# GW - ____001_____

# WORK PLANS

## Group 3 SWMUs 4-5 & AOCs 22-26

## June 2008 (Revised January 2009)

Western Refining

BLOOMFIELD REFINERY

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James Bearzi, Bureau Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Bldg 1
Santa Fe, NM 87505-6303

Re: Response to November 4, 2008 NOTICE OF DISAPPROVAL
Investigation Work Plan Group 3
Western Refining Southwest, Inc., Bloomfield Refinery
EPA ID# NMD089416416
HWB-GRCB-08-004

Dear Mr. Bearzi:

Western Refining Southwest, Inc., Bloomfield Refinery has prepared the following responses to your comments (dated November 4, 2008) on the referenced investigation work plan. The revised work plan is enclosed, along with a CD containing a red-line strikeout copy noting changes from the original version (June 2008).

***Comment 1***

*In Section 5.1 (Drilling Activities), page 12, Western states "[a]ll soil borings will be drilled to the water table if possible without potentially causing vertical migration of contamination."*

*The potential for vertical migration of contamination is neglible because there is no perched water table. No revision is necessary.*

**Response:**

None required.

***Comment 2***

*In Section 5.1 (Drilling Activities), page 12, Western states "[i]f contamination is detected at the water table, then the boring will be drilled five feet below the water table or to refusal. Soil borings to be completed as permanent monitoring wells will be drilled to the top of bedrock (Nacimiento Formation) and the anticipated completion depth ranges from 35 to 40 feet. Soil samples will be collected continuously and logged by a qualified geologist or engineer. Slotted (0.01 inch) PVC well screen will be placed at the bottom of the well and will extend for 15 feet to ensure that the entire saturated zone is open to the well. A 10/20 sand filter pack will be installed to two feet over the top of the well screen."*

*The monitoring wells must be screened to cross the water table with approximately five feet of screen above the water table and five to ten feet of screen below the water table. This will allow for seasonal fluctuations, detection of separate phase hydrocarbons, and vadose zone monitoring. The wells should encompass a minimum water column of five feet if possible. The Work Plan must be revised to address the well screen lengths as described above.*

**Response:**
As requested, the discussion in Section 5.1, page 5-1 has been revised to clarify that the well screen will be placed such that it will extend across the water table with approximately five feet of screen above the water table and to the extent possible the entire saturated zone will be open to the well.

***Comment 3***

*In Section 5.2 (Soil Sampling), under SWMU No. 5, page 13, Western states "[t]o assess the potential for a release from the sump, which collects the wash water inside the eastern end of the warehouse building, a soil boring has been located just outside the warehouse building in a down-gradient direction from the sump. The soil boring will be completed as a permanent monitoring well (See Section 5.3.2)." In the same Section, page 14 under AOC No. 25, Western states "[a]s discussed above a soil boring will be installed just outside the 90-day storage area in the down-gradient direction and it will be completed as a permanent monitoring well (Figure 8)."*

*It is not clear from the above statements if one or two soil borings will be completed as monitoring wells. The first paragraph places the soil boring outside the warehouse building while the second paragraph places the soil boring outside the 90-day storage area. Additionally, the descriptions do not make it clear that the warehouse and 90-day storage are adjacent to one another. The descriptions read as if two soil borings will be installed, but Figure 8 only shows one boring at SWMU No. 5 and AOC No. 25. Western must revise the above paragraphs to clarify the proposed work.*

**Response:**

The 90-day storage area is actually located within the eastern most portion of the warehouse building and this relationship is explained at several locations within the work plan. The text in Section 5.2 (page 5-2) has been revised to provide more clarification on this issue and to clarify there is only one sump in this area and that one soil boring/permanent monitoring well will be installed down-gradient of the sump.

***Comment 4***

*In Section 5.2 (Soil Sampling), page 13, SWMU No. 5, Western described the installation of a soil boring to be completed as a monitoring well outside the warehouse building.*

*Western must revise Figures 2 and 8 to move the proposed soil boring/monitoring well approximately 20 feet west, placing the well further down-gradient from the sump in the general direction of groundwater flow.*

**Response:**

The proposed soil boring/monitoring well has been move 20 feet west as directed and this is reflected on Figures 8 and 11. Due to the difficulty in seeing the proposed locations on Figure 2, this information was removed from Figure 2 and new figures have been added for each SWMU/AOC as requested in comment no. 14.

***Comment 5***

*In Section 5.2 (Soil Sampling), page 13 and 14, AOC No. 22, Western makes references to the locations of soil borings and surface samples but does not always identify how many soil borings will be advanced or how many surface samples will be collected.*

*Western must revise the paragraph in the work Plan to identify the number of surface samples to be collected and the number of soil borings to be drilled.*

**Response:**

The discussion in Section 5.2 (page 5-3) for AOC No. 22 has been revised to clarify the number of surface samples, number of soil borings and depth of each.

***Comment 6***

*In Section 5.2 (Soil Sampling), page 14, under AOC No. 24, Western states "AOC No. 24 includes the area where Tanks 41 and 43 are located. These tanks are used to temporarily store crude oil with a high water fraction."*

*The above quote implies Tanks 41 and 43 are currently in use. Email correspondence dated September 9 and 10, 2008, between the Oil Conservation division (OCD) and Western indicates that Tank 43 is no longer in service and is scheduled to be demolished. Western must revise the Work Plan to provide the current status of Tank 43 and indicate if the tank will be replaced. If Tank 43 is removed, Western must propose to collect a representative number of discrete samples from the soils beneath the tank to confirm that releases have not occurred. In addition, either in the background section or another appropriate section of the Work Plan, Western must clearly describe the current status of each SWMU and AOC.*

**Response:**

The discussion in Sections 2.5 (page 2-3) and 5.2 (page 5-3) regarding AOC No. 24 has been revised to indicate that Tank 43 is not currently in service. There is no currently scheduled date for removal of Tank 43 and no samples are proposed from beneath the tank while it remains in-place.

***Comment 7***

*Section 5.2 (Soil Sampling), page 14, AOC No. 24 Western states "[t]he boring to the northwest of the heater treater will be completed as a permanent monitoring well if there is any indication of saturation in any of the three soil borings completed in this area."*

*As written, it is not clear if the boring will only be completed as a monitoring well if there is saturation in any of the three soil borings. It is also not clear if saturation is observed in either of the other two soil borings, then those borings will be converted into monitoring wells. Western must revise the Work Plan to clarify the above statement.*

**Response:**

Section 5.2 (pages 5-3 and 5-4) has been revised to state that the boring located northwest of the heater treater at AOC No. 24 will be drilled to the top of bedrock and that it will be completed as a permanent monitoring well if there is any indication of saturation at this location. The other two borings located on the northwest corners of Tanks 41 and 43 may be drilled to saturation based on the presence of potential contamination in soil samples collected while drilling. If these borings extend to saturation, then a ground water sample will be collected and analyzed but permanent monitoring wells are not proposed at these locations inside the tank dikes that surround Tanks 41 and 43.

***Comment 8***

*Section 5.2 (Soil Sampling), page 15, AOC No.25 Western states "[t]he warehouse is currently used to store dry materials and mechanical equipment and as an employee health center, and as such does not present a threat of release to the environment."*

*Western must revise the above sentence to identify the dry materials stored in the warehouse.*

**Response:**

As requested, the portion of Section 5.2 (page 5-4) that describes AOC No. 25 has been revised to explain that "dry materials" include paper files, cement, catalysts, and office equipment. A reference to photos #4 and #5 in Appendix A has also been added.

***Comment 9***

*Western references the collection of surface samples throughout Section 5 (Investigation Methods).*

*Western does not define the depths at which the surface samples will be collected. Because volatile organic compounds (VOCs) are a concern at this site, the surface samples must be collected from 0-6 inches and one to two feet below ground surface. Western must revise the Work Plan accordingly.*

**Response:**

The text on page 5-5 that list the sampling intervals for soil samples has been revised to clarify that samples will be collected from the 0-6" and 18-24" intervals at all borings and surface soil sample locations.

***Comment 10***

*Western must add the analyses of total dissolved solids to the general chemistry parameters found in Section 5.8 (Chemical Analyses), page 24. Western must also state, in Section 5.8, that diesel range organics (DRO) will be analyzed for the extended carbon range.*

**Response:**

The table, which lists the chemical analyses on page 5-13, Section 5.8, has been revised to include total dissolved solids. In addition, the text above the table has been revised to provide for analysis by SW-846 Method 8015B for gasoline range (C5-C10), diesel range (>C10-C28), and motor oil range (>C28-C36) organics.

***Comment 11***

*In Section 7 (Schedule), page 27, Western states "[c]ompletion of the data gap analysis will complete all activities conducted under this investigation work plan. If the data gap analysis indicates that additional investigation activities are necessary to satisfy the site investigation objectives, then Western may notify the NMED of the need to conduct additional assessment at the conclusion of the data gap analysis. If such notification is provided to NMED< any and all relevant information collected by Western will be provided to NMED, which pertains to the determination that additional assessment is required. If so directed by NMED, then Western will prepare and submit a revised investigation work plan to collect the data identified in the data gap analysis. This revised investigation work plan will be submitted to the NMED for review and approval within 60 days of notice to proceed. Otherwise, Western will prepare an investigation report pursuant to Section X.C of the Order. The investigation report will be submitted to the NMED within 120 days of completion of the data gap analysis." NMED has the following comments:*

a *Western states "[i]f so directed by NMED, then Western will prepare and submit a revised investigation work plan to collect the data identified in the data gap analysis." Western cannot revise an already approved Work Plan by NMED. If additional work is necessary that is identified by Western's data gap analysis, then a Phase II work plan will be required by NMED, upon review of the results of the first phase of the investigation. Western must remove this sentence from Section 7 of the Work Plan.*

b *Western may provide the information acquired through the data gap analysis in the investigation report.*

c *Western may complete the data gap analysis as described and complete additional work prior to the submittal of the investigation report. The additional work completed would be conducted at risk; NMED may require additional investigation activities upon review of the investigation report. If Western chooses to complete additional work at risk, the work must be completed in accordance with the standards established in the July 27, 2007 Order, and be included in investigation report.*

d *NMED will not approve the information pertaining to the "data gap analysis" in Section 7.0 as currently stated in the Report.*

**Response:**

All references in Section 7.0 to the preparation of revised investigation work plans and completion of additional investigation activities have been deleted. Western understands that if it chooses to complete additional work that these activities will be "conducted at risk" and "must be completed in accordance with the standards established in the July 27, 2007 Order."

***Comment 12***

*In Figure 2 of the Work Plan, Western provides proposed surface sampling and soil boring locations, monitoring well locations, and previous sampling locations referenced within the Work Plan. It is difficult to identify many of these locations (e.g., Soil borings B-1 through B-4 are difficult to locate within the figure).*

*Western must revise Figure 2 to clearly identify the proposed surface sampling, soil boring and monitoring well locations, as well as historical locations referenced within the Work Plan. In addition, Western must identify the purpose of the blue arrows included in Figure 2.*

**Response:**

Due to the difficulty in seeing the proposed sample locations on Figure 2, these locations have been removed from this figure. The proposed sample locations are now shown on Figures 8 through 14. The blue arrows (surface water drainage patterns) have been added to the legend of Figure 2.

***Comment 13***

*In Figures 8 and 9, Western provides the sample and monitoring well locations on aerial photographs, but none of the SWMU's and AOCs are identified or labeled.*

*Western must revise Figures 8 and 9 to identify and label the locations of the SWMUs and AOCs.*

**Response:**

The locations of the SWMUs and AOCs have been added to Figures 8 and 9.

***Comment 14***

*Western must revise the Work Plan to add additional figures (site plans-11x17) for each individual SWMU and AOC. Each figure must provide sufficient detail to clearly identify features such as catch basins, piping, sumps, surface and subsurface features. For example, the description provided for AOC No. 22 states "[a]t each loading rack, the trucks are parked on a concrete pad that drains to a single sump." The figure provided for AOC No. 22 must clearly identify the concrete pad and drainages to the sump, as well as the sump.*

**Response:**

Additional figures (Figures 10 – 14) have been added as requested. The location of large scale site features (e.g., the auxiliary warehouse building and loading racks) are shown in the original aerial photos and smaller features (e.g., individual sumps and drain lines) have been added.

***Comment 15***

*Western must revise the sampling section of the Work Plan to propose and include headspace vapor monitoring details for percent carbon dioxide and oxygen above the water table in all newly installed monitoring wells.*

**Response:**

Section 5.2.3 Groundwater Sampling has been revised and is now titled Groundwater and Vadose Zone Vapor Sampling. A provision has been added on page 5-7 to include the field analysis of a total well vapor sample for percent carbon dioxide and oxygen.

***Comment 16***

*Western provided photographs in Appendix A of the Work Plan, but they do not provide any directional reference. In the future, if photographs are provided, the description should include the direction the photograph was taken (e.g., SWMU #2 facing east). No revision necessary.*

**Response:**

None required.

If you have questions or would like to discuss the revised work plan, please contact me at (505) 632-4171.

Sincerely,

James R. Schmaltz
Environmental Manager
Western Refining Southwest, Inc.
Bloomfield Refinery

cc: Hope Monzeglio – NMED HWB
Wayne Price – NMOCD (w/attachment)
Dave Cobrain – NMED HWB
John Kieling – NMED HWB
Laurie King – EPA Region 6 (w/attachment)
Todd Doyle – Western Refining – Bloomfield Refinery
Allen Hains – Western Refining El Paso Refinery
Scott Crouch – RPS JDC Austin

RPS JDC

404 Camp Craft Rd., Austin, Texas 78746
Tel: (512) 347 7588 Fax: (512) 347 8243
Internet: www.rpsgroup.com/energy

# INVESTIGATION WORK PLAN

## Group 3 (SWMU No. 4 Transportation Terminal Sump, SWMU No. 5 Heat Exchanger Bundle Cleaning Area, AOC No. 22 Product Loading Rack and Crude Receiving Loading Racks, AOC No. 23 Southeast Holding Ponds, AOC No. 24 Tank Areas 41 and 43, AOC No. 25 Auxiliary Warehouse and 90-Day Storage Area, and AOC No. 26 Tank Area 44 and 45)

**Bloomfield Refinery**
**Western Refining Southwest, Inc.**
**#50 Rd 4990**
**Bloomfield, New Mexico 87413**

**June 2008**
**(Revised January 2009)**

James R. Schmaltz
Environmental Manager
Western Refining Southwest, Inc.
Bloomfield Refinery

Scott T. Crouch, P.G.
Senior Consultant

RPS JDC, Inc.
404 Camp Craft Rd.
Austin, Texas 78746

RPS JDC

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RPS JDC

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# Executive Summary

The Bloomfield Refinery, which is located in the Four Corners Area of New Mexico, has been in operation since the late 1950s. Past inspections by State and federal environmental inspectors have identified locations where releases to the environment may have occurred. These locations are generally referred to as Solid Waste Management Units (SWMUs) or Areas of Concern (AOCs).

Pursuant to the terms and conditions of an Order issued on July 27, 2007 by the New Mexico Environment Department (NMED) to San Juan Refining Company and Giant Industries Arizona, Inc. for the Bloomfield Refinery, this Investigation Work Plan has been prepared for the SWMUs designated as Group 3. A Class I permit modification was approved on June 10, 2008 to reflect the change in ownership of the refinery to Western Refining Southwest, Inc. The operator is now Western Refining Southwest, Inc. – Bloomfield Refinery

The planned investigation activities include soil and groundwater samples, which will be collected and analyzed for potential site-related constituents. The specific sampling locations, sample collection procedures, and analytical methods are included. These activities are based, in part, on the results of previous site investigation activities.

SWMU Group 3 includes SWMU No. 4 Transportation Terminal Sump, SWMU No. 5 Heat Exchanger Bundle Cleaning Area, AOC No. 22 Product Loading Rack and Crude Receiving Loading Racks, AOC No. 23 Southeast Holding Ponds, AOC No. 24 Tank Areas 41 and 43, AOC No. 25 Auxiliary Warehouse and 90-Day Storage Area, and AOC No. 26 Tank Areas 44 and 45. The Order requires that San Juan Refining Company and Giant Industries Arizona, Inc. ("Western") determine and evaluate the presence, nature, and extent of historical releases of contaminants at the aforementioned SWMUs.

RPS JDC

# Section 1 Introduction

The Bloomfield Refinery is located immediately south of Bloomfield, New Mexico in San Juan County (Figure 1). The physical address is #50 Road 4990, Bloomfield, New Mexico 87413. The Bloomfield Refinery is located on approximately 263 acres. Bordering the facility is a combination of federal and private properties. Public property managed by the Bureau of Land Management lies to the south. The majority of undeveloped land in the vicinity of the facility is used extensively for oil and gas production and, in some instances, grazing. U.S. Highway 44 is located approximately one-half mile west of the facility. The topography of the main portion of the site is generally flat with steep bluffs to the north where the San Juan River intersects Tertiary terrace deposits.

The Bloomfield Refinery is a crude oil refinery currently owned by Western Refining Southwest, Inc., which is a wholly owned subsidiary of Western Refining Company, and it is operated by Western Refining Southwest, Inc. – Bloomfield Refinery. The Bloomfield Refinery has an approximate refining capacity of 18,000 barrels per day. Various process units are operated at the facility, including crude distillation, reforming, fluidized catalytic cracking, sulfur recovery, merox treater, catalytic polymerization and diesel hydrotreating. Current and past operations have produced gasoline, diesel fuels, jet fuels, kerosene, propane, butane, naphtha, residual fuel, fuel oils, and LPG.

On July 27, 2007, the New Mexico Environment Department (NMED) issued an Order to San Juan Refining Company and Giant Industries Arizona, Inc. ("Western") requiring investigation and corrective action at the Bloomfield Refinery. This Investigation Work Plan has been prepared for the Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) designated as Group 3 in the Order. This includes:

- SWMU No. 4 Transportation Terminal Sump;
- SWMU No. 5 Heat Exchanger Bundle Cleaning Area;
- AOC No. 22 Product Loading Rack and Crude Receiving Loading Racks;
- AOC No. 23 Southeast Holding Ponds;
- AOC No. 24 Tank Areas 41 and 43;
- AOC No. 25 Auxiliary Warehouse and 90-Day Storage Area; and
- AOC No. 26 Tank Areas 44 and 45.

The location of the individual SWMUs and AOCs is shown on Figure 2 and all of the SWMUs and AOCs are located on the southeastern portion of the refinery property.

The purpose of the site investigation is to determine and evaluate the presence, nature, and extent of releases of contaminants in accordance with 20.4.1.500 New Mexico Administrative Code (NMAC) incorporating 40 Code of Federal Regulations (CFR) Section 264.101. The investigation activities will be conducted in accordance with Section IV of the Order.

# Section 2
# Background

This section presents background information for each of the SWMUs, including a review of historical waste management activities for each location to identity the following:

- type and characteristics of all waste and all contaminants handled in the subject SWMU/AOC;
- known and possible sources of contamination;
- history of releases; and
- known extent of contamination.

## 2.1 SWMU No. 4 Transportation Terminal Sump

The Transportation Terminal Sump is located across the road to the northeast of the auxiliary warehouse/90-day storage area and immediately west of bullet tanks B-22 and B-23. In the past this area was used as truck cleaning location but this practice was stopped in 1986 and the sump was backfilled. There are no documented specific instances of releases at the sump but use of the area for truck cleaning may have resulted in small releases over time.

During an inspection conducted by EPA in 1984, two water samples (an aqueous phase and oily phase) and one soil sample were collected and analyzed. A concentration of 2.2 ppm of cadmium was reported in the soil sample and an oily phase water sample contained 1.3 ppm cadmium and 40 ppm chromium (Giant, 2003). During a subsequent Phase II RCRA Facility Investigation (RFI) conducted in 1994, two soil borings (B-1 and B-2) were installed near the sump (Figure 2). Samples were collected continuously at each boring to a depth of 12 feet. Based on the highest photo ionization detection (PID) readings, one sample was collected from each boring for analysis. The samples were analyzed for volatile organic compounds (VOCs; USEPA method 8240), semi-volatile organic compounds (SVOCs; USEPA method 8270), total petroleum hydrocarbons (TPH; USEPA method 418.1), and metals (USEPA method 6010/7000 series). The results of these soil analyses are summarized in Table 5. Because no organic constituents were detected in both samples and the metal concentrations were reported to have been within background ranges, Giant Refining Company requested No Further Action (NFA) for this SWMU in their Solid Waste Management Unit Assessment Report (Giant, 2003).

## 2.2 SWMU No. 5 Heat Exchanger Bundle Cleaning Area

The Heat Exchanger Bundle Cleaning Area, which has been identified as SWMU No. 5, is located at the east end of the auxiliary warehouse (Figure 2). Heat exchanger bundles are periodically cleaned at this location to remove scale deposits. The cleaning usually takes place on a concrete slab at the east end of the auxiliary warehouse, which has concrete curbs, portable side wall curtains, and drains to a sump located inside the warehouse. There are large metal doors that open at the east end of the warehouse and occasionally during the winter, cleaning operations take place inside the warehouse in a fully enclosed room with sheet metal walls, concrete floor, and concrete lined collection sump (i.e., the 90-day storage area). The sump, which is designed to collect all wash water and any waste materials generated during cleaning operations, is approximately four feet wide, four feet deep and 50 feet long. Any sludge that collects in the sump is removed upon completion of cleaning operations, containerized and sent off-site for disposal to comply with 90-day on-site storage regulations. There is no indication of documented spills in this area. The likely constituents of concern are organic petroleum compounds and metals, which could precipitate on the heat exchangers.

No soil samples have been collected and analyzed from the Heat Exchanger Bundle Cleaning Area in the past; however, groundwater quality has been assessed down-gradient of this area. Figure 5 shows the potentiometric surface of the shallow groundwater, which underlies the refinery property. Monitor well MW-13 is located approximately 250 feet down-gradient and groundwater samples have been routinely collected from this well and analyzed for potential constituents of concern. The only detection, which could be representative of site-related impacts, is low concentrations of methyl tertiary butyl ether (MTBE). The groundwater analyses are summarized in Tables 1 through 4.

## 2.3 AOC No. 22 Product Loading Rack and Crude Receiving Loading Racks

The loading racks are used to unload crude oil, which is transported to the refinery via tanker trucks, and to load out refined product onto tanker trucks for distribution at retail gasoline stations (Figure 2). The primary constituents of concern are petroleum constituents and to a lesser extent additives (e.g., MTBE and ethanol), which may be present in the area of the product loading racks. Documented releases of petroleum products and crude oil have occurred at the loading racks.

Two soil borings (B-3 and B-4) were installed at the loading racks during the Phase II RFI in 1994 (Figures 8 and 12). Each boring was completed to a depth of 12 feet with soil samples continuously collected and screened with a PID. No indication of contamination was recorded at the B-3 location and a sample was collected from the 6-8' interval based on the depth of underground piping in the area. The 10-12' interval was selected at B-4 based on the highest PID reading. These samples were analyzed for VOCs, SVOCs, TPH, and metals, and the results are presented in Table 5. Only one organic constituent was detected in the sample collected at B-3 (methylene chloride at 0.11 mg/kg). Benzene, toluene, ethylbenzene, and xylene (BTEX) were detected at low concentrations in sample B-4. Metals were detected in both samples but were reported to be within background ranges (Groundwater Technology, Inc., 1994).

## 2.4 AOC No. 23 Southeast Holding Ponds

The southeast holding ponds are located at the southeastern most corner of the active portion of the refinery property (Figure 2). There are two ponds, which each cover approximately 4.5 acres. The "ponds" are actually double lined (60-milimeter high density polyethylene) surface impoundments with a leak detection system. They were constructed in 1995 to provide temporary storage of treated wastewater, which is routinely disposed in the on-site injection well. The temporary storage only occurs when the injection well is not available due to maintenance related issues and most of the water is routinely removed from the ponds once the injection well becomes operational.

There has not been any indication of leaks from the ponds. As the pond are used sporadically to store treated wastewater, the potential constituents of concern would be petroleum constituents.

## 2.5 AOC No. 24 Tank Areas 41 and 43

Tanks 41 and 43 are located at the southern edge of the active portion of the refinery property (Figure 2). These tanks are associated with the crude oil receiving racks and have been used to temporarily store crude oil, which contains an unacceptably high fraction of water. Tank 43 is not currently in service. There was a small spill of approximately 100 to 150 gallons of oily water that spilled near Tank 43 in 2006.

No soil investigations have been conducted in this area but a monitor well (MW-6) was installed immediately to the west during the 1994 RFI. This well was dry when installed and remains dry.

## 2.6 AOC No. 25 Auxiliary Warehouse and 90-Day Storage Area

The auxiliary warehouse and 90-day storage area are located in the same building, which is approximately 300 feet south of Sullivan road and 650 feet west of the crude oil loading rack (Figure 2). Pictures of the area are provided in Appendix A. The metal building was originally used as a truck terminal prior to construction of the terminal at its current location in some time prior to 1984. The truck terminal was used for general maintenance and repair of the tanker trucks and auxiliary equipment. No drains or sumps are located within the portion of the building used as the warehouse but as described above, there is a sump in the 90-Day Storage Area that collects water, which drains from the Heat Exchanger Bundle Cleaning Pad. There are no documented releases associated with the historical truck terminal operations; however, the types of potential constituents of concern associated with these activities include petroleum constituents (e.g., fuels, motor oil, transmission fluids, etc.) and chlorinated solvents (e.g., tetrachloroethylene and trichloroethylene).

The auxiliary warehouse is currently used to store dry materials (e.g., large bags of catalyst beads) and auxiliary equipment (e.g., small pumps and generators). An employee health center is located in the far western end of the warehouse. There have been no documented spills at the warehouse and there are no associated potential types of constituents for assessment beyond those identified above for the historical truck terminal operations. The 90-day storage area is used for temporary storage of materials that are shipped off-site for disposal at approved disposal facilities. The types of materials stored include mostly recovered materials from small spills (e.g., contaminated soil and absorbent materials, heat exchange bundle sludge, tank bottoms, etc.) All materials are containerized in steel drums or plastic lined totes, the storage area has a roof to prevent contact with stormwater, a concrete floor and a large concrete lined sump to collect any material that may leak. There have not been any documented releases from the 90-day storage area and any spills within the 90-day storage area are immediately removed to prevent a release to the environment.

No soil samples have been collected and analyzed from the area near the auxiliary warehouse or 90-day storage area; however, groundwater quality has been assessed down-gradient of this area. Figure 5 shows the potentiometric surface of the shallow ground water, which underlies the refinery property. Monitor well MW-13 is located approximately 250 feet down-gradient and ground water samples have been routinely collected from this well and analyzed for potential constituents of concern. The only detection, which could be representative of site-related impacts, is low concentrations of methyl tertiary butyl ether (MTBE). The ground water analyses are summarized in Tables 1 through 4.

## 2.7 AOC No. 26 Tank Areas 44 and 45

Tanks 44 and 45 are located a short distance south of Sullivan road and immediately northeast of the product loading rack (Figure 2). These tanks are used to store additives, which are blended at the product loading racks. The materials stored in the tanks have included MTBE, naphtha, and ethanol. There are no documented reportable spills from these tanks.

No soil samples or ground water samples have been collected in the immediate vicinity of tanks 44 and 45. The types of potential constituents of concern in the area of tanks 44 and 45 include petroleum constituents, MTBE and ethanol.

# Section 3
# Site Conditions

The conditions at the site, including surface and subsurface conditions that could affect the fate and transport of any contaminants, are discussed below. This information is based on recent visual observations and historical subsurface investigations.

## 3.1 Surface Conditions

Regionally, the surface topography slopes toward the floodplain of the San Juan River, which runs along the northern boundary of the refinery complex. To the south of the refinery, the drainage is to the northwest. North of the refinery, surface water flows in a southeasterly direction toward the San Juan River. The active portion of the refinery property, where the process units and storage tanks are located, is generally of low relief with an overall northwest gradient of approximately 0.02 ft/ft. The refinery sits on an alluvial floodplain terrace deposit and there is a steep bluff (approx. drop of 90 feet) at the northern boundary of the refinery where the San Juan River intersects the floodplain terrace, which marks the southern boundary of the floodplain.

There are two locally significant arroyos, one immediately east and another immediately west of the refinery, which collect most of the surface water flows in the area, thus significantly reducing surface water flows across the refinery. A minor drainage feature is located on the eastern portion of the refinery, where the Landfill Pond (SWMU No. 9) is located and there are several steep arroyos along the northern refinery boundary that primarily capture only local surface water flows and minor ground water discharges.

The refinery complex is bisected by County Rd #4990 (Sulivan Road), which runs east-west. The process units, storage tanks (crude oil and liquid products), and wastewater treatment systems are located north of the county road. The crude oil and product loading racks, LPG storage tanks and loading racks, maintenance buildings/90-day storage area, pipeline offices, transportation truck shop, and the Class I injection well are located south of the county road. There is very little vegetation throughout these areas with most surfaces composed of concrete, asphalt, or gravel. The area between the refinery and the San Juan River does have limited vegetation on slopes that are not too steep to support vegetation.

## 3.2 Subsurface Conditions

Numerous soil borings and monitoring wells have been completed across the refinery property during previous site investigations and installation of the slurry wall, which runs along the northern and western refinery boundary. Based on the available site-specific and regional subsurface information, the site is underlain by the Quaternary Jackson Lake terrace deposits, which unconformably overlie the Tertiary Nacimiento Formation. The Jackson Lake deposits consist of fine grained sand, silt and clay that grades to coarse sand, gravel and cobble size material closer to the contact with the Nacimiento Formation. The Jackson Lake Formation is over 40 feet thick near the southeast portion of the site and generally thins to the northwest toward the San Juan River. The Nacimiento Formation is primarily composed of fine grained materials (e.g., carbonaceous mudstone/claystone with interbedded sandstones) with a reported local thickness of approximately 570 feet (Groundwater Technology Inc., 1994).

Figures 3 and 4 present cross-sections of the shallow subsurface based on borings logs from on-site monitoring well completions. The uppermost aquifer is under water table conditions and occurs within the sand and gravel deposits of the Jackson Lake Formation. The Nacimiento Formation functions as an aquitard at the site and prevents site related contaminants from migrating to deeper aquifers. The potentiometric surface as measured in April 2007 is presented as Figure 5 and shows the groundwater flowing to the northwest, toward the San Juan River.

Previous site investigations have identified and delineated impacts to groundwater from historical site operations. Figure 6 shows the distribution of SPH in the subsurface based on the apparent thickness of SPH measured in monitoring wells. Dissolved-phase impacts are depicted on Figure 7.

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# Section 4
# Scope of Services

## 4.1 Anticipated Activities

Pursuant to Section IV of the Order, a scope of services was developed to determine and evaluate the presence, nature, extent, fate, and transport of contaminants. To accomplish this objective, soil and groundwater samples will be collected at the SWMU No. 4 Transportation Terminal Sump, SWMU No. 5 Heat Exchanger Bundle Cleaning Area, AOC No. 22 Product Loading Rack and Crude Receiving Loading Racks, AOC No. 23 Southeast Holding Ponds, AOC No. 24 Tank Areas 41 and 43, AOC No. 25 Auxiliary Warehouse and 90-Day Storage Area, and AOC No. 26 Tank Areas 44 and 45. Soil borings will be installed and samples collected as discussed in Section 5.2. The installation of monitoring wells and collection of groundwater samples is discussed in Section 5.3.

## 4.2 Background Information Research

Documents containing the results of previous investigations and subsequent routine groundwater monitoring data from monitoring wells were reviewed to facilitate development of this work plan. In addition, the results of tracer analytical data from line testing were evaluated. The previously collected data provides very good information on the overall subsurface conditions, including hydrogeology and contaminant distribution within groundwater on a site-wide basis. The data collected under this scope of services will supplement the existing groundwater information and provide SWMU-specific information regarding contaminant occurrence and distribution within soils and groundwater.

## 4.3 Collection and Management of Investigation Derived Waste

Drill cuttings, excess sample material and decontamination fluids, and all other investigation derived waste (IDW) associated with soil borings will be contained and characterized using methods based on the boring location, boring depth, drilling method, and type of contaminants suspected or encountered. All purged groundwater and decontamination water will be characterized prior to disposal unless it is disposed in the refinery wastewater treatment system upstream of the API Separator. An IDW management plan is included as Appendix B.

## 4.4 Surveys

The horizontal coordinates and elevation of each surface sampling location; the surface coordinates and elevation of each boring or test pit, the top of each monitoring well casing, and the ground surface at each monitoring well location; and the locations of all other pertinent structures will be determined by a registered New Mexico professional land surveyor in accordance with the State Plane Coordinate System (NMSA 1978 47-1-49-56 (Repl. Pamp. 1993)). Alternate survey methods may be proposed by the Respondents in site-specific work plans. Any proposed survey method must be approved by the Department prior to implementation. The surveys will be conducted in accordance with Sections 500.1 through 500.12 of the Regulations and Rules of the Board of Registration for Professional Engineers and Surveyors Minimum Standards for Surveying in New Mexico. Horizontal positions will be measured to the nearest 0.1-ft, and vertical elevations will be measured to the nearest 0.01-ft.

# Section 5
# Investigation Methods

The purpose of the site investigation is to determine and evaluate the presence, nature, and extent of releases of contaminants. Guidance on selecting and developing sampling plans as provided in *Guidance for Choosing a Sampling Design for Environmental Data Collection* (EPA, 2000) was utilized to select the appropriate sampling strategy for each of the SWMUs.

## 5.1 Drilling Activities

Soil and monitoring well borings will be drilled using either hollow-stem auger or if necessary, air rotary methods including ODEX. Monitoring well construction/completions will be conducted in accordance with the requirements of Section IX of the Order. The preferred method will be hollow-stem auger to increase the ability to recover undisturbed samples and potential contaminants. The drilling equipment will be properly decontaminated before drilling each boring.

The NMED will be notified as early as practicable if conditions arise or are encountered that do not allow the advancement of borings to the specified depths or at planned sampling locations. Appropriate actions (e.g., installation of protective surface casing or relocation of borings to a less threatening location) will be taken to minimize any negative impacts from investigative borings. If contamination is detected at the water table, then the boring will be drilled five feet below the water table or to refusal. Soil borings to be completed as permanent monitoring wells will be drilled to the top of bedrock (Nacimiento Formation) and the anticipated completion depth ranges from 35 to 40 feet. Soil samples will be collected continuously and logged by a qualified geologist or engineer. Slotted (0.01 inch) PVC well screen will be placed at the bottom of the well and will extend for 10 to 15 feet to ensure that the well is screened across the water table and to the extent possible the entire saturated zone is open to the well, with approximately five feet of screen above the water table. A 10/20 sand filter pack will be installed to two feet over the top of the well screen.

The drilling and sampling will be accomplished under the direction of a qualified engineer or geologist who will maintain a detailed log of the materials and conditions encountered in each boring. Both sample information and visual observations of the cuttings and core samples will be recorded on the boring log. Known site features and/or site survey grid markers will be used as references to locate each boring prior to surveying the location as described in Section 4.4. The boring locations will be measured to the nearest foot, and locations will be recorded on a scaled site map upon completion of each boring.

## 5.2 Soil Sampling

SWMU No. 4 is the former Transportation Terminal Sump. In the past this area was used as a truck cleaning location but this practice was stopped in 1986 and the sump was backfilled. During a RCRA RFI conducted in 1994, two soil borings (B-1 and B-2) were installed near the sump (Figures 8 and 10). Samples were collected continuously at each boring to a depth of 12 feet. No organic constituents were detected in either sample and the metal concentrations were reported to have been within background ranges. To further evaluate the potential for any releases, a soil boring will be installed at the location of the former sump and drilled to the top of bedrock (Figure 8). The boring will be completed as a permanent monitoring well (see Section 5.3.2).

SWMU No. 5 is the Heat Exchanger Bundle Cleaning Area. The cleaning usually takes place on a concrete slab at the east end of the auxiliary warehouse, which has concrete curbs, portable side wall curtains, and drains to a sump located inside the warehouse. There is the potential for contaminants to have been physically washed off the heat exchangers onto the adjacent surface soils. This supports a judgmental sampling design and six surface soil samples have been located around the edge of the concrete pad (Figures 8 and 11). To assess the potential for a release from the sump, which collects the wash water inside the eastern end of the warehouse building, a soil boring has been located just outside the warehouse building in a down-gradient direction from the sump. There is only the one sump in this area of the facility and in addition to collecting wash water from the bundle cleaning activities, it is also located within the 90-day storage area (AOC No. 25) where it could collect any spills that occur within the 90-day storage area. The soil boring will be drilled to the top of bedrock and completed as a permanent monitoring well (see Section 5.3.2).

AOC No. 22 includes the crude oil and product loading racks. The loading racks are used to unload crude oil, which is transported to the refinery via tanker trucks, and to load out refined product onto tanker trucks for distribution at retail gasoline stations. To assess the potential for constituents to have migrated or been transported off the concrete pads, four surface soil samples are located where trucks exit the loading racks (Figures 8 and 12).

Documented releases of petroleum products and crude oil have occurred at the loading racks primarily in the location of the sumps. At each loading rack, the trucks are parked on a concrete pad that drains to a single sump. If the sump over flows at the product loading rack, then there is a small earthen impoundment located down slope that collects the overage. Soils borings (B-3 and B-4) were installed near the sumps during the 1994 RFI. No organic contaminants were detected at B-3 but there were detections at the bottom (12') of B-4. One new soil boring is located near earlier boring B-4 to assess potential releases at this sump, which drains the product loading rack. This boring will be drilled to a minimum depth of 17', which is five feet below earlier detections of organic constituents in 1994. The boring will be drilled deeper, as necessary, to extend five feet below any indication of contamination or to the top of bedrock, whichever is shallower. One soil boring has been located at the center of the earthen impoundment near the product loading rack to evaluate vertical impacts and will be drilled to a minimum depth of 10 feet. The boring will be drilled deeper, as necessary, to extend five feet below any indication of contamination or to the top of bedrock, whichever is shallower. Four surface samples are located around the earthen impoundment to assess lateral impacts (Figures 8 and 12). In addition, one soil boring, which will be completed as a permanent monitoring well, has been located in a down-gradient direction from the product loading racks to assess potential impacts to groundwater (see Section 5.3.2).

To assess potential releases from the sump at the crude receiving racks, one soil boring will be installed on the down-gradient (west) side of the concrete sump to evaluate vertical impacts and will be drilled to a minimum depth of 10 feet. The boring will be drilled deeper, as necessary, to extend five feet below any indication of contamination or to the top of bedrock, whichever is shallower. Three surface samples are located around the concrete sump to assess lateral impacts (Figures 8 and 12). In addition, one soil boring, which will be completed as a permanent monitoring well, has been located in a down-gradient direction from the crude receiving loading racks to assess potential impacts to groundwater. Within AOC No. 22, 11 surface soil sample locations have been selected and five soils borings will be installed, with two completed as permanent monitoring wells.

The evaporation ponds (AOC No. 23) have double liners with a leak detection system and are used to store only minimal amounts of water, thus reducing the potential leaks. In addition, the two closest down-gradient monitoring wells (MW-5 and MW-6) are both dry. A new monitoring well will be installed immediately down-gradient of the ponds to determine if there are any impacts to groundwater from the ponds (Figure 9).

AOC No. 24 includes the area where Tanks 41 and 43 are located (Figures 2 and 13). Tank 41 is used to temporarily store crude oil with a high water fraction and Tank 43 is not currently in service. There was a small spill of approximately 100 to 150 gallons of oily water near Tank 43 in 2006. To assess potential impacts from this and any other past spills near the tanks, four surface samples and two soil borings are located within the immediate area of the tanks and a third boring is located just northwest of the heater treater. All three soil borings are located to the northwest of the tanks and heater treater, which should be in a down-gradient direction if groundwater is present. Monitor well MW-6 is located down-gradient approx. 150 feet to the west and is dry. The boring to the northwest of the heater treater will be drilled to the top of bedrock and completed as a permanent monitoring well if there is any indication of saturation present in the subsurface soils at this location. The other two borings that are located immediately adjacent to Tanks 41 and 43 will be drilled to a minimum depth of 10 feet. If there is evidence of impacts at 10 feet, then the borings will be drilled deeper to depth of five feet below any indication of contamination.

AOC No. 25 includes the auxiliary warehouse and the 90-day storage area, which is located within the eastern most bay of the warehouse building. The 90-day storage area is enclosed, has a concrete floor, with a concrete sump that is used mainly to collect wash water from the adjacent heat exchanger bundle cleaning pad. Any releases in the 90-day storage area would be contained in the sump. As discussed above for SWMU No. 5, which is located immediately adjacent to AOC No. 25, one soil boring will be installed just outside the 90-day storage area (i.e., eastern portion of auxiliary warehouse) in the down-gradient direction and it will be completed as a permanent monitoring well (Figures 8 and 11). Groundwater samples collected at this location should be able to detect any release to groundwater from either the bundle cleaning operations or releases at the 90-day storage area.

The warehouse is currently used to store dry materials and mechanical equipment and as an employee health center, and as such does not present a threat of release to the environment. The dry materials stored in the warehouse include paper files, cement, catalysts, and office equipment (see photos #4 and #5 in Appendix A). Historical operations as a truck terminal may have presented a threat of a release but the only sump present is located in what is now the 90-

day storage area. There are no floor drains or other obvious areas for potential releases. There is a back door on the south side of building, which could have been used to discard waste materials and a surface soil sample will be located off the concrete in this area (Figures 8 and 11). In addition, surface water flows to the southeast corner of the building where it enters a drainage pipe. One of the surface soil samples, which are discussed above for the heat exchanger bundle cleaning pad, is located at the entrance to a storm water collection pipe and should be able to detect the presence of contaminants washed or otherwise discharged from the warehouse building.

Tanks 44 and 45 are included as AOC No. 26 (Figures 8 and 14). These tanks are used to store additives (e.g., MTBE, naphtha, and ethanol), which are blended at the product loading racks. Three surface soil samples will be collected within the tank dikes at both of the tanks and an additional surface soil sample will be collected near the station where additives are off-loaded for filling into the storage tanks. Two soils borings, which will be drilled to bedrock and completed as permanent monitoring wells, are located down-gradient of the tanks.

A decontaminated split-barrel sampler or continuous five-foot core barrel will be used to obtain samples during the drilling of each boring. Surface samples may be collected using decontaminated, hand-held stainless steel sampling device, shelby tube, or thin-wall sampler, or a pre-cleaned disposable sampling device. A portion of the sample will be placed in pre-cleaned, laboratory-prepared sample containers for laboratory chemical analysis. The use of an Encore® Sampler or other similar device will be used during collection of soil samples for VOC analysis. The remaining portions of the sample will be used for logging and field screening as discussed in Section 5.2.1. Sample handling and chain-of-custody procedures will be in accordance with the procedures presented below in Section 5.4.

Discrete soil samples will be collected for laboratory analyses at the following intervals:

- 0-6" (all borings and surface soil samples);
- 18-24" (all borings and surface soil samples);
- from the 6" interval at the top of saturation;
- the sample from each boring with the greatest apparent degree of contamination, based on field observations and field screening; and
- any additional intervals as determined based on field screening results.

Quality Assurance/Quality Control (QA/QC) samples will be collected to monitor the validity of the soil sample collection procedures as follows:

- field duplicates will be collected at a rate of 10 percent;
- equipment blanks will be collected from all sampling apparatus at a frequency of 10 percent or one per day if disposable sampling equipment is used; and
- field blanks will be collected at a frequency of one per day.

### 5.2.1 Soil Sample Field Screening and Logging

Samples obtained from the borings will be screened in the field on 2.5 foot intervals for evidence of contaminants. Field screening results will be recorded on the exploratory boring and excavation logs. Field screening results will be used to aid in the selection of soil samples for laboratory analysis. The primary screening methods include: (1) visual examination, (2) olfactory examination, and (3) headspace vapor screening for volatile organic compounds. Additional screening for site- or release-specific characteristics such as pH or for specific compounds using field test kits may be conducted where appropriate.

Visual screening includes examination of soil samples for evidence of staining caused by petroleum-related compounds or other substances that may cause staining of natural soils such as elemental sulfur or cyanide compounds. Headspace vapor screening targets volatile organic compounds and involves placing a soil sample in a plastic sample bag or a foil sealed container allowing space for ambient air. The container will be sealed and then shaken gently to expose the soil to the air trapped in the container. The sealed container will be allowed to rest for a minimum of 5 minutes while vapors equilibrate. Vapors present within the sample bag's headspace will then be measured by inserting the probe of the instrument in a small opening in the bag or through the foil. The maximum value and the ambient air temperature will be recorded on the field boring or test pit log for each sample.

The monitoring instruments will be calibrated each day to the manufacturer's standard for instrument operation. A photo-ionization detector (PID) equipped with a 10.6 or higher electron volt (eV) lamp or a combustible gas indicator will be used for VOC field screening. Field screening results may be site- and boring-specific and the results may vary with instrument type, the media screened, weather conditions, moisture content, soil type, and type of contaminant, therefore, all conditions capable of influencing the results of field screening will be recorded on the field logs.

The physical characteristics of the samples (such as mineralogy, ASTM soil classification, moisture content, texture, color, presence of stains or odors, and/or field screening results), depth where each sample was obtained, method of sample collection, and other observations will be recorded in the field log by a qualified geologist or engineer. Detailed logs of each boring will be completed in the field by a qualified engineer or geologist. Additional information, such as the presence of water-bearing zones and any unusual or noticeable conditions encountered during drilling, will be recorded on the logs.

## 5.3 Groundwater Water Monitoring

### 5.3.1 Groundwater Levels

Groundwater level and SPH thickness measurements will be obtained at each new monitoring well prior to purging in preparation for a sampling event. Measurement data and the date and time of each measurement will be recorded on a site monitoring data sheet. The depth to groundwater and SPH thickness levels will be measured to the nearest 0.01 ft. The depth to groundwater and SPH thickness will be recorded relative to the surveyed well casing rim or other surveyed datum. A corrected water table elevation will be provided in wells containing SPH by adding 0.8 times the measured SPH thickness to the measured water table elevation. Groundwater and SPH levels will be measured in all wells within 48 hours of the start of obtaining water level measurements. All automated and manual extraction of SPH and water from recovery wells, observation wells, and collection wells, which is close enough to affect measurements at the new wells, will be discontinued for 48 hours prior to the measurement of water and product levels.

Groundwater level and SPH thickness measurements will also be obtained at each new monitoring well during the next regularly scheduled facility-wide groundwater sampling event to facilitate preparation of a facility-wide potentiometric surface map.

### 5.3.2 Groundwater and Vadose Zone Vapor Sampling

Eight new monitoring wells will be completed in locations as shown on Figures 8 and 9. The locations were chosen to evaluate groundwater quality immediately down-gradient of potential source areas. In addition, if any other soil borings encounter groundwater, then a groundwater sample will be collected for analysis prior to plugging the boring.

New monitoring wells will be developed once all new wells have been completed and it may take several days to complete well development. Groundwater samples will initially be obtained from newly constructed monitoring wells no later than five days after the completion of well development. Prior to collection of the groundwater sample from new monitoring wells, a total well vapor sample will be analyzed for percent carbon dioxide and oxygen. Pursuant to Section VIII.A.8. of the Order, the vapor monitoring will be conducted by sealing the top of the well with a cap containing a sample port. Polyethylene tubing will be used to connect the sample port to a low-velocity pump, if necessary, or directly to a field instrument that is capable of measuring percent carbon dioxide and oxygen. The field vapor measurements, date and time of each measurement, and the instrument used will be recorded on a vapor monitoring data sheet.

A second round of groundwater monitoring and sampling will be conducted no sooner than 30 days and not later than 75 days of the initial sampling event. Subsequent sampling events will be dependent upon the analytical results of the first two sampling events and as specified by the NMED. All monitoring wells scheduled for sampling during a groundwater sampling event will be sampled within 15 days of the start of the monitoring and sampling event. Groundwater samples will be collected from borings not intended to be completed as monitoring wells prior to abandonment of the borings, if ground water is encountered.

### 5.3.3 Well Purging

All zones in each monitoring well will be purged by removing groundwater with a dedicated bailer or disposable bailer prior to sampling in order to ensure that formation water is being sampled. Purge volumes (a minimum of three well volumes including filter pack) will be determined by monitoring, at a minimum, groundwater pH, specific conductance, dissolved oxygen concentrations, oxidation-reduction potential, and temperature after every two gallons or each well volume, whichever is less, has been purged from the well. Purging will continue, as needed, until the specific conductance, pH, and temperature readings are within 10 percent between readings for three consecutive measurements. Field water quality parameters will also be compared to historical data provided in Table 6 to ensure that the measurements are indicative of formation water. The volume of groundwater purged, the instruments used, and the readings obtained at each interval will be recorded on the field-monitoring log. Well purging may also be conducted in accordance with the NMED's Position Paper *Use of Low-Flow and other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring* (October 30, 2001, as updated).

### 5.3.4 Groundwater Sample Collection

Groundwater samples will be collected within 24 hours of the completion of well purging using dedicated bailers or disposal bailers. Alternatively, well sampling may also be conducted in accordance with the NMED's Position Paper *Use of Low-Flow and other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring* (October 30, 2001, as updated). Sample collection methods will be documented in the field monitoring reports. The samples will be transferred to the appropriate, clean, laboratory-prepared containers provided by the analytical laboratory. Sample handling and chain-of-custody procedures will be in accordance with the procedures presented below in Section 5.4.

Groundwater samples intended for metals analysis will be submitted to the laboratory as total metals samples. QA/QC samples will be collected to monitor the validity of the groundwater sample collection procedures as follows:

- Field duplicate water samples will be obtained at a frequency of ten percent, with a minimum, of one duplicate sample per sampling event;
- Field blanks will be obtained at a minimum frequency of one per day per site or unit. Field blanks will be generated by filling sample containers in the field with deionized water and submitting the samples, along with the groundwater samples, to the analytical laboratory for the appropriate analyses.
- Equipment rinsate blanks will be obtained for chemical analysis at the rate of ten percent or a minimum of one rinsate blank per sampling day. Equipment rinsate blanks will be collected at a rate of one per sampling day if disposable sampling equipment is used. Rinsate samples will be generated by rinsing deionized water through unused or decontaminated sampling equipment. The rinsate sample will be placed in the appropriate sample container and submitted with the groundwater samples to the analytical laboratory for the appropriate analyses.
- Trip blanks will accompany laboratory sample bottles and shipping and storage containers intended for VOC analyses. Trip blanks will consist of a sample of analyte-free deionized water prepared by the laboratory and placed in an appropriate sample container. The trip blank will be prepared by the analytical laboratory prior to the sampling event and will be kept with the shipping containers and placed with other water samples obtained from the

site each day. Trip blanks will be analyzed at a frequency of one for each shipping container of samples to be analyzed for VOCs.

## 5.4 Sample Handling

At a minimum, the following procedures will be used at all times when collecting samples during investigation, corrective action, and monitoring activities:

1. Neoprene, nitrile, or other protective gloves will be worn when collecting samples. New disposable gloves will be used to collect each sample;

2. All samples collected of each medium for chemical analysis will be transferred into clean sample containers supplied by the project analytical laboratory with the exception of soil, rock, and sediment samples obtained in Encore® samplers. Sample container volumes and preservation methods will be in accordance with the most recent standard EPA and industry accepted practices for use by accredited analytical laboratories. Sufficient sample volume will be obtained for the laboratory to complete the method-specific QC analyses on a laboratory-batch basis; and

3. Sample labels and documentation will be completed for each sample following procedures discussed below. Immediately after the samples are collected, they will be stored in a cooler with ice or other appropriate storage method until they are delivered to the analytical laboratory. Standard chain-of-custody procedures, as described below, will be followed for all samples collected. All samples will be submitted to the laboratory soon enough to allow the laboratory to conduct the analyses within the method holding times. At a minimum, all samples will be submitted to the laboratory within 48 hours after their collection.

Chain-of-custody and shipment procedures will include the following:

1. Chain-of-custody forms will be completed at the end of each sampling day, prior to the transfer of samples off site.

2. Individual sample containers will be packed to prevent breakage and transported in a sealed cooler with ice or other suitable coolant or other EPA or industry-wide accepted method. The drainage hole at the bottom of the cooler will be sealed and secured in

case of sample container leakage. Temperature blanks will be included with each shipping container.

3. Each cooler or other container will be delivered directly to the analytical laboratory.

4. Glass bottles will be separated in the shipping container by cushioning material to prevent breakage.

5. Plastic containers will be protected from possible puncture during shipping using cushioning material.

6. The chain-of-custody form and sample request form will be shipped inside the sealed storage container to be delivered to the laboratory.

7. Chain-of-custody seals will be used to seal the sample-shipping container in conformance with EPA protocol.

8. Signed and dated chain-of-custody seals will be applied to each cooler prior to transport of samples from the site.

9. Upon receipt of the samples at the laboratory, the custody seals will be broken, the chain-of-custody form will be signed as received by the laboratory, and the conditions of the samples will be recorded on the form. The original chain-of-custody form will remain with the laboratory and copies will be returned to the relinquishing party.

10. Copies of all chain-of-custody forms generated as part of sampling activities will be maintained on-site.

## 5.5 Decontamination Procedures

The objective of the decontamination procedures is to minimize the potential for cross-contamination. A designated decontamination area will be established for decontamination of drilling equipment, reusable sampling equipment and well materials. The drilling rig will be decontaminated prior to entering the site or unit. Drilling equipment or other exploration equipment that may come in contact with the borehole will be decontaminated by steam cleaning, by hot-water pressure washing, or by other methods approved by the Department prior to drilling each new boring.

Sampling or measurement equipment, including but not limited to, stainless steel sampling tools, split-barrel or core samplers, well developing or purging equipment, groundwater quality measurement instruments, and water level measurement instruments, will be decontaminated in accordance with the following procedures or other methods approved by the Department before each sampling attempt or measurement:

1. Brush equipment with a wire or other suitable brush, if necessary or practicable, to remove large particulate matter;
2. Rinse with potable tap water;
3. Wash with nonphosphate detergent or other detergent approved by the Department (examples include Fantastik™, Liqui-Nox®);
4. Rinse with potable tap water; and
5. Double rinse with deionized water.

All decontamination solutions will be collected and stored temporarily as described in Section 4.3. Decontamination procedures and the cleaning agents used will be documented in the daily field log.

## 5.6 Field Equipment Calibration Procedures

Field equipment requiring calibration will be calibrated to known standards, in accordance with the manufacturers' recommended schedules and procedures. At a minimum, calibration checks will be conducted daily, or at other intervals approved by the Department, and the instruments will be recalibrated, if necessary. Calibration measurements will be recorded in the daily field logs. If field equipment becomes inoperable, its use will be discontinued until the necessary repairs are made. In the interim, a properly calibrated replacement instrument will be used.

## 5.7 Documentation of Field Activities

Daily field activities, including observations and field procedures, will be recorded in a field log book. The original field forms will be maintained at the Facility. Copies of the completed forms will be maintained in a bound and sequentially numbered field file for reference during field activities. Indelible ink will be used to record all field activities. Photographic documentation of field activities will be performed, as appropriate. The daily record of field activities will include the following:

1. Site or unit designation;
2. Date;

3. Time of arrival and departure;
4. Field investigation team members including subcontractors and visitors;
5. Weather conditions;
6. Daily activities and times conducted;
7. Observations;
8. Record of samples collected with sample designations and locations specified;
9. Photographic log;
10. Field monitoring data, including health and safety monitoring;
11. Equipment used and calibration records, if appropriate;
12. List of additional data sheets and maps completed;
13. An inventory of the waste generated and the method of storage or disposal; and
14. Signature of personnel completing the field record.

## 5.8 Chemical Analyses

All samples collected for laboratory analysis will be submitted to an accredited laboratory. The laboratory will use the most recent standard EPA and industry-accepted analytical methods for target analytes as the testing methods for each medium sampled. Chemical analyses will be performed in accordance with the most recent EPA standard analytical methodologies and extraction methods.

Groundwater and soil samples will be analyzed by the following methods:

- SW-846 Method 8260 volatile organic compounds;
- SW-846 Method 8270 semi-volatile organic compounds; and
- SW-846 Method 8015B gasoline range (C5-C10), diesel range (>C10-C28), and motor oil range (>C28-C36) organics.

Groundwater and soil samples will also be analyzed for the following metals using the indicated analytical methods.

| Analyte | Analytical Method |
|---|---|
| Antimony | SW-846 method 6010/6020 |
| Arsenic | SW-846 method 6010/6020 |
| Barium | SW-846 method 6010/6020 |
| Beryllium | SW-846 method 6010/6020 |
| Cadmium | SW-846 method 6010/6020 |
| Chromium | SW-846 method 6010/6020 |
| Cobalt | SW-846 method 6010/6020 |
| Cyanide | SW-846 method 335.4/335.2 mod |
| Lead | SW-846 method 6010/6020 |
| Mercury | SW-846 method 7470/7471 |
| Nickel | SW-846 method 6010/6020 |
| Selenium | SW-846 method 6010/6020 |
| Silver | SW-846 method 6010/6020 |
| Vanadium | SW-846 method 6010/6020 |
| Zinc | SW-846 method 6010/6020 |

In addition, groundwater samples will also be analyzed for the following general chemistry parameters.

| Analyte | Analytical Method |
|---|---|
| Total Dissolved Solids | SM-2540C |
| Bicarbonate | SM-2320B |
| Chloride | EPA method 300.0 |
| Sulfate | EPA method 300.0 |
| Calcium | EPA method 6010/6020 |
| Magnesium | EPA method 6010/6020 |
| Sodium | EPA method 6010/6020 |
| Potassium | EPA method 6010/6020 |
| Manganese | SW-846 method 6010/6020 |
| Nitrate/nitrite | EPA method 300.0 |
| Ferric/ferrous Iron | SW-846 method 6010/6020 & SM 3500Fe2+ |

As discussed in section 5.3.3, field measurements will be obtained for pH, specific conductance, dissolved oxygen concentrations, oxidation-reduction potential, and temperature.

## 5.9 Data Quality Objectives

The Data Quality Objectives (DQOs) were developed to ensure that newly collected data are of sufficient quality and quantity to address the projects goals, including Quality Assurance/Quality Control (QA/QC) issues. The project goals are established in the Order and are to determine and evaluate the presence, nature, and extent of releases of contaminants at specified SWMUs. The type of data required to meet the project goals includes chemical analyses of soil and groundwater to determine if there has been a release of contaminants at the individual SWMUs.

The quantity of data is SWMU specific and is based on the historical operations at individual locations. The quality of data that is required is consistent across locations and is specified in Section VIII.D.7.c of the Order. In general, method detection limits should be 20% or less of the applicable background levels, cleanup standards and screening levels.

Additional DQOs include precision, accuracy, representativeness, completeness, and comparability. Precision is a measurement of the reproducibility of measurements under a given set of circumstances and is commonly stated in terms of standard deviation or coefficient of variation (EPA, 1987). Precision is also specific to sampling activities and analytical performance. Sampling precision will be evaluated through the analyses of duplicate field samples and laboratory replicates will be utilized to assess laboratory precision.

Accuracy is a measurement in the bias of a measurement system and may include many sources of potential error, including the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analysis techniques (EPA, 1987). An evaluation of the accuracy will be performed by reviewing the results of field/trip blanks, matrix spikes, and laboratory QC samples.

Representativeness is an expression of the degree to which the data accurately and precisely represent the true environmental conditions. Sample locations and the number of samples have been selected to ensure the data is representative of actual environmental conditions. Based on SWMU specific conditions, this may include either biased (i.e., judgmental) locations/depths or unbiased (systematic grid samples) locations, as discussed in Section 5.2 for soils and 5.3.2 for groundwater. In addition, sample collection techniques (e.g., purging of monitoring wells to collect formation water) will be utilized to help ensure representative results. An evaluation of on-going groundwater monitoring results will be performed to assess representativeness.

Completeness is defined as the percentage of measurements taken that are actually valid measurements, considering field QA and laboratory QC problems. EPA Contract Laboratory Program (CLP) data has been found to be 80-85% complete on a nationwide basis and this has been extrapolated to indicate that Level III, IV, and V analytical techniques will generate data that are approximately 80% complete (EPA, 1986). As an overall project goal, the completeness goal is 85%; however, some samples may be critical base on location or field screening results and thus a sample –by-sample evaluation will be performed to determine if the completeness goals have been obtained.

Comparability is a qualitative parameter, which expresses the confidence with which one data set can be compared to another. Industry standard sample collection techniques and routine EPA analytical methods will be utilized to help ensure data are comparable to historical and future data. Analytical results will be reported in appropriate units for comparison to historical data and cleanup levels.

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# Section 6
# Monitoring and Sampling Program

## 6.1 Groundwater Monitoring

After the initial investigation activities are completed, a second round of groundwater samples will be collected to confirm the initial groundwater analyses for samples collected at new monitoring wells. The groundwater samples will be collected no sooner than 30 days after the initial sampling event and no later than 75 days after the initial sampling event. If possible, the second sampling event will be timed to coincide with the regularly scheduled semiannual groundwater sampling events. The samples will be analyzed for the same constituents for which the first samples were analyzed.

Any subsequent sampling events will be based on the results of the first two analyses and will be approved by the NMED prior to implementation.

# Section 7
# Schedule

This investigation work plan will be implemented within 90 days of NMED approval. The estimated timeframes for each of the planned activities is as shown below:

- field work (inclusive of all soil and initial groundwater sampling) -- five weeks;
- laboratory analyses for initial sampling event – four weeks;
- data reduction and validation (soils and initial groundwater event) – three weeks;
- second groundwater sampling event – one week;
- laboratory analyses for second groundwater sampling event – three weeks;
- data reduction and validation (second groundwater event) – two weeks; and
- data gap analysis – three weeks.

Completion of the data gap analysis will complete all activities conducted under this investigation workplan. Western will then prepare an investigation report pursuant to Section X.C of the Order. The investigation report will be submitted to the NMED within 120 days of completion of the data gap analysis.

# Section 8
# References

EPA, 1987, Data Quality Objectives for Remedial Response Activities; United States Environmental Protection Agency, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, OSWER Directive 9355.0-7B, 85p

EPA, 1991, Human Health Evaluation Manual, Part B: "Development of Risk-Based Preliminary Remediation Goals; United States Environmental Protection Agency, Office of Solid Waste and Emergency Response; Memorandum December 13, 1991, OSWER Directive 9285.7-01B, 54p.

EPA, 1996, Soil Screening Guidance: User's Guide; United States Environmental Protection Agency, Office of Solid Waste and Emergency Response; Publication 9355.4-23, p. 123.

EPA, 2000, Guidance on Choosing a Sampling Design for Environmental Data Collection, EPA/240/R-02/005, EPA QA/G-5S, 168 p.

EPA, 2006, Guidance on Systematic Planning Using the Data Quality Objectives Process, United States Environmental Protection Agency, Office of Environmental Information; EPA/240/B-06/001, p. 111.

Giant Industries, 2003, Solid Waste Management Unit Assessment Report, Giant Refining Company Bloomfield Refinery.

Groundwater Technology Inc., 1994, RCRA Facility Investigation/Corrective Measures Study Report Bloomfield Refining Company #50 County Road 4990 Bloomfield, New Mexico, p.51.

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# Tables

**Table 1**
**Volatile Organic Ground Water Analytical Results Summary**
**Group 3 Investigation Work Plan**
**Bloomfield Refinery - Bloomfield, New Mexico**

| | | Parameters | | | | |
|---|---|---|---|---|---|---|
| | | **Benzene (mg/L)** | **Toluene (mg/L)** | **Ethylbenzene (mg/L)** | **Xylene (mg/L)** | **MTBE (mg/L)** |
| **WQCC 20NMAC 6.2.3103 (mg/L):** | | **0.005 (2)** | **0.75 (1)** | **0.7 (2)** | **0.62 (1)** | **0.011 (3)** |
| **Well ID:** | **Date Sampled:** | | | | | |
| **MW #3** | 4/5/2006 | <0.001 | <0.001 | <0.001 | <0.003 | <0.0025 |
| | 8/5/2005 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| | 4/11/2005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0025 |
| | 8/21/2003 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| **MW-5** | Dry | | | | | |
| **MW-6** | Dry | | | | | |
| **MW #13** | 4/1/2007 | <0.001 | <0.001 | <0.001 | <0.002 | 0.0048 |
| | 8/15/2006 | <0.001 | <0.001 | <0.001 | <0.003 | 0.007 |
| | 4/5/2006 | <0.001 | <0.001 | <0.001 | <0.003 | 0.01 |
| | 8/5/2005 | <0.001 | <0.001 | <0.001 | <0.001 | 0.015 |
| | 4/11/2005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.014 |
| | 8/23/2004 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.027 |
| | 3/3/2004 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.02 |
| | 8/21/2003 | <0.001 | <0.001 | <0.001 | <0.001 | 0.061 |
| | 3/3/2003 | <0.0005 | <0.0005 | <0.0005 | 0.0012 | 0.049 |
| **MW #30** | 4/1/2007 | 5.7 | 3.3 | 5.4 | 21 | <0.620 |
| | 4/5/2006 | 3.5 | 1.4 | 2.6 | 6.8 | <0.620 |
| | 4/11/2005 | 5.7 | 3.7 | 4.4 | 12 | <0.10 |
| | 8/23/2004 | 1.7 | 0.37 | 1.9 | 2.5 | <0.10 |
| **MW #31** | 4/1/2007 | 4.3 | <0.100 | 1.4 | 4.7 | <0.250 |
| | 4/5/2006 | 6.1 | 1.5 | 0.94 | 4.5 | <0.120 |
| | 4/11/2005 | 2.6 | 0.062 | 0.45 | 1.2 | <0.250 |
| | 8/23/2004 | 3.7 | 0.4 | 0.32 | 1.2 | <0.250 |
| **MW #44** | 4/1/2007 | <0.001 | 0.0058 | 0.0026 | 0.034 | <0.0025 |
| | 4/5/2006 | <0.001 | <0.001 | <0.001 | <0.003 | 0.0028 |
| | 4/11/2005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.0041 |

Notes:
mg/L = milligram per liter
MW = monitoring well
RW = recovery well
NA = not analyzed
NE = not established
MTBE = methyl tertiary butyl ether
1 - WQCC 20NMAC 6.2.33103 = New Mexico Standard for Groundwater of 10,000 ug/L TDS or less.
2 - EPA Maximum Contaminant Level
3 - EPA Region VI Human Health Medium-Specific Screening Level 2007

**Table 2**
**Total Metals Ground Water Analytical Results Summary**
**Group 3 Investigation Work Plan**
**Bloomfield Refinery - Bloomfield, New Mexico**

| | | Parameters | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Arsenic (mg/L)** | **Barium (mg/L)** | **Cadmium (mg/L)** | **Chromium (mg/L)** | **Lead (mg/L)** | **Selenium (mg/L)** | **Silver (mg/L)** | **Mercury (mg/L)** |
| **40 CFR 141.62 MCL (mg/L):** | | **0.01 (1)** | **2.0** | **0.005** | **0.10** | **0.015** | **0.05** | **0.1 (2)** | **0.002** |
| **Well ID:** | **Date Sampled:** | | | | | | | | |
| **MW #3** | 8/5/2005 | NA | NA | NA | 0.016 | <0.005 | NA | NA | NA |
| | 8/21/2003 | NA | NA | NA | 0.029 | **0.022** | NA | NA | <0.0002 |
| **MW-5** | Dry | | | | | | | | |
| **MW-6** | Dry | | | | | | | | |
| **MW #13** | 8/15/2006 | <0.02 | 0.025 | <0.002 | <0.006 | 0.0078 | <0.05 | <0.005 | <0.0002 |
| | 8/5/2005 | NA | NA | NA | 0.012 | <0.005 | NA | NA | NA |
| | 8/23/2004 | <0.02 | 0.028 | <0.002 | 0.085 | <0.005 | <0.05 | <0.005 | <0.0002 |
| | 8/21/2003 | NA | NA | NA | 0.45 | <0.005 | NA | NA | <0.0002 |
| **MW #30** | 8/23/2004 | <0.02 | 0.24 | <0.002 | 0.0073 | 0.011 | <0.05 | <0.005 | 0.00023 |
| **MW #31** | 8/23/2004 | <0.02 | 0.35 | <0.002 | 0.0088 | <0.005 | <0.05 | <0.005 | 0.00022 |
| **MW #44** | 8/23/2004 | <0.02 | 0.084 | <0.002 | 0.1 | 0.036 | <0.05 | <0.005 | 0.00033 |

Notes:
mg/L = milligram per liter
MW = monitoring well
RW = recovey well
NA= not analyzed

NE = not established

40 CFR 141.62 MCL = National Primar Drinking Water Regulations: Maxiumum Contaminant Levels and Maximum Residual Disinfectant Levels

(1) MCL as of 1/23/2006

(2) National secondary drinking water regulation

## Table 3
## Dissolved Metals Ground Water Analytical Results Summary
### Group 3 Investigation Work Plan
### Bloomfield Refinery- Bloomfield, New Mexico

| | | Parameters | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic (mg/L) | Barium (mg/L) | Cadmium (mg/L) | Calcium (mg/L) | Chromium (mg/L) | Copper (mg/L) | Iron (mg/L) | Lead (mg/L) | Magnesium (mg/L) | Manganese (mg/L) | Potassium (mg/L) | Selenium (mg/L) | Silver (mg/L) | Sodium (mg/L) | Uranium (mg/L) | Zinc (mg/L) |
| **WQCC 20NMAC 6.2.3103 (mg/L):** | | **0.01** | **1.0** | **0.01** | **NE** | **0.05** | **1.0** | **1.0** | **0.05** | **NE** | **0.20** | **NE** | **0.05** | **0.05** | **NE** | **0.03 (1)** | **10.0** |
| **Well ID:** | **Date Sampled:** | | | | | | | | | | | | | | | | |
| **MW #3** | 8/5/2005 | <0.02 | 0.018 | <0.002 | 480 | <0.006 | <0.006 | 0.047 | <0.005 | 130 | **0.43** | 7.6 | <0.05 | <0.005 | 1300 | <0.1 | 0.018 |
| | 8/21/2003 | <0.02 | 0.3 | <0.002 | 490 | <0.006 | <0.006 | 0.27 | <0.005 | 140 | **0.58** | 10 | 0.024 | <0.005 | 1100 | <0.1 | 0.094 |
| **MW-5** | Dry | | | | | | | | | | | | | | | | |
| **MW-6** | Dry | | | | | | | | | | | | | | | | |
| **MW #13** | 8/15/2006 | <0.02 | 0.025 | <0.002 | 250 | <0.006 | 0.0063 | <0.02 | 0.0078 | 82 | 1.1 | 3.6 | <0.05 | <0.005 | 620 | <0.10 | 0.061 |
| | 8/5/2005 | <0.02 | 0.028 | <0.002 | 240 | <0.006 | <0.006 | <0.02 | <0.005 | 85 | 1.1 | 3.8 | <0.05 | <0.005 | 570 | <0.1 | 0.0088 |
| | 8/23/2004 | <0.02 | 0.022 | <0.002 | 210 | <0.006 | <0.006 | 0.046 | <0.005 | 80 | 0.58 | 3.6 | <0.05 | <0.005 | 610 | <0.1 | 0.021 |
| | 8/21/2003 | <0.02 | 0.33 | <0.002 | 270 | <0.006 | 0.0096 | 0.04 | <0.005 | 110 | 1.1 | 5.3 | 0.16 | <0.005 | 680 | <0.1 | 0.09 |
| **MW #30** | 8/23/2004 | <0.02 | 0.13 | <0.002 | 350 | <0.006 | 0.0061 | 4.7 | 0.0051 | 88 | 2.1 | <10.0 | <0.05 | <0.005 | 750 | <0.1 | 0.046 |
| **MW #31** | 8/23/2004 | <0.02 | 0.35 | <0.002 | 220 | <0.006 | <0.006 | 0.46 | <0.005 | 67 | 0.58 | 4.8 | <0.05 | <0.005 | 640 | <0.1 | 0.019 |
| **MW #44** | 8/23/2004 | <0.02 | 0.046 | <0.002 | 520 | 0.034 | 0.027 | 76 | 0.015 | 87 | 1.7 | 44 | <0.05 | <0.005 | 970 | <0.10 | 0.084 |

Notes:
mg/L = milligram per liter
MW = monitoring well
RW = recovery well
NE = not established
NA = Not Analyzed
WQCC 20NMAC 6.2.33103 = New Mexico Standard for Groundwater of 10,000 ug/L or less

**Table 4**
**General Chemistry Ground Water Analytical Results Summary**
**Group 3 Investigation Work Plan**
**Bloomfield Refinery - Bloomfield, New Mexico**

| | | Parameters | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Fluoride (mg/L) | Chloride (mg/L) | Bromide (mg/L) | Nitrite (mg/L) | Nitrogen (mg/L) | Phosphorus (mg/L) | Sulfate (mg/L) | TDS (mg/L) | E.C. (umhos/cm) | $CO_2$ (mg/L) | Alk (mg/L) |
| WQCC 20NMAC 6.2.3103 (mg/L): | | **1.6** | **250** | **NE** | **NE** | **10** | **NE** | **600** | **1000** | **NE** | **NE** | **NE** |
| **Well ID:** | **Date Sampled:** | | | | | | | | | | | |
| **MW #3** | 8/5/2005 | 0.33 | 1200 | 4.5 | <0.50 | 42 | <0.50 | 2300 | 6200 | 8300 | 680 | 680 |
| | 8/21/2003 | 0.17 | 1400 | 22 | NA | 41 | <0.50 | 1900 | 5700 | 8500 | NA | NA |
| **MW-5** | Dry | | | | | | | | | | | |
| **MW-6** | Dry | | | | | | | | | | | |
| **MW #13** | 8/15/2006 | 0.12 | 310 | 3.7 | 8.3 | NA | <0.50 | 1100 | 3000 | 4300 | 910 | 960 |
| | 8/5/2005 | 0.15 | 320 | 4.6 | 0.23 | 6.1 | <0.50 | 1000 | 3000 | 4600 | 1000 | 1000 |
| | 8/23/2004 | 0.2 | 330 | 4.3 | 1.6 | 6.6 | <0.50 | 950 | 2800 | 3400 | 860 | 950 |
| | 8/21/2003 | 0.19 | 510 | 13 | <0.10 | 12 | <0.50 | 840 | 3100 | 5000 | 1000 | 917 |
| **MW #30** | 8/23/2004 | 0.18 | 360 | 5.6 | <0.10 | <0.10 | <0.10 | 720 | 3100 | 3900 | 1200 | 1400 |
| **MW #31** | 8/23/2004 | 0.19 | 370 | 7.2 | <0.10 | 0.14 | <0.50 | 750 | 2800 | 3700 | 980 | 1100 |
| **MW #44** | 8/23/2004 | 0.3 | 210 | 0.79 | <0.10 | <0.10 | <0.50 | 2800 | 4800 | 5200 | 400 | 450 |

Notes:
Alk = alkalinity, total
$CO_2$ = Carbon Dioxide
E.C. = electrical conductivity
TDS = total dissolved solids
umhos/cm = micro-mhos per centimeter
mg/L = milligram per liter
NE = not established
NA = not analyzed
MW = monitoring well
RW = recovery well
WQCC 20NMAC 6.2.33103 = New Mexico Standard for Groundwater of 10,000 ug/L or less

**Table 5**
**Soil Analytical Results Summary**
**Group 3 Investigation Work Plan**
**Bloomfield Refinery - Bloomfield, New Mexico**

| | | | Parameters | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Acetone (mg/kg) | Benzene (mg/kg) | Toluene (mg/kg) | Ethylbenzene (mg/kg) | m.p-Xylene (mg/kg) | o-Xylene (mg/kg) | Methylene chloride (mg/kg) | Semi-Volatile Organics | Total Petroleum Hydrocarbons | Beryllium (mg/kg) | Cadmium (mg/kg) | Chromium (mg/kg) | Copper (mg/kg) | Lead (mg/kg) | Nickel (mg/kg) | Thallium (mg/kg) | Zinc (mg/kg) |
| | Soil Screening Levels (mg/kg): | | 19.1 (3) | 0.02 (3) | 21.7 (3) | 20.2 (3) | 2.06 (3) | 81.4 (3) | 0.17 (3) | NA | NA | 56.2 (2) | 27.5 (3) | 100,000 (4) | 1030 (3) | 800 (1) | 953 (3) | 3.43 | 13,600 (3) |
| Sample No. | Sample Location | Date Sampled | | | | | | | | | | | | | | | | | |
| B-1 (2.5-4.5') | at SWMU No. 4 | 2/22/1994 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.66 | 4.5 | 9.7 | 12 | ND | 9.8 | 25 | 46 |
| B-2 (10-12') | at SWMU No. 4 | 2/22/1994 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.53 | 3 | 8.5 | 8.9 | ND | 7 | 15 | 34 |
| B-3 (6-8') | at AOC No. 22 | 2/22/1994 | ND | ND | ND | ND | ND | ND | 0.11 | ND | ND | 0.54 | 3.2 | 8 | 8.8 | ND | 7.4 | 15 | 35 |
| B-4 (10-12') | at AOC No. 22 | 2/22/1994 | ND | 0.012 | 0.023 | 0.004J | 0.031 | 0.022 | ND | ND | ND | 0.53 | 3.1 | 9.9 | 8.2 | ND | 7.2 | 19 | 32 |

Notes:
mg/kg = milligram per kilogram
ND - not detected, quantitation limit not provided in 1994 RFI Investigatio Report
NA = not available
NE = not established
The listed soil screening level is the lowest of the available NMED industrial/occupational, construction, and soil-to-ground water DAF 20 screening levels (Rev. 4 6/2006)
1 - Industrial/Occupational Soil Screening Level
2 - Construction Work Soil Screening Level
3 - Soil-to-Ground Water Screening Level

**Table 6**
**Field Measurement Summary**
**Group 3 Investigation Work Plan**
**Western Refinery Company - Bloomfield, New Mexico**

| | | Field Measurements | | | | |
|---|---|---|---|---|---|---|
| Well ID: | Date Sampled: | E.C. (umhos/cm) | pH (s.u.) | Temperature (deg F) | DO (mg/L) | ORP (--) |
| MW #3 | 8/15/2006 | NS | NS | NS | NS | NS |
| | 4/6/2006 | 7212 | 7.02 | 65 | NR | NR |
| | 8/1/2005 | 7685 | 6.98 | 67 | NS | -44 |
| | 4/6/2005 | 2535 | 7.02 | 61 | NS | NS |
| | 8/23/2004 | 7558 | 6.96 | 64 | NS | -11 |
| | 8/25/2003 | 7818 | 6.96 | 66 | NM | 57 |
| MW #5 | 8/15/2006 | DRY | | | | |
| | 4/6/2006 | DRY | | | | |
| | 8/1/2005 | DRY | | | | |
| | 4/4/2005 | DRY | | | | |
| | 8/23/2004 | DRY | | | | |
| | 8/25/2003 | DRY | | | | |
| MW #6 | 8/15/2006 | DRY | | | | |
| | 4/6/2006 | DRY | | | | |
| | 8/1/2005 | DRY | | | | |
| | 4/4/2005 | DRY | | | | |
| | 8/24/2004 | DRY | | | | |
| | 3/2/2004 | DRY | | | | |
| | 8/25/2003 | DRY | | | | |
| | 3/3/2003 | DRY | | | | |
| MW #13 | 8/15/2006 | 3993 | 6.93 | 62 | 0.56 | 246 |
| | 4/6/2006 | 4108 | 7.06 | 63 | NR | NR |
| | 8/1/2005 | 4113 | 6.94 | 63 | 6.2 | 166 |
| | 4/5/2005 | 4038 | 7.05 | 60 | NR | NR |
| | 8/18/2004 | 3638 | 6.79 | 62 | 5.0 | 158 |
| | 3/3/2004 | 3895 | 6.96 | 59 | NM | NM |
| | 8/21/2003 | 4573 | 6.77 | 64 | 5.6 | 86 |
| | 3/3/2003 | 4153 | 6.65 | 58 | NM | NM |
| MW #30 | 8/15/2006 | NR | NR | NR | NR | NR |
| | 4/6/2006 | 3246.3 | 6.9 | 65.1 | NR | NR |
| | 8/1/2005 | NR | NR | NR | NR | NR |
| | 4/12/2005 | 3349 | 6.99 | 61 | NR | NR |
| | 8/23/2004 | 4480 | 6.90 | 62 | over range | -196 |
| MW #31 | 8/15/2006 | NR | NR | NR | NR | NR |
| | 4/6/2006 | 3891.7 | 7.0 | 63.5 | NR | NR |
| | 8/1/2005 | NR | NR | NR | NR | NR |
| | 4/5/2005 | 3731 | 7.01 | 61 | NR | NR |
| | 8/25/2004 | 3945 | 7.07 | 64 | 3.4 | -19 |
| MW #44 | 8/15/2006 | NR | NR | NR | NR | NR |
| | 4/6/2006 | 5585.3 | 6.8 | 62.5 | NR | NR |
| | 8/1/2005 | NR | NR | NR | NR | NR |
| | 4/12/2005 | 5559 | 6.93 | 59 | NR | NR |
| | 8/23/2004 | 5589 | 6.90 | 60 | 5.3 | -52 |

Notes:
deg F = degrees Fahrenheit
E.C. = electrical conductivity
mg/L = milligrams per liter
MW = monitoring well
NM = not measured
NR = not required
ORP = Oxidation-reduction potential
SPH = separate phase hydrocarbon contained in well, not sampled
s.u. = standard units (recorded by portable pH meter)
umhos/cm = micro-mhos per centimeter
NS = not sampled, well is dry
NPP = no product present

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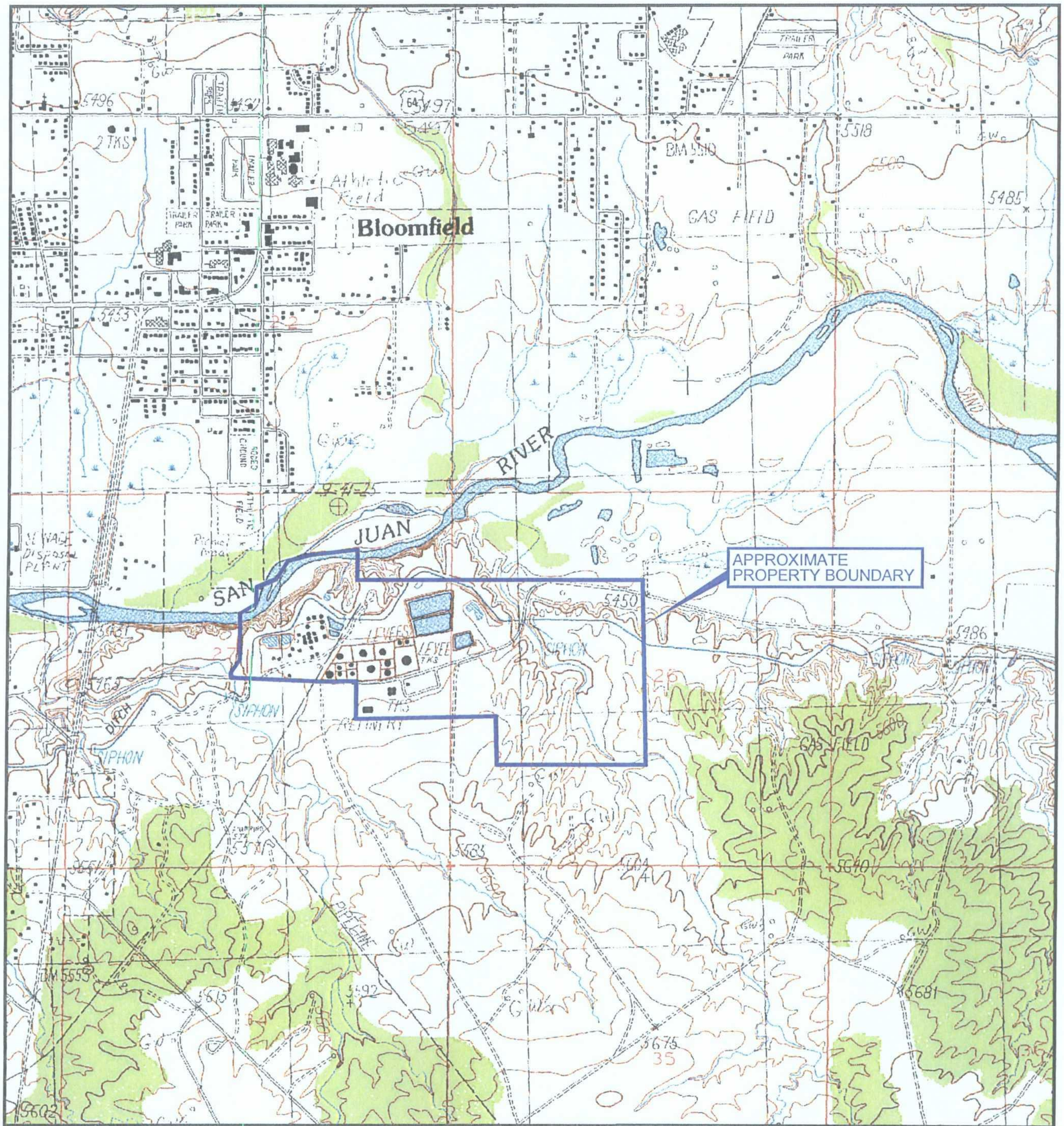
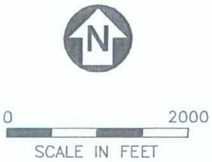
# Figures




Map Source: USGS 7.5 Min. Quad Sheet BLOOMFIELD, NM., 1985.





QUADRANGLE LOCATION

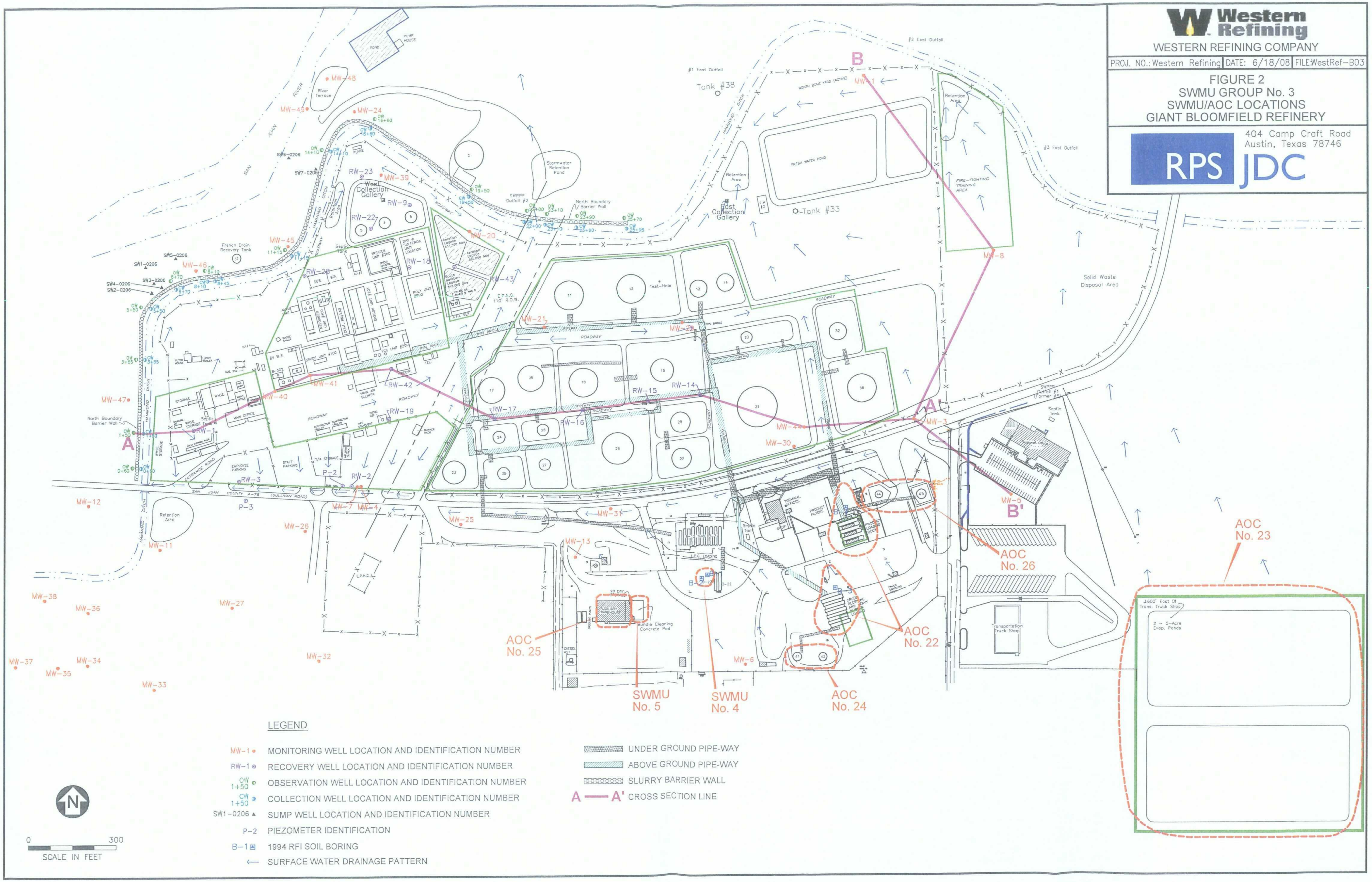
Western Refining

WESTERN REFINING SOUTHWEST

| PROJ. NO.: Western Refining | DATE: 6/19/08 | FILE: WestRef-A25 |
|---|---|---|

FIGURE 1
SITE LOCATION MAP
BLOOMFIELD REFINERY

RPS JDC
404 Camp Craft Road
Austin, Texas 78746




**Western Refining**

WESTERN REFINING COMPANY

PROJ. NO.: Western Refining | DATE: 6/18/08 | FILE: WestRef-B03

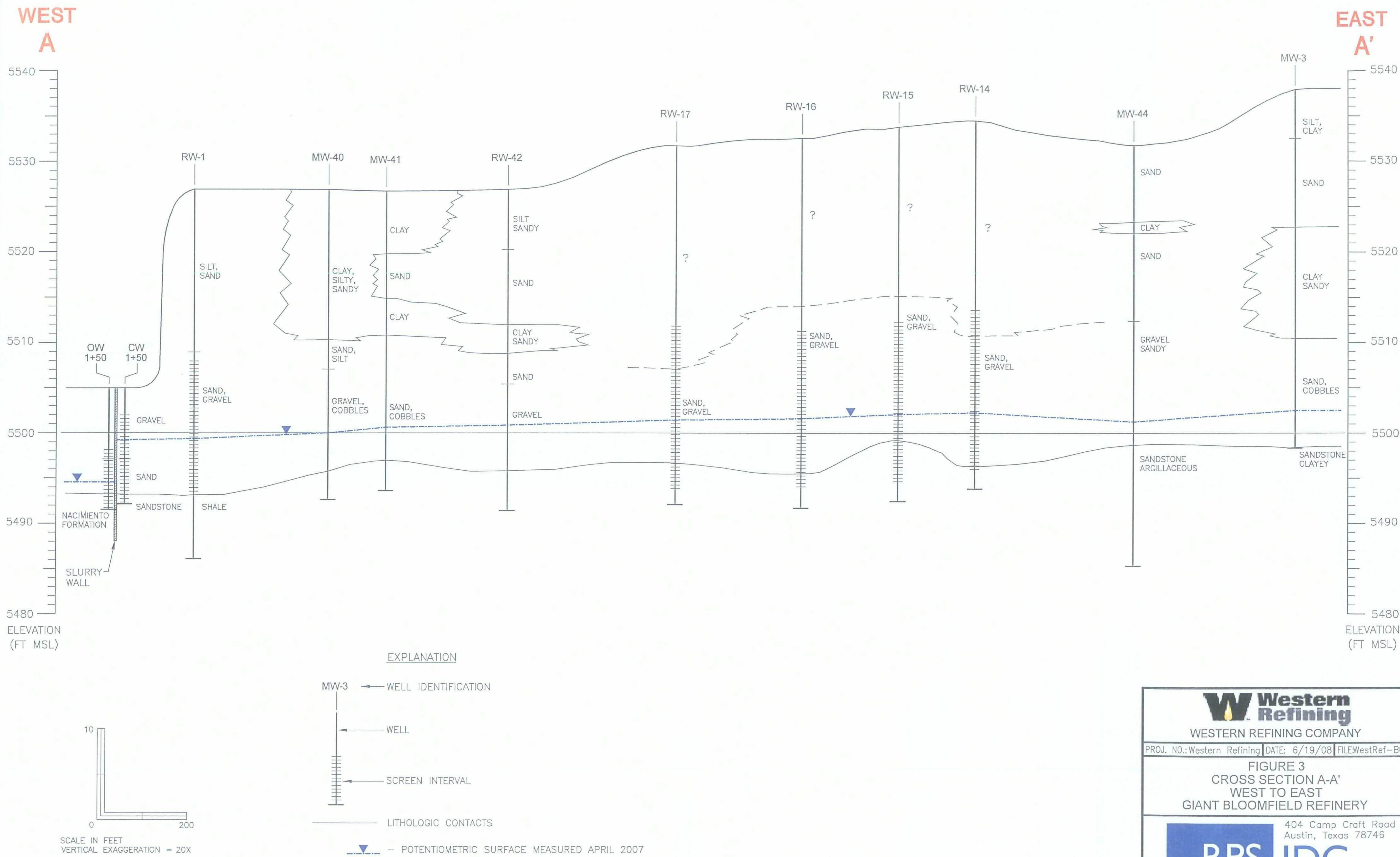
FIGURE 2
SWMU GROUP No. 3
SWMU/AOC LOCATIONS
GIANT BLOOMFIELD REFINERY

RPS JDC
404 Camp Craft Road
Austin, Texas 78746

LEGEND

- MW-1 ● MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
- RW-1 ⊕ RECOVERY WELL LOCATION AND IDENTIFICATION NUMBER
- OW 1+50 ○ OBSERVATION WELL LOCATION AND IDENTIFICATION NUMBER
- CW 1+50 ○ COLLECTION WELL LOCATION AND IDENTIFICATION NUMBER
- SW1-0206 ▲ SUMP WELL LOCATION AND IDENTIFICATION NUMBER
- P-2 PIEZOMETER IDENTIFICATION
- B-1 ⊞ 1994 RFI SOIL BORING
- ← SURFACE WATER DRAINAGE PATTERN
- UNDER GROUND PIPE-WAY
- ABOVE GROUND PIPE-WAY
- SLURRY BARRIER WALL
- A — A' CROSS SECTION LINE

0 — 300
SCALE IN FEET




Western Refining

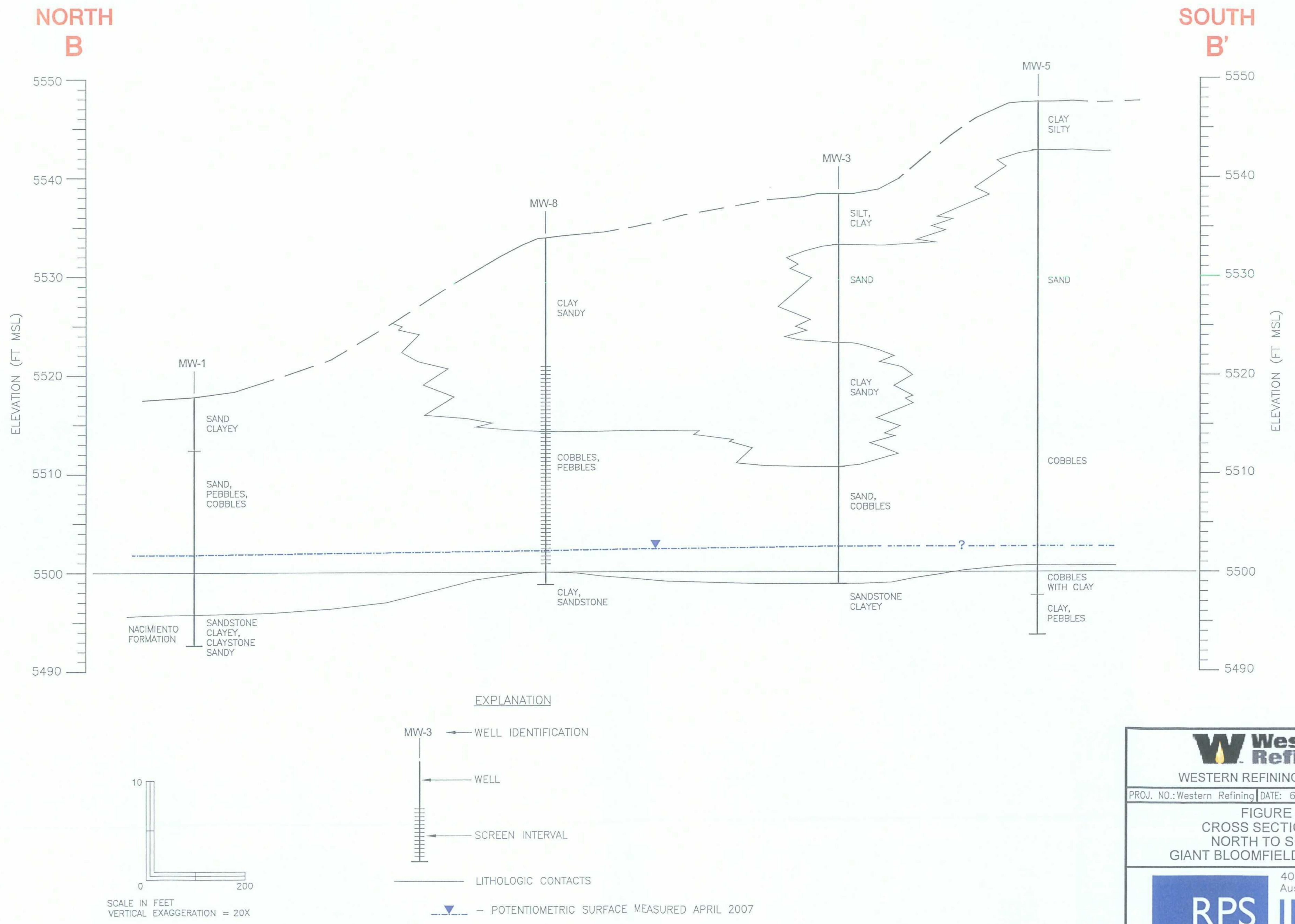
WESTERN REFINING COMPANY

| PROJ. NO.: Western Refining | DATE: 6/19/08 | FILE: WestRef-B06 |
|---|---|---|

FIGURE 3
CROSS SECTION A-A'
WEST TO EAST
GIANT BLOOMFIELD REFINERY

404 Camp Craft Road
Austin, Texas 78746

RPS JDC




Western Refining

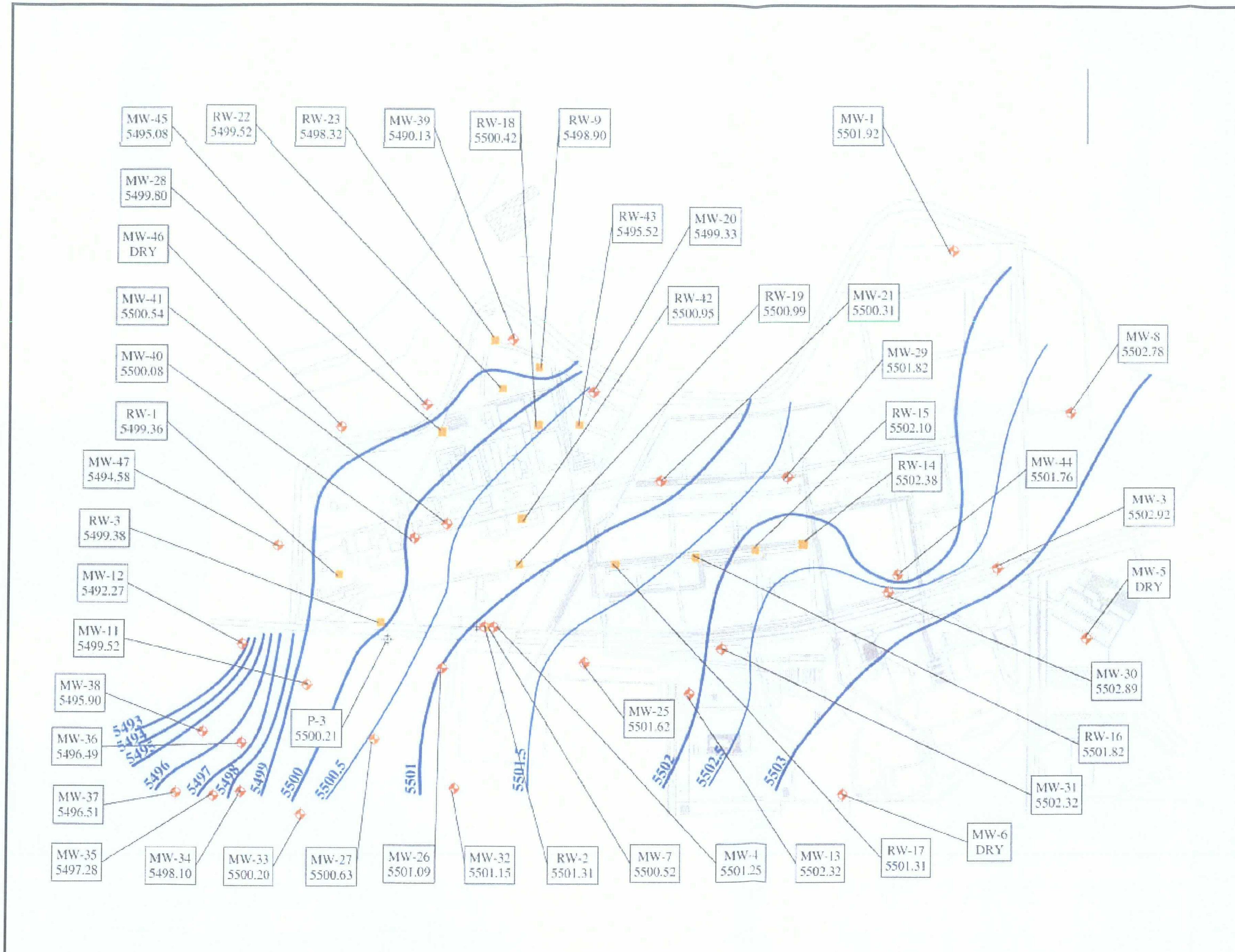
WESTERN REFINING COMPANY

| PROJ. NO.: Western Refining | DATE: 6/19/08 | FILE: WestRef-B07 |
|---|---|---|

FIGURE 4
CROSS SECTION B-B'
NORTH TO SOUTH
GIANT BLOOMFIELD REFINERY

404 Camp Craft Road
Austin, Texas 78746

RPS JDC




Map Source: Malcolm-Pirnie Facility-Wide Groundwater Monitoring Plan, Western Refining Bloomfield Refinery, Figure 7 Groundwater.mxd, July 2007.

Western Refining

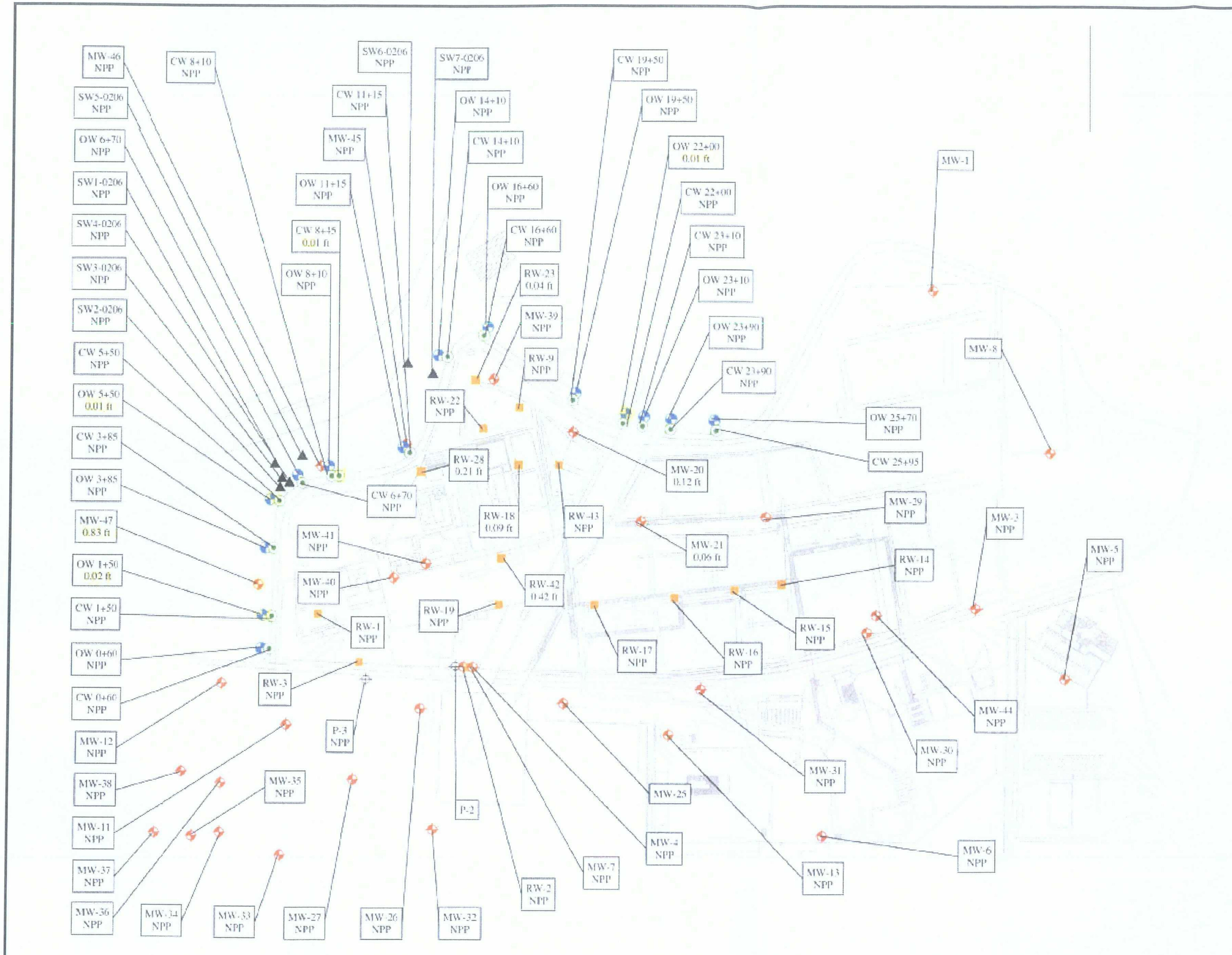
WESTERN REFINING COMPANY

| PROJ. NO.: Western Refining | DATE: 6/19/08 | FILE: WestRef-B08 |
| --- | --- | --- |

FIGURE 5
APRIL 2007
POTENTIOMETRIC SURFACE
GIANT BLOOMFIELD REFINERY

404 Camp Craft Road
Austin, Texas 78746

RPS JDC




## Legend

- Monitoring Well
- Observation Well
- Recovery Well
- Piezometer
- Collection Well
- Sump Well
- Site

MW-35 NPP - Well ID

ft = Feet

NPP = No Product Present
NA = Not Available

Note:
OWs and CWs were collected on 1/15/07
SWs were collected on 1/2/07

Western Refining
WESTERN REFINING COMPANY

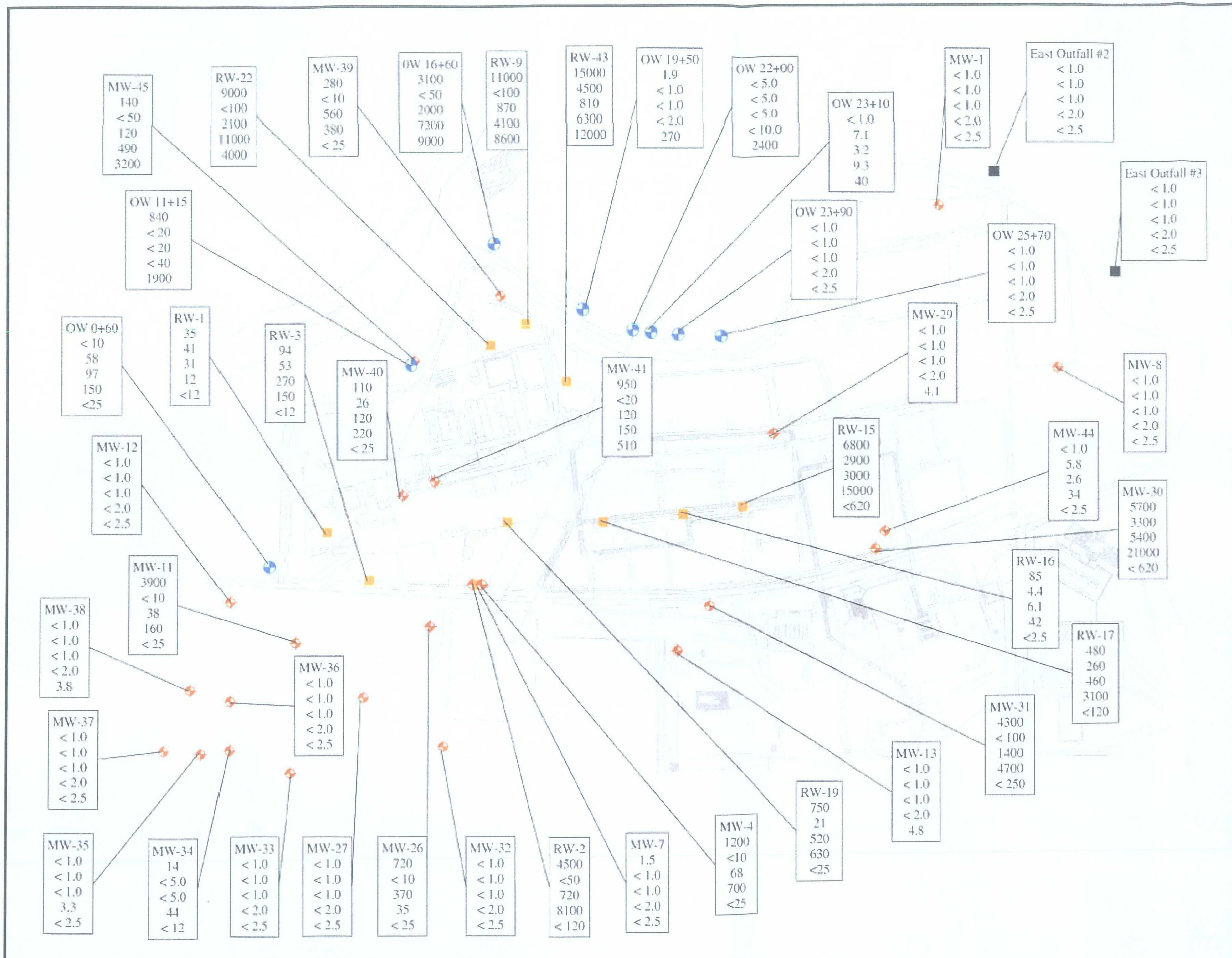
PROJ. NO.: Western Refining | DATE: 6/19/08 | FILE: WestRef-B09

FIGURE 6
SPRING 2007
SEPARATE PHASE
HYDROCARBON THICKNESS MAP
GIANT BLOOMFIELD REFINERY

404 Camp Craft Road
Austin, Texas 78746

RPS JDC

Map Source: Malcolm-Pirnie Facility-Wide Groundwater Monitoring Plan, Western Refining Bloomfield Refinery, Figure 8 Separate Phase Hydrocarbon Map.mxd, July 2007.




Map Source: Malcolm–Pirnie Facility–Wide Groundwater Monitoring Plan, Western Refining Bloomfield Refinery, Figure 4 Concentration Map.mxd, July 2007.

N

0 1200
SCALE IN FEET

**Legend**

- Monitoring Well
- Observation Well
- Outfall
- Recovery Well
- Site

| MW-35 | |
|---|---|
| < 1.0 | - Benzene |
| < 1.0 | - Toluene |
| < 1.0 | - Ethylbenzene |
| 3.3 | - Xylenes, Total |
| < 2.5 | - MTBE |

All concentrations in micrograms per liter (ug/L)

Western Refining
WESTERN REFINING COMPANY

PROJ. NO.:Western Refining | DATE: 6/19/08 | FILE:WestRef–B10

FIGURE 7
SPRING 2007
DISSOLVED-PHASE
GROUNDWATER DATA
GIANT BLOOMFIELD REFINERY

404 Camp Craft Road
Austin, Texas 78746

RPS JDC


Aerial Map Source: Google Maps, 2008 DigitalGlobe.

N

0 100
SCALE IN FEET

LEGEND

- PROPOSED SOIL BORING LOCATION
- W PROPOSED MONITORING WELL COMPLETION
- MW-6 MONITORING WELL LOCATION
- SURFACE SOIL SAMPLE
- B-1 1994 RFI SOIL BORING

Western Refining

WESTERN REFINING COMPANY

| PROJ. NO.: Western Refining | DATE: 6/18/08 | FILE: WestRef–B04 |
|---|---|---|

FIGURE 8
SWMU No. 4 AND No. 5,
AOC No. 22, 24, 25 AND 26
SAMPLE LOCATIONS MAP
GIANT BLOOMFIELD REFINERY

404 Camp Craft Road
Austin, Texas 78746

RPS JDC


Aerial Map Source: Google Maps, 2008 DigitalGlobe.

0 120
SCALE IN FEET

LEGEND

PROPOSED SOIL BORING LOCATION

W PROPOSED MONITORING WELL COMPLETION

MW-5 MONITORING WELL LOCATION

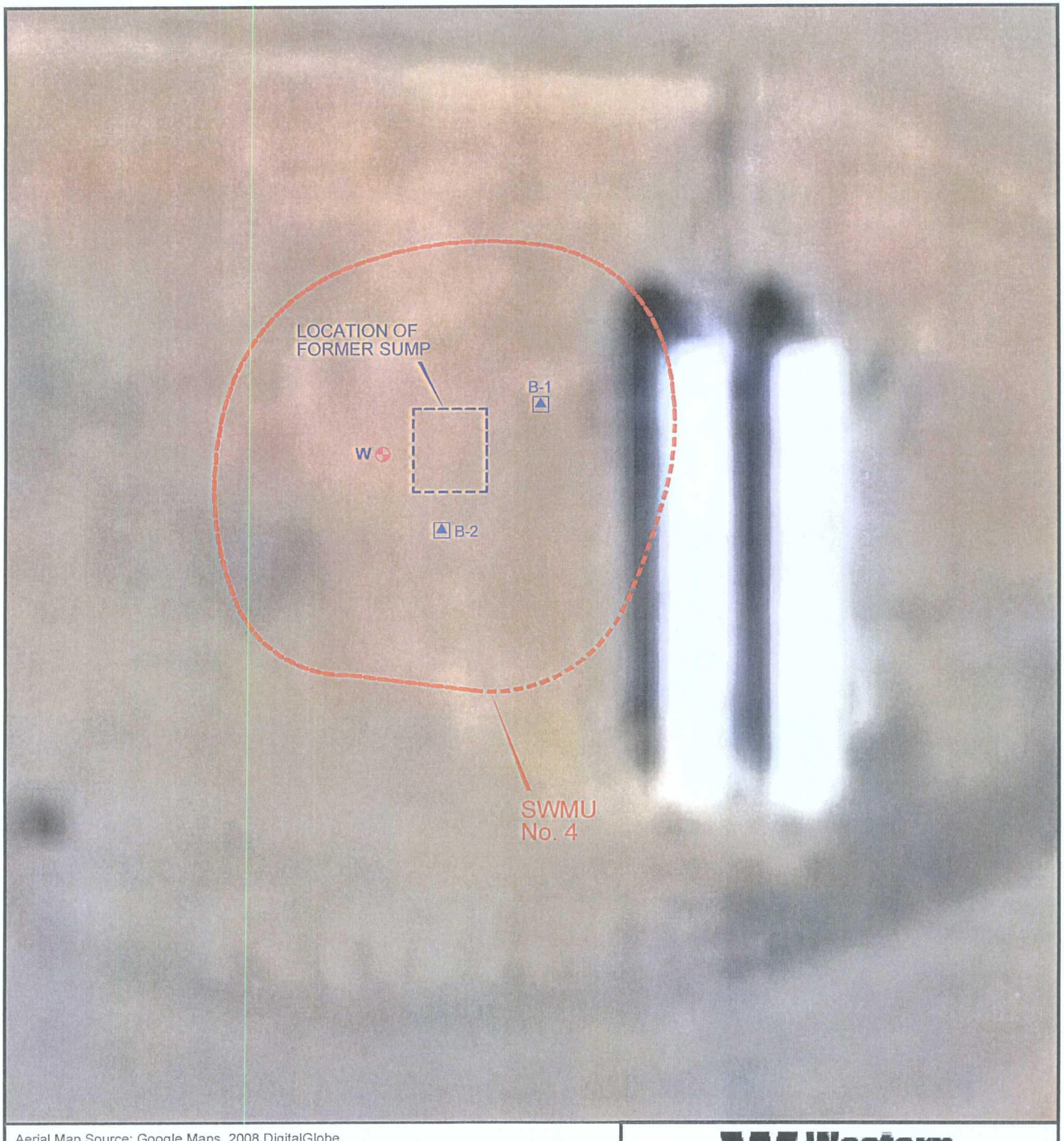
Western Refining

WESTERN REFINING COMPANY

| PROJ. NO.: Western Refining | DATE: 6/18/08 | FILE: WestRef-B05 |
|---|---|---|

FIGURE 9
AOC No. 23
SAMPLE LOCATIONS MAP
GIANT BLOOMFIELD REFINERY

404 Camp Craft Road
Austin, Texas 78746
RPS JDC




Aerial Map Source: Google Maps, 2008 DigitalGlobe.

0 20
SCALE IN FEET

LEGEND

PROPOSED SOIL BORING LOCATION

W PROPOSED MONITORING WELL COMPLETION

B-1 1994 RFI SOIL BORING

Western Refining

WESTERN REFINING COMPANY

| PROJ. NO.: Western Refining | DATE: 1/6/09 | FILE: WestRef-A27 |
|---|---|---|

FIGURE 10
SWMU No. 4
SAMPLE LOCATIONS MAP
GIANT BLOOMFIELD REFINERY

404 Camp Craft Road
Austin, Texas 78746
RPS JDC


Aerial Map Source: Google Maps, 2008 DigitalGlobe.

N

0 30
SCALE IN FEET

LEGEND

PROPOSED SOIL BORING LOCATION
W PROPOSED MONITORING WELL COMPLETION
SURFACE SOIL SAMPLE

Western Refining
WESTERN REFINING COMPANY

| PROJ. NO.: Western Refining | DATE: 1/6/09 | FILE: WestRef-B17 |
|---|---|---|

FIGURE 11
SWMU No. 5 AND AOC No. 25
SAMPLE LOCATIONS MAP
GIANT BLOOMFIELD REFINERY

RPS JDC
404 Camp Craft Road
Austin, Texas 78746


Aerial Map Source: Google Maps, 2008 DigitalGlobe.

LEGEND

- PROPOSED SOIL BORING LOCATION
- W PROPOSED MONITORING WELL COMPLETION
- SURFACE SOIL SAMPLE
- B-3 1994 RFI SOIL BORING
- DRAIN
- UNDERGROUND PIPING (APPROX. LOCATION)

N

0 40
SCALE IN FEET

Western Refining

WESTERN REFINING COMPANY

PROJ. NO.: Western Refining | DATE: 1/6/09 | FILE: WestRef-B17

FIGURE 12
AOC No. 22
SAMPLE LOCATIONS MAP
GIANT BLOOMFIELD REFINERY

404 Camp Craft Road
Austin, Texas 78746
RPS JDC


Aerial Map Source: Google Maps, 2008 DigitalGlobe.

N

0 20
SCALE IN FEET

LEGEND

- PROPOSED SOIL BORING LOCATION
- W PROPOSED MONITORING WELL COMPLETION
- SURFACE SOIL SAMPLE

Western Refining

WESTERN REFINING COMPANY

| PROJ. NO.: Western Refining | DATE: 1/6/09 | FILE: WestRef-B17 |
|---|---|---|

FIGURE 13
AOC No. 24
SAMPLE LOCATIONS MAP
GIANT BLOOMFIELD REFINERY

RPS JDC
404 Camp Craft Road
Austin, Texas 78746


Aerial Map Source: Google Maps, 2008 DigitalGlobe.

N

0 30
SCALE IN FEET

LEGEND

- PROPOSED SOIL BORING LOCATION
- W PROPOSED MONITORING WELL COMPLETION
- SURFACE SOIL SAMPLE

Western Refining

WESTERN REFINING COMPANY

PROJ. NO.: Western Refining | DATE: 1/6/09 | FILE: WestRef-B17

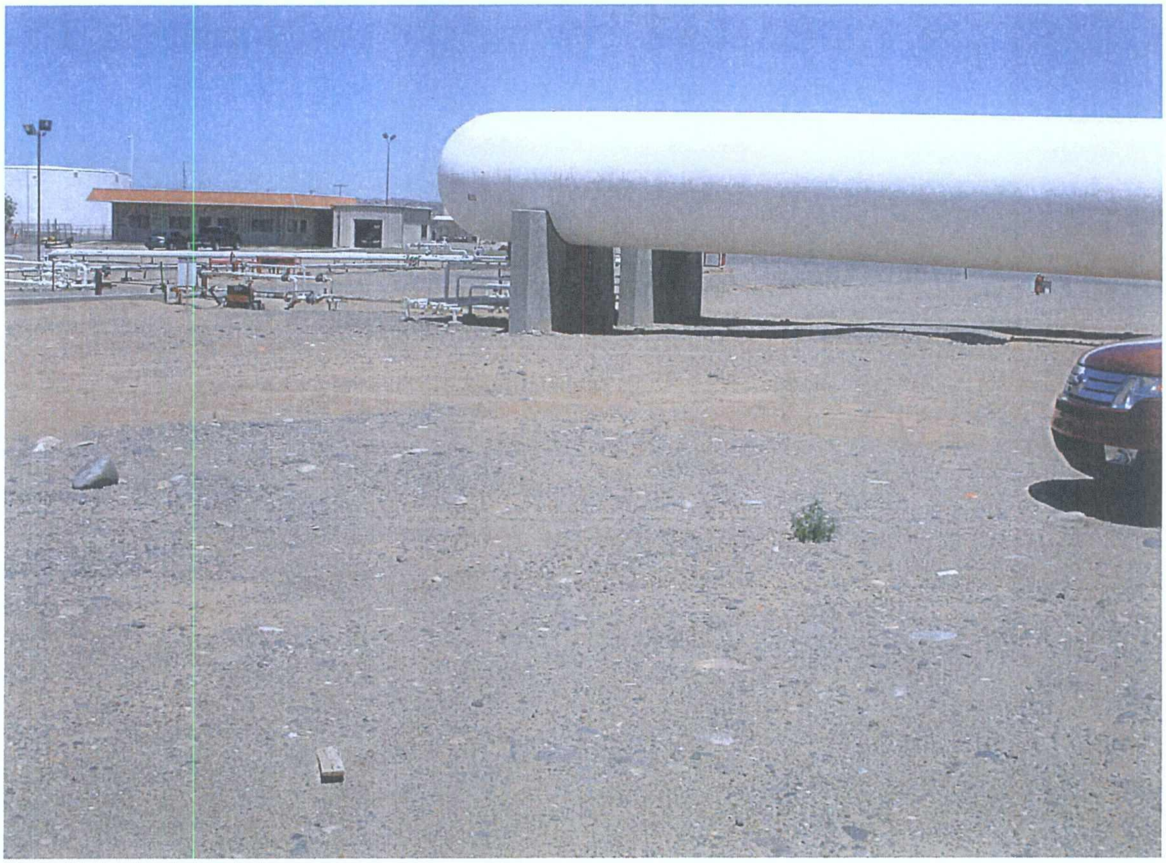
FIGURE 14
AOC No. 26
SAMPLE LOCATIONS MAP
GIANT BLOOMFIELD REFINERY

404 Camp Craft Road
Austin, Texas 78746

RPS JDC

# Appendix A

## Photographs



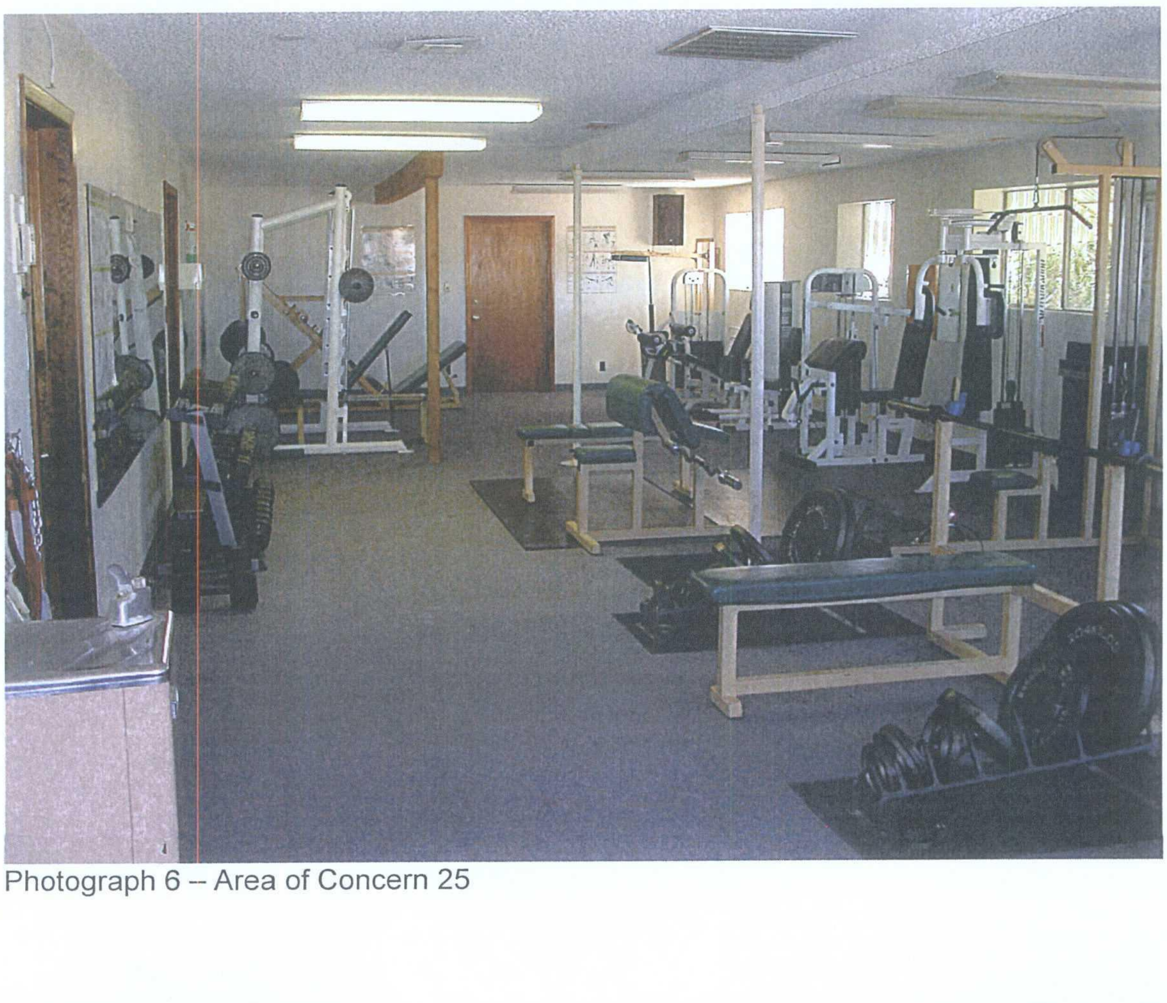
Photograph 1 -- Solid Waste Management Unit #4

Photograph 2 -- Solid Waste Management Unit #5

Photograph 3 – Solid Waste Management Unit #5

Photograph 4 – Area of Concern 25

Photograph 5 -- Area of Concern 25

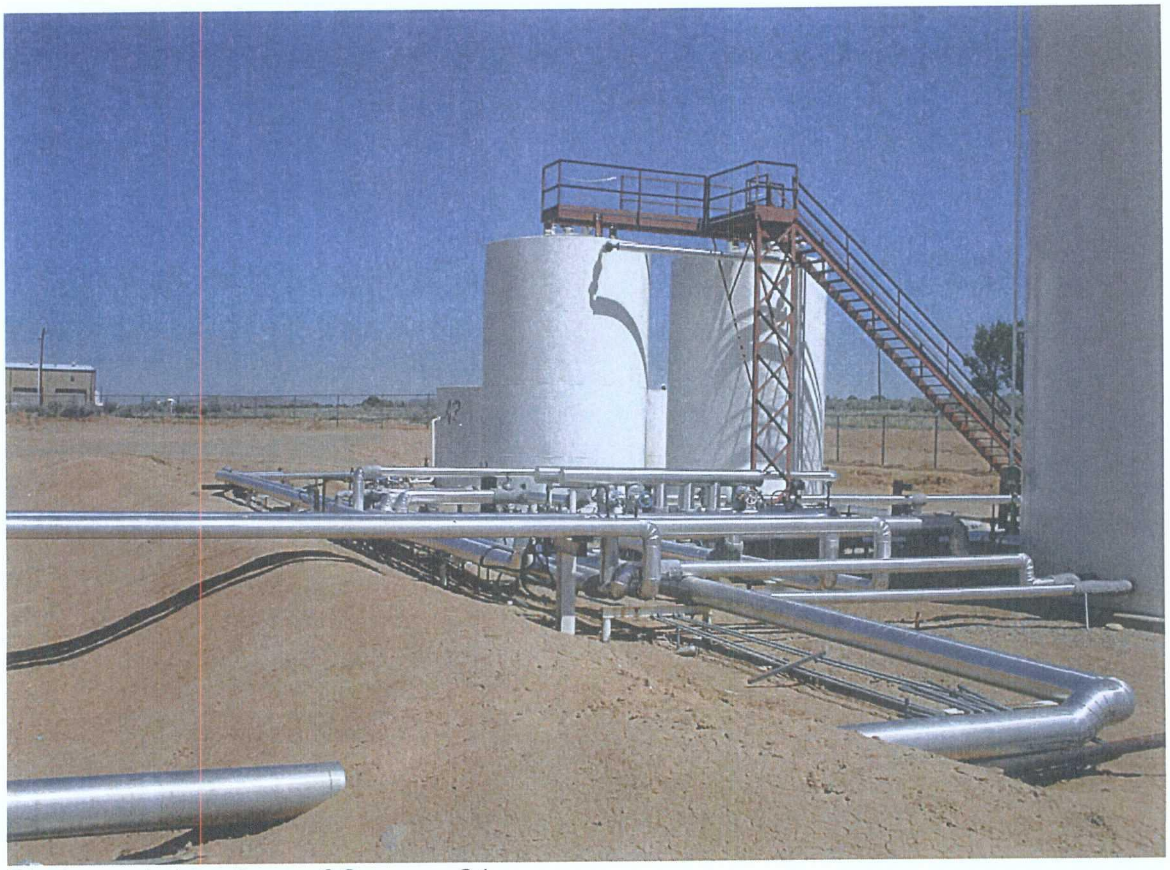

Photograph 6 -- Area of Concern 25

Photograph 7 – Area of Concern 25

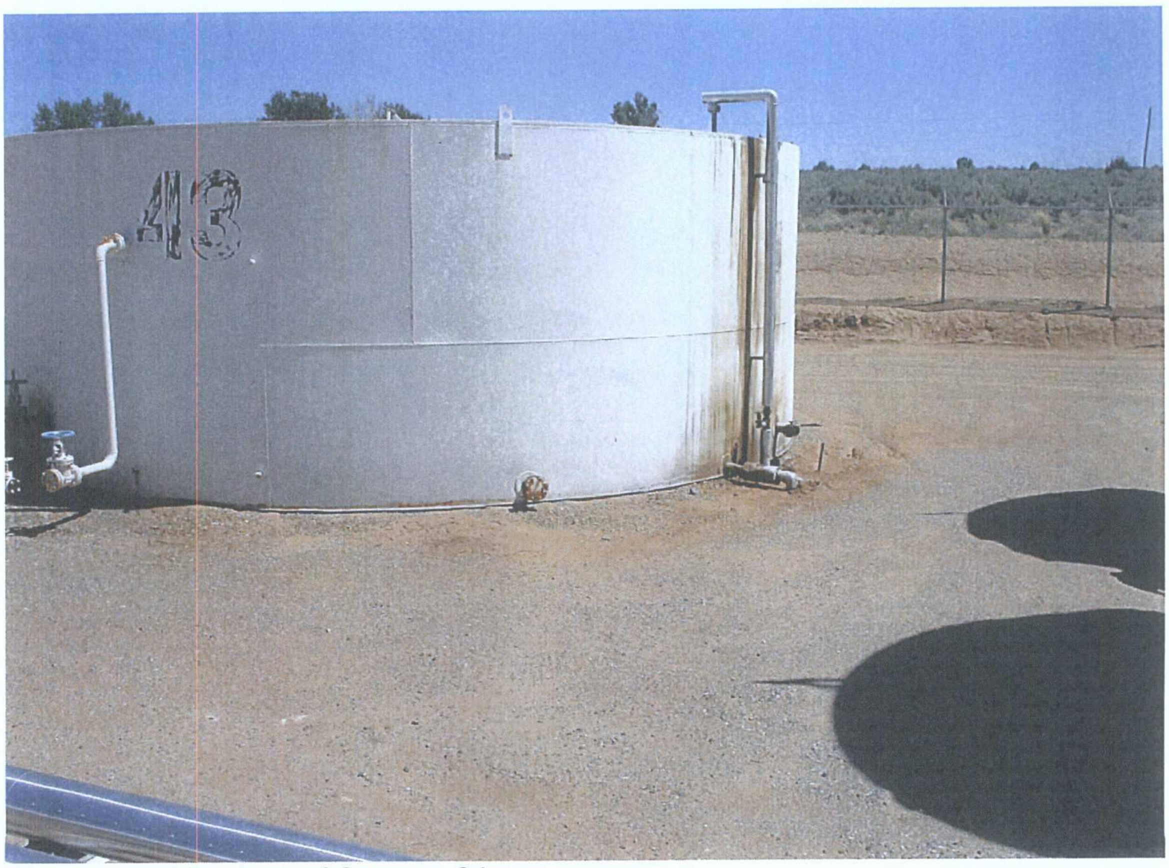
Photograph 8– Area of Concern 22

Photograph 9 -- Area of Concern 22

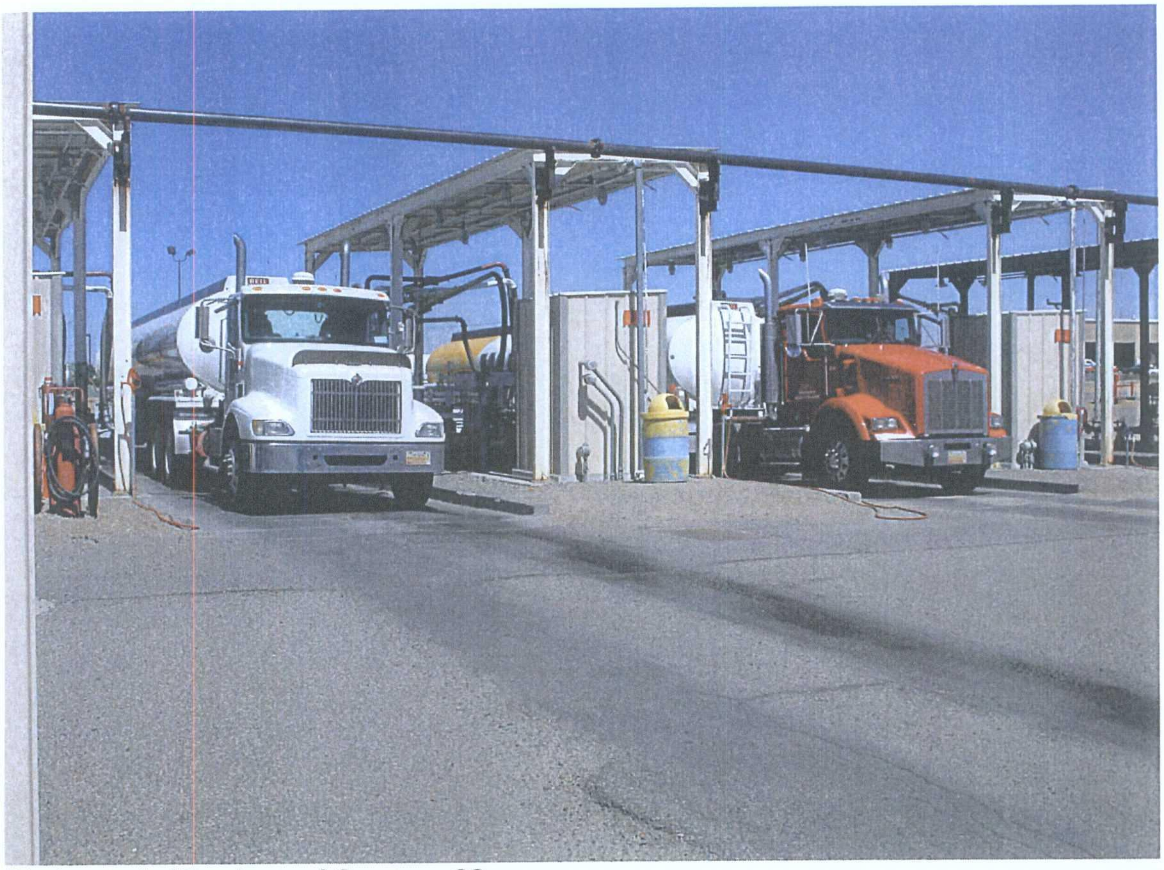
Photograph 10 – Area of Concern 22



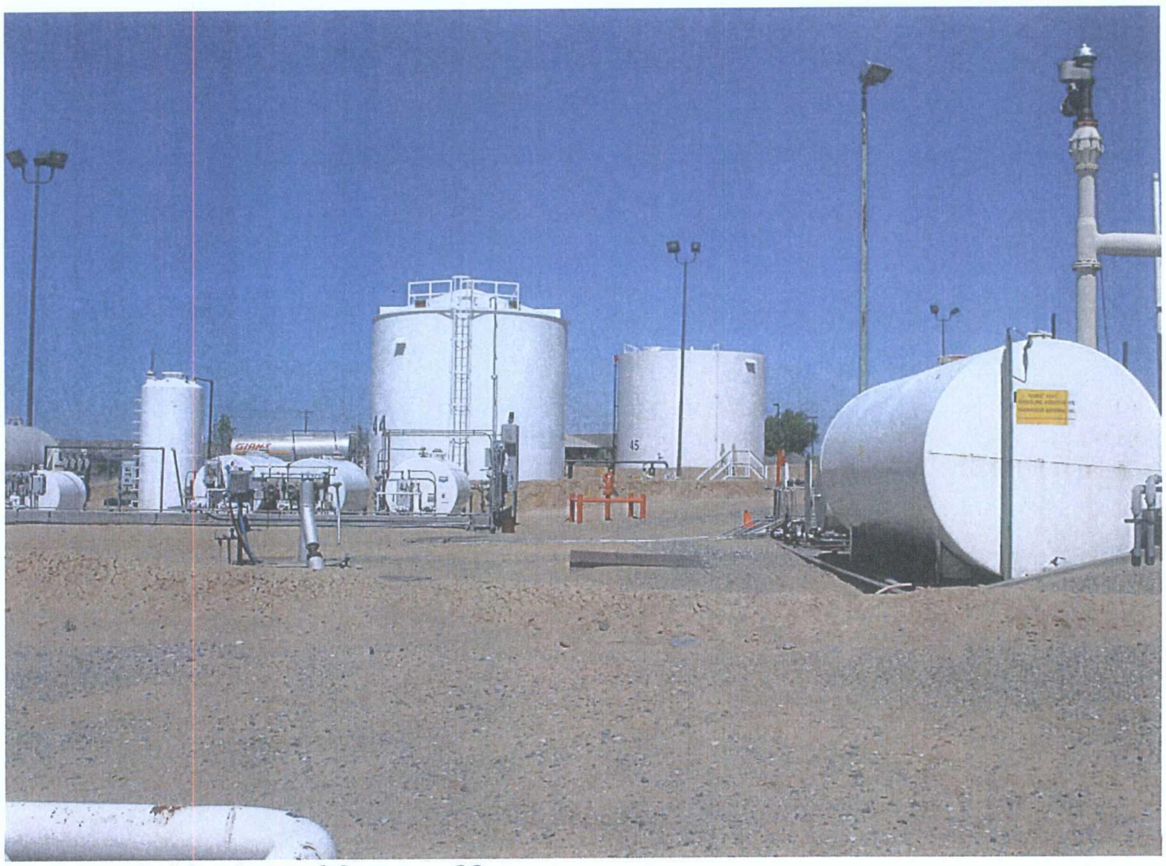
Photograph 11 – Area of Concern 24



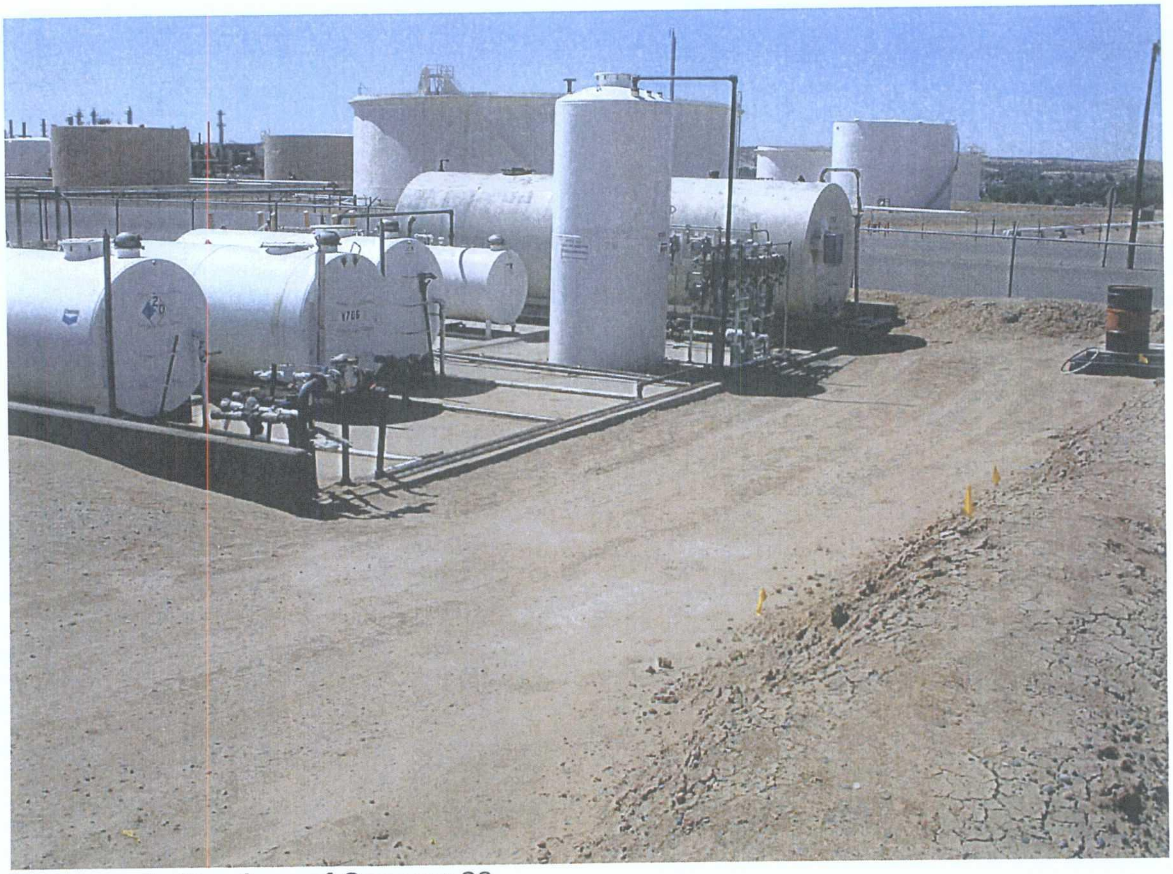

Photograph 12 – Area of Concern 24

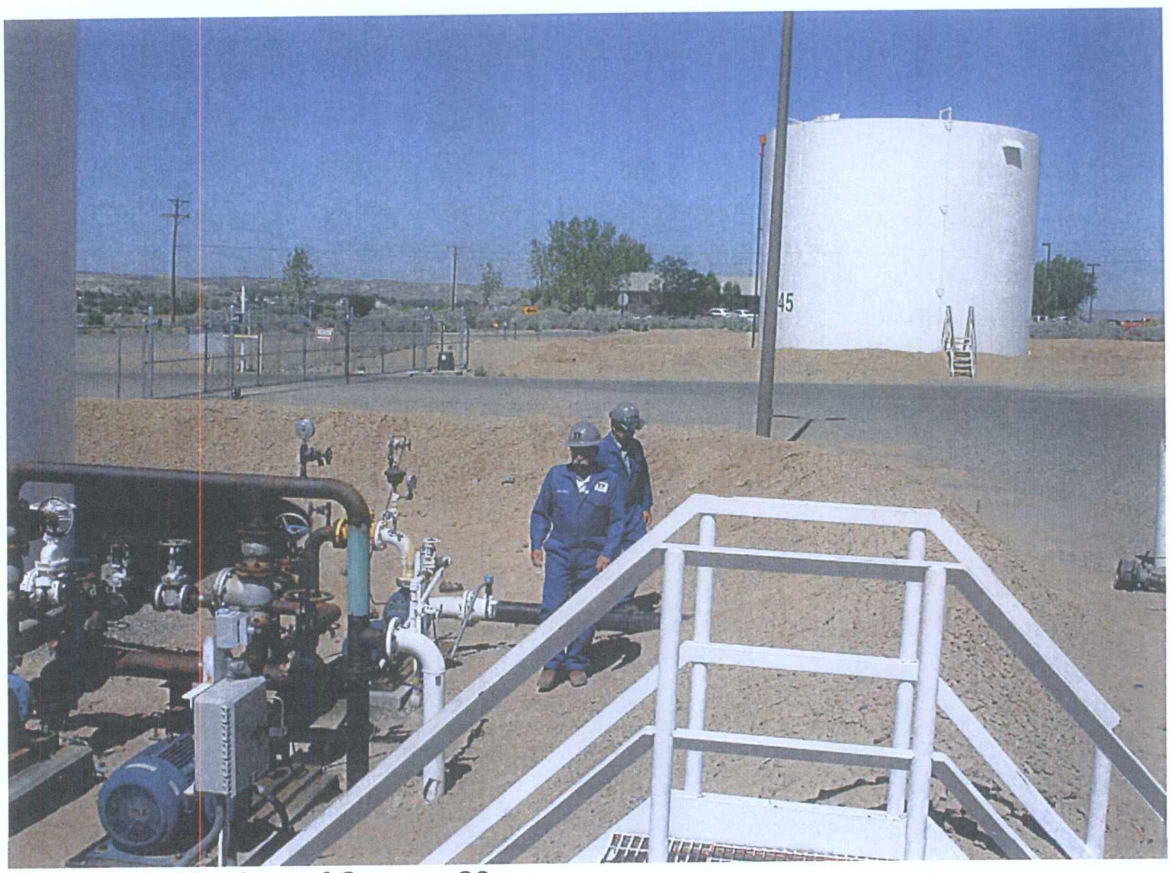


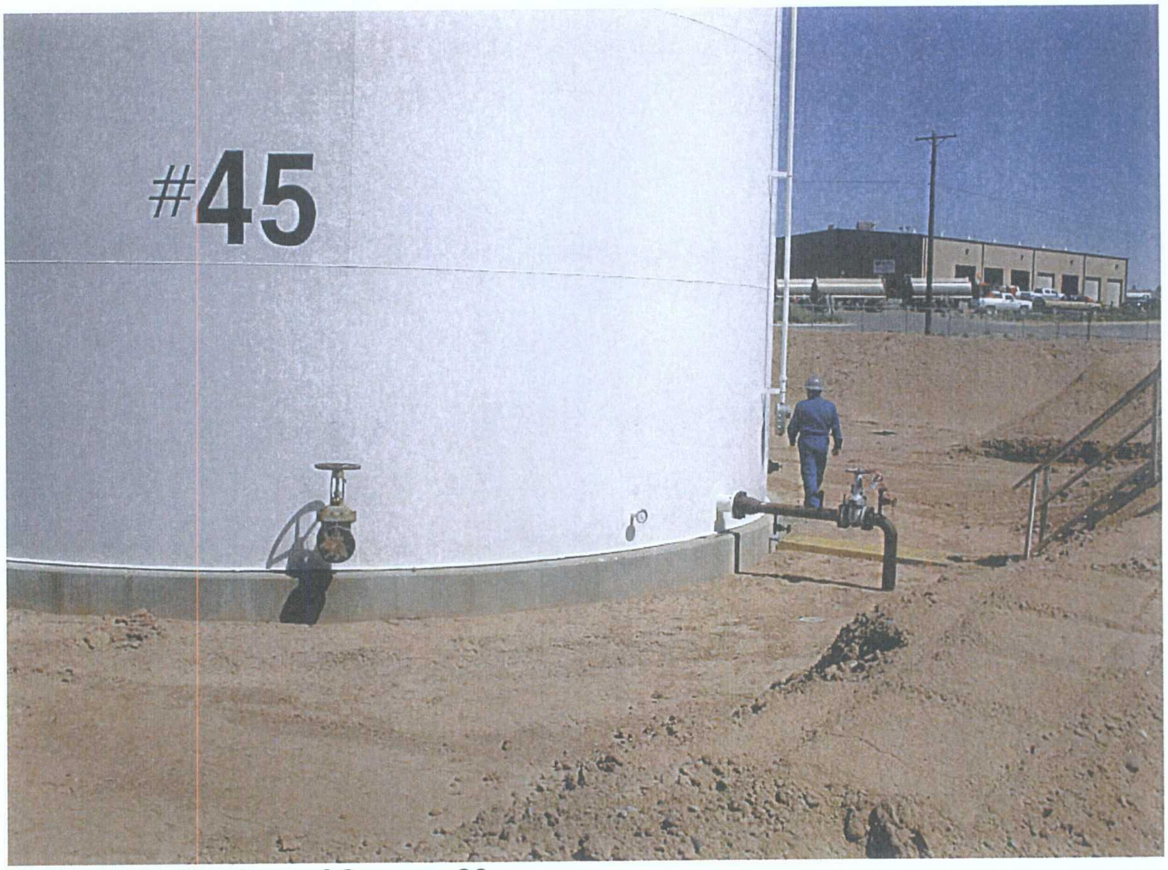
Photograph 13 – Area of Concern 22



Photograph 14 – Area of Concern 22


Photograph 15 – Area of Concern 22


Photograph 16 – Area of Concern 26



Photograph 17 – Area of Concern 26


Photograph 18 – Area of Concern 27


Photograph 19 – Area of Concern 25

RPS JDC

# Appendix B

## Investigation Derived Waste (IDW) Management Plan

RPS JDC

# IDW Management Plan

All IDW will be properly characterized and disposed of in accordance with all federal, State, and local rules and regulations for storage, labeling, handling, transport, and disposal of waste. The IDW may be characterized for disposal based on the known or suspected contaminants potentially present in the waste. It is assumed that there are no listed wastes present in environmental media at any of the planned investigation areas.

A dedicated decontamination area will be setup prior to any sample collection activities. The decontamination pad will be constructed so as to capture and contain all decontamination fluids (e.g., wash water and rinse water) and foreign materials washed off the sampling equipment. The fluids will be pumped directly into suitable storage containers (e.g., labeled 55-gallon drums), which will be located at satellite accumulation areas until the fluids are disposed in the refinery wastewater treatment system upstream of the API separator. The solids captured in the decontamination pad will be shoveled into 55-gallon drums and stored at the designated satellite accumulation area pending proper waste characterization for off-site disposal.

Drill cuttings generated during installation of soil borings and monitoring wells will be placed directly into 55-gallon drums and staged in the satellite accumulation area pending results of the waste characterization sampling. The portion of soil cores, which are not retained for analytical testing, will be placed into the same 55-gallon drums used to store the associated drill cuttings.

The solids (e.g., drill cuttings and used soil cores) will be characterized by testing to determine if there are any hazardous characteristics in accordance with 40 Code of Federal Regulations (CFR) Part 261. This includes tests for ignitability, corrosivity, reactivity, and toxicity. If the materials are not characteristically hazardous, then further testing will be performed pursuant to the requirements of the facility to which the materials will be transported. Depending upon the results of analyses for individual investigation soil samples, additional analyses may TPH and polynuclear aromatic hydrocarbons.

Purge water generated during groundwater sampling activities will be containerized in 55-gallons drums and then disposed in the refinery wastewater treatment system upstream of the API separator. All miscellaneous waste materials (e.g., discarded gloves, packing materials, etc.) will be placed into the refinery's solid waste storage containers for off-site disposal.