel abandoned well materials were pressure washed prior to disposal. The wash water was placed in steel 55-gallon drums for proper disposal by PPG. Boring/well installation logs and well abandonment logs were submitted to the WDNR.

4.4.5 Monitoring Well Survey

Advanced Surveying and Mapping Company was subcontracted to survey the on-site wells. Horizontal locations and vertical elevations were obtained from all monitoring wells (new and existing) at the Site. Elevations were recorded to the nearest 0.01 foot relative to the plant datum. Well locations were recorded to the nearest 0.1 foot relative to the plant grid system and existing structure landmarks.

4.4.6 Groundwater Elevations

On October 24, 1996, after the completion of the well and piezometer installation activities, groundwater elevation measurements of all monitoring wells (24) were collected. The monitoring wells were collected using an electronic water level indicator graduated to 0.01 foot. This data was used to determine the groundwater flow directions and gradient.

4.4.7 Hydraulic Conductivity Tests

Hydraulic conductivity measurements were collected from three monitoring wells (LW-6, LP-2 and LP-4). The hydraulic conductivity measurements (falling and rising head) were collected using slug test methods outlined in Appendix A of the FSP. The tests involved the use of a Hermit data logger, transducer and 5-foot-long PVC slug. Hydraulic conductivity data were collected from LW-6 located adjacent to the east side of the Tank Farm Area, from LP-2 located near the northeast corner of the Tank Farm Area, and from LP-4 located near the southwest corner of the Tank Farm Area.

4.5 DATA VALIDATION

Data validation of analytical data was performed to determine whether the data were technically valid, of known or acceptable quality and legally defensible. Validation of the RFI data was performed in accordance with Section 9.22 of the QAPP. Validation was performed on all analytical data collected during the RFI.

TABLE 4-1
SUMMARY OF RFI FIELD ACTIVITIES

AREA (SWMU #)	FIELD ACTIVITY	NUMBER OF SAMPLES	ANALYTES	RATIONALE
Background Samples	Three borings to a depth of 5 ft. Two samples each boring (0.5 ft. -2.5 ft. & 3 ft. - 5 ft.)	6 soil	Metals	Determine background levels of metals
WTC Accumulation Area SWMU 3	Four hand auger borings to a depth of 3 ft. Two borings to a depth of 3.5 ft.	6 soil	VOCs, SVOCs, Alcohol	Assess solvent and acid spills
Large Accumulation Area, SWMU 4	Nine hand auger borings at a depth of 2 ft.	9 soil	VOCS, Metals	Assess potential historical spills
Lab Accumulation Area, SWMU 9	Five hand auger borings to a depth of 3.5 ft.	5 soil	VOCs, Metals	Assess potential historical spills
Resin Plant DCS Accumulation Tank, SWMU 8 (RFA #14)	One hand auger boring to a depth of 3.5 ft.	1 soil	VOCs, SVOCs, Alcohols, Metals	Assess potential historical spills
Interceptor Basin Outfall, SWMU 20	Three sediment samples 0 ft. - 1 ft. below channel bed	3 sediment	VOCs, Metals	Assess if historical releases have impacted sediments in nearby channel
Tank Far, SWMU 8 (FRA #11, 12 & 13), 17 and 18	Installation of LP-2, LP-4, LW-5 outside tank farm area: LW-5 to a depth of 15 ft. and LP-2 and LP-4 to a depth of 30 ft. Develop wells, measure groundwater levels and collect Groundwater Samples.	3 water	VOCs, SVOCs, Alcohols, Metals	Assess groundwater quality and gradients
	Collect soil samples from 3 well borings	6 soil	Organic matter content, OM fraction, grainsize, moisture content	Provide physical data needed for evaluation of corrective action alternatives
	MW-9 abandoned and replaced	Well abandoned and replaced to accommodate new tank farm construction		
	In-situ hydraulic conductivity tests	2	NA	Assess hydrogeologic conditions
	Sample 7 existing groundwater wells (TW-6, MW-9, MW-10, MW-11, MW-14, MW-15 & MW-16	7 water	VOCs, SVOCs, Alcohols, Metals	Assess groundwater quality
	Abandoned 4 GW wells (TW-2, TW-3, TW-4, & TW-8)	NA	NA	Construction activities

TABLE 4-2
ANALYTICAL SAMPLING SUMMARY[1]

SITE	SWMU #	MATRIX	QA/QC					TOTAL NUMBER OF SAMPLES			
			NO. OF INVESTIGATIVE SAMPLES	FIELD DUPLICATE[2]	FIELD BLANK[3]	MS/MD[4]	TRIP BLANK[5]	VOCs 8240/60	SVOCs 8270	ALCOHOL 8015	METALS 6010
Background		Soil	6	1	0	0	0	0	0	0	7
WTC Accumulation Area	3	Soil	6	0	1	1	1	9	8	8	8
Large Accumulation Area	4	Soil	9	1	1	1	1	12	0	0	11
Lab Accumulation Area	9	Soil	5	1	1	0	1	8	0	0	7
Resin Plant DCS Accumulation Tank	8(RFA #14)	Soil	1	0	0	0	0	1	1	1	1
Totals: Shallow Soil Samples			27	3	2	2	3	30	9	9	34
Interceptor Basin Outfall	20	Sediment	3	1	1	0	1	6	0	0	5
Tank Farm Area[7,8]	8,17,18	Ground-water	10	1	2	1	4	18	14	14	14 filtered 3 unfiltered

[1] Sample summary based on scope specified in Field Sampling Plan text and QAPP requirements.

[2] One field duplicate was collected for every 10 or fewer samples for each matrix.

[3] One field blank was collected for every 10 or fewer samples of groundwater. In addition one field blank sample was prepared by pouring distilled water over a decontaminated hand auger for each area.

[4] One MS/MD sample was collected for every group of 20 or fewer samples for volatile analysis for each matrix.

[5] A trip blank for VOCs analyses was included in each sample shipment containing water of soil matrix samples for VOCs analysis.

[6] Total number includes QA/QC samples.

[7] 10 wells were sampled for filtered metals analysis. Samples from 3 of the 10 wells were also analyzed for unfiltered metals.

[8] Six soil samples were collected from three newly installed monitoring wells and analyzed for physical parameters including grain size distribution; organic matter content; organic matter fraction; and moisture content.

5. RFI RESULTS

This section presents the results of RFI data collection activities. The data were generated following the implementation of the RFI scope of work presented in Section 1.1 of this report. Historic data were used to supplement the data collected during the RFI in order to perform a human health risk assessment, ecological risk assessment, and an evaluation of the nature and extent of target compounds. The risk assessments are presented in Section 6.0 and 7.0, and the nature and extent evaluation in Section 8.0.

Tables presented in this section include a summary of detected constituents only. Tables are presented in this manner to simplify the presentation of information. Complete data tables are included in Appendix C. A summary of the various data tables and corresponding figures depicting sample locations is provided below.

RFI Sample Activities	Data Table No.	Figure No.
Soils - Background	5-1	5-1
Soils - SWMU 3	5-2	5-1
Soils - SMWU 4	5-2	5-1
Soils - SWMU 9	5-2	5-1
Soils - SWMU 8(RFA 14)	5-2	5-1
Soils - SWMU 20	5-3	5-2
Tank Farm Area		
Subsurface Soils	5-4	5-3
Hydraulic Conductivity	5-5	5-3
Groundwater - Elevation	5-6	5-4
Groundwater - Chemical	5-7	5-5
Groundwater - Background	5-8	5-5

The type and concentration of organic compounds detected, if any, were unique to the area investigated. Metals, other than arsenic, were consistently detected in all soil and sediment samples at levels below Region V DQLs. Metals that do not have corresponding DQLs are discussed further in the risk

assessments. Arsenic concentrations in soil and sediment samples, however, were statistically similar to background concentrations as detailed in Appendix E-1. Consequently, the following discussion of RFI SWMU soil and sediment results is limited to detected organic compounds.

5.1 SOIL SAMPLE RESULTS

5.1.1 Hand Auger Samples

Soil sample locations are presented on Figure 5-1. Compounds detected at all SWMUs outside of the Tank Farm Area were below Region V DQLs.

5.1.1.1 Background Samples

Three locations (PPG-HA01 through PPG-HA03) were sampled to establish background concentrations of metals in soils. Analytical results are presented on Table 5-1. Two samples from each location (intervals 0.5 to 2.5 ft-bgs and 3.0 to 5.0 ft-bgs) were collected and analyzed for the eleven metals listed in the Work Plan documents (metals). Metals concentrations in the background samples did not exceed Region V DQLs except for arsenic. Arsenic concentrations detected in the background samples are similar to one another and are representative of typical background conditions (Dragun, 1988). The results for inorganic constituents from these six samples were used for statistical comparison with arsenic in Site soil and many inorganics in sediment samples in the human health and ecological risk assessment.

5.1.1.2 WTC Accumulation Area - SWMU 3

Four locations (PPG-HA04 through PPG-HA07) adjacent to the trench along the WTC Accumulation Area SWMU 3 and two locations (PPG-HA08 and PPG-HA09) within a small drainage ditch to the southeast of SMWU 3 were sampled and analyzed for constituents detailed in Section 4.0. Analytical results are presented on Table 5-2. VOCs, or alcohol compounds were not present above the laboratory's reporting limits (reporting limits) or Region V DQLs in the six soil samples collected.

Several SVOCs were detected. The quantified values, however, were qualified as an estimate (J) because the concentrations were detected below the reporting limit. Only bis(2-ethyl hexyl)phthalate and butyl

benzyl phthalate in sample PPG-HA06-01 were detected above the reporting limit. These concentrations, however, are not above the DQLs.

5.1.1.3 Large Accumulation Area - SWMU 4

Nine locations (PPG-HA16 through PPG-HA24) in the vicinity of the Large Accumulation Area SWMU 4 were sampled. Analytical results are presented on Table 5-2. VOCs were not detected above Region V DQLs. Acetone was detected, but at levels below the reporting limit.

5.1.1.4 Lab Accumulation Area - SWMU 9

Five locations in the vicinity of the Lab Accumulation Area (PPG-HA11 through PPG-HA15) were sampled. Analytical results are presented on Table 5-2. No compounds were present above Region V DQLs. VOCs including ethylbenzene, tetrachloroethene and xylene were detected in three samples at levels below the reporting limit except for xylene in PPG-HA11-02. Xylene was present in this sample at a level of 9.9 µg/l.

5.1.1.5 Resin Plant MIBK Distillate Accumulation Tank - SWMU 8 (RFA 14)

One location (PPG-HA10) was sampled adjacent to the concrete containment for the tank. Analytical results are presented on Table 5-2. VOCs, SVOCs and alcohols were not detected above the reporting limit or Region V DQLs. Bis(2-ethylhexyl)phthalate was detected, but at levels below the reporting limit.

5.2 SEDIMENT SAMPLE RESULTS

Interceptor Basin - SWMU 20

Three sediment samples (PPG-SD01 through PPG-SD03) were collected from three locations within the channel adjacent to SWMU 20. Sediment sampling locations are presented on Figure 5-2 and analytical results on Table 5-3. No VOCs were present at levels above the Region V DQLs. Six VOCs including acetone, methylene chloride, tetrachloroethene, xylenes, 1,2,4-trimethyl benzene and n-propylbenzene, were detected in the three sediment samples. All results were qualified as estimates except xylene. The majority

of constituents were detected in sample PPG-SD01-01 which was collected adjacent to the spillway. Only acetone was detected in the downgradient sample PPG-SD03-01.

5.3 SUBSURFACE SOIL SAMPLE RESULTS

Tank Farm Area

Three soil borings (LP-2, LP-4 and LW-5) were installed at locations outside the Tank Farm Area. The soil boring locations are shown on Figure 5-3 and analytical results presented on Table 5-4. Two soil samples were collected from each boring and analyzed for grain size analysis, total organic carbon and moisture content. These data were collected to supplement the existing data related to the environmental setting and physical soil characteristics. The results indicate that the soil is predominantly a brown to grey lean clay with a maximum total organic carbon (TOC) content of 6,800 mg/kg and an average TOC of 4,483 mg/kg. The maximum moisture content was 15.2%

The lithology and other relevant information was described and recorded on soil boring logs which are presented in Appendix A. This data was used to generate geologic cross sections for the Tank Farm Area. The cross sections and more detailed lithologic evaluation, particularly with regard to the Tank Farm Area are presented in Section 8.

The geologic information from the newly installed borings is consistent with the historic data and the glacial environment of origin for materials beneath the Site. Man-placed fill material is situated in the vicinity of the Tank Farm Area from the ground surface to a maximum of approximately 19.5 feet-bgs. Fill thickness on either side of the Tank Farm Area is approximately 1 to 2 feet except south in the area of the former impoundment basin. In most cases, a discontinuous, relatively thin naturally-occurring silt layer is present underlying the fill with an average thickness of 2 feet. The maximum thickness of the silt deposit is 7 feet in GTB3.

Underlying the fill material is a fairly uniform and continuous clay deposit present throughout the Tank Farm Area. In the north, silt and sand lenses (and occasionally gravel lenses) punctuate the clay. The presence of these sporadic lenses are consistent with the glacial origins of the formation.

The three borings were completed as monitoring wells for use in the groundwater investigation activities as discussed in Section 5.4.

5.4 GROUNDWATER INVESTIGATION RESULTS

Groundwater investigation activities consisted of chemical sample collection, water level measurements, and hydraulic conductivity data from wells located around the Tank Farm Area. Tables 5-5 though 5-8 provide tabulated results of the groundwater investigation activities.

Analytical samples were collected from ten monitoring wells (Figure 5-4). VOCs, SVOCs or alcohols were not detected in four Tank Farm Area perimeter wells MW-9, MW-10, MW-11 and MW-14 above reporting limits or the Region V DQLs. Up to six VOCs (acetone, benzene, ethylbenzene, isopropylbenzene, toluene and xylenes), and two SVOCs (2,4-dimethylphenol and diethyl phthalate), were detected in wells LP-2, LP-4, LW-6, MW-15 and MW-16. Wells LP-2 and LP-4 are proximal to the Tank Farm Area and LW-6 is adjacent to the Tank Farm Area sump. MW-15 and MW-16, however, are sidegradient to upgradient of the Tank Farm Area. Samples from LW-6 and MW-16 exhibited the most impact, however, only benzene in MW-16 was present at a level above the DQL.

Metals were detected in all samples but at concentrations below Region V DQLs except for lead in LW-6 and MW-11. Metals detected which do not have a corresponding Region V DQL (aluminum, arsenic, calcium, chromium, iron, magnesium), are addressed in the risk assessment sections.

One well (TW-6) located upgradient from the Site and along the northwest property was selected for background sample collection. One VOC (carbon disulfide) and two SVOCs (diethyl phthalate and bis(2-ethylhexyl)phthalate) were detected in the sample from TW-6. The levels reported however, are below the Region V DQLs. Metals were also detected in the sample but also at concentrations below the Region V DQL. Metals detected that do not have a corresponding Region V DQL include aluminum, arsenic, calcium, chromium, iron, magnesium and mercury.

To assess groundwater conditions in the Tank Farm Area, water level measurements from the upper groundwater zone were collected on October 24, 1996 from 16 monitoring wells (Figure 5-5).

Groundwater flow patterns indicate that the Tank Farm Area sump controls the hydraulic gradient in the upper groundwater zone of the aquifer.

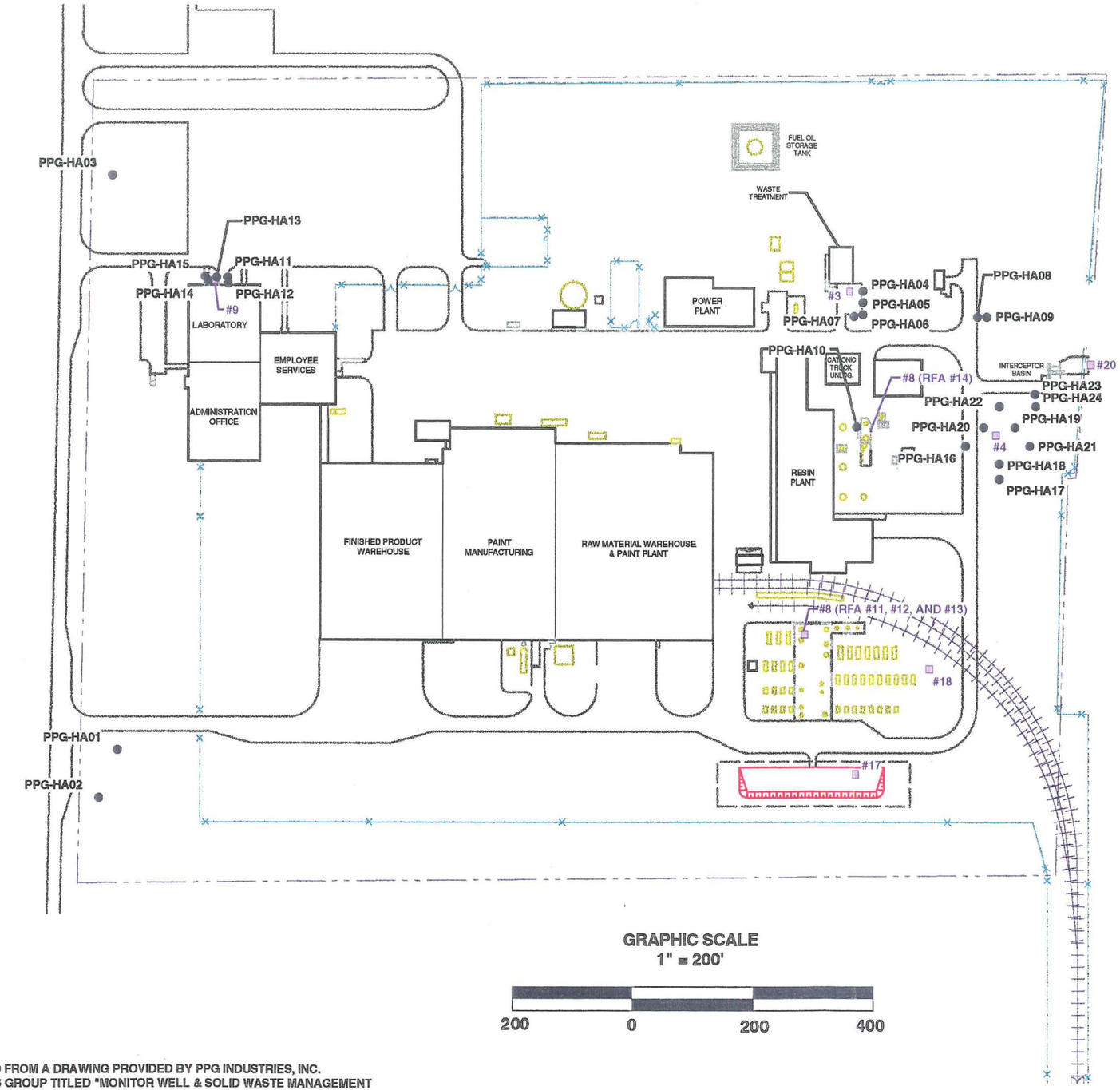
Vertical gradients from the fill in the Tank Farm Area to the uppermost sand/gravel lens in the glacial clay formation was assessed in five well pairs. Well pairs to the east of the Tank Farm Area (LP-1/LW-1 and LP-2/LW-2) exhibited a downward vertical gradient as well as the well pair to the north (MW-15/MW-16). A well pair on the western side of the Tank Farm Area (LP-3/LW-3) exhibited an upward vertical gradient. There was no verical gradient between LP-4/LW-4.

Hydraulic conductivity tests (i.e. slug tests) were performed on two newly installed monitoring wells (LP-2 and LW-6). The wells are screened in sand/gravel lenses present in the glacial clay formation. The Bouwer and Rice method was used to calculate the hydraulic conductivity of the surrounding soils from the data collected. The soils have an average hydraulic conductivity of 1.9×10^{-03} cm/sec based on the slug tests, which is consistent with sand or gravel lenses of this type.

5.5 DATA VALIDATION

RFI data were validated in accordance with the methods described in Section 9.22 of the QAPP. All data were of sufficient quality such that no data generated during the RFI were rejected except for acid extractable compounds in the duplicate groundwater sample PPG-GWMW16-01-09. These data were rejected because of low surrogate recoveries. Not enough sample volume remained for re-extraction and the acid extractable data were rejected. The data quality of the actual sample, PPG-GWMW16-01, was acceptable, therefore, re-sampling and re-analysis of the MW-16 sample point was not required. Data validation reports are presented in Appendix D.

Additionally, some data required qualification. Qualifiers were added to the quantified value when one or more QA/QC parameters were outside acceptable ranges. Predominantly the data was qualified as an estimate (J) when concentrations were detected below the reporting limit.



GRAPHIC SCALE
1" = 200'

200 0 200 400

LEGEND:

PPG-HA11 — RFI HAND AUGER SOIL BORING LOCATION

#8 — SOLID WASTE MANAGEMENT UNIT LOCATION AND REFERENCE NUMBER DESIGNATED IN FEDERAL PERMIT

NOTES:

1. BASE MAP DEVELOPED FROM A DRAWING PROVIDED BY PPG INDUSTRIES, INC. COATINGS AND RESINS GROUP TITLED "MONITOR WELL & SOLID WASTE MANAGEMENT UNIT LOCATIONS", DATED JULY 13, 1992.

FIGURE 5-1

PPG INDUSTRIES INC. OAK CREEK, WISCONSIN	RFI HAND AUGER SOIL BORING LOCATION RCRA FACILITY INVESTIGATION	
ICF KAISER ENGINEERS, INC. PITTSBURGH, PA	7/31/97	T. BLAIR
	1" = 200'	SOILRFI.WOR

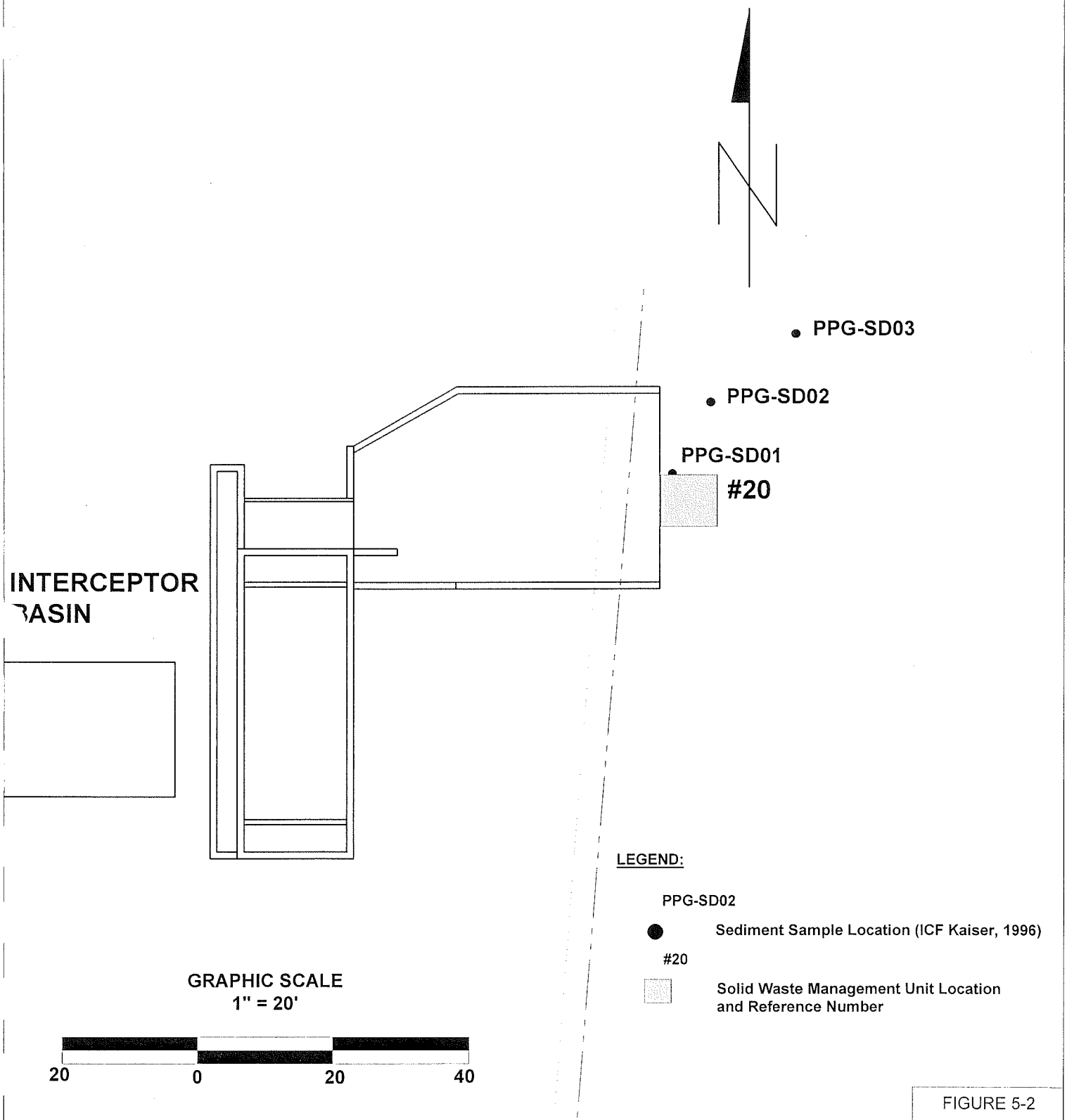


FIGURE 5-2

PPG INDUSTRIES INC. OAK CREEK, WISCONSIN	RFI SEDIMENT SAMPLE LOCATION MAP RCRA FACILITY INVESTIGATION	
ICF KAISER ENGINEERS, INC. PITTSBURGH, PA	7/31/97	T. BLAIR
	1" = 20'	FIG5_2.WOR

RAW MATERIAL WAREHOUSE
& PAINT PLANT

LP-2

LP-5

TANK FARM

LP-4

N

FUTURE ABOVEGROUND STORAGE
TANK FARM AREA LIMITS

FORMER IMPOUNDMENT BASIN

LEGEND:

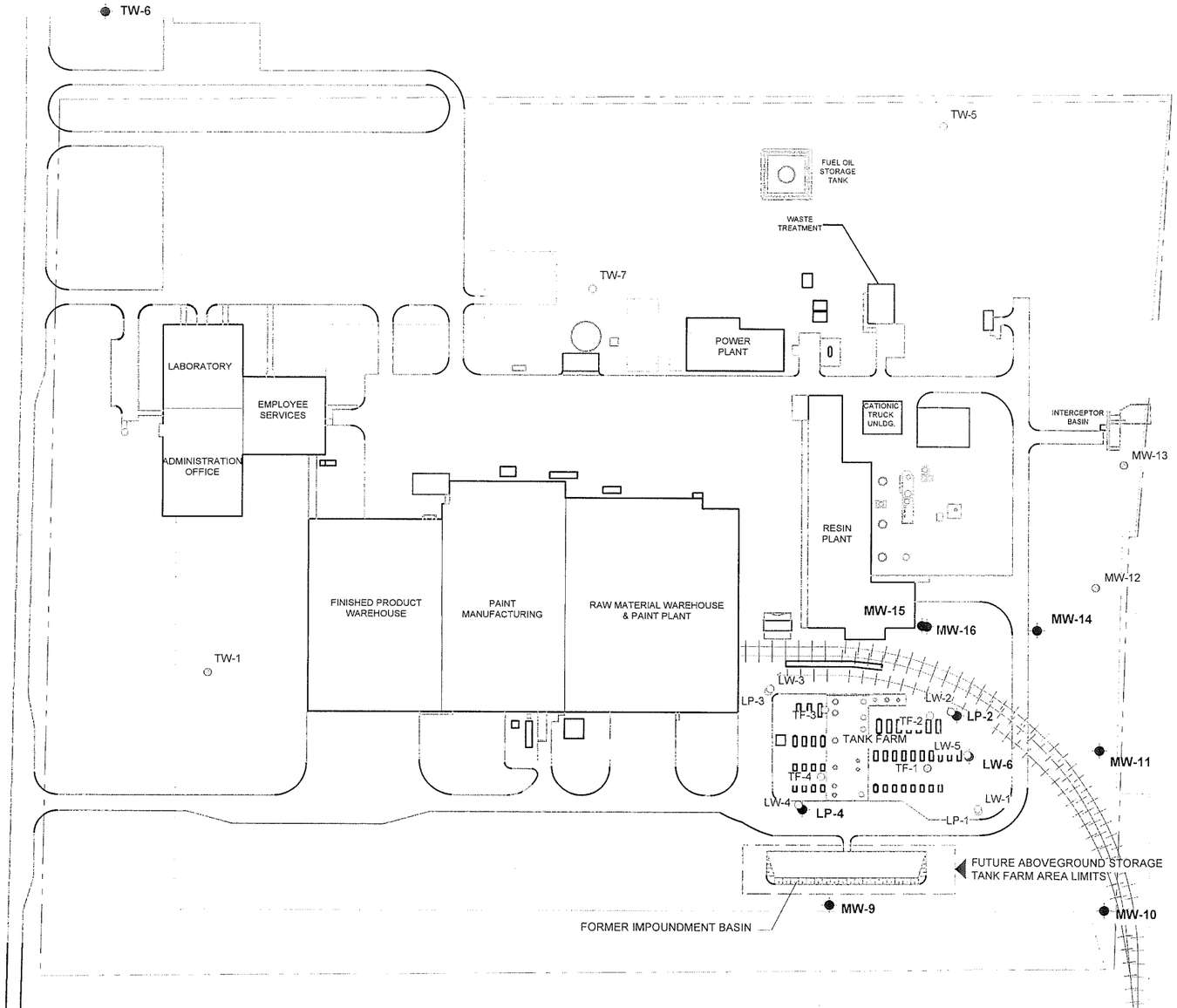
LP-2 ● RFI SOIL BORING (ICF KAISER, 1996)

GRAPHIC SCALE
1" = 60'

60 0 60 180

FIGURE 5-3

PPG INDUSTRIES INC. OAK CREEK, WISCONSIN	RFI SOIL BORING LOCATION MAP RCRA FACILITY INVESTIGATION	
ICF KAISER ENGINEERS, INC. PITTSBURGH, PA	7/31/97	T. BLAIR
	1" = 200'	FIG5_3.WOR



N

LEGEND:

MW-9 ● **RFI GROUNDWATER SAMPLE LOCATION (ICF Kaiser, 1996)**

TF-1 ○ **EXISTING MONITORING WELL LOCATION**

GRAPHIC SCALE
1" = 200'

200 0 200 400

FIGURE 5-4

PPG INDUSTRIES INC. OAK CREEK, WISCONSIN	RFI GROUNDWATER MONITORING WELL SAMPLE LOCATION MAP RCRA FACILITY INVESTIGATION	
ICF KAISER ENGINEERS, INC. PITTSBURGH, PA	7/31/97	T. BLAIR
	1" = 200'	FIG5_4.WOR

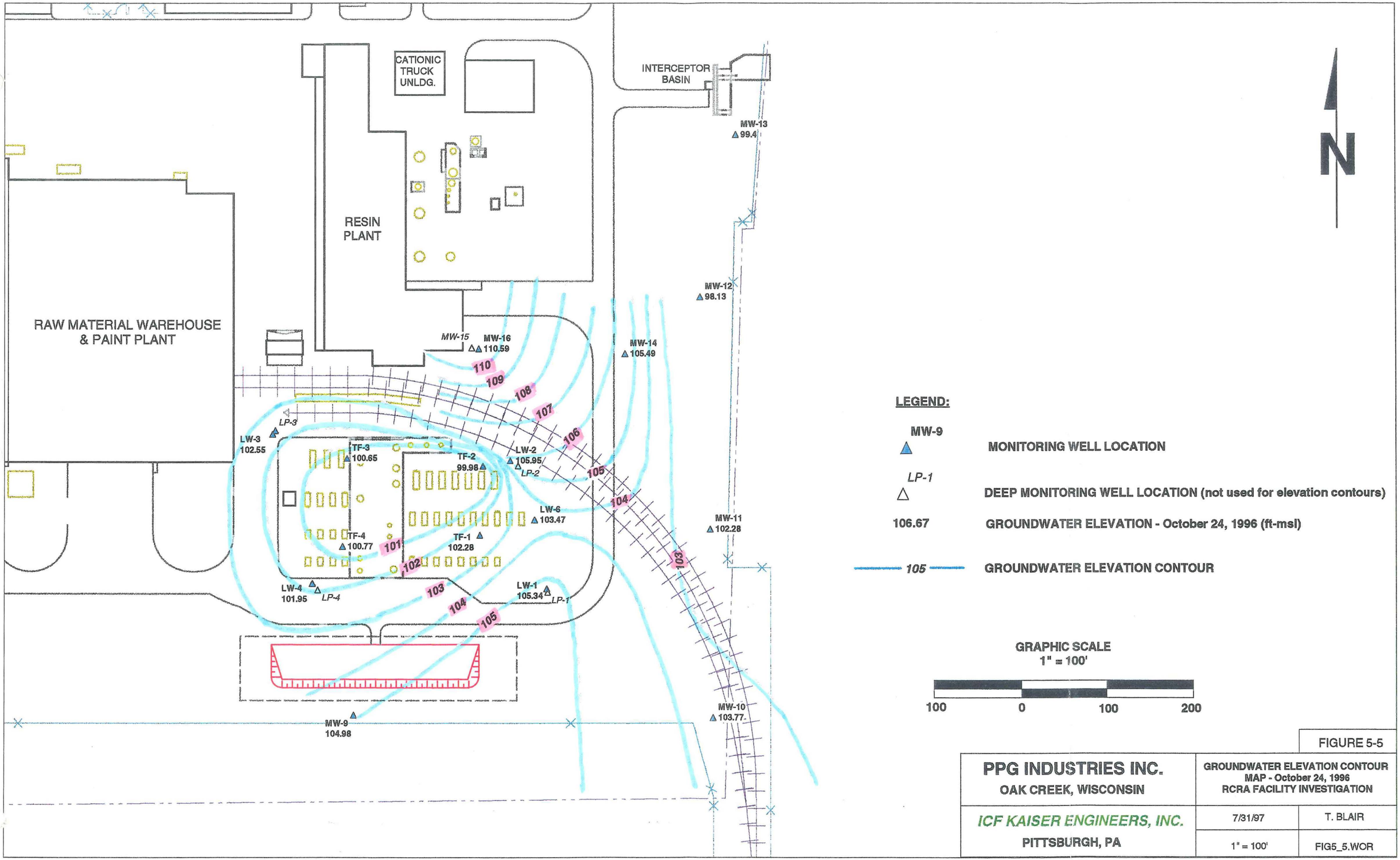


FIGURE 5-5

PPG INDUSTRIES INC. OAK CREEK, WISCONSIN	GROUNDWATER ELEVATION CONTOUR MAP - October 24, 1996 RCRA FACILITY INVESTIGATION	
ICF KAISER ENGINEERS, INC. PITTSBURGH, PA	7/31/97	T. BLAIR
	1" = 100'	FIG5_5.WOR

TABLE 5-1
Background Soil Sampling Results
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION DEPTH (ft - bgs) SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA01-0.5 BACKGROUND 1 0.5 - 2.5 10/1/96	PPG-HA01-03 BACKGROUND 1 3.0 - 5.0 10/1/96	PPG-HA01-03-09 BACKGROUND 1 3.0 - 5.0 10/1/96	PPG-HA02-0.5 BACKGROUND 2 0.5 - 2.5 10/1/96	PPG-HA02-03 BACKGROUND 2 3.0 - 5.0 10/1/96	PPG-HA03-0.5 BACKGROUND 3 0.5 - 2.5 10/1/96	PPG-HA03-03 BACKGROUND 3 3.0 - 5.0 10/1/96	Average Concentration (mg/kg)
METALS (mg/kg)									
Aluminum	---	16700	8540	6420	19500	11100	16600	13400	13180.00
Arsenic	0.32	**7.6**	**5.5**	**6.5**	**4.4**	**5.1**	**7.9**	**6.8**	6.26
Barium	5300	75.3	42.2	31.4	90.6	48.4	106	66.7	65.80
Cadmium	38	0.16 J	0.19 J	0.17 J	0.16 J	0.17 J	0.048 J	0.11	0.14
Calcium	---	26900	79000	82500	53000	84000	3580	62900	55982.86
Chromium	210	26.8	15.5	11.8	31.1	18.7	26.4	23.2	21.93
Iron	---	25200	15600	14900	22800	16400	26500	18900	20042.86
Lead	400	15.8 J	7.5 J	6.8 J	8.9 J	6.9 J	13.8 J	11.1 J	10.11
Magnesium	---	17700	43500	47100	35300	35400	5450	36300	31535.71
Mercury	23	0.051 J	0.02 J	0.018 J	0.022 J	0.017 J	0.052 J	0.021	0.03
Nickel	1500	30.9 J	18.5 J	19.1 J	30.3 J	18.6 J	22.8 J	27.5 J	23.96

J - Estimated.

TABLE 5-2
RFI Subsurface Soil Sampling Results
Summary of Detected Constituents - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION DEPTH (ft - bgs) SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA04-01 SWMU # 3 1.0 - 3.0 10/1/96	PPG-HA05-01 SWMU # 3 1.0 - 3.0 10/1/96	PPG-HA06-01 SWMU # 3 1.0 - 3.0 10/1/96	PPG-HA07-01 SWMU # 3 1.0 - 3.0 10/1/96	PPG-HA08-01.5 SWMU # 3 1.5 - 3.5 10/1/96	PPG-HA09-01.5 SWMU # 3 1.5 - 3.5 10/1/96	PPG-HA10-01.5 SWMU # 8 RFA 14 1.5 - 3.5 10/1/96	PPG-HA11-02 SWMU # 9 2.0 - 4.0 10/1/96	PPG-HA12-01.5 SWMU # 9 1.5 - 3.5 10/1/96
VOLATILES (ug/kg)										
Acetone	2,000,000	110 U	110 U	110 U	110 U	120 U	110 U	100 U	120 U	110 U
Ethylbenzene	2,900,000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	5.2 U	5.8 U	5.3 U
Tetrachloroethene	7000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	5.2 U	3.6 J	5.3 U
Xylenes (total)	980,000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	5.2 U	9.9	5.3 U
SEMIVOLATILES (ug/kg)										
2-Methylnaphthalene	---	360 U	350 U	370 U	370 U	89 J	380 U	340 U	NA	NA
Benzo(a)pyrene	61	**360 U**	**350 U**	48 J	**370 U**	**400 U**	43 J	**340 U**	NA	NA
Benzo(b)fluoranthene	610	360 U	350 U	80 J	49 J	400 U	62 J	340 U	NA	NA
Benzo(k)fluoranthene	6100	360 U	350 U	370 U	44 J	400 U	49 J	340 U	NA	NA
Butyl benzyl phthalate	13,000,000	360 U	350 U	650	370 U	150 J	380 U	340 U	NA	NA
Chrysene	24,000	360 U	350 U	43 J	370 U	51 J	380 U	340 U	NA	NA
Di-n-butyl phthalate	---	360 U	350 U	45 J	370 U	400 U	380 U	340 U	NA	NA
Fluoranthene	2,600,000	360 U	350 U	44 J	370 U	400 U	380 U	340 U	NA	NA
Indeno(1,2,3-cd)pyrene	610	360 U	350 U	48 J	370 U	400 U	380 U	340 U	NA	NA
Naphthalene	800,000	360 U	350 U	77 J	300 J	400 U	380 U	340 U	NA	NA
Pyrene	2,000,000	360 U	350 U	52 J	370 U	400 U	380 U	340 U	NA	NA
bis(2-Ethylhexyl) phthalate	32,000	140 J	150 J	790	140 J	400 J	380 U	140 J	NA	NA
METALS (mg/kg)										
Aluminum	---	2500	3260	5910	10500	11200	11700	2430	9420	9700
Arsenic	0.32	**2**	**2.3**	**2.8**	**6.3**	**4.8**	**5.3**	**2.1**	**4.5**	**5**
Barium	5300	12.3	15.3	288	49.3	109	55.8	12.6	52.7	56.3
Cadmium	38	0.11 J	0.11 J	0.41	0.23 J	0.24 J	0.063	0.12 J	0.15 J	0.18 J
Calcium	---	92300	88900	92100	92600	84700	82100	113000	74700	67300
Chromium	210	5.9	6.1	45.5	18.1	22.1	21.6	4.9	17.9	17.2
Iron	---	6840	7150	10800	16100	17200	16600	8230	16800	15100
Lead	400	4.2 J	3.4 J	78.9 J	8.9 J	27.6 J	10.6 J	5.2 J	7.2 J	10.9 J
Magnesium	---	47100	42800	57400	50100	39500	39300	66800	40900	32700
Mercury	23	0.013 J	0.11 U	0.33	0.023 J	0.062 J	0.015	0.012 J	0.023 J	0.028 J
Nickel	1500	16.1 J	7.5 J	12.6 J	17.5 J	21.7 J	21.9 J	7.1 J	19.7 J	17.3 J

U - Not detected.
J - Estimated.
B - Blank contamination.
NA - Not analyzed.

TABLE 5-2
RFI Subsurface Soil Sampling Results
Summary of Detected Constituents - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION DEPTH (ft - bgs) SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA13-01.5 SWMU # 9 1.5 - 3.5 10/1/96	PPG-HA14-01.5 SWMU # 9 1.5 - 3.5 10/1/96	PPG-HA15-01 SWMU # 9 1.0 - 3.0 10/1/96	PPG-HA15-01-09 SWMU # 9 1.0 - 3.0 10/1/96	PPG-HA16-01.25 SWMU # 4 1.25 - 3.25 9/30/96	PPG-HA17-01 SWMU # 4 1.0 - 3.0 9/30/96	PPG-HA17-01-09 SWMU # 4 1.0 - 3.0 9/30/96	PPG-HA18-01 SWMU # 4 1.0 - 3.0 9/30/96
VOLATILES (ug/kg)									
Acetone	2,000,000	120 U	110 U	120 U	110 U	100 U	9.4 J	15 J	120 U
Ethylbenzene	2,900,000	2.4 J	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U	6.1 U	6.2 U
Tetrachloroethene	7000	5.8 U	5.6 U	5.8 U	3.7 J	5.2 U	6 U	6.1 U	6.2 U
Xylenes (total)	980,000	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U	6.1 U	6.2 U
SEMIVOLATILES (ug/kg)									
2-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	61	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	610	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	6100	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	13,000,000	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	24,000	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	---	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	2,600,000	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	610	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	800,000	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	2,000,000	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate	32,000	NA	NA	NA	NA	NA	NA	NA	NA
METALS (mg/kg)									
Aluminum	---	17200	9510	11500	9900	399	14300	19700	24600
Arsenic	0.32	**7**	**5.1**	**6.7**	**5.2**	**0.4 BJ**	**6.7**	**8.4**	**6.5**
Barium	5300	53.2	49.1	54.8	50.4	3.5 J	83.6	91.4	109
Cadmium	38	0.19 J	0.21 J	0.24	0.24	0.21 U	0.24 U	0.45	0.5
Calcium	---	51300	82200	76200	80500	188000 J	3940 J	2730 J	34900 J
Chromium	210	26.2	17.1	19.4	19	1.3	25.2	30.1	37.5
Iron	---	23200	16200	18800	16600	1320	22200	27600	28100
Lead	400	10.9 J	7.2 J	9 J	9.8 J	1.1	16	14.7	11
Magnesium	---	27700	41900	39100	41900	120000 J	5390 J	6240 J	29700 J
Mercury	23	0.027 J	0.018 J	0.033 J	0.019 J	0.1 U	0.043	0.065 J	0.022 J
Nickel	1500	26.6 J	19.3 J	21.6 J	20.9 J	4.2 U	25.5	26.3	33.9

U - Not detected.
J - Estimated.
B - Blank contamination.
NA - Not analyzed.

TABLE 5-2
RFI Subsurface Soil Sampling Results
Summary of Detected Constituents - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION DEPTH (ft - bgs) SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA19-02 SWMU # 4 2.0 - 4.0 9/30/96	PPG-HA20-01.5 SWMU # 4 1.5 - 3.5 9/30/96	PPG-HA21-02 SWMU # 4 2.0 - 4.0 9/30/96	PPG-HA22-01.5 SWMU # 4 1.5 - 3.5 9/30/96	PPG-HA23-02 SWMU # 4 2.0 - 4.0 9/30/96	PPG-HA24-01.5 SWMU # 4 1.5 - 3.5 9/30/96
VOLATILES (ug/kg)							
Acetone	2,000,000	100 U	110 U	120 U	130 U	13 J	110 U
Ethylbenzene	2,900,000	5.2 U	5.4 U	5.8 U	6.3 U	6.2 U	5.4 U
Tetrachloroethene	7000	5.2 U	5.4 U	5.8 U	6.3 U	6.2 U	5.4 U
Xylenes (total)	980,000	5.2 U	5.4 U	5.8 U	6.3 U	6.2 U	5.4 U
SEMIVOLATILES (ug/kg)							
2-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	61	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	610	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	6100	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	13,000,000	NA	NA	NA	NA	NA	NA
Chrysene	24,000	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	---	NA	NA	NA	NA	NA	NA
Fluoranthene	2,600,000	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	610	NA	NA	NA	NA	NA	NA
Naphthalene	800,000	NA	NA	NA	NA	NA	NA
Pyrene	2,000,000	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate	32,000	NA	NA	NA	NA	NA	NA
METALS (mg/kg)							
Aluminum	---	953	648	15000	26100	19900	13300
Arsenic	0.32	**0.9 BJ**	**3.7**	**6.7**	**6.4**	**8.1**	**5.3**
Barium	5300	5.4 J	22	89.5	125	75.2	67.8
Cadmium	38	0.043 J	0.66	0.53	0.46	0.47	0.48
Calcium	---	140000 J	132000 J	19700 J	4510 J	21000 J	59400 J
Chromium	210	2.2	1.7	24.5	40.9	31	21.5
Iron	---	2480	20200	23000	31300	27200	17400
Lead	400	2.9	54.4	18.4	12.1	11.9	15.8
Magnesium	---	88000 J	84300 J	14200 J	11400 J	18800 J	39000 J
Mercury	23	0.1 U	0.11 U	0.042 J	0.034 J	0.04 J	0.038 J
Nickel	1500	2.7 J	4.2 J	22.9	38.9	28.5	18.7

U - Not detected.
J - Estimated.
B - Blank contamination.
NA - Not analyzed.

TABLE 5-3
RFI Sediment Sampling Results - SWMU 20
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION DEPTH (ft - bgs) SAMPLE DATE PARAMETER	Region V DQLs	PPG-SD01-01 SWMU # 20 0.0 - 1.0 10/2/96	PPG-SD02-01 SWMU # 20 0.0 - 1.0 10/2/96	PPG-SD03-01 SWMU # 20 0.0 - 1.0 10/2/96	PPG-SD03-01-09 SWMU # 20 0.0 - 1.0 10/2/96
VOLATILES (ug/kg)					
1,2,4-Trimethylbenzene	---	11	6.6 U	6.8 U	7.1 U
Acetone	2,000,000	40 J	14 J	11 J	29 J
Methylene chloride	11,000	4.8 J	4.1 J	6.8 U	7.1 U
Tetrachloroethene	7,000	6.8 U	3.5 J	6.8 U	7.1 U
Xylenes (total)	980,000	100	6.6 UJ	6.8 U	7.1 U
n-Propylbenzene	---	6 J	6.6 U	6.8 U	7.1 U
METALS (mg/kg)					
Aluminum	---	15000	11400	13200	14300
Arsenic	0.32	**6.5**	**6**	**5.3**	**5.2**
Barium	5300	97.7	93.2	102	104
Cadmium	38	0.16	0.29	0.43	0.34
Calcium	---	8470	3010 K	3650 K	3580 K
Chromium	210	26.8	21.7 K	23.8 K	25.8 K
Iron	---	22300	20500	21600	22000
Lead	400	20.9	15.1 J	14.7 J	18.7 J
Magnesium	---	8050	3720 K	4150 K	4540 K
Mercury	23	0.12	0.073 J	0.061 J	0.082 J
Nickel	1500	25.3	21.6	22.4	26.2

U - Not detected.
J - Estimated.
K - Estimated, biased high.
NA - Not analyzed.

TABLE 5-4
RFI Subsurface Soil Sampling Results - Tank Farm Area, SWMU 8(RFA#11,12 and 13), 17 and 18
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION DEPTH (ft - bgs) SAMPLE DATE PARAMETER	PPG-SSLP2-06 Tank Farm Area 6.0-8.0 9/17/96	PPG-SSLP2-21 Tank Farm Area 21.0-23.0 9/17/96	PPG-SSLP4-11 Tank Farm Area 11.0-13.0 9/17/96	PPG-SSLP4-28.5 Tank Farm Area 28.5-30.5 9/17/96	PPG-SSLP5-3.5 Tank Farm Area 3.5-5.5 9/18/96	PPG-SSLP5-3.5-09 Tank Farm Area 3.5-5.5 9/18/96
Soil Description	Brown lean clay; lt. sand; tr.gravel	Gray silty clay; lt.sand; tr.gravel	Brownish gray lean clay; lt.sand; tr.gravel	Gray & tr.brown silty sand, clayey w/ gravel	Brownish gray lean clay; some sand, few gravel	Brownish gray lean clay; lt.sand; tr.gravel
% Gravel	4.2	4.3	0.8	17.8	10.1	2.7
% Sand	23.1	21	23.6	38.6	31.5	11.9
% Silt	39.6	43.3	38.9	28.5	31.3	44.2
% Clay	33.1	31.4	36.7	15.1	27.1	41.2
Percent Moisture	14.3	12.2	15.2	12.2	14	13.9
Percent Solids	85.7	87.8	84.8	87.8	86	86.1
Total Organic Carbon (mg/kg)	4100	2600	6800	4100	4600	4700

TABLE 5-5
GROUNDWATER ELEVATION DATA
OCTOBER 24, 1996

Well Label	Test Date	GW Elev. (ft.)
LP-1	10/24/96	105.35
LP-2	10/24/96	99.76
LP-3	10/24/96	103.30
LP-4	10/24/96	102.24
LW-1	10/24/96	105.63
LW-2	10/24/96	102.64
LW-3	10/24/96	102.89
LW-4	10/24/96	101.41
LW-6	10/24/96	92.53
MW-10	10/24/96	101.31
MW-11	10/24/96	99.88
MW-12	10/24/96	95.76
MW-13	10/24/96	97.07
MW-14	10/24/96	106.07
MW-15	10/24/96	102.33
MW-16	10/24/96	108.17
MW-9	10/24/96	102.54
TF-1	10/24/96	100.02
TF-2	10/24/96	98.27
TF-3	10/24/96	98.28
TF-4	10/24/96	98.74
TW-1	10/24/96	106.08
TW-5	10/24/96	112.77
TW-6	10/24/96	112.29
TW-7	10/24/96	110.77

TABLE 5-6
GROUNDWATER ELEVATION DATA
OCTOBER 24, 1996

Fill Horizontal Gradient	
Well Number	**GW Elevation (ft.) [1]**
LW-1	105.34
LW-2	105.95
LW-3	102.55
LW-4	101.95
LW-6	103.47
MW-9	104.98
MW-10	103.77
MW-11	102.28
MW-12	98.13
MW-13	99.40
MW-14	105.49
MW-16	110.59
TF-1	102.28
TF-2	99.98
TF-3	100.65
TF-4	100.77

Fill Clay Formation Vertical Gradient				
Well No.	**GW Zone**	**Screen Interval Elevation - Ft. [1]**	**Groundwater Elevation - Ft.**	**Vertical Gradient (Ft.)**
LP-1	Lower	84.51 - 79.51	104.87	-0.47
LW-1	Upper	109.55 - 99.55	105.34	Down
LP-2	Lower	88.37 - 83.37	102.49	-3.46
LW-2	Upper	109 - 99	105.95	Down
LP-3	Lower	85.5 - 80.5	102.94	+0.39
LW-3	Upper	110.58 - 100.58	102.55	Up
LP-4	Lower	90.68 - 85.68	101.95	+0.00
LW-4	Upper	110.34 - 100.34	101.95	No Gradient
MW-15	Lower	90.64 - 80.64	104.79	-5.80
MW-16	Upper	NA	110.59	Down

[1] Plant Datum

Table 5-7
RFI Groundwater Sampling Results
Summary of Detected Constituents - TANK FARM AREA
PPG - OAK CREEK

SAMPLE ID WELL NUMBER SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWLP2-01 LP2 10/9/96	PPG-GWLP4-01 LP4 10/9/96	PPG-GWLW6-01 LW6 10/23/96	PPG-GWMW10-01 MW10 10/8/96	PPG-GWMW11-01 MW11 10/8/96	PPG-GWMW14-01 MW14 10/9/96	PPG-GWMW15-01 MW15 10/7/96	PPG-GWMW16-01 MW16 10/7/96
VOLATILES (ug/l)									
Acetone	610	20 U	20 U	9.7 J	20 U	20 U	20 U	11 BJ	15 BJ
Benzene	0.39	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	4.3 J
Ethylbenzene	1,300	0.55 J	0.43 J	65	1 U	1 U	1 U	1 U	140
Isopropylbenzene	---	0.67 J	0.65 J	2.5 U	1 U	1 U	1 U	0.43 J	5 U
Toluene	720	1 U	1 U	22	1 U	1 U	1 U	1 U	5 U
Xylenes (total)	1,400	0.49 J	1 U	170	1 U	1 U	1 U	1 U	100
SEMIVOLATILES (ug/l)									
2,4-Dimethylphenol	730	10 UJ	10 U	3 J	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	29,000	1.1 J	3.4 J	10 U	10 U	10 U	10 U	10 U	10 U
TOTAL METALS (mg/l)									
Aluminum	---	0.625 K	0.2 UK	9.23	0.2 UK	48.4 K	0.0416 J	0.2 U	0.0611 J
Arsenic	0.000038	0.003 U	0.003 U	0.0113	0.003 U	0.0183	0.003 U	0.003 U	0.0106
Barium	2.6	0.135 J	0.0809 J	0.159 J	0.103 J	0.728	0.195 J	0.0504	0.111 J
Cadmium	0.018	0.002 U	0.00035 J	0.0012 J	0.00029 J	0.002 J	0.00084 J	0.002 U	0.002 U
Calcium	---	61.6	31.4	77.1	46.5	427	159	92.3	78.9
Chromium	0.18	0.0038 J	0.01 U	0.0247	0.01 U	0.0958 K	0.0035 J	0.005 U	0.01 U
Iron	---	0.798	0.0463 J	25.7	0.1 U	74.2	1.93	0.1 U	1.69
Lead	0.004	0.003 U	0.003 U	0.0125	0.003 U	0.0274	0.003 U	0.003 U	0.003 U
Magnesium	---	71.2 K	21.7 K	50.5	68.5 K	188 K	229 K	0.415	48.3
Mercury	0.011	0.000093 J	0.00011 J	0.0002 U	0.000097 J	0.00017 J	0.000093 J	0.000032 B	0.000096 BJ
Nickel	0.73	0.04 U	0.04 U	0.0271 J	0.04 U	0.0904	0.372	0.04 U	0.04 U
FILTERED METALS (mg/l)									
Aluminum (Filtered)	---	NA	NA	0.2 U	NA	0.168 J	NA	NA	NA
Arsenic (Filtered)	0.000038	NA	NA	0.003 U	NA	0.003 U	NA	NA	NA
Barium (Filtered)	2.6	NA	NA	0.0844 J	NA	0.0375 J	NA	NA	NA
Cadmium (Filtered)	0.018	NA	NA	0.00077 J	NA	0.002 U	NA	NA	NA
Calcium (Filtered)	---	NA	NA	55.8	NA	133	NA	NA	NA
Iron (Filtered)	---	NA	NA	0.1 U	NA	0.165	NA	NA	NA
Magnesium (Filtered)	---	NA	NA	40.2	NA	79.7 K	NA	NA	NA
Mercury (Filtered)	0.011	NA	NA	0.0002 U	NA	0.000083 J	NA	NA	NA

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not analyzed.
K - Estimated, biased high.
R - Rejected.

Table 5-7
RFI Groundwater Sampling Results
Summary of Detected Constituents - TANK FARM AREA
PPG - OAK CREEK

SAMPLE ID WELL NUMBER SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWMW16-01-09 MW16 10/7/96	PPG-GWMW9-01 MW9 10/8/96
VOLATILES (ug/l)			
Acetone	610	6.3 BJ	20 U
Benzene	0.39	4.1 J	1 U
Ethylbenzene	1,300	120	1 U
Isopropylbenzene	---	5 U	1 U
Toluene	720	5 U	1 U
Xylenes (total)	1,400	86	1 U
SEMIVOLATILES (ug/l)			
2,4-Dimethylphenol	730	--- R	10 U
Diethyl phthalate	29,000	10 U	10 U
TOTAL METALS (mg/l)			
Aluminum	---	0.2 U	8.04 K
Arsenic	0.000038	0.0138	0.0043
Barium	2.6	0.124 J	0.171
Cadmium	0.018	0.00021 J	0.0004
Calcium	---	85.6	83.8
Chromium	0.18	0.01 U	0.0284 K
Iron	---	1.95	12.2
Lead	0.004	0.003 U	0.0074
Magnesium	---	53.9	61.7 K
Mercury	0.011	0.000082 BJ	0.00005
Nickel	0.73	0.04 U	0.0276
FILTERED METALS (mg/l)			
Aluminum (Filtered)	---	NA	0.2 UK
Arsenic (Filtered)	0.000038	NA	0.0045
Barium (Filtered)	2.6	NA	0.0936
Cadmium (Filtered)	0.018	NA	0.00023
Calcium (Filtered)	---	NA	69.6
Iron (Filtered)	---	NA	0.105
Magnesium (Filtered)	---	NA	54.6 K
Mercury (Filtered)	0.011	NA	0.000036

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not analyzed.
K - Estimated, biased high.
R - Rejected.

TABLE 5-8
Upgradient Groundwater Sampling Results
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQL's	PPG-GWTW6-01 UPGRADIENT 10/8/96
VOLATILES (ug/l)		
Carbon disulfide	21	3.3
SEMIVOLATILES (ug/l)		
Diethyl phthalate	29,000	12
bis(2-Ethylhexyl) phthalate	4.8	3.6 J
METALS (mg/l)		
Barium	2.6	0.0867 J
Cadmium	0.018	0.00029 J
Calcium	---	69.8
Iron	---	0.0601 J
Lead	0.004	0.0024 J
Magnesium	---	75.5
Mercury	0.011	0.000072 BJ
Nickel	0.73	0.0242 J

J - Estimated.
B - Blank contamination.

6. HUMAN HEALTH RISK ASSESSMENT

The RFI was performed to meet the objectives of identifying potential chemical releases from several SWMUs and to further understand the nature and extent of chemicals previously identified in the Tank Farm Area. The next step in the Corrective Action process is to determine if the chemicals detected require further action. PPG will address any site contamination that poses an unacceptable risk to human health or the environment based on realistic site use and potential exposure scenarios. This approach is consistent with recent USEPA Region V guidance (USEPA Region V, 1996a).

This section presents the baseline human health risk assessment for the PPG Site SWMUs investigated in the RFI. A baseline risk assessment evaluates potential risks under current and likely future site conditions in the absence of corrective measures. Current and future conditions at the Site will be the same (i.e., industrial) for most of the SWMU areas. The risk assessments of SWMUs 3, 4, 8, 9, and 20 are based on an identical industrial land use scenario for both current and likely future site conditions. Thus, the analyses presented in this report for these SWMUs represent the complete baseline risk assessment.

The Tank Farm Area is subject to multiple Federal and State regulations. The area contains three SWMUs (8 [RFA 11, 12, and 13], 17, and 18) subject to Corrective Action requirements. PPG has elected to close the USTs and is currently constructing a new aboveground tank farm to replace the USTs. Regulations require the USTs be removed from service or upgraded by December 22, 1998. The process of closing the USTs will dramatically affect the current conditions of the Tank Farm Area. Therefore, it is inappropriate to assess future use risk scenarios at this time, since the site conditions will significantly change within the next few years via the closure of the USTs. Accordingly, this document presents an assessment of potential risks associated with the Tank Farm Area for current conditions only. An addendum to this report, presenting an assessment of potential risk from future site use scenarios, will be submitted upon completion of UST closure activities.

6.1 INTRODUCTION

6.1.1 Purpose of the Risk Assessment

Human health risk assessment is defined as the scientific evaluation of potential health effects posed by a particular substance or mixture of substances. The purpose of this risk assessment is to provide quantitative analyses, in a conservative and health-protective manner, of the likelihood that adverse health effects may be associated with potential exposures to constituents in environmental media at selected SWMUs. In providing health-related information on potential human contact with site-associated constituents, this risk assessment is designed to provide a sound basis for risk management decisions.

This risk assessment presents an analysis of site conditions in the absence of corrective measures. It provides an understanding of the nature of chemical releases from a site, the pathways of human exposure, and the degree to which such releases may pose a potential for adverse health effects.

6.1.2 Regulatory Framework

This risk assessment has been prepared to be consistent with the USEPA risk assessment guidance (USEPA Region V, 1995a), and follows federal guidelines for the performance of risk assessments (USEPA, 1989a, 1991, 1992a, 1992b, 1996a).

A human health risk assessment typically includes the following four steps:

- **Identification of Constituents of Interest (COIs).** An evaluation of site investigation data and identification of COIs with regard to potential health effects;

- **Exposure Assessment.** Identification of the human receptors potentially exposed to site-originated constituents and the likely extent of their exposure under defined exposure scenarios;

- **Toxicity Assessment.** A description of the relationship between the magnitude of exposure (dose) and the probability of occurrence of adverse health effects (response) associated with the constituents of interest; and

- **Risk Characterization.** Description of the nature and magnitude of potential human health risks, comparison to federal criteria regarding health risks at hazardous waste sites, and a discussion of uncertainties in the analysis.

If COIs and complete exposure pathways are identified for a SWMU, then a toxicity assessment of COIs and a quantitative risk characterization is conducted. If no COIs and/or no complete exposure pathways are identified for a SWMU, then a quantitative risk characterization is not necessary to conclude that risks are acceptable for that SWMU.

6.2 IDENTIFICATION OF CONSTITUENTS OF INTEREST

The RFI included the investigation of five individual SWMUs and the Tank Farm Area, the latter of which encompasses three additional SWMUs and associated groundwater. In addition, soil data from a previous investigation (Warzyn, 1992a) were available for the Tank Farm Area. Collectively, these data are adequate to conduct a baseline risk assessment, and a preliminary risk screening was completed to identify constituents of interest (COIs) for these areas as the initial step toward completing a risk assessment for the site.

An important step in the risk assessment is to identify the COIs at each SWMU. Although a number of constituents have been detected in soils at the individual SWMUs, most of these pose a negligible concern by customary risk assessment standards, as explained below, and may be eliminated from further consideration following this preliminary step. The following were used as screening criteria to identify COIs.

USEPA Region V Data Quality Levels (DQLs). USEPA Region V uses the Region IX PRGs (USEPA Region IX, 1995) for residential exposure to determine Data Quality Levels (DQLs) for environmental site investigations (USEPA Region V, 1995a). In this way, appropriate analytical methods are chosen that allow discernment of risk-based concentrations in RCRA investigated environmental media. USEPA Region IX has developed PRGs for environmental media that are conservative, risk-based values for residential or industrial exposure scenarios; these values incorporate incidental ingestion, dermal contact,

and inhalation exposure pathways. Risk-based values for a residential scenario are the most conservative of standard exposure scenarios, as they assume nearly continuous exposure for 30 years.

Therefore, for the Site RFI risk assessment, a screening procedure was performed whereby maximum detected constituent concentrations from individual SWMUs were compared with USEPA Region V DQLs. This is a conservative approach because the PRGs upon which the DQLs are based assume residential exposure, and the Site is expected to remain an industrial facility. Constituents with maximum detections that were below DQLs were eliminated as COIs and were not further considered in the quantitative risk assessment. Details are provided in Section 6.2.2.

Low inherent toxicity. Constituents such as calcium, iron, and magnesium, do not have risk-based PRGs because they are essential nutrients and considered to be of low inherent toxicity. Therefore, these can be eliminated as COIs on this basis.

Comparison with background. A premise of the RFI is that COIs are site-related constituents. Inorganic constituents detected in SWMU soils and sediments may reflect background levels. Therefore, for a number of inorganic constituents, concentrations in SWMU soils and sediments were compared with background sample levels. Inorganic constituents were eliminated as COIs if SWMU concentrations were not different from background. Appendix E-1 presents the methodology and results of this statistical analysis.

USEPA Soil Screening Levels (SSLs) for soil-to-groundwater pathway. The potential for constituents in soil to migrate to groundwater is evaluated in this section, as this migration pathway may pertain to a risk assessment of groundwater. USEPA has developed conservative Soil Screening Levels (SSLs) for this potential migration pathway. The USEPA derived the SSLs using a simple linear partitioning equation to which they applied a dilution attenuation factor (DAF; USEPA, 1996b). The partitioning of a constituent from soil to water is a function of many variables, both constituent-specific (e.g., K_{ow}) and site-specific (e.g., f_{oc}). The attenuation that occurs between the source area and a hypothetical receptor location is a function of many additional parameters, most of which are site-specific (e.g., travel distance) as opposed to constituent-specific. USEPA (1996b) provides soil-to-groundwater SSLs based on dilution attenuation factors of 20 and 1. The DAF of 20 may be applied for small source areas (<1/2 acre), whereas the DAF of 1 is recommended for large sites (>30 acres). The only SWMU area that is greater than 1/2 acre is the

Tank Farm Area. Therefore, the SSLs based on the DAF of 20 were used to evaluate soil data from SWMUs 3, 4, 8 (RFA 14), and 9. The SSLs based on a DAF of 1 were applied to the evaluation of soils data from the Tank Farm Area because its size exceeds 1/2 acre. However, this is a very conservative approach because the Tank Farm Area is much smaller than 30 acres.

In deriving SSLs for soil-to-groundwater migration, USEPA made default assumptions regarding these variables. These assumptions are highly conservative; thus, the default USEPA SSLs represent an overly conservative estimation of the potential for migration to groundwater.

6.2.1 Data Evaluation

This section describes the types of analytical data that were available and used in the risk assessment to identify COIs for each SWMU. As indicated above, soil samples were collected in September/October 1996 from SWMUs 3, 4, 8 (RFA 14), and 9. Sediment samples were collected from SWMU 20, and groundwater samples were collected as part of the Tank Farm Area investigation. Section 5 of this report describes these samples and presents their locations. In addition, historical data from soil samples collected in the Tank Farm Area in 1991 (Warzyn, 1992a) were incorporated into the risk assessment. Field analyzed data were not included in the risk assessment because of uncertainty in the quantification of these data. A number of samples in the former impoundment basin area were excluded from the risk evaluation of current conditions because soils from this area are no longer present. They were excavated and appropriately disposed of during 1996 as part of the construction of the new aboveground storage tank farm, which is being built to replace the USTs of the Tank Farm Area. Table 6-1 presents a list of samples used in the risk assessment. Descriptions and results of the human health risk screening processes for each environmental medium follow.

6.2.2 Soil

Analytical soil data from individual SWMUs were summarized in the following manner. For each detected constituent, the range of detections, range of detection limits, and frequency of detection were determined. Maximum detected concentrations of each detected constituent were compared with USEPA Region V DQLs (USEPA Region V, 1995a) for soil to screen out constituents present at concentrations below risk-based levels. Constituents were also eliminated as COIs on the basis of low inherent toxicity and

comparison with background. Maximum detected concentrations in site soils also were compared with USEPA SSLs (USEPA, 1996b) for potential soil-to-groundwater migration.

SWMUs 3, 4, 8 (RFA 14), and 9

Tables 6-2, 6-3, 6-4, and 6-5 present the preliminary risk screening for soils from SWMUs 3, 4, 8 (RFA 14), and 9, respectively. For SWMUs 3, 4, 8 (RFA 14), and 9, no COIs were identified for soils because maximum detected concentrations were all below both risk-based and soil-to-groundwater migration screening criteria. Therefore, current and future exposure to constituents in these SWMU soils would yield acceptable risks and noncarcinogenic hazards for human receptors, and migration of constituents from soil-to-groundwater is not likely to be a significant pathway.

Tank Farm Area (SWMUs 8 [RFA 11, 12, and 13], 17, and 18)

Laboratory analytical data from 60 surface soil and boring samples, which were collected during an investigation in 1991 (Warzyn, 1992a), were used to prepare a preliminary risk screening of constituents in soil in the Tank Farm Area. Table 6-6 shows the results of the risk screening. Maximum concentrations of detected constituents were compared with USEPA Region V DQLs for soil and USEPA SSLs to identify COIs in soil. Many constituents were screened out because the maximum concentrations were below both risk-based and soil-to-groundwater migration screening criteria. Ethylbenzene and xylenes were detected at concentrations above the risk-based DQLs and are therefore identified as COIs for the quantitative risk assessment.

A number of constituents were detected at concentrations greater than the very conservative SSLs (DAF of 1) for soil-to-groundwater migration; these are benzene, ethylbenzene, styrene, 1,1,2,2-tetrachloroethane, tetrachloroethylene, toluene, and xylenes. Therefore, there may be the potential for migration of these constituents from soil-to-groundwater. A more detailed discussion of groundwater follows in section 6.2.4.

6.2.3 Sediments

Table 6-7 presents the preliminary human health risk screening for sediment samples associated with SWMU 20. Sediment samples were collected at SWMU 20, the Interceptor Outfall Basin, and

downstream from the outfall in the unnamed tributary that runs along the east side of the plant. These samples were collected during the RFI and analyzed for site-associated constituents. Preliminary human health risk screening was completed. Maximum concentrations of constituents in sediments were compared with USEPA Region V DQLs for soil. This is a conservative approach, as exposure frequency and duration to soil are higher than those for exposure to sediment. Additionally, sediment concentrations of inorganic constituents were compared with background soil levels. The sediments result from surface soil runoff in the plant facility; therefore, using soil background for comparison with these sediments was deemed appropriate.

All detected constituent concentrations in sediments were below USEPA Region V DQLs for soil or of low inherent toxicity, except for arsenic. Arsenic was eliminated as a COI because it was not detected at concentrations statistically greater than background. Appendix E-1 presents the statistical methodology and results of this comparison. Because there were no COIs identified for potential risk to human health, it can be concluded that exposure to constituents in sediments from SWMU 20 and downstream would yield acceptable risks and noncarcinogenic hazard indices for human receptors.

6.2.4 Groundwater

There are no complete groundwater exposure pathways under current conditions in the Tank Farm Area. Groundwater directly below the Tank Farm Area is generally contained in a zone above clay till, and there are currently no drinking water or production wells in this groundwater zone. This groundwater zone would not yield sufficient water to support either type of use. Groundwater in the Tank Farm Area is collected via an underdrain system, accumulated in a subgrade sump, and discharged to the local POTW. Hydrogeologic data indicate that the pumping of the sump controls the hydraulic gradient in the Tank Farm Area. Consequently, constituents in groundwater in the Tank Farm Area are not migrating off-site. The hydrogeologic data are supported by the water quality data obtained from plant perimeter wells downgradient of the Tank Farm Area (MW-10, MW-11). These wells do not have detectable levels of organic constituents (Table 5-7). Because there are no complete exposure pathways for groundwater, it is not necessary to quantitatively evaluate groundwater exposure pathways under current conditions. Following closure of the Tank Farm Area USTs, groundwater conditions are likely to change significantly because potential source areas in soil will be eliminated or contained. Therefore, an evaluation of post-tank

closure conditions on groundwater, as well as soil, will be deferred until after the closure activities are completed.

6.2.5 Risk Screening Conclusions

Table 6-8 presents a summary of the risk screening results for SWMUs evaluated in the RFI. No constituents of interest were identified for SWMUs 3, 4, 8 (RFA 14), 9, and 20, as site constituent levels were below USEPA Region V DQLs, conservative risk-based screening criteria. Therefore, adverse human health effects would not be anticipated with exposure to constituents in these areas. The only area for which constituents of interest were identified was the Tank Farm Area. The COIs for the Tank Farm Area are ethylbenzene and xylenes. Therefore, this area will be evaluated in the quantitative risk assessment that follows.

6.3 EXPOSURE ASSESSMENT - TANK FARM AREA

Exposure assessment is the process of measuring or estimating the intensity, frequency, and duration of human exposure to an agent in the environment. "In its most complete form, exposure assessment should describe the magnitude, duration, schedule, and route of exposure; the size, nature, and classes of the populations exposed; and the uncertainties in all estimates" (NAS, 1983). Accordingly, this section of the risk assessment characterizes potential exposure scenarios to identify the exposure pathways. For these pathways, constituent concentrations in all relevant media are estimated, and the extent of receptors' constituent intake and absorption are quantitatively evaluated.

6.3.1 Pathways of Human Exposure

An exposure pathway describes the course that a constituent takes from its original source to a human receptor. Each exposure pathway includes the following elements: (1) a source or constituent release from a source (e.g., spill, leaking tank), (2) an exposure medium (e.g., soil, air), (3) a point of potential contact for the receptor with the exposure medium (e.g., exposed surface soil), and (4) an exposure route at the contact point (e.g., incidental ingestion, dermal contact). An exposure pathway is considered complete when all of these elements are present. Only complete exposure pathways are evaluated quantitatively in the risk assessment.

6.3.1.1 Potential Exposure Media and Routes of Exposure

Soil: Ethylbenzene and xylenes were identified as COIs in soil in the Tank Farm Area. A plant worker could be exposed to these constituents in soil through incidental ingestion and dermal contact with intact surface soil. Under current conditions, there are no receptors who routinely are engaged in digging activities in the Tank Farm Area. Therefore, exposure pathways with subsurface soil are not complete.

Workers who will be involved in tank closure activities could be excavating soils. However, unrestricted exposure to subsurface soil, airborne particulates and volatiles would not occur because these workers would wear appropriate personal protection equipment and would be following a Health and Safety Plan for the closure activities.

Air Volatile Emissions: Ethylbenzene and xylenes may be released from soil to air through volatilization. Receptors could be exposed through inhalation.

Air Particulate Emissions: Constituent-containing soil particulates could be transported to ambient air through wind erosion of surface soil. However, ethylbenzene and xylenes are the only identified COIs in soil, and these constituents are volatile and unlikely to be significantly associated with airborne soil particles. Therefore, the emissions of particulates to air is not evaluated in the quantitative risk assessment.

Groundwater: While there are detected levels of site-originated constituents in groundwater in the immediate vicinity of the Tank Farm Area, there are no current receptors who have potential to contact groundwater. Organic constituents in groundwater are not migrating off-site, as perimeter wells downgradient of the Tank Farm Area do not have detectable levels of organics. Therefore, further quantitative evaluation of current groundwater pathways is not necessary in this risk assessment.

6.3.1.2 Potential Receptors

The potential human receptors at a site must be characterized in order to evaluate potential exposure pathways. Potential receptors for the Tank Farm Area are identified based on the assumption that current and future land uses are industrial and will not change in the foreseeable future.

Current site activities include daily operation, maintenance, and inspection of facilities in the Tank Farm Area. Because ethylbenzene and xylenes were identified as constituents of interest in soil, there are potentially complete exposure pathways for plant workers with the opportunity to contact surface soils in the Tank Farm Area.

6.3.1.3 Identification of Potential Exposure Pathways

Complete exposure pathways require exposure media with elevated levels of site-associated constituents and receptors with the opportunity to contact these media. Table 6-9 presents potential exposure pathways at this site under current land use conditions. Exposures resulting from all complete pathways are quantitatively evaluated in this assessment.

6.3.2 Quantification of Exposure Point Concentrations

The quantitative evaluation of exposure begins with the estimation of constituent concentrations in all potential exposure media. For the Tank Farm Area, these media are soil and air. Exposure point concentrations (EPCs) of constituents of interest must be determined in order to conduct quantitative risk calculations. The following section describe how EPCs were estimated for constituents in soil and air, respectively.

6.3.2.1 Soil

The USEPA recommends that the 95% UCL of the mean concentration be used as the EPC for constituents in soils. This statistic was calculated for ethylbenzene and xylenes in soil, and the methodology and results of this are found in Appendix E-2. For both ethylbenzene and xylenes in soil, the 95% UCL exceeded the maximum detected concentration. In such a case, USEPA indicates that the maximum detected concentration should be used as the EPC. Therefore, the maximum detected concentrations of ethylbenzene and xylenes (810 and 2100 mg/kg, respectively) were selected as estimates of EPCs in soil for incidental ingestion of and dermal contact with soil.

6.3.2.2 Air Concentrations

Ethylbenzene and xylenes are considered volatile organic compounds. Potential on-site concentrations of these constituents in air were estimated from soil concentrations by applying the soil-to-air volatilization factor (VF) from USEPA Soil Screening Guidance (1996b) to the EPCs in soil. Use of this volatilization model in the risk assessment provides a very conservative estimate of concentrations in air for the following reasons.

First, the use of this model may overestimate volatile emissions when applied to concentrations greater than the soil saturation limit (C_{sat}). This is the case in this assessment as the EPCs for both ethylbenzene and xylenes are greater than their respective theoretical C_{sat} estimates. According to USEPA (1996b), the VF is reliable for concentrations of volatile constituents in soil that are less than the C_{sat}, and volatile emissions are at their maximum at the C_{sat} of a volatile constituent in soil. Second, the EPCs for ethylbenzene and xylenes are the maximum detected concentrations and are very conservative estimates of site-wide concentrations. Actual site-wide concentrations are almost certainly much lower. For these reasons, the use of the maximum concentrations, despite their exceeding the respective C_{sat} values, appears to be highly conservative and will not underestimate airborne exposure.

The chemical-specific factors and calculated VFs for ethylbenzene and xylenes are presented in Table 6-10. An air concentration is estimated by dividing the soil concentration by the VF, and estimated air concentrations for ethylbenzene and xylenes are also presented in Table 6-10.

6.3.3 Estimation of Constituent Exposure and Intake

The USEPA Guidelines for Exposure Assessment (USEPA, 1992a) define constituent exposure as "the condition of a chemical contacting the outer boundary of a human." The constituents are contained in an environmental medium such as water, soil, or air. Generally two steps are required for a constituent to enter a body; contact with the outer boundary of the body (exposure) and then crossing the boundary from outside to inside the body (intake). In most exposure routes, intake is evaluated in terms of how much of the carrier medium containing the constituents crosses the outer boundary (e.g., amount of soil ingested, volume of air inhaled). Dermal contact pathways, however, are evaluated in terms of uptake, or the absorption of the constituent through the skin. Although the constituent is generally contained in a carrier

medium, such as water, during dermal exposure the carrier medium is typically not absorbed at the same rate as the constituent.

Two types of doses, applied and internal, are defined for evaluating constituent exposure (USEPA, 1992a). The applied dose is the amount of a constituent present at an absorption barrier (e.g., lung, skin, gastrointestinal tract) and available for absorption. The applied dose is estimated as the amount of constituent ingested, inhaled, or contained in material contacting the skin. This is analogous to the administered dose in a dose-response experiment. The internal dose is the amount of constituent actually absorbed across the barrier and available for internal biological interactions. It is the portion of the internal dose that actually reaches cells, sites, or membranes where adverse effects occur. Doses are generally presented as dose rates (dose per unit time) on a per-unit-body-weight basis (units of mg/kg-day).

Noncarcinogenic health effects are evaluated by calculating the average dose of a constituent over the course of the exposure period. This dose is termed the Average Daily Dose (ADD). In a risk assessment, the calculated ADD is estimated quantitatively using assumptions about the duration, frequency, and magnitude of exposure experienced by each receptor, and assumptions about the constituent properties that influence absorption. Table 6-11 presents the general form of the equation used to evaluate intake of constituents.

Carcinogenic health effects are evaluated in terms of an individual's increased risk of developing cancer over a lifetime. However, as discussed in Section 6.4.2, neither ethylbenzene nor xylenes are considered to be carcinogenic. Therefore, this risk assessment evaluates only noncarcinogenic hazards associated with potential exposure to COIs.

6.3.4 Estimation of Constituent Absorption

The extent of gastrointestinal bioavailability depends on the properties of the constituent and the properties of the matrix with which it is ingested. This risk assessment includes the evaluation of incidental soil ingestion. For ethylbenzene and xylenes in soil, a conservative absorption factor of 100 percent (a default for organic constituents) is assumed.

The administered dose in a dermal exposure pathway is the amount of constituent in the volume of soil contacting the skin. Only a small fraction of this amount of the chemical will actually penetrate the skin and enter the body of a receptor. Dermal exposure calculations are, therefore, always calculated as an absorbed dose and require the inclusion of a dermal absorption factor. For a organic constituents, a conservative absorbance factor of 10% was used. This value is used in the calculations of the dermal contact with soil pathways.

6.3.5 Exposure Parameters

The quantitative estimation of constituent intake involves the incorporation of numerical assumptions for a variety of exposure parameters. Where guidance was available, exposure assumptions used in these dose calculations are based on USEPA recommended values (1989a, 1991a, 1996a). Some exposure values are not addressed in the available guidance, and in these cases, values were derived based on site characteristics or best professional judgment. All exposure assumptions utilized in this risk assessment are described below.

6.3.5.1 All Pathways

The following factors are consistent across all of the exposure pathways considered in this assessment.

6.3.5.1.1 Exposure Frequency and Duration

The industrial worker receptor in this assessment is assumed to be a full-time worker. This receptor would have an exposure frequency of 250 days per year (USEPA, 1989a). The exposure duration is 25 years, which is an upperbound estimate of the length of time a person is employed at one location (USEPA, 1989a).

6.3.5.1.2 Body Weight

The default value for average body weight of an adult is 70 kg based on USEPA guidance (1989a).

6.3.5.1.3 Averaging Time

As described above, the doses for noncarcinogenic health effects are averaged over the specific period of exposure for a given receptor. Noncarcinogenic averaging times are, therefore, calculated by multiplying the exposure duration for the receptor by 365 days/year. Neither of the COIs in this assessment are considered to be carcinogenic.

6.3.5.2 Incidental Ingestion of Soil

The following factors are incorporated into calculations of the soil ingestion pathway. Exposure factors for the industrial worker and the general calculation for this pathway are presented in Table 6-11.

Soil Ingestion Rate. The ingestion rate for the standard industrial worker is 50 mg/kg (USEPA, 1991a).

Gastrointestinal Bioavailability Factor. A conservative relative gastrointestinal bioavailability factor is included in calculations of the soil ingestion pathway. This value is 100% for ethylbenzene and xylenes.

6.3.6 Dermal Contact with Soil

The following factors are incorporated into calculations of the dermal contact with soil pathway. Exposure factors for the industrial worker and the general calculation for this pathway are presented in Table 6-13.

Skin Surface Area. Industrial workers are assumed to wear appropriate clothing during outdoor activities that may involve soil contact. For this types of worker, skin surface area available for dermal contact with soil is assumed to be the typical case clothing scenario for outdoor activities as described by USEPA dermal guidance (1992c). Exposed skin areas are the head and hands, for a total of 2,000 cm^2.

Soil Adherence Factor. The soil adherence factor describes the amount of soil which is assumed to be in contact with the exposed skin surface area. The value 0.07 mg/cm^2 was used in this assessment for the industrial worker. This is the average of the mean soil adherences measured for Grounds Keepers, a receptor with a reasonable maximum exposure to soil, as presented in USEPA (1996a). Applying the soil adherence factor for the Grounds Keeper to the Industrial Worker is likely to be conservative.

6.3.6.1 Inhalation of Volatile Constituents Released from Soil

The following factors are incorporated into calculations of inhalation of volatile constituents from soil pathway. Exposure factors for the industrial worker and the general calculation for this pathway are presented in Table 6-14.

Inhalation Rate. A standard inhalation rate of 2.5 m^3/hr was assumed in this risk assessment. This is for a worker engaged in moderate to heavy activity (USEPA, 1996a).

Exposure Time. The exposure time is a standard 8 hour work day.

6.4 TOXICITY ASSESSMENT

The toxicity assessment provides a description of the relationship between a dose of a chemical and the anticipated incidence of an adverse health effect. The majority of existing knowledge about the dose-response relationship is based on data collected from studies of animals (usually rodents), studies of human occupational exposures, and theories about how humans respond to environmental doses of chemicals.

The USEPA has developed dose-response assessment techniques to set "acceptable" levels of human exposure to chemicals in the environment. These USEPA-derived risk criteria address both subchronic and chronic noncarcinogenic health effects and potential carcinogenic health risks.

6.4.1 Evaluation of Noncarcinogenic Responses

This risk assessment evaluates potential noncarcinogenic health effects associated with ethylbenzene and xylenes. The subsections that follow discuss the mechanisms of noncarcinogenic response, the derivation of acceptable dose levels, the manner in which these levels are used in this risk assessment, and some of the limitations of these values. The limitations are addressed in greater detail in the uncertainty analysis section of this report (subsection 6.6).

6.4.1.1 Background

It is widely accepted that noncarcinogenic biological effects of chemical substances occur only after a threshold dose is achieved (Klaasen, 1996). Physiological mechanisms exist that will minimize the adverse effect, through pharmacokinetic means such as absorption, distribution, metabolism, and excretion. Therefore, a range of exposures and resulting doses can be tolerated by a receptor with essentially no chance of developing adverse effects. The threshold dose for a compound is usually estimated from the no observed adverse effect level (NOAEL) or the lowest observed adverse effect level (LOAEL), as determined from animal studies or human data. The NOAEL is the highest dose at which no adverse effects occur, while the LOAEL is the lowest dose at which adverse effects are discernible.

6.4.1.2 Noncarcinogenic Health Effects Criteria

USEPA uses the NOAEL or LOAEL estimates of threshold dose to establish chronic reference doses (RfDs) for human exposure. An RfD is an estimate of a daily exposure level (dose) that is unlikely to present an appreciable risk of deleterious effects during a lifetime. RfDs are expressed in units of dose (mg/kg-day) and incorporate uncertainty factors to account for limitations in the quality or quantity of available data. Separate RfDs are derived for oral and inhalation exposure.

The RfDs for ethylbenzene and xylenes are listed below, and discussion about the sources of these values and the studies upon which they are based is found in Appendix E-3.

Constituent	Oral RfD (mg/kg-day)	Inhalation RfD (mg/kg-day)	Dermal RfD (mg/kg-day)
Ethylbenzene	0.1	0.286	0.1
Xylenes	2.0	0.2	2.0

6.4.2 Carcinogenic Health Effects Criteria

USEPA uses a two-step approach for evaluating potential carcinogenic effects of chemicals. First the substance is assigned a weight-of-evidence classification reflecting the likelihood that the chemical is a

human carcinogen. Second, a cancer slope factor (CSF) is calculated for known or probable human carcinogens.

The USEPA weight-of-evidence classification system for carcinogenicity has the following categories.

- Group A chemicals (human carcinogens) are agents for which there is sufficient evidence of carcinogenicity from human studies.

- Groups B1 and B2 chemicals (probable human carcinogens) are agents for which there is limited evidence of carcinogenicity from human studies (B1) or sufficient evidence in animal studies and inadequate evidence from human studies (B2).

- Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals.

- Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

- Group E chemicals (evidence of noncarcinogenicity) are agents for which there is no evidence of carcinogenicity in adequate human or animal studies.

Both ethylbenzene and xylenes are classified as Group D (USEPA, 1997). Therefore, only noncarcinogenic health effects are evaluated for these constituents.

6.5 RISK CHARACTERIZATION

Risk characterization is the final step of the baseline health risk assessment process. It includes a description of the nature and magnitude of the potential for occurrence of adverse health effects under a specific set of conditions. In this step, the toxicity assessment and site-specific exposure assessment are integrated into quantitative and qualitative estimates of potential health risks.

6.5.1 Approach

In this section, potential noncarcinogenic health effects are calculated and summarized for the industrial worker receptor in the Tank Farm Area. The likelihood of occurrence of adverse noncarcinogenic effects depends on the relationship between the RfD and the estimated average chemical dose received by the receptor. Received doses less than the RfD are not likely to be associated with any adverse health effects and are, generally, not of regulatory concern. Doses that exceed the RfD are considered to present the potential for adverse effects.

Noncarcinogenic responses are evaluated numerically using parameters known as the hazard quotient (HQ) and hazard index (HI). The HQ is obtained by dividing the average daily dose (ADD) by the RfD as presented below. The average daily dose is the estimated daily dose of a chemical averaged over the specific duration of exposure, which may not necessarily be an entire lifetime.

$$ADD / RfD = HQ$$

Each dose calculation with a specific combination of chemical, receptor, and exposure pathway, will have a distinct average daily dose and calculated hazard quotient. Hazard quotients associated with all chemicals for a particular pathway are summed to yield the hazard index, as indicated:

$$HQ_i + HQ_{ii} + HQ_{iii} + ... = HI$$

If a receptor is subject to exposure through more than one pathway, the hazard indices for all pathways are summed. A calculated hazard index of one or less indicates that an adverse effect would not be anticipated. Conversely, an HI greater than 1.0 indicates that there is a potential for a non-carcinogenic health effect to occur as a result of exposure to constituents released from the site.

Risk Characterization Results

Table 6-15 presents the hazard quotients by pathway and the hazard index for the industrial worker receptor in the Tank Farm Area. Risk calculations are found in Appendix E-4. The estimated non-carcinogenic HI for the industrial worker 0.15. This HI is below the acceptable benchmark of 1 designated

by USEPA (1989a). Therefore, adverse noncarcinogenic effects are unlikely to result from exposure at the Tank Farm Area under baseline conditions.

6.6 UNCERTAINTY ANALYSIS

Uncertainties are inherent in every aspect of a quantitative risk assessment. The inclusion of site-specific factors, which this assessment has attempted to incorporate, decreases uncertainty, although significant uncertainty persists in even the most site-specific and accurate risk assessments. A careful and comprehensive analysis of the critical areas of uncertainty in a risk assessment is a very important part of the risk assessment process. The uncertainty analysis provides a context for better understanding the assessment conclusions by identifying the uncertainties that have most significantly affected the assessment results.

USEPA (1992a) guidance stresses the importance of providing a complete analysis of uncertainties so that risk management decisions take these uncertainties into account when evaluating risk assessment conclusions. The major sources of uncertainty in this risk assessment are identified qualitatively below.

6.6.1 Uncertainties in Hazard Identification

Uncertainties in the hazard identification step of the risk assessment are associated with the available analytical data and the selection process for identification of constituents of interest.

- **Identification of Constituents of Interest.** Multiple uncertainties exist in the process of identifying constituents of interest and representative concentrations of these constituents. These include uncertainties associated with selection of sampling locations and procedures utilized in chemical analyses.

- **Age of the Data.** The sampling data used for the risk assessment of the Tank Farm Area were collected in 1991, providing results which are greater than 5 years old. For non-persistent constituents such as ethylbenzene and xylenes, these data most likely overestimate the current levels of constituent presence at the Tank Farm Area. Therefore, the potential hazards associated

with contact to these constituents at the Tank Farm Area are expected to be less than those estimated herein.

- **Focused vs. Random Sampling.** The environmental sampling used in this assessment was conducted in a purposeful manner designed to locate the highest likely concentrations of constituents. Random sampling would have been more likely to provide a representative set of values to be incorporated into the risk assessment for consistency with the other exposure considerations. This directed sampling effort tends to lead to an overestimation of the risks.

6.6.2 Uncertainties in Exposure Assessment

The USEPA approach to exposure assessments generally requires standard exposure scenarios rather than realistic site-specific evaluations of exposure. Under this approach, if a constituent is found to be present at a site, it is assumed that exposure to that substance will occur, regardless of whether that exposure is realistic or likely.

- **Use of Maximum Detected Concentrations as Exposure Point Concentrations.** The maximum detected concentration for ethylbenzene and xylene in soil were used as the exposure point concentrations in this risk assessment. Relying on these values is highly conservative and likely overestimates actual exposures of receptors to ethylbenzene and xylenes.

- **Soil-to-Air Volatilization Model.** Use of the volatilization model from the USEPA Soil Screening Guidance (USEPA, 1996b) in the risk assessment provides a very conservative estimate of concentrations in air. The EPCs for ethylbenzene and xylenes are greater than their respective C_{sat} values, and the use of this model may overestimate volatile emissions when applied to concentrations greater than the C_{sat}. According to USEPA (1996b), volatile emissions are at their maximum at the C_{sat} of a volatile constituent in soil. Compounding the conservatism of the VF is the likely overestimation of the EPCs for ethylbenzene and xylenes.

- **Use of Default Exposure Factors.** The scientific literature contains many examples of carefully designed and conducted studies which indicate that appropriate environmental exposure factors are significantly lower than those recommended by the USEPA (1989a, 1991a). These include soil

ingestion rates (Calabrese et. al., 1989) in particular. The use of the USEPA default values tends to result in overestimates of the risks.

- **Dermal Absorbance Factor.** The dermal absorbance factor of 10% for organic constituents is conservative when applied to volatile constituents such as ethylbenzene and xylenes. For volatile constituents in soil, a competing process with dermal absorption from soil is volatilization loss from soil to air. USEPA Region III dermal exposure guidance (USEPA Region III, 1995) recognizes that volatile organics have lower dermal absorbance factors than less volatile constituents. For volatile organics with relatively high vapor pressures such as benzene (95.2 mm Hg), Region III recommends applying a very low absorbance factor in the risk assessment of 0.05% based on Skowronski et. al., (1988) and Franz (1984). For volatile organic constituents such as ethylbenzene and xylenes, with vapor pressures lower than benzene's, Region III recommends a default absorbance factor of 3% based on its professional judgement.

6.6.3 Uncertainties in Toxicity Assessment

- **Extrapolation from animals to humans.** Dose-response (toxicity) assessments rarely incorporate direct data about the effects of environmental constituents on human receptors. The RfDs for both ethylbenzene and xylenes are based on studies in rodents. Therefore, human toxicity assessments for these constituents involve the extrapolation of results from studies on animals to humans. Extrapolation across species introduces uncertainty in the human health risk evaluation. Including uncertainty factors in the RfD derivation likely results in greater conservatism of the estimate. Two conservative assumptions are made that may not be valid. These are that the results of the most sensitive animal study are appropriate to apply to humans and that humans are more sensitive than the most sensitive species on a body weight basis. Interspecies dose conversion may also be limited by differences in lifespan, body size, breathing rates, or the route of administration utilized in a study.

6.6.4 Uncertainties in Risk Characterization

- **Risk Characterization.** The typical approach to risk assessment involves conservatively multiplying the upper bound exposure assumptions together to evaluate exposure. USEPA risk

assessment guidance (1989a) specifies that numerous factors in the exposure equation should each be represented by the 95th percentile value for that variable. These factors include the representative concentration, the contact rate with the environmental medium, and the exposure frequency and duration. Multiplying all of these upper bound values results in a risk estimate which is higher than the risks to 99.99% of the population. Thus, virtually all potentially exposed receptors will have a much lower level of risk than calculated following USEPA guidance.

All of the steps of the exposure assessment and toxicity assessment, including all of the factors incorporated into the dose calculations, individually include a conservative "safety margin." When all of these factors are combined, the margins of error are compounded and scientific accuracy is sacrificed.

6.6.5 Human Health Risk Assessment Conclusions

The RFI baseline risk assessment of the Site indicates that noncarcinogenic hazards and theoretical excess lifetime cancer risks are acceptable according to USEPA criteria. For SWMUs 3, 4, 8 (RFA 14), 9 and 20, no constituents were detected at concentrations above either conservative risk-based concentrations or soil-to-groundwater values. Therefore, theoretical excess lifetime cancer risks and noncarcinogenic hazards associated with potential exposure to these sites would be acceptable and no remedial activity would be warranted for the protection of human health. Because current and likely future conditions of SWMUs 3, 4, 8 (RFA 14), 9, and 20 are expected to be the same, no further risk evaluation of these areas is needed.

The risk assessment also indicates that current theoretical excess lifetime cancer risks and noncarcinogenic hazards are acceptable for the Tank Farm Area. No potentially carcinogenic constituents were identified as COIs in soil. Ethylbenzene and xylenes were detected at concentrations exceeding conservative risk-based screening values and soil-to-groundwater protection values. A site-specific quantitative risk assessment was conducted to evaluate exposure to ethylbenzene and xylenes in Tank Farm Area soils. Conservatively estimated noncarcinogenic hazards for a standard industrial worker are acceptable. A quantitative risk evaluation of groundwater was not needed because there are no complete exposure pathways with groundwater under current conditions. Therefore, no remedial activity is warranted for the imminent protection of human health.

TABLE 6-1

SAMPLES USED IN THE RISK ASSESSMENT

Area	Medium	Sample Numbers		
SWMU 3	Soil[1]	PPG-HA04-01	PPG-HA05-01	PPG-HA06-01
		PPG-HA07-01	PPG-HA08-01.5	PPG-HA09-01.5
SWMU 4	Soil[1]	PPG-HA16-01.25	PPG-HA19-02	PPG-HA22-01.5
		PPG-HA17-01	PPG-HA20-01.5	PPG-HA23-02
		PPG-HA17-01-09	PPG-HA21-02	PPG-HA24-01.5
		PPG-HA18-01		
SWMU 8	Soil[1]	PPG-HA10-01		
SWMU 9	Soil[1]	PPG-HA11-02	PPG-HA13-01.5	PPG-HA15-01
		PPG-HA12-01.5	PPG-HA14-01.5	PPG-HA15-01-09
SWMU 20	Sediment[1]	PPG-SD01-01	PPG-SD03-01	PPG-SD03-01-09
		PPG-SD02-01		
Tank Farm Area	Soil[2]	B1-13.5	GS-1	GS-28
		B10-6.0	GS-10	GS-20
		B10-13.5	GS-11	GS-3
		B11-11.0	GS-12	GS-30
		B11-3.5	GS-13	GS-31
		B2-1.0	GS-14	GS-32
		B2-33.0	GS-15	GS-33
		B2-21.0	GS-16	GS-34
		B2-13.5	GS-17	GS-35
		B3-13.5	GS-18	GS-36
		B4-13.5	GS-19	GS-37
		B5-8.5	GS-2	GS-38
		B6-6.0	GS-20	GS-39
		B6-18.5	GS-21	GS-4
		B7-8.5	GS-22	GS-40
		B7-18.5	GS-23	GS-5
		B8-18.5	GS-24	GS-6
		B8-1.0	GS-25	GS-7
		B9-1.0	GS-26	GS-8
		B9-13.5	GS-27	GS-9

[1] Source: RFI, fall 1996 (Appendix C).
[2] Source: Warzyn, 1992a.

TABLE 6-2

PRELIMINARY RISK SCREENING FOR CONSTITUENTS OF INTEREST
WTC ACCUMULATION AREA (SWMU 3) SOIL

Constituent	Range of Detections (mg/kg)	Range of Detection Limits (mg/kg)	Frequency of Detection	USEPA Region V DQL[1] (mg/kg)	USEPA SSLs Soil/GW[2] (mg/kg)	Constituent of Interest	Rationale for Exclusion
ORGANICS							
Benzo(a)pyrene	0.043 J - 0.048 J	0.35 - 0.40	2/6	0.061	8	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Benzo(b)fluoranthene	0.049 J - 0.080 J	0.35 - 0.40	3/6	0.61	5	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Benzo(k)fluoranthene	0.044 J - 0.049 J	0.35 - 0.40	2/6	6.1	49	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Butyl benzyl phthalate	0.15 J - 0.65	0.35 - 0.38	2/6	13,000	930	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Butyl phthalate (Di-n-)	0.045 J	0.35 - 0.40	1/6	6,500[7]	2,300	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Chrysene	0.043 J - 0.051 J	0.35 - 0.38	2/6	24	160	No	Maximum detection below USEPA Region IX value and SSL for soil-to-groundwater.
bis(2-Ethylhexyl)phthalate	0.14 J - 0.79	0.38	5/6	32	3,600	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Fluoranthene	0.044 J	0.35 - 0.40	1/6	2,600	4,300	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Indeno(1,2,3-cd)pyrene	0.048 J	0.35 - 0.40	1/6	0.61	14	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
2-Methylnaphthalene	0.089 J	0.35 - 0.38	1/6	800[3]	84[3]	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Naphthalene	0.077 J - 0.30 J	0.35 - 0.40	2/6	800	84	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Pyrene	0.052 J	0.35 - 0.40	1/6	2,000	4,200	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.

TABLE 6-2 (Continued)

PRELIMINARY RISK SCREENING FOR CONSTITUENTS OF INTEREST
WTC ACCUMULATION AREA (SWMU 3) SOIL

Constituent	Range of Detections (mg/kg)	Range of Detection Limits (mg/kg)	Frequency of Detection	USEPA Region V DQL[1] (mg/kg)	USEPA SSLs Soil/GW[2] (mg/kg)	Constituent of Interest	Rationale for Exclusion
INORGANICS							
Aluminum	2,500 - 11,700	--	6/6	77,000[7]	--	No	Maximum detection below USEPA Region IX value.
Arsenic	2.0 - 6.3	--	6/6	0.32	29	No	Site data not statistically different from background.[4]
Barium	12.3 - 288	--	6/6	5,300	1,600	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Cadmium	0.063 - 0.41	--	6/6	38	8	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Calcium	82,100 - 92,600	--	6/6	--	--	No	Low inherent toxicity.
Chromium (total)	5.9 - 45.5	--	6/6	210[5]	38[6]	No	Maximum detection below USEPA Region V value. Below SSL for soil-to-groundwater if assume total Cr is 1:6 for CrVI:CrIII.
Iron	6,840 - 17,200	--	6/6	--	--	No	Low inherent toxicity.
Lead	3.4 - 78.9	--	6/6	400	--	No	Maximum detection below USEPA Region V value.
Magnesium	39,300 - 57,400	--	6/6	--	--	No	Low inherent toxicity.
Mercury	0.013 J - 0.33	0.11	5/6	23	--	No	Maximum detection below USEPA Region V value.
Nickel	7.5 - 21.9	--	6/6	1,500	130	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.

[1] USEPA Region V DQLs are derived exclusively from USEPA Region IX residential soil PRGs (1995) as per USEPA Region V (1995a).
[2] A conservative dilution/attenuation factor of 20 has been applied. Per USEPA (1996a), this DAF is appropriate for sites <1/2 acre in area.
[3] Naphthalene is used as surrogate because it is similar in structure and may be more acutely toxic than 2-methylnaphthalene (Sax and Lewis, 1989).
[4] As per USEPA guidance (1995), an ANOVA of background data and site data sets for arsenic was performed. The background and site data sets were not found to be statistically different (Appendix E-1).
[5] Value for total chromium assuming a ratio of 1/6 for Cr VI to Cr III.
[6] For Cr VI. Using the Cr VI value for total chromium is likely to be highly conservative.
[7] USEPA Region IX residential soil PRG (1995). This value was used because there was no USEPA Region V DQL for this constituent.

TABLE 6-3

PRELIMINARY RISK SCREENING FOR CONSTITUENTS OF INTEREST
LARGE ACCUMULATION AREA (SWMU 4) SOIL

Constituent	Range of Detections (mg/kg)	Range of Detection Limits (mg/kg)	Frequency of Detection	USEPA Region V DQL[1] (mg/kg)	USEPA SSLs Soil/GW[2] (mg/kg)	Constituent of Interest	Rationale for Exclusion
ORGANICS							
Acetone	0.0094 J - 0.015 J	0.1 - 0.13	3/10	2,000	16	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
INORGANICS							
Aluminum	399 - 26,100	--	10/10	77,000[6]	--	No	Maximum detection below USEPA Region IX value.
Arsenic	0.4 BJ - 8.4	--	10/10	0.32	29	No	Site data not statistically different from background.[3]
Barium	3.5 J - 125	--	10/10	5,300	1,600	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Cadmium	0.043 J - 0.66	0.21 - 0.24	9/10	38	8	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Calcium	2,730 - 188,000	--	10/10	--	--	No	Low inherent toxicity.
Chromium	1.3 - 40.9	--	10/10	210[4]	38[5]	No	Maximum detection below USEPA Region V value. Below SSL for soil-to-groundwater if assume total Cr is 1:6 for CrVI:CrIII.
Iron	1,320 - 31,300	--	10/10	--	--	No	Low inherent toxicity.
Lead	1.1 - 54.4	--	10/10	400	--	No	Maximum detection below USEPA Region V value.
Magnesium	5,390 - 120,000	--	10/10	--	--	No	Low inherent toxicity.

TABLE 6-3 (Continued)

PRELIMINARY RISK SCREENING FOR CONSTITUENTS OF INTEREST LARGE ACCUMULATION AREA (SWMU 4) SOIL

Constituent	Range of Detections (mg/kg)	Range of Detection Limits (mg/kg)	Frequency of Detection	USEPA Region V DQL[1] (mg/kg)	USEPA SSLs Soil/GW[2] (mg/kg)	Constituent of Interest	Rationale for Exclusion
Mercury	0.022 J - 0.065 J	0.10 - 0.11	7/10	23	--	No	Maximum detection below USEPA Region V value.
Nickel	2.7 J - 38.9	4.2	9/10	1,500	130	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.

[1] USEPA Region V DQLs are derived exclusively from USEPA Region IX residential soil PRGs (1995) as per USEPA Region V (1995a).
[2] A conservative dilution/attenuation factor of 20 was applied. Per USEPA (1996a), this DAF is appropriate for sites <1/2 acre in area.
[3] As per USEPA guidance (1995), an ANOVA of background data and site data sets for arsenic was performed. The background and site data sets were not found to be statistically different (Appendix E-1).
[4] Value for total chromium assuming a ratio of 1/6 for Cr VI to Cr III.
[5] Value for Cr VI. Using the Cr VI value for total chromium is likely to be highly conservative.
[6] USEPA Region IX residential soil PRG (1995). This value was used because there was no USEPA Region V DQL for this constituent.

TABLE 6-4

PRELIMINARY RISK SCREENING FOR CONSTITUENTS OF INTEREST
RESIN PLANT DCS TANK [SWMU 8 (RFA 14)] SOIL

Constituent	Range of Detections (mg/kg)	Frequency of Detection	USEPA Region V DQL[1] (mg/kg)	USEPA SSLs Soil/GW[2] (mg/kg)	Constituent of Interest	Rationale for Exclusion
ORGANICS						
bis(2-Ethylhexyl)phthalate	0.14 J	1/1	32	3,600	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
INORGANICS						
Aluminum	2,430	1/1	77,000[6]	--	No	Maximum detection below USEPA Region IX value.
Arsenic	2.1	1/1	0.32	29	No	Not statistically different from background.[3]
Barium	12.6	1/1	5,300	1,600	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Cadmium	0.12 J	1/1	38	8	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Calcium	113,000	1/1	--	--	No	Low inherent toxicity.
Chromium	4.9	1/1	210[4]	38[5]	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Iron	8,230	1/1	--	--	No	Low inherent toxicity.

TABLE 6-4 (Continued)

PRELIMINARY RISK SCREENING FOR CONSTITUENTS OF INTEREST
RESIN PLANT DSC TANK [SWMU 8 (RFA 14)] SOIL

Constituent	Range of Detections (mg/kg)	Frequency of Detection	USEPA Region V DQL[1] (mg/kg)	USEPA SSLs Soil/GW[2] (mg/kg)	Constituent of Interest	Rationale for Exclusion
Lead	5.2 J	1/1	400	--	No	Maximum detection below USEPA Region V value.
Magnesium	66,800	1/1	--	--	No	Low inherent toxicity.
Mercury	0.012 J	1/1	23	--	No	Maximum detection below USEPA Region V value.
Nickel	7.1 J	1/1	1,500	130	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.

[1] USEPA Region V DQLs are derived exclusively from USEPA Region IX residential soil PRGs (1995) as per USEPA Region V (1995a).
[2] A conservative dilution/attenuation factor of 20 has been applied. Per USEPA (1996a), this DAF is appropriate for sites <1/2 acre in area.
[3] As per USEPA guidance (1995), an ANOVA of background data and site data sets for arsenic was performed. The background and site data sets were not found to be statistically different (Appendix E-1).
[4] Value for total chromium assuming a ratio of 1/6 for Cr VI to Cr III.
[5] Value for Cr VI. Using the Cr VI value for total chromium is likely to be highly conservative.
[6] USEPA Region IX residential soil PRG (1995). This value was used because there was no USEPA Region V DQL for this constituent.

TABLE 6-5

PRELIMINARY SCREENING FOR CONSTITUENTS OF INTEREST
LAB ACCUMULATION AREA (SWMU 9) SOIL

Constituent	Range of Detections (mg/kg)	Range of Detection Limits (mg/kg)	Frequency of Detection	USEPA Region V DQL[1] (mg/kg)	USEPA SSLs Soil/GW[2] (mg/kg)	Constituent of Interest	Rationale for Exclusion
ORGANICS							
Ethylbenzene	0.0024 J	0.0053 - 0.0058	1/6	2,900	13	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Tetrachloroethylene	0.0036 J - 0.0037 J	0.0053 - 0.0058	2/6	7	0.06	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Xylenes	0.0099	0.0053 - 0.0058	1/6	980	190	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
INORGANICS							
Aluminum	9,420 - 17,200	--	6/6	77,000[6]	--	No	Maximum detection below USEPA Region V value.
Arsenic	4.5 - 7.0	--	6/6	0.32	29	No	Not statistically different from background.[3]
Barium	49.1 - 56.3	--	6/6	5,300	1,600	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Cadmium	0.15 J - 0.24	--	6/6	38	8	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Calcium	51,300 - 82,200	--	6/6	--	--	No	Low inherent toxicity.
Chromium	17.1 - 26.2	--	6/6	210[4]	38[5]	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Iron	15,100 - 23,200	--	6/6	--	--	No	Low inherent toxicity.

TABLE 6-5 (Continued)

PRELIMINARY RISK SCREENING FOR CONSTITUENTS OF INTEREST
LAB ACCUMULATION AREA (SWMU 9) SOIL

Constituent	Range of Detections (mg/kg)	Range of Detection Limits (mg/kg)	Frequency of Detection	USEPA Region V DQL[1] (mg/kg)	USEPA SSLs Soil/GW[2] (mg/kg)	Constituent of Interest	Rationale for Exclusion
Lead	7.2 - 10.9	--	6/6	400	--	No	Maximum detection below USEPA Region V value.
Magnesium	27,700 - 41,900	--	6/6	--	--	No	Low inherent toxicity.
Mercury	0.018 J - 0.033 J	--	6/6	23	--	No	Maximum detection below USEPA Region V value.
Nickel	17.3 - 26.6	--	6/6	1,500	130	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.

[1] USEPA Region V DQLs are derived exclusively from USEPA Region IX residential soil PRGs (1995) as per USEPA Region V (1995a).
[2] A conservative dilution/attenuation factor of 20 was applied. Per USEPA (1996a), this DAF is appropriate for sites <1/2 acre in area.
[3] As per USEPA guidance (1995), an ANOVA of background data and site data sets for arsenic was performed. The background and site data sets were not found to be statistically different (Appendix E-1).
[4] Value for total chromium assuming a ratio of 1/6 for Cr VI to Cr III.
[5] Value for Cr VI. Using the Cr VI value for total chromium is likely to be highly conservative.
[6] USEPA Region IX residential soil PRG (1995). This value was used because there was no USEPA Region V DQL for this constituent.

TABLE 6-6

PRELIMINARY RISK SCREENING FOR CONSTITUENTS OF INTEREST
TANK FARM AREA SOIL (HISTORICAL DATA)

Constituent	Range of Detections (mg/kg)	Frequency of Detection	USEPA Region V DQL[1] (mg/kg)	USEPA SSLs Soil/GW[2] (mg/kg)	COI Soil	COI Soil-to-GW	Comments
ORGANICS							
Acetone	0.064 B - 0.094 B	5/60	2,000	0.8	No	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Benzene	0.002 J - 0.010	3/60	1.4	0.002	No	Yes	Maximum detection below USEPA Region V value but exceeds SSL for soil-to-groundwater.
Chlorobenzene	0.001 J - 0.014	4/60	160	0.07	No	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Chloroform	0.001	1/60	0.53	0.03	No	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
trans-1,4-Dichloro-2-butene	0.009 J	1/60	0.0076	--	No	NA	Maximum detection exceeds Region V value; however, frequency of detection is low (<2%).
Ethylbenzene	0.001 J - 810	23/60	2,900	0.7	Yes	Yes	Maximum detection exceeds both USEPA Region V value and SSL for soil-to-groundwater.
Ethylmethacrylate	0.008 J	1/60	340	--	No	NA	Maximum detection below USEPA Region V value.
Methyl butyl ketone	0.130 - 0.180	2/60	5,200[3]	--	No	NA	Maximum detection below USEPA Region V value.
Methylene chloride	0.046 B - 0.063 B	4/60	11	0.001	No	No	Blank contaminant.
Methyl ethyl ketone	0.006 J - 9.8	8/60	8,700	--	No	NA	Maximum detection below USEPA Region V value.
Methyl isobutyl ketone	0.001 J - 390	8/60	5,200	--	No	NA	Maximum detection below USEPA Region V value.
Styrene	0.001 J - 52	5/60	2,200	0.2	No	Yes	Maximum detection below USEPA Region V value but exceeds SSL for soil-to-groundwater.
1,1,2,2-Tetrachloroethane	0.007 J - 0.011 J	3/60	0.90	0.0002	No	Yes	Maximum detection below USEPA Region V value but exceeds SSL for soil-to-groundwater.
Tetrachloroethylene	0.002 J - 0.02 J	4/60	7	0.003	No	Yes	Maximum detection below USEPA Region V value but exceeds SSL for soil-to-groundwater.

TABLE 6-6 (Continued)

PRELIMINARY RISK SCREENING FOR CONSTITUENTS OF INTEREST TANK FARM AREA SOIL (HISTORICAL DATA)

Constituent	Range of Detections (mg/kg)	Frequency of Detection	USEPA Region V DQL[1] (mg/kg)	USEPA SSLs Soil/GW[2] (mg/kg)	COI Soil	COI Soil-to-GW	Comments
Toluene	0.002 J - 630	20/60	1,900	0.6	No	Yes	Maximum detection below USEPA Region V value but exceeds SSL for soil-to-groundwater.
Trichloroethylene	0.002 J	1/60	7,100	0.003	No	No	Maximum detection below USEPA Region V value and SSL for soil-to-groundwater.
Trichlorofluoromethane	0.001 J	1/60	710	--	No	NA	Maximum detection below USEPA Region V value.
Xylenes	0.004 J - 2,100	32/60	980	9	Yes	Yes	Maximum detection exceeds both USEPA Region V value and SSL for soil-to-groundwater.

[1] USEPA Region V DQLs are derived exclusively from USEPA Region IX residential soil PRGs (1995) as per USEPA Region V (1995a).
[2] A conservative dilution/attenuation factor of 1 has been applied. USEPA (1996a) provides SSLs for soil-to-groundwater migration with a DAF of 20 for sites <1/2 acre in size and a DAF of 1 for sites >30 acres. Because the Tank Farm is larger than 1/2 acre (approx. 1 acre), the more conservative DAF of 1 was applied.
[3] The value for methyl isobutyl ketone was used as a surrogate based on structural similarity.

NA - Not applicable because a SSL for soil-to-groundwater was not available (USEPA, 1996a) for this constituent.

TABLE 6-7

PRELIMINARY RISK SCREENING FOR CONSTITUENTS OF INTEREST
INTERCEPTOR BASIN OUTFALL (SWMU 20) SEDIMENTS
HUMAN HEALTH RISK ASSESSMENT

Constituent	Range of Detections (mg/kg)	Range of Detection Limits (mg/kg)	Frequency of Detection	USEPA Region V DQL Soil[1] (mg/kg)	Constituent of Interest	Rationale for Exclusion
ORGANICS						
Acetone	0.011 J - 0.040 J	--	4/4	2,000	No	Maximum detection below USEPA Region V value.
Methylene chloride	0.0041 J - 0.0048 J	0.0068 - 0.0071	2/4	11	No	Maximum detection below USEPA Region V value.
n-Propylbenzene	0.006 J	0.0066 - 0.0071	1/4	19[2]	No	Maximum detection below USEPA Region V value.
Tetrachloroethylene	0.0035 J	0.0068 - 0.0071	1/4	7	No	Maximum detection below USEPA Region V value.
1,2,4-Trimethylbenzene	0.011 J	0.0066 - 0.0071	1/4	980[3]	No	Maximum detection below USEPA Region V value.
Xylenes	0.10	0.0066 - 0.0071	1/4	980	No	Maximum detection below USEPA Region V value.
INORGANICS						
Aluminum	11,400 - 15,000	--	4/4	77,000[5]	No	Maximum detection below USEPA Region IX value. Not statistically different from background.[4]
Arsenic	5.2 - 6.5	--	4/4	0.32	No	Not statistically different from background.[4]
Barium	93.2 - 104	--	4/4	5,300	No	Maximum detection below USEPA Region V value. Not statistically different from background.[4]
Cadmium	0.29 - 0.43	--	4/4	38	No	Maximum detection below USEPA Region V value.
Calcium	3,010 - 8,470	--	4/4	--	No	Low inherent toxicity.
Chromium	21.7 - 26.8	--	4/4	210	No	Maximum detection below USEPA Region V value. Not statistically different from background.[4]
Iron	20,500 - 22,300	--	4/4	--	No	Low inherent toxicity. Not statistically different from background.[4]

TABLE 6-7 (Continued)

PRELIMINARY RISK SCREENING FOR CONSTITUENTS OF INTEREST INTERCEPTOR BASIN OUTFALL (SWMU 20) SEDIMENTS

Constituent	Range of Detections (mg/kg)	Range of Detection Limits (mg/kg)	Frequency of Detection	USEPA Region V DQL Soil[1] (mg/kg)	Constituent of Interest	Rationale for Exclusion
Lead	14.7 - 20.9	--	4/4	400	No	Maximum detection below USEPA Region V value.
Magnesium	3,720 - 8,050	--	4/4	--	No	Low inherent toxicity.
Mercury	0.061 J - 0.12	--	4/4	23	No	Maximum detection below USEPA Region V value.
Nickel	21.6 - 26.2	--	4/4	1,500	No	Maximum detection below USEPA Region V value. Not statistically different from background.[4]

[1] USEPA Region V DQLs (1995a) are derived exclusively from USEPA Region IX residential soil PRGs (USEPA Region IX, 1995). Comparing sediment concentrations to soil PRGs is a very conservative practice as potential exposure frequency with sediments would be much lower than those with residential soil.

[2] The USEPA residential soil PRG (1995) for cumene was used conservatively as a surrogate because this constituent is similar in structure and more acutely toxic than n-propylbenzene (Sax and Lewis, 1989). There was no USEPA Region V DQL (1995a) for either constituent.

[3] Xylene was used as a surrogate because it is similar in structure. Xylene may be somewhat less acutely toxic than 1,2,4-trimethylbenzene (Sax and Lewis, 1989); however, the maximum detection is four orders of magnitude lower than the PRG for xylene. Therefore, 1,2,4-methylbenzene is unlikely to be present at a level of concern for human receptors in sediment.

[4] As per USEPA guidance (1995), an ANOVA of background data and site data sets for inorganic constituents was performed. The data set for this constituent was not found to be statistically different from background (Appendix E-1).

[5] Value is USEPA Region IX residential soil PRG (1995) because there was no USEPA Region V DQL for aluminum.

TABLE 6-8

SUMMARY OF CONSTITUENTS OF INTEREST
PPG OAK CREEK FACILITY, RFI

Area	Medium	Constituents of Interest	Human Health Risk Assessment
SWMU 3	Soil	None identified	Acceptable - No COIs
SWMU 4	Soil	None identified	Acceptable - No COIs
SWMU 8 (RFA 14)	Soil	None identified	Acceptable - No COIs
SWMU 9	Soil	None identified	Acceptable - No COIs
SWMU 20	Sediment	None identified	Acceptable - No COIs
Tank Farm Area [SWMUs 8(RFA 11, 12 and 13), 17, 18]	Soil	Ethylbenzene Xylenes	Evaluate quantitatively (Continue to Section 6.3)

TABLE 6-9

IDENTIFICATION OF COMPLETE EXPOSURE PATHWAYS
CURRENT BASELINE RISK ASSESSMENT

Exposure Medium	Potential Receptors	Potential Exposure Routes	Pathway Complete
Surface Soil	Industrial Worker	Incidental Ingestion Dermal Contact	Yes. Constituents of interest were identified in soils of the Tank Farm Area.
Subsurface Soil	None	None	No. Constituents of interest were identified in soil, but no receptors routinely contact subsurface soil.
Groundwater	None	None	No. There is no current or anticipated future use of groundwater.
Air - Volatiles	Industrial Worker	Inhalation	Yes. Volatile constituents of interest were identified for inhalation pathways.
Air - Particulates	None	None	No. Although wind erosion could generate airborne soil particles from surface soil, identified COIs are more likely to volatilize than remain adsorbed to an airborne soil particle.

TABLE 6-10

CALCULATION OF CONSTITUENT-SPECIFIC VOLATILIZATION FACTORS

Equation:

$$VF\ (m^3/kg) = Q/C \times \frac{(3.14 \times Da \times T)^{1/2}}{(2 \times Pb \times Da)} \times 10^{-4}\ (m^2/cm^2)$$

where:

$$Da\ (cm^2/s) = \frac{(Ea^{10/3} \times DiH' + Ew^{10/3}\ Dw) / n^2}{PbKd + Ew + EaH'}$$

Parameter	Symbol	Value	Units	Source
dispersion factor	Q/C	68.81	$\frac{(g/m^2\text{-}s)}{(kg/m^3)}$	USEPA (1996b) default
air-filled soil porosity	Ea	0.284	L_{air}/L_{soil}	n - Ew
total soil porosity	n	0.434	L_{pore}/L_{soil}	1 - (Pb/Ps)
water-filled soil porosity	Ew	0.15	L_{water}/L_{soil}	USEPA (1996b) default
dry soil bulk density	Pb	1.5	g/cm^3	USEPA (1996b) default
soil particle density	Ps	2.65	g/cm^3	USEPA (1996b)default
diffusivity in air	Di	ethylbenzene = 0.075 xylenes = 0.087	cm^2/sec	USEPA (1996b)
Henry's Law Constant	H'	ethylbenzene = 0.323 xylenes = 0.276	unitless	USEPA (1996b)
diffusivity in water	Dw	ethylbenzene = 7.8 E-06 xylenes = 2.6 E-05	cm^2/sec	USEPA (1996b)
soil-water partition coefficient	Kd	ethylbenzene = 2.178 xylenes = 2.316	cm^3/g	Koc x foc
soil-organic carbon partition coefficient	Koc	ethylbenzene = 363 xylenes = 386	cm^3/g	USEPA (1996b)
exposure interval	T	9.5×10^8	sec	USEPA (1996b) default
fraction organic carbon	foc	0.006	g/g	USEPA (1996b) default

$$C_{air} = \frac{EPC_{soil}}{VF}$$

COI	C_{sat} (mg/kg)	EPC_{soil} (mg/kg)	VF (m^3/kg)	C_{air} (mg/m^3)
Ethylbenzene	230	810	5322	0.15
Xylenes	320	2100	5491	0.38

TABLE 6-11

GENERAL FORMULA FOR CALCULATION OF CONSTITUENT INTAKES

Equation:

$$Intake\ (mg / kg - day) = \frac{C \times CR \times EF \times ED}{BW \times AT}$$

Symbol	Factor	Units	Comments
C	Constituent Concentration	mg/kg, mg/m^3	Concentration of Constituents
CR	Contact Rate	mg/day, m^3/hr	Receptor's rate of contact with environmental medium
EF	Exposure Frequency	days/year	Days per year that receptor may be exposed
ED	Exposure Duration	years	Number of years during which receptor may be exposed
BW	Body Weight	kilograms	Intake is normalized for receptor's body weight
AT	Averaging Time	days	Period over which exposure is averaged

TABLE 6-12

VALUES USED IN DOSE CALCULATIONS - INCIDENTAL INGESTION OF SOIL

Equation:

$$\text{Total Ingested Dose} = \frac{CS \times IR \times CF \times EF \times ED \times ABS_G}{BW \times AT}$$

Symbol	Exposure Factor	Current On-Site Worker
CS	Constituent Concentration in Soil (mg/kg)	Constituent and Area Specific
IR	Soil Ingestion Rate	50 mg/day
CF	Conversion Factor	1×10^{-6} kg/mg
EF	Exposure Frequency	250 days/year
ED	Exposure Duration	25 years
ABS_G	Gastrointestinal Bioavailability Factor (unitless)	1
BW	Body Weight	70 kg
AT	Averaging Time	25,550 days (C) ED x 365 days (NC)

(NC) Noncarcinogenic averaging time.
(C) Carcinogenic averaging time.

TABLE 6-13

VALUES USED IN DOSE CALCULATIONS - DERMAL CONTACT WITH SOIL

Equation:

$$\text{Total Dermally Absorbed Dose} = \frac{CS \times CF \times SA \times AF \times ABS_D \times EF \times ED}{BW \times AT}$$

Symbol	Exposure Factor	Current On-Site Worker
CS	Constituent Concentration in Soil (mg/kg)	Constituent Specific
CF	Conversion Factor	1×10^{-6} kg/mg
SA	Skin Surface Area Exposed	2,000 cm^2
AF	Soil Adherence Factor	0.07 mg/cm^2
ABS_D	Dermal Absorption Factor (unitless)	Chemical Specific
EF	Exposure Frequency	250 days/year
ED	Exposure Duration	25 years
BW	Body Weight	70 kg
AT	Averaging Time	ED x 365 days (NC) 25,550 (C)

(NC) Noncarcinogenic averaging time.
(C) Carcinogenic averaging time.

TABLE 6-14

VALUES USED IN DOSE CALCULATIONS - INHALATION OF VOLATILE CONSTITUENTS IN AIR

Equation:

$$\text{Total Inhaled Dose} = \frac{CA \times IR \times EF \times ET \times ED}{BW \times AT}$$

Symbol	Exposure Factor	Current On-Site Worker
CA	Constituent Concentration in Air ($mg/m^{3)}$	Constituent Specific
IR	Inhalation Rate	2.5 m^3/day
EF	Exposure Frequency	250 days/year
ET	Exposure Time	8 hours/day
ED	Exposure Duration	25 years
BW	Body Weight	70 kg
AT	Averaging Time	ED x 365 days (NC) 25,550 days (C)

(NC) Noncarcinogenic averaging time.
(C) Carcinogenic averaging time.

TABLE 6-15

SUMMARY OF HEALTH RISK CALCULATIONS - CURRENT ON-SITE WORKER TANK FARM AREA

Exposure Pathway	Hazard Index	Theoretical Excess Lifetime Cancer Risk
Incidental Ingestion of Soil	0.004	NC
Dermal Contact with Soil	0.001	NC
Inhalation of Volatile Constituents	0.14	NC
TOTAL	0.15	NC

NC = Constituents of interest are not carcinogenic.

7. ECOLOGICAL RISK ASSESSMENT

7.1 INTRODUCTION

This section presents the results of an ecological risk assessment which evaluates the potential for adverse effects to non-domesticated flora and fauna associated with various SWMUs at the Site. Ecological risk assessment, as defined by the USEPA's "*Framework for Ecological Risk Assessment*", is a process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors (USEPA, 1992d). The potential stressors that have been identified in association with the areas of concern at the Site are primarily constituents that have been released to environmental media within the SWMUs or in nearby areas. Therefore, the purpose of the ecological risk assessment is to provide a qualitative and quantitative analysis of the likelihood of adverse effects to receptor ecosystems associated with releases of these constituents to environmental media.

The ecological risk assessment has been conducted in accordance with USEPA Federal and Region V guidance (USEPA, 1989c; 1992d; 1996c; U.S. EPA Region V, 1994). The objectives of this ecological risk assessment are to:

- Qualitatively characterize the potential ecological receptors that have been observed or could be present in terrestrial or aquatic habitats on or adjacent to the site;

- Assess potential exposures of ecological receptors to constituents of interest in various environmental media within terrestrial or aquatic habitats under current conditions; and

- Characterize the risks associated with exposures of ecological receptors to constituents of interest in various environmental media under current conditions.

The ecological risk assessment uses the general framework outlined in the USEPA's *Framework for Ecological Risk Assessment* (USEPA, 1992d; 1996c). This framework is conceptually similar to the approach used for the human health risk assessment, but is distinctive in its emphasis in three areas:

- The ecological risk assessment considers effects beyond those on individuals of a single species and examines effects on populations, communities, or ecosystems;

- There is no single set of ecological values or resources to be protected that can be generally applied to every site; and

- If appropriate, the ecological risk assessment can consider non-chemical as well as chemical stressors.

This ecological risk assessment, which is based on USEPA (1992d; 1996c) guidance, consists of three main elements:

- **Problem Formulation.** Review of available physical and biological data on the site and on receptor habitats that may be affected by releases of constituents to environmental media to (1) identify potential ecological receptors (i.e., biological communities, populations, individuals, or habitats potentially at risk); (2) identify the COIs and other stressors for ecological receptors; (3) identify potential exposure pathways; and (4) determine the appropriate assessment and measurement endpoints for the ecological risk assessment.

- **Analysis (Exposure and Effects Assessments).** If ecological receptors are identified with significant complete exposure pathways, an analysis phase is warranted. This is an estimation of the magnitude of exposure of the ecological receptors to the COIs and identification of exposure-response standards for COIs in environmental media for which there are complete exposure pathways.

- **Risk Characterization.** Description of the nature and the magnitude of potential environmental risks by comparing exposure estimates and exposure-response standards for ecological receptors, evaluation of the necessity for remedial action or further studies, and discussion of the uncertainties in the analysis.

This document is organized in a manner consistent with the above-mentioned elements of an ecological risk assessment. The results of these elements of the ecological risk assessment for the site are described in the following subsections.

7.2 PROBLEM FORMULATION

The objectives of the problem formulation phase are to identify potential ecological receptor species and habitats, to determine the COIs and other stressors, and to determine the assessment and measurement endpoints to be evaluated in the ecological risk assessment. The problem formulation is used to create a conceptual site model by describing the ecological receptors and exposure pathways to be evaluated during the analysis phase. As such, the problem formulation consists of the following steps:

- Identification of potential ecological receptors,
- Description of the conceptual site model,
- Selection of the COIs, and
- Selection of appropriate assessment and measurement endpoints.

The following subsections describe the results of these steps.

7.2.1 Potential Ecological Receptors

The Site is located in a mixed agricultural, industrial, and residential area of the City of Oak Creek and is bounded by agricultural land, South 13th Street, and a right-of-way of the Chicago, Milwaukee, and St. Paul Railroad.

Potential receptor habitats and receptors were identified from previous surveys of the Site and adjacent areas and observations during visits to the Site (Warzyn, 1992b). These surveys include information on common native species in these areas and on state- or federal-listed threatened or endangered species reported to inhabit the vicinity of the Site.

7.2.1.1 Threatened or Endangered Species Considerations

A previous review of records of threatened or endangered species in the vicinity of the Site indicates that a state-endangered plant species, heartleaf plaintain (*Plantago cordata*) is reported from wetlands approximately 0.5 miles downstream along the small, unnamed tributary that receives runoff from the Site. However, exposure in wetlands downstream of the Site is unlikely to occur unless significant concentrations of COIs are found in the unnamed tributary directly adjacent to the outfall.

7.2.1.2 Terrestrial Receptor Habitats

Most of the Site is covered by roads, parking lots, gravel, or buildings, is vegetated at most by mown grass, and does not support viable habitat for terrestrial ecological receptors. This includes SWMUs 3, 4, and 9 (i.e., Container Accumulation Areas), SWMU 17 (Impoundment Basin), SWMU 18 (Tank Farm Sump), and Resin Plant DCS in SWMU 8 (RFA 14). Land-use immediately adjacent to the Site is either for agriculture or for transportation right-of-way. Therefore, there are no significant habitats for terrestrial ecological receptors immediately adjacent to the Site. An approximately 40-acre area of beech woods [known as the Root River Forest and classified as a natural and scientific area (SEWRPC, 1987)] is located approximately 900 feet southeast of the Site along the unnamed tributary that receives runoff from the Site. However, this area would not receive direct releases from the Site.

7.2.1.3 Wetlands

A previous review of information on wetlands in the vicinity of the Site indicates that there is a wetland approximately 100 feet downstream of the Site along the unnamed tributary that receives runoff from the Site. Other wetland areas 3,000 feet to the northeast and 700 to 1,000 feet to the south along Root River are not hydraulically connected with the Site. Exposure in wetlands downstream from the Site is unlikely to occur unless significant concentrations of COIs are found in the unnamed tributary directly adjacent to the outfall.

7.2.1.4 Aquatic Receptor Habitats

Surface water leaving the Site consists entirely of stormwater runoff. Most stormwater runoff from manufacturing areas of the Site (i.e., the north yard area, roof drains from the paint and resin plants, the employee parking lot, and internal roads and yard areas) is routed to the interceptor basin. The contents of

the interceptor basin are released through a WPDES-regulated outfall (SWMU 20) to the unnamed tributary along the eastern edge of the property that flows to the Root River. Two other small drainage swales empty into the unnamed tributary. These swales receive runoff from small areas in the southeast and northeast corners of the Site, including the north employee parking lot, the grass area along the north property line, and a gravel parking area occasionally used to stage trailers.

Runoff from the south side of the manufacturing facility, including the shipping and receiving area, the grassy area along the west property boundary, the trailer and tank wagon parking areas, and roof drains from the administrative/technical building and finished good warehouse is conveyed primarily through underground pipes to the drainage ditch along South 13th Street, that ultimately discharges to the Root River. However, this area of the facility does not encompass any SWMUs requiring further action, and the drainage ditch is not significant ecological habitat.

Runoff from other areas of the site, including the above-ground and underground Tank Farm Area, were formerly routed to an impoundment basin south of the Tank Farm Area. This basin has recently been removed and replaced with an above-ground tank farm. This runoff water is now contained in the north-south running drainage trench that was blocked off at the northern edge of the former basin. The contained water is sampled by PPG and is disposed in the interceptor basin or, if impacted, at an off-site disposal facility. Therefore, this surface water is only released from the site after it is sampled to assure that it meets WPDES standards.

Aquatic receptor habitat associated with the Site are found within the unnamed tributary, which receives discharges from the interceptor basin outfall (SWMU #20). Ecological receptor species in this tributary would be aquatic invertebrates or fish. While wetlands that are downgradient of the Site along this unnamed tributary could also be exposed to constituents transported by the unnamed tributary, exposure in these habitats would only be significant if ecologically significant concentrations are found in the unnamed tributary directly adjacent to the outfall.

7.2.2 Conceptual Site Model

A conceptual Site model was developed for facility to focus the assessment on those ecological receptors and exposure pathways most relevant to current Site conditions. The conceptual Site model identifies the likely transport and exposure pathways for COIs in various environmental media to ecological receptors associated with the Site.

7.2.2.1 Potential Exposure Pathways

Part of the rationale for selection of ecological receptor habitats and species is the presence of complete exposure pathways for the COIs. A complete exposure pathway is one that meets the following four criteria (USEPA, 1989c):

- A source of COIs must be present;
- Release and transport mechanisms and media must be available to move the chemicals from the source to the ecological receptors;
- An opportunity must exist for the ecological receptors to contact the affected media; and
- A means must exist by which the chemical is taken up by ecological receptors, such as ingestion or dermal contact.

Source, Release Mechanisms, Transport Media, and Exposure Media

Review of data for the Site indicate that any releases to environmental media have generally occurred as a result of spills, which occurred during normal operations, but these spills have been limited by an established spill control program and secondary containment. In addition, soils are generally covered by asphalt, cement, gravel, or buildings, and there is no significant ecological habitat. Because of this, soils would not be exposure media for ecological receptors. In addition, suspected releases of COIs could infiltrate to groundwater or be transported by surface stormwater runoff. Groundwater is not an exposure medium for ecological receptors, but stormwater runoff could be a transport medium for COIs.

Potentially-impacted stormwater runoff from the Site is primarily routed to the interceptor basin and is released though a WPDES-permitted outfall. Currently, controls are in place on this outfall that contain surface water that does not meet WPDES standards. Therefore, surface water is not a significant exposure media for aquatic receptors in the unnamed tributary. However, there may have been periods in the past when releases did not meet WPDES standards, and certain constituents may persist in sediments of the unnamed tributary. Sediments would be exposure media for aquatic receptors, such as fish or aquatic invertebrates.

Potential Exposure Points

An exposure point is a location of contact between ecological receptors and COIs. There are no exposure points in terrestrial habitats associated with Site. The Site does not contain significant ecological habitat, and there are no exposure points with surface soil for terrestrial receptors. Also, there are no exposure pathways for subsurface soils or groundwater. Current surface water discharges through Outfall 001, and release controls are in place that would prevent release of water that does not meet the WPDES standards. Therefore, surface water would not be a significant exposure point for aquatic receptors. Certain constituents, however, could persist in sediments from previous releases, and sediments would be a potential exposure point for aquatic receptors in the unnamed tributary.

Potential Exposure Routes

An exposure route is the mechanism by which a receptor species might take up a chemical. For aquatic receptors, exposure to COIs in sediments occurs primarily through direct contact with the sediments.

7.2.2.2 Complete Exposure Pathways

On the basis of this evaluation, there is a complete exposure pathway for sediments in the unnamed tributary adjacent to the Site. COIs in sediments potentially could impact aquatic receptors in the unnamed tributary. The next section presents an analysis of whether there are any potential COIs associated with sediments.

7.2.3 Selection of COIs

This step involves the selection of the constituents that have potential for adversely impacting aquatic receptors in the unnamed tributary adjacent to the Site. COIs are selected based on their concentration in sediments, environmental fate and transport considerations, and ecological toxicity. Constituents resulting from past activities at the Site, that were detected or measured at concentrations in sediments above concentrations with the potential to have adverse effects on aquatic receptors and for which there are obvious transport and exposure pathways were selected as the COIs for ecological receptors.

Table 6-1 found in the human health risk assessment section includes a list of all the sediment samples that were evaluated in the ecological assessment. Several organic constituents were detected in sediments.

An important step in the ecological risk assessment is the identification of the COIs for sediment in the unnamed tributary adjacent to the Site. COIs are those constituents that are present as a result of past activities at the Site and have the potential to adversely affect ecological receptors.

Identification of COIs is accomplished by qualitative methods. First, the concentration of a constituent detected in sediments is compared to background concentrations, if available, to determine whether the constituent concentration is above background levels and likely to be site-originated. In order to compare Site data with background, standard statistical procedures as outlined in USEPA (1995) are used. These procedures include either the parametric one-way Analysis of Variance (parametric ANOVA) or the non-parametric Wilcoxon rank-sum test. The parametric ANOVA is generally considered the preferred test for these comparisons, but the use of the parametric ANOVA requires that less that 15% of the data are non-detects, the data fit a normal or log-normal distribution and that the subgroups to be compared have equal variances. Therefore, these assumptions were first tested.

The assumption that the data fit a normal or lognormal distribution was tested with the Shapiro-Wilk test (Gilbert, 1987). To test for fit to a lognormal distribution, the data were transformed by taking the $\log_e$ of each sample observation. For constituents in which the data fit a normal or lognormal distribution and less than 15% of the samples are nondetects, the assumption that the variances were equal between the subgroups was tested with the F test for homogeneity of variance (Sokal and Rohlf, 1969).

If both of the above assumptions were met for a constituent and medium, a parametric ANOVA test was used to test the hypothesis that the Site data were not significantly greater than background (USEPA, 1995). If any of the assumptions were not met, the Wilcoxon rank-sum test was used (USEPA, 1995). Appendix E-1 contains a more detailed description of the methods and results of this statistical analysis.

Second, it is appropriate to make a qualitative assessment of the risk associated with a Site-originated constituent by comparing the maximum detected concentration to established environmental criteria for protection of ecological receptors. These criteria include USEPA sediment quality criteria (USEPA, 1993) or Ontario sediment quality guidelines for sediments (OME, 1993). In the absence of such criteria for organic constituents, equivalent criteria may be calculated from ambient water quality criteria (AWQC) with the sediment equilibrium-partitioning methods used to calculated the USEPA sediment quality criteria. The screening process for sediments in the unnamed tributary adjacent to the Site is presented in Table 7-1 and described in the following subsection.

7.2.3.1 Sediments - Unnamed Tributary

Detected constituents, their ranges of detection, basis for identifying COIs for sediments of the unnamed tributary are presented in Table 7-1. Discussion of this process for constituents in sediments of the unnamed tributary follows.

Comparison with Background. As described, the concentrations of inorganic constituents in sediments of the unnamed tributary were compared with soil background samples taken at the Site (Table 6-1). The results of the Shapiro-Wilk test, the results of the F-test, and the results of the parametric ANOVA test are presented in Appendix E-1. On the basis of this comparison, aluminum, arsenic, barium, chromium, iron, and nickel were excluded as COIs.

Low Inherent Toxicity. Constituents that are essential nutrients or are known to be of low toxicity were excluded as COIs. Calcium and magnesium were excluded as COIs in sediments on the basis.

Ontario Provincial Sediment Quality Guidelines. The Water Resources Branch of the Ontario Ministry of the Environment has published guidelines for ecological effects of sediments-sorbed chemicals [primarily metals, nutrients, persistent pesticides, polychlorinated biphenyls (PCBs), and PAHs] (OME, 1993). The lowest effect level (LEL) from these guidelines is cited by USEPA Region V (1996b) as an appropriate

sediment screening value and was used to screen the COIs in sediments in the absence of an USEPA Sediment Quality Criterion. On this basis, cadmium, lead, and mercury were excluded as COIs in sediments.

Sediment Quality Criteria based on Freshwater Chronic AWQC. The USEPA's published sediment quality criteria (1993) are derived by calculating the sediment concentration that results in pore water concentrations equal to a final chronic value which is equivalent to the freshwater chronic AWQC (USEPA, 1993). For organic chemicals with freshwater chronic AWQCs (USEPA, 1986), a sediment quality criterion was calculated with these methods as outlined in Table 7-2. If AWQCs were not available, the secondary chronic value as calculated by Suter and Mabrey (1994) was used to calculate a sediment criterion. The sediment criterion was compared to the maximum detected sediment concentration. On this basis, acetone, methylene chloride, n-propylbenzene, tetrachloroethylene, 1,2,4-trimethylbenzene, and xylenes were excluded as COIs in sediments.

7.2.3.2 Summary

Based on comparisons with the above criteria, all detected constituents in sediments were excluded as COIs. As a result, there are no COIs in sediments of the unnamed tributary adjacent to the Site. Because there are no COIs in sediments, the one environmental medium that is a potential exposure medium for ecological receptors, there are no complete exposure pathways for ecological receptors. Therefore, it is not necessary to conduct the analysis phase of the ecological risk assessment is needed.

7.3 RISK CHARACTERIZATION

Because most of the SWMU areas are covered by asphalt, concrete, gravel, or buildings and there are no significant habitats for terrestrial ecological receptors, there are no ecological exposure pathways for soils. There are also no ecological exposure pathways for groundwater.

Surface water, which is released to the unnamed stream adjacent to the Site, is discharged in compliance with a WPDES permit and therefore is not a significant exposure medium for aquatic receptors. Sediments could be an exposure medium for aquatic receptors, but no COIs were identified in sediments in the problem formulation. Because there are no COIs present, sediments do not represent a significant exposure pathway for ecological receptors.

Because there are no significant exposure pathways for environmental media, there is no potential for adverse effects to ecological receptors associated with the Site. Therefore, no corrective measures are warranted to protect ecological receptors.

TABLE 7-1

PRELIMINARY SCREENING FOR CONSTITUENTS OF INTEREST
INTERCEPT BASIN OUTFALL (SWMU 20) SEDIMENTS
ECOLOGICAL RISK ASSESSMENT

Constituent	Range of Detections (mg/kg)	Frequency of Detection	Sediment Criteria[1] (mg/kg)	Constituent of Interest	Rationale for Exclusion
ORGANICS					
Acetone	0.011 J - 0.040 J	4/4	0.064	No	Maximum detection below sediment value.
Methylene chloride	0.0041 J - 0.0048 J	2/4	0.033	No	Maximum detection below sediment value.
n-Propylbenzene	0.006 J	1/4	2.11[2]	No	Maximum detection below sediment value.
Tetrachloroethylene	0.0035 J	1/4	0.260	No	Maximum detection below sediment value.
1,2,4-Trimethylbenzene	0.011 J	1/4	4.52[3]	No	Maximum detection below sediment value.
Xylenes	0.10	1/4	0.508	No	Maximum detection below sediment value.
INORGANICS					
Aluminum	11,400 - 15,000	4/4	--	No	Not statistically different from background.[4]
Arsenic	5.2 - 6.5	4/4	6	No	Not statistically different from background.[4]
Barium	93.2 - 104	4/4	--	No	Not statistically different from background.[4]
Cadmium	0.29 - 0.43	4/4	0.6	No	Maximum detection below sediment value.
Calcium	3,010 - 8,470	4/4	--	No	Low inherent toxicity.
Chromium	21.7 - 26.8	4/4	26	No	Not statistically different from background.[4]
Iron	20,500 - 22,300	4/4	--	No	Not statistically different from background.[4]
Lead	14.7 - 20.9	4/4	31	No	Maximum detection below sediment value.
Magnesium	3,720 - 8,050	4/4	--	No	Low inherent toxicity.
Mercury	0.061 J - 0.12	4/4	0.2	No	Maximum detection below sediment value.
Nickel	21.6 - 26.2	4/4	16	No	Not statistically different from background.[4]

[1] Sediment quality criteria from Table 7-2 for organics and OME (1993) for inorganics.
[2] Benzene used conservatively as surrogate because similar in structure and more acutely toxic than n-propylbenzene (Sax and Lewis, 1989).
[3] Xylene used as a surrogate because similar in structure.
[4] As per USEPA guidance (USEPA, 1995. Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites. R.P. Breckenridge and A.B. Crockett, Office of Research and Development. EPA/540/5-96/500), an ANOVA of background data and site data sets for arsenic was performed. The data sets were not found to be statistically different.

TABLE 7-2

DERIVATION OF SEDIMENT QUALITY CRITERIA FOR CONSTITUENTS WITH AMBIENT WATER QUALITY CRITERIA

Constituent	Chronic Ambient Water Quality Criteron[1] (µg/L)	$\log_{10} K_{ow}$	Reference	$\log_{10} K_{oc}$[2]	Sediment Quality Criterion[3] (mg/kg)
Acetone	122,000[4]	-0.24	Leo et al. (1971)	-0.24	0.064
Methylene chloride	110[5]	1.51	Hansch & Leo (1979)	1.48	0.033
n-Propylbenzene	53[6,5]	3.66	Howard (1997)	3.60	2.11
Tetrachloroethylene	84	2.53	Banerjee et al. (1980)	2.49	0.260
1,2,4-Trimethylbenzene	86.2[7,4]	3.78	Hansch and Leo (1985)	3.72	4.52
Xylenes	86.2[4]	2.77	Leo et al. (1971)	2.72	0.508

[1] Chronic ambient water quality criterion from USEPA (1986).
[2] Calculated from K_{ow} with regression equation from USEPA (1993).
[3] An average sediment TOC concentration of 0.1% was used; the SQC was calculated as outlined in USEPA (1993).
[4] In the absence of any AWQC from USEPA (1986), the secondary chronic value from Suter and Mabrey (1994) was used.
[5] Only an acute LOAEL was available in USEPA (1986), an a chronic NOAEL was estimated by division with an uncertainty factor of 100.
[6] Benzene used conseratively as surrogate because similar structure and more acutely toxic than n-propylbenzene (Sax and Lewis, 1989).
[7] Xylene used as a surrogate because similar structure.

8. NATURE AND EXTENT OF CONTAMINATION

The RFI results and risk assessments presented in previous sections of this report have shown that with the exception of the Tank Farm Area, no site-related constituents were identified at SWMUs at concentrations exceeding levels of concern (i.e., Region V DQLs) or significantly above background levels. Therefore, a detailed discussion on the nature and extent of contamination at these SWMUs is not presented. The Tank Farm Area , however, is more complex for several reasons: 1) The area is subject to both RCRA corrective action and UST regulations, 2) The area has been extensively studied through previous investigations and the RFI and 3) Site conditions have changed through the initiation of construction activities for a new above-ground tank farm in the area. Accordingly, this section provides a detailed discussion of soil and groundwater conditions in the Tank Farm Area to support conclusions and recommendations relating to potential corrective measures.

8.1 TANK FARM AREA SOIL CONDITIONS

The discussion of nature and extent of constituents of interest (COIs) in soils in the Tank Farm Area [including SWMUs 8 (RFA 11, 12, and 13), 17, and 18] is primarily on data contained in the Soil and Groundwater Assessment Report prepared by Warzyn (1992) and collected during the RFI. As discussed in Section 3.5 of this RFI Report (Overview of Previous Investigations), the analytical data set presented in Warzyn's 1992 report contains the appropriate level of QA/QC such that the data can be compiled with RFI data and the total data set used with confidence for risk assessment purposes and subsequent identification of COIs.

Fifty four shallow ("GS" series) and 22 deep ("B" series) test borings were installed in 1991 to assess soil and groundwater conditions in the Tank Farm Area (Warzyn, 1992). A total of 95 soil samples were collected and analyzed for a suite of VOCs by Method 8240 to investigate potential releases in and around the Tank Farm Area. "GS" series borings were advanced to 2 ft-bgs and "B" series borings to depths varying between 20.5 and 35.5 ft bgs. Figure 8-1 provides the location of all soil borings installed at the Tank Farm Area. Note that soils at the location of several of the "GS" series (GS43 through 54) and "B" series (B12 and B13) discussed in this section have been excavated and removed in 1996 as part of the first phase of aboveground storage tank construction.

Based on a comparison of VOC concentrations to risk-based Region V DQLs and USEPA SSLs, seven COIs (1,1,2,2-tetrachloroethane, tetrachloroethylene, ethylbenzene, methylene chloride, styrene, toluene, and xylenes) are present in Tank Farm Area soil. COIs, identified by comparing soil concentrations with Region V DQLs, include ethylbenzene and xylenes. The Region V DQLs are based on conservative residential risk criteria, which take into account potential exposure via incidental ingestion, dermal contact, and inhalation. COIs, identified by comparing soil concentrations to USEPA SSLs for migration from soil to groundwater, include all seven VOCs listed previously. The SSLs are values based on very conservative, default assumptions, which typically overestimate the potential for migration of constituents from soil into groundwater.

Table 8-1 provides a summary of the analytical results from the 1992 borings and sample depths where COI concentrations exceed the Region V DQLs and Table 8-2 indicates where COI concentrations exceeded the USEPA SSLs. Figure 8-2 provides a map summarizing the soil sample locations and depths where COI concentrations exceeded the Region V DQLs and/or SSLs.

As indicated on the tables and Figure 8-2, ethylbenzene, toluene, and xylenes are the constituents that occur at levels of interest most frequently throughout the Tank Farm Area. One or more of these three constituents are present at concentrations of interest in 14 of the 95 (1992) soil samples.

Ethylbenzene concentrations exceed the Region V DQLs in only two of the 95 soil samples. Xylenes exceed the Region V DQL in only five of the 95 soil samples. Toluene concentrations are not above the Region V DQLs in any of the 95 samples. The ethylbenzene and xylene exceedances are in surface or near surface soil samples. However, the results of the human health risk assessment, demonstrate that these two constituents are not present in the Tank Farm Area at concentrations of concern.

The remaining COIs (tetrachloroethylene, 1,1,2,2-tetrachloroethane, methylene chloride, and styrene) were detected infrequently at concentrations exceeding the SSLs, but below Region V DQLs. Methylene chloride and tetrachloroethylene, the most frequently detected of these four COIs were detected in only four of 95 soil samples. Methylene chloride, a common analytical laboratory chemical, was also detected in the associated blank sample. Its presence in the four samples is believed to be an artifact of the laboratory and not attributable to soil conditions in the Tank Farm Area. Tetrachloroethylene, 1,1,2,2-tetrachloroethane, and styrene were found only in surface (0 to 2 ft-bgs) or near surface (1 to 3 ft-bgs) samples. The absence

of these VOCs in deeper samples collected from the Tank Farm Area suggests that leaching to groundwater at concentrations of concern has not occurred.

Although not used in the risk assessment due to the lack of appropriate QA/QC, numerous soil samples were collected from soil borings installed in and around the Tank Farm Area in 1987 ("A" series borings) (OHM, 1987) and in 1995 (the "HA" and "GP" series borings) (Montgomery Watson, 1995). The soil samples were analyzed for ethylbenzene, toluene, and xylene. Analytical results for samples from these borings are consistent with the Warzyn (1992) data. As illustrated on Figure 8-2, ethylbenzene, toluene, xylene, or a combination of these exceeded USEPA SSLs in only seven borings (HA03, HA05, HA07, HA08, GP25, GP35, GP40) in or near the Tank Farm Area. Constituent concentrations did not exceed the Region V DQLs in any of the samples. None of the "A" series sample concentrations exceeded the SSLs.

A portion of the soil located in the Tank Farm Area, was removed in the fall of 1996 during the first phase of the aboveground storage tank construction. A portion of the soil south of the Tank Farm, including that where boring GP40 was located, was removed during the second phase of the aboveground storage tank construction. These soils were disposed in accordance with PPG's Contaminated Soils Management Plan. Additional soils in this area (represented by locations GP25 and GP35) will be removed in the final phase of the aboveground tank farm construction project scheduled for 1998.

8.2 TANK FARM AREA GROUNDWATER CONDITIONS

Twenty five groundwater monitoring wells, inclusive of active and abandoned wells, provide groundwater data for the Tank Farm Area. The locations of the Area wells are shown on Figure 8-3. Four of these wells, TW-2, TW-3, TW-4 and TW-8, installed in 1981 have been abandoned. Four wells (TF-1, TF-2, TF-3 and TF-4), installed in 1994, screened in the tank farm backfill, were installed to record water levels, not for collection of groundwater samples. Of the remaining 17, one well, (LW-5), was reported dry and was never sampled. Five wells (MW-15, LP-1, LP-2, LP-3 and LP-4) are screened approximately five to ten feet below the water table and the remaining 11 wells (MW-9, MW-10, MW-11, MW-12, MW-14, MW-16, LW-1, LW-2, LW-3, LW-4, and LW-6) are screened across the water table.

A drainage system exists in the tank farm backfill. The tank farm underdrain system is extensive, with over 1,400 linear feet of perforated piping adjacent to the underground storage tanks, and additional non-

perforated piping leading between tanks to the system sump. Groundwater is pumped continuously from this sump and discharged to the sanitary sewer system, which conveys the water to the POTW. Groundwater samples have been drawn from this sump since December 1988.

8.2.1 Historic Analytical Results

Table 8-3 provides a summary of the minimum, maximum, and average concentration, and frequency of detection for the constituents detected in historic (pre-RFI) groundwater samples. The summary was compiled from the following sources:

- Groundwater monitoring results for 1988, 1989, 1990, and 1991;
- the 1992 Soil and Groundwater Assessment Report; and
- the UST Leak Detection Program analytical results for 1993 and 1994.

Historic groundwater sampling in the vicinity of the Tank Farm Area has included the sump and 22 monitoring wells (LW-1 through LW-4, MW-9 through MW-16, TW-1 through TW-8, LP-1, and LP-3). Past groundwater testing has included analysis for dissolved lead and an extensive list of more than 100 organic (volatile and semivolatile) compounds.

Only 20 organic compounds have been detected in past Tank Farm Area groundwater samples, primarily from the shallow water table wells. The only constituents detected in samples from deep wells include acetone, methylene chloride, bis(2-ethylhexyl)phthalate, and 2-butanone (MEK) in MW-15 and diethylenetriamine in LP-1 and LP-3.

Organic compounds that have been detected consistently in samples from Tank Farm Area wells (i.e. in more than 75% of the samples from a well) include the following:

- diethylenetriamine (LW-1, LW-2, LW-3, LW-4, LP-1, LP-3, TW-3, and the sump)
- ethylbenzene (LW-4 and the sump)
- Napthalite VM&P Aliphitic (LW-4 and the sump)
- Solvesso 100 (LW-4 and the sump)
- toluene (the sump)

- VM&P Naptha Acetate (LW-4 and the sump)
- xylenes (LW-4 and the sump)
- 2-butanone (the sump)

Samples from Well LW-4 and the sump have historically contained the most frequently detected and elevated concentrations of organic compounds. Organic compounds have never been detected in MW-10, MW-11, and MW-14. Past testing detected dissolved lead in samples from several wells; however, these detections were not persistent or frequent.

8.2.2 RFI Data

During the RFI, nine groundwater monitoring wells were sampled and analyzed for VOCs, SVOCs, alcohols, total metals, and filtered metals. Wells sampled during the RFI include LP-2, LP-4, LW-6, MW-9, MW-10, MW-11, MW-14, MW-15, and MW-16.

Table 8-4 and Figure 8-3 provide a summary of the wells sampled during the RFI that contain constituents at concentrations that exceed the Region V DQLs for groundwater. Wells containing constituents exceeding the Region V DQLs for groundwater include LW-6, MW-9. MW-11, and MW-16. The only constituents detected in samples at concentrations exceeding the DQLs were one VOC (benzene) and two metals (arsenic and lead). Benzene exceeded the DQL in only one well (MW-16). Arsenic exceeded the DQL in four wells (LW-6, MW-9, MW-11, and MW-16) and lead in two (LW-6 and MW-11).

RFI groundwater data for the primary constituents of interest for the Tank Farm Area (ethylbenzene and xylene) are provided in Figure 8-4. These figures show that all Tank Farm Area wells where VOCs have been detected, with the exception of MW-16, are within the groundwater capture zone created by the underdrain sump. VOCs detected at MW-16 are believed to be isolated and of limited extent based on analysis of samples from other, nearby downgradient wells (MW-14 and MW-11) which have never contained detectable concentrations of VOCs. The limited and sporadic detections of lead in Tank Farm Area RFI samples is consistent with the historic groundwater data.

8.3 TANK FARM CONSTITUENT FATE AND TRANSPORT ASSESSMENT

8.3.1 Soil

As discussed in Section 8.1, soil in the Tank Farm Area contains some VOCs, which have the potential to migrate to groundwater at levels of interest based on a comparison to conservative, default USEPA SSL values. The VOCs of interest, primarily ethylbenzene, toluene, and xylene, were found in only about 15 percent (14 of 95) of the soil samples collected throughout the Tank Farm Area (Warzyn, 1992).

The principal migration pathway for the VOCs in soil would be vertically downward toward groundwater. If the constituents illustrated on Figure 8-2 were to migrate to groundwater at levels of interest, they would be hydraulically contained within the capture zone created by the Tank Farm underdrain sump. The RFI groundwater analytical data, which show no VOCs in the Tank Farm Area at concentrations above the DQLs for groundwater, suggest there is limited migration from soil to groundwater and that constituents are contained within the Tank Farm Area by operation of the sump.

8.3.2 Groundwater

Shallow groundwater at the Oak Creek Plant occurs at depths of 5 to 15 feet below ground surface in unconsolidated glacial till usually described as stiff silty clay with traces of sand and gravel (Figure 8-5 through 8-8). These materials appear to be low in hydraulic conductivity, but the formation can have higher-than-expected transmissivity due to the presence of silty/sandy layers. Thin (usually 1 to 4 feet thick) silt or sand layers have been observed in over half of the borings at the site. Transmissivity in this setting would be governed by the degree to which silty/sandy layers are present and the degree of interconnection between these layers. The formation has yielded relatively little water in many of the borings and wells, however other wells have recharged quickly. Hydraulic conductivities were tested in two wells (Wells LP-2 and LW-6) and ranged from 1.5×10^{-4} to 3.7×10^{-3} cm/sec (0.4 to 10 ft/day). The two wells tested were screened across a silty/sandy seam. Consequently the hydraulic conductivities measured reflect the hydraulic conductivity in the more transmissive zones. The hydraulic conductivity of the tills is likely one to two orders of magnitude lower (1×10^{-5} cm/sec).

Facility-wide, groundwater flow is generally toward the south and southeast. The configuration of the water table and inferred groundwater flow directions is depicted in the Tank Farm Area on Figure 8-4. Hydraulic gradients at the eastern side of the facility appear to be controlled by an unnamed surface

drainage that parallels the rail line at the eastern facility boundary. The elevation of this drainage, estimated to be 99 feet (relative to plant datum), represents the local base level for groundwater. Groundwater levels over most of the facility are higher in elevation. Therefore, it is likely that shallow groundwater moving to the east from the site discharges to this drainage.

The Tank Farm underdrain system creates a groundwater depression. The system is designed to maintain groundwater within the Tank Farm backfill at levels below the base of the tanks. Underdrain invert elevations are generally 103 to 104 feet at the west and south side of the Tank Farm, and 100 to 102 feet at the north and east sides. Wells installed immediately adjacent to the underdrain system (LP-3, LP-4, and LW-6) have water level elevations in the range of 100 to 103 feet. These groundwater levels closely match the drain invert design elevations and verify the functioning of the underdrain system. Groundwater elevations surrounding the tank farm are higher than the levels near the underdrain system, with levels eight feet higher to the north, four feet higher to the south, and one to two feet higher to the east. Although there are no local wells to the west of the Tank Farm, it can be inferred that groundwater to the west is comparably higher. The water level data indicate that groundwater in the vicinity of the Tank Farm, and upgradient of the Tank Farm, is effectively captured by the underdrain system.

The preceding conceptual model of groundwater flow allows an estimation of the effects of a shutdown of the underdrain system. A shutdown of the underdrain system would result in equilibration of the Tank Farm area groundwater levels with the surrounding water table, an increase of at least four feet based on nearby monitoring wells. The resulting groundwater levels would be greater than those to the east, and the resulting gradient would cause groundwater from the Tank Farm Area to flow east or toward the unnamed drainage.

8.4 SUMMARY

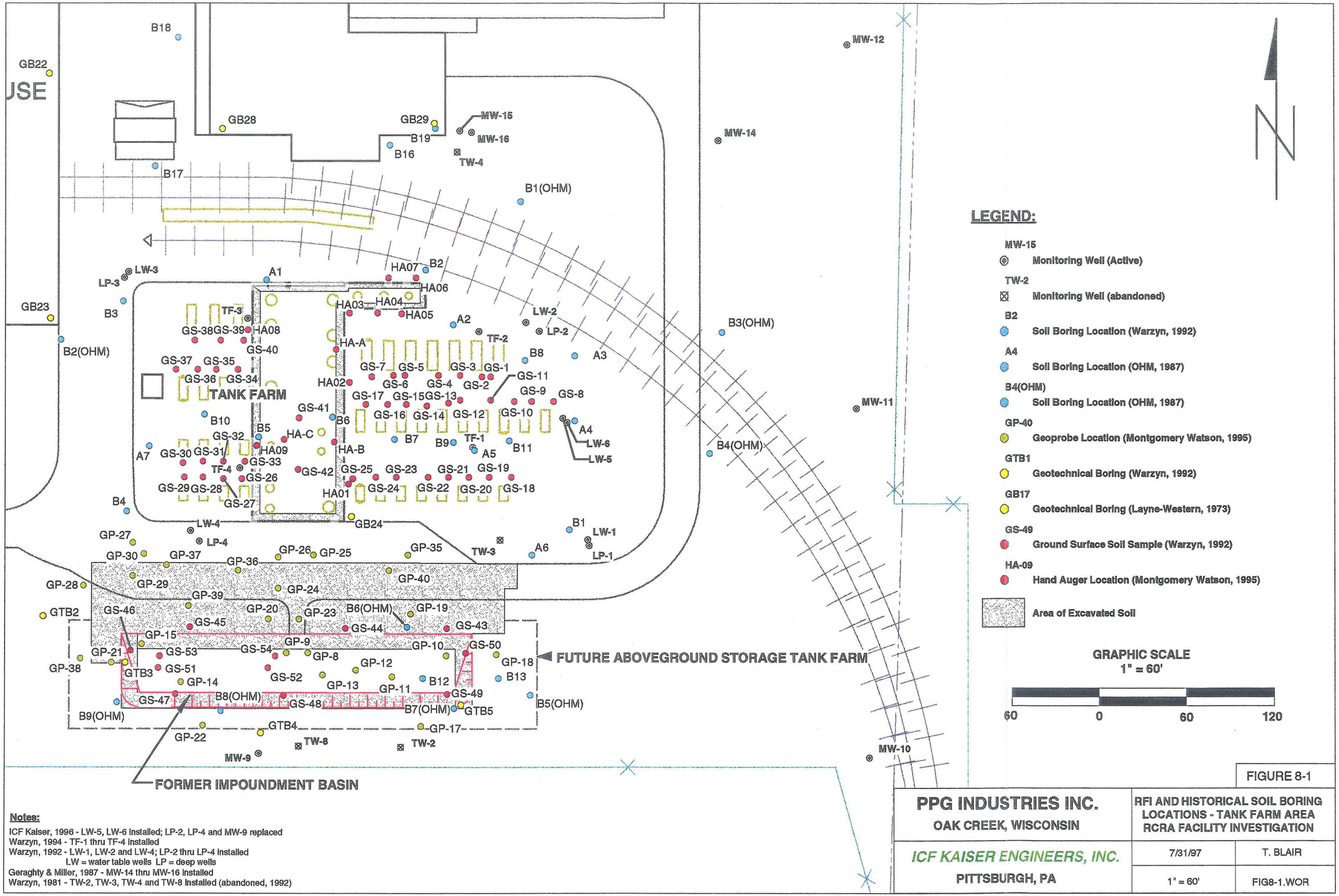
8.4.1 Soils

The risk assessment shows constituents detected in soil at the Tank Farm Area are not present at levels that present a concern to human health or the environment. Although some constituents are present at concentrations exceeding the USEPA SSLs for migration from soil to groundwater, the SSLs are based on very conservative, default assumptions that overestimate soil leaching potential. The RFI groundwater

data, which show no VOCs in groundwater in the immediate vicinity of the Tank Farm at levels above Region V DQLs, suggest that no significant constituent leaching to groundwater from soil is occurring. Also, if constituents were to leach from soil to groundwater in the Tank Farm Area, they would be captured by the existing underdrain sump.

8.4.2 Groundwater

Under current and future conditions in which the underdrain system effectively captures groundwater from the Tank Farm Area, there are no complete exposure pathways for constituents in groundwater. The conceptual model indicates that constituents in Tank Farm Area groundwater could migrate toward the unnamed drainage if groundwater is not captured by the underdrain system. Under such a scenario, there could be complete exposure pathways. This result could occur only if pumping from the underdrain system in the Tank Farm were stopped.



Notes:

ICF Kaiser, 1996 - LW-5, LW-6 installed; LP-2, LP-4 and MW-9 replaced
Warzyn, 1994 - TF-1 thru TF-4 installed
Warzyn, 1992 - LW-1, LW-2 and LW-4; LP-2 thru LP-4 installed
LW = water table wells LP = deep wells
Geraghty & Miller, 1987 - MW-14 thru MW-16 installed
Warzyn, 1981 - TW-2, TW-3, TW-4 and TW-8 installed (abandoned, 1992)

FIGURE 8-1

PPG INDUSTRIES INC. OAK CREEK, WISCONSIN	RFI AND HISTORICAL SOIL BORING LOCATIONS - TANK FARM AREA RCRA FACILITY INVESTIGATION	
ICF KAISER ENGINEERS, INC. PITTSBURGH, PA	7/31/97	T. BLAIR
	1" = 60'	FIG8-1.WOR

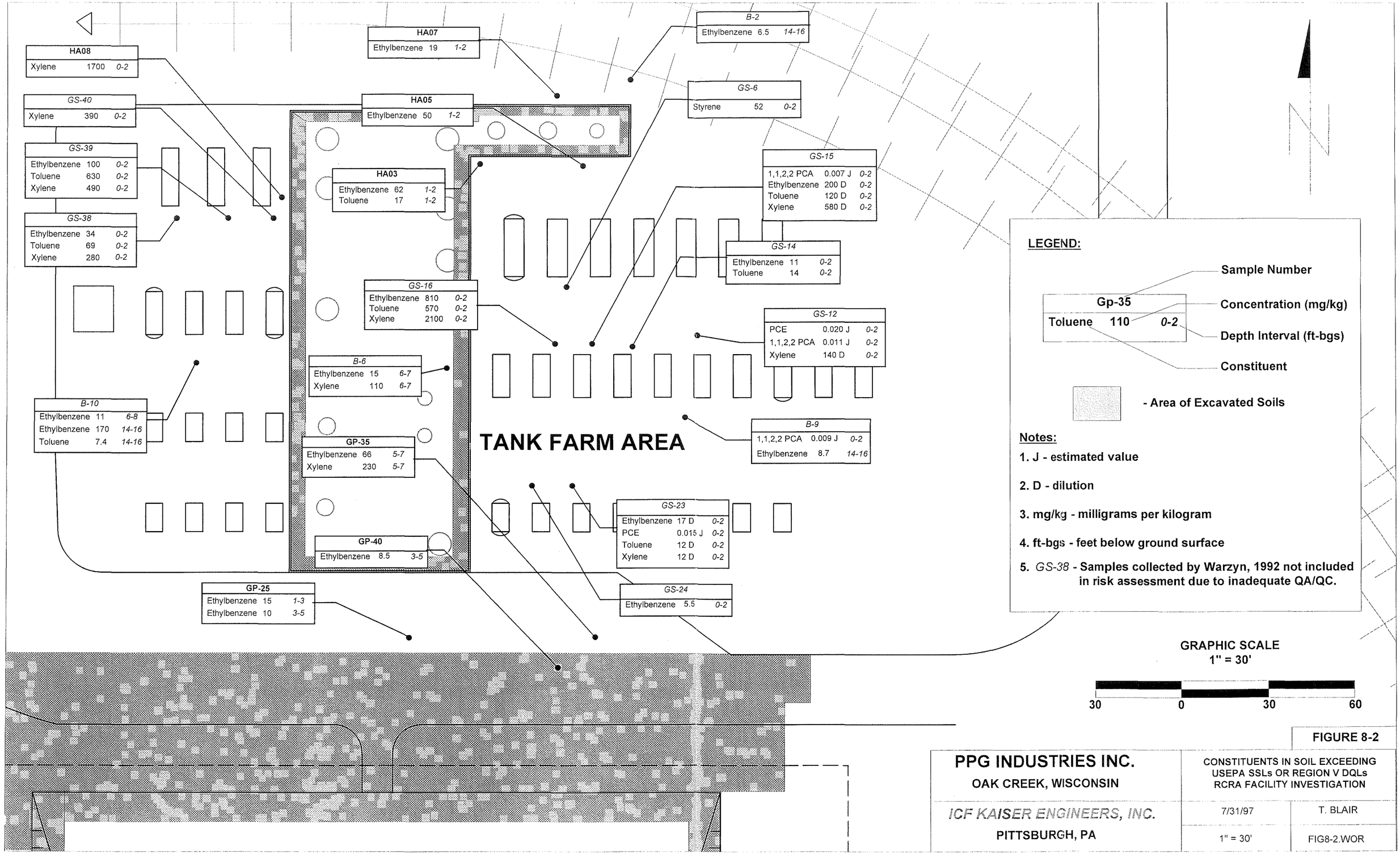


FIGURE 8-2

PPG INDUSTRIES INC. OAK CREEK, WISCONSIN	CONSTITUENTS IN SOIL EXCEEDING USEPA SSLs OR REGION V DQLs RCRA FACILITY INVESTIGATION
ICF KAISER ENGINEERS, INC. PITTSBURGH, PA	7/31/97 — T. BLAIR 1" = 30' — FIG8-2.WOR

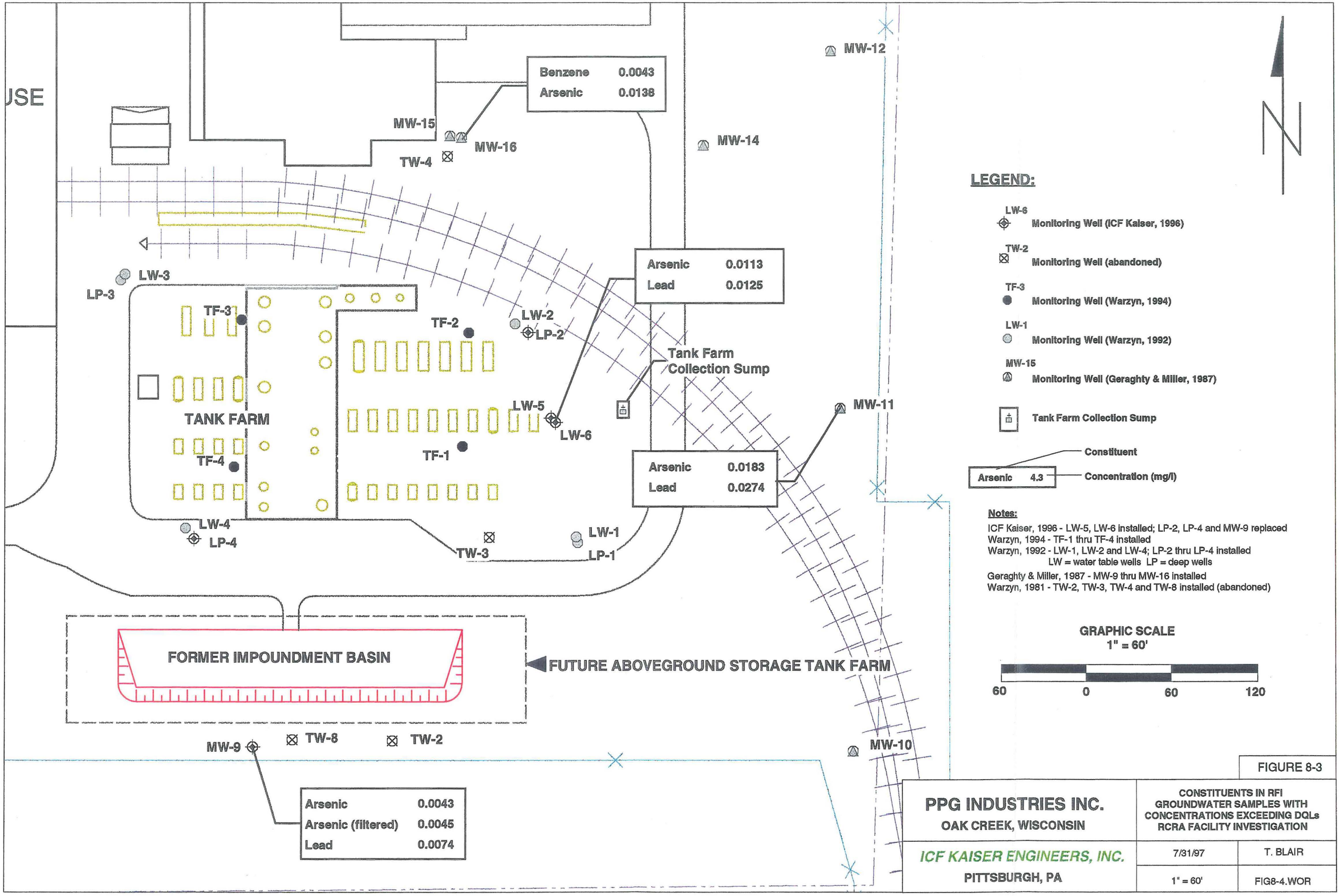


FIGURE 8-3

PPG INDUSTRIES INC. OAK CREEK, WISCONSIN	CONSTITUENTS IN RFI GROUNDWATER SAMPLES WITH CONCENTRATIONS EXCEEDING DQLs RCRA FACILITY INVESTIGATION	
ICF KAISER ENGINEERS, INC. PITTSBURGH, PA	7/31/97	T. BLAIR
	1" = 60'	FIG8-4.WOR

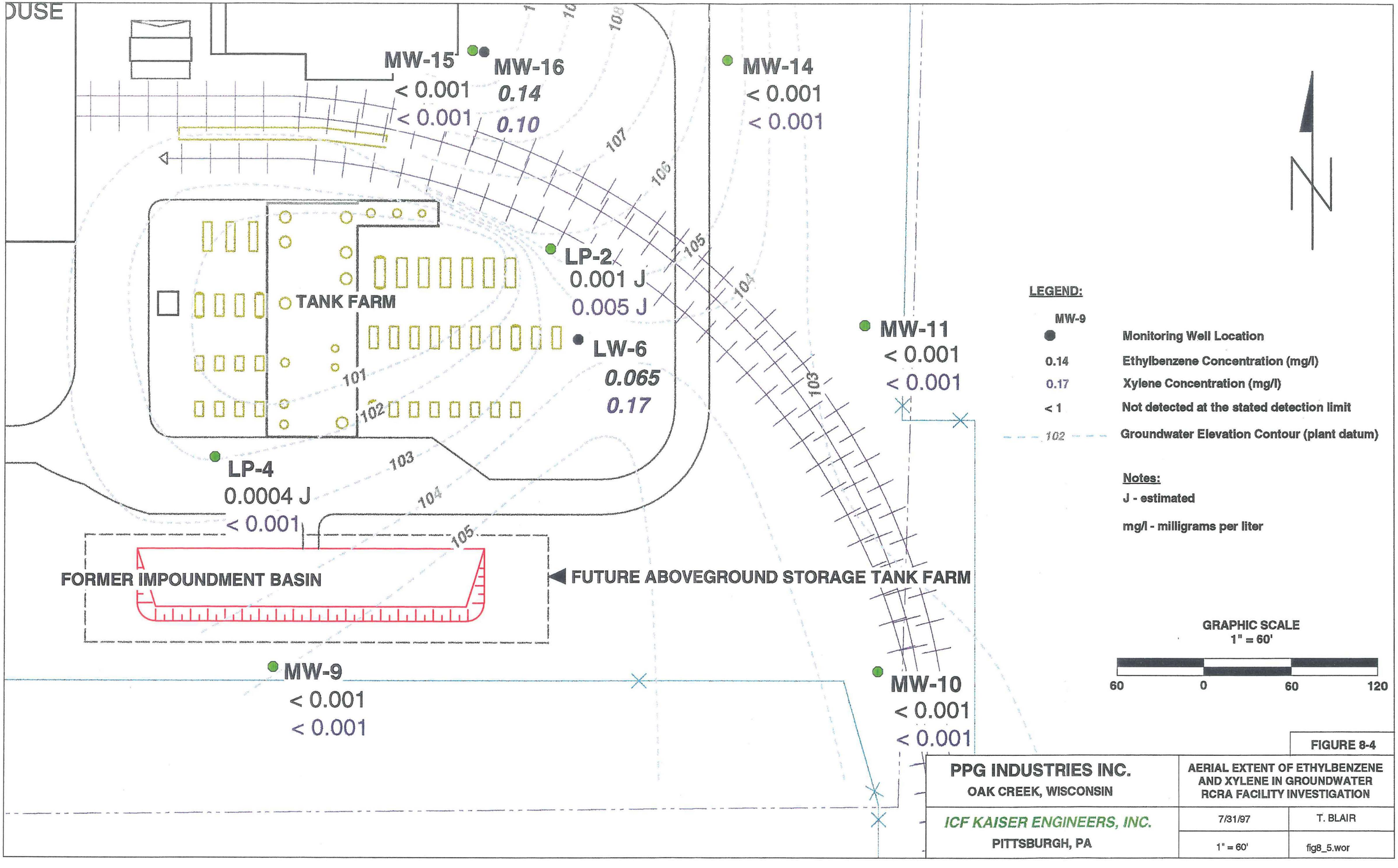


FIGURE 8-4

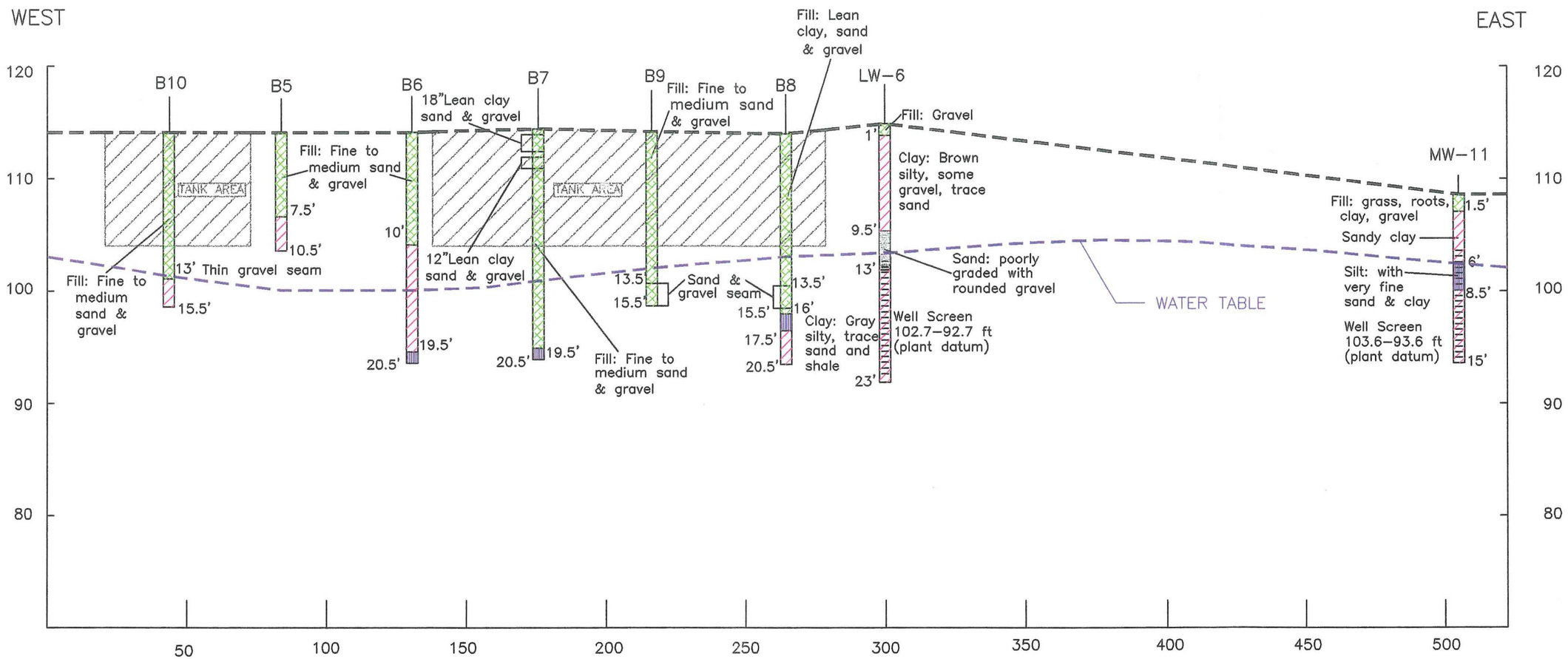
PPG INDUSTRIES INC. OAK CREEK, WISCONSIN	AERIAL EXTENT OF ETHYLBENZENE AND XYLENE IN GROUNDWATER RCRA FACILITY INVESTIGATION	
ICF KAISER ENGINEERS, INC. PITTSBURGH, PA	7/31/97	T. BLAIR
	1" = 60'	fig8_5.wor

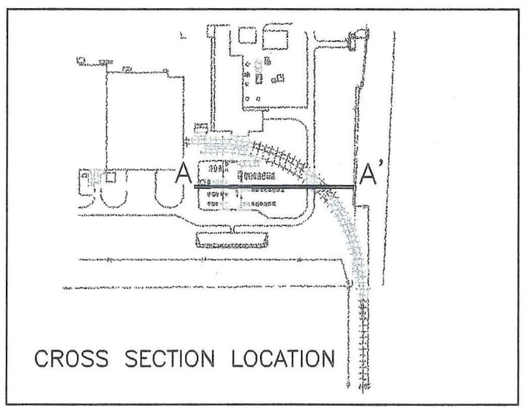
JOB NO.: 6693000701 PLOT SCALE: 1=1

STARTED ON: 4/18/96 REVISED: 7/23/97

A A'

WEST EAST





CROSS SECTION LOCATION

LEGEND

FILL
CONCRETE
CLAY
SAND
SILT
THIN SAND, CLAY, GRAVEL, OR SILT SEAMS
WELL SCREEN
GROUND SURFACE
WATER TABLE

NOTES

HORIZONTAL SCALE 1" : 40'

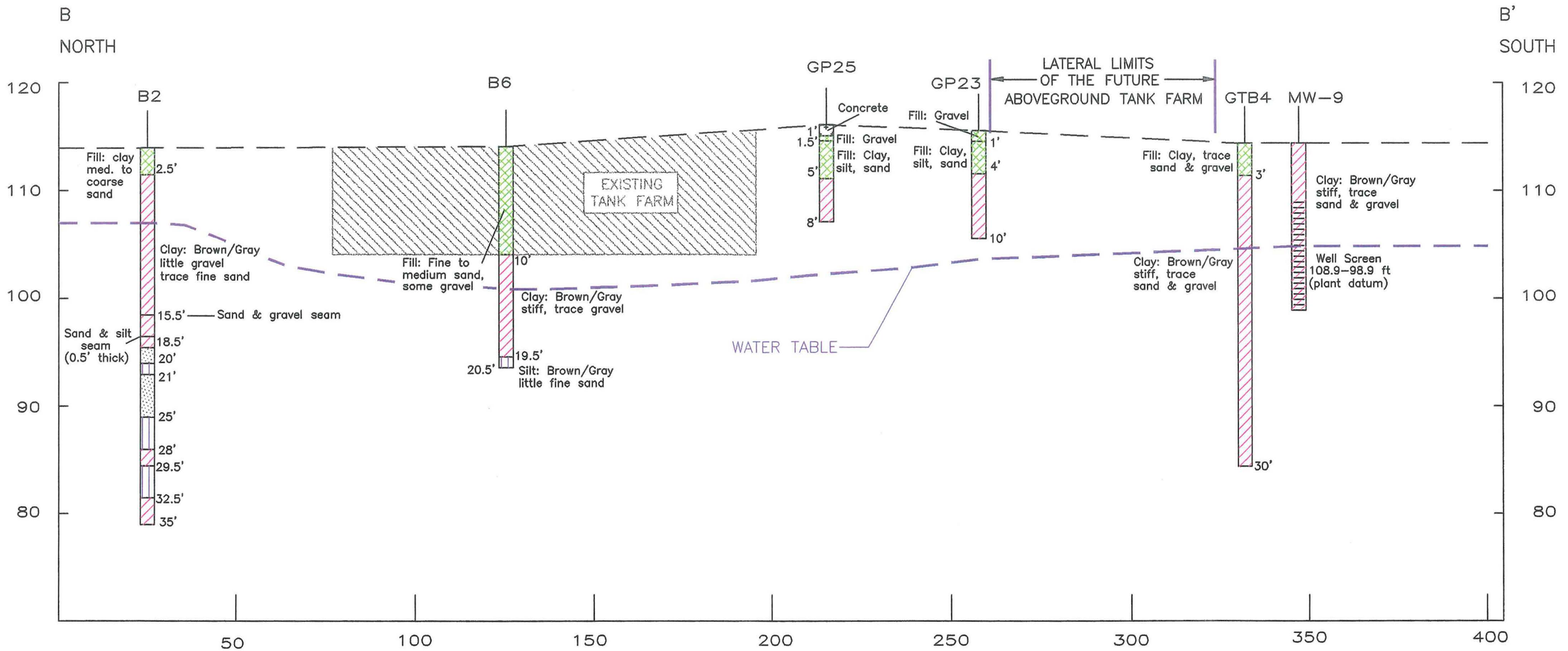
VERTICAL SCALE 1" : 10'

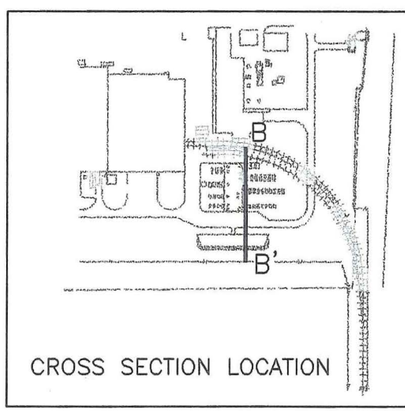
FIGURE 8–5

PPG OAK CREEK OAK CREEK, WISCONSIN	GEOLOGIC CROSS SECTION A–A' RCRA FACILITY INVESTIGATION REPORT	
ICF KAISER ENGINEERS PITTSBURGH, PA	DATE: 7/31/97	DR.: T. BLAIR
	SCALE: AS NOTED	DWG. NO. 10157001

JOB NO.: 6693000701 PLOT SCALE: 1=1

STARTED ON: 4/25/96 REVISED: 7/23/97





CROSS SECTION LOCATION

LEGEND

FILL
CONCRETE
CLAY
SAND
SILT
THIN SAND, GRAVEL, OR SILT SEAMS
WELL SCREEN
GROUND SURFACE
WATER TABLE

NOTES

HORIZONTAL SCALE 1" : 30'

VERTICAL SCALE 1" : 10'

FIGURE 8–6

PPG OAK CREEK OAK CREEK, WISCONSIN	GEOLOGIC CROSS SECTION B–B' RCRA FACILITY INVESTIGATION REPORT
ICF KAISER ENGINEERS PITTSBURGH, PA	DATE: 7/31/97 DR.: T. Blair SCALE: AS NOTED DWG. NO. 10157002

JOB NO.: 6693000701 PLOT SCALE: 1=1

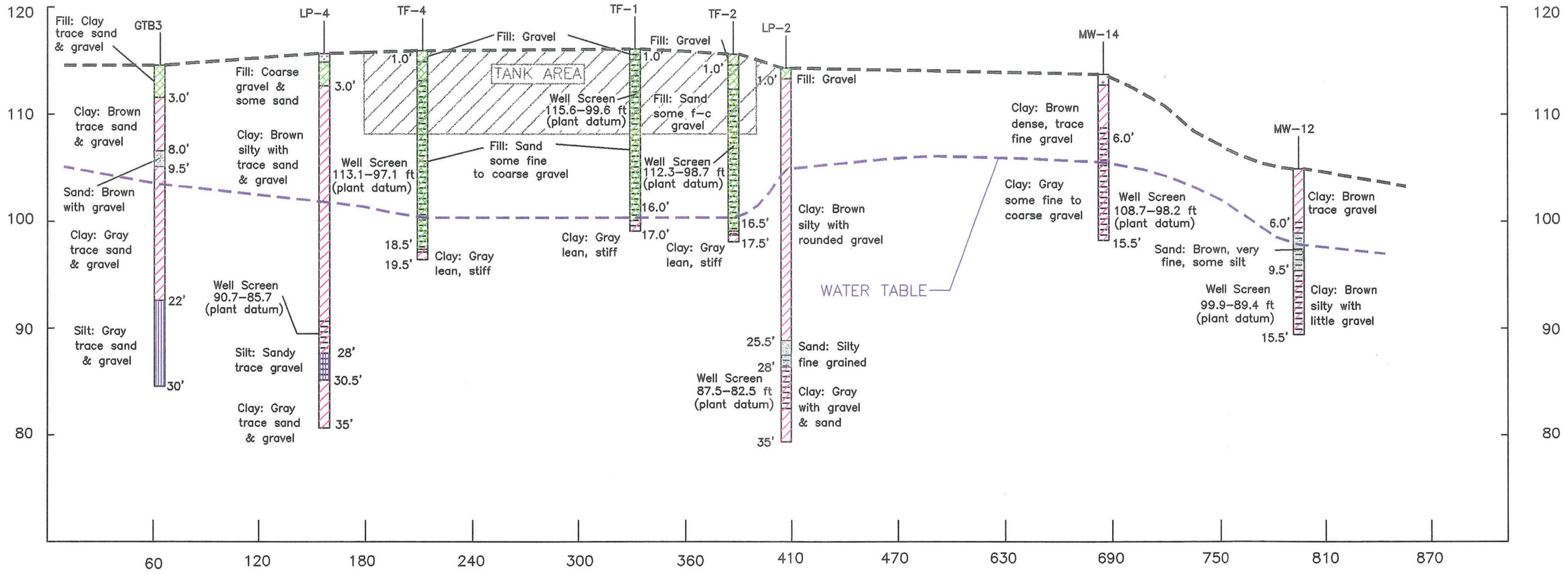
STARTED ON: 6/26/97 REVISED: 7/23/97

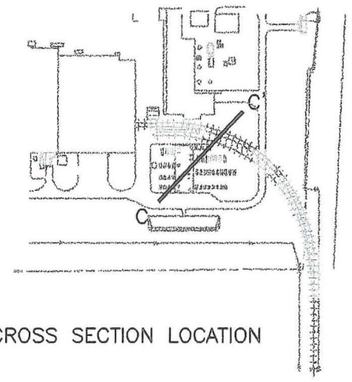
C

SOUTHWEST

C'

NORTHEAST





CROSS SECTION LOCATION

LEGEND

- FILL
- CONCRETE
- CLAY
- SAND
- SILT
- THIN SAND, CLAY, GRAVEL, OR SILT SEAMS
- WELL SCREEN
- GROUND SURFACE
- WATER TABLE

NOTES

HORIZONTAL SCALE 1" : 60'

VERTICAL SCALE 1" : 10'

FIGURE 8–7

PPG OAK CREEK OAK CREEK, WISCONSIN	GEOLOGIC CROSS SECTION C–C' RCRA FACILITY INVESTIGATION REPORT
ICF KAISER ENGINEERS PITTSBURGH, PA	DATE: 7/31/97 DR.: T. BLAIR SCALE: AS NOTED DWG. NO. XSECTDD

JOB NO.: 6693000701 PLOT SCALE: 1=1

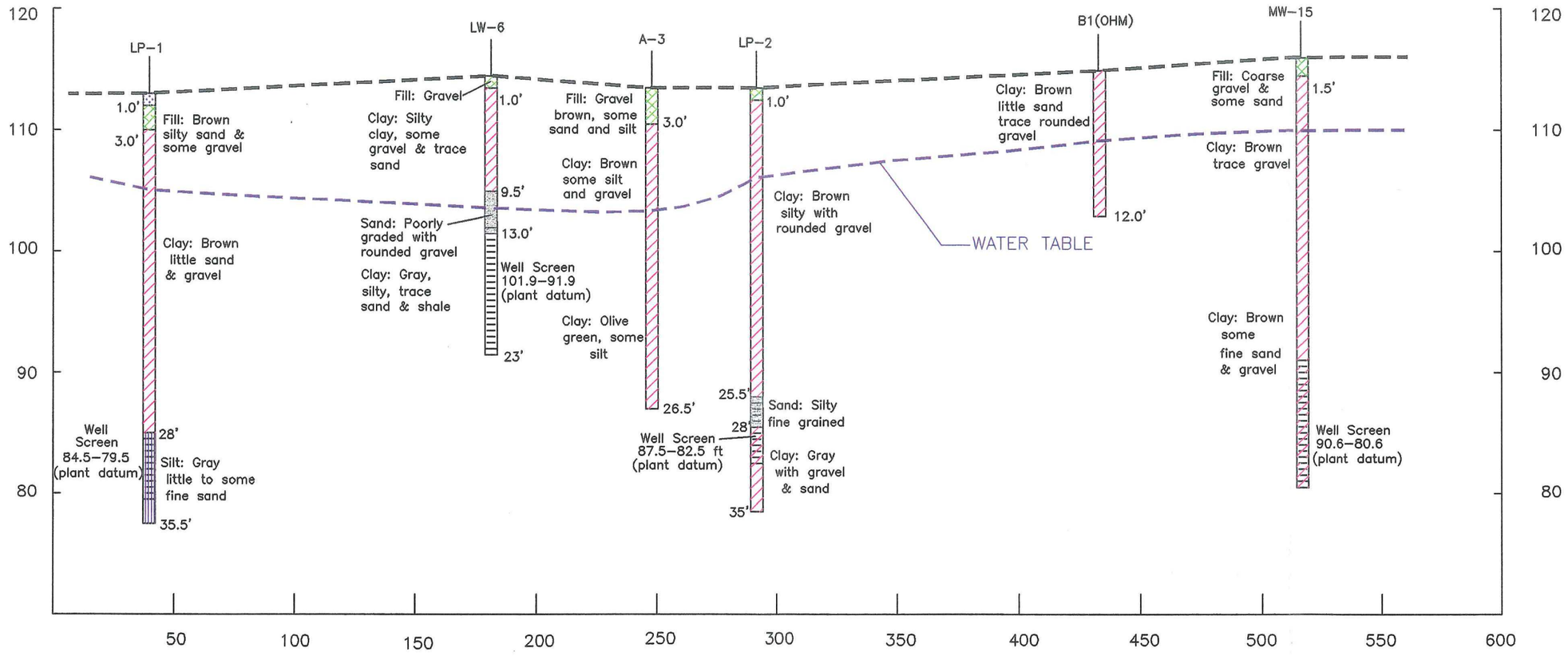
STARTED ON: 6/26/97 REVISED: 7/23/97

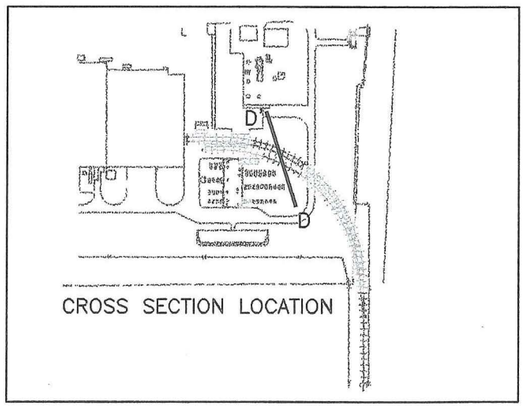
D

SOUTHEAST

D'

NORTHWEST





CROSS SECTION LOCATION

LEGEND

FILL
CONCRETE
CLAY
SAND
SILT
THIN SAND, CLAY, GRAVEL, OR SILT SEAMS
WELL SCREEN
GROUND SURFACE
WATER TABLE

NOTES

HORIZONTAL SCALE 1" : 30'

VERTICAL SCALE 1" : 10'

FIGURE 8–8

PPG OAK CREEK OAK CREEK, WISCONSIN	GEOLOGIC CROSS SECTION D–D' RCRA FACILITY INVESTIGATION REPORT
ICF KAISER ENGINEERS PITTSBURGH, PA	DATE: 7/31/97 DR.: T. BLAIR SCALE: AS NOTED DWG. NO. XSECTEE

TABLE 8-1

SUMMARY OF COIs IN SOIL
BASED ON REGION V DQL's - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH (ft) SAMPLE DATE PARAMETER	Region V DQL's	GS-15 0.00-2.0 8/2/91	GS-16 0.00-2.0 8/7/91	GS-39 0.00-2.0 8/6/91	GS-40 0.00-2.0 8/7/91
VOLATILES (mg/kg)					
Ethylbenzene	230	--	810	--	--
Xylenes (total)	320	580 D	2,100	490	390

-- Not detected, or below DQL.
D - Dilution.
Table based on Warzyn 1992 Soil Analytical Data.

TABLE 8-2

SUMMARY OF COIs IN SOIL
BASED ON USEPA SSLs - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH (ft) SAMPLE DATE PARAMETER	SSL mg/kg	B10 6.00-8.00 8/6/91	B10 13.50-15.50 8/14/91	B2 33.00-35.00 8/9/91	B2 13.50-15.50 8/13/91	B4 3.50-15.5 8/9/91	B6 6.00-7.00 8/12/91	B9 1.00-3.00 8/15/91	B9 3.50-15.5 8/16/91	GS-12 0.00-2.00 8/6/91	GS-14 0.00-2.00 8/5/91
VOLATILES (mg/kg)											
1,1,2,2-Tetrachloroethane	0.001	--	--	--	--	--	--	0.0095 J	--	0.011 J	--
Ethylbenzene	5	11	170	--	6.5	--	15	--	8.7	--	11
Methylene chloride	0.01	--	--	0.046 B	--	0.047 B	--	--	--	--	--
Styrene	2	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene	0.003	--	--	--	--	--	--	--	--	0.02	--
Toluene	5	--	7	--	--	--	--	--	--	--	14
Xylenes (total)	74	--	--	--	--	--	110	--	--	140 D	--

-- Not detected, or below DQL.
J - Estimated.
B - Blank contamination.
D - Dilution.
Table based on Warzyn 1992 Soil Analytical Data.

TABLE 8-2

SUMMARY OF COIs IN SOIL
BASED ON USEPA SSLs - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH (ft) SAMPLE DATE PARAMETER	SSL mg/kg	GS-15 0.00-2.00 8/2/91	GS-16 0.00-2.00 8/7/91	GS-23 0.00-2.00 8/5/91	GS-24 0.00-2.00 8/5/91	GS-3 0.00-2.00 8/2/91	GS-38 0.00-2.00 8/5/91	GS-39 0.00-2.00 8/6/91	GS-40 0.00-2.00 8/7/91	GS-6 0.00-2.00 8/7/91	GS-9 0.00-2.00 8/2/91
VOLATILES (mg/kg)											
1,1,2,2-Tetrachloroethane	0.001	0.007 J	810	--	--	--	--	--	--	--	--
Ethylbenzene	5	200 D	--	17 D	5.5	--	34	100	--	--	--
Methylene chloride	0.01	--	--	--	--	0.063 B	--	--	--	--	0.048 B
Styrene	2	--	--	--	--	--	--	--	--	520	--
Tetrachloroethylene	0.003	--	--	15	--	--	--	--	--	--	--
Toluene	5	120 D	570	12 D	--	--	69	630	--	--	--
Xylenes (total)	74	580 D	2,100	140 D	--	--	280	490	390	--	--

-- Not detected, or below DQL.
J - Estimated.
B - Blank contamination.
D - Dilution.
Table based on Warzyn 1992 Soil Analytical Data.

TABLE 8-3
SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER
PPG, OAK CREEK FACILITY, 1988-1994

Constituent[1] Well numbers	Number of Samples	Number of Detections	Minimum mg/L	Maximum mg/L	Average mg/L
Acetone					
MW-15	4	1	0.012	0.012	0.012
Benzene					
MW-16	4	2	0.003	0.018	0.0105
TW-4	4	1	0.018	0.018	0.018
TW-6	4	1	0.001	0.001	0.001
Diethylene Glycol					
Sump[4]	24	1	30.5	30.5	30.5
Diethylenetriamine					
LW-1[4]	23	22	0.38	1.19	0.698
LW-2[4]	24	23	0.12	0.68	0.325
LW-3[4]	24	23	0.2	1.82	0.928
LW-4[4]	24	23	0.945	2.175	1.365
LP-1[4]	24	23	0.35	1.59	0.998
LP-3[4]	24	23	0.16	1.11	0.564
TW-3[4]	24	23	0.18	1.35	0.668
Sump[4]	24	8	0.075	0.925	0.38
Ethylbenzene					
MW-16	4	1	2.2	2.2	2.2
TW-4	4	3	1.413	2.6	1.971
LW-1[2,4]	25	4	0.0002	0.00091	0.0004
LW-2[2]	1	1	0.00358	0.00358	0.00358
LW-4[2,4]	25	25	5.3	33	13.2
TW-3[1,4]	28	2	0.00062	0.00084	0.00073
Sump[2,4]	26	26	3.23	15.55	9.58
Isobutyl Alcohol					
Sump[4]	24	1	36.5	36.5	36.5
Methylene Chloride					
MW-9	4	1	0.007	0.007	0.007
MW-12	4	1	0.005	0.005	0.005
MW-13	4	1	0.008	0.008	0.008
MW-14	4	1	0.009	0.009	0.009
MW-15	4	1	0.006	0.006	0.006
TW-1	4	1	0.007	0.007	0.007
TW-3	4	1	0.008	0.008	0.008
TW-4	4	1	0.51	0.51	0.51
TW-6	4	1	0.007	0.007	0.007
TW-7	4	1	0.006	0.006	0.006
TW-8	4	1	0.006	0.006	0.006
Naphthalene					
LW-4[2]	1	1	0.958	0.958	0.958

TABLE 8-3 (continued)
SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER
PPG, OAK CREEK FACILITY, 1988-1994

Constituent[1] Well numbers	Number of Samples	Number of Detections	Minimum mg/L	Maximum mg/L	Average mg/L
Naphthalite VM&P Aliphatic					
LW-4[4]	5	5	26	32	28.8
Sump[4]	5	5	23	66.5	47.3
Solvesso 100					
LW-4[4]	24	24	12.5	945	77.27
Sump[4]	24	24	5.15	240	29.472
Toluene					
MW-12	4	1	3.2	3.2	3.2
MW-16	4	1	0.001	0.001	0.001
TW-4	4	2	0.001	0.0032	0.0021
TW-5	4	2	0.0016	0.0036	0.0026
LW-1[2]	1	1	0.00124	0.00124	0.00124
LW-2[2]	1	1	0.00173	0.00173	0.00173
LW-3[2,4]	25	1	0.000184	0.00018	0.00018
LW-4[2,4]	25	4	0.1355	0.553	0.251
LP-1[2,4]	25	1	0.00015	0.00015	0.00015
LP-3[2,4]	25	1	0.0007	0.0007	0.0007
Sump[2,4]	26	26	3.95	15	8.498
VM&P Naphtha Acetate					
LW-4[4]	23	23	19	1450	114.108
Sump[4]	23	23	8.85	300	43.147
Xylenes					
LW-1[2,4]	25	12	0.00056	0.008	0.0016
LW-4[2,4]	25	25	5.317	35.865	13.428
MW-12	4	1	9	9	9
MW-16	4	2	2.9	3.5	3.2
TW-3[1,2,4]	29	3	0.00083	18.61	6.206
TW-4	4	3	1.9	10.678	5.259
TW-7	4	1	6.2	6.2	6.2
LW-1[2]	1	1	0.00802	0.00802	0.00802
LW-2[2]	1	1	0.00657	0.00657	0.00657
LW-4[2]	1	1	7.832	7.832	7.832
Sump[2,4]	26	26	6.54	32.74	19.157
Bis (2-ethylhexyl)-phthalate					
MW-11	4	1	0.017	0.017	0.017
MW-12	4	1	0.024	0.024	0.024
MW-13	4	1	0.017	0.017	0.017
MW-14	4	1	0.038	0.038	0.038
MW-15	4	1	0.025	0.025	0.025
MW-16	4	1	0.022	0.022	0.022

TABLE 8-3 (continued)
SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER
PPG, OAK CREEK FACILITY, 1988-1994

Constituent[1] Well numbers	Number of Samples	Number of Detections	Minimum mg/L	Maximum mg/L	Average mg/L
Di-n-butylphthalate					
TW-4	4	1	0.005	0.005	0.005
TW-7	4	1	0.009	0.009	0.009
2-Butanone (MEK)					
MW-15	4	1	0.029	0.029	0.029
LW-1[4]	25	1	0.408	0.408	0.408
LW-2[4]	25	1	0.107	0.107	0.107
Sump[2,4]	26	21	2.045	77.25	19.6
LW-3[2]	1	1	0.022	0.022	0.022
2,4-Dimethylphenol					
MW-16	4	2	0.03	0.046	0.038
TW-4	4	2	0.015	0.035	0.025
4-Methyl-2-Pentanone					
LW-1[2,4]	25	1	0.347	0.347	0.347
LW-2[2,4]	25	2	0.0302	0.141	0.0856
TW-3	29	1	0.012	0.012	0.012
LW-4[2,4]	25	12	0.62	14.8	3.256
Sump[2,4]	26	26	17.3	84.05	37.732
1,2,4-Trimethylbenzene					
LW-2[2]	1	1	0.00051	0.00051	0.00051
LW-4[2]	1	1	1.5	1.5	1.5
1,3,5-Trimethylbenzene					
LW-4[2]	1	1	0.42	0.42	0.42
Dissolved Lead[3]					
MW-10	14	1	0.001	0.001	0.001
MW-11	14	1	0.002*	0.002*	0.002
MW-13	14	1	0.001	0.001	0.001
MW-14	13	1	0.004	0.004	0.004
MW-15	14	3	0.001	0.035*	0.0123
MW-16	14	1	0.001	0.001	0.001
TW-2	14	3	0.001	0.001	0.001
TW-3	14	3	0.001*	0.001*	0.001
TW-4	14	2	0.001	0.002	0.0015
TW-5	14	6	0.001*	0.002	0.0015
TW-6	14	7	0.001*	0.002	0.00114
TW-7	14	1	0.001	0.001	0.001

* Trip and Field Blanks were reported to be 1 ug/L on 8/20/88, Geraghty & Miller, Inc., June, 1989.

[1] Unless otherwise specified, Geraghty & Miller, Inc., October, 1988; November, 1989; November, 1990; November, 1991.

[2] Warzyn Inc., June, 1992, Project # 2735003

[3] Geraghty & Miller, Inc., July, 1989; April, 1990; July, 1990; Nov., 1990; Feb., 1991; Nov., 1991; Feb., 1992; May, 1992.

[4] UST Leak Detection Program, 1993-1994.

TABLE 8-4

RFI GROUNDWATER SAMPLING RESULTS
SUMMARY OF DETECTED CONSTITUENTS - TANK FARM AREA
PPG - OAK CREEK

SAMPLE ID WELL NUMBER SAMPLE DATE PARAMETER	Region V DQL's	PPG-GWLW6-01 LW6 10/23/96	PPG-GWWM11-01 MW11 10/8/96	PPG-GWMW16-01 MW16 10/7/96	PPG-GWMW16-01-09 MW16 10/7/96	PPG-GWMW9-01 MW9 10/8/96
VOLATILES (mg/kg)						
Benzene	0.00039	--	--	0.0043 J	0.0041 J	--
TOTAL METALS (mg/l)						
Arsenic	0.000038	0.0113	0.0183	0.0106	0.0138	0.0043
Lead	0.004	0.0125	0.0274	--	--	0.0074
FILTERED METALS (mg/l)						
Arsenic (filtered)	0.000038	--	--	--	--	0.0045

-- Not detected, or below DQL.
J - Estimated.

9. SUMMARY/CONCLUSIONS

9.1 BACKGROUND

This report documents the completion of Tasks IV and V (Facility Investigation and Investigation Analysis) of the RFI Scope of Work attached to PPG's RCRA permit. Tasks I-III of the Scope of Work were previously satisfied through the completion of the USEPA-approved RFI Work Plan documents.

The historical information summarized in the description of current conditions (DOCC) established several key factors relating to the overall assessment of environmental issues at this facility, including:

- The Plant was constructed in 1975 on land previously used for agricultural purposes only;
- Production activities have basically remained the same since operations began affording PPG a thorough understanding of all chemicals used and wastes generated by plant processes;
- Waste management activities occurred at relatively few locations and have been tightly controlled; and
- Spill Containment and sitewide stormwater runoff control mechanisms have been in place to effectively contain releases on site

9.2 RFI OBJECTIVES

Based on available historical information, it was determined that additional data were required for 10 solid waste management units (SWMUs) at the facility. The RFI Work Plan was accordingly developed to satisfy two objectives. The first objective was to collect sufficient data at 5 SWMUs not previously investigated to establish if site-related chemicals were present at levels exceeding USEPA Region V DQLs. The second objective was to collect additional data to fully define the nature and extent of reported releases of site-related chemicals from 5 SWMUs within or an integral part of the Tank Farm Area. Satisfying the RFI objectives resulted in the collection of 33 soil samples, three sediment samples, the installation of four new groundwater monitoring wells, the replacement of one existing monitoring well and the collection and analysis of 10 groundwater well samples.

9.3 RFI RESULTS

Review of validated soils and sediment data revealed that sporadic detections of VOCs were observed at some of the 5 SWMUs that were not previously investigated (SWMU Nos. 3,4, 8 [RFA 14], 9 and 20). However, none of these detections were at concentrations exceeding Region V DQLs. The same was true for concentrations of metals

in these samples with the exception of arsenic. Arsenic was screened out because the levels detected in the soil/sediment samples were statistically similar to background soil concentrations.

The remaining RFI data collection activities focused on providing additional information on groundwater flow and quality in the Tank Farm Area including SWMUs 8 (RFA 11, 12, 13), 17 and 18. These data supported earlier studies indicating that impacts to groundwater are localized in or near the Tank Farm Area with no evidence of significant migration due to the hydrogeological setting and the influence on groundwater flow resulting from the operation of the Tank Farm underdrain system.

9.4 RISK ASSESSMENT

PPG intends to address contamination that represents an unacceptable risk to human health or the environment under realistic current and future site use and exposure scenarios. The permit conditions also specify that the RFI identify potential human and ecological receptors. Therefore, detailed human health and ecological risk assessments were performed using applicable guidance and Regional policy.

9.4.1 SWMUs 3, 4, 8 (RFA 14), 9 and 20

As previously stated, the soils from SWMUs 3,4,8 (RFA 14) and 9 did not contain site-related chemicals at concentrations exceeding Region V DQLs. Because the DQLs are based on USEPA Region IX's PRG, these values were used to screen out maximum soil concentrations at these SWMUs based on potential exposures through incidental ingestion, dermal contact or inhalation. The maximum concentrations were also screened using USEPA's Soil Screening Levels (SSLs) for the potential to migrate from soil to groundwater. These are human health criteria for the identification of COIs for risk assessment. For each SWMU, soil concentrations were all below both types of screening criteria. Therefore, current and future exposure to constituents in SWMU soils would yield acceptable risks and noncarcinogenic hazards for human receptors, and migration of constituents from soil to groundwater is not likely to be a significant pathway. An ecological risk assessment is not necessary for these SWMUs because these areas do not have habitat to support ecological receptors.

Sediment samples were collected at SWMU 20, the Interceptor Basin Outfall, and downstream from the outfall in the unnamed creek that runs along the east side of the plant. These samples were collected during the RFI and analyzed for site-associated constituents. Preliminary risk screening was completed for both human and ecological receptors. The latter evaluation was warranted because the unnamed creek contains habitat to support ecological receptors. For the human health evaluation, maximum concentrations of constituents in sediments were compared with Region V DQLs for soil. This is a conservative approach as exposure frequency and duration to soil are higher than those for exposure to sediment. Additionally, sediment concentrations of inorganic constituents were

compared with background soil levels. The sediments result from surface runoff in the plant facility; therefore, using soil background for comparison with these sediments was deemed appropriate. All constituent concentrations in sediments were below USEPA Region V DQLs for soil, except for arsenic. However, arsenic was eliminated as a constituent of interest because it was not detected in concentrations statistically greater than background. Because there were no constituents of interest identified for human health, it can be concluded that exposure to constituents in sediments from SWMU 20 and downstream would yield acceptable risks and noncarcinogenic hazards for human receptors.

For the ecological evaluation, maximum sediment concentrations were compared with conservative, published or estimated sediment criteria for ecological receptors. Additionally, inorganic constituent concentrations were compared with background levels. As a result of this process, no constituents of interest were identified for ecological receptors in sediments from SWMU 20 or downstream. Therefore, adverse effects to ecological receptors will not occur from exposure to constituents in sediments.

The RFI baseline risk assessment of SWMUs 3, 4, 8 (RFA 14), 9, and 20 indicates that noncarcinogenic hazards and theoretical excess lifetime cancer risks are within a range considered acceptable by USEPA. Furthermore, adverse effects to ecological receptors are unlikely based on the results of an ecological risk screening. Because current and likely future conditions of SWMUs 3, 4, 8 (RFA 14), 9, and 20 are expected to be the same, no further risk evaluation of these areas is needed .

9.4.2 SWMU 8 (RFA 11, 12, 13), 17, and 18 Tank Farm Area

An extensive set of data were used to evaluate the risk from exposure to soils in the Tank Farm Area. Maximum concentrations of detected constituents from nearly 100 samples were compared with USEPA Region V DQLs and USEPA SSLs to identify constituents of interest in soil. Ethylbenzene and xylenes were detected at concentrations above the risk-based DQLs and were evaluated in a quantitative risk assessment. The quantitative risk assessment presented a standard worker scenario, and evaluated constituent exposure through incidental ingestion of soil, dermal contact with soil, and inhalation of volatile constituents released from soil. No potentially carcinogenic constituents were identified as COIs in soil. Conservatively estimated noncarcinogenic hazards for a standard industrial worker in the Tank Farm Area are acceptable for both ethylbenzene and xylenes under current conditions.

A quantitative risk evaluation of groundwater under current conditions was not performed because there is no complete groundwater exposure pathways. This determination was made based on the fact that the aquifer in question is not suitable to supply sufficient water for potable or industrial uses because of its low yield. Furthermore, the impacts to groundwater within the Tank Farm Area are captured by the Tank Farm underdrain

system. Therefore, no corrective measures are warranted for the protection of human health under current site use and exposure scenarios.

Determining the risk to human or ecological receptors under likely future site use and exposure scenarios for the Tank Farm Area is not appropriate at this time. The Area is subject to regulations under both RCRA Corrective Action and UST management programs. PPG has elected to formally close the underground tanks and replace them with a new aboveground tank farm which is currently under construction. Because closure will significantly alter current site conditions through possible additional soil removal or in-situ remediation, it is presently not worthwhile to assess potential risks based on an extrapolation of current site conditions. PPG proposes to perform additional risk assessment when UST closure activities are completed and representative data regarding future conditions can be meaningfully extrapolated.

REFERENCES

Andrew, F.D., R.L. Buschbom, W.C. Cannon, R.A. Miller, L.F. Montgomery, D.W. Phelps, et al. (1981) Teratologic assessment of ethylbenzene and 2-ethoxyethanol. Battelle Pacific Northwest Laboratory, Richland, Wash. PB 83-208074.

Banerjee, S., S.H. Yalkowsky, and S.C. Valvani. 1980. Water solubility and octanol/water partition coefficients of organic limitations of the solubility partition correlation. Environmental Science and Technology 14: 1227-1229.

Calabrese, E.J., R. Barnes, E.J. Stanek III, H. Pastides, C.E. Gilbert, P. Veneman, X. Wang, A. Laszity, and P.T. Kostecki. (1989) How much soil do young children ingest: An epidemiologic study. *Reg. Toxicol. Pharmacol.* 10:123-137.

Code of Federal Regulations (CFR), 40 - Protection of the Environment, Part 280: Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST).

Franz, T.J. (1984) Percutaneous absorption of benzene. Adv. Modern Environ. Toxicol. Vol. 6. *Applied Toxicology of Petroleum Hydrocarbons.* Princeton Scientific Publishers, Inc., Princeton, N.J. pp. 61-70.

Gilbert, R.O. 1987. Statistical methods for environmental pollution monitoring. Van Nostrand Reinhold Co., New York, NY.

Hansch, C. and A. Leo. (1979) Substituent constants for correlation analysis in chemistry and biology. John Wiley and Sons, Inc., New York, NY.

Hansch, C. and A. Leo. (1985) Medchem Project. Pomona College, Claremont, CA.

Hardin, B.D., G.P. Bond, M.R. Sikov, F.D. Andrew, R.P. Beliles, and R.W. Niemeier. (1981) Testing of selected workplace chemicals for teratogenic potential. *Scand. J. Work Environ. Health* 7(suppl 4):66-75.

Howard, P.H. (1997) *Handbook of environmental fate and exposure data for organic chemicals.* Volume V, Solvents 3. Lewis Publishers, Boca Raton, FL.

Klaasen, C.D. (ed.). (1996) *Casarett and Doull's Toxicology: The Basic Science of Poisons*, 5th edition. Casarett and Doull, eds. MacMillan Publishing, New York.

Leo A., C. Hansch, and D. Elkus. (1971) Chemical Reviews 71: 525-616.

National Academy of Sciences (NAS, 1983). *Risk Assessment in the Federal Government: Managing the Process.* Washington, DC, National Academy Press.

National Toxicology Program. (NTP; 1986) NTP Technical Report on the Toxicology and Carcinogenesis of Xylenes (mixed) (60.2% m-xylene, 13.6% p-xylene, 17.0 ethylbenzene, and 9.1% o-xylene) (CAS No. 1330-20-7) in F344/N Rats and B6C3F1 Mice (Gavage Studies). U.S. Dept. of Health and Human Services, Research Triangle Park, N.C. NIH Pub. No. 86-2583.

Ontario Ministry of the Environment (OME). (1993) *Guidelines for the protection and management of aquatic sediment quality in Ontario.* Ontario Ministry of Environment and Energy, Toronto, ON, Canada. August 1993.

Skowronski, G.A., R.M. Turkall, and M.S. Abdel-Rahman. (1988) Soil adsorption alters bioavailability of benzene in dermally exposed male rats. *Am. Ind. Hyg. Assoc. J.* 49(10):506-511.

Statistical Analysis System. (SAS, 1989) *6.08 TS 405.* SAS Institute, Inc. Carey, NC.

SAS Institute. (SAS, 1993) *SAS Language: Reference, Version 6, 1st Edition.* SAS Institute Inc., Cary, NC.

SAS Institute. (SAS, 1994) *SAS/STAT user's guide, Version 6, 4th Edition.* SAS Institute Inc., Cary, NC.

Sax, N.I. and R.J. Lewis, Sr. (1989) Dangerous properties of industrial materials. Seventh edition. Van Nostrand Reinhold, New York, NY.

Shapiro, S.S. and M.R. Wilk. (1965) An analysis of variance test for normality (complete samples). *Biometrika* 52: 591-611.

Sokal, R.R. and F.J. Rohlf. 1969. Biometry. W.H. Freeman and Co., San Francisco, CA.

Southeast Wisconsin Regional Planning Commission (SEWRPC). (1987) *A solid waste management plan for Milwaukee County, Wisconsin.* July 1987.

Suter, G.W. and J.B. Mabrey. (1994) Toxicological benchmarks for screening potential contaminants of concern for effects on aquatic biota: 1994 revision. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-96/R1.

USEPA. (1986) Quality criteria for water 1986. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA/440/5-86/001.

USEPA. (1987) *Unfinished Business: A Comparative Assessment of Environmental Problems.* EPA/230/2-87/025a.

USEPA. (1989a) *Risk Assessment Guidance for Superfund. Volume I. Human Health Evaluation Manual.* EPA/540/1-89/002.

USEPA. (1989b) *Statistical analysis of groundwater monitoring data at RCRA facilities.* EPA/530-SW-89-026. U.S. Environmental Protection Agency, Office of Solid Waste, Washington, DC.

USEPA. (1989c) *Risk assessment guidance for superfund, Volume II. Environmental evaluation manual.* EPA/540/1-89/001. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC.

USEPA. (1991) *Human Health Evaluation Manual, Supplemental Guidance:* "Standard Default Exposure Factors." [Memo from Timothy Fields Jr. to Bruce Diamond]. March 25.

USEPA. (1992a) "Guidelines for Exposure Assessment." Notice. *Fed. Register* 57:22888-22936.

USEPA. (1992b) *Supplemental Guidance to RAGS. Calculating the Concentration Term.* Office of Solid Waste and Emergency Response, Washington, D.C. Publication 9285.7, May 1992.

USEPA. (1992c) *Dermal Exposure Assessment: Principles and Applications.* Interim Report. EPA/600/8-91/011B. January 1992.

USEPA. (1992d) *Framework for ecological risk assessment.* U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC. EPA/630/R+92/001.

USEPA. (1992e) *Statistical analysis of groundwater monitoring data at RCRA facilities. Addendum to interim final guidance.* U.S. Environmental Protection Agency, Office of Solid Waste, Washington, DC.

USEPA. (1993) Technical basis for deriving sediment quality criteria for nonionic organic contaminants for the protection of benthic organisms by using equilibrium partitioning. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA/822/R-93/011.

USEPA. (1995) Determination of background concentrations of inorganics in soils and sediments at hazardous waste sites. U.S. Environmental Protection Agency, Engineering Forum, Washington, DC. EPA/540/5-96/500.

USEPA. (1996a) *Exposure Factors Handbook. Volume I of III - General Factors.* Update to Exposure Factor Handbook EPA/600/8-89/043. Office of Research and Development, National Center for Environmental Assessment. EPA/600/P-95/002Ba. August. SAB Review Draft.

USEPA. (1996b) *Soil Screening Guidance: Technical Background Document.* EPA/540/R-95/128. Office of Solid Waste and Emergency Response. April.

USEPA. (1996c) *Proposed guidelines for ecological risk assessment.* EPA/630/R-95/002B. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC.

USEPA. (1997) *Integrated Risk Information System (IRIS).* On-line.

USEPA Region V. (1994) Ecological risk assessment guidance for RCRA correction action. U.S. Environmental Protection Agency, Region V, Waste Management Division, Chicago, IL.

USEPA Region V. (1995a) "Sitting at the RCRA Data Quality Level Table - Update 1." Memorandum from Karl E. Bremer, Chief of Waste Management Branch to Waste Management Branch Section Chiefs. December 14.

USEPA Region V. (1995b) Development and use of ecotox thresholds. BTAG Ecological Risk Assessment Bulletin #1. U.S. Environmental Protection Agency, Region V, Chicago, IL.

USEPA Region V. (1996a) "Corrective Action Principles." Memorandum from Norman Niedergang, Director of Waste, Pesticides & Toxics Division to Branch Chiefs, Section Chiefs, and Corrective Action Staff. November 19.

USEPA, Region V. (1996b) *Development and use of ecotox thresholds*. BTAG Ecological Risk Assessment Bulletin #1. U.S. Environmental Protection Agency, Biological Technical Assistance Group, Chicago, IL.

USEPA Region IX. (1996) *Region 9 Preliminary Remediation Goals (PRGs) 1996.* Stanford J. Smucker, Regional Toxicologist. August.

Warzyn. (1992a) *Soil and Groundwater Assessment.* PPG Industries, Inc., Oak Creek, WI Facility. June.

Warzyn. (1992b). *RCRA facility investigation: I. Description of current conditions and II. Pre-investigation evaluation of corrective measure technologies*. Prepared by Warzyn Inc., Milwaukee, WI for PPG Industries, Inc., Oak Creek, WI.

Wisconsin NR 720. IHS Environmental Information, Inc. ENFLEX, May 1997.

Wolf, M.A., V.K. Rowe, D.D. McCollister, R.L. Hollingsworth, and F. Oyen. (1956) Toxicological studies of certain alkylated benzenes and benzene. *Arch. Ind. Health* 14:387-398.

APPENDIX A

BORING/WELL INSTALLATION LOGS

State of Wisconsin
Department of Natural Resources

Route To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☒ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Other

SOIL BORING LOG INFORMATION

Form 4400-122 7-91

Page 1 of 1

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
PPG INDUSTRIES INC.		TF01

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
J & J SOIL TESTING MIKE WEIBELHAUS	10-13-94	10-13-94	6¼ IN. HSA

DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
	TF01	____ Feet MSL	716.1 Feet MSL	11 inches

Boring Location
State Plane ____ N, ____ E S/C/N | Lat ____ Long ____
1/4 of SW 1/4 of Section 32 T 5 N. R 22 (E)W

Local Grid Location (if applicable)
☐ N ____ Feet ☐ S ☐ E ____ Feet ☐ W

County	DNR County Code	Civil Town/City/or Village
MILWAUKEE	41	OAK CREEK

Sample Number	Sample Length Recovered (in.)	Blow Counts	Depth In Ft	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plastic Limit	P 200	ROD/ Comments
				CRUSHED, LT. GRAY DOLOMITE GRAVEL	FILL									
				YELLOWISH BROWN, F-M SAND, SOME F-C GRAVEL	FILL									
			5											
			10	COLOR GRADING TO GRAY AT APPROX. 11 FT WITH STRONG SOLVENT ODOR.										
				(BORING BLIND DRILLED, SOIL DESCRIPTIONS BASED ON AUGER CUTTINGS AND PREVIOUS BORING INFORMATION)										
			15	V. STIFF TO HARD, GRAY LEAN CLAY	CL									
				END OF BORING AT 17.0 FEET										

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Terry J. Marek | Firm WARZYN INC.

This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than $10 nor more than $5,000 for each violation. Fined not less than $10 or more than $100 or imprisoned not less than 30 days, or both, for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

WARZYN

STICK-UP MONITORING WELL CONSTRUCTION SUMMARY

JOB NO. 4034.0020

Facility/Project Name: PPG INDUSTRIES INC

Local Grid Location of Well: ☐ N. ft. ☐ S. ☐ E. ft. ☐ W.

Well Name: TF 01

Type of Well: Water Table Observation Well ☒ Piezometer ☐

Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N, ____ ft. E.

Date Well Installed: 10-13-94

Section Location of Waste/Source: ☐ E. ☐ W.

Well Installed By: (Person's Name and Firm)

(Geologist) T. MARCH

Distance Well Is From Waste/Source Boundary: 0 ft.

Location of Well Relative to Waste/Source: ☐ Upgradient ☐ Sidegradient ☒ Downgradient ☐ Not Known

(Driller) M. NIEBELHAUS J+J SOIL TESTING

Protective pipe, top elevation 118.21 ft. MSL

Well casing top elevation 118.35 ft. MSL

Land surface elevation 116.1 ft. MSL

Surface Seal, bottom 113.6 ft. MSL or 2.5 ft.

USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

Sieve analysis attached? ☐ Yes ☒ No

Drilling method used: Rotary ☐ Hollow Stem Auger ☒ Other ☐

Drilling fluid used: Water ☐ Air ☐ Drilling Mud ☐ None ☒

Drilling additives used? ☐ Yes ☒ No

Describe ____

Source of water: N/A

	ELEVATION	DEPTH
Bentonite seal, top	NONE ft. MSL or	ft.
Fine sand, top	NONE ft. MSL or	ft.
Filter pack, top	113.6 ft. MSL or	2.5 ft.
Screen joint, top	113.3 ft. MSL or	2.8 ft.
Well bottom	99.7 ft. MSL or	16.4 ft.
Filter pack, bottom	99.1 ft. MSL or	17.0 ft.
Borehole, bottom	99.1 ft. MSL or	17.0 ft.

Borehole, diameter 11.0 in.

O.D. well casing 4.50 in.

I.D. well casing 4.06 in.

Cap and lock? ☒ Yes ☐ No

Protective cover pipe:
Inside diameter: 5.8 in.
Length: 4.8 ft.
Material: Steel ☒ Other ☐

Additional protection? ☒ Yes ☐ No
If yes, describe: 4"X6" WOODEN POSTS

Surface seal: Bentonite ☒ Concrete ☐ Other ☐

Material between well casing and protective pipe: Bentonite ☐ Annular space seal ☐ Other ☒ FILTER SAND

Annular space seal: NONE Granular Bentonite ☐
____ Lbs/gal mud weight... Bentonite-sand slurry ☐
____ Lbs/gal mud weight..... Bentonite slurry ☐
____ % Bentonite..... Bentonite-cement grout ☐
____ cu ft volume added for any of the above

How installed: Tremie ☐ Tremie pumped ☐ Gravity ☐

Bentonite seal: Bentonite granules ☐ Bentonite pellets ☐ Other ☐
☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in.

Fine sand material: Manufacturer, product name & mesh size
NONE
Volume added ____ cu ft

Filter pack material: Manufacturer, product name & mesh size
AMERICAN MATERIALS, RED FLINT, #30
Volume added 7.9 cu ft

Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐

Screen material: 304 STAINLESS STEEL
Screen type: Factory cut ☐ Continuous slot ☒ Other ☐

Manufacturer JOHNSON
Slot size: 0.10 in.
Slotted length: 12.5 ft.
Backfill material (below filter pack): None ☒ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Jerry D. Mowell | Firm: Warzyn Inc.

IPRIOR/STICKLO

State of Wisconsin
Department of Natural Resources

Route To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☒ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Other

SOIL BORING LOG INFORMATION

Form 4400-122 7-91

Page 1 of 1

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
PPG INDUSTRIES INC.		TF02

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
J+J SOIL TESTING MIKE WEIBELHAUS	10-13-94	10-13-94	6¼ IN. HSA

DNR Facility Well No.	Unique Well No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		TF02	____ Feet MSL	115.6 Feet MSL	11 inches

Boring Location
State Plane ____ N, ____ E S/C/N | Lat ____ ____ ____ Long

____ 1/4 of SW 1/4 of Section 32 T 5 N R 22 (E) W

Local Grid Location (if applicable)
____ Feet ☐N ☐S ____ Feet ☐E ☐W

County	DNR County Code	Civil Town/City/or Village
MILWAUKEE	41	OAK CREEK

Sample Number	Sample Length Recovered (in.)	Blow Counts	Depth in Ft	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plastic Limit	P 200	RQD/ Comments
			0	CRUSHED, LT. GRAY DOLOMITE GRAVEL	FILL									
				YELLOWISH BROWN, F-M SAND, SOME F-C GRAVEL	FILL									
			5											
				COLOR CHANGING TO GRAY APPROX. 8 FT. WITH STRONG SOLVENT ODOR AND SLIGHT SHEEN.										
			10											
				(BORING BLIND DRILLED. SOIL DESCRIPTIONS BASED ON AUGER CUTTINGS AND PREVIOUS BORING INFORMATION										
			15	V. STIFF TO HARD, GRAY LEAN CLAY	CL									
				END OF BORING AT 17.5 FEET										

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Jerry J. March | Firm WARZYN INC.

This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than $10 nor more than $5,000 for each violation. Fined not less than $10 or more than $100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

WARZYN

STICK-UP MONITORING WELL CONSTRUCTION SUMMARY

JOB NO. 4034.0020

Facility/Project Name: PPG INDUSTRIES INC	Local Grid Location of Well: ☐ N. ft. ☐ S. ☐ E. ft. ☐ W.	Well Name: TF-02
Type of Well: Water Table Observation Well ☒ Piezometer ☐	Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N, ____ ft. E.	Date Well Installed: 10-13-94
	Section Location of Waste/Source: ☐ E. ☐ W.	Well Installed By: (Person's Name and Firm) (Geologist) T. MARCH
Distance Well is From Waste/Source Boundary: 0 ft.	Location of Well Relative to Waste/Source: ☐ Upgradient ☐ Sidegradient ☒ Downgradient ☐ Not Known	(Driller) M. WEIBELHAUS – J+J SOIL TESTING

Protective pipe, top elevation 117.57 ft. MSL

Well casing top elevation 117.30 ft. MSL

Land surface elevation 115.6 ft. MSL

Surface Seal, bottom 113.1 ft. MSL or 2.5 ft.

USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

Sieve analysis attached? ☐ Yes ☒ No

Drilling method used: Rotary ☐ Hollow Stem Auger ☒ Other ☐

Drilling fluid used: Water ☐ Air ☐ Drilling Mud ☐ None ☒

Drilling additives used? ☐ Yes ☒ No

Describe ____

Source of water: N/A

	ELEVATION	DEPTH
Bentonite seal, top	NONE ft. MSL	ft.
Fine sand, top	NONE ft. MSL	ft.
Filter pack, top	113.1 ft. MSL	2.5 ft.
Screen joint, top	112.3 ft. MSL	3.3 ft.
Well bottom	98.1 ft. MSL	16.9 ft.
Filter pack, bottom	98.1 ft. MSL	17.5 ft.
Borehole, bottom	98.1 ft. MSL	17.5 ft.

Borehole, diameter 11.0 in.

O.D. well casing 4.50 in.

I.D. well casing 4.06 in.

Cap and lock? ☒ Yes ☐ No

Protective cover pipe:
Inside diameter: 5.8 in.
Length: 4.5 ft.
Material: Steel ☒ Other ☐

Additional protection? ☒ Yes ☐ No
If yes, describe: 4"X6" WOODEN POSTS

Surface seal: Bentonite ☒ Concrete ☐ Other ☐

Material between well casing and protective pipe:
Bentonite ☐ Annular space seal ☐ Other ☒ FILTER SAND

Annular space seal: NONE Granular Bentonite ☐
____ Lbs/gal mud weight... Bentonite-sand slurry ☐
____ Lbs/gal mud weight..... Bentonite slurry ☐
____ % Bentonite..... Bentonite-cement grout ☐
____ cu ft volume added for any of the above

How installed: Tremie ☐ Tremie pumped ☐ Gravity ☐

Bentonite seal: Bentonite granules ☐
☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ Other ☐

Fine sand material: Manufacturer, product name & mesh size: NONE
Volume added ____ cu ft

Filter pack material: Manufacturer, product name & mesh size: AMERICAN MATERIALS, RED FLINT, #30
Volume added 8.2 cu ft

Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐

Screen material: 304 STAINLESS STEEL
Screen type: Factory cut ☐ Continuous slot ☒ Other ☐
Manufacturer JOHNSON
Slot size: .010 in.
Slotted length: 13.5 ft.

Backfill material (below filter pack): None ☒ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Terry D. March | Firm: Warzyn Inc.

IPRION/STICKUP

State of Wisconsin
Department of Natural Resources

Route To:
- ☐ Solid Waste
- ☐ Emergency Response
- ☐ Wastewater
- ☐ Haz. Waste
- ☒ Underground Tanks
- ☐ Water Resources
- ☐ Other

SOIL BORING LOG INFORMATION

Form 4400-122 7-91

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
PPG INDUSTRIES INC.		TF-03

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
J & J SOIL TESTING MIKE WEIBELHAUS	10-13-94	10-13-94	6¼ IN. HSA

DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
	TF03	___ Feet MSL	___ Feet MSL	11 inches

Boring Location
State Plane ___ N, ___ E S/C/N | Lat ___ Long ___
___ 1/4 of SW 1/4 of Section 32 T 5 N, R 22 ☐E ☒W
Local Grid Location (if applicable) ☐N ☐S ___ Feet ☐E ☐W

County	DNR County Code	Civil Town/City/or Village
MILWAUKEE	41	OAK CREEK

Sample Number	Sample Length Recovered (in.)	Blow Counts	Depth In Ft	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plastic Limit	P 200	RQD/ Comments
				CRUSHED, LT. GRAY DOLOMITE GRAVEL	FILL									
				YELLOWISH BROWN, F-M SAND, SOME F-C GRAVEL										
			5											
			10	COLOR CHANGING TO GRAY AT APPROX. 10 FT, WITH STRONG SOLVENT ODOR.										
			15	(BORING BLIND DRILLED. SOIL DESCRIPTIONS BASED ON AUGER CUTTINGS AND PREVIOUS BORING INFORMATION)										
				V. STIFF TO HARD, GRAY LEAN CLAY	CL									
				END OF BORING AT 19.5 FEET										

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Terry J. March / Firm WARZYN INC.

This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than $10 nor more than $5,000 for each violation. Fined not less than $10 or more than $100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

WARZYN

STICK-UP MONITORING WELL CONSTRUCTION SUMMARY

JOB NO. 4034.0020

Facility/Project Name: PPG INDUSTRIES INC.

Local Grid Location of Well: ☐ N. ft. ☐ S. ☐ E. ft. ☐ W.

Well Name: TF'03

Type of Well: Water Table Observation Well ☒ Piezometer ☐

Grid Origin Location: Lat. Long. or St. Plane ft. N. ft. E.

Date Well Installed: 10-13-94

Section Location of Waste/Source: ☐ E. ☐ W.

Well Installed By: (Person's Name and Firm)

(Geologist) T. MARCH

Distance Well Is From Waste/Source Boundary: 0 ft.

Location of Well Relative to Waste/Source: ☐ Upgradient ☐ Sidegradient ☒ Downgradient ☐ Not Known

(Driller) M. WEIBELHAUS - J & J SOIL TESTING

Protective pipe, top elevation 118.23 ft. MSL

Well casing top elevation 118.52 ft. MSL

Land surface elevation 116.1 ft. MSL

Surface Seal, bottom 113.6 ft. MSL or 2.5 ft.

USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

Sieve analysis attached? ☐ Yes ☒ No

Drilling method used: Rotary ☐ Hollow Stem Auger ☒ Other ☐

Drilling fluid used: Water ☐ Air ☐ Drilling Mud ☐ None ☒

Drilling additives used? ☐ Yes ☒ No

Describe

Source of water: N/A

	ELEVATION		DEPTH	
Bentonite seal, top	NONE	ft. MSL or		ft.
Fine sand, top	NONE	ft. MSL or		ft.
Filter pack, top	113.6	ft. MSL or	2.5	ft.
Screen joint, top	113.2	ft. MSL or	2.9	ft.
Well bottom	97.3	ft. MSL or	18.8	ft.
Filter pack, bottom	96.6	ft. MSL or	19.5	ft.
Borehole, bottom	96.6	ft. MSL or	19.5	ft.

Borehole, diameter 11.0 in.

O.D. well casing 4.50 in.

I.D. well casing 4.06 in.

Cap and lock? ☒ Yes ☐ No

Protective cover pipe:
Inside diameter: 5.8 in.
Length: 4.5 ft.
Material: Steel ☒ Other ☐

Additional protection? ☒ Yes ☐ No
If yes, describe: 4"x4" WOODEN POST

Surface seal: Bentonite ☒ Concrete ☐ Other ☐

Material between well casing and protective pipe: Bentonite ☐ Annular space seal ☐ Other ☒

Annular space seal: NONE FILTER SAND
Granular Bentonite ☐
Lbs/gal mud weight... Bentonite-sand slurry ☐
Lbs/gal mud weight..... Bentonite slurry ☐
% Bentonite..... Bentonite-cement grout ☐
cu ft volume added for any of the above

How installed: Tremie ☐ Tremie pumped ☐ Gravity ☐

Bentonite seal: Bentonite granules ☐ Bentonite pellets ☐ Other ☐
☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in.

Fine sand material: Manufacturer, product name & mesh size
NONE
Volume added cu ft

Filter pack material: Manufacturer, product name & mesh size
AMERICAN MATERIALS RED FLINT #30
Volume added 9.3 cu ft

Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐

Screen material: 304 STAINLESS STEEL
Screen type: Factory cut ☐ Continuous slot ☒ Other ☐

Manufacturer JOHNSON
Slot size: .010 in.
Slotted length: 15.5 ft.

Backfill material (below filter pack): None ☒ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Terry J March | Firm: Warzyn Inc.

PRIOR/STICKUP

State of Wisconsin
Department of Natural Resources

Route To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☒ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Other

SOIL BORING LOG INFORMATION

Form 4400-122 7-91

Page 1 of 1

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
PPG INDUSTRIES INC.		TF04

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
J & J SOIL TESTING MIKE WEIBELHAUS	10-13-94	10-13-94	6 1/4 IN. HSA

DNR Well ID Number	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
	TF04	Feet MSL	115.9 Feet MSL	11 Inches

Boring Location
State Plane ____ N, ____ E S/C/N | Lat ____ Long ____
____ 1/4 of SW 1/4 of Section 32, T 5 N, R 22 ☒E ☐W

Local Grid Location (if applicable)
____ Feet ☐N ☐S ____ Feet ☐E ☐W

County	DNR County Code	Civil Town/City/or Village
MILWAUKEE	41	OAK CREEK

Sample Number	Sample Length Recovered (in.)	Blow Counts	Depth In Ft	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plastic Limit	P 200	ROD/ Comments
				CRUSHED, LT. GRAY DOLOMITE GRAVEL	FILL									
				YELLOWISH BROWN, F-M SAND, SOME F-C GRAVEL	FILL									
			5	COLOR CHANGING TO GRAY AT APPROX. 7 FT. WITH STRONG SOLVENT ODOR.										
			10											
			15	(BORING BLIND DRILLED, SOIL DESCRIPTIONS BASED ON AUGER CUTTINGS AND PREVIOUS BORING INFORMATION)										
				V. STIFF TO HARD, GRAY LEAN CLAY	CL									
				END OF BORING AT 19.5 FEET										

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Jerry J. Marek | Firm: WARZYN INC.

This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than $10 nor more than $5,000 for each violation. Fined not less than $10 or more than $100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

WARZYN

STICK-UP MONITORING WELL CONSTRUCTION SUMMARY

JOB NO. 4034.0020

Facility/Project Name: PPG INDUSTRIES INC

Local Grid Location of Well: ft. N. ☐ S. ☐ ft. E. ☐ W. ☐

Well Name: TF04

Type of Well: Water Table Observation Well ☒ Piezometer ☐

Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N, ____ ft. E.

Date Well Installed: 10-05-94

Section Location of Waste/Source: E. ☐ W. ☐

Well Installed By: (Person's Name and Firm)

(Geologist) T. MARCH

Distance Well Is From Waste/Source Boundary: 0 ft.

Location of Well Relative to Waste/Source: Upgradient ☐ Sidegradient ☐ Downgradient ☒ Not Known ☐

(Driller) M. WEIBELHAUS - J+J SOIL TESTING

Protective pipe, top elevation 117.91 ft. MSL

Well casing top elevation 118.09 ft. MSL

Land surface elevation 115.9 ft. MSL

Surface Seal, bottom 113.4 ft. MSL or 2.5 ft.

USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

Sieve analysis attached? ☐ Yes ☒ No

Drilling method used: Rotary ☐ Hollow Stem Auger ☒ Other ☐

Drilling fluid used: Water ☐ Air ☐ Drilling Mud ☐ None ☒

Drilling additives used? ☐ Yes ☒ No

Describe ____

Source of water: ____

	ELEVATION		DEPTH
Bentonite seal, top	NONE ft. MSL	or	ft.
Fine sand, top	NONE ft. MSL	or	ft.
Filter pack, top	113.4 ft. MSL	or	2.5 ft.
Screen joint, top	113.0 ft. MSL	or	2.9 ft.
Well bottom	97.1 ft. MSL	or	18.8 ft.
Filter pack, bottom	96.4 ft. MSL	or	17.5 ft.
Borehole, bottom	96.4 ft. MSL	or	17.5 ft.
Borehole, diameter	11.0 in.		
O.D. well casing	4.50 in.		
I.D. well casing	4.06 in.		

Cap and lock? ☒ Yes ☐ No

Protective cover pipe:
Inside diameter: 5.8 in.
Length: 4.8 ft.
Material: Steel ☒ Other ☐

Additional protection? ☒ Yes ☐ No
If yes, describe: 4"X4" WOODEN POST

Surface seal: Bentonite ☒ Concrete ☐ Other ☐

Material between well casing and protective pipe:
Bentonite ☐ Annular space seal ☐ Other ☒ FILTER SAND

Annular space seal: NONE Granular Bentonite ☐
____ Lbs/gal mud weight... Bentonite-sand slurry ☐
____ Lbs/gal mud weight..... Bentonite slurry ☐
____ % Bentonite..... Bentonite-cement grout ☐
____ cu ft volume added for any of the above

How installed: Tremie ☐ Tremie pumped ☐ Gravity ☐

Bentonite seal: ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite granules ☐ Bentonite pellets ☐ Other ☐

Fine sand material: Manufacturer, product name & mesh size
NONE
Volume added ____ cu ft

Filter pack material: Manufacturer, product name & mesh size
AMERICAN MATERIALS, RED FLINT, #30
Volume added 9.3 cu ft

Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐

Screen material: 304 STAINLESS STEEL
Screen type: Factory cut ☐ Continuous slot ☒ Other ☐

Manufacturer JOHNSON
Slot size: .010 in.
Slotted length: 15.5 ft.
Backfill material (below filter pack): None ☒ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Terry J. March | Firm Warzyn Inc.

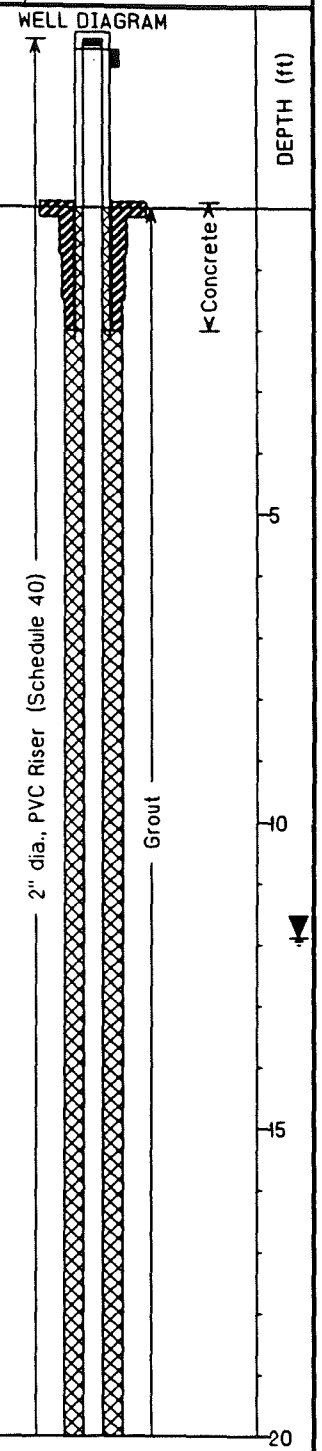
(PRIOR/STICKUP)

ICF KAISER

BORING LOG LP-2

PROJECT NAME: PPG Oak Creek RFI	WATER LEVELS REL. TO GROUND SURFACE	BORING NO.: LP-2
PROJECT LOCATION: Oak Creek, Wisconsin	▽ DURING DRILLING: 24 ft bgs	EASTING:
DRILLING FIRM: Fox Exploration	▼ WELL LEVEL: 11.88 ft bgs (10/24/96)	NORTHING:
DRILLING METHOD: 4.25" Hollow Stem Auger	G. S. ELEV: 114.37 ft (plant system)	START DATE: 09/17/96
LOGGED BY: Scott Symonds	RISER ELEV: 117.10 ft (plant system)	FINISH DATE: 09/17/96

DEPTH (ft)	RECOVERY	PENETROMETER	BLOWS/6in.	PID/FID (ppm)	SAMPLE ID/ SAMPLE DEPTH	MATERIAL DESCRIPTION	USCS	SOIL SYMBOL
						Gravel		
	14"	4.5	9 10 17 4	ND	1	Very stiff, brown silty CLAY with rounded gravel, trace sand.		
	14"	4.5	5 7 2	ND	2	Very stiff, brownish gray silty CLAY with rounded gravel and subrounded shale.		
5	15"	2.5	3 5 1	ND	3	Damp, stiff, mottled brown and gray silty CLAY.		
	15"	2	3 5 2	ND	4	Moist, soft, mottled brown and gray silty CLAY.		
10	13"	1.5	2 2 2	ND	5	Moist, soft, brown silty CLAY.	CL	
	15"	1	2 4 3	ND	6	Moist, soft, mottled brown and gray silty CLAY with little gravel and sand.		
15	17"	2	5 7 5	ND	7	Moist, gray silty CLAY with trace gravel and sand.		
	18"	2.5	6 11	ND	8	SAME AS ABOVE		
20								



NOTES:
1. Hand Penetrometer in tons/sq. ft.
2. USCS = Unified Soil Classification System
3. ND = No Detection
4. trace (< 5%); few (5%-10%); little (15%-25%); some (30%-45%); mostly (50%-100%)

ICF KAISER

BORING LOG LP-2

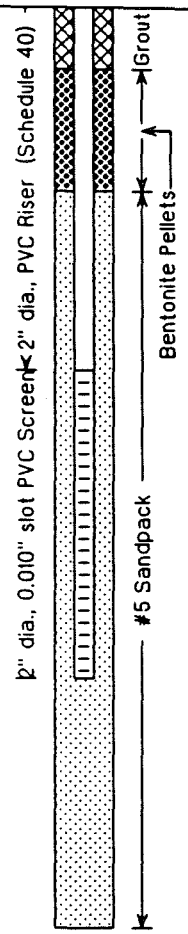
PROJECT NAME: PPG Oak Creek RFI
PROJECT LOCATION: Oak Creek, Wisconsin
DRILLING FIRM: Fox Exploration
DRILLING METHOD: 4.25" Hollow Stem Auger
LOGGED BY: Scott Symonds

WATER LEVELS REL. TO GROUND SURFACE
▽ DURING DRILLING: 24 ft bgs
▼ WELL LEVEL: 11.88 ft bgs (10/24/96)
G. S. ELEV: 114.37 ft (plant system)
RISER ELEV: 117.10 ft (plant system)

BORING NO.: LP-2
EASTING:
NORTHING:
START DATE: 09/17/96
FINISH DATE: 09/17/96

DEPTH (ft)	RECOVERY	PENETROMETER	BLOWS/6in.	PID/FID (ppm)	SAMPLE ID/ SAMPLE DEPTH	MATERIAL DESCRIPTION	USCS	SOIL SYMBOL
			3					
	18"	2.5	6	ND	9	SAME AS ABOVE		
			12				CL	
			3					
	10"	3	14	ND	10	Wet, stiff, gray silty CLAY with some sand and trace gravel.		
25			19					
			10					
	16"	NA	24	ND	11	Saturated, fine grained silty SAND.	SM	
			25					
			20					
	18"	3.5	21	ND	12	Very stiff, gray silty CLAY with gravel and sand.		
30			21					
			17					
	18"	4.5	19	ND	13	Very stiff, gray silty CLAY with trace shale and rounded gravel.	CL	
			27					
			3					
	16"	3.5	5	ND	14	SAME AS ABOVE		
35			12					
						END OF BORING AT 35 FEET		
40								

WELL DIAGRAM



DEPTH (ft)

NOTES:
1. Hand Penetrometer in tons/sq. ft.
2. USCS = Unified Soil Classification System
3. ND = No Detection
4. trace (< 5%); few (5%-10%); little (15%-25%); some (30%-45%); mostly (50%-100%)

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: PPG INDUSTRIES / PPG RFI	Local Grid Location of Well: see FIG 1 ft. ☐N ☐S see FIG 1 ft. ☐E ☐W	Well Name: LP-2
Facility License, Permit or Monitoring Number: _____	Grid Origin Location: Lat. See FIG 1 Long. SEE FIG 1 or St. Plane SEE FIG 1 ft. N, SEE FIG 1 ft. E.	Wis. Unique Well Number / DNR Well Number: _____ / _____
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	Section Location of Waste/Source: NW 1/4 of SW 1/4 of Sec. 32, T. 5 N, R. 22 ☒E ☐W	Date Well Installed: 09/17/96 (m m d d y y)
Distance Well Is From Waste/Source Boundary: UNKNOWN ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☒ Sidegradient d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm) JERRY HAMMAN / FOX EXPLORATION
Is Well A Point of Enforcement Std. Application? ☒ Yes ☐ No		

A. Protective pipe, top elevation 777.21 ft. ~~MSL~~ plant system
B. Well casing, top elevation 777.02 ft. ~~MSL~~ plant system
C. Land surface elevation 774.37 ft. ~~MSL~~ plant system
D. Surface seal, bottom _____ ft. MSL or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ __ _____

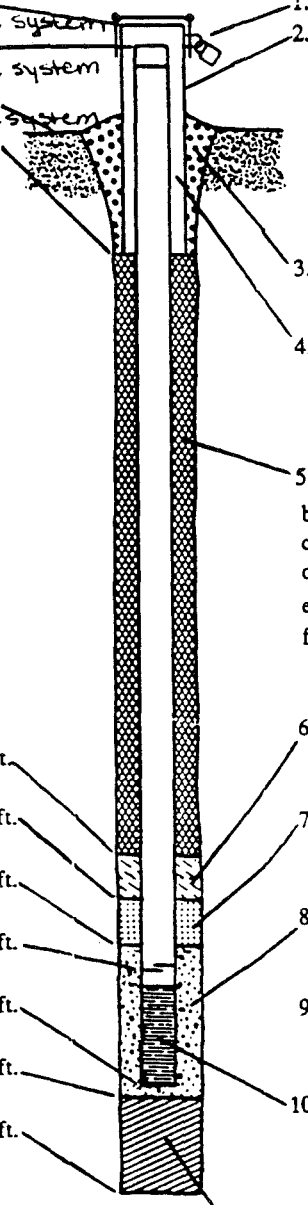
15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe _____

17. Source of water (attach analysis):
N/A

E. Bentonite seal, top _____ ft. MSL or 21.0 ft.
F. Fine sand, top N/A ft. MSL or N/A ft.
G. Filter pack, top _____ ft. MSL or 23.0 ft.
H. Screen joint, top _____ ft. MSL or 25.92 ft.
I. Well bottom _____ ft. MSL or 30.92 ft.
J. Filter pack, bottom _____ ft. MSL or 35.0 ft.
K. Borehole, bottom _____ ft. MSL or 35.0 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.34 in.
N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe: (square)
a. Inside diameter: 4" x 4" ___ in.
b. Length: 5.0 ft.
c. Material: Steel ☒ 04; Other ☐ __ _____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☐ 30; Concrete ☒ 01
2' x 2' FORMED CONCRETE PAD Other ☐ __
4. Material between well casing and protective pipe:
Bentonite ☒ 30; Annular space seal ☐ __
Bentonite-Cement Grout Other ☐ __
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. 5 % Bentonite . . . . . Bentonite-cement grout ☒ 50
e. 6.22 Ft^3 volume added for any of the above
f. How installed: Tremie ☒ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☒1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☒ 32
c. _____ Other ☐ __
7. Fine sand material: Manufacturer, product name & mesh size
a. NONE __
b. Volume added _____ ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. GLOBAL WELL SUPPLY, #5 SAND __
b. Volume added 4.02 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24
_____ Other ☐ __
10. Screen material: PVC __
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01
_____ Other ☐ __
b. Manufacturer JOHNSON FILTRATION SYSTEM, IN
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ 14
NONE Other ☐ __

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm
Scott C. Symonds	ICF Kaiser Engineers

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

ICF KAISER

BORING LOG LP-4

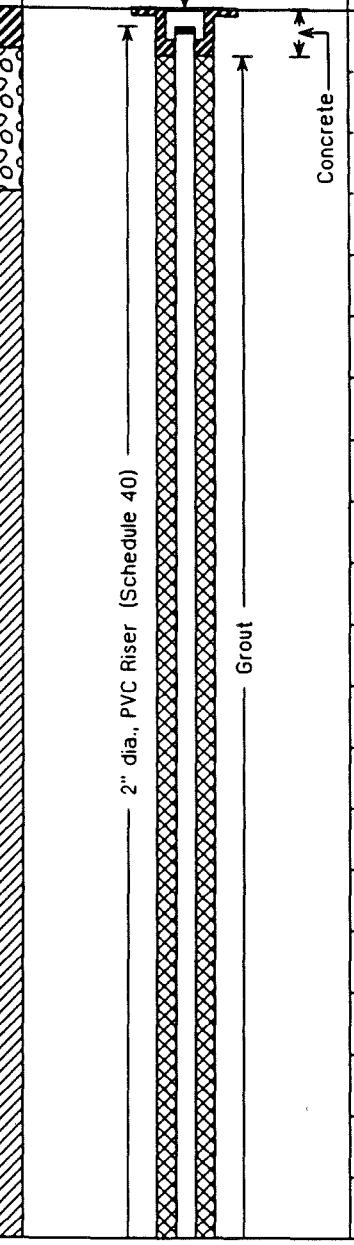
PROJECT NAME: PPG Oak Creek RFI
PROJECT LOCATION: Oak Creek, Wisconsin
DRILLING FIRM: Fox Exploration
DRILLING METHOD: 4.25" Hollow Stem Auger
LOGGED BY: Scott Symonds

WATER LEVELS REL. TO GROUND SURFACE
▽ DURING DRILLING: 28 ft bgs
▼ WELL LEVEL: 13.73 ft bgs (10/24/96)
G. S. ELEV: 115.68 ft (plant system)
RISER ELEV: 115.39 ft (plant system)

BORING NO.: LP-4
EASTING:
NORTHING:
START DATE: 09/17/96
FINISH DATE: 09/17/96

DEPTH (ft)	RECOVERY	PENETROMETER	BLOWS/6in.	PID/FID (ppm)	SAMPLE ID/ SAMPLE DEPTH	MATERIAL DESCRIPTION	USCS	SOIL SYMBOL
						Concrete	CONC	
	12"	NA	10 18 20	ND	1	Crushed limestone and gravel FILL.	FILL	
			5					
	15"	4.5+	8 13	ND	2	Very stiff, mottled brown and gray silty CLAY with trace sand and gravel.		
5			4					
	12"	4.5+	5 5	ND	3	Very stiff, brown silty CLAY with trace sand and gravel.		
			1					
	14"	2	2 3	ND	4	Damp, soft, brown silty CLAY with trace sand and rounded gravel.		
10			1					
	15"	0.5	2 2	ND	5	Moist, very soft, brown silty CLAY with trace sand and rounded gravel.	CL	
			2					
		2.5	2 5	ND	6	Stiff, gray silty CLAY with trace sand and shale.		
15			3					
		2.5	4 5	ND	7	SAME AS ABOVE		
			3					
		3	4	ND	8	SAME AS ABOVE, slightly more silt.		
20			4					

WELL DIAGRAM



DEPTH (ft)

NOTES:
1. Hand Penetrometer in tons/sq. ft.
2. USCS = Unified Soil Classification System
3. ND = No Detection
4. trace (< 5%); few (5%-10%); little (15%-25%); some (30%-45%); mostly (50%-100%)

ICF KAISER

BORING LOG LP-4

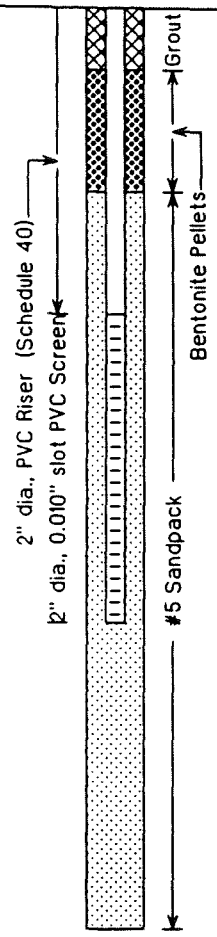
PROJECT NAME: PPG Oak Creek RFI
PROJECT LOCATION: Oak Creek, Wisconsin
DRILLING FIRM: Fox Exploration
DRILLING METHOD: 4.25" Hollow Stem Auger
LOGGED BY: Scott Symonds

WATER LEVELS REL. TO GROUND SURFACE
▽ DURING DRILLING: 28 ft bgs
▼ WELL LEVEL: 13.73 ft bgs (10/24/96)
G. S. ELEV: 115.68 ft (plant system)
RISER ELEV: 115.39 ft (plant system)

BORING NO.: LP-4
EASTING:
NORTHING:
START DATE: 09/17/96
FINISH DATE: 09/17/96

DEPTH (ft)	RECOVERY	PENETROMETER	BLOWS/6in.	PID/FID (ppm)	SAMPLE ID/ SAMPLE DEPTH	MATERIAL DESCRIPTION	USCS	SOIL SYMBOL
			3					
	16"	2.5	4	ND	9	SAME AS ABOVE		
			5					
			3					
	15"	2.5	5	ND	10	SAME AS ABOVE	CL	
25			5					
			8					
	18"	4.5	10	ND	11	SAME AS ABOVE, very stiff.		
			12					
			3					
	15"	NA	4	ND	12	Wet, SANDY SILT with trace rounded gravel.	SM	
30			7					
			7					
	16"	4.5+	9	ND	13	Very stiff, gray silty CLAY with trace sand and gravel.		
			4				CL	
			5					
	17"	4.5	6	ND	14	SAME AS ABOVE		
35			9					
						END OF BORING AT 35 FEET		
40								

WELL DIAGRAM



DEPTH (ft)

NOTES:
1. Hand Penetrometer in tons/sq. ft.
2. USCS = Unified Soil Classification System
3. ND = No Detection
4. trace (< 5%); few (5%-10%); little (15%-25%); some (30%-45%); mostly (50%-100%)

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: PPG Industries / PPG RFI	Local Grid Location of Well: See Fig 1 ft. ☐N ☐S See Fig 1 ft. ☐E ☐W	Well Name: LP-4
Facility License, Permit or Monitoring Number: _____	Grid Origin Location: Lat. See Fig 1 Long. See Fig 1 or St. Plane See Fig 1 ft. N, See Fig 1 ft. E.	Wis. Unique Well Number / DNR Well Number: _____ / _____
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	Section Location of Waste/Source: NW 1/4 of SW 1/4 of Sec. 32, T. 5 N, R. 22 ☒E ☐W	Date Well Installed: 09/17/96 (m m d d y y)
Distance Well Is From Waste/Source Boundary: Unknown ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☒ Sidegradient; d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm) Jerry Hamman / Fox Exploration
Is Well A Point of Enforcement Std. Application? ☒ Yes ☐ No		

A. Protective pipe, top elevation 115.70 ft. MSL Plant System
B. Well casing, top elevation 115.39 ft. MSL plant system
C. Land surface elevation 115.68 ft. MSL plant system
D. Surface seal, bottom _____ ft. MSL or 2.75 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ __

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe N/A

17. Source of water (attach analysis):
N/A

E. Bentonite seal, top _____ ft. MSL or 21.0 ft.
F. Fine sand, top N/A ft. MSL or N/A ft.
G. Filter pack, top _____ ft. MSL or 23.0 ft.
H. Screen joint, top _____ ft. MSL or 25.0 ft.
I. Well bottom _____ ft. MSL or 30.0 ft.
J. Filter pack, bottom _____ ft. MSL or 35.0 ft.
K. Borehole, bottom _____ ft. MSL or 35.0 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.34 in.
N. I.D. well casing 2.00 in.

1. Cap and lock? ☐ Yes ☒ No
2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 2.5 ft.
c. Material: Steel ☒ 04; Other ☐ __
d. Additional protection? ☒ Yes ☐ No
If yes, describe: steel cover
3. Surface seal: Bentonite ☐ 30; Concrete ☒ 01; Other ☐ __
12" diameter
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ __; Other ☐ __
none
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. 5 % Bentonite . . . . . Bentonite-cement grout ☒ 50
e. 6.30 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 32
b. ☒ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☒ 34
c. _____ Other ☐ __
7. Fine sand material: Manufacturer, product name & mesh size
a. none used
b. Volume added _____ ft³
8. Filter pack material: Manufacturer, product name and mesh si
a. Global Well Supply #5 Sand
b. Volume added 4.64 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 2; Flush threaded PVC schedule 80 ☐ 2; Other ☐ __
10. Screen material: PVC
a. Screen type: Factory cut ☐ 1; Continuous slot ☐ 0; Other ☐ __
b. Manufacturer Johnson Filtration System 7
c. Slot size: 0.010
d. Slotted length: 5.0
11. Backfill material (below filter pack): None ☐ 1; Other ☐ __
#5 Sand

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Scott F. Symonds | Firm: ICF Kaiser Engineers

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats. and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

ICF KAISER

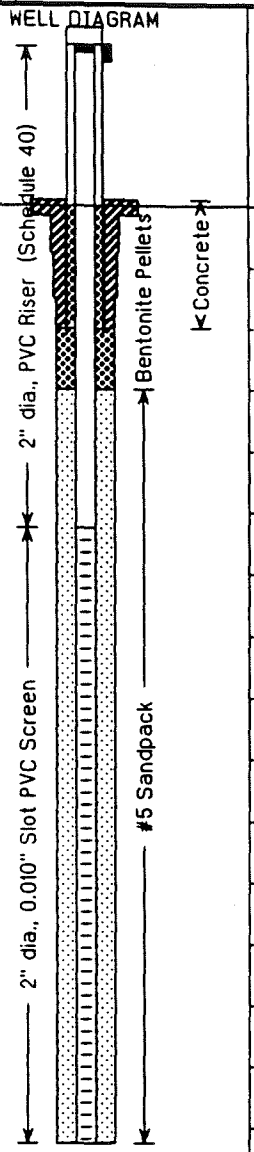
BORING LOG LW-5

PROJECT NAME: PPG Oak Creek RFI
PROJECT LOCATION: Oak Creek, Wisconsin
DRILLING FIRM: Fox Exploration
DRILLING METHOD: 4.25" Hollow Stem Auger
LOGGED BY: Scott Symonds

WATER LEVELS REL. TO GROUND SURFACE
▽ DURING DRILLING: ____
▼ WELL LEVEL: (DRY 10/24/96)
G. S. ELEV: 115.16 ft (plant system)
RISER ELEV: 117.75 ft (plant system)

BORING NO.: LW-5
EASTING: ____
NORTHING: ____
START DATE: 09/18/96
FINISH DATE: 09/18/96

DEPTH (ft)	RECOVERY	PENETROMETER	BLOWS/6in.	PID/FID (ppm)	SAMPLE ID/ SAMPLE DEPTH	MATERIAL DESCRIPTION	USCS	SOIL SYMBOL
			8			Gravel.	GP	
	15"	4	9	ND	1	Stiff, brown silty CLAY with some gravel, trace sand.		
			10					
			6					
	16"	3.5	5	ND	2	SAME AS ABOVE, less gravel.		
5			6				CL	
			6					
	17"	3.5	6	ND	3	Very stiff, mottled brown and gray silty CLAY with trace silt.		
			10					
			6					
	15"	3	7	40	4	SAME AS ABOVE		
10			8			Damp, fine grained SAND.	SW	
			8					
	14"	NA	10	200	5	Poorly graded SAND with rounded gravel. ODOR.	SP	
			8					
			2					
	15"	2.5	4	30	6	Gray silty CLAY with trace sand and shale.	CL	
15			8					
						END OF BORING AT 15.26 FEET		
20								



DEPTH (ft)

NOTES:
1. Hand Penetrometer in tons/sq. ft.
2. USCS = Unified Soil Classification System
3. ND = No Detection
4. trace (< 5%); few (5%-10%); little (15%-25%); some (30%-45%); mostly (50%-100%)

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: PPG Industries / PPG RFI	Local Grid Location of Well: See Fig 1 ft. ☐N ☐S, See Fig 1 ft. ☐E ☐W	Well Name: LW-5
Facility License, Permit or Monitoring Number: _____	Grid Origin Location: Lat. See Fig 1 Long. See Fig 1 or St. Plane See Fig 1 ft. N, See Fig 1 ft. E.	Wis. Unique Well Number / DNR Well Number: _____ / _____
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: NW 1/4 of SW 1/4 of Sec. 32, T. 5 N, R. 22 ☒E ☐W	Date Well Installed: 09/18/96 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: Unknown ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☒ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm) Jerry Hamman / Fox Exploration
Is Well A Point of Enforcement Std. Application? ☒ Yes ☐ No		

A. Protective pipe, top elevation 112.06 ft. ~~MSL~~ plant system
B. Well casing, top elevation 111.75 ft. ~~MSL~~ plant system
C. Land surface elevation 110.16 ft. ~~MSL~~ plant system
D. Surface seal, bottom _____ ft. MSL or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☒ SP ☒
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

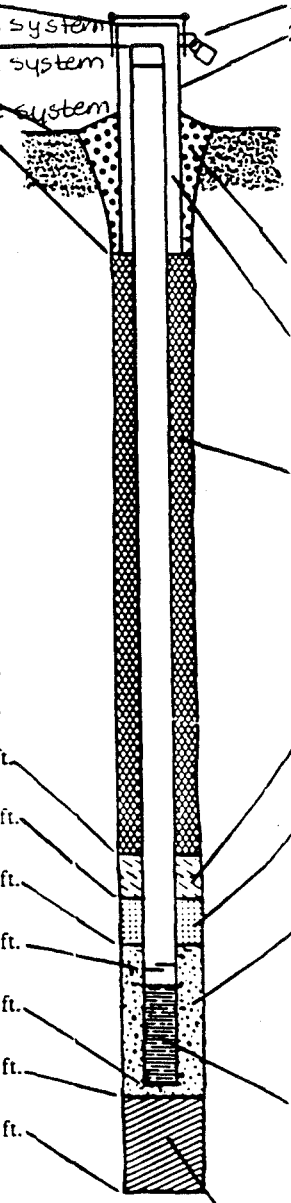
14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ __ _____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe _____

17. Source of water (attach analysis):
N/A

E. Bentonite seal, top _____ ft. MSL or 0.75 ft.
F. Fine sand, top NA ft. MSL or N/A ft.
G. Filter pack, top _____ ft. MSL or 3.0 ft.
H. Screen joint, top _____ ft. MSL or 5.26 ft.
I. Well bottom _____ ft. MSL or 15.26 ft.
J. Filter pack, bottom _____ ft. MSL or 15.26 ft.
K. Borehole, bottom _____ ft. MSL or 15.26 ft.
L. Borehole, diameter 7.0 in.
M. O.D. well casing 2.375 in.
N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe: (square)
a. Inside diameter: 4" x 4" in.
b. Length: 5.0 ft.
c. Material: Steel ☒ 04; Other ☐ __ _____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☐ 30; Concrete ☒ 01; Other ☐ __
2' x 2' Formed Concrete Pad
4. Material between well casing and protective pipe:
Bentonite ☐ 30; Annular space seal ☐ __; Other ☒ __
1/4" bentonite pellets
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
See #6b
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☒ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☒ 32
c. _____ Other ☐ __
7. Fine sand material: Manufacturer, product name & mesh size
a. none used
b. Volume added _____ ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Global Well Supply, #5 Sand
b. Volume added 4.01 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 2; Flush threaded PVC schedule 80 ☐ 2; Other ☐ __ _____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 1; Continuous slot ☐ 0; Other ☐ __ _____
b. Manufacturer Johnson Filtration System Inc
c. Slot size: 0.020
d. Slotted length: 10.0
11. Backfill material (below filter pack): None ☐ 1; Other ☐ __
none

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Matt F. Symonds | Firm: ECI Conestoga Engineers

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

ICF KAISER

BORING LOG LW-6

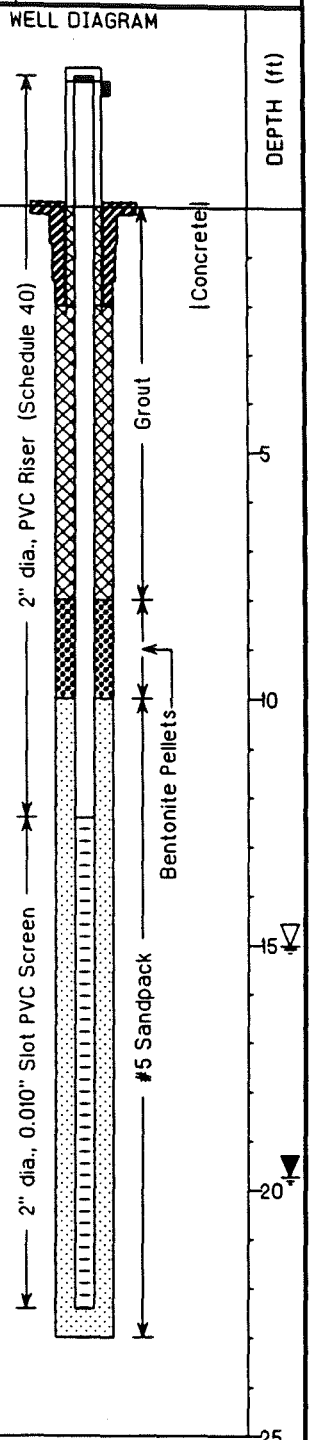
PROJECT NAME: PPG Oak Creek RFI
PROJECT LOCATION: Oak Creek, Wisconsin
DRILLING FIRM: Fox Exploration
DRILLING METHOD: 4.25" Hollow Stem Auger
LOGGED BY: Scott Symonds

WATER LEVELS REL. TO GROUND SURFACE
▽ DURING DRILLING: 15 ft bgs
▼ WELL LEVEL: 19.71 ft bgs (10/24/96)
G. S. ELEV: 114.88 ft (plant system)
RISER ELEV: 117.52 ft (plant system)

BORING NO.: LW-6
EASTING:
NORTHING:
START DATE: 10/14/96
FINISH DATE: 10/14/96

DEPTH (ft)	RECOVERY	PENETROMETER	BLOWS/6in.	PID/FID (ppm)	SAMPLE ID/ SAMPLE DEPTH	MATERIAL DESCRIPTION	USCS	SOIL SYMBOL
			8			Gravel	GP	
	15"	4	9	ND	1	Stiff, brown silty CLAY with some gravel, trace sand.		
			10					
			6					
	18"	3.5	5	ND	2	SAME AS ABOVE		
5			6				CL	
			6					
	17"	3.5	6	ND	3	Very stiff, mottled brown and gray silty CLAY with trace silt.		
			10					
			6					
	15"	3	7	40	4	SAME AS ABOVE		
10			8			Damp, fine grained SAND.	SW	
			8					
	14"	NA	10	200	5	Poorly graded SAND with rounded gravel. ODOR.	SP	
			8					
			2					
	15"	2.5	4	30	6	Gray silty CLAY with trace sand and shale.		
15			8					
			6					
	23"	4	7	ND	7	Very stiff, gray silty CLAY with trace sand and shale fragments.		
			10					
			6				CL	
	21"	3.5	8		8	SAME AS ABOVE (hit cobble/boulder at approximately 20 ft)		
20			12					
			6					
			10		9	SAME AS ABOVE		
			14					
						END OF BORING AT 23 FEET		
25								

WELL DIAGRAM



DEPTH (ft)

NOTES:
1. Hand Penetrometer in tons/sq. ft.
2. USCS = Unified Soil Classification System
3. ND = No Detection
4. trace (< 5%); few (5%-10%); little (15%-25%); some (30%-45%); mostly (50%-100%)

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: PPG Industries / PPG RFI	Local Grid Location of Well: See Fig 1 ft. ☐N ☐S, See Fig 1 ft. ☐E ☐W	Well Name: LW-6
Facility License, Permit or Monitoring Number: _____	Grid Origin Location: Lat. See Fig 1 Long. See Fig 1 or St. Plane See Fig 1 ft. N. See Fig 1 ft. E.	Wis. Unique Well Number: _____ DNR Well Number: _____
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: NW 1/4 of SW 1/4 of Sec. 32, T. 5 N, R. 22 ☒E ☐W	Date Well Installed: 10/14/96 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: Unknown ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☒ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm) Willie Goodwin / Fox Exploration
Is Well A Point of Enforcement Std. Application? ☒ Yes ☐ No		

A. Protective pipe, top elevation 117.20 ft. MSL
B. Well casing, top elevation 117.52 ft. MSL
C. Land surface elevation 114.88 ft. MSL
D. Surface seal, bottom _____ ft. MSL or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

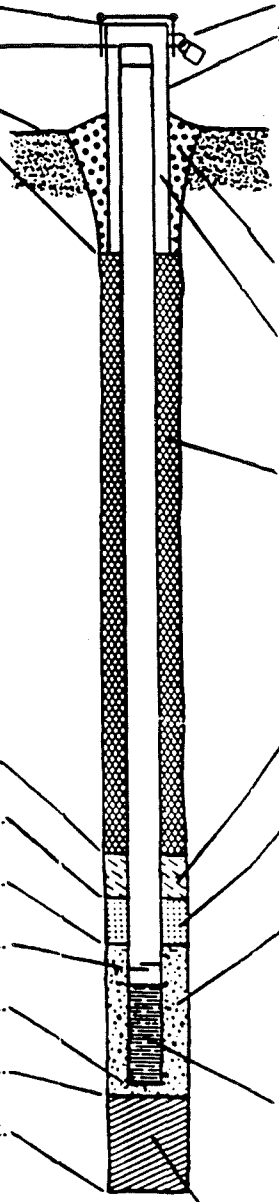
14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ __

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe N/A

17. Source of water (attach analysis):
N/A

E. Bentonite seal, top _____ ft. MSL or 8.0 ft.
F. Fine sand, top N/A ft. MSL or N/A ft.
G. Filter pack, top _____ ft. MSL or 10.0 ft.
H. Screen joint, top _____ ft. MSL or 12.41 ft.
I. Well bottom _____ ft. MSL or 22.41 ft.
J. Filter pack, bottom _____ ft. MSL or 23.0 ft.
K. Borehole, bottom _____ ft. MSL or 23.0 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.34 in.
N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe: (square)
a. Inside diameter: 4" x 4" ___.__ in.
b. Length: ___.__ ft.
c. Material: Steel ☒ 04; Other ☐ __
d. Additional protection? ☐ Yes ☐ No
If yes, describe: _____
3. Surface seal: Bentonite ☐ 30; Concrete ☒ 01; Other ☐ __
2'x2' Formed Concrete Pad
4. Material between well casing and protective pipe:
Bentonite ☐ 30; Annular space seal ☐ __; Other ☒ __
Bentonite-Cement Grout
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. 5 % Bentonite ..... Bentonite-cement grout ☒ 50
e. 1.96 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 3
b. ☒ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☒ 3
c. _____ Other ☐ __
7. Fine sand material: Manufacturer, product name & mesh size
a. N/A (none used)
b. Volume added _____ ft³
8. Filter pack material: Manufacturer, product name and mesh si
a. Global Well Supply #5 Sand
b. Volume added 4.27 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 2
Flush threaded PVC schedule 80 ☐ 2
Other ☐ __
10. Screen material: PVC
a. Screen type: Factory cut ☒ 1; Continuous slot ☐ 0; Other ☐ __
b. Manufacturer Johnson Filtration Systems Inc
c. Slot size: 0.010
d. Slotted length: 10.0
11. Backfill material (below filter pack): None ☒ 1; Other ☐ __
NONE

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Jeff F. Symonds | Firm: IT Kleinfelder Engineers

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

ICF KAISER

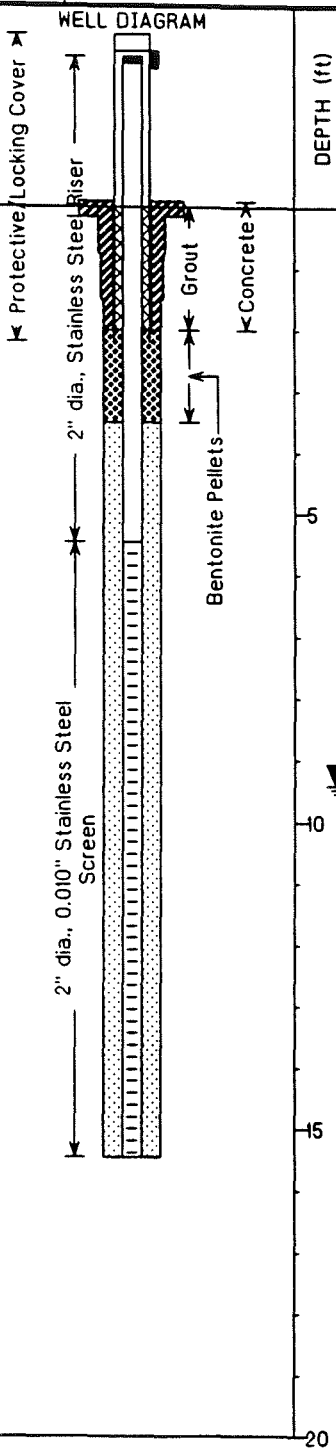
BORING LOG MW-9

PROJECT NAME: PPG Oak Creek RFI
PROJECT LOCATION: Oak Creek, Wisconsin
DRILLING FIRM: Fox Exploration
DRILLING METHOD: 4.25" Hollow Stem Auger
LOGGED BY: Scott Symonds

WATER LEVELS REL. TO GROUND SURFACE
▽ DURING DRILLING: ____
▼ WELL LEVEL: 9.41 ft bgs (10/24/96)
G. S. ELEV: 114.39 ft (plant system)
RISER ELEV: 116.83 ft (plant system)

BORING NO.: MW-9
EASTING: ____
NORTHING: ____
START DATE: 09/18/96
FINISH DATE: 09/18/96

DEPTH (ft)	RECOVERY	PENETROMETER	BLOWS/6in.	PID/FID (ppm)	SAMPLE ID/ SAMPLE DEPTH	MATERIAL DESCRIPTION	USCS	SOIL SYMBOL
						Grass		
			8					
	13"	4.5+	9	ND	1	Dry, very stiff, brown silty CLAY with trace sand and rounded gravel.		
			10					
			9					
	16"	4.5+	9	ND	2	Mottled brown and gray silty CLAY with trace silt and gravel.		
5			10					
			4					
	15"	4.5+	9	ND	3	Very stiff, brown silty CLAY with trace sand and gravel.		
			13					
			4				CL	
	16"	4.5+	22	ND	4	SAME AS ABOVE		
10			17					
			8					
	15"	4	10	ND	5	Gray silty CLAY with trace sand and shale.		
			13					
			4					
	16"	2	3	ND	6	SAME AS ABOVE		
15			3					
						END OF BORING AT 15.46 FEET		
20								



NOTES:
1. Hand Penetrometer in tons/sq. ft.
2. USCS = Unified Soil Classification System
3. ND = No Detection
4. trace (< 5%); few (5%-10%); little (15%-25%); some (30%-45%); mostly (50%-100%)

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: PPG Industries / PPG RFI	Local Grid Location of Well: See Fig 1 ft. ☐N ☐S See Fig 1 ft. ☐E ☐W	Well Name: MW-9
Facility License, Permit or Monitoring Number: _____	Grid Origin Location: Lat. See Fig 1 Long. See Fig 1 or St. Plane See Fig 1 ft. N. See Fig 1 ft. E.	Wis. Unique Well Number / DNR Well Number: _____
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: NW 1/4 of SW 1/4 of Sec. 32, T. 5 N, R. 22 ☒E ☐W	Date Well Installed: 09/18/96 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: Unknown ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☒ Sidegradient; d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Jerry Hamman / Fox Exploration
Is Well A Point of Enforcement Std. Application? ☒ Yes ☐ No		

A. Protective pipe, top elevation 1172.20 ft. ~~MSL~~ plant system
B. Well casing, top elevation 1166.83 ft. ~~MSL~~ plant system
C. Land surface elevation 1164.29 ft. ~~MSL~~ plant system
D. Surface seal, bottom _____ ft. MSL or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

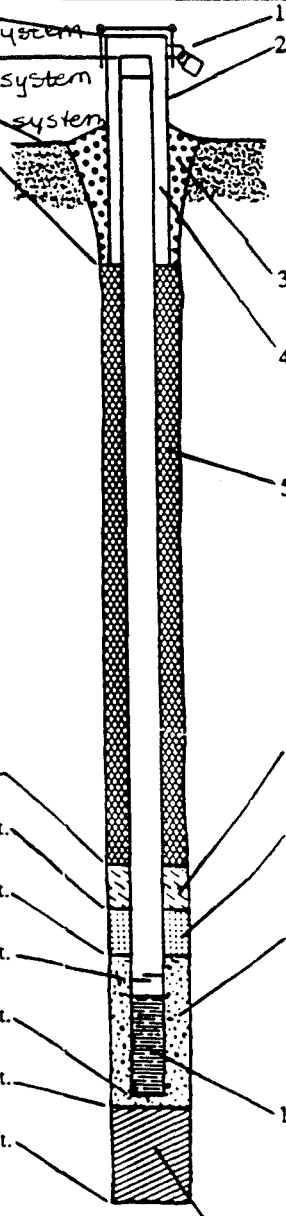
14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ __
_____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe N/A

17. Source of water (attach analysis):
N/A

E. Bentonite seal, top _____ ft. MSL or 2.0 ft.
F. Fine sand, top N/A ft. MSL or N/A ft.
G. Filter pack, top _____ ft. MSL or 3.5 ft.
H. Screen joint, top _____ ft. MSL or 5.46 ft.
I. Well bottom _____ ft. MSL or 15.46 ft.
J. Filter pack, bottom _____ ft. MSL or 15.46 ft.
K. Borehole, bottom _____ ft. MSL or 15.46 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.34 in.
N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe: (square)
a. Inside diameter: 4" x 4" in.
b. Length: 5.0 ft.
c. Material: Steel ☒ 04; Other ☐ __
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☐ 30; Concrete ☒ 01; Other ☐ __
2' x 2' Formed Concrete Pad
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ __; Other ☒ __
Grout
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . . . Bentonite-cement grout ☒ 50
e. < 1 Ft³ volume added for any of the above
f. How installed: see 6b; Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☒ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☒ 32
c. _____ Other ☐ __
7. Fine sand material: Manufacturer, product name & mesh size
a. Not Used
b. Volume added N/A ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Global Well Supply, #5 Sand
b. Volume added 3.91 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ __
_____
10. Screen material: Stainless
a. Screen type: Factory cut ☐ 11; Continuous slot ☐ 01; Other ☐ __
Wire wrapped
b. Manufacturer Johnson Filtration System, Inc
c. Slot size: 0.010 in
d. Slotted length: 10.0 ft
11. Backfill material (below filter pack): None ☒ 14; Other ☐ __
None

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm
[signature]	IT Kaiser Engineers

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats. and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

APPENDIX B

WELL DEVELOPMENT LOGS

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
PPG INDUSTRIES/PPG RFI	MILWAUKEE	LP-2
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number**	**DNR Well Number**
_____	41	_____	_____

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☒ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐ __

3. Time spent developing well 10 min.

4. Depth of well (from top of well casisng) 33.65 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 21.28 gal.

7. Volume of water removed from well 20.0 gal.

8. Volume of water added (if any) N/A gal.

9. Source of water added N/A

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 22.00 ft.	14.61 ft.
Date	b. 10/02/96 m m d d y y	10/24/96 m m d d y y
Time	c. 12:30 ☐ a.m. ☒ p.m.	13:06 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	3.0 inches	1.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Cloudy >200 on Turbidity Meter	Clear ☐ 20 Turbid ☒ 25 (Describe) Cloudy >200 on Turbidity Meter

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	N/A mg/l	N/A mg/l
15. COD	N/A mg/l	N/A mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: MARK LARSON

Firm: ICF KAISER

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Mark Larson

Print Initials: ___

Firm: _____

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
PPG Industries / PPG RFI	Milwaukee	LP-4
Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
_____	41	_____	_____

		Before Development	After Development
1. Can this well be purged dry?	☒ Yes ☐ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	☒ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☐ 62		
surged with block, bailed and pumped	☐ 70		
compressed air	☐ 20		
bailed only	☐ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other _____	☐		
11. Depth to Water (from top of well casing)	a.	13.39 ft.	13.44 ft.
Date	b.	10/09/96 m m d d y y	10/24/96 m m d d y y
Time	c.	1:30 ☐ a.m. ☒ p.m.	12:51 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		≈2.0 inches	≈1.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe)	Clear ☐ 20 Turbid ☒ 25 (Describe)
		Cloudy >200 on Turbidity Meter	Cloudy >200 on Turbidity Meter
3. Time spent developing well		30 min.	
4. Depth of well (from top of well casisng)		29.71 ft.	
5. Inside diameter of well		2.00 in.	
6. Volume of water in filter pack and well casing		19.04 gal.	
7. Volume of water removed from well (bailed dry)		3.5 gal.	
8. Volume of water added (if any)		0.0 gal.	
9. Source of water added		N/A	
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☒ No		

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids		_____ mg/l	_____ mg/l
15. COD		_____ mg/l	_____ mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: MARK LARSON

Firm: IEF Kaiser

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Mark Larson

Print Initials: _____

Firm: _____

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
DPG Industries/DPG RFI	Milwaukee	LW-5

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
_____	41	_____	_____

	Before Development	After Development
1. Can this well be purged dry?	☒ Yes ☐ No	
2. Well development method		
surged with bailer and bailed	☐ 41	
surged with bailer and pumped	☐ 61	
surged with block and bailed	☐ 42	
surged with block and pumped	☐ 62	
surged with block, bailed and pumped	☐ 70	
compressed air	☐ 20	
bailed only	☐ 10	
pumped only	☐ 51	
pumped slowly	☐ 50	
Other Dry	☒	
11. Depth to Water (from top of well casing) a.	DRY ft.	DRY ft.
Date b.	10/08/96 (mm dd yy)	10/24/96 (mm dd yy)
Time c.	4:05 ☐ a.m. ☒ p.m.	1:10 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	___.__ inches	___.__ inches
13. Water clarity	Clear ☐ 10 Turbid ☐ 15 (Describe) N/A	Clear ☐ 20 Turbid ☐ 25 (Describe) N/A
3. Time spent developing well	0 min.	
4. Depth of well (from top of well casisng)	17.85 ft.	
5. Inside diameter of well	2.00 in.	
6. Volume of water in filter pack and well casing	0.0 gal.	
7. Volume of water removed from well	0.0 gal.	
8. Volume of water added (if any)	0.0 gal.	
9. Source of water added	N/A	
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☒ No	

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg
15. COD	____.__ mg/l	____.__ mg

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: MARK LARSON

Firm: CF KAISER

I hereby certify that the above information is true and correct to the b of my knowledge.

Signature: Mark Larson

Print Initials: ___

Firm: _____

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
PPG Industries/PPG RFI	Milwaukee	LW-6
Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
_____	41	_____	_____

		Before Development	After Development
1. Can this well be purged dry?	☒ Yes ☐ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	☒ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☐ 62		
surged with block, bailed and pumped	☐ 70		
compressed air	☐ 20		
bailed only	☐ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other _____	☐ __		
11. Depth to Water (from top of well casing)		a. 22.34 ft.	22.35 ft.
Date		b. 10/23/96 (m m d d y y)	10/24/96 (m m d d y y)
Time		c. 11:45 ☒ a.m. ☐ p.m.	1:08 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		___.__ inches	___.__ inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Cloudy > 200 on Turbidity Meter	Clear ☐ 20 Turbid ☒ 25 (Describe) Cloudy >200 on Turbidity Meter
3. Time spent developing well		___45 min.	
4. Depth of well (from top of well casisng)		25.05 ft.	
5. Inside diameter of well		2.00 in.	
6. Volume of water in filter pack and well casing		___7.05 gal.	
7. Volume of water removed from well (bailed dry)		___1.5 gal.	
8. Volume of water added (if any)		N/A gal.	
9. Source of water added		N/A	
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☒ No		

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	_____.__ mg/l	_____.__ mg/l
15. COD	_____.__ mg/l	_____.__ mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: Mark Larson

Firm: IT Kaiser Engineers

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Mark Larson

Print Initials: ____

Firm: _____

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
PPG Industries / PPG RFI	Milwaukee	MW-9
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	41	_____ / _____

	Before Development	After Development
1. Can this well be purged dry?	☒ Yes ☐ No	
2. Well development method		
surged with bailer and bailed ☐ 41		
surged with bailer and pumped ☒ 61		
surged with block and bailed ☐ 42		
surged with block and pumped ☐ 62		
surged with block, bailed and pumped ☐ 70		
compressed air ☐ 20		
bailed only ☐ 10		
pumped only ☐ 51		
pumped slowly ☐ 50		
Other _____ ☐ __		
11. Depth to Water (from top of well casing)	a. 11.64 ft.	11.85 ft.
Date	b. 10/08/96 (m m d d y y)	10/24/96 (m m d d y y)
Time	c. 2:45 ☐ a.m. ☒ p.m.	12:40 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	___.__ inches	___.__ inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) cloudy >200 on Turbidity Meter	Clear ☐ 20 Turbid ☒ 25 (Describe) Cloudy >200 on Turbidity meter
3. Time spent developing well	15 min.	
4. Depth of well (from top of well casisng)	17.90 ft.	
5. Inside diameter of well	2.00 in.	
6. Volume of water in filter pack and well casing	16.34 gal.	
7. Volume of water removed from well (purged dry)	20 gal.	
8. Volume of water added (if any)	0.0 gal.	
9. Source of water added	N/A	
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☒ No	
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	_____.__ mg/l	_____.__ mg/l
15. COD	_____.__ mg/l	_____.__ mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: MARK LARSON

Firm: ICF KAISER

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Mark Larson

Print Initials: ____

Firm: _____

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

APPENDIX C

ANALYTICAL DATA SUMMARY

APPENDIX C
RFI Soil Sampling Results - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA04-01 SWMU # 3 10/1/96	PPG-HA05-01 SWMU # 3 10/1/96	PPG-HA06-01 SWMU # 3 10/1/96	PPG-HA07-01 SWMU # 3 10/1/96	PPG-HA08-01.5 SWMU # 3 10/1/96	PPG-HA09-01.5 SWMU # 3 10/1/96	PPG-HA09-01.5-DUP SWMU # 3 10/1/96	PPG-HA10-01.5 MIBK TANK 10/1/96
VOLATILES (ug/kg)									
1,1,1,2-Tetrachloroethane	4800	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
1,1,1-Trichloroethane	3200000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
1,1,2,2-Tetrachloroethane	900	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
1,1,2-Trichloroethane	1400	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
1,1-Dichloroethane	840000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
1,1-Dichloroethene	38	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
1,2,3-Trichlorobenzene	---	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
1,2,3-Trichloropropane	6.6	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
1,2,4-Trimethylbenzene	---	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
1,2-Dibromo-3-chloropropane	320	11 U	11 U	11 U	11 U	12 U	11 U	NA	10 U
1,2-Dibromoethane	5.1	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
1,2-Dichloroethane	440	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
1,2-Dichloropropane	680	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
2-Butanone (MEK)	8700000	110 U	110 U	110 U	110 U	120 U	110 U	NA	100 U
2-Chloroethyl vinyl ether	---	11 U	11 U	11 U	11 U	12 U	11 U	NA	10 U
2-Chlorotoluene	---	11 U	11 U	11 U	11 U	12 U	11 U	NA	10 U
2-Hexanone	---	54 U	53 U	56 U	57 U	61 U	57 U	NA	52 U
4-Methyl-2-pentanone (MIBK)	5200000	54 U	53 U	56 U	57 U	61 U	57 U	NA	52 U
Acetone	2000000	110 U	110 U	110 U	110 U	120 U	110 U	NA	100 U
Benzene	1400	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Bromobenzene	---	11 U	11 U	11 U	11 U	12 U	11 U	NA	10 U
Bromodichloromethane	1400	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Bromoform	56000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Bromomethane	15000	11 U	11 U	11 U	11 U	12 U	11 U	NA	10 U
Carbon disulfide	16000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Carbon tetrachloride	470	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Chlorobenzene	160000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Chloroethane	1100000	11 U	11 U	11 U	11 U	12 U	11 U	NA	10 U
Chloroform	530	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Chloromethane	2000	11 U	11 U	11 U	11 U	12 U	11 U	NA	10 U
Dibromochloromethane	5300	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Dibromomethane	650000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Dichlorodifluoromethane	110000	22 U	21 U	22 U	23 U	24 U	23 U	NA	21 U
Ethylbenzene	2900000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Isopropylbenzene	---	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Methylene chloride	11000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Styrene	2200000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Tetrachloroethene	7000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Toluene	1900000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Trichloroethene	7100	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
Trichlorofluoromethane	710000	11 U	11 U	11 U	11 U	12 U	11 U	NA	10 U
Vinyl chloride	5.2	11 U	11 U	11 U	11 U	12 U	11 U	NA	10 U
Xylenes (total)	980000	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
cis-1,2-Dichloroethene	---	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
cis-1,3-Dichloropropene	510	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.

APPENDIX C
RFI Soil Sampling Results - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA04-01 SWMU # 3 10/1/96	PPG-HA05-01 SWMU # 3 10/1/96	PPG-HA06-01 SWMU # 3 10/1/96	PPG-HA07-01 SWMU # 3 10/1/96	PPG-HA08-01.5 SWMU # 3 10/1/96	PPG-HA09-01.5 SWMU # 3 10/1/96	PPG-HA09-01.5-DUP SWMU # 3 10/1/96	PPG-HA10-01.5 MIBK TANK 10/1/96
VOLATILES (ug/kg) (cont.)									
n-Propylbenzene	---	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
trans-1,2-Dichloroethene	---	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
trans-1,3-Dichloropropene	510	5.4 U	5.3 U	5.6 U	5.7 U	6.1 U	5.7 U	NA	5.2 U
SEMIVOLATILES (ug/kg)									
1,2,4-Trichlorobenzene	620,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
1,2-Dichlorobenzene	2,300,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
1,3-Dichlorobenzene	2,800,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
1,4-Dichlorobenzene	7,400	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
2,4,5-Trichlorophenol	6,500,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
2,4,6-Trichlorophenol	40,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
2,4-Dichlorophenol	200,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
2,4-Dimethylphenol	1,300,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
2,4-Dinitrophenol	130,000	1700 U	1700 U	1800 U	1800 U	2000 U	1800 U	NA	1700 U
2,4-Dinitrotoluene	130,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
2,6-Dinitrotoluene	65,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
2-Chloronaphthalene	5,200,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
2-Chlorophenol	330,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
2-Methylnaphthalene	---	360 U	350 U	370 U	370 U	89 J	380 U	NA	340 U
2-Methylphenol	3,300,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
2-Nitroaniline	3,900	1700 U	1700 U	1800 U	1800 U	2000 U	1800 U	NA	1700 U
2-Nitrophenol	---	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
3,3'-Dichlorobenzidine	990	720 U	700 U	730 U	750 U	810 U	750 U	NA	690 U
3-Nitroaniline	---	1700 U	1700 U	1800 U	1800 U	2000 U	1800 U	NA	1700 U
4,6-Dinitro-2-methylphenol	---	1700 U	1700 U	1800 U	1800 U	2000 U	1800 U	NA	1700 U
4-Bromophenyl phenyl ether	---	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
4-Chloro-3-methylphenol	---	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
4-Chloroaniline	260,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
4-Chlorophenyl phenyl ether	---	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
4-Methylphenol	330,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
4-Nitroaniline	---	1700 U	1700 U	1800 U	1800 U	2000 U	1800 U	NA	1700 U
4-Nitrophenol	---	1700 U	1700 U	1800 U	1800 U	2000 U	1800 U	NA	1700 U
Acenaphthene	360,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Acenaphthylene	---	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Anthracene	19,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Benzo(a)anthracene	610	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Benzo(a)pyrene	61	360 U	350 U	48 J	370 U	400 U	43 J	NA	340 U
Benzo(b)fluoranthene	610	360 U	350 U	80 J	49 J	400 U	62 J	NA	340 U
Benzo(ghi)perylene	---	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Benzo(k)fluoranthene	6,100	360 U	350 U	370 U	44 J	400 U	49 J	NA	340 U
Butyl benzyl phthalate	13,000,000	360 U	350 U	650	370 U	150 J	380 U	NA	340 U
Carbazole	---	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Chrysene	24,000	360 U	350 U	43 J	370 U	51 J	380 U	NA	340 U
Di-n-butyl phthalate	---	360 U	350 U	45 J	370 U	400 U	380 U	NA	340 U
Di-n-octyl phthalate	1,300,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Dibenz(a,h)anthracene	61	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.

APPENDIX C
RFI Soil Sampling Results - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA04-01 SWMU # 3 10/1/96	PPG-HA05-01 SWMU # 3 10/1/96	PPG-HA06-01 SWMU # 3 10/1/96	PPG-HA07-01 SWMU # 3 10/1/96	PPG-HA08-01.5 SWMU # 3 10/1/96	PPG-HA09-01.5 SWMU # 3 10/1/96	PPG-HA09-01.5-DUP SWMU # 3 10/1/96	PPG-HA10-01.5 MIBK TANK 10/1/96
SEMIVOLATILES (ug/kg) (cont.)									
Dibenzofuran	260,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Diethyl phthalate	52,000,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Dimethyl phthalate	100,000,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Fluoranthene	2,600,000	360 U	350 U	44 J	370 U	400 U	380 U	NA	340 U
Fluorene	300,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Hexachlorobenzene	280	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Hexachlorobutadiene	5,700	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Hexachlorocyclopentadiene	450,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Hexachloroethane	32,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Indeno(1,2,3-cd)pyrene	610	360 U	350 U	48 J	370 U	400 U	380 U	NA	340 U
Isophorone	470,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
N-Nitrosodi-n-propylamine	63	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
N-Nitrosodiphenylamine	91,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Naphthalene	800,000	360 U	350 U	77 J	300 J	400 U	380 U	NA	340 U
Nitrobenzene	33,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Pentachlorophenol	2,500	1700 U	1700 U	1800 U	1800 U	2000 U	1800 U	NA	1700 U
Phenanthrene	---	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Phenol	39,000,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
Pyrene	2,000,000	360 U	350 U	52 J	370 U	400 U	380 U	NA	340 U
Pyridine	65,000	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
bis(2-Chloroethoxy)methane	---	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
bis(2-Chloroethyl) ether	74	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
bis(2-Chloroisopropyl) ether	---	360 U	350 U	370 U	370 U	400 U	380 U	NA	340 U
bis(2-Ethylhexyl) phthalate	32,000	140 J	150 J	790	140 J	400 J	380 U	NA	140 J
ALCOHOLS (ug/kg)									
1-Butanol	---	540 U	530 U	560 U	570 U	610 U	570 U	NA	520 U
Isobutyl alcohol	20,000,000	540 U	530 U	560 U	570 U	610 U	570 U	NA	520 U
METALS (mg/kg)									
Aluminum	---	2500	3260	5910	10500	11200	11700	12600	2430
Arsenic	0.32	2	2.3	2.8	6.3	4.8	5.3	4.7	2.1
Barium	5300	12.3	15.3	288	49.3	109	55.8	55.1	12.6
Cadmium	38	0.11 J	0.11 J	0.41	0.23 J	0.24 J	0.063	0.036	0.12 J
Calcium	---	92300	88900	92100	92600	84700	82100	74600	113000
Chromium	210	5.9	6.1	45.5	18.1	22.1	21.6	22.5	4.9
Iron	---	6840	7150	10800	16100	17200	16600	16300	8230
Lead	400	4.2 J	3.4 J	78.9 J	8.9 J	27.6 J	10.6 J	8.1	5.2 J
Magnesium	---	47100	42800	57400	50100	39500	39300	36100	66800
Mercury	23	0.013 J	0.11 U	0.33	0.023 J	0.062 J	0.015	0.016	0.012 J
Nickel	1500	16.1 J	7.5 J	12.6 J	17.5 J	21.7 J	21.9 J	22.9	7.1 J

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.

APPENDIX C
RFI Soil Sampling Results - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA11-02 SWMU # 9 10/1/96	PPG-HA12-01.5 SWMU # 9 10/1/96	PPG-HA13-01.5 SWMU # 9 10/1/96	PPG-HA14-01.5 SWMU # 9 10/1/96	PPG-HA15-01 SWMU # 9 10/1/96	PPG-HA15-01-09 SWMU # 9 10/1/96	PPG-HA16-01.25 SWMU # 4 9/30/96	PPG-HA17-01 SWMU # 4 9/30/96
VOLATILES (ug/kg)									
1,1,1,2-Tetrachloroethane	4800	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
1,1,1-Trichloroethane	3200000	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
1,1,2,2-Tetrachloroethane	900	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
1,1,2-Trichloroethane	1400	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
1,1-Dichloroethane	840000	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
1,1-Dichloroethene	38	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
1,2,3-Trichlorobenzene	---	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
1,2,3-Trichloropropane	6.6	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
1,2,4-Trimethylbenzene	---	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
1,2-Dibromo-3-chloropropane	320	12 U	11 U	12 U	11 U	12 U	11 U	10 U	12 U
1,2-Dibromoethane	5.1	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
1,2-Dichloroethane	440	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
1,2-Dichloropropane	680	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
2-Butanone (MEK)	8700000	120 U	110 U	120 U	110 U	120 U	110 U	100 U	120 U
2-Chloroethyl vinyl ether	---	12 U	11 U	12 U	11 U	12 U	11 U	10 U	12 U
2-Chlorotoluene	---	12 U	11 U	12 U	11 U	12 U	11 U	10 U	12 U
2-Hexanone	---	58 U	53 U	58 U	56 U	58 U	57 UJ	52 U	60 U
4-Methyl-2-pentanone (MIBK)	5200000	58 U	53 U	58 U	56 U	58 U	57 U	52 U	60 U
Acetone	2000000	120 U	110 U	120 U	110 U	120 U	110 U	100 U	9.4 J
Benzene	1400	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
Bromobenzene	---	12 U	11 U	12 U	11 U	12 U	11 U	10 U	12 U
Bromodichloromethane	1400	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
Bromoform	56000	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
Bromomethane	15000	12 U	11 U	12 U	11 U	12 U	11 U	10 U	12 U
Carbon disulfide	16000	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
Carbon tetrachloride	470	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
Chlorobenzene	160000	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
Chloroethane	1100000	12 U	11 U	12 U	11 U	12 U	11 U	10 U	12 U
Chloroform	530	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
Chloromethane	2000	12 U	11 U	12 U	11 U	12 U	11 U	10 U	12 U
Dibromochloromethane	5300	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
Dibromomethane	650000	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
Dichlorodifluoromethane	110000	23 U	21 U	23 U	23 U	23 U	23 U	21 U	24 U
Ethylbenzene	2900000	5.8 U	5.3 U	2.4 J	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
Isopropylbenzene	---	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
Methylene chloride	11000	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
Styrene	2200000	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
Tetrachloroethene	7000	3.6 J	5.3 U	5.8 U	5.6 U	5.8 U	3.7 J	5.2 U	6 U
Toluene	1900000	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
Trichloroethene	7100	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
Trichlorofluoromethane	710000	12 U	11 U	12 U	11 U	12 U	11 U	10 U	12 U
Vinyl chloride	5.2	12 U	11 U	12 U	11 U	12 U	11 U	10 U	12 U
Xylenes (total)	980000	9.9	5.3 U	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
cis-1,2-Dichloroethene	---	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
cis-1,3-Dichloropropene	510	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.

APPENDIX C
RFI Soil Sampling Results - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA11-02 SWMU # 9 10/1/96	PPG-HA12-01.5 SWMU # 9 10/1/96	PPG-HA13-01.5 SWMU # 9 10/1/96	PPG-HA14-01.5 SWMU # 9 10/1/96	PPG-HA15-01 SWMU # 9 10/1/96	PPG-HA15-01-09 SWMU # 9 10/1/96	PPG-HA16-01.25 SWMU # 4 9/30/96	PPG-HA17-01 SWMU # 4 9/30/96
VOLATILES (ug/kg) (cont.)									
n-Propylbenzene	---	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
trans-1,2-Dichloroethene	---	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 U	5.2 U	6 U
trans-1,3-Dichloropropene	510	5.8 U	5.3 U	5.8 U	5.6 U	5.8 U	5.7 UJ	5.2 U	6 U
SEMIVOLATILES (ug/kg)									
1,2,4-Trichlorobenzene	620,000	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	2,300,000	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2,800,000	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	7,400	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	6,500,000	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	40,000	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	200,000	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	1,300,000	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	130,000	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	130,000	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	65,000	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	5,200,000	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	330,000	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	3,300,000	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	3,900	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	---	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	990	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	---	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	---	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	---	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	---	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	260,000	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	---	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	330,000	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	---	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	---	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	360,000	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	---	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	19,000	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	610	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	61	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	610	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(ghi)perylene	---	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	6,100	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	13,000,000	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	---	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	24,000	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	---	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	1,300,000	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	61	NA	NA	NA	NA	NA	NA	NA	NA

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.

APPENDIX C
RFI Soil Sampling Results - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA11-02 SWMU # 9 10/1/96	PPG-HA12-01.5 SWMU # 9 10/1/96	PPG-HA13-01.5 SWMU # 9 10/1/96	PPG-HA14-01.5 SWMU # 9 10/1/96	PPG-HA15-01 SWMU # 9 10/1/96	PPG-HA15-01-09 SWMU # 9 10/1/96	PPG-HA16-01.25 SWMU # 4 9/30/96	PPG-HA17-01 SWMU # 4 9/30/96
SEMIVOLATILES (ug/kg) (cont.)									
Dibenzofuran	260,000	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	52,000,000	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	100,000,000	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	2,600,000	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	300,000	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	280	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	5,700	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	450,000	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	32,000	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	610	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	470,000	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-propylamine	63	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	91,000	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	800,000	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	33,000	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	2,500	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	---	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	39,000,000	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	2,000,000	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	65,000	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	---	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	74	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	---	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate	32,000	NA	NA	NA	NA	NA	NA	NA	NA
ALCOHOLS (ug/kg)									
1-Butanol	---	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl alcohol	20,000,000	NA	NA	NA	NA	NA	NA	NA	NA
METALS (mg/kg)									
Aluminum	---	9420	9700	17200	9510	11500	9900	399	14300
Arsenic	0.32	4.5	5	7	5.1	6.7	5.2	0.4 BJ	6.7
Barium	5300	52.7	56.3	53.2	49.1	54.8	50.4	3.5 J	83.6
Cadmium	38	0.15 J	0.18 J	0.19 J	0.21 J	0.24	0.24	0.21 U	0.24 U
Calcium	---	74700	67300	51300	82200	76200	80500	188000 J	3940 J
Chromium	210	17.9	17.2	26.2	17.1	19.4	19	1.3	25.2
Iron	---	16800	15100	23200	16200	18800	16600	1320	22200
Lead	400	7.2 J	10.9 J	10.9 J	7.2 J	9 J	9.8 J	1.1	16
Magnesium	---	40900	32700	27700	41900	39100	41900	120000 J	5390 J
Mercury	23	0.023 J	0.028 J	0.027 J	0.018 J	0.033 J	0.019 J	0.1 U	0.043
Nickel	1500	19.7 J	17.3 J	26.6 J	19.3 J	21.6 J	20.9 J	4.2 U	25.5

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.

APPENDIX C
RFI Soil Sampling Results - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA17-01-09 SWMU # 4 9/30/96	PPG-HA17-01-DUP SWMU # 4 9/30/96	PPG-HA18-01 SWMU # 4 9/30/96	PPG-HA19-02 SWMU # 4 9/30/96	PPG-HA20-01.5 SWMU # 4 9/30/96	PPG-HA21-02 SWMU # 4 9/30/96	PPG-HA22-01.5 SWMU # 4 9/30/96	PPG-HA23- SWMU # 4 9/30/96
VOLATILES (ug/kg)									
1,1,1,2-Tetrachloroethane	4800	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
1,1,1-Trichloroethane	3200000	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
1,1,2,2-Tetrachloroethane	900	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
1,1,2-Trichloroethane	1400	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
1,1-Dichloroethane	840000	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
1,1-Dichloroethene	38	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
1,2,3-Trichlorobenzene	---	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
1,2,3-Trichloropropane	6.6	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
1,2,4-Trimethylbenzene	---	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
1,2-Dibromo-3-chloropropane	320	12 U	NA	12 U	10 U	11 U	12 U	13 U	12
1,2-Dibromoethane	5.1	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
1,2-Dichloroethane	440	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
1,2-Dichloropropane	680	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
2-Butanone (MEK)	8700000	120 U	NA	120 U	100 U	110 U	120 U	130 U	120
2-Chloroethyl vinyl ether	---	12 U	NA	12 U	10 U	11 U	12 U	13 U	12
2-Chlorotoluene	---	12 U	NA	12 U	10 U	11 U	12 U	13 U	12
2-Hexanone	---	61 U	NA	62 U	52 U	54 U	58 U	63 U	62
4-Methyl-2-pentanone (MIBK)	5200000	61 U	NA	62 U	52 U	54 U	58 U	63 U	62
Acetone	2000000	15 J	NA	120 U	100 U	110 U	120 U	130 U	13
Benzene	1400	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Bromobenzene	---	12 U	NA	12 U	10 U	11 U	12 U	13 U	12
Bromodichloromethane	1400	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Bromoform	56000	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Bromomethane	15000	12 U	NA	12 U	10 U	11 U	12 U	13 U	12
Carbon disulfide	16000	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Carbon tetrachloride	470	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Chlorobenzene	160000	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Chloroethane	1100000	12 U	NA	12 U	10 U	11 U	12 U	13 U	12
Chloroform	530	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Chloromethane	2000	12 U	NA	12 U	10 U	11 U	12 U	13 U	12
Dibromochloromethane	5300	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Dibromomethane	650000	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Dichlorodifluoromethane	110000	25 U	NA	25 U	21 U	22 U	23 U	25 U	25
Ethylbenzene	2900000	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Isopropylbenzene	---	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Methylene chloride	11000	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Styrene	2200000	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Tetrachloroethene	7000	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Toluene	1900000	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Trichloroethene	7100	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
Trichlorofluoromethane	710000	12 U	NA	12 U	10 U	11 U	12 U	13 U	12
Vinyl chloride	5.2	12 U	NA	12 U	10 U	11 U	12 U	13 U	12
Xylenes (total)	980000	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
cis-1,2-Dichloroethene	---	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
cis-1,3-Dichloropropene	510	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.

APPENDIX C
RFI Soil Sampling Results - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA17-01-09 SWMU # 4 9/30/96	PPG-HA17-01-DUP SWMU # 4 9/30/96	PPG-HA18-01 SWMU # 4 9/30/96	PPG-HA19-02 SWMU # 4 9/30/96	PPG-HA20-01.5 SWMU # 4 9/30/96	PPG-HA21-02 SWMU # 4 9/30/96	PPG-HA22-01.5 SWMU # 4 9/30/96	PPG-HA23- SWMU # 4 9/30/96
VOLATILES (ug/kg) (cont.)									
n-Propylbenzene	---	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
trans-1,2-Dichloroethene	---	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
trans-1,3-Dichloropropene	510	6.1 U	NA	6.2 U	5.2 U	5.4 U	5.8 U	6.3 U	6.2
SEMIVOLATILES (ug/kg)									
1,2,4-Trichlorobenzene	620,000	NA	NA	NA	NA	NA	NA	NA	
1,2-Dichlorobenzene	2,300,000	NA	NA	NA	NA	NA	NA	NA	
1,3-Dichlorobenzene	2,800,000	NA	NA	NA	NA	NA	NA	NA	
1,4-Dichlorobenzene	7,400	NA	NA	NA	NA	NA	NA	NA	
2,4,5-Trichlorophenol	6,500,000	NA	NA	NA	NA	NA	NA	NA	
2,4,6-Trichlorophenol	40,000	NA	NA	NA	NA	NA	NA	NA	
2,4-Dichlorophenol	200,000	NA	NA	NA	NA	NA	NA	NA	
2,4-Dimethylphenol	1,300,000	NA	NA	NA	NA	NA	NA	NA	
2,4-Dinitrophenol	130,000	NA	NA	NA	NA	NA	NA	NA	
2,4-Dinitrotoluene	130,000	NA	NA	NA	NA	NA	NA	NA	
2,6-Dinitrotoluene	65,000	NA	NA	NA	NA	NA	NA	NA	
2-Chloronaphthalene	5,200,000	NA	NA	NA	NA	NA	NA	NA	
2-Chlorophenol	330,000	NA	NA	NA	NA	NA	NA	NA	
2-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA	
2-Methylphenol	3,300,000	NA	NA	NA	NA	NA	NA	NA	
2-Nitroaniline	3,900	NA	NA	NA	NA	NA	NA	NA	
2-Nitrophenol	---	NA	NA	NA	NA	NA	NA	NA	
3,3'-Dichlorobenzidine	990	NA	NA	NA	NA	NA	NA	NA	
3-Nitroaniline	---	NA	NA	NA	NA	NA	NA	NA	
4,6-Dinitro-2-methylphenol	---	NA	NA	NA	NA	NA	NA	NA	
4-Bromophenyl phenyl ether	---	NA	NA	NA	NA	NA	NA	NA	
4-Chloro-3-methylphenol	---	NA	NA	NA	NA	NA	NA	NA	
4-Chloroaniline	260,000	NA	NA	NA	NA	NA	NA	NA	
4-Chlorophenyl phenyl ether	---	NA	NA	NA	NA	NA	NA	NA	
4-Methylphenol	330,000	NA	NA	NA	NA	NA	NA	NA	
4-Nitroaniline	---	NA	NA	NA	NA	NA	NA	NA	
4-Nitrophenol	---	NA	NA	NA	NA	NA	NA	NA	
Acenaphthene	360,000	NA	NA	NA	NA	NA	NA	NA	
Acenaphthylene	---	NA	NA	NA	NA	NA	NA	NA	
Anthracene	19,000	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)anthracene	610	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)pyrene	61	NA	NA	NA	NA	NA	NA	NA	
Benzo(b)fluoranthene	610	NA	NA	NA	NA	NA	NA	NA	
Benzo(ghi)perylene	---	NA	NA	NA	NA	NA	NA	NA	
Benzo(k)fluoranthene	6,100	NA	NA	NA	NA	NA	NA	NA	
Butyl benzyl phthalate	13,000,000	NA	NA	NA	NA	NA	NA	NA	
Carbazole	---	NA	NA	NA	NA	NA	NA	NA	
Chrysene	24,000	NA	NA	NA	NA	NA	NA	NA	
Di-n-butyl phthalate	---	NA	NA	NA	NA	NA	NA	NA	
Di-n-octyl phthalate	1,300,000	NA	NA	NA	NA	NA	NA	NA	
Dibenz(a,h)anthracene	61	NA	NA	NA	NA	NA	NA	NA	

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.

APPENDIX C
RFI Soil Sampling Results - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA17-01-09 SWMU # 4 9/30/96	PPG-HA17-01-DUP SWMU # 4 9/30/96	PPG-HA18-01 SWMU # 4 9/30/96	PPG-HA19-02 SWMU # 4 9/30/96	PPG-HA20-01.5 SWMU # 4 9/30/96	PPG-HA21-02 SWMU # 4 9/30/96	PPG-HA22-01.5 SWMU # 4 9/30/96	PPG-HA23- SWMU # 4 9/30/96
SEMIVOLATILES (ug/kg) (cont.)									
Dibenzofuran	260,000	NA	NA	NA	NA	NA	NA	NA	
Diethyl phthalate	52,000,000	NA	NA	NA	NA	NA	NA	NA	
Dimethyl phthalate	100,000,000	NA	NA	NA	NA	NA	NA	NA	
Fluoranthene	2,600,000	NA	NA	NA	NA	NA	NA	NA	
Fluorene	300,000	NA	NA	NA	NA	NA	NA	NA	
Hexachlorobenzene	280	NA	NA	NA	NA	NA	NA	NA	
Hexachlorobutadiene	5,700	NA	NA	NA	NA	NA	NA	NA	
Hexachlorocyclopentadiene	450,000	NA	NA	NA	NA	NA	NA	NA	
Hexachloroethane	32,000	NA	NA	NA	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	610	NA	NA	NA	NA	NA	NA	NA	
Isophorone	470,000	NA	NA	NA	NA	NA	NA	NA	
N-Nitrosodi-n-propylamine	63	NA	NA	NA	NA	NA	NA	NA	
N-Nitrosodiphenylamine	91,000	NA	NA	NA	NA	NA	NA	NA	
Naphthalene	800,000	NA	NA	NA	NA	NA	NA	NA	
Nitrobenzene	33,000	NA	NA	NA	NA	NA	NA	NA	
Pentachlorophenol	2,500	NA	NA	NA	NA	NA	NA	NA	
Phenanthrene	---	NA	NA	NA	NA	NA	NA	NA	
Phenol	39,000,000	NA	NA	NA	NA	NA	NA	NA	
Pyrene	2,000,000	NA	NA	NA	NA	NA	NA	NA	
Pyridine	65,000	NA	NA	NA	NA	NA	NA	NA	
bis(2-Chloroethoxy)methane	---	NA	NA	NA	NA	NA	NA	NA	
bis(2-Chloroethyl) ether	74	NA	NA	NA	NA	NA	NA	NA	
bis(2-Chloroisopropyl) ether	---	NA	NA	NA	NA	NA	NA	NA	
bis(2-Ethylhexyl) phthalate	32,000	NA	NA	NA	NA	NA	NA	NA	
ALCOHOLS (ug/kg)									
1-Butanol	---	NA	NA	NA	NA	NA	NA	NA	
Isobutyl alcohol	20,000,000	NA	NA	NA	NA	NA	NA	NA	
METALS (mg/kg)									
Aluminum	---	19700	16800	24600	953	648	15000	26100	19900
Arsenic	0.32	8.4	7.1	6.5	0.9 BJ	3.7	6.7	6.4	8.1
Barium	5300	91.4	84.8	109	5.4 J	22	89.5	125	75.2
Cadmium	38	0.45	0.24 U	0.5	0.043 J	0.66	0.53	0.46	0.47
Calcium	---	2730 J	4300	34900 J	140000 J	132000 J	19700 J	4510 J	21000
Chromium	210	30.1	28.6	37.5	2.2	1.7	24.5	40.9	31
Iron	---	27600	24000	28100	2480	20200	23000	31300	27200
Lead	400	14.7	18.3	11	2.9	54.4	18.4	12.1	11.9
Magnesium	---	6240 J	6060	29700 J	88000 J	84300 J	14200 J	11400 J	18800
Mercury	23	0.065 J	0.077	0.022 J	0.1 U	0.11 U	0.042 J	0.034 J	0.04
Nickel	1500	26.3	26.6	33.9	2.7 J	4.2 J	22.9	38.9	28.5

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.

APPENDIX C
RFI Soil Sampling Results - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	2	PPG-HA24-01.5 SWMU # 4 9/30/96
VOLATILES (ug/kg)			
1,1,1,2-Tetrachloroethane	4800	U	5.4 U
1,1,1-Trichloroethane	3200000	U	5.4 U
1,1,2,2-Tetrachloroethane	900	U	5.4 U
1,1,2-Trichloroethane	1400	U	5.4 U
1,1-Dichloroethane	840000	U	5.4 U
1,1-Dichloroethene	38	U	5.4 U
1,2,3-Trichlorobenzene	---	U	5.4 U
1,2,3-Trichloropropane	6.6	U	5.4 U
1,2,4-Trimethylbenzene	---	U	5.4 U
1,2-Dibromo-3-chloropropane	320	U	11 U
1,2-Dibromoethane	5.1	U	5.4 U
1,2-Dichloroethane	440	U	5.4 U
1,2-Dichloropropane	680	U	5.4 U
2-Butanone (MEK)	8700000	U	110 U
2-Chloroethyl vinyl ether	---	U	11 U
2-Chlorotoluene	---	U	11 U
2-Hexanone	---	U	54 U
4-Methyl-2-pentanone (MIBK)	5200000	U	54 U
Acetone	2000000	J	110 U
Benzene	1400	U	5.4 U
Bromobenzene	---	U	11 U
Bromodichloromethane	1400	U	5.4 U
Bromoform	56000	U	5.4 U
Bromomethane	15000	U	11 U
Carbon disulfide	16000	U	5.4 U
Carbon tetrachloride	470	U	5.4 U
Chlorobenzene	160000	U	5.4 U
Chloroethane	1100000	U	11 U
Chloroform	530	U	5.4 U
Chloromethane	2000	U	11 U
Dibromochloromethane	5300	U	5.4 U
Dibromomethane	650000	U	5.4 U
Dichlorodifluoromethane	110000	U	21 U
Ethylbenzene	2900000	U	5.4 U
Isopropylbenzene	---	U	5.4 U
Methylene chloride	11000	U	5.4 U
Styrene	2200000	U	5.4 U
Tetrachloroethene	7000	U	5.4 U
Toluene	1900000	U	5.4 U
Trichloroethene	7100	U	5.4 U
Trichlorofluoromethane	710000	U	11 U
Vinyl chloride	5.2	U	11 U
Xylenes (total)	980000	U	5.4 U
cis-1,2-Dichloroethene	---	U	5.4 U
cis-1,3-Dichloropropene	510	U	5.4 U

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.

APPENDIX C
RFI Soil Sampling Results - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	2	PPG-HA24-01.5 SWMU # 4 9/30/96
VOLATILES (ug/kg) (cont.)			
n-Propylbenzene	---	U	5.4 U
trans-1,2-Dichloroethene	---	U	5.4 U
trans-1,3-Dichloropropene	510	U	5.4 U
SEMIVOLATILES (ug/kg)			
1,2,4-Trichlorobenzene	620,000	NA	NA
1,2-Dichlorobenzene	2,300,000	NA	NA
1,3-Dichlorobenzene	2,800,000	NA	NA
1,4-Dichlorobenzene	7,400	NA	NA
2,4,5-Trichlorophenol	6,500,000	NA	NA
2,4,6-Trichlorophenol	40,000	NA	NA
2,4-Dichlorophenol	200,000	NA	NA
2,4-Dimethylphenol	1,300,000	NA	NA
2,4-Dinitrophenol	130,000	NA	NA
2,4-Dinitrotoluene	130,000	NA	NA
2,6-Dinitrotoluene	65,000	NA	NA
2-Chloronaphthalene	5,200,000	NA	NA
2-Chlorophenol	330,000	NA	NA
2-Methylnaphthalene	---	NA	NA
2-Methylphenol	3,300,000	NA	NA
2-Nitroaniline	3,900	NA	NA
2-Nitrophenol	---	NA	NA
3,3'-Dichlorobenzidine	990	NA	NA
3-Nitroaniline	---	NA	NA
4,6-Dinitro-2-methylphenol	---	NA	NA
4-Bromophenyl phenyl ether	---	NA	NA
4-Chloro-3-methylphenol	---	NA	NA
4-Chloroaniline	260,000	NA	NA
4-Chlorophenyl phenyl ether	---	NA	NA
4-Methylphenol	330,000	NA	NA
4-Nitroaniline	---	NA	NA
4-Nitrophenol	---	NA	NA
Acenaphthene	360,000	NA	NA
Acenaphthylene	---	NA	NA
Anthracene	19,000	NA	NA
Benzo(a)anthracene	610	NA	NA
Benzo(a)pyrene	61	NA	NA
Benzo(b)fluoranthene	610	NA	NA
Benzo(ghi)perylene	---	NA	NA
Benzo(k)fluoranthene	6,100	NA	NA
Butyl benzyl phthalate	13,000,000	NA	NA
Carbazole	---	NA	NA
Chrysene	24,000	NA	NA
Di-n-butyl phthalate	---	NA	NA
Di-n-octyl phthalate	1,300,000	NA	NA
Dibenz(a,h)anthracene	61	NA	NA

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.

APPENDIX C
RFI Soil Sampling Results - SWMU 3, 4, 8(RFA#14) and 9
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	2	PPG-HA24-01.5 SWMU # 4 9/30/96
SEMIVOLATILES (ug/kg) (cont.)			
Dibenzofuran	260,000	NA	NA
Diethyl phthalate	52,000,000	NA	NA
Dimethyl phthalate	100,000,000	NA	NA
Fluoranthene	2,600,000	NA	NA
Fluorene	300,000	NA	NA
Hexachlorobenzene	280	NA	NA
Hexachlorobutadiene	5,700	NA	NA
Hexachlorocyclopentadiene	450,000	NA	NA
Hexachloroethane	32,000	NA	NA
Indeno(1,2,3-cd)pyrene	610	NA	NA
Isophorone	470,000	NA	NA
N-Nitrosodi-n-propylamine	63	NA	NA
N-Nitrosodiphenylamine	91,000	NA	NA
Naphthalene	800,000	NA	NA
Nitrobenzene	33,000	NA	NA
Pentachlorophenol	2,500	NA	NA
Phenanthrene	---	NA	NA
Phenol	39,000,000	NA	NA
Pyrene	2,000,000	NA	NA
Pyridine	65,000	NA	NA
bis(2-Chloroethoxy)methane	---	NA	NA
bis(2-Chloroethyl) ether	74	NA	NA
bis(2-Chloroisopropyl) ether	---	NA	NA
bis(2-Ethylhexyl) phthalate	32,000	NA	NA
ALCOHOLS (ug/kg)			
1-Butanol	---	NA	NA
Isobutyl alcohol	20,000,000	NA	NA
METALS (mg/kg)			
Aluminum	---		13300
Arsenic	0.32		5.3
Barium	5300		67.8
Cadmium	38		0.48
Calcium	---	J	59400 J
Chromium	210		21.5
Iron	---		17400
Lead	400		15.8
Magnesium	---	J	39000 J
Mercury	23	J	0.038 J
Nickel	1500		18.7

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.

APPENDIX C

RFI Groundwater Sampling Results - TANK FARM AREA (SWMU 8(RFA#11, 12 and 13), 17 and 18)

PPG - OAK CREEK

SAMPLE ID WELL NUMBER SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWLP2-01 LP2 10/9/96	PPG-GWLP4-01 LP4 10/9/96	PPG-GWLW6-01 LW6 10/23/96	PPG-GWMW10-01 MW10 10/8/96	PPG-GWMW11-01 MW11 10/8/96	PPG-GWMW14-01 MW14 10/9/96	PPG-GWMW15-01 MW15 10/7/96	PPG-GWMW15-01-DUP MW15 10/7/96
VOLATILES (ug/l)									
1,1,1,2-Tetrachloroethane	0.43	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,1,1-Trichloroethane	1,300	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,1,2,2-Tetrachloroethane	0.055	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,1,2-Trichloroethane	0.2	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,1,2-Trichlorotrifluoroethane	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,1-Dichloroethane	810	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,1-Dichloroethene	0.046	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,1-Dichloropropene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,2,3-Trichlorobenzene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,2,3-Trichloropropane	31	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,2,4-Trimethylbenzene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,2-Dibromo-3-chloropropane	0.048	2 U	2 U	5 U	2 U	2 U	2 U	2 U	NA
1,2-Dibromoethane	0.00076	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,2-Dichloroethane	0.12	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,2-Dichloropropane	0.16	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,3,5-Trimethylbenzene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
1,3-Dichloropropane	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
2,2-Dichloropropane	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
2-Butanone (MEK)	1,900	20 U	20 U	50 U	20 U	20 U	20 U	20 U	NA
2-Chlorotoluene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
2-Hexanone	---	50 U	50 U	120 U	50 U	50 U	50 U	50 U	NA
4-Chlorotoluene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
4-Methyl-2-pentanone (MIBK)	2,900	5 U	5 U	12 U	5 U	5 U	5 U	5 U	NA
Acetone	610	20 U	20 U	9.7 J	20 U	20 U	20 U	11 BJ	NA
Benzene	0.39	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Bromobenzene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Bromochloromethane	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Bromodichloromethane	0.18	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Bromoform	8.5	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Bromomethane	8.7	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Carbon disulfide	21	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Carbon tetrachloride	0.17	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Chlorobenzene	39	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Chloroethane	710	2 U	2 U	5 U	2 U	2 U	2 U	2 U	NA
Chloroform	0.16	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Chloromethane	1.5	2 U	2 U	5 U	2 U	2 U	2 U	2 U	NA
Dibromochloromethane	1	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Dibromomethane	370	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Dichlorodifluoromethane	390	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Ethylbenzene	1,300	0.55 J	0.43 J	65	1 U	1 U	1 U	1 U	NA
Isopropylbenzene	---	0.67 J	0.65 J	2.5 U	1 U	1 U	1 U	0.43 J	NA
Methylene chloride	4.3	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Styrene	1,600	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Tetrachloroethene	1.1	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Toluene	720	1 U	1 U	22	1 U	1 U	1 U	1 U	NA

U - Not Detected.
J - Estimated.
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R - Rejected.

APPENDIX C
RFI Groundwater Sampling Results - TANK FARM AREA (SWMU 8(RFA#11, 12 and 13), 17 and 18)
PPG - OAK CREEK

SAMPLE ID WELL NUMBER SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWLP2-01 LP2 10/9/96	PPG-GWLP4-01 LP4 10/9/96	PPG-GWLW6-01 LW6 10/23/96	PPG-GWMW10-01 MW10 10/8/96	PPG-GWMW11-01 MW11 10/8/96	PPG-GWMW14-01 MW14 10/9/96	PPG-GWMW15-01 MW15 10/7/96	PPG-GWMW15-01-DUP MW15 10/7/96
VOLATILES (ug/l) (cont.)									
Trichloroethene	1.6	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Trichlorofluoromethane	1,300	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Vinyl chloride	0.02	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
Xylenes (total)	1,400	0.49 J	1 U	170	1 U	1 U	1 U	1 U	NA
cis-1,2-Dichloroethene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
cis-1,3-Dichloropropene	0.081	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
n-Butylbenzene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
n-Propylbenzene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
p-Isopropyltoluene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
sec-Butylbenzene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
tert-Butylbenzene	---	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
trans-1,2-Dichloroethene	120	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
trans-1,3-Dichloropropene	0.081	1 U	1 U	2.5 U	1 U	1 U	1 U	1 U	NA
SEMIVOLATILES (ug/l)									
1,2,4-Trichlorobenzene	190	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
1,2-Dichlorobenzene	370	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
1,3-Dichlorobenzene	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
1,4-Dichlorobenzene	0.47	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
2,4,5-Trichlorophenol	3,700	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
2,4,6-Trichlorophenol	6.1	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
2,4-Dichlorophenol	110	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
2,4-Dimethylphenol	730	10 UJ	10 U	3 J	10 U	10 U	10 U	10 U	NA
2,4-Dinitrophenol	73	10 UJ	50 U	50 U	50 U	50 U	50 U	50 U	NA
2,4-Dinitrotoluene	73	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
2,6-Dinitrotoluene	37	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
2-Chloronaphthalene	2,900	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
2-Chlorophenol	180	10 UJ	10 U	10 U	10 U	10 U	10 U	10 UJ	NA
2-Methylnaphthalene	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
2-Methylphenol	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
2-Nitroaniline	2.2	10 UJ	50 U	50 U	50 U	50 U	50 U	50 U	NA
2-Nitrophenol	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
3,3'-Dichlorobenzidine	0.15	10 UJ	20 U	20 U	20 U	20 U	20 U	20 U	NA
3-Nitroaniline	---	10 UJ	50 U	50 U	50 U	50 U	50 U	50 U	NA
4,6-Dinitro-2-methylphenol	---	10 UJ	50 U	50 U	50 U	50 U	50 U	50 U	NA
4-Bromophenyl phenyl ether	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
4-Chloro-3-methylphenol	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 UJ	NA
4-Chloroaniline	150	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
4-Chlorophenyl phenyl ether	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
4-Methylphenol	180	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
4-Nitroaniline	---	10 UJ	50 U	50 U	50 U	50 U	50 U	50 U	NA
4-Nitrophenol	---	10 UJ	50 U	50 U	50 U	50 U	50 U	50 U	NA
Acenaphthene	370	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Acenaphthylene	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Anthracene	1,800	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Benzo(a)anthracene	0.092	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA

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APPENDIX C
RFI Groundwater Sampling Results - TANK FARM AREA (SWMU 8(RFA#11, 12 and 13), 17 and 18)
PPG - OAK CREEK

SAMPLE ID WELL NUMBER SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWLP2-01 LP2 10/9/96	PPG-GWLP4-01 LP4 10/9/96	PPG-GWLW6-01 LW6 10/23/96	PPG-GWMW10-01 MW10 10/8/96	PPG-GWMW11-01 MW11 10/8/96	PPG-GWMW14-01 MW14 10/9/96	PPG-GWMW15-01 MW15 10/7/96	PPG-GWMW15-01-DUP MW15 10/7/96
SEMIVOLATILES (ug/l) (cont.)									
Benzo(a)pyrene	0.0092	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Benzo(b)fluoranthene	0.092	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Benzo(ghi)perylene	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Benzo(k)fluoranthene	0.92	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Butyl benzyl phthalate	7,300	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Carbazole	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Chrysene	9.2	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Di-n-butyl phthalate	3,700	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Di-n-octyl phthalate	730	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Dibenz(a,h)anthracene	0.0092	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Dibenzofuran	150	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Diethyl phthalate	29,000	1.1 J	3.4 J	10 U	10 U	10 U	10 U	10 U	NA
Dimethyl phthalate	370,000	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Fluoranthene	1,500	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Fluorene	240	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Hexachlorobenzene	0.042	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Hexachlorobutadiene	0.86	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Hexachlorocyclopentadiene	260	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Hexachloroethane	4.8	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Indeno(1,2,3-cd)pyrene	0.092	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Isophorone	71	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
N-Nitrosodi-n-propylamine	0.0096	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
N-Nitrosodiphenylamine	14	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Naphthalene	240	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Nitrobenzene	18	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Pentachlorophenol	0.56	10 UJ	50 U	50 U	50 U	50 U	50 U	50 U	NA
Phenanthrene	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Phenol	22,000	10 UJ	10 U	10 U	10 U	10 U	10 U	10 UJ	NA
Pyrene	1,100	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
Pyridine	37	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
bis(2-Chloroethoxy)methane	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
bis(2-Chloroethyl) ether	0.0098	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
bis(2-Chloroisopropyl) ether	---	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
bis(2-Ethylhexyl) phthalate	4.8	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	NA
ALCOHOLS (ug/l)									
1-Butanol	---	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	NA
Isobutyl alcohol	11,000	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	NA
TOTAL METALS (mg/l)									
Aluminum	---	0.625 K	0.2 UK	9.23	0.2 UK	48.4 K	0.0416 J	0.2 U	0.2 U
Arsenic	0.000038	0.003 U	0.003 U	0.0113	0.003 U	0.0183	0.003 U	0.003 U	0.003 U
Barium	2.6	0.135 J	0.0809 J	0.159 J	0.103 J	0.728	0.195 J	0.0504	0.0493
Cadmium	0.018	0.002 U	0.00035 J	0.0012 J	0.00029 J	0.002 J	0.00084 J	0.002 U	0.002 U
Calcium	---	61.6	31.4	77.1	46.5	427	159	92.3	90.8
Chromium	0.18	0.0038 J	0.01 U	0.0247	0.01 U	0.0958 K	0.0035 J	0.005 U	0.005 U
Iron	---	0.798	0.0463 J	25.7	0.1 U	74.2	1.93	0.1 U	0.1 U

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APPENDIX C
RFI Groundwater Sampling Results - TANK FARM AREA (SWMU 8(RFA#11, 12 and 13), 17 and 18)
PPG - OAK CREEK

SAMPLE ID WELL NUMBER SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWLP2-01 LP2 10/9/96	PPG-GWLP4-01 LP4 10/9/96	PPG-GWLW6-01 LW6 10/23/96	PPG-GWMW10-01 MW10 10/8/96	PPG-GWMW11-01 MW11 10/8/96	PPG-GWMW14-01 MW14 10/9/96	PPG-GWMW15-01 MW15 10/7/96	PPG-GWMW15-01-DUP MW15 10/7/96
TOTAL METALS (mg/l) (cont.)									
Lead	0.004	0.003 U	0.003 U	0.0125	0.003 U	0.0274	0.003 U	0.003 U	0.003 U
Magnesium	---	71.2 K	21.7 K	50.5	68.5 K	188 K	229 K	0.415	0.401
Mercury	0.011	0.000093 J	0.00011 J	0.0002 U	0.000097 J	0.00017 J	0.000093 J	0.000032 B	0.000022
Nickel	0.73	0.04 U	0.04 U	0.0271 J	0.04 U	0.0904	0.372	0.04 U	0.04 U
FILTERED METALS (mg/l)									
Aluminum (Filtered)	---	NA	NA	0.2 U	NA	0.168 J	NA	NA	NA
Arsenic (Filtered)	0.000038	NA	NA	0.003 U	NA	0.003 U	NA	NA	NA
Barium (Filtered)	2.6	NA	NA	0.0844 J	NA	0.0375 J	NA	NA	NA
Cadmium (Filtered)	0.018	NA	NA	0.00077 J	NA	0.002 U	NA	NA	NA
Calcium (Filtered)	---	NA	NA	55.8	NA	133	NA	NA	NA
Chromium (Filtered)	0.18	NA	NA	0.005 U	NA	0.01 UK	NA	NA	NA
Iron (Filtered)	---	NA	NA	0.1 U	NA	0.165	NA	NA	NA
Lead (Filtered)	0.004	NA	NA	0.003 U	NA	0.003 U	NA	NA	NA
Magnesium (Filtered)	---	NA	NA	40.2	NA	79.7 K	NA	NA	NA
Mercury (Filtered)	0.011	NA	NA	0.0002 U	NA	0.000083 J	NA	NA	NA
Nickel (Filtered)	0.73	NA	NA	0.04 U	NA	0.04 U	NA	NA	NA

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APPENDIX C
RFI Groundwater Sampling Results - TANK FARM AREA (SWMU 8(RFA#11, 12 and 13), 17 and 18)
PPG - OAK CREEK

SAMPLE ID WELL NUMBER SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWMW16-01 MW16 10/7/96	PPG-GWMW16-01-09 MW16 10/7/96	PPG-GWMW9-01 MW9 10/8/96	PPG-GWMW9-01-DUP MW9 10/8/96
VOLATILES (ug/l)					
1,1,1,2-Tetrachloroethane	0.43	5 U	5 U	1 U	NA
1,1,1-Trichloroethane	1,300	5 U	5 U	1 U	NA
1,1,2,2-Tetrachloroethane	0.055	5 U	5 U	1 U	NA
1,1,2-Trichloroethane	0.2	5 U	5 U	1 U	NA
1,1,2-Trichlorotrifluoroethane	---	5 U	5 U	1 U	NA
1,1-Dichloroethane	810	5 U	5 U	1 U	NA
1,1-Dichloroethene	0.046	5 U	5 U	1 U	NA
1,1-Dichloropropene	---	5 U	5 U	1 U	NA
1,2,3-Trichlorobenzene	---	5 U	5 U	1 U	NA
1,2,3-Trichloropropane	31	5 U	5 U	1 U	NA
1,2,4-Trimethylbenzene	---	5 U	5 U	1 U	NA
1,2-Dibromo-3-chloropropane	0.048	10 U	10 U	2 U	NA
1,2-Dibromoethane	0.00076	5 U	5 U	1 U	NA
1,2-Dichloroethane	0.12	5 U	5 U	1 U	NA
1,2-Dichloropropane	0.16	5 U	5 U	1 U	NA
1,3,5-Trimethylbenzene	---	5 U	5 U	1 U	NA
1,3-Dichloropropane	---	5 U	5 U	1 U	NA
2,2-Dichloropropane	---	5 U	5 U	1 U	NA
2-Butanone (MEK)	1,900	100 U	100 U	20 U	NA
2-Chlorotoluene	---	5 U	5 U	1 U	NA
2-Hexanone	---	250 U	250 U	50 U	NA
4-Chlorotoluene	---	5 U	5 U	1 U	NA
4-Methyl-2-pentanone (MIBK)	2,900	25 U	25 U	5 U	NA
Acetone	610	15 BJ	6.3 BJ	20 U	NA
Benzene	0.39	4.3 J	4.1 J	1 U	NA
Bromobenzene	---	5 U	5 U	1 U	NA
Bromochloromethane	---	5 U	5 U	1 U	NA
Bromodichloromethane	0.18	5 U	5 U	1 U	NA
Bromoform	8.5	5 U	5 U	1 U	NA
Bromomethane	8.7	5 U	5 U	1 U	NA
Carbon disulfide	21	5 U	5 U	1 U	NA
Carbon tetrachloride	0.17	5 U	5 U	1 U	NA
Chlorobenzene	39	5 U	5 U	1 U	NA
Chloroethane	710	10 U	10 U	2 U	NA
Chloroform	0.16	5 U	5 U	1 U	NA
Chloromethane	1.5	10 U	10 U	2 U	NA
Dibromochloromethane	1	5 U	5 U	1 U	NA
Dibromomethane	370	5 U	5 U	1 U	NA
Dichlorodifluoromethane	390	5 U	5 U	1 U	NA
Ethylbenzene	1,300	140	120	1 U	NA
Isopropylbenzene	---	5 U	5 U	1 U	NA
Methylene chloride	4.3	5 U	5 U	1 U	NA
Styrene	1,600	5 U	5 U	1 U	NA
Tetrachloroethene	1.1	5 U	5 U	1 U	NA
Toluene	720	5 U	5 U	1 U	NA

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.
K - Estimated, biased high.
R - Rejected.

APPENDIX C
RFI Groundwater Sampling Results - TANK FARM AREA (SWMU 8(RFA#11, 12 and 13), 17 and 18)
PPG - OAK CREEK

SAMPLE ID WELL NUMBER SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWMW16-01 MW16 10/7/96	PPG-GWMW16-01-09 MW16 10/7/96	PPG-GWMW9-01 MW9 10/8/96	PPG-GWMW9-01-DUP MW9 10/8/96
VOLATILES (ug/l) (cont.)					
Trichloroethene	1.6	5 U	5 U	1 U	NA
Trichlorofluoromethane	1,300	5 U	5 U	1 U	NA
Vinyl chloride	0.02	5 U	5 U	1 U	NA
Xylenes (total)	1,400	100	86	1 U	NA
cis-1,2-Dichloroethene	---	5 U	5 U	1 U	NA
cis-1,3-Dichloropropene	0.081	5 U	5 U	1 U	NA
n-Butylbenzene	---	5 U	5 U	1 U	NA
n-Propylbenzene	---	5 U	5 U	1 U	NA
p-Isopropyltoluene	---	5 U	5 U	1 U	NA
sec-Butylbenzene	---	5 U	5 U	1 U	NA
tert-Butylbenzene	---	5 U	5 U	1 U	NA
trans-1,2-Dichloroethene	120	5 U	5 U	1 U	NA
trans-1,3-Dichloropropene	0.081	5 U	5 U	1 U	NA
SEMIVOLATILES (ug/l)					
1,2,4-Trichlorobenzene	190	10 U	10 U	10 U	NA
1,2-Dichlorobenzene	370	10 U	10 U	10 U	NA
1,3-Dichlorobenzene	---	10 U	10 U	10 U	NA
1,4-Dichlorobenzene	0.47	10 U	10 U	10 U	NA
2,4,5-Trichlorophenol	3,700	10 U	--- R	10 U	NA
2,4,6-Trichlorophenol	6.1	10 U	--- R	10 U	NA
2,4-Dichlorophenol	110	10 U	--- R	10 U	NA
2,4-Dimethylphenol	730	10 U	--- R	10 U	NA
2,4-Dinitrophenol	73	50 U	--- R	50 U	NA
2,4-Dinitrotoluene	73	10 U	10 U	10 U	NA
2,6-Dinitrotoluene	37	10 U	10 U	10 U	NA
2-Chloronaphthalene	2,900	10 U	10 U	10 U	NA
2-Chlorophenol	180	10 UJ	--- R	10 U	NA
2-Methylnaphthalene	---	10 U	10 U	10 U	NA
2-Methylphenol	---	10 U	--- R	10 U	NA
2-Nitroaniline	2.2	50 U	50 U	50 U	NA
2-Nitrophenol	---	10 U	--- R	10 U	NA
3,3'-Dichlorobenzidine	0.15	20 U	20 U	20 U	NA
3-Nitroaniline	---	50 U	50 U	50 U	NA
4,6-Dinitro-2-methylphenol	---	50 U	--- R	50 U	NA
4-Bromophenyl phenyl ether	---	10 U	10 U	10 U	NA
4-Chloro-3-methylphenol	---	10 UJ	--- R	10 U	NA
4-Chloroaniline	150	10 U	10 U	10 U	NA
4-Chlorophenyl phenyl ether	---	10 U	10 U	10 U	NA
4-Methylphenol	180	10 U	--- R	10 U	NA
4-Nitroaniline	---	50 U	50 U	50 U	NA
4-Nitrophenol	---	50 U	--- R	50 U	NA
Acenaphthene	370	10 U	10 U	10 U	NA
Acenaphthylene	---	10 U	10 U	10 U	NA
Anthracene	1,800	10 U	10 U	10 U	NA
Benzo(a)anthracene	0.092	10 U	10 U	10 U	NA

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.
K - Estimated, biased high.
R - Rejected.

APPENDIX C

RFI Groundwater Sampling Results - TANK FARM AREA (SWMU 8(RFA#11, 12 and 13), 17 and 18)

PPG - OAK CREEK

SAMPLE ID WELL NUMBER SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWMW16-01 MW16 10/7/96	PPG-GWMW16-01-09 MW16 10/7/96	PPG-GWMW9-01 MW9 10/8/96	PPG-GWMW9-01-DUP MW9 10/8/96
SEMIVOLATILES (ug/l) (cont.)					
Benzo(a)pyrene	0.0092	10 U	10 U	10 U	NA
Benzo(b)fluoranthene	0.092	10 U	10 U	10 U	NA
Benzo(ghi)perylene	---	10 U	10 U	10 U	NA
Benzo(k)fluoranthene	0.92	10 U	10 U	10 U	NA
Butyl benzyl phthalate	7,300	10 U	10 U	10 U	NA
Carbazole	---	10 U	10 U	10 U	NA
Chrysene	9.2	10 U	10 U	10 U	NA
Di-n-butyl phthalate	3,700	10 U	10 U	10 U	NA
Di-n-octyl phthalate	730	10 U	10 U	10 U	NA
Dibenz(a,h)anthracene	0.0092	10 U	10 U	10 U	NA
Dibenzofuran	150	10 U	10 U	10 U	NA
Diethyl phthalate	29,000	10 U	10 U	10 U	NA
Dimethyl phthalate	370,000	10 U	10 U	10 U	NA
Fluoranthene	1,500	10 U	10 U	10 U	NA
Fluorene	240	10 U	10 U	10 U	NA
Hexachlorobenzene	0.042	10 U	10 U	10 U	NA
Hexachlorobutadiene	0.86	10 U	10 U	10 U	NA
Hexachlorocyclopentadiene	260	10 U	10 U	10 U	NA
Hexachloroethane	4.8	10 U	10 U	10 U	NA
Indeno(1,2,3-cd)pyrene	0.092	10 U	10 U	10 U	NA
Isophorone	71	10 U	10 U	10 U	NA
N-Nitrosodi-n-propylamine	0.0096	10 U	10 U	10 U	NA
N-Nitrosodiphenylamine	14	10 U	10 U	10 U	NA
Naphthalene	240	10 U	10 U	10 U	NA
Nitrobenzene	18	10 U	10 U	10 U	NA
Pentachlorophenol	0.56	50 U	--- R	50 U	NA
Phenanthrene	---	10 U	10 U	10 U	NA
Phenol	22,000	10 UJ	--- R	10 U	NA
Pyrene	1,100	10 U	10 U	10 U	NA
Pyridine	37	10 U	10 U	10 U	NA
bis(2-Chloroethoxy)methane	---	10 U	10 U	10 U	NA
bis(2-Chloroethyl) ether	0.0098	10 U	10 U	10 U	NA
bis(2-Chloroisopropyl) ether	---	10 U	10 U	10 U	NA
bis(2-Ethylhexyl) phthalate	4.8	10 U	10 U	10 U	NA
ALCOHOLS (ug/l)					
1-Butanol	---	1000 U	1000 U	1000 U	NA
Isobutyl alcohol	11,000	1000 U	1000 U	1000 U	NA
TOTAL METALS (mg/l)					
Aluminum	---	0.0611 J	0.2 U	8.04 K	6.93
Arsenic	0.000038	0.0106	0.0138	0.0043	0.0053
Barium	2.6	0.111 J	0.124 J	0.171	0.171
Cadmium	0.018	0.002 U	0.00021 J	0.0004	0.00052
Calcium	---	78.9	85.6	83.8	86.5
Chromium	0.18	0.01 U	0.01 U	0.0284 K	0.0283
Iron	---	1.69	1.95	12.2	11.4

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.
K - Estimated, biased high.
R - Rejected.

APPENDIX C
RFI Groundwater Sampling Results - TANK FARM AREA (SWMU 8(RFA#11, 12 and 13), 17 and 18)
PPG - OAK CREEK

SAMPLE ID WELL NUMBER SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWMW16-01 MW16 10/7/96	PPG-GWMW16-01-09 MW16 10/7/96	PPG-GWMW9-01 MW9 10/8/96	PPG-GWMW9-01-DUP MW9 10/8/96
TOTAL METALS (mg/l) (cont.)					
Lead	0.004	0.003 U	0.003 U	0.0074	0.0073
Magnesium	---	48.3	53.9	61.7 K	63.4
Mercury	0.011	0.000096 BJ	0.000082 BJ	0.00005	0.000054
Nickel	0.73	0.04 U	0.04 U	0.0276	0.0288
FILTERED METALS (mg/l)					
Aluminum (Filtered)	---	NA	NA	0.2 UK	0.2 U
Arsenic (Filtered)	0.000038	NA	NA	0.0045	0.003 U
Barium (Filtered)	2.6	NA	NA	0.0936	0.0909
Cadmium (Filtered)	0.018	NA	NA	0.00023	0.002 U
Calcium (Filtered)	---	NA	NA	69.6	68
Chromium (Filtered)	0.18	NA	NA	0.005 UK	0.005 U
Iron (Filtered)	---	NA	NA	0.105	0.0643
Lead (Filtered)	0.004	NA	NA	0.003 U	0.003 U
Magnesium (Filtered)	---	NA	NA	54.6 K	53.3
Mercury (Filtered)	0.011	NA	NA	0.000036	0.000045
Nickel (Filtered)	0.73	NA	NA	0.04 U	0.04 U

U - Not Detected.
J - Estimated.
B - Blank Contamination.
NA - Not Analyzed.
K - Estimated, biased high.
R - Rejected.

APPENDIX C
RFI Soil Sampling Results - Tank Farm Area, SWMU 8(RFA#11,12 and 13), 17 and 18
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	PPG-SSLP2-06 Tank Farm Area 9/17/96	PPG-SSLP2-21 Tank Farm Area 9/17/96	PPG-SSLP4-11 Tank Farm Area 9/17/96	PPG-SSLP4-28.5 Tank Farm Area 9/17/96	PPG-SSLP5-3.5 Tank Farm Area 9/18/96	PPG-SSLP5-3.5-09 Tank Farm Area 9/18/96	PPG-SSLP5-3.5-09-DUP Tank Farm Area 9/18/96
Percent Moisture	14.3 %	12.2 %	15.2 %	12.2 %	14 %	13.9 %	10.4 %
Percent Solids	85.7 %	87.8 %	84.8 %	87.8 %	86 %	86.1 %	89.6 %
Total Organic Carbon (mg/kg)	4100	2600	6800	4100	4600	4700	NA

Need update table w/ grain size analysis 5-4

NA - Not Analyzed.

APPENDIX C
RFI Sediment Sampling Results - SWMU 20
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-SD01-01 SWMU # 20 10/2/96	PPG-SD01-01-DUP SWMU # 20 10/2/96	PPG-SD02-01 SWMU # 20 10/2/96	PPG-SD03-01 SWMU # 20 10/2/96	PPG-SD03-01-09 SWMU # 20 10/2/96
VOLATILES (ug/kg)						
1,1,1,2-Tetrachloroethane	4800	6.8 U	NA	6.6 UJ	6.8 U	7.1 U
1,1,1-Trichloroethane	3,200,000	6.8 U	NA	6.6 U	6.8 U	7.1 U
1,1,2,2-Tetrachloroethane	900	6.8 U	NA	6.6 U	6.8 U	7.1 U
1,1,2-Trichloroethane	1,400	6.8 U	NA	6.6 UJ	6.8 U	7.1 U
1,1-Dichloroethane	840,000	6.8 U	NA	6.6 U	6.8 U	7.1 U
1,1-Dichloroethene	38	6.8 U	NA	6.6 U	6.8 U	7.1 U
1,2,3-Trichlorobenzene	---	6.8 U	NA	6.6 U	6.8 U	7.1 U
1,2,3-Trichloropropane	6.6	6.8 U	NA	6.6 U	6.8 U	7.1 U
1,2,4-Trimethylbenzene	---	11	NA	6.6 U	6.8 U	7.1 U
1,2-Dibromo-3-chloropropane	320	14 U	NA	13 U	14 U	14 U
1,2-Dibromoethane	5.1	6.8 U	NA	6.6 UJ	6.8 U	7.1 U
1,2-Dichloroethane	440	6.8 U	NA	6.6 U	6.8 U	7.1 U
1,2-Dichloropropane	680	6.8 U	NA	6.6 U	6.8 U	7.1 U
2-Butanone (MEK)	8,700,000	140 U	NA	130 U	140 U	140 U
2-Chloroethyl vinyl ether	---	14 U	NA	13 U	14 U	14 U
2-Chlorotoluene	---	14 U	NA	13 U	14 U	14 U
2-Hexanone	---	68 U	NA	66 UJ	68 U	71 U
4-Methyl-2-pentanone (MIBK)	5,200,000	68 U	NA	66 U	68 U	71 U
Acetone	2,000,000	40 J	NA	14 J	11 J	29 J
Benzene	1,400	6.8 U	NA	6.6 U	6.8 U	7.1 U
Bromobenzene	---	14 U	NA	13 U	14 U	14 U
Bromodichloromethane	1,400	6.8 U	NA	6.6 U	6.8 U	7.1 U
Bromoform	56,000	6.8 U	NA	6.6 UJ	6.8 U	7.1 U
Bromomethane	15,000	14 U	NA	13 U	14 U	14 U
Carbon disulfide	16,000	6.8 U	NA	6.6 U	6.8 U	7.1 U
Carbon tetrachloride	470	6.8 U	NA	6.6 U	6.8 U	7.1 U
Chlorobenzene	160,000	6.8 U	NA	6.6 UJ	6.8 U	7.1 U
Chloroethane	1,100,000	14 U	NA	13 U	14 U	14 U
Chloroform	530	6.8 U	NA	6.6 U	6.8 U	7.1 U
Chloromethane	2,000	14 U	NA	13 U	14 U	14 U
Dibromochloromethane	5,300	6.8 U	NA	6.6 UJ	6.8 U	7.1 U
Dibromomethane	650,000	6.8 U	NA	6.6 U	6.8 U	7.1 U

U - Not Detected.
J - Estimated.
K - Estimated, biased high.
NA - Not Analyzed.

APPENDIX C
RFI Sediment Sampling Results - SWMU 20
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-SD01-01 SWMU # 20 10/2/96	PPG-SD01-01-DUP SWMU # 20 10/2/96	PPG-SD02-01 SWMU # 20 10/2/96	PPG-SD03-01 SWMU # 20 10/2/96	PPG-SD03-01-09 SWMU # 20 10/2/96
VOLATILES (ug/kg) (cont)						
Dichlorodifluoromethane	110,000	27 U	NA	26 U	27 U	29 U
Ethylbenzene	2,900,000	6.8 U	NA	6.6 UJ	6.8 U	7.1 U
Isopropylbenzene	---	6.8 U	NA	6.6 UJ	6.8 U	7.1 U
Methylene chloride	11,000	4.8 J	NA	4.1 J	6.8 U	7.1 U
Styrene	2,200,000	6.8 U	NA	6.6 UJ	6.8 U	7.1 U
Tetrachloroethene	7,000	6.8 U	NA	3.5 J	6.8 U	7.1 U
Toluene	1,900,000	6.8 U	NA	6.6 UJ	6.8 U	7.1 U
Trichloroethene	7,100	6.8 U	NA	6.6 U	6.8 U	7.1 U
Trichlorofluoromethane	710,000	14 U	NA	13 U	14 U	14 U
Vinyl chloride	5.2	14 U	NA	13 U	14 U	14 U
Xylenes (total)	980,000	100	NA	6.6 UJ	6.8 U	7.1 U
cis-1,2-Dichloroethene	---	6.8 U	NA	6.6 U	6.8 U	7.1 U
cis-1,3-Dichloropropene	510	6.8 U	NA	6.6 U	6.8 U	7.1 U
n-Propylbenzene	---	6 J	NA	6.6 U	6.8 U	7.1 U
trans-1,2-Dichloroethene	---	6.8 U	NA	6.6 U	6.8 U	7.1 U
trans-1,3-Dichloropropene	510	6.8 U	NA	6.6 UJ	6.8 U	7.1 U
METALS (mg/kg)						
Aluminum	---	15000	14500	11400	13200	14300
Arsenic	0.32	6.5	6.2	6	5.3	5.2
Barium	5300	97.7	92.9	93.2	102	104
Cadmium	38	0.16	0.22	0.29	0.43	0.34
Calcium	---	8470	9060	3010 K	3650 K	3580 K
Chromium	210	26.8	29	21.7 K	23.8 K	25.8 K
Iron	---	22300	21100	20500	21600	22000
Lead	400	20.9	32.3	15.1 J	14.7 J	18.7 J
Magnesium	---	8050	7780	3720 K	4150 K	4540 K
Mercury	23	0.12	0.15	0.073 J	0.061 J	0.082 J
Nickel	1500	25.3	25.4	21.6	22.4	26.2

U - Not Detected.
J - Estimated.
K - Estimated, biased high.
NA - Not Analyzed.

APPENDIX C
RFI Soil Sampling Results - Background
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION DEPTH (ft - bgs) SAMPLE DATE PARAMETER	Region V DQLs	PPG-HA01-0.5 BACKGROUND 1 0.5 - 2.5 10/1/96	PPG-HA01-03 BACKGROUND 1 3.0 - 5.0 10/1/96	PPG-HA01-03-09 BACKGROUND 1 3.0 - 5.0 10/1/96	PPG-HA02-0.5 BACKGROUND 2 0.5 - 2.5 10/1/96	PPG-HA02-03 BACKGROUND 2 3.0 - 5.0 10/1/96	PPG-HA03-0.5 BACKGROUND 3 0.5 - 2.5 10/1/96	PPG-HA03-03 BACKGROUND 3 3.0 - 5.0 10/1/96	PPG-HA03-03-DUP BACKGROUND 3 3.0 - 5.0 10/1/96
METALS (mg/kg)									
Aluminum	---	16700	8540	6420	19500	11100	16600	13400	13100
Arsenic	0.32	7.6	5.5	6.5	4.4	5.1	7.9	6.8	5.7
Barium	5300	75.3	42.2	31.4	90.6	48.4	106	66.7	61
Cadmium	38	0.16 J	0.19 J	0.17 J	0.16 J	0.17 J	0.048 J	0.11	0.078
Calcium	---	26900	79000	82500	53000	84000	3580	62900	66200
Chromium	210	26.8	15.5	11.8	31.1	18.7	26.4	23.2	22.6
Iron	---	25200	15600	14900	22800	16400	26500	18900	18000
Lead	400	15.8 J	7.5 J	6.8 J	8.9 J	6.9 J	13.8 J	11.1 J	9.9
Magnesium	---	17700	43500	47100	35300	35400	5450	36300	37100
Mercury	23	0.051 J	0.02 J	0.018 J	0.022 J	0.017 J	0.052 J	0.021	0.022
Nickel	1500	30.9 J	18.5 J	19.1 J	30.3 J	18.6 J	22.8 J	27.5 J	24.3

J - Estimated.
NA - Not analyzed.

APPENDIX C
RFI Groundwater Sampling Results - Background
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWTW6-01 UPGRADIENT 10/8/96
VOLATILES (ug/l)		
1,1,1,2-Tetrachloroethane	0.43	1 U
1,1,1-Trichloroethane	1,300	1 U
1,1,2,2-Tetrachloroethane	0.055	1 U
1,1,2-Trichloroethane	0.2	1 U
1,1,2-Trichlorotrifluoroethane	---	1 U
1,1-Dichloroethane	810	1 U
1,1-Dichloroethene	0.046	1 U
1,1-Dichloropropene	---	1 U
1,2,3-Trichlorobenzene	---	1 U
1,2,3-Trichloropropane	31	1 U
1,2,4-Trimethylbenzene	---	1 U
1,2-Dibromo-3-chloropropane	0.048	2 U
1,2-Dibromoethane	0.00076	1 U
1,2-Dichloroethane	0.12	1 U
1,2-Dichloropropane	0.16	1 U
1,3,5-Trimethylbenzene	---	1 U
1,3-Dichloropropane	---	1 U
2,2-Dichloropropane	---	1 U
2-Butanone (MEK)	1,900	20 U
2-Chlorotoluene	---	1 U
2-Hexanone	---	50 U
4-Chlorotoluene	---	1 U
4-Methyl-2-pentanone (MIBK)	2,900	5 U
Acetone	610	20 U
Benzene	0.39	1 U
Bromobenzene	---	1 U
Bromochloromethane	---	1 U
Bromodichloromethane	0.18	1 U
Bromoform	8.5	1 U
Bromomethane	8.7	1 U
Carbon disulfide	21	3.3
Carbon tetrachloride	0.17	1 U
Chlorobenzene	39	1 U
Chloroethane	710	2 U
Chloroform	0.16	1 U
Chloromethane	1.5	2 U
Dibromochloromethane	1	1 U
Dibromomethane	370	1 U
Dichlorodifluoromethane	390	1 U
Ethylbenzene	1,300	1 U
Isopropylbenzene	---	1 U
Methylene chloride	4.3	1 U
Styrene	1,600	1 U
Tetrachloroethene	1.1	1 U
Toluene	720	1 U
Trichloroethene	1.6	1 U
Trichlorofluoromethane	1,300	1 U
Vinyl chloride	0.02	1 U
Xylenes (total)	1,400	1 U
cis-1,2-Dichloroethene	---	1 U
cis-1,3-Dichloropropene	0.081	1 U
n-Butylbenzene	---	1 U
n-Propylbenzene	---	1 U

J - Estimated.
NA - Not analyzed.
B - Blank Contamination.
U - Not detected.

APPENDIX C
RFI Groundwater Sampling Results - Background
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWTW6-01 UPGRADIENT 10/8/96
VOLATILES (ug/l) (cont.)		
p-Isopropyltoluene	---	1 U
sec-Butylbenzene	---	1 U
tert-Butylbenzene	---	1 U
trans-1,2-Dichloroethene	120	1 U
trans-1,3-Dichloropropene	0.081	1 U
SEMIVOLATILES (ug/l)		
1,2,4-Trichlorobenzene	190	10 U
1,2-Dichlorobenzene	370	10 U
1,3-Dichlorobenzene	---	10 U
1,4-Dichlorobenzene	0.47	10 U
2,4,5-Trichlorophenol	3,700	10 U
2,4,6-Trichlorophenol	6.1	10 U
2,4-Dichlorophenol	110	10 U
2,4-Dimethylphenol	730	10 U
2,4-Dinitrophenol	73	50 U
2,4-Dinitrotoluene	73	10 U
2,6-Dinitrotoluene	37	10 U
2-Chloronaphthalene	2,900	10 U
2-Chlorophenol	180	10 UJ
2-Methylnaphthalene	---	10 U
2-Methylphenol	---	10 U
2-Nitroaniline	2.2	50 U
2-Nitrophenol	---	10 U
3,3'-Dichlorobenzidine	0.15	20 U
3-Nitroaniline	---	50 U
4,6-Dinitro-2-methylphenol	---	50 U
4-Bromophenyl phenyl ether	---	10 U
4-Chloro-3-methylphenol	---	10 UJ
4-Chloroaniline	150	10 U
4-Chlorophenyl phenyl ether	---	10 U
4-Methylphenol	180	10 U
4-Nitroaniline	---	50 U
4-Nitrophenol	---	50 U
Acenaphthene	370	10 U
Acenaphthylene	---	10 U
Anthracene	1,800	10 U
Benzo(a)anthracene	0.092	10 U
Benzo(a)pyrene	0.0092	10 U
Benzo(b)fluoranthene	0.092	10 U
Benzo(ghi)perylene	---	10 U
Benzo(k)fluoranthene	0.92	10 U
Butyl benzyl phthalate	7,300	10 U
Carbazole	---	10 U
Chrysene	9.2	10 U
Di-n-butyl phthalate	3,700	10 U
Di-n-octyl phthalate	730	10 U
Dibenz(a,h)anthracene	0.0092	10 U
Dibenzofuran	150	10 U
Diethyl phthalate	29,000	12
Dimethyl phthalate	370,000	10 U
Fluoranthene	1,500	10 U
Fluorene	240	10 U
Hexachlorobenzene	0.042	10 U

J - Estimated.
NA - Not analyzed.
B - Blank Contamination.
U - Not detected.

APPENDIX C
RFI Groundwater Sampling Results - Background
PPG - OAK CREEK

SAMPLE ID SAMPLE LOCATION SAMPLE DATE PARAMETER	Region V DQLs	PPG-GWTW6-01 UPGRADIENT 10/8/96
SEMIVOLATILES (ug/l)		
Hexachlorobutadiene	0.86	10 U
Hexachlorocyclopentadiene	260	10 U
Hexachloroethane	4.8	10 U
Indeno(1,2,3-cd)pyrene	0.092	10 U
Isophorone	71	10 U
N-Nitrosodi-n-propylamine	0.0096	10 U
N-Nitrosodiphenylamine	14	10 U
Naphthalene	240	10 U
Nitrobenzene	18	10 U
Pentachlorophenol	0.56	50 U
Phenanthrene	---	10 U
Phenol	22,000	10 UJ
Pyrene	1,100	10 U
Pyridine	37	10 U
bis(2-Chloroethoxy)methane	---	10 U
bis(2-Chloroethyl) ether	0.0098	10 U
bis(2-Chloroisopropyl) ether	---	10 U
bis(2-Ethylhexyl) phthalate	4.8	3.6 J
ALCOHOLS (ug/l)		
1-Butanol	---	1000 U
Isobutyl alcohol	11,000	1000 U
METALS (mg/l)		
Aluminum	---	0.2 U
Arsenic	0.000038	0.003 U
Barium	2.6	0.0867 J
Cadmium	0.018	0.00029 J
Calcium	---	69.8
Chromium	0.18	0.01 U
Iron	---	0.0601 J
Lead	0.004	0.0024 J
Magnesium	---	75.5
Mercury	0.011	0.000072 BJ
Nickel	0.73	0.0242 J

J - Estimated.
NA - Not analyzed.
B - Blank Contamination.
U - Not detected.

APPENDIX C
HISTORICAL SAMPLE RESULTS - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH(ft) SAMPLE DATE PARAMETER	Region V DQLs	B1 13.50-15.5 8/8/91	B10 6.00-8.0 8/6/91	B10 13.50-15.5 8/14/91	B11 11.00-13.0 8/14/91	B11 3.50-5.5 8/16/91	B2 1.00-3.0 8/8/91	B2 33.00-35.0 8/9/91	B2 21.00-23.0 8/10/91
VOLATILES (ug/kg)									
1,1,2,2-Tetrachloroethane	900	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	8,700,000	100 U	9400	100 U	100 U	45	100 U	100 U	100 U
2-Hexanone	---	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	5,200,000	100 U	100 U	100 U	100 U	120	72000 D	100 U	100 U
Acetone	2,000,000	66 J	ND	ND	ND	ND	ND	70 B	ND
Benzene	1,400	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Crotonaldehyde	---	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	160,000	ND	ND	ND	ND	ND	14	ND	ND
Chloroform	530	ND	ND	ND	ND	ND	ND	ND	ND
Ethylmethacrylate	340,000	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	2,900,000	5 U	11000	170000	4000	190	1100 DJ	5 U	5 U
Methylene chloride	2,000	ND	ND	ND	ND	ND	ND	46 B	ND
Styrene	2,200,000	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,4-Dichloro-2-Butene	7.6	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	7,000	ND	ND	ND	ND	ND	2 J	ND	ND
Toluene	1,900,000	5 U	1200	7400	5 U	12	36	5 U	5 U
Trichloroethene	7,100	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	710,000	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	980,000	5 U	14000	18000	7000	1100	6600 D	5 U	5 U

U - Not detected.
NA - Not analyzed.
ND - Not detected,detection limit not available.
J - Estimated
B - blank contamination.
D - Dilution.

APPENDIX C
HISTORICAL SAMPLE RESULTS - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH(ft) SAMPLE DATE PARAMETER	Region V DQLs	B2 13.50-15.5 8/13/91	B3 13.50-15.5 8/9/91	B4 13.50-15.5 8/9/91	B5 8.50-10.5 8/14/91	B6 6.00-7.0 8/12/91	B6 18.50-20.5 8/14/91	B7 8.50-10.5 8/13/91	B7 18.50-20.5 8/23/91
VOLATILES (ug/kg)									
1,1,2,2-Tetrachloroethane	900	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	8,700,000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Hexanone	---	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	5,200,000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Acetone	2,000,000	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1,400	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Crotonaldehyde	---	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	160,000	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	530	ND	ND	ND	ND	ND	ND	ND	ND
Ethylmethacrylate	340,000	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	2,900,000	6500	5 U	5 U	5 U	15000	5 U	640 J	10
Methylene chloride	2,000	ND	ND	47 B	ND	ND	ND	ND	ND
Styrene	2,200,000	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,4-Dichloro-2-Butene	7.6	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	7,000	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1,900,000	5 U	5 U	5 U	5 U	4500 J	5 U	330 J	5 U
Trichloroethene	7,100	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	710,000	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	980,000	15000	5 U	5 U	5 U	110000	5 U	530 J	7

U - Not detected.
NA - Not analyzed.
ND - Not detected,detection limit not available.
J - Estimated
B - blank contamination.
D - Dilution.

APPENDIX C
HISTORICAL SAMPLE RESULTS - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH(ft) SAMPLE DATE PARAMETER	Region V DQLs	B8 18.50-20.5 8/14/91	B8 1.00-3.0 8/15/91	B9 1.00-3.0 8/15/91	B9 13.50-15.5 8/16/91	GS-1 0.00-2.0 8/2/91	GS-10 0.00-2.0 8/2/91	GS-11 0.00-2.0 8/2/91	GS-12 0.00-2.0 8/6/91
VOLATILES (ug/kg)									
1,1,2,2-Tetrachloroethane	900	ND	ND	9 J	ND	ND	ND	ND	11 J
2-Butanone (MEK)	8,700,000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	360
2-Hexanone	---	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	5,200,000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	9500 DJ
Acetone	2,000,000	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1,400	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Crotonaldehyde	---	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	160,000	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	530	ND	ND	ND	ND	ND	ND	ND	ND
Ethylmethacrylate	340,000	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	2,900,000	5 U	3900 D	5 U	8700	5 U	5 U	5 U	4300 DJ
Methylene chloride	2,000	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	2,200,000	ND	ND	ND	ND	ND	ND	ND	400
Trans-1,4-Dichloro-2-Butene	7.6	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	7,000	ND	ND	ND	ND	ND	ND	ND	20 J
Toluene	1,900,000	5 U	5 U	5 U	820 J	5 U	5 U	5 U	3300 DJ
Trichloroethene	7,100	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	710,000	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	980,000	5 U	51000 D	5 U	27000	340	5 U	5 U	140000 D

U - Not detected.
NA - Not analyzed.
ND - Not detected,detection limit not available.
J - Estimated
B - blank contamination.
D - Dilution.

APPENDIX C
HISTORICAL SAMPLE RESULTS - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH(ft) SAMPLE DATE PARAMETER	Region V DQLs	GS-13 0.00-2.0 8/2/91	GS-14 0.00-2.0 8/5/91	GS-15 0.00-2.0 8/2/91	GS-16 0.00-2.0 8/7/91	GS-17 0.00-2.0 8/2/91	GS-18 0.00-2.0 8/6/91	GS-19 0.00-2.0 8/2/91	GS-2 0.00-2.0 8/2/91	GS-20 0.00-2.0 8/2/91
VOLATILES (ug/kg)										
1,1,2,2-Tetrachloroethane	900	ND	ND	7 J	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	8,700,000	100 U	100 U	80	100 U	100 U	100 U	100 U	100 U	100 U
2-Hexanone	---	ND	ND	130	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	5,200,000	100 U	100 U	120000 D	390000	100 U	100 U	100 U	100 U	100 U
Acetone	2,000,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1,400	5 U	5 U	10	5 U	5 U	5 U	5 U	5 U	5 U
Crotonaldehyde	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	160,000	ND	ND	7	ND	ND	ND	ND	ND	ND
Chloroform	530	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylmethacrylate	340,000	ND	ND	8 J	ND	ND	ND	ND	ND	ND
Ethylbenzene	2,900,000	5 U	11000	200000 D	810000	5 U	5 U	5 U	5 U	5 U
Methylene chloride	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	2,200,000	ND	ND	89	ND	ND	ND	ND	ND	ND
Trans-1,4-Dichloro-2-Butene	7.6	ND	ND	9 J	ND	ND	ND	ND	ND	ND
Tetrachloroethene	7,000	ND	ND	2 J	ND	ND	ND	ND	ND	ND
Toluene	1,900,000	5 U	14000	120000 D	570000	5 U	5 U	5 U	5 U	5 U
Trichloroethene	7,100	ND	ND	2 J	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	710,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	980,000	5 U	28000	580000 D	2100000	5 U	5 U	5 U	76	5 U

U - Not detected.
NA - Not analyzed.
ND - Not detected,detection limit not available.
J - Estimated
B - blank contamination.
D - Dilution.

APPENDIX C
HISTORICAL SAMPLE RESULTS - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH(ft) SAMPLE DATE PARAMETER	Region V DQLs	GS-21 0.00-2.0 8/2/91	GS-22 0.00-2.0 8/2/91	GS-23 0.00-2.0 8/5/91	GS-24 0.00-2.0 8/5/91	GS-25 0.00-2.0 8/2/91	GS-26 0.00-2.0 8/2/91	GS-27 0.00-2.0 8/7/91	GS-28 0.00-2.0 8/6/91	GS-29 0.00-2.0 8/8/91
VOLATILES (ug/kg)										
1,1,2,2-Tetrachloroethane	900	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	8,700,000	100 U	100 U	100 U	100 U	34	100 U	100 U	100 U	100 U
2-Hexanone	---	ND	ND	ND	ND	180	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	5,200,000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Acetone	2,000,000	ND	ND	ND	ND	71 B	ND	ND	ND	ND
Benzene	1,400	5 U	5 U	7 J	5 U	5 U	5 U	5 U	5 U	5 U
Crotonaldehyde	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	160,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	530	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylmethacrylate	340,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	2,900,000	5 U	5 U	17000 D	5500	26	5 U	5 U	27	5 U
Methylene chloride	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	2,200,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,4-Dichloro-2-Butene	7.6	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	7,000	ND	ND	15 J	ND	ND	ND	ND	ND	ND
Toluene	1,900,000	5 U	5 U	12000 D	2300	16	5 U	5 U	3 J	5 U
Trichloroethene	7,100	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	710,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	980,000	5 U	5 U	140000 D	26000	81	5 U	5 U	15	5 U

U - Not detected.
NA - Not analyzed.
ND - Not detected,detection limit not available.
J - Estimated
B - blank contamination.
D - Dilution.

APPENDIX C
HISTORICAL SAMPLE RESULTS - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH(ft) SAMPLE DATE PARAMETER	Region V DQLs	GS-3 0.00-2.0 8/2/91	GS-30 0.00-2.0 8/3/91	GS-31 0.00-2.0 8/5/91	GS-32 0.00-2.0 8/10/91	GS-33 0.00-2.0 8/6/91	GS-34 0.00-2.0 8/6/91	GS-35 0.00-2.0 8/4/91	GS-36 0.00-2.0 8/8/91	GS-37 0.00-2.0 8/4/91
VOLATILES (ug/kg)										
1,1,2,2-Tetrachloroethane	900	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	8,700,000	100 U	100 U	8700	100 U	100 U	100 U	6 J	100 U	100 U
2-Hexanone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	5,200,000	100 U	100 U	100 U	100 U	100 U	100 U	22	100 U	1 J
Acetone	2,000,000	ND	ND	ND	ND	ND	64 B	94 B	ND	ND
Benzene	1,400	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Crotonaldehyde	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	160,000	ND	ND	ND	ND	ND	ND	1 J	ND	ND
Chloroform	530	ND	1	ND	ND	ND	ND	ND	ND	ND
Ethylmethacrylate	340,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	2,900,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylene chloride	2,000	63 B	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	2,200,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,4-Dichloro-2-Butene	7.6	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	7,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1,900,000	5 U	5 U	5 U	5 U	5 U	5 U	8	5 U	5 U
Trichloroethene	7,100	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	710,000	ND	ND	ND	ND	ND	ND	ND	ND	1 J
Xylenes (total)	980,000	31	5 U	9 J	5 U	5 U	5 U	24	1700	4 J

U - Not detected.
NA - Not analyzed.
ND - Not detected,detection limit not available.
J - Estimated
B - blank contamination.
D - Dilution.

APPENDIX C
HISTORICAL SAMPLE RESULTS - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH(ft) SAMPLE DATE PARAMETER	Region V DQLs	GS-38 0.00-2.0 8/5/91	GS-39 0.00-2.0 8/6/91	GS-4 0.00-2.0 8/5/91	GS-40 0.00-2.0 8/7/91	GS-41 0.00-2.0 8/4/91	GS-42 0.00-2.0 8/4/91	GS-43 0.00-2.0 8/9/91	GS-44 0.00-2.0 8/16/91	GS-45 0.00-2.0 8/16/91
VOLATILES (ug/kg)										
1,1,2,2-Tetrachloroethane	900	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	8,700,000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Hexanone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	5,200,000	100 U	100 U	100 U	9900 J	100 U	100 U	100 U	100 U	100 U
Acetone	2,000,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1,400	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Crotonaldehyde	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	160,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	530	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylmethacrylate	340,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	2,900,000	34000	100000	5 U	5 U	5 U	15	5 U	5 U	1
Methylene chloride	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	2,200,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,4-Dichloro-2-Butene	7.6	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	7,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1,900,000	69000	630000	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	7,100	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	710,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	980,000	280000	490000	2100	390000	5 U	29	5 U	5 U	5 U

U - Not detected.
NA - Not analyzed.
ND - Not detected,detection limit not available.
J - Estimated
B - blank contamination.
D - Dilution.

APPENDIX C
HISTORICAL SAMPLE RESULTS - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH(ft) SAMPLE DATE PARAMETER	Region V DQLs	GS-46 0.00-2.0 8/16/91	GS-47 0.00-2.0 8/14/91	GS-48 0.00-2.0 8/16/91	GS-49 0.00-2.0 8/16/91	GS-5 0.00-2.0 8/2/91	GS-50 0.00-2.0 8/16/91	GS-53 1.00-2.0 1/30/92	GS-53 3.00-4.0 1/30/92	GS-5 1.00-2 8/16/9
VOLATILES (ug/kg)										
1,1,2,2-Tetrachloroethane	900	ND	ND	ND	ND	ND	ND	NA	NA	ND
2-Butanone (MEK)	8,700,000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	
2-Hexanone	---	ND	ND	ND	ND	ND	ND	NA	NA	ND
4-Methyl-2-pentanone (MIBK)	5,200,000	100 U	100 U	100 U	100 U	ND	100 U	100 U	100 U	
Acetone	2,000,000	ND	ND	ND	ND	ND	ND	ND	ND	
Benzene	1,400	5 U	5 U	5 U	5 U	2 J	5 U	5 U	5 U	
Crotonaldehyde	---	ND	ND	ND	ND	ND	ND	NA	NA	ND
Chlorobenzene	160,000	ND	ND	ND	ND	2 J	ND	NA	NA	ND
Chloroform	530	ND	ND	ND	ND	ND	ND	NA	NA	ND
Ethylmethacrylate	340,000	ND	ND	ND	ND	ND	ND	NA	NA	ND
Ethylbenzene	2,900,000	5 U	5 U	5 U	5 U	5 U	5 U	15300	9.1 UJ	
Methylene chloride	2,000	ND	ND	ND	ND	ND	ND	NA	NA	ND
Styrene	2,200,000	ND	ND	ND	ND	ND	ND	NA	NA	ND
Trans-1,4-Dichloro-2-Butene	7.6	ND	ND	ND	ND	ND	ND	NA	NA	ND
Tetrachloroethene	7,000	ND	ND	ND	ND	ND	ND	NA	NA	ND
Toluene	1,900,000	5 U	5 U	5 U	5 U	ND	5 U	740 UJ	7.6 UJ	
Trichloroethene	7,100	ND	ND	ND	ND	ND	ND	NA	NA	ND
Trichlorofluoromethane	710,000	ND	ND	ND	ND	ND	ND	NA	NA	ND
Xylenes (total)	980,000	5 U	5 U	5 U	5 U	200	5 U	31600	13.6	

U - Not detected.
NA - Not analyzed.
ND - Not detected,detection limit not available.
J - Estimated
B - blank contamination.
D - Dilution.

APPENDIX C
HISTORICAL SAMPLE RESULTS - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH(ft) SAMPLE DATE PARAMETER	Region V DQLs	0	GS-53 3.00-4.0 8/16/91	GS-54 1.00-2.0 1/30/92	GS-54 2.00-3.0 1/30/92	GS-54 1.00-2.0 8/16/91	GS-54 2.00-3.0 8/16/91	GS-6 0.00-2.0 8/7/91	GS-7 0.00-2.0 8/2/91	GS-8 0.00-2.0 8/2/91
VOLATILES (ug/kg)										
1,1,2,2-Tetrachloroethane	900		ND	NA	NA	ND	ND	ND	ND	ND
2-Butanone (MEK)	8,700,000	NA	NA	100 U	100 U	NA	NA	9800	100 U	100 U
2-Hexanone	---		ND	NA	NA	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	5,200,000	NA	NA	5380	5890	NA	NA	100 U	100 U	100 U
Acetone	2,000,000	NA	NA	ND	ND	NA	NA	ND	ND	ND
Benzene	1,400	NA	NA	5 U	5 U	NA	NA	5 U	5 U	5 U
Crotonaldehyde	---		ND	NA	NA	ND	ND	ND	ND	ND
Chlorobenzene	160,000		ND	NA	NA	ND	ND	ND	ND	ND
Chloroform	530		ND	NA	NA	ND	ND	ND	ND	ND
Ethylmethacrylate	340,000		ND	NA	NA	ND	ND	ND	ND	ND
Ethylbenzene	2,900,000	NA	NA	373000	43900	NA	NA	5 U	37	1 J
Methylene chloride	2,000		ND	NA	NA	ND	ND	ND	ND	ND
Styrene	2,200,000		ND	NA	NA	ND	ND	52000	17	1 J
Trans-1,4-Dichloro-2-Butene	7.6		ND	NA	NA	ND	ND	ND	ND	ND
Tetrachloroethene	7,000		ND	NA	NA	ND	ND	ND	ND	ND
Toluene	1,900,000	NA	NA	376000	49400	NA	NA	5 U	ND	5 U
Trichloroethene	7,100		ND	NA	NA	ND	ND	ND	ND	ND
Trichlorofluoromethane	710,000		ND	NA	NA	ND	ND	ND	ND	ND
Xylenes (total)	980,000	NA	NA	1083000	136200	NA	NA	5 U	8	5 U

U - Not detected.
NA - Not analyzed.
ND - Not detected,detection limit not available.
J - Estimated
B - blank contamination.
D - Dilution.

APPENDIX C
HISTORICAL SAMPLE RESULTS - TANK FARM AREA
PPG - OAK CREEK

SAMPLE LOCATION SAMPLE DEPTH(ft) SAMPLE DATE PARAMETER	Region V DQLs	GS-9 0.00-2.0 8/2/91
VOLATILES (ug/kg)		
1,1,2,2-Tetrachloroethane	900	ND
2-Butanone (MEK)	8,700,000	100 U
2-Hexanone	---	ND
4-Methyl-2-pentanone (MIBK)	5,200,000	100 U
Acetone	2,000,000	ND
Benzene	1,400	5 U
Crotonaldehyde	---	ND
Chlorobenzene	160,000	ND
Chloroform	530	ND
Ethylmethacrylate	340,000	ND
Ethylbenzene	2,900,000	5 U
Methylene chloride	2,000	48 B
Styrene	2,200,000	ND
Trans-1,4-Dichloro-2-Butene	7.6	ND
Tetrachloroethene	7,000	ND
Toluene	1,900,000	5 U
Trichloroethene	7,100	ND
Trichlorofluoromethane	710,000	ND
Xylenes (total)	980,000	5 U

U - Not detected.
NA - Not analyzed.
ND - Not detected,detection limit not available.
J - Estimated
B - blank contamination.
D - Dilution.

APPENDIX D

DATA VALIDATION REPORTS

RELEASE OF VALIDATED DATA

Project: PPG Oak Creek
Date: February 3, 1997
SDG: A6J250167
ICF Package: PPG #10
Reviewer: Edward Sedlmyer

Validation was performed on the volatile, alcohol, semivolatile, and metals analytical results for 3 samples collected October 23, 1996. Quanterra Inc. (North Canton) analyzed the samples using SW846 methods. The data validation was performed in accordance with the *U.S.EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review,* February 1994, as applicable to SW846 methods. Samples in this SDG included:

Field Sample ID	Lab Sample ID	Field Sample ID	Lab Sample ID
PPG-FB-06	A6J250167-001	PPG-GWLW6-01	A6J250167-002
TRIP BLANK TB-10	A6J250167-003		

Sample number TB-10 was designated as a trip blank and sample numbers PPG-FB-06 was designated as a field blank for the sample associated with this SDG. The items reviewed were as follows:

VOLATILE ORGANICS

Method: SW-846 Method 8260A.

Samples: All samples.

Holding Time: All samples met the 14 day holding time requirement.

GC/MS Instrument Performance Check: The bromofluorobenzene (BFB) met ion abundance criteria and all samples were analyzed within the 12 hour tune time.

Initial Calibrations: The initial calibrations associated with the samples met minimum response criteria for the SPCCs and the %RSD criteria of <30% for all CCC and PPG target compounds.

Continuing Calibrations: The continuing calibration associated with the samples met minimum response criteria for the SPCCs and the %RSD criteria (<20% for all CCC and PPG target compounds except acetone, 2-butanone, and 4-methyl-2-pentanone, which are <50%).

Blanks: No target compounds were detected in the blanks associated with this SDG.

Surrogates: All surrogates met the lab specific recovery criteria.

Matrix Spike/Duplicate: The MS/MSD was performed on the field blank (PPG-FB-06). No action was taken on the MS/MSD.

Laboratory Control Sample: The LCS met percent recovery criteria.

Internal Standards: The internal standards met the -50% to +100% response criteria.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: The volatile results were acceptable as reported and no qualification of the data is necessary.

Note: The PPG target compounds are as follows: acetone, benzene, 2-butanone, ethylbenzene, 4-methyl-2-pentanone, isopropylbenzene, styrene, toluene, 1,2,4-trimethylbenzene, and xylenes.

ALCOHOLS

Method: SW-846 Method 8015.

Samples: PPG-GWLW6-01 and PPG-FB-06.

Holding Time: All samples met the 14 day holding time requirement.

Initial Calibrations: The initial calibration analyzed on 9/12/96 and associated with the samples in this SDG had a correlation coefficient >0.995 for all compounds.

Continuing Calibrations: The continuing calibrations met the 15% difference criteria.

Blanks: No target compounds were detected in the preparation blank associated with these samples.

Surrogates: All surrogates met percent recovery criteria of 40-160%.

Matrix Spike/Duplicate: The MS/MSD was performed on the field blank (PPG-FB-06). No action was taken on the MS/MSD. The LCS associated with this SDG met percent recovery criteria.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: The alcohol results were acceptable as reported and no qualification of the data is necessary.

Note: The PPG target compounds are as follows: n-butyl alcohol and isobutyl alcohol.

SEMIVOLATILE ORGANICS

Method: SW-846 Method 8270.

Samples: PPG-GWLW6-01 and PPG-FB-06.

Holding Time: All samples met the 7 day extraction, and the 40 day analysis holding time requirement.

GC/MS Instrument Performance Check: The decafluorotriphenylphosphine (DFTPP) met ion abundance criteria and all samples were analyzed within the 12-hour tune time.

Initial Calibrations: The initial calibrations associated with this SDG met minimum response criteria for the SPCCs and the %RSD criteria of <30% for the CCC and PPG target compounds.

Continuing Calibrations: The continuing calibrations associated with this SDG met minimum response criteria for the SPCCs and the %RSD criteria of <20% for the CCC and PPG target compounds.

Blanks: No target compounds were detected in the preparation blanks associated with these samples.

Surrogates: Terphenyl-d14 had a high recovery for sample PPG-FB-06 (field blank). No compounds were detected in this sample and no action was taken on the high surrogates.

Matrix Spike/Duplicate: The MS/MSD was performed on the field blank (PPG-FB-06). No action was taken on the MS/MSD.

Laboratory Control Sample: The LCS met percent recovery criteria.

Internal Standards: The internal standards met the -50% to +100% response criteria.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: The semivolatile results were acceptable as reported and no qualification of the data is necessary.

Note: The PPG target compounds are as follows: 2,4-dimethylphenol, di-n-butylphthalate, di-n-octylphthalate, naphthalene, and pyridine.

METALS

Method: SW-846 Method 6000/7000.

Samples: PPG-GWLW6-01 and PPG-FB-06.

Holding Time: All samples met the 180 day holding time requirement, (28 days for mercury).

Initial and Continuing Calibration Verification: All of the ICVs and CCVs met the 90-110% criteria. The CRDL standard recoveries were within 85-105%.

Blanks: Aluminum (70.3 ug/L), calcium (205 ug/L), and iron (84.1 ug/L) were detected in the continuing calibration, preparation, and field blanks (maximum concentration in parenthesis). Comparison with the raw data indicated that all sample concentrations are >5X the blank concentration so no qualification of the data is necessary.

ICP Interference Check Sample (ICS): The ICS recoveries met the 80-120% criteria.

Matrix spikes: The MS/MSD was performed on the field blank (PPG-FB-06). No action was taken on the MS/MSD.

Laboratory Control Sample: All the LCS recoveries met the 80-120% criteria.

Field Duplicate: A field duplicate was not performed on a sample in this data package.

Laboratory Duplicate: A Laboratory duplicate was not performed on a sample in this data package.

Serial Dilution: The serial dilution met the 10% difference criteria.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: All of the metals results were acceptable as reported and no qualification of the data is necessary.

Note: The PPG target compounds are as follows: arsenic, barium, cadmium, chromium, lead mercury, and nickel.

Quanterra Inc. uses laboratory generated control limits for surrogate and matrix spike recoveries to determine if the volatile and semivolatile analyses meet criteria. The laboratory generated surrogate and matrix spike recovery criteria are as follows for the volatile and semivolatile methods:

VOLATILE SURROGATE LIMITS			
Aqueous		**Solid**	
Surrogate	**QC Limits (%)**	**Surrogate**	**QC Limits**
1,2-dichloroethane-d4	69-127	1,2-dichloroethane-d4	61-115
toluene-d8	90-112	toluene-d8	82-129
bromofluorobenzene	87-114	bromofluorobenzene	64-112

SEMIVOLATILE SURROGATE LIMITS			
Aqueous		**Solid**	
Surrogate	**QC Limits (%)**	**Surrogate**	**QC Limits**
nitrobenzene-d5	30-122	nitrobenzene-d5	53-98
2-fluorobiphenyl	54-116	2-fluorobiphenyl	56-107
terphenyl-d14	53-135	terphenyl-d14	56-145
phenol-d5	10-149	phenol-d5	46-103
2-fluorophenol	10-104	2-fluorophenol	42-100
2,4,6-tribromophenol	20-143	2,4,6-tribromophenol	31-123

VOLATILE MATRIX SPIKE LIMITS					
Aqueous			**Solid**		
Spike Compound	**RPD (%)**	**QC Limits (%)**	**Spike Compound**	**RPD (%)**	**QC Limits (%)**
1,1-dichloroethene	20	75-113	1,1-dichloroethene	27	10-234
trichloroethene	22	71-110	trichloroethene	20	71-157
chlorobenzene	18	81-115	chlorobenzene	19	37-160
toluene	24	78-126	toluene	15	47-150
benzene	17	78-117	benzene	21	37-151

SEMIVOLATILE MATRIX SPIKE LIMITS					
Aqueous			**Solid**		
Spike Compound	**RPD (%)**	**QC Limits (%)**	**Spike Compound**	**RPD (%)**	**QC Limits (%)**
1,2,4-trichlorobenzene	28	44-142	1,2,4-trichlorobenzene	28	44-142
acenaphthene	28	47-145	acenaphthene	28	47-145
2,4-dinitrotoluene	22	39-139	2,4-dinitrotoluene	22	39-139
pyrene	25	52-115	pyrene	25	52-115
N-nitrosodi-n-propylamine	55	10-230	N-nitrosodi-n-propylamine	55	10-230
1,4-dichlorobenzene	32	20-124	1,4-dichlorobenzene	32	20-124
pentachlorophenol	49	14-176	pentachlorophenol	49	14-176
phenol	23	10-112	phenol	23	10-112
2-chlorophenol	29	23-134	2-chlorophenol	29	23-134
4-chloro-3-methylphenol	37	22-147	4-chloro-3-methylphenol	37	22-147
4-nitrophenol	47	10-132	4-nitrophenol	47	10-132

RELEASE OF VALIDATED DATA

Project: PPG Oak Creek
Date: December 10, 1996
SDG: A6I190156
ICF Package: PPG #4
Reviewer: Edward Sedlmyer

Validation was performed on the total organic carbon analytical results for 6 samples collected September 17 and 18, 1996. Quanterra Inc. (North Canton) analyzed the samples using SW846 methods. The data validation was performed in accordance with the *U.S.EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review,* February 1994, as applicable to SW846 methods. Samples in this SDG included:

Field Sample ID	Lab Sample ID	Field Sample ID	Lab Sample ID
PPG-SSLP2-06	A6I190156-001	PPG-SSLP2-21	A6I190156-002
PPG-SSLP4-11	A6I190156-003	PPG-SSLP4-28.5	A6I190156-004
PPG-SSLP5-3.5	A6I190156-005	PPG-SSLP5-3.5-09	A6I190156-006

The items reviewed were as follows:

TOTAL ORGANIC CARBON

Method: SMCA Walkley-black.

Samples: All samples.

Holding Time: All samples met the 28 day holding time requirement.

Calibrations: No calibration data was provided.

Blanks: No total organic carbon was detected in the method blank.

Laboratory Control Sample: The LCS recovery for samples associated with this SDG met the 75-125% criteria.

Laboratory Duplicate Sample: The laboratory duplicate had a RPD of less than 40%, which is acceptable.

Reported CRQLs: The reported sample results have been adjusted for moisture content.

Summary: The total organic carbon results were acceptable as reported and no qualification of the data is necessary.

RELEASE OF VALIDATED DATA

Project: PPG Oak Creek
Date: December 9, 1996
SDG: A6J010137
ICF Package: PPG #5
Reviewer: Edward Sedlmyer

Validation was performed on the volatile and metals analytical results for 12 samples collected September 30, 1996. Quanterra Inc. (North Canton) analyzed the samples using SW846 methods. The data validation was performed in accordance with the *U.S.EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review,* February 1994, as applicable to SW846 methods. Samples in this SDG included:

Field Sample ID	Lab Sample ID	Field Sample ID	Lab Sample ID
PPG-HA16-01.25	A6J010137-001	PPG-HA17-01	A6J010137-002
PPG-HA17-01-09	A6J010137-003	PPG-HA18-01	A6J010137-004
PPG-HA19-02	A6J010137-005	PPG-HA20-01.25	A6J010137-006
PPG-HA21-02	A6J010137-007	PPG-HA22-01.5	A6J010137-008
PPG-HA24-01.5	A6J010137-009	PPG-HA23-02	A6J010137-010
PPG-FB03	A6J010137-011	TB03	A6J010137-012

Sample number TB03 was designated as a trip blank and sample number PPG-FB03 was designated as a field blank for samples associated with this SDG. The items reviewed were as follows:

VOLATILE ORGANICS

Method: SW-846 Method 8260A.

Samples: All samples.

Holding Time: All samples met the 14 day holding time requirement.

GC/MS Instrument Performance Check: The bromofluorobenzene (BFB) met ion abundance criteria and all samples were analyzed within the 12 hour tune time.

Initial Calibrations: The initial calibration associated with this SDG met minimum response criteria for the SPCCs and the %RSD criteria of <30% for all CCC and PPG target compounds.

Continuing Calibrations: The continuing calibrations associated with this SDG met minimum response criteria for the SPCCs and the %RSD criteria (<20% for all CCC and PPG target compounds except acetone, 2-butanone, and 4-methyl-2-pentanone, which are <50%).

Blanks: Methylene chloride was detected in the field blank (1.8 ug/L). However no methylene chloride was detected in any samples associated with this SDG so no qualification of the data is necessary.

Surrogates: All surrogates met the lab specific recovery criteria.

Matrix Spike/Duplicate: The MS/MSD performed on sample PPG-HA21-02 met accuracy and precision criteria for all compounds.

Laboratory Control Sample: The LCS's had met percent recovery criteria.

Field Duplicate: No dectections greater than the CRDL.

Internal Standards: The internal standards met the -50% to +100% response criteria.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: The volatile results were acceptable as reported and no qualification of the data is necessary.

Note: The PPG target compounds are as follows: acetone, benzene, 2-butanone, ethylbenzene, 4-methyl-2-pentanone, isopropylbenzene, styrene, toluene, 1,2,4-trimethylbenzene, and xylenes.

METALS

Method: SW-846 Method 6000/7000.

Samples: All samples except for TB03.

Holding Time: All samples met the 180 day holding time requirement, (28 days for mercury).

Initial and Continuing Calibration Verification: All of the ICVs and CCVs met the 90-110% criteria. The CRDL standard recoveries were within 85-115%.

Blanks: Aluminum (54.7 ug/L), calcium (219.0 ug/L), iron (53.1 ug/L), and magnesium (86.3 ug/L) were detected in the continuing calibration and field blanks (maximum concentration in parenthesis). Comparison with the raw data indicated that all sample concentrations are >5X the blank concentration so no qualification of the data is necessary.

Arsenic (0.37 mg/Kg), barium (0.15 mg/Kg), calcium (24.8 mg/Kg), iron (7.2 mg/Kg), and magnesium (4.0 mg/Kg) were detected in the preparation blank associated with the soil samples. All sample results less than 5X the blank concentration have been qualified "B" due to blank contamination.

ICP Interference Check Sample (ICS): The ICS recoveries met the 80-120% criteria.

Matrix spikes: The MS/MSD performed on sample PPG-HA21-02 had the following metals outside of the 75-125% criteria: Calcium (159% and 62%) and magnesium (73% and 131%). The recovery results for aluminum and iron were not calculated because the sample concentration was greater than 4X the spike amount. The calcium and magnesium results for samples associated with this SDG have been qualified "J" as estimated.

Laboratory Duplicate: The Laboratory duplicate RPD's met the ±20% criteria.

Laboratory Control Sample: All the LCS recoveries met the 80-120% criteria.

Field Duplicate: The field duplicate RPD for calcium (118%) exceeded the ±35% criteria. All calcium results have been qualified "J" as estimated.

Serial Dilution: The calcium percent difference of 14.3% exceeded the 10% difference criteria. All calcium results have been qualified "J" as estimated.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: All of the metals results were acceptable as reported with the following qualifications:

Sample	Parameter	Qualifiers
PPG-HA16-01.25 PPG-HA19-02	arsenic	B
All samples	calcium, magnesium	J

Note: The PPG target compounds are as follows: arsenic, barium, cadmium, chromium, lead mercury, and nickel.

Quanterra Inc. uses laboratory generated control limits for surrogate and matrix spike recoveries to determine if the volatile analyses meet criteria. The laboratory generated surrogate and matrix spike recovery criteria are as follows for the volatile method:

VOLATILE SURROGATE LIMITS			
Aqueous		**Solid**	
Surrogate	**QC Limits (%)**	**Surrogate**	**QC Limits**
1,2-dichloroethane-d4	69-127	1,2-dichloroethane-d4	61-115
toluene-d8	90-112	toluene-d8	82-129
bromofluorobenzene	87-114	bromofluorobenzene	64-112

VOLATILE MATRIX SPIKE LIMITS					
Aqueous			**Solid**		
Spike Compound	**RPD (%)**	**QC Limits (%)**	**Spike Compound**	**RPD (%)**	**QC Limits (%)**
1,1-dichloroethene	20	75-113	1,1-dichloroethene	27	10-234
trichloroethene	22	71-110	trichloroethene	20	71-157
chlorobenzene	18	81-115	chlorobenzene	19	37-160
toluene	24	78-126	toluene	15	47-150
benzene	17	78-117	benzene	21	37-151

RELEASE OF VALIDATED DATA

Project: PPG Oak Creek
Date: December 9, 1996
SDG: A6J040162
ICF Package: PPG #6
Reviewer: Edward Sedlmyer

Validation was performed on the volatile and metals analytical results for 6 samples collected October 2, 1996. Quanterra Inc. (North Canton) analyzed the samples using SW846 methods. The data validation was performed in accordance with the *U.S.EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review,* February 1994, as applicable to SW846 methods. Samples in this SDG included:

Field Sample ID	Lab Sample ID	Field Sample ID	Lab Sample ID
PPG-FB-04	A6J040162-001	PPG-SD03-01	A6J040162-002
PPG-SD03-01-09	A6J040162-003	PPG-SD02-01	A6J040162-004
PPG-SD01-01	A6J040162-005	TRIP BLANK TB-06	A6J040162-006

Sample number TRIP BLANK TB-06 was designated as a trip blank and sample number PPG-FB-04 was designated as a field blank for samples associated with this SDG. The items reviewed were as follows:

VOLATILE ORGANICS

Method: SW-846 Method 8260A.

Samples: All samples.

Holding Time: All samples met the 14 day holding time requirement.

GC/MS Instrument Performance Check: The bromofluorobenzene (BFB) met ion abundance criteria and all samples were analyzed within the 12 hour tune time.

Initial Calibrations: The initial calibration analyzed on 10/21/96 and associated with the aqueous samples met minimum response criteria for the SPCCs and the %RSD criteria of <30% for all CCC and PPG target compounds.

Continuing Calibrations: The continuing calibrations analyzed on 10/14 and 10/16, 1996 and associated with this SDG met minimum response criteria for the SPCCs and the %RSD criteria

(<20% for all CCC and PPG target compounds except acetone, 2-butanone, and 4-methyl-2-pentanone, which are <50%).

Blanks: No target compounds were detected in the blanks associated with this SDG.

Surrogates: All surrogates met the lab specific recovery criteria.

Matrix Spike/Duplicate: The MS/MSD performed on sample PPG-SD03-01 met accuracy and precision criteria for all compounds.

Laboratory Control Sample: The LCS had met percent recovery criteria.

Field Duplicate: No detections greater than the CRDL.

Internal Standards: The chlorobenzene-d5 internal standard for sample PPG-SD02-01 had a low response (35263, below the 36955 criteria). The compounds associated with this internal standard have been qualified "J" as estimated.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: The volatile results were acceptable as reported with the following qualifications:

Sample	Compound	Qualifier
PPG-SD02-01	ethylbenzene, toluene, isopropylbenzene, styrene, total xylene, trans-1,3-dichloropropene, 1,1,2-trichloroethane, tetrachloroethene, dibromochloromethane, 1,2-dibromoethane, chlorobenzene, bromoform, 2-hexanone, 1,1,1,2-tetrachloroethane	J

Note: The PPG target compounds are as follows: acetone, benzene, 2-butanone, ethylbenzene, 4-methyl-2-pentanone, isopropylbenzene, styrene, toluene, 1,2,4-trimethylbenzene, and xylenes.

METALS

Method: SW-846 Method 6000/7000.

Samples: All samples except for TRIP BLANK TB-07.

Holding Time: All samples met the 180 day holding time requirement, (28 days for mercury).

Initial and Continuing Calibration Verification: All of the ICVs and CCVs met the 90-110% criteria. The CRDL standard recoveries were within 75-125%.

Blanks: Aluminum (33.1 ug/L), cadmium (0.25 ug/L), calcium (198.4 ug/L), iron (17.1 ug/L), mercury (0.083 ug/L), and magnesium (50.4 ug/L) were detected in the continuing calibration and field blanks (maximum concentration in parenthesis). Comparison with the raw data indicated that all sample concentrations are >5X the blank concentration so no qualification of the data is necessary.

Mercury (0.076 ug/L) and iron (47.6 ug/L) were detected in the preparation blank associated with the aqueous samples. All sample results less than 5X the blank concentration have been qualified "B" due to blank contamination.

ICP Interference Check Sample (ICS): The ICS recoveries met the 80-120% criteria.

Matrix spikes: The MS/MSD performed on sample PPG-SD03-01 had a high MSD recovery for chromium (126%, above the 75-125% criteria). The chromium results have been qualified "K" as biased high. The recovery results for aluminum and iron were not calculated because the sample concentration was greater than 4X the spike amount.

The matrix spike performed on sample PPG-SD01-01 had a high matrix spike recovery for chromium (122%, above the 75-125% criteria), calcium (198%, above the 75-125% criteria), and magnesium (143%, above the 75-125% criteria). The chromium, calcium, and magnesium results have been qualified "K" as biased high. The recovery results for aluminum and iron were not calculated because the sample concentrations were greater than 4X the spike amount.

Laboratory Duplicate: The Laboratory duplicate for lead had a high RPD (43%, above the 20% criteria). The lead results have been qualified "J" as estimated.

Laboratory Control Sample: All the LCS recoveries met the 80-120% criteria.

Field Duplicate: The field duplicate RPDs were within ±25%.

Serial Dilution: The serial dilution met the 10% difference criteria.

Summary: All of the metals results were acceptable as reported with the following qualifications:

Sample	Parameter	Qualifiers
All Samples	lead	J
All Samples	chromium, calcium, magnesium	K
PPG-FB-04	mercury	B

Note: The PPG target compounds are as follows: arsenic, barium, cadmium, chromium, lead mercury, and nickel.

Quanterra Inc. uses laboratory generated control limits for surrogate and matrix spike recoveries to determine if the volatile analyses meet criteria. The laboratory generated surrogate and matrix spike recovery criteria are as follows for the volatile method:

VOLATILE SURROGATE LIMITS			
Aqueous		**Solid**	
Surrogate	**QC Limits (%)**	**Surrogate**	**QC Limits**
1,2-dichloroethane-d4	69-127	1,2-dichloroethane-d4	61-115
toluene-d8	90-112	toluene-d8	82-129
bromofluorobenzene	87-114	bromofluorobenzene	64-112

VOLATILE MATRIX SPIKE LIMITS					
Aqueous			**Solid**		
Spike Compound	**RPD (%)**	**QC Limits (%)**	**Spike Compound**	**RPD (%)**	**QC Limits (%)**
1,1-dichloroethene	20	75-113	1,1-dichloroethene	27	10-234
trichloroethene	22	71-110	trichloroethene	20	71-157
chlorobenzene	18	81-115	chlorobenzene	19	37-160
toluene	24	78-126	toluene	15	47-150
benzene	17	78-117	benzene	21	37-151

RELEASE OF VALIDATED DATA

Project: PPG Oak Creek
Date: December 9, 1996
SDG: A6J090153
ICF Package: PPG #7
Reviewer: Edward Sedlmyer

Validation was performed on the volatile, alcohol, semivolatile, and metals analytical results for 5 samples collected October 7 and 8, 1996. Quanterra Inc. (North Canton) analyzed the samples using SW846 methods. The data validation was performed in accordance with the *U.S.EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review,* February 1994, as applicable to SW846 methods. Samples in this SDG included:

Field Sample ID	Lab Sample ID	Field Sample ID	Lab Sample ID
PPG-GWMW15-01	A6J090153-001	PPG-GWMW16-01	A6J090153-002
PPG-GWMW16-01-09	A6J090153-003	PPG-GWTW6-01	A6J090153-004
TRIP BLANK TB-07	A6J090153-005		

Sample number TRIP BLANK TB-07 was designated as a trip blank for samples associated with this SDG. The items reviewed were as follows:

VOLATILE ORGANICS

Method: SW-846 Method 8260A.

Samples: All samples.

Holding Time: All samples met the 14 day holding time requirement.

GC/MS Instrument Performance Check: The bromofluorobenzene (BFB) met ion abundance criteria and all samples were analyzed within the 12 hour tune time.

Initial Calibrations: The initial calibration analyzed on 10/21/96 and associated with the aqueous samples met minimum response criteria for SPCCs and the %RSD criteria of <30% for all CCC and PPG target compounds.

Note: All samples were analyzed within the 12 hour tune time during the initial calibration so no continuing calibration was analyzed for this SDG.

Blanks: Acetone (3.7 ug/L) was detected in the preparation blank associated with the aqueous samples. The results for acetone ≤10X the blank concentration have been qualified "B" due to blank contamination in samples PPG-GWMW15-01 (11.0 ug/L), PPG-GWMW16-01 (15.0 ug/L), and PPG-GWMW16-01-09 (6.3 ug/L). No target compounds were detected in the trip blank.

Surrogates: All surrogates met the lab specific percent recovery criteria.

Matrix Spike/Duplicate: The MS/MSD performed on sample PPG-GWTW6-01 met accuracy and precision criteria for all compounds.

Laboratory Control Sample: The LCS met percent recovery criteria.

Field Duplicate: The field duplicate RPDs were within ±20%.

Internal Standards: The internal standards met the -50% to +100% response criteria.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs have been adjusted to reflect sample dilutions.

Summary: The volatile results were acceptable as reported with the following qualifications:

Sample	Compound	Qualifier
PPG-GWMW15-01 PPG-GWMW16-01 PPG-GWMW16-01-09	acetone	B

Note: The PPG target compounds are as follows: acetone, benzene, 2-butanone, ethylbenzene, 4-methyl-2-pentanone, isopropylbenzene, styrene, toluene, 1,2,4-trimethylbenzene, and xylenes.

ALCOHOLS

Method: SW-846 Method 8015.

Samples: All samples except for TRIP BLANK TB-07.

Holding Time: All samples met the 14 day holding time requirement.

Initial Calibrations: The initial calibration analyzed on 9/16/96 and associated with the aqueous samples had a correlation coefficient >0.995 for all compounds.

Continuing Calibrations: The continuing calibrations met the 15% difference criteria.

Blanks: No target compounds were detected in the preparation blank associated with these samples.

Surrogates: All surrogates met percent recovery criteria of 40-160%.

Matrix Spike/Duplicate: A MS/MSD was not performed on any samples associated with this SDG. The LCS associated with the samples had a low recovery for ethyl ether (35%, below the 50-150% criteria). Ethyl ether analyses was not performed on the PPG Oak Creek samples, so no action was needed.

Field Duplicate: No target compounds were detected.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: The alcohol results were acceptable as reported and no qualification of the data is necessary.

Note: The PPG target compounds are as follows: n-butyl alcohol and isobutyl alcohol.

SEMIVOLATILE ORGANICS

Method: SW-846 Method 8270.

Samples: All samples except for TRIP BLANK TB-07.

Holding Time: All samples met the 7 day extraction, and the 40 day analysis holding time requirement.

GC/MS Instrument Performance Check: The decafluorotriphenylphosphine (DFTPP) met ion abundance criteria and all samples were analyzed within the 12-hour tune time.

Initial Calibrations: The initial calibration analyzed on 10/6/96 and associated with the aqueous samples met minimum response criteria for the SPCCs and the %RSD criteria of <30% for all CCC and PPG target compounds.

Continuing Calibrations: The continuing calibrations analyzed on 10/21 and 10/24, 1996 and associated with the aqueous samples met minimum response criteria for the SPCCs and the %D criteria of <20% for all CCC and PPG compounds.

Blanks: No target compounds were detected in the preparation blanks associated with these samples.

Surrogates: Sample PPG-GWMW16-01 had a low terphenyl-d14 recovery (52%, below the 53-135% criteria). The sample was re-extracted, outside of the hold time, with acceptable results. The original analyses is considered the valid result since it was extracted within the hold time and only had one surrogate per fraction outside of criteria. No qualification of the results is necessary for sample PPG-GWMW16-01.

Sample PPG-GWMW16-01-09 had a low phenol-d5 recovery (9.0%, below the 10-149% criteria) and a low 2-fluorophenol recovery (1.5%, below the 10-104% criteria). Not enough sample volume existed for re-extraction and the acid fraction results for sample PPG-GWMW16-01-09 have been rejected.

Sample PPG-GWTW6-01 had a low terphenyl-d14 recovery (40%, below the 53-135% criteria). The sample was re-extracted, outside of the hold time, with similar results confirming a possible matrix effect. The original analyses is considered the valid result since it was extracted within the hold time and only had one surrogate per fraction outside of criteria. No qualification of the results is necessary for sample PPG-GWTW6-01.

Matrix Spike/Duplicate: A MS/MSD was not performed on any samples associated with this SDG. The LCS associated with the samples extracted on 10/10/96 had low recoveries for the following samples: phenol (5.0%, below the 10-101% criteria), 2-chlorophenol (2.0%, below the 28-119% criteria), and 4-chloro-3-methylphenol (36%, below the 47-108% criteria). The results for these compounds have been qualified "J" as estimated and may be biased low for all samples associated with this SDG.

Internal Standards: The internal standards met the -50% to +100% response criteria.

Field Duplicate: No target compounds were detected.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: The semivolatile results were acceptable with the following qualifications:

Sample	Compound	Qualifier
All samples	phenol, 2-chlorophenol, 4-chloro-3-methylphenol	J
PPG-GWMW16-01-09	acid fraction	R

Note: The PPG target compounds are as follows: 2,4-dimethylphenol, di-n-butylphthalate, di-n-octylphthalate, naphthalene, and pyridine.

METALS

Method: SW-846 Method 6000/7000.

Samples: All samples except for TRIP BLANK TB-07.

Holding Time: All samples met the 180 day holding time requirement, (28 days for mercury).

Initial and Continuing Calibration Verification: All of the ICVs and CCVs met the 90-110% criteria. The CRDL standard recoveries were within 90-110%.

Blanks: Calcium (31.3 ug/L) and magnesium (22.3 ug/L) were detected in the continuing calibration blanks (maximum concentration in parenthesis). Comparison with the raw data indicated that all sample concentrations are >5X the blank concentration so no qualification of the data is necessary.

Mercury (0.076 ug/L) and iron (47.6 ug/L) were detected in the preparation blank. All sample results less than 5X the blank concentration have been qualified "B" due to blank contamination.

ICP Interference Check Sample (ICS): The ICS recoveries met the 80-120% criteria.

Matrix spikes: The MS/MSD associated with this SDG had a high recovery for chromium (150% and 127%, above the 75-125% criteria) and magnesium (479% and 397%, above the 75-125% criteria). The recovery results for aluminum and calcium were not calculated because the sample concentration was greater than 4X the spike amount. No action was taken on the MS/MSD recoveries since the MS/MSD was not performed on a PPG Oak Creek sample.

Laboratory Control Sample: All the LCS recoveries met the 80-120% criteria.

Laboratory Duplicate Sample: The laboratory duplicate RPD's met the ±20% criteria.

Field Duplicate: The field duplicate RPDs were within ±20%.

Serial Dilution: A serial dilution was not performed for this SDG.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: All of the metals results were acceptable as reported with the following qualifications:

Sample	Parameter	Qualifiers
PPG-GWMW15-01 PPG-GWMW16-01 PPG-GWMW16-01-09 PPG-GWTW6-01	mercury	B

Note: The PPG target compounds are as follows: arsenic, barium, cadmium, chromium, lead mercury, and nickel.

Quanterra Inc. uses laboratory generated control limits for surrogate and matrix spike recoveries to determine if the volatile and semivolatile analyses meet criteria. The laboratory generated surrogate and matrix spike recovery criteria are as follows for the volatile and semivolatile methods:

VOLATILE SURROGATE LIMITS			
Aqueous		**Solid**	
Surrogate	**QC Limits (%)**	**Surrogate**	**QC Limits**
1,2-dichloroethane-d4	69-127	1,2-dichloroethane-d4	61-115
toluene-d8	90-112	toluene-d8	82-129
bromofluorobenzene	87-114	bromofluorobenzene	64-112

SEMIVOLATILE SURROGATE LIMITS			
Aqueous		**Solid**	
Surrogate	**QC Limits (%)**	**Surrogate**	**QC Limits**
nitrobenzene-d5	30-122	nitrobenzene-d5	53-98
2-fluorobiphenyl	54-116	2-fluorobiphenyl	56-107
terphenyl-d14	53-135	terphenyl-d14	56-145
phenol-d5	10-149	phenol-d5	46-103
2-fluorophenol	10-104	2-fluorophenol	42-100
2,4,6-tribromophenol	20-143	2,4,6-tribromophenol	31-123

VOLATILE MATRIX SPIKE LIMITS					
Aqueous			**Solid**		
Spike Compound	**RPD (%)**	**QC Limits (%)**	**Spike Compound**	**RPD (%)**	**QC Limits (%)**
1,1-dichloroethene	20	75-113	1,1-dichloroethene	27	10-234
trichloroethene	22	71-110	trichloroethene	20	71-157
chlorobenzene	18	81-115	chlorobenzene	19	37-160
toluene	24	78-126	toluene	15	47-150
benzene	17	78-117	benzene	21	37-151

SEMIVOLATILE MATRIX SPIKE LIMITS					
Aqueous			**Solid**		
Spike Compound	**RPD (%)**	**QC Limits (%)**	**Spike Compound**	**RPD (%)**	**QC Limits (%)**
1,2,4-trichlorobenzene	28	44-142	1,2,4-trichlorobenzene	28	44-142
acenaphthene	28	47-145	acenaphthene	28	47-145
2,4-dinitrotoluene	22	39-139	2,4-dinitrotoluene	22	39-139
pyrene	25	52-115	pyrene	25	52-115
N-nitrosodi-n-propylamine	55	10-230	N-nitrosodi-n-propylamine	55	10-230
1,4-dichlorobenzene	32	20-124	1,4-dichlorobenzene	32	20-124
pentachlorophenol	49	14-176	pentachlorophenol	49	14-176
phenol	23	10-112	phenol	23	10-112
2-chlorophenol	29	23-134	2-chlorophenol	29	23-134
4-chloro-3-methylphenol	37	22-147	4-chloro-3-methylphenol	37	22-147
4-nitrophenol	47	10-132	4-nitrophenol	47	10-132

RELEASE OF VALIDATED DATA

Project: PPG Oak Creek
Date: December 10, 1996
SDG: A6J020143
ICF Package: PPG #8
Reviewer: Edward Sedlmyer

Validation was performed on the volatile, alcohol, semivolatile, and metals analytical results for 24 samples collected October 1, 1996. Quanterra Inc. (North Canton) analyzed the samples using SW846 methods. The data validation was performed in accordance with the *U.S.EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review,* February 1994, as applicable to SW846 methods. Samples in this SDG included:

Field Sample ID	Lab Sample ID	Field Sample ID	Lab Sample ID
PPG-HA01-0.5	A6J020143-001	PPG-HA01-03	A6J020143-002
PPG-HA01-03-09	A6J020143-003	PPG-HA02-0.5	A6J020143-004
PPG-HA02-03	A6J020143-005	PPG-HA03-0.5	A6J020143-006
PPG-HA03-03	A6J020143-007	PPG-HA11-02	A6J020143-008
PPG-HA12-01.5	A6J020143-009	PPG-HA13-01.5	A6J020143-010
PPG-HA14-01.5	A6J020143-011	PPG-HA15-01	A6J020143-012
PPG-HA15-01-09	A6J020143-013	PPG-FB-02	A6J020143-014
TB-04	A6J020143-015	PPG-HA04-01	A6J020143-016
PPG-HA05-01	A6J020143-017	PPG-HA06-01	A6J020143-018
PPG-HA07-01	A6J020143-019	PPG-HA08-01.5	A6J020143-020
PPG-HA09-01.5	A6J020143-021	PPG-HA10-01.5	A6J020143-022
PPG-FB-01	A6J020143-023	TB-05	A6J020143-024

Sample number TB-04 and TB-05 were designated as trip blanks and sample numbers PPG-FB-02 and PPG-FB-01 were designated as field blanks for samples associated with this SDG. The items reviewed were as follows:

VOLATILE ORGANICS

Method: SW-846 Method 8260A.

Samples: All samples except PPG-HA01-0.5, PPG-HA01-03, PPG-HA01-03-09, PPG-HA02-0.5, PPG-HA02-03, PPG-HA03-0.5, and PPG-HA03-03.

Holding Time: All samples met the 14 day holding time requirement.

GC/MS Instrument Performance Check: The bromofluorobenzene (BFB) met ion abundance criteria and all samples were analyzed within the 12 hour tune time.

Initial Calibrations: The initial calibrations associated with the aqueous and soil samples met minimum response criteria for the SPCCs and the %RSD criteria of <30% for all CCC and PPG target compounds.

Continuing Calibrations: The continuing calibration associated with the soil samples met minimum response criteria for the SPCCs and the %RSD criteria (<20% for all CCC and PPG target compounds except acetone, 2-butanone, and 4-methyl-2-pentanone, which are <50%).

Blanks: Methylene chloride (0.55 ug/L) was detected in the field blank (PPG-FB-02) associated with this SDG. However, methylene chloride was not detected in any of the associated samples so no qualification of the data is necessary.

Acetone (10.0 ug/L) and methylene chloride (0.68 ug/L) were detected in the trip blank (TB-04) associated with this SDG. However, acetone and methylene chloride were not detected in any of the associated samples so no qualification of the data is necessary.

Surrogates: All surrogates met the lab specific recovery criteria.

Matrix Spike/Duplicate: The MS/MSD performed on sample PPG-HA07-01 met accuracy and precision criteria for all compounds.

Laboratory Control Sample: The LCS met percent recovery criteria.

Field Duplicate: The duplicate perfromed on sample PPG-HA07-01 had no detections greater than the CRDL.

Internal Standards: Sample PPG-HA15-01-09 had low internal standard responses for 1,4-difluorobenzene (36034, below the 39078 criteria) and chlorobenzene-d5 (21366, below the 31984 criteria). The results for the compounds associated with these internal standards have been qualified "J" as estimated.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: The volatile results were acceptable as reported with the following qualifications:

Sample	Compound	Qualifier
PPG-HA15-01-09	ethylbenzene, toluene, isopropylbenzene, styrene, total xylene, trans-1,3-dichloropropene, 1,1,2-trichloroethane, tetrachloroethene, dibromochloromethane, 1,2-dibromoethane, chlorobenzene, bromoform, 2-hexanone, 1,1,1,2-tetrachloroethane, benzene	J

Note: The PPG target compounds are as follows: acetone, benzene, 2-butanone, ethylbenzene, 4-methyl-2-pentanone, isopropylbenzene, styrene, toluene, 1,2,4-trimethylbenzene, and xylenes.

ALCOHOLS

Method: SW-846 Method 8015.

Samples: PPG-HA04-01, PPG-HA05-01, PPG-HA06-01, PPG-HA07-01, PPG-HA08-01.5, PPG-HA09-01.5, PPG-HA10-01.5, and PPG-FB-01.

Holding Time: All samples met the 14 day holding time requirement.

Initial Calibrations: The initial calibration analyzed on 9/12/96 and associated with the samples in this SDG had a correlation coefficient >0.995 for all compounds.

Continuing Calibrations: The continuing calibrations met the 15% difference criteria.

Blanks: No target compounds were detected in the preparation blank associated with these samples.

Surrogates: All surrogates met percent recovery criteria of 40-160%.

Matrix Spike/Duplicate: The MS/MSD performed on sample PPG-HA07-01 met the recovery criteria for all compounds except ethyl ether (32% and 32%, below the 50-150% criteria). The LCSs associated with this SDG also had low recoveries for ethyl ether (28% and 35%, below the 50-150% criteria). Ethyl ether analyses was not performed on the PPG Oack Creek samples, no action was needed.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: The alcohol results were acceptable as reported and no qualifiction of the data is necessary.

Note: The PPG target compounds are as follows: n-butyl alcohol and isobutyl alcohol.

SEMIVOLATILE ORGANICS

Method: SW-846 Method 8270.

Samples: PPG-HA04-01, PPG-HA05-01, PPG-HA06-01, PPG-HA07-01, PPG-HA08-01.5, PPG-HA09-01.5, PPG-HA10-01.5, and PPG-FB-01.

Holding Time: All samples met the 7 day extraction, and the 40 day analysis holding time requirement.

GC/MS Instrument Performance Check: The decafluorotriphenylphosphine (DFTPP) met ion abundance criteria and all samples were analyzed within the 12-hour tune time.

Initial Calibrations: The initial calibrations associated with this SDG met minimum response criteria for the SPCCs and the %RSD criteria of <30% for the CCC and PPG target compounds.

Continuing Calibrations: The continuing calibrations associated with this SDG met minimum response criteria for the the SPCCs and the %RSD criteria of <20% for the CCC and PPG target compounds.

Blanks: No target compounds were detected in the preparation blanks associated with these samples.

Surrogates: All surrogates met the lab specific recovery criteria.

Matrix Spike/Duplicate: The MS/MSD performed on sample PPG-HA07-01 met accuracy and precision criteria for all compounds.

Laboratory Control Sample: The LCS had met percent recovery criteria.

Internal Standards: The internal standards met the -50% to +100% response criteria.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: The semivolatile results were acceptable as reported and no qualification of the data is necessary.

Note: The PPG target compounds are as follows: 2,4-dimethylphenol, di-n-butylphthalate, di-n-octylphthalate, naphthalene, and pyridine.

METALS

Method: SW-846 Method 6000/7000.

Samples: All samples except for TB-04 and TB-05.

Holding Time: All samples met the 180 day holding time requirement, (28 days for mercury).

Initial and Continuing Calibration Verification: All of the ICVs and CCVs met the 90-110% criteria. The CRDL standard recoveries were within 75-110%.

Blanks: Aluminum (84.2 ug/L), calcium (314 ug/L), iron (100 ug/L), nickel (19.6 ug/L), and magnesium (136 ug/L) were detected in the continuing calibration and field blanks (maximum concentration in parenthesis). Comparison with the raw data indicated that all sample concentrations are >5X the blank concentration so no qualification of the data is necessary.

Aluminum (5.1 mg/Kg), barium (0.22 mg/Kg), calcium (53.4 mg/Kg), iron (13.6 mg/Kg), and magnesium (5.9 mg/Kg) were detected in the preparation blank associated with the soil samples. However all sample results were greater than 5X the blank concentration so no qualification of the data is necessary.

ICP Interference Check Sample (ICS): The ICS recoveries met the 80-120% criteria.

Matrix spikes: The MS/MSD performed on sample PPG-HA07-01 met accuracy and precision criteria. The recovery results for aluminum, calcium, iron, and magnesium were not calculated because the sample concentrations were greater than 4X the spike amount.

Laboratory Control Sample: All the LCS recoveries met the 80-120% criteria.

Field Duplicate: The field duplicate performed on sample PPG-HA07-01 met the RPD criteria of ±35%.

Laboratory Duplicate: The Laboratory duplicate for lead had a high RPD (26%, above the 20% criteria). The lead results have been qualified "J" as estimated.

Serial Dilution: The lead (11.3 %D) and nickel (10.9 %D) percent differences exceeded the 10% difference criteria. All lead and nickel results have been qualified "J" as estimated.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: All of the metals results were acceptable as reported with the following qualifications:

Sample	Parameter	Qualifiers
All samples	lead and nickel	J

Note: The PPG target compounds are as follows: arsenic, barium, cadmium, chromium, lead mercury, and nickel.

Quanterra Inc. uses laboratory generated control limits for surrogate and matrix spike recoveries to determine if the volatile and semivolatile analyses meet criteria. The laboratory generated surrogate and matrix spike recovery criteria are as follows for the volatile and semivolatile methods:

VOLATILE SURROGATE LIMITS			
Aqueous		**Solid**	
Surrogate	**QC Limits (%)**	**Surrogate**	**QC Limits**
1,2-dichloroethane-d4	69-127	1,2-dichloroethane-d4	61-115
toluene-d8	90-112	toluene-d8	82-129
bromofluorobenzene	87-114	bromofluorobenzene	64-112

SEMIVOLATILE SURROGATE LIMITS			
Aqueous		**Solid**	
Surrogate	**QC Limits (%)**	**Surrogate**	**QC Limits**
nitrobenzene-d5	30-122	nitrobenzene-d5	53-98
2-fluorobiphenyl	54-116	2-fluorobiphenyl	56-107
terphenyl-d14	53-135	terphenyl-d14	56-145
phenol-d5	10-149	phenol-d5	46-103
2-fluorophenol	10-104	2-fluorophenol	42-100
2,4,6-tribromophenol	20-143	2,4,6-tribromophenol	31-123

VOLATILE MATRIX SPIKE LIMITS	
Aqueous	**Solid**

Spike Compound	RPD (%)	QC Limits (%)	Spike Compound	RPD (%)	QC Limits (%)
1,1-dichloroethene	20	75-113	1,1-dichloroethene	27	10-234
trichloroethene	22	71-110	trichloroethene	20	71-157
chlorobenzene	18	81-115	chlorobenzene	19	37-160
toluene	24	78-126	toluene	15	47-150
benzene	17	78-117	benzene	21	37-151

SEMIVOLATILE MATRIX SPIKE LIMITS					
Aqueous			Solid		
Spike Compound	RPD (%)	QC Limits (%)	Spike Compound	RPD (%)	QC Limits (%)
1,2,4-trichlorobenzene	28	44-142	1,2,4-trichlorobenzene	28	44-142
acenaphthene	28	47-145	acenaphthene	28	47-145
2,4-dinitrotoluene	22	39-139	2,4-dinitrotoluene	22	39-139
pyrene	25	52-115	pyrene	25	52-115
N-nitrosodi-n-propylamine	55	10-230	N-nitrosodi-n-propylamine	55	10-230
1,4-dichlorobenzene	32	20-124	1,4-dichlorobenzene	32	20-124
pentachlorophenol	49	14-176	pentachlorophenol	49	14-176
phenol	23	10-112	phenol	23	10-112
2-chlorophenol	29	23-134	2-chlorophenol	29	23-134
4-chloro-3-methylphenol	37	22-147	4-chloro-3-methylphenol	37	22-147
4-nitrophenol	47	10-132	4-nitrophenol	47	10-132

RELEASE OF VALIDATED DATA

Project: PPG Oak Creek
Date: December 10, 1996
SDG: A6J110156
ICF Package: PPG #9
Reviewer: Edward Sedlmyer

Validation was performed on the volatile, alcohol, semivolatile, and metals analytical results for 11 samples collected October 8 and 9, 1996. Quanterra Inc. (North Canton) analyzed the samples using SW846 methods. The data validation was performed in accordance with the *U.S.EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review,* February 1994, as applicable to SW846 methods. Samples in this SDG included:

Field Sample ID	Lab Sample ID	Field Sample ID	Lab Sample ID
PPG-GWMW9-01	A6J110156-001	PPG-GWMW9-01 (FLT)	A6J110156-002
PPG-GWLP2-01	A6J110156-003	PPG-GWMW14-01	A6J110156-004
TRIP BLANK TB09	A6J110156-005	PPG-FB-05	A6J110156-006
PPG-GWLP4-01	A6J110156-007	PPG-GWMW11-01	A6J110156-008
PPG-GWMW11-01 (FLT)	A6J110156-009	PPG-GWMW10-01	A6J110156-010
TB-08	A6J110156-011		

Sample numbers TRIP BLANK TB09 and TB-08 were designated as trip blanks and sample number PPG-FB-05 was designated as a field blank for samples associated with this SDG. The items reviewed were as follows:

VOLATILE ORGANICS

Method: SW-846 Method 8260A.

Samples: All samples except PPG-GWMW9-01 (FLT) and PPG-GWMW11-01 (FLT).

Holding Time: All samples met the 14 day holding time requirement.

GC/MS Instrument Performance Check: The bromofluorobenzene (BFB) met ion abundance criteria and all samples were analyzed within the 12 hour tune time.

Initial Calibrations: The initial calibrations associated with this SDG met minimum response criteria for the SPCCs and the %RSD criteria of <30% for all CCC and PPG target compounds.

Continuing Calibrations: The continuing calibrations associated with this SDG met minimum response criteria for all SPCCs and the %RSD criteria (<20% for all CCCs and PPG target compounds except acetone, 2-butanone, and 4-methyl-2-pentanone, which are <50%).

Blanks: 2-Butanone (29.0 ug/L) was detected in the field blank (PPG-FB-05) associated with this SDG. However, 2-butanone was not detected in any of the associated samples so no qualification of the data is necessary.

Dichlorodifluoromethane (0.44 ug/L) was detected in the preparation blank analyzed on 10/23/96. However, dichlorodifluoromethane was not detected in any of the associated samples so no qualification of the data is necessary.

Surrogates: All surrogates met the lab specific recovery criteria.

Matrix Spike/Duplicate: The MS/MSD performed on sample PPG-GWMW11-01 met accuracy and precision criteria for all compounds.

Laboratory Control Sample: The LCS met percent recovery criteria.

Internal Standards: The internal standards met the -50% to +100% response criteria.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met the QAPP requirements.

Summary: The volatile results were acceptable as reported and no qualification of the data is necessary.

Note: The PPG target compounds are as follows: acetone, benzene, 2-butanone, ethylbenzene, 4-methyl-2-pentanone, isopropylbenzene, styrene, toluene, 1,2,4-trimethylbenzene, and xylenes.

ALCOHOLS

Method: SW-846 Method 8015.

Samples: All samples except PPG-GWMW9-01, TRIP BLANK TB09, PPG-GWMW11-01, and TB-08.

Holding Time: All samples met the 14 day holding time requirement.

Initial Calibrations: The initial calibrations analyzed on 9/12 and 9/16, 1996 and associated with the samples in this SDG had a correlation coefficient >0.995 for all compounds.

Continuing Calibrations: The continuing calibrations associated with this SDG met the 15% difference criteria.

Blanks: No target compounds were detected in the preparation blank associated with these samples.

Surrogates: All surrogates met percent recovery criteria of 40-160%.

Matrix Spike/Duplicate: The MS/MSD performed on sample PPG-GWMW11-01 met recovery criteria for all compounds except ethyl ether (30% and 31%, below the 50-150% criteria). The LCS also had a low recovery for ethyl ether (35%, below the 50-150%). Ethyl ether analyses was not performed on the PPG Oak Creek samples so no action was needed.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met QAPP requirements.

Summary: The alcohol results were acceptable as reported and no qualification of the data is necessary.

Note: The PPG target compounds are as follows: n-butyl alcohol and isobutyl alcohol.

SEMIVOLATILE ORGANICS

Method: SW-846 Method 8270.

Samples: All samples except PPG-GWMW9-01, TRIP BLANK TB09, PPG-GWMW11-01, and TB-08.

Holding Time: All samples met the 7 day extraction, and the 40 day analysis holding time requirement.

GC/MS Instrument Performance Check: The decafluorotriphenylphosphine (DFTPP) met ion abundance criteria and all samples were analyzed within the 12-hour tune time.

Initial Calibrations: The initial calibrations associated with this SDG met minimum response criteria for the SPCCs and the %RSD criteria of <30% for the CCC and PPG target compounds.

Continuing Calibrations: The continuing calibrations associated with this SDG met minimum response criteria for the SPCCs and the %RSD criteria of <20% for the CCC and PPG target compounds.

Blanks: No target compounds were detected in any blanks associated with these samples.

Surrogates: Sample PPG-GWMW10-01 had a low terphenyl-d14 recovery (49%, below the 53-135% criteria). The sample was re-extracted, outside of the hold time, with acceptable results. The original analyses is considered the valid result since it was extracted within the hold time and only had one surrogate per fraction outside of criteria. No qualification of the results is necessary for sample PPG-GWMW10-01.

Sample PPG-GWLP2-01 had a low 2-fluorophenol recovery (0.0%, below the 10-104% criteria). The sample was re-extracted 8 days outside of the holding time requirement with acceptable recoveries. The re-analyses is considered the valid result and all compounds have been qualified "J" as estimated.

Sample PPG-GWMW14-01 had a low terphenyl-d14 recovery (49%, below the 53-135% criteria). The sample was re-extracted, outside of the hold time, with acceptable results. The original analyses is considered the valid result since it was extracted within the hold time and only had one surrogate per fraction outside of criteria. No qualification of the results is necessary for sample PPG-GWMW14-01.

Matrix Spike/Duplicate: The MS/MSD performed on sample PPG-GWMW11-01 had a high MS/MSD recovery for 4-nitrophenol (157% and 193%, above the 10-132% criteria). The LCSs associated with this SDG had acceptable 4-nitrophenol recoveries. No action was taken on the high 4-nitrophenol recoveries since the LCSs had acceptable recoveries and 4-nitrophenol was not detected in any samples.

Laboratory Control Sample: The LCS met percent recovery criteria.

Internal Standards: The internal standards met the -50% to +100% response criteria.

Target Compound Identification: No problems were observed with compound identification or quantitation for analyses associated with these samples.

Reported CRQLs: The CRQLs met the QAPP requirement.

Summary: The semivolatile results were acceptable as reported with the following qualifications:

Sample	Compound	Qualifiers
PPG-GWLP2-01 RE	All compounds	J

Note: The PPG target compounds are as follows: 2,4-dimethylphenol, di-n-butylphthalate, di-n-octylphthalate, naphthalene, and pyridine.

METALS

Method: SW-846 Method 6000/7000.

Samples: All samples except for TRIP BLANK TB09 and TB-08.

Holding Time: All samples met the 180 day holding time requirement, (28 days for mercury).

Initial and Continuing Calibration Verification: All of the ICVs and CCVs met the 90-110% criteria. The CRDL standard recoveries were within 90-125%.

Blanks: Aluminum (84.2 ug/L), calcium (314 ug/L), iron (100 ug/L), nickel (19.6 ug/L), and magnesium (136 ug/L) were detected in the continuing calibration and field blanks (maximum concentration in parenthesis). Comparison with the raw data indicated that all sample concentrations are >5X the blank concentration so no qualification of the data is necessary.

Aluminum (5.1 mg/Kg), barium (0.22 mg/Kg), calcium (53.4 mg/Kg), iron (13.6 mg/Kg), and magnesium (5.9 mg/Kg) were detected in the preparation blank associated with the soil samples. However all sample results were greater than 5X the blank concentration so no qualification of the data is necessary.

ICP Interference Check Sample (ICS): The ICS recoveries met the 80-120% criteria.

Matrix spikes: The MS/MSD performed on sample PPG-GWMW11-01 had a high recovery for chromium (150% and 127%, above the 75-125% criteria) and magnesium (479% and 397%, above the 75-125% criteria). The positive results for chromium and magnesium have been qualified "K" as biased high for all samples. The recovery results for aluminum and calcium were not calculated because the sample concentration was greater than 4X the spike amount.

The matrix spike performed on sample PPG-GWMW9-01 had a high recovery for aluminum (146%, above the 75-125% criteria). The positive results for aluminum have been qualified "K" as biased high for all samples. The recovery result for iron was not calculated because the sample concentration was greater than 4X the spike amount.

Laboratory Control Sample: All the LCS recoveries met the 80-120% criteria.

Laboratory Duplicate Sample: The laboratory duplicate RPD met the ±20% criteria.

Serial Dilution: The serial dilution met the 10% difference criteria.

Reported CRQLs: The CRQLs met the QAPP requirement.

Summary: All of the metals results were acceptable as reported with the following qualifications:

Sample	Parameter	Qualifiers
All samples	magnesium, aluminum	K
PPG-GWMW9-01 PPG-GWLP2-01 PPG-GWMW14-01 PPG-GWMW11-01	chromium	K

Note: The PPG target compounds are as follows: arsenic, barium, cadmium, chromium, lead mercury, and nickel.

Quanterra Inc. uses laboratory generated control limits for surrogate and matrix spike recoveries to determine if the volatile and semivolatile analyses meet criteria. The laboratory generated

surrogate and matrix spike recovery criteria are as follows for the volatile and semivolatile methods:

VOLATILE SURROGATE LIMITS			
Aqueous		**Solid**	
Surrogate	**QC Limits (%)**	**Surrogate**	**QC Limits**
1,2-dichloroethane-d4	69-127	1,2-dichloroethane-d4	61-115
toluene-d8	90-112	toluene-d8	82-129
bromofluorobenzene	87-114	bromofluorobenzene	64-112

SEMIVOLATILE SURROGATE LIMITS			
Aqueous		**Solid**	
Surrogate	**QC Limits (%)**	**Surrogate**	**QC Limits**
nitrobenzene-d5	30-122	nitrobenzene-d5	53-98
2-fluorobiphenyl	54-116	2-fluorobiphenyl	56-107
terphenyl-d14	53-135	terphenyl-d14	56-145
phenol-d5	10-149	phenol-d5	46-103
2-fluorophenol	10-104	2-fluorophenol	42-100
2,4,6-tribromophenol	20-143	2,4,6-tribromophenol	31-123

VOLATILE MATRIX SPIKE LIMITS					
Aqueous			**Solid**		
Spike Compound	**RPD (%)**	**QC Limits (%)**	**Spike Compound**	**RPD (%)**	**QC Limits (%)**
1,1-dichloroethene	20	75-113	1,1-dichloroethene	27	10-234
trichloroethene	22	71-110	trichloroethene	20	71-157
chlorobenzene	18	81-115	chlorobenzene	19	37-160
toluene	24	78-126	toluene	15	47-150

benzene	17	78-117	benzene	21	37-151

SEMIVOLATILE MATRIX SPIKE LIMITS					
Aqueous			**Solid**		
Spike Compound	**RPD (%)**	**QC Limits (%)**	**Spike Compound**	**RPD (%)**	**QC Limits (%)**
1,2,4-trichlorobenzene	28	44-142	1,2,4-trichlorobenzene	28	44-142
acenaphthene	28	47-145	acenaphthene	28	47-145
2,4-dinitrotoluene	22	39-139	2,4-dinitrotoluene	22	39-139
pyrene	25	52-115	pyrene	25	52-115
N-nitrosodi-n-propylamine	55	10-230	N-nitrosodi-n-propylamine	55	10-230
1,4-dichlorobenzene	32	20-124	1,4-dichlorobenzene	32	20-124
pentachlorophenol	49	14-176	pentachlorophenol	49	14-176
phenol	23	10-112	phenol	23	10-112
2-chlorophenol	29	23-134	2-chlorophenol	29	23-134
4-chloro-3-methylphenol	37	22-147	4-chloro-3-methylphenol	37	22-147
4-nitrophenol	47	10-132	4-nitrophenol	47	10-132

APPENDIX E

RISK ASSESSMENT DOCUMENTATION

APPENDIX E-1

The concentration of a constituent in a specific medium is compared to an appropriate background data set, if available, to determine whether the constituent is site-originated or the observed concentration is representative of natural background. In order to compare site data with background, standard statistical procedures as outlined in USEPA (1989b, 1992e, 1995) are used. These procedures include either the parametric one-way Analysis of Variance (parametric ANOVA) test or the non-parametric Wilcoxon rank-sum test. The parametric ANOVA is considered the preferred test for these comparisons, but the valid use of the parametric ANOVA requires that less than 15% of the data are non-detects, the data fit either a normal or log-normal distribution, and that the subgroups to be compared (i.e., the site data set and the background data set) have equal variances. If less than 15% of the data are non-detects, then the latter two assumptions are tested statistically. The results of the tests of these conditions for inorganic constituents in sediment are presented in Tables E-1 and E-2, and for arsenic in Site soils in Tables E-4 and E-5.

The assumption that the data fit a normal or log-normal distribution is tested with the Shapiro-Wilk test (Shapiro and Wilk, 1965; Gilbert, 1987). To test for fit to a log-normal distribution, the data are transformed by taking the $\log_e$ of each sample observation before conducting the Shapiro-Wilk test. The test statistic W for the Shapiro-Wilk test may calculated as outlined USEPA (1992e). The test statistic W is then compared to the critical value W(N,0.05) in a table of critical values for the Shapiro-Wilk test as presented USEPA (1992). Most tables of the critical values of W present only values up to N=50, but the PROC UNIVARIATE procedure of SAS (1994) calculates W, calculates the actual probability of the calculated test statistic W, and is able to calculate probabilities of W for N > 50.

For constituents that fit a normal or log-normal distribution, the assumption that the variances were equal between the site data set and background data set is tested with the F test for homogeneity of variance (Sokal and Rohlf, 1969). The F test for homogeneity of variances is calculated by hand as follows. First, the sample variance is calculated for the background data and for the site sampling data. Sample variance is calculated as:

$$s^2 = \frac{\Sigma (y_i - \bar{y})^2}{n - 1}$$

where y_i is the value of each value in the data set and $\bar{y}$ is the mean value of the data set.

The test statistic is calculated as the ratio:

$$F = \frac{s^2_s}{s^2_b}$$

where s^2_s is the variance of the site sampling data set and s^2_b is the variance of the background data set. The F statistic is than compared to the critical values of $F(n_s,n_b,0.025)$ and $F(n_s,n_b,0.975)$ in a table of critical values for the F statistic where n_s is the sample size of the site sampling data set and n_b is the sample size of the background data set. If the calculated F statistic is less than $F(n_s,n_b,0.025)$ or greater

than $F(n_s,n_b,0.975)$, there is a significant difference between the variances of the two groups. When using SAS, the PROBF function calculates the actual probability of the calculated F statistic (SAS, 1993).

All of the above conditions were met for each constituent and area. Therefore, a parametric ANOVA test was used to test the hypothesis that the site data were not significantly greater than background (USEPA, 1989b; 1992e). If more than 15% of the data had been non-detects or if either of the assumptions were not met, the Wilcoxon rank-sum test would have been used (USEPA, 1989b; 1992e). However, data for all of the inorganic constituents detected in sediments met the above conditions, and parametric ANOVAs were conducted. The results of the parametric ANOVA tests for sediment inroganics are presented in Table E-3, and for arsenic in Site soils in Table E-6.

A one-way parametric analysis of variance (ANOVA) is conducted as outlined in EPA (1989b). The F statistic is calculated as the ratio:

$$F = \frac{MS_{SB}}{MS_E}$$

where MS_{SB} is the mean square of the variation between the background data and site sampling data and MS_E is the mean square of the variation within the background data and within the site sampling data. The F statistic is negative (-), if the mean of the site sampling data is less than the mean of the background data and positive (+), if the mean of the site sampling data is greater than the mean of the background data. This F statistic is than compared to the critical value F(1,N-2,0.05) in a table of critical values for the F statistic where N is total sample size of both data sets for a medium. For a one-sided test of the hypothesis that the site sampling data is not greater than the background data, the site sampling data is greater than background if the calculated F statistic is greater than the critical value F(1,N+2,0.05). These analyses were conducted with the PROC GLM procedure of SAS (1994).

TABLE E-1

F TEST FOR EQUALITY OF VARIANCES - SEDIMENT DATA FROM UNNAMED CREEK

Constituent	Distribution	> 15% Nondetects	df_b/df_s[1]	F value	p of F value[2]	Variance Equal?
Aluminum	Normal	No	5/2	0.158	0.14	Yes
Arsenic	Normal	No	5/2	0.207	0.18	Yes
Barium	Normal	No	5/2	0.035	0.033	Yes
Cadmium	Normal	No	5/2	0.305	0.12	Yes
Chromium	Normal	No	5/2	0.151	0.14	Yes
Iron	Normal	No	5/2	0.040	0.039	Yes
Lead	Normal	No	5/2	0.683	0.45	Yes
Mercury	Normal	No	5/2	0.336	0.14	Yes
Nickel	Normal	No	5/2	0.127	0.12	Yes

[1] df_b is the degrees of freedom for the background sample group whose variance was the numerator of the F ratio and df_s is the degrees of freedom for the site sample group whose variance was the denominator of the F ratio.

[2] For a two-sided test, variance is significantly different among the groups if $p < 0.025$.

TABLE E-2

SHAPIRO-WILKS TEST FOR FIT TO A NORMAL OR LOG-NORMAL DISTRIBUTION - SEDIMENT DATA FROM UNNAMED CREEK

Constituent	N	Normal Distribution		Log-normal Distribution		Distribution
		W	p[1]	W	p[2]	
Aluminum	9	0.9176	0.92	0.9532	0.72	Normal
Arsenic	9	0.9704	0.89	0.9708	0.90	Normal
Barium	9	0.8964	0.23	0.8649	0.11	Normal
Cadmium	9	0.9098	0.31	0.8486	0.07	Normal
Chromium	9	0.9532	0.72	0.9231	0.41	Normal
Iron	9	0.9680	0.87	0.9507	0.69	Normal
Lead	9	0.9457	0.64	0.9616	0.49	Normal
Mercury	9	0.8822	0.16	0.9290	0.47	Normal
Nickel	9	0.9227	0.41	0.9349	0.52	Normal

[1] If $p < 0.05$, the data does not fit a normal distribution.
[2] If $p < 0.05$, the data does not fit a log-normal distribution.

TABLE E-3

**COMPARISON OF SAMPLING AND BACKGROUND DATA -
SEDIMENT DATA FROM UNNAMED CREEK**

Constituent	Distribution[1]	Variances Equal?[1]	Test	n_b/n_s[2]	Statistic	p of statistic[3]	Significantly greater than background?
Aluminum	Normal	Yes	parametric ANOVA	6/3	F = - 0.01	0.54	No
Arsenic	Normal	Yes	parametic ANOVA	6/3	F = - 0.18	0.66	No
Barium	Normal	Yes	parametric ANOVA	6/3	F = 3.33	0.055	No
Cadmium	Normal	Yes	parametric ANOVA	6/3	F = 4.38	0.037	Yes
Chromium	Normal	Yes	parametric ANOVA	6/3	F = 0.23	0.32	No
Iron	Normal	Yes	parametric ANOVA	6/3	F = 0.05	0.41	No
Lead	Normal	Yes	parametric ANOVA	6/3	F = 8.30	0.012	Yes
Mercury	Normal	Yes	parametric ANOVA	6/3	F = 16.16	< 0.01	Yes
Nickel	Normal	Yes	parametric ANOVA	6/3	F = -0.03	0.56	No

[1] See Tables E-1 and E-2.

[2] n_b is the number of observations for the background sample group and n_s is the number of observations for the site sample group.

[3] For a one-sided test, the sample data were significantly greater than background if $p < 0.05$.

TABLE E-4

SHAPIRO-WILKS TEST FOR FIT TO A NORMAL OR LOG-NORMAL DISTRIBUTION - SOIL DATA FOR ARSENIC

Constituent	N	W normal	p normal[1]	W log-normal	p log-normal[2]	Distribution
Arsenic	30	0.9346	0.08	0.7496	< 0.01	Normal

[1] If $p < 0.05$, the data does not fit a normal distribution.
[2] If $p < 0.05$, the data does not fit a log-normal distribution.

TABLE E-5

F TEST FOR EQUALITY OF VARIANCES - SOIL DATA FOR ARSENIC

Constituent	Distribution	> 15% Nondetects	df_b/df_s[1]	F value	p of F value[2]	Variance Equal?
Arsenic	Normal	No	5/23	0.419	0.16	Yes

[1] df_b is the degrees of freedom for the background sample group whose variance was the numerator of the F ratio and df_s is the degrees of freedom for the site sample group whose variance was the denominator of the F ratio.

[2] For a two-sided test, variance is significantly different among the groups if $p < 0.025$.

TABLE E-6

COMPARISON OF SAMPLING AND BACKGROUND DATA - SOIL DATA FOR ARSENIC

Constituent	Distribution[1]	Variances Equal?[1]	Test	n_b/n_s[2]	Statistic	p of statistic[3]	Significantly different from background?
Arsenic	Normal	Yes	parametric ANOVA	6/25	F = 1.612	0.43	No

[1] See Tables E-4 and E-5.

[2] n_b is the number of observations for the background sample group and n_s is the number of observations for the site sample group.

[3] For the test of the null hypothesis, B = SWMU 20 = SWMU 9 = SWMU 4 = SWMU 3 = SWMU 8 (RFA 14), the sample data were significantly different from background if p £ 0.025.

APPENDIX E-2

CALCULATING EXPOSURE POINT CONCENTRATIONS

Quantification of Exposure Point Concentrations

Potential exposure to constituents in the environment is directly proportional to the concentrations of constituents in environmental media (e.g., soil and water) and characteristics of exposure (e.g., frequency and duration). The concentrations at exposure points generally are referred to as exposure point concentrations (EPCs). The analytical results for samples from a given area are combined to derive a single concentration (EPC) for each constituent that represents the level of that constituent to which potential receptors may be exposed. For constituents in soil, EPCs were statistically calculated from sampling data.

The first step in the statistical calculation of EPCs is an evaluation of the useability of the data for statistical calculations. Following this, the statistical method used to calculate representative constituent concentrations is selected based on the distribution of the data.

Data Useability Evaluation

The following data evaluation procedures are applied to the data set before representative concentrations are calculated. These procedures are consistent with USEPA (1989) guidance concerning the useability of data in risk assessments.

Only validated sample results were used in statistical calculations. Samples with qualifiers 'R' (unreliable) are excluded; however, samples with 'J' (estimated value), 'K' (estimated; biased high), or 'L' (estimated; biased low) are used.

Concentrations in Soil

EPCs generally are estimated using measured concentrations in environmental media, or estimated based on fate and transport models. Depending on the distribution of the data (normal versus lognormal), the proportion of the samples reported as non-detect, and the total number of samples, there are several statistical parameters that may be used to estimate EPCs. USEPA supplemental risk assessment guidance (USEPA, 1992b) stipulates that the EPC estimates should be based on the 95% upper confidence limit (95% UCL) of the arithmetic mean to estimate an RME scenario. RME conditions are defined by USEPA as the "highest exposure that is reasonably expected to occur at the site."

The Shapiro and Wilk test (W-test) was performed using Statistical Analysis System (SAS, 1989) to determine if each soil and sediment data set is consistent with a normal or lognormal distribution. Data sets for both ethylbenzene and xylenes in soil had closer fits to a lognormal than to a normal distribution, although not to statistical significance.

The 95% UCL for constituents which fit a lognormal distribution were calculated using the following equation (USEPA, 1992b):

$$95\%\ \text{UCL} = \exp\left(\bar{y} + 0.5\ \sigma_{\bar{y}}^2 + \frac{\sigma_{\bar{y}}\ H}{\sqrt{n-1}}\right)$$

where:

95% UCL	=	95% upper confidence limit
$\bar{y}$	=	mean of log-transformed data
[y	=	standard deviation of the log-transformed data
H	=	H-statistic for the one-sided (upper) confidence limit
n	=	number of samples

In cases where there is a high degree of variability in a data set, the calculated 95% UCL may exceed the maximum detected concentration of a constituent, as is the case for ethylbenzene and xylenes in soil. According to USEPA risk assessment guidance (USEPA, 1989), the maximum detected concentration is used as the representative concentration for risk assessment calculations.

OBS	SAMPNUMB	PARAM	DVQUAL	UNITS	VALIDVAL	NEWVALUE
.	B1	ETHYLBENZENE		UG/KG	5	2.5
2	B10	ETHYLBENZENE		UG/KG	11000	11000.0
3	B10	ETHYLBENZENE		UG/KG	170000	170000.0
4	B11	ETHYLBENZENE		UG/KG	4000	4000.0
5	B11	ETHYLBENZENE		UG/KG	190	190.0
6	B2	ETHYLBENZENE	DJ	UG/KG	1100	1100.0
7	B2	ETHYLBENZENE		UG/KG	5	2.5
8	B2	ETHYLBENZENE		UG/KG	5	2.5
9	B2	ETHYLBENZENE		UG/KG	6500	6500.0
10	B3	ETHYLBENZENE		UG/KG	5	2.5
11	B4	ETHYLBENZENE		UG/KG	5	2.5
12	B5	ETHYLBENZENE		UG/KG	5	2.5
13	B6	ETHYLBENZENE		UG/KG	15000	15000.0
14	B6	ETHYLBENZENE		UG/KG	5	2.5
15	B7	ETHYLBENZENE	J	UG/KG	640	640.0
16	B7	ETHYLBENZENE		UG/KG	10	10.0
17	B8	ETHYLBENZENE		UG/KG	5	2.5
18	B8	ETHYLBENZENE	D	UG/KG	3900	3900.0
19	B9	ETHYLBENZENE		UG/KG	5	2.5
20	B9	ETHYLBENZENE		UG/KG	8700	8700.0
21	GS-1	ETHYLBENZENE		UG/KG	5	2.5
22	GS-10	ETHYLBENZENE		UG/KG	5	2.5
23	GS-11	ETHYLBENZENE		UG/KG	5	2.5
24	GS-12	ETHYLBENZENE	DJ	UG/KG	4300	4300.0
25	GS-13	ETHYLBENZENE		UG/KG	5	2.5
26	GS-14	ETHYLBENZENE		UG/KG	11000	11000.0
7	GS-15	ETHYLBENZENE	D	UG/KG	200000	200000.0
28	GS-16	ETHYLBENZENE		UG/KG	810000	810000.0
29	GS-17	ETHYLBENZENE		UG/KG	5	2.5
30	GS-18	ETHYLBENZENE		UG/KG	5	2.5
31	GS-19	ETHYLBENZENE		UG/KG	5	2.5
32	GS-2	ETHYLBENZENE		UG/KG	5	2.5
33	GS-20	ETHYLBENZENE		UG/KG	5	2.5
34	GS-21	ETHYLBENZENE		UG/KG	5	2.5
35	GS-22	ETHYLBENZENE		UG/KG	5	2.5
36	GS-23	ETHYLBENZENE	D	UG/KG	17000	17000.0
37	GS-24	ETHYLBENZENE		UG/KG	5500	5500.0
38	GS-25	ETHYLBENZENE		UG/KG	26	26.0
39	GS-26	ETHYLBENZENE		UG/KG	5	2.5
40	GS-27	ETHYLBENZENE		UG/KG	4400	2200.0
41	GS-28	ETHYLBENZENE		UG/KG	27	27.0
42	GS-29	ETHYLBENZENE		UG/KG	4400	2200.0
43	GS-3	ETHYLBENZENE		UG/KG	5	2.5
44	GS-30	ETHYLBENZENE		UG/KG	5	2.5
45	GS-31	ETHYLBENZENE		UG/KG	27	14.0
46	GS-32	ETHYLBENZENE		UG/KG	5	2.5
47	GS-33	ETHYLBENZENE		UG/KG	5	2.5
48	GS-34	ETHYLBENZENE		UG/KG	5	2.5
49	GS-35	ETHYLBENZENE		UG/KG	5	2.5
50	GS-36	ETHYLBENZENE		UG/KG	670	335.0
51	GS-37	ETHYLBENZENE		UG/KG	5	2.5
2	GS-38	ETHYLBENZENE		UG/KG	34000	34000.0
53	GS-39	ETHYLBENZENE		UG/KG	100000	100000.0
54	GS-4	ETHYLBENZENE		UG/KG	28	14.0
55	GS-40	ETHYLBENZENE		UG/KG	13000	6500.0
56	GS-41	ETHYLBENZENE		UG/KG	5	2.5

OBS	SAMPNUMB	PARAM	DVQUAL	UNITS	VALIDVAL	NEWVALUE
7	GS-42	ETHYLBENZENE		UG/KG	15	15.0
58	GS-5	ETHYLBENZENE		UG/KG	5	2.5
59	GS-6	ETHYLBENZENE		UG/KG	2000	1000.0
60	GS-7	ETHYLBENZENE		UG/KG	37	37.0
61	GS-8	ETHYLBENZENE	J	UG/KG	1	1.0
62	GS-9	ETHYLBENZENE		UG/KG	5	2.5
63	B1	XYLENES		UG/KG	5	2.5
64	B10	XYLENES		UG/KG	14000	14000.0
65	B10	XYLENES		UG/KG	18000	18000.0
66	B11	XYLENES		UG/KG	7000	7000.0
67	B11	XYLENES		UG/KG	1100	1100.0
68	B2	XYLENES	D	UG/KG	6600	6600.0
69	B2	XYLENES		UG/KG	5	2.5
70	B2	XYLENES		UG/KG	5	2.5
71	B2	XYLENES		UG/KG	15000	15000.0
72	B3	XYLENES		UG/KG	5	2.5
73	B4	XYLENES		UG/KG	5	2.5
74	B5	XYLENES		UG/KG	5	2.5
75	B6	XYLENES		UG/KG	110000	110000.0
76	B6	XYLENES		UG/KG	5	2.5
77	B7	XYLENES	J	UG/KG	530	530.0
78	B7	XYLENES		UG/KG	7	7.0
79	B8	XYLENES		UG/KG	5	2.5
80	B8	XYLENES	D	UG/KG	51000	51000.0
81	B9	XYLENES		UG/KG	5	2.5
82	B9	XYLENES		UG/KG	27000	27000.0
3	GS-1	XYLENES		UG/KG	340	340.0
84	GS-10	XYLENES		UG/KG	5	2.5
85	GS-11	XYLENES		UG/KG	5	2.5
86	GS-12	XYLENES	D	UG/KG	140000	140000.0
87	GS-13	XYLENES		UG/KG	5	2.5
88	GS-14	XYLENES		UG/KG	28000	28000.0
89	GS-15	XYLENES	D	UG/KG	580000	580000.0
90	GS-16	XYLENES		UG/KG	2100000	2100000.0
91	GS-17	XYLENES		UG/KG	5	2.5
92	GS-18	XYLENES		UG/KG	5	2.5
93	GS-19	XYLENES		UG/KG	5	2.5
94	GS-2	XYLENES		UG/KG	76	76.0
95	GS-20	XYLENES		UG/KG	5	2.5
96	GS-21	XYLENES		UG/KG	5	2.5
97	GS-22	XYLENES		UG/KG	5	2.5
98	GS-23	XYLENES	D	UG/KG	140000	140000.0
99	GS-24	XYLENES		UG/KG	26000	26000.0
100	GS-25	XYLENES		UG/KG	81	81.0
101	GS-26	XYLENES		UG/KG	5	2.5
102	GS-27	XYLENES		UG/KG	4400	2200.0
103	GS-28	XYLENES		UG/KG	15	15.0
104	GS-29	XYLENES		UG/KG	4400	2200.0
105	GS-3	XYLENES		UG/KG	31	31.0
106	GS-30	XYLENES		UG/KG	5	2.5
107	GS-31	XYLENES	J	UG/KG	9	9.0
8	GS-32	XYLENES		UG/KG	5	2.5
109	GS-33	XYLENES		UG/KG	5	2.5
110	GS-34	XYLENES		UG/KG	5	2.5
111	GS-35	XYLENES		UG/KG	24	24.0
112	GS-36	XYLENES		UG/KG	1700	1700.0

OBS	SAMPNUMB	PARAM	DVQUAL	UNITS	VALIDVAL	NEWVALUE
3	GS-37	XYLENES	J	UG/KG	4	4.0
114	GS-38	XYLENES		UG/KG	280000	280000.0
115	GS-39	XYLENES		UG/KG	490000	490000.0
116	GS-4	XYLENES		UG/KG	2100	2100.0
117	GS-40	XYLENES		UG/KG	390000	390000.0
118	GS-41	XYLENES		UG/KG	5	2.5
119	GS-42	XYLENES		UG/KG	29	29.0
120	GS-5	XYLENES		UG/KG	200	200.0
121	GS-6	XYLENES		UG/KG	2000	1000.0
122	GS-7	XYLENES		UG/KG	8	8.0
123	GS-8	XYLENES		UG/KG	5	2.5
124	GS-9	XYLENES		UG/KG	5	2.5

OBS	PARAM	NN	LN	NMEAN	LMEAN	NSTD	LSTD
	ETHYLBENZENE	62	62	22827.20	4.09074	107494.38	3.98103
2	XYLENES	62	62	71521.27	4.90885	285059.64	4.46345

OBS	NW	LNW	PNORM	PLNORM	TCRIT	NUCL95
1	0.24040	0.77421	0	.0001	1.67022	45628.70
2	0.29180	0.80327	0	.0001	1.67022	131987.58

OBS	PARAM	Normal Mean of Untransformed Data	Normal STD of Untransformed Data	95% Confidence Interval of Normal	Test Statistic for Normality (W)	Prob. Dist. Normal	H from Land for Lognormal 95% UCI
1	ETHYLBENZENE	22827.20	107494.38	45628.70	0.24040	0	6.2211
2	XYLENES	71521.27	285059.64	131987.58	0.29180	0	6.9222

OBS	Normal Mean of Log-transformed Data	Normal STD of Log-transformed Data	95% Confidence Interval of Lognormal	Test Statistic for Lognormality (W)	Prob. Dist. Lognormal
1	59.784	3.98103	3937430	0.77421	.0001
2	135.483	4.46345	149971000	0.80327	.0001

APPENDIX E-3

■ Ethylbenzene

IRIS (USEPA, 1997) provides an oral reference dose and an inhalation reference concentration for ethylbenzene. The effects of concern are liver and kidney toxicity for oral exposure and developmental toxicity for inhalation exposure. Ethylbenzene is not considered classifiable as to human carcinogenicity by the USEPA due to a lack of animal bioassays and human studies.

- Chronic Oral Reference Dose

The chronic oral RfD for ethylbenzene is 0.1 mg/kg-day. This dose is based on a 182-day rat subchronic to chronic oral bioassay by Wolf et al. (1956) in which ethylbenzene was given five days/week at doses of 13.6, 136, 408, or 680 mg/kg/day in olive oil gavage. A total of 10 albino female rats per dose group and 20 controls were used in the study. The LOAEL of 408 mg/kg/day is associated with histopathologic changes in the liver and kidney. An uncertainty factor of 1000 reflects 10 for both intraspecies and interspecies variability to the toxicity of this constituent in lieu of specific data and 10 for extrapolation of a subchronic effect level to its chronic equivalent.

- Chronic Inhalation Reference Dose

The chronic inhalation reference dose of 0.286 was converted from the inhalation reference concentration listed in IRIS (USEPA, 1997). The reference concentration is based on developmental inhalation studies by Andrew et al. (1981) and Hardin et al. (1981) in which Wistar rats and New Zealand white rabbits were exposed to ethylbenzene for 6 to 7 hours/day, 7 days/week during days 1-19 and 1-24 of gestation, respectively, to nominal concentrations of 0, 100, or 1000 ppm. A separate group of rats was exposed pregestationally for 3 weeks prior to mating and exposure was continued into the gestational period. The researchers noted a reduced number of live rabbit kits per litter at the high concentration. The results of the rabbit study indicate a NOAEL of 100 ppm based on a lack of developmental effects in rabbits. The researchers also reported that exposure to ethylbenzene resulted in skeletal variants in rats. In rats exposed only during gestation, an elevated incidence of extra ribs in the fetuses of both the high and 100 ppm groups; in rats who were exposed for three weeks prior to mating and continued to be exposed throughout gestation, the increased incidence of extra ribs was seen only in the high exposure group. A LOAEL of 1000 ppm was determined for the rat study. An uncertainty factor of 300 for the RfD reflects a factor of 10 to protect unusually sensitive individuals, 3 to adjust for interspecies conversion, and 10 to adjust for the absence of multigenerational reproductive and chronic studies.

■ Xylenes

IRIS (USEPA, 1997) provides a reference dose for oral exposure to xylenes. The effects of concern are hyperactivity, decreased body weight, and increased mortality (males). Xylenes are not considered classifiable as to human carcinogenicity (group D) by the USEPA, because orally administered technical xylene mixtures did not result in significant increases in incidences in tumor responses in rats or mice of both sexes.

- **Chronic Oral Reference Dose**

The chronic oral reference dose of 2.0 mg/kg-day for xylenes is based on a chronic rat gavage study performed by the National Toxicology Program (NTP; 1986). In this study, groups of 50 male and 50 female Fischer 344 rats were given gavage doses of 0, 250, or 500 mg/kg/day of mixed xylenes, and 50 male and 50 female B6C3F1 mice were given 0, 500, or 1000 mg/kg/day of mixed xylenes. All animals were administered mixed xylenes five days/week for 103 weeks. The researchers observed a dose-related increase in mortality in male rats. Mice given the high dose exhibited hyperactivity, a manifestation of CNS toxicity. The NOAEL for the study was 250 mg/kg/day. An uncertainty of 100 was chosen for the oral RfD: 10 for species-to-species extrapolation and 10 to protect sensitive individuals.

- **Chronic Inhalation Reference Dose**

The inhalation RfD of 0.2 mg/kg-day is presented in the USEPA Region III RBC Table (USEPA Region III, 1997). This is a value for ortho and meta-xylenes that has been withdrawn from IRIS. Therefore, use of this value adds to the uncertainty of the risk estimate for inhalation of xylenes.

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Constituent	VOC? yes=1 no=0	CARC? yes=1 no=0	Cancer Slope Factors $(mg/kg-d)^{-1}$			Reference Doses – Chronic (mg/kg–d)		
			Oral	Inhalation	Dermal	Oral	Inhalation	Dermal
Ethylbenzene	1	0	NC	NC	NC	1E–01	2.86E–01	1E–01
Xylenes	1	0	NC	NC	NC	2E+00	2.0E–01	2E+00

Constituent	Reference Doses – Subchronic (mg/kg–d)			Absorption Factors				
				Oral		Dermal		Inhalation
	Oral	Inhalation	Dermal	Soil	Water	Soil	Water (PC)	Dusts
Ethylbenzene	NA	NA	NA	1.0	NA	0.1	NA	1.0
Xylenes	NA	NA	NA	1.0	NA	0.10	NA	1.0

EXPOSURE POINT CONCENTRATIONS

Constituent	Soil (mg/kg)	Particulates (mg/m^3)	Volatiles (mg/m^3)
Ethylbenzene	810.00	NA	1.52E–01
Xylenes	2100.00	NA	3.82E–01

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VOLITILIZATION FACTOR: CHEMICAL–SPECIFIC VALUES

Constituent	H' (unitless)	Koc (cm^3/g)	Kd (cm^3/g)	Di (cm^2/sec)	Dw (cm^2/sec)	D_A (cm^2/s)	VF (m^3/kg)
Ethylbenzene	3.23E–01	363.0	2.178	0.075	7.80E–06	5.52E–04	5322.0
Xylenes	2.76E–01	386	2.316	0.087	2.60E–05	5.18E–04	5490.9

VOLITILIZATION FACTOR – EQUATION

Parameter	Value	Variable	Units	Source
dispersion factor	68.81	Q/C	$\frac{(g/m^2-s)}{(kg/m^3)}$	USEPA (1996) Soil Screening Guidance default value
air–filled soil porosity	0.284	Ea	L_{air}/L_{soil}	n – Ew
total soil porosity	0.434	n	L_{pore}/L_{soil}	1– (Pb/Ps)
water–filled soil porosity	0.15	Ew	L_{water}/L_{soil}	USEPA (1996) Soil Screening Guidance default value
dry soil bulk density	1.5	Pb	g/cm^3	USEPA (1996) Soil Screening Guidance default value
soil particle density	2.65	Ps	g/cm^3	USEPA (1996) Soil Screening Guidance default value
diffusivity in air	––	Di	cm^2/sec	chemical–specific
Henry's Law Constant	––	H'	––	chemical–specific
diffusivity in water	––	Dw	cm^2/sec	chemical–specific
soil–water partition coef.	––	Kd	cm^3/g	Koc x foc
soil oc partition coeff.	––	Koc	cm^3/g	chemical–specific
exposure interval	9.5E+08	T	s	USEPA (1996) Soil Screening Guidance default value
fraction organic carbon	0.006	Foc	g/g	USEPA (1996) Soil Screening Guidance default value

$$VF\ (m^3/kg) = Q/C \times \frac{(3.14 \times D_A \times T)^{1/2} \times 10^{-4}\ (m^2/cm^2)}{(2 \times Pb \times D_A)}$$

$$\text{where } D_A = \frac{[\ (Ea^{10/3}\ Di\ H' + Ew^{10/3} Dw) / n^2\ ]}{Pb\ Kd + Ew + Ea\ H'}$$

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EXPOSURE PARAMETERS

Parameter	Value	Units
ALL PATHWAYS		
Body Weight	70	kg
Exposure Duration	25	yr
Averaging Time–NC	9125	days
Averaging Time–CA	25550	days
SOIL INGESTION		
Ingestion Rate	50	mg/day
Exposure Frequency	250	days/yr
DERMAL CONTACT WITH SOIL		
Surface Area	2000	cm^2
Adherence Factor	0.07	mg/cm^2
Exposure Frequency	250	days/yr
INHALATION OF PARTICULATES		
Inhalation Rate	2.5	m^3/hr
Exposure Time	8	hr/day
Exposure Frequency	250	days/yr
INHALATION OF VOLATILES		
Inhalation Rate	2.5	m^3/hr
Exposure Time	8	hr/day
Exposure Frequency	250	days/yr

INDUSTRIAL WORKER
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INCIDENTAL INGESTION OF SOIL

Constituent	Soil (mg/kg)	Oral AF	ADD (mg/kg–d)	RfD (mg/kg–d)	HQ	LADD (mg/kg–d)	CSF $(mg/kg–d)^{-1}$	Risk
Ethylbenzene	810	1	4.0E–04	0.1	4.0E–03	1.4E–04	NC	NC
Xylenes	2100	1	1.0E–03	2	5.1E–04	3.7E–04	NC	NC

HI	Risk
4.5E–03	NA

DERMAL CONTACT WITH SOIL

Constituent	Soil (mg/kg)	Dermal AF	ADD (mg/kg–d)	RfD (mg/kg–d)	HQ	LADD (mg/kg–d)	CSF $(mg/kg–d)^{-1}$	Risk
Ethylbenzene	810	0.1	1.1E–04	0.1	1.1E–03	4.0E–05	NC	NC
Xylenes	2100	0.1	2.9E–04	2	1.4E–04	1.0E–04	NC	NC

HI	Risk
1.3E–03	NA

INHALATION OF VOLATILES

Constituent	AIR (mg/m^3)	IH AF	ADD (mg/kg–d)	RfD (mg/kg–d)	HQ	LADD (mg/kg–d)	CSF $(mg/kg–d)^{-1}$	Risk
Ethylbenzene	0.152198	1	3.0E–02	0.286	1.0E–01	1.1E–02	NC	NC
Xylenes	0.382453	1	7.5E–02	2	3.7E–02	2.7E–02	NC	NC

HI	Risk
1.4E–01	NA

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Summary Hazard Indices

Constituent	Soil		Inhalation of Particulates	Inhalation of Volatiles	TOTAL
	Ingestion	Dermal			
Ethylbenzene	3.96E–03	1.11E–03	NA	1.04E–01	0.109213
Xylenes	5.14E–04	1.44E–04	NA	3.74E–02	0.038080
TOTAL	0.004	0.00	NA	0.14	0.15