GW - 1

WORK PLANS

2004

GIANT
REFINING COMPANY

November 16, 2004

Mr. Roger Anderson
Environmental Bureau Chief
New Mexico Oil Conservation Division
1220 South Street Francis Drive
Santa Fe, NM 87505

Re: Corrective Action Plan

Dear Mr. Anderson:

Enclosed please find the Corrective Action Plan for the Giant Bloomfield Refinery. This is the plan that Giant had committed to in our meeting on October 18, in Santa Fe. This plan describes Giant's proposed actions to mitigate the off-site migration of petroleum hydrocarbons within the shallow-zone soils along the north property boundary of the Bloomfield refinery.

Giant is committed to the installation of a containment barrier and fluid collection systems, along the north refinery boundary. You can find an estimated implementation schedule in Figure 6. Your timely review and approval of this plan is greatly appreciated. Giant would like to start construction of the barrier wall in mid to late January.

Thanks again for working with us and if you have any questions regarding this plan please contact me at (505)

Sincerely,

James R. Schmaltz
Environmental Manager

Cc: Wayne Price. OCD, Santa Fe Office w/plan
Denny Foust, OCD, Aztec Office w/plan
Bob Wilkerson, EPA w/plan
Dave Cobrain/Hope Monzeglio NMED Hazardous Waste Bureau w/plan

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NEW MEXICO
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CORRECTIVE ACTION PLAN

GIANT BLOOMFIELD REFINERY

November 17, 2004

Prepared for:

Giant Refining Company

50 Road 4990

Bloomfield, New Mexico 87413

Prepared by:

Malcolm Pirnie, Inc.

4646 E. Van Buren St., Suite 400

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1.0 INTRODUCTION

1.1 PURPOSE

This Corrective Action Plan describes Giant's proposed actions to mitigate the off-site migration of petroleum hydrocarbons within the shallow-zone soils along the north property boundary of the Giant Refinery in Bloomfield, New Mexico. For the Corrective Action, Giant has committed to the installation of a containment barrier and fluid collection systems along the north refinery boundary, extending from County Road 4990 to a location approximately 200 feet east of the El Paso Natural Gas Pipelines.

1.2 FACILITY DESCRIPTION

The Bloomfield refinery was originally built in the late 1950's and has been operated by Kimball Campbell, O.L. Garretson (Plateau), Suburban Propane, Inc. (Plateau), Bloomfield Refining Company and Giant Refining Company. The facility consists of approximately 285 acres and is located approximately one mile south of Bloomfield, New Mexico on a bluff overlooking the San Juan River (Figure 1).

1.3 CORRECTIVE ACTION DESCRIPTION

Recent emergence of active seeps of petroleum hydrocarbons at the face of the river bluff on the north side of the refinery prompted the New Mexico Oil Conservation Division (OCD) to issue Giant an Emergency Action Directive stating the actions required by the agency. Upon receiving the Emergency Action Directive, Giant implemented the tasks outlined therein, which included the installation of temporary catchments and excavation of hydrocarbon-stained soil from the identified areas along the San Juan River bluff. In addition, Giant collected water samples from the San Juan River upstream of the refinery and at the mouth of each draw of concern. Giant continues to provide progress reports of these activities to OCD.

As a corrective action to mitigate further migration of petroleum hydrocarbons towards the San Juan River and beyond the northern property boundaries of the refinery, Giant

has committed to the installation of a containment barrier wall approximately 2,600 feet in length along the north side of the Hammond Ditch and extending from County Road 4990 to a location approximately 200 feet east of the El Paso Natural Gas Pipelines. In addition, a fluids collection system consisting of multiple recovery wells and/or collection galleries positioned along the plant side of the barrier will be installed to provide hydraulic control of fluids accumulating upgradient of the barrier.

Results from previous site characterization activities, information collected during boring campaigns conducted between November 2003 and October 2004, and a conceptual model of the Nacimiento Formation surface elevation will be used to determine the containment barrier design, develop performance specifications for construction of the containment barrier, and prepare a preliminary design for the fluids collection system. Final design of the collection system will be completed upon installation of the containment barrier and collection of additional groundwater and product level data.

2.0 SITE GEOLOGY

The Bloomfield Refinery is located within the San Juan Basin, a sub-province of the Colorado Plateau physiographic province, about 120 ft above the present river level and 500 feet from the river.

There are three distinct stratigraphic units that underlay the Bloomfield Refinery. From oldest to youngest these units are: the Nacimiento Formation, the Jackson Lake Terrace, and an unnamed structureless loess unit composed of silts and fine windblown sand that have been deposited as the result of eolian deposition.

GEOLOGY ALONG NORTH BOUNDARY

Surficial Windblown Sands

- ✓ Depth: 0 to 4 feet deep
- ✓ Permeability: Low to Moderate
- ✓ Saturation: Dry

Jackson Lake Terrace

- ✓ Depth: 6 to 10 feet deep
- ✓ Permeability: Moderate to High
- ✓ Saturation: Dry to 1-ft depth; water bearing
- ✓ Seeps located in erosional channels

Nacimiento Formation

- ✓ Perching unit for Jackson Lake Terrace
- ✓ Thickness: Approximately 900 feet
- ✓ Permeability: Low
- ✓ Saturation: Non-water bearing

During the last glacial retreat, wind blown sand and silt from the floodplains settled over the course clastics to form structureless loess deposits.

The underlining Quaternary Jackson Lake Terrace deposits consist of 10 to 15 feet of course-grained fluvioglacial outwash. It is primarily composed of well rounded gravels, cobbles, and sand sized rocks placed as the result of high energy deposition during melting of the last glacial advance. The cobbles and gravel is often disk-shaped. Cobbles and boulders are commonly observed in the deposits.

The Nacimiento Formation is described as an inter-bedded black carbonaceous mudstone/clay stone with white, medium to coarse-grained sandstones approximately 570 feet thick in this area. The Nacimiento Formation at the outcrop is a tight unfractured rock unit. A permeable saturated cobble and sand layer directly overlies the bedrock (Nacimiento Formation) at the site in areas of depressions (draws) within the bedrock formation. The morphology of the contact between the Quaternary cobble and silt of the Jackson Lake Terrace in the vicinity of the facility and the underlying Nacimiento Formation is important in that it influences control over the direction of the groundwater and SPH flow.

3.0 HYDROLOGY

Surface water in the vicinity of the refinery includes the San Juan River (to the north) and the Hammond Ditch along the north property boundary. The town of Bloomfield and the surrounding areas derive their potable water from the San Juan River, which is controlled by the Navajo Dam. The San Juan River level is approximately 75 feet lower than the Hammond Ditch, and the Hammond Ditch in turn is approximately 25 feet lower than the grade level in the northwestern part of the refinery. Water within the Hammond Ditch, a concrete lined channel, is used for irrigation and watering of livestock and not intended for human consumption.

Since the lining of the Hammond Ditch in 2001, it is no longer a contributor to local groundwater recharge at the site. Stormwater within the facility is collected in the curbed, concrete-paved process areas connected to sewers leading to the wastewater treatment system. Some areas not served by sewers collect process and stormwater in sumps, which are then emptied by a vacuum truck for delivery to the wastewater treatment system.

Prior to the lining of the Hammond Ditch, the infiltration of source water through the shallow-zone soils served as a hydraulic curtain for the migration of Phase-Separated Hydrocarbon (PSH) along the north property boundary. Lining of the Hammond Ditch and the decommissioning of unlined surface water ponds within the process area of the refinery has resulted in a significant reduction in groundwater recharge to the shallow-zone water-bearing zone on top of the Nacimiento Formation.

4.0 SITE CHARACTERIZATION DATA

This section describes recent site characterization and routine monitoring data that will be used to design and construct the north boundary barrier and fluids collection system.

4.1 WATER LEVEL & PHASE-SEPARATED HYDROCARBON (PSH) DATA

Giant conducts routine monitoring activities at the refinery, which include monthly groundwater and product level measurements in monitoring wells and peizometers (installed in soil borings made to investigate the depth to the Nacimiento Formation) along the north property boundary. Groundwater and product level measurements were collected during the months of August and October of 2004 from these location points along the north property boundary. Table 1 summarizes these data with respect to the well depth and Nacimiento Formation surface elevation. This information, combined with the collection of additional monitoring data, will be used to design the fluids collection system and provide the barrier installation contractor with soil saturation information for excavation purposes.

4.2 SLUG TESTS

In order to further understand the nature and variability of the shallow-zone soils and their hydraulic behavior, additional site characterization activities were conducted by Malcolm Pirnie, Inc. and Precision Engineering, Inc. during October 2004. Field activities included the completion of slug tests on monitoring wells MW-45 and MW-47.

The slug tests were performed to monitor the recovery rate of fluids through the shallow-zone soils. Results from the slug tests were used to estimate the aquifer properties of the shallow-zone soils and the anticipated amount of fluids accumulation along the barrier. This information will also be provided to the barrier installation contractor for estimating slurry loss into the formation during barrier construction. The following summarizes the hydraulic properties estimated from the slug test data:

Summary of Hydraulic Properties from Slug Tests

Well ID	Transmissivity (Ft^2/day)	Hydraulic Conductivity (Ft/day)
MW-45	N/A	N/A
MW-47	19.6	31.6

It should be noted that MW-45 penetrates into the Nacimiento Formation approximately 10 feet. In addition, the groundwater level measured in MW-45 during October 2004 was below the top of the Nacimiento formation. As such, the results of the slug test performed on MW-45 are not representative of the hydraulic properties of the shallow-zone soils, but rather the impermeable nature of the Nacimiento Formation.

4.3 NACIMIENTO FORMATION SURFACE CONTOUR MODEL DEVELOPMENT

Giant has conducted several drilling campaigns over the years to assess the environmental impacts of historic product releases at the refinery. In 1997, Giant

commissioned the development of a Nacimiento Formation conceptual model to assess its topographic character beneath the refinery. An initial conceptual model was developed using information from previous drilling activities. Data collected from additional borings made in November 2003 and July 2004 to specifically investigate the Nacimiento Formation were added to the conceptual model to develop a July 2004 version of the contour model (Figure 2).

A review of the July 2004 Nacimiento Formation contour model identified some uncertainties with respect to the elevation of the Nacimiento Formation along the western and far eastern portions of the proposed barrier alignment. As such, seven (7) additional soil borings were installed by Precision Engineering, Inc. during October 2004; five (5) borings were installed along the west portion and two (2) along the east portion of the proposed barrier alignment. Figure 3 shows the location of the July and October 2004 borings with respect to the proposed barrier alignment.

Each boring installed during the October 2004 drilling campaign was drilled 3 to 5 feet into the Nacimiento Formation. Soil samples were collected every 2.5 ft and submitted to a geotechnical laboratory for grain size analysis to estimate properties important for the design of the barrier and collection system. Samples collected of the Nacimiento Formation were also submitted to the lab for hydraulic conductivity testing. The following summarizes the hydraulic conductivity test results for the samples collected during the October 2004 boring campaign.

Hydraulic Conductivity Data of Nacimiento Formation

Depth of Sample (ft)	Hydraulic Conductivity (cm / sec)
12 - 12.5	6.0×10^{-7}
9.5 – 10.5	1.2×10^{-9}

The lithologic logs for the borings installed in July and October 2004 are included in Appendix A. It is our understanding that OCD has copies of the previous borings on file.

5.0 HYDROGEOLOGY OF SHALLOW-ZONE SOILS

The hydraulic properties of the shallow-zone soils are key factors in estimating the hydraulic effects of the containment barrier, as well as in the design of the fluids collection system. Results from site characterization activities, in conjunction with the Nacimiento Formation contour model, provide a conceptual understanding of the hydrogeologic behavior of the shallow-zone soils.

5.1 NACIMIENTO FORMATION SURFACE CONCEPTUAL MODEL

As discussed in Section 2.0, the shallow-zone soils (windblown sands and Jackson Lake Terrace deposits) are underlain by the non-water bearing Nacimiento Formation. The surface contour model of the Nacimiento Formation, as discussed in Section 4.3, indicates that depressions (troughs) exist within the Nacimiento Formation surface in areas along the north property boundary and underlying the refinery process areas. With the significant reduction of groundwater recharge after the lining of the Hammond Ditch and decommissioning of unlined surface water ponds within the process areas of the refinery, the surface contours of the Nacimiento Formation likely influence the migration and accumulation of groundwater and PSH beneath the refinery. This notion is further discussed in Section 5.2. Figure 4 shows the updated version of the Nacimiento Formation surface contour model based on information collected during the October 2004 drilling campaign.

5.2 SHALLOW-ZONE GROUNDWATER CONDITIONS

Based on the groundwater and product level measurements collected in August and October 2004 (shown in Table 1), the occurrence of fluids along the north property boundary varies based on the underlying topography of the Nacimiento Formation.

These fluids level measurements were used to develop a cross-sectional profile along the proposed barrier alignment (Figure 5). As shown in Figure 5, there were areas where no groundwater was detected, which support the notion that the surface contours of the Nacimiento Formation likely influence the collection of fluids within the overlying thin water-bearing zone. Figure 4 shows the location of the north boundary wells containing detectable PSH with respect to the updated surface contour of the Nacimiento Formation.

5.3 AQUIFER TEST RESULTS

The hydraulic properties of the perched aquifer located above the Nacimiento Formation were previously tested during several aquifer tests conducted by Groundwater Technologies in June 1994. Two types of tests were attempted: a short-term, variable discharge rate (step-drawdown test), and a long-term pumping test. The objective of the short-term, variable discharge rate test was to estimate the specific capacity of the well and estimate the sustainable flowrate. The objective of the long-term aquifer test was to estimate the hydraulic properties of the saturated zone, which include the transmissivity, hydraulic conductivity, and specific yield. The following is a summary of the estimated hydraulic properties of the shallow-zone developed from these tests (Groundwater Technology, 1994).

Summary of Hydraulic Properties

Well No.	**Transmissivity** (ft^2 / day)	**Hydraulic Conductivity** (ft/day)	**Storativity** (Dimensionless)
MP-3	1412	177	0.015
MP-4	1260	158	0.003
RW-22	353	44	NA

The calculated values of transmissivity and hydraulic conductivity from the June 1994 aquifer tests are indicative of a high-permeability saturated zone, representing sand and gravel deposits.

A slug test was performed on MW-47, as discussed in Section 4.2. The results from the slug test have similar hydraulic properties to the wells tested above. Note, the above wells were located in the plant facility and had much greater saturated thickness. Based on the aquifer test and slug test results, the Jackson Lake Terrace Deposits have hydraulic conductivity, ranging between 40 to 180 ft/day, averaging 150 ft/day. The deposits exhibit high permeability characteristics, but have minimal saturated thickness near the Hammond Ditch.

5.4 CONCLUSIONS

Based on the hydraulic properties of the shallow-zone soils and limited saturation, groundwater flow and fluids accumulating along the proposed barrier are estimated to be below 10 gallons per minute (gpm). This estimate was determined based on the following:

$$Q = \frac{K\,I\,A}{\eta}$$ where

K = 150 ft/day

η = 40% porosity

I = .002ft/ft gradient

A = 2600 feet x 2 feet saturation

It is our opinion that groundwater that flows toward the barrier will accumulate in the depressions on the surface of the Nacimiento Formation. Collection methods to extract the groundwater behind the barrier may include collection trenches, wells, or other methods. It is believed that extracting groundwater only in the depressions will provide sufficient capture of groundwater behind the barrier. This approach will cause groundwater to move from the higher elevations to the lower areas of depressions and limit potential groundwater level rise away from the collection areas.

5.5 ADDITIONAL MONITORING PLAN

Continued monitoring of the groundwater and PSH levels along the north property boundary, including the soil borings installed in October 2004, will be conducted by Giant on a monthly basis through January 2005. The water level information will be used

to confirm preliminary conclusions with respect to the amount of fluids that may accumulate at the barrier and to prepare a final design for the fluids collection system (Section 6.2). Table 2 includes the list of monitoring wells and soil borings along the north property boundary that will be included in the on-going monitoring activities.

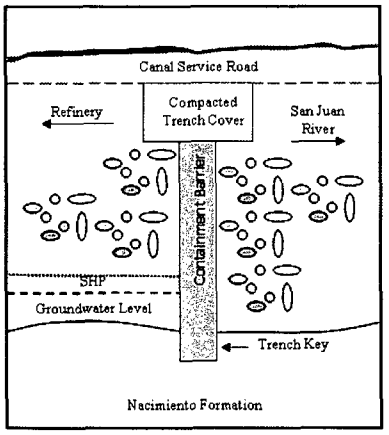
6.0 PROPOSED CORRECTIVE ACTION PLAN

As a corrective action to mitigate further off-site migration of petroleum hydrocarbons, Giant has committed to the installation of a containment barrier and fluids collection system along the north property boundary. The containment barrier will extend from County Road 4990 to a location approximately 200 feet east of the El Paso Natural Gas Pipelines. The approximately 2,600-foot long barrier will be installed along the north side of and parallel to the Hammond Ditch, within the existing service roadway. A fluids collection system, consisting of multiple fluids recovery location points along the refinery side of the barrier, will serve to provide hydraulic control of fluids accumulating along the barrier.

6.1 BARRIER CONCEPT

In general, the north boundary barrier will be constructed by excavating a narrow trench, typically 3 to 5 feet wide, through the Jackson Lake Terrace and into the Nacimiento Formation. The barrier, varying in depth from approximately 10 to 15 feet along the alignment, will key into the top of the Nacimiento Formation a minimum of 3 feet to mitigate potential underflow of fluids.

Barrier Concept



The barrier design and method of construction will be determined by Giant based on competitive proposals solicited from experienced barrier contractors. The performance requirement will be to install a finished barrier that provides a hydraulic conductivity (permeability (k)) of $1x10^{-7}$ cm/sec or less.

Several designs and construction methods are available to achieve this performance objective: soil-bentonite slurry trench walls; soil-cement slurry trench walls; slurry trench with geo-membrane barrier; and shallow soil mixing using bentonite and/or cement to create an in-place wall. Contractor proposals will be evaluated based on their ability to achieve the required performance specifications, constructability considering site conditions, ability to meet the desired installation schedule, and cost effectiveness.

Appropriate construction quality control measures will be applied during barrier construction to verify that the performance requirements will be achieved.

Clean soil excavated from the trench may be utilized by the contractor for barrier construction (if appropriate) and for backfill purposes. Contaminated soil will be segregated to the extent possible and properly stock-piled in a separate location on-site for proper characterization and subsequent management. Giant will determine the management approach (e.g., on-site treatment or off-site disposal) for the contaminated soil once the quantity and character of the soil is determined.

6.1.1 Utility Crossings

Subsurface utilities have been identified at three locations along the proposed barrier alignment. Those locations are:

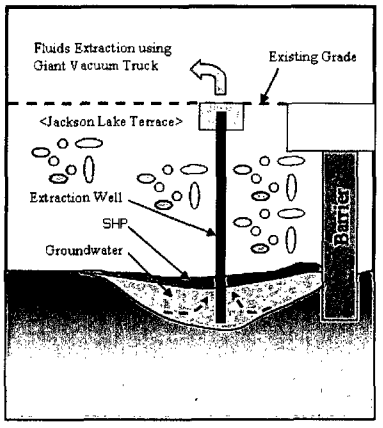
- Tank 37 (French Drain Collection System), located approximately 50 feet east of SB1-0704,
- Fire water supply pipeline, located approximately 100 feet west of the El Paso Pipeline easement, and
- El Paso Natural Gas Pipelines, located within a 100-foot easement west of P8 (SB7-1103).

In locations where it is possible to install sufficient barrier height to achieve the desired performance, the barrier will pass beneath the utilities. However, depending on the depth of the subsurface utilities with respect to the Nacimiento Formation in those locations, utilities may be required to penetrate the barrier. If so, proper sealing techniques will be employed at those locations to mitigate leakage.

6.2 FLUIDS COLLECTION CONCEPT

Hydraulic control of fluids (groundwater and PSH) captured by the barrier will be accomplished by installing a series of collection wells and/or interceptor trenches at locations along the length of the barrier. Conceptually, collection wells or trenches will be located at Nacimiento trough intersections along the barrier. Additional collection points may be required along the barrier based on the results of the additional water level monitoring (Section 5.5) and/or operational experience after the barrier is installed.

Fluids Collection System



Fluids will be removed from the collection points using a vacuum truck when necessary based on fluids level monitoring results. Collected fluids will delivered to the existing French Drain collection tank near SB2-0704.

6.3 IMPLEMENTATION CONCEPT

Implementation of the barrier and fluids collection system will be completed in two phases. Phase I will include development of construction documents and solicitation of bids for the containment barrier, followed by construction of the barrier. Phase II will consist of the design and installation of the fluids collection system. The fluids collection system will be installed after completion of the containment barrier construction.

6.4 CONSTRUCTION PERMITS

Giant will comply with all permitting requirements associated with the construction of the containment barrier.

Preliminarily, it appears only a construction stormwater permit will be required. Giant will submit a Notice of Intent (NOI) to United States Environmental Protection Agency (USEPA) Region 6 prior to the start of construction activities. The NOI process will include an Endangered Species Act Review by United States Fish and Wildlife Services (USFWS) for the adjacent reach of the San Juan River, and development of a Storm Water Pollution Prevention Plan (SWPPP).

VOC air emissions during the excavation activities are expected to be insignificant and not trigger any state permitting requirements. On-site treatment (e.g., landfarming) of petroleum-contaminated soils may require air permitting activities. Giant will further evaluate that issue if on-site soil treatment is pursued.

7.0 SCHEDULE

Construction of the northern boundary containment barrier is anticipated to start by January 17, 2004. Figure 6 shows the estimated implementation schedule.

8.0 REFERENCES

Groundwater Technology, 1994. Uppermost Aquifer Hydraulic Testing and Modeling; Giant Refining Company.

TABLE 1
Groundwater and Phase-Separated Hydrocarbon (PSH) Level Data

Well ID	Date of Data Collection	Field Data			Data Interpretation		
		Total Boring Depth Below Grade (ft)	Depth to Water Below Grade (ft)	Depth to SPH Below Grade (ft)	Depth to Nacimiento Below Grade (ft)	Water Depth on top of Nacimiento (ft)	SPH Depth on Top of Groundwater (ft)
MW-47	8/16/2004	14.28	8.86	7.68	10.2	1.34	1.18
	10/13/2004	14.28	8.59	7.54	10.2	1.61	1.05
MW-46	8/16/2004	10.39	ND	ND	6.5	0	0
	10/13/2004	10.39	ND	ND	6.5	0	0
SB1-0704	9/1/2004	10	7.67	ND	8	0.33	0
	10/13/2004	10	7.59	ND	8	0.41	0
SB2-0704	8/30/2004	11.5	7.47	ND	10	2.53	0
	10/13/2004	11.5	7.4	ND	10	2.6	0
SB3-0704	9/1/2004	11.5	8.42	7.41	10	1.58	1.01
	10/13/2004	11.5	8.43	7.38	10	1.57	1.05
MW-45 [1]	8/16/2004	16.92	Not Measured	Not Measured	7	Not Measured	Not Measured
	10/13/2004	16.92	13.04	8.79	7	[2]	[2]
SB4-0704	9/1/2004	11	8.21	ND	9.5	1.29	0
	10/13/2004	11	7.96	ND	9.5	1.54	0
SB5-0704	9/1/2004	10.5	Not Measured	Not Measured	9.25	Not Measured	Not Measured
	10/13/2004	10.5	7.46	ND	9.25	1.79	0
MW-24	8/26/2004	15.14	ND	13.96	12.5	0	[2]
	10/13/2004	15.14	Not Measured	Not Measured	12.5	Not Measured	Not Measured
P6 (SB8-1103)	8/30/2004	11	9.98	9.62	11	1.02	0.36
	10/13/2004	11	9.81	9.48	11	1.19	0.33
SB6-0704	8/30/2004	10.5	7.44	ND	8	0.56	0
	10/13/2004	10.5	7.17	ND	8	0.83	0
SB7-0704	8/30/2004	10.5	7.35	6.78	9	1.65	0.57
	10/13/2004	10.5	6.77	6.44	9	2.23	0.33
P7 (SB9-1103)	8/30/2004	14	6.84	ND	12	5.16	0
	10/13/2004	14	6.68	ND	12	5.32	0
P8 (SB7-1103)	8/30/2004	12	9.42	9.32	10.5	1.08	0.1
	10/13/2004	12	9.38	9.28	10.5	1.12	0.1
SB8-0704	9/1/2004	10.5	6.6	ND	9	2.4	0
	10/13/2004	10.5	6.55	ND	9	2.45	0
P9 (SB6-1103)	8/30/2004	10.5	7.13	ND	8	0.87	0
	10/13/2004	10.5	7.08	ND	8	0.92	0

Notes:

(1) = Groundwater level not measured in August '04 because monitoring well is currently equipped with a submersible pump, serving as a Recovery Well.

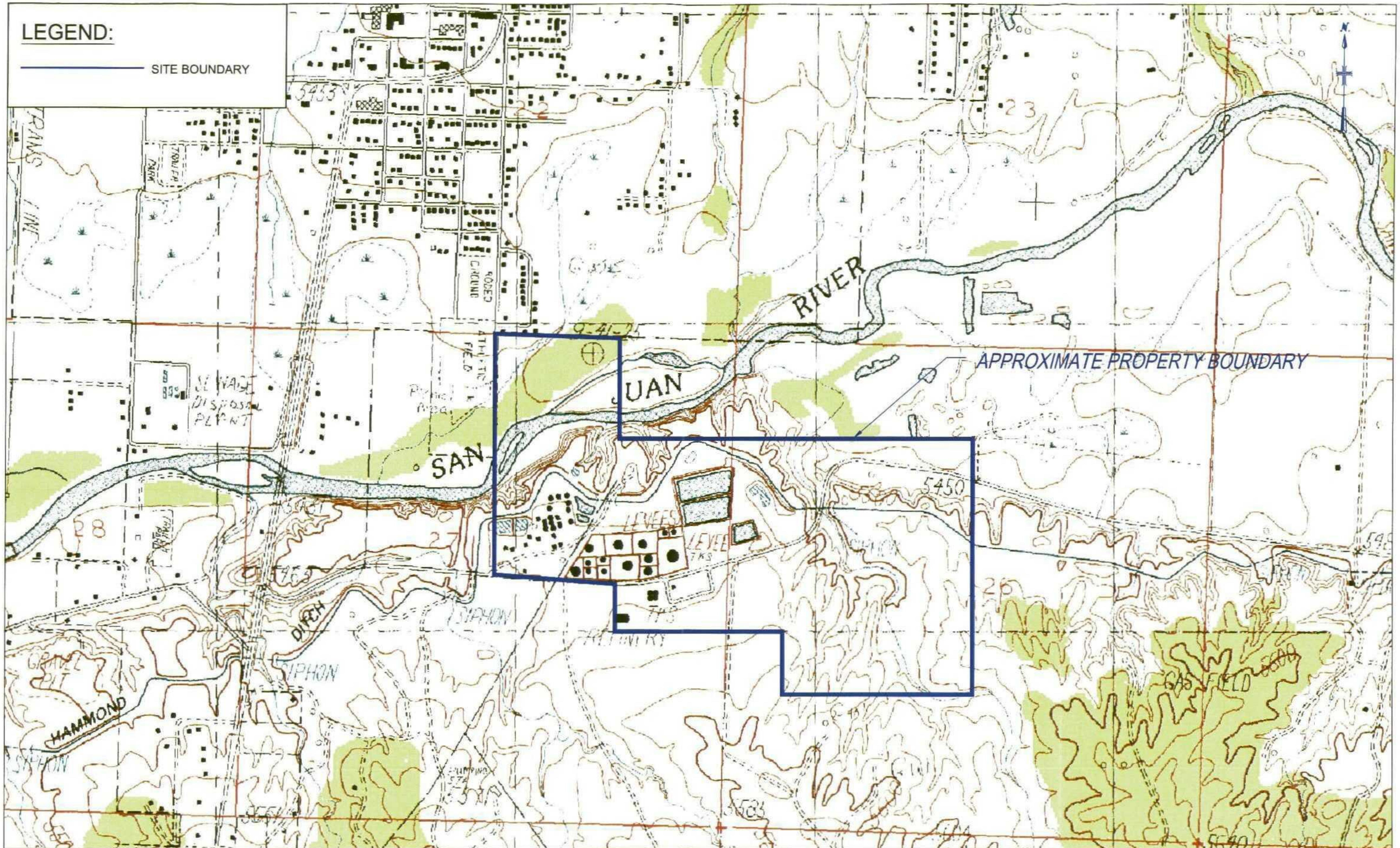
(2) = Depth to groundwater and/or PSH measured to be below top of Nacimiento Formation due to total well depth. Fluid thickness within well sump not representative of fluids depth overlying Nacimiento Formation surface.

ND = Not Detected

TABLE 2

Monthly Monitoring Schedule

Well ID	November 8th, 2004		
SB2-1004	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB3-1004	November 8th, 2004	December 6th, 2004	January 3rd, 2005
MW-47	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB4-1004	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB5-1004	November 8th, 2004	December 6th, 2004	January 3rd, 2005
MW-46	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB6-1004	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB1-0704	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB2-0704	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB3-0704	November 8th, 2004	December 6th, 2004	January 3rd, 2005
MW-45	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB4-0704	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB5-0704	November 8th, 2004	December 6th, 2004	January 3rd, 2005
P-6 (SB8-1103)	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB6-0704	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB7-0704	November 8th, 2004	December 6th, 2004	January 3rd, 2005
P-7 (SB9-1103)	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB7-1004	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB8-1004	November 8th, 2004	December 6th, 2004	January 3rd, 2005
P-8 (SB7-1103)	November 8th, 2004	December 6th, 2004	January 3rd, 2005
SB8-0704	November 8th, 2004	December 6th, 2004	January 3rd, 2005
P-9 (SB6-1103)	November 8th, 2004	December 6th, 2004	January 3rd, 2005



MALCOLM PIRNIE	GIANT REFINERY BLOOMFIELD, NEW MEXICO CORRECTIVE ACTION PLAN	SITE LOCATION NOT TO SCALE	MALCOLM PIRNIE, INC. NOVEMBER 2004 FIGURE 1

LEGEND:

- 5492 — EXISTING NACIMIENTO FORMATION 2' CONTOUR INTERVAL
- 5500 — EXISTING NACIMIENTO FORMATION 10' CONTOUR INTERVAL
- SOIL BORING / PIEZOMETER
- RECOVERY / MONITORING WELL

MALCOLM PIRNIE	GIANT REFINERY BLOOMFIELD, NEW MEXICO CORRECTIVE ACTION PLAN	JULY 2004 - NACIMIENTO FORMATION SURFACE CONTOUR MAP SCALE:1"=200'	MALCOLM PIRNIE, INC. NOVEMBER 2004 FIGURE 2

LEGEND:

- BARRIER WALL LOCATION
- SOIL BORING / PIEZOMETER - NOVEMBER 2003
- SOIL BORING / PIEZOMETER - JULY 2004
- SOIL BORING / PIEZOMETER - OCTOBER 2004
- SOIL BORING
- PIEZOMETER
- RECOVERY / MONITORING WELL

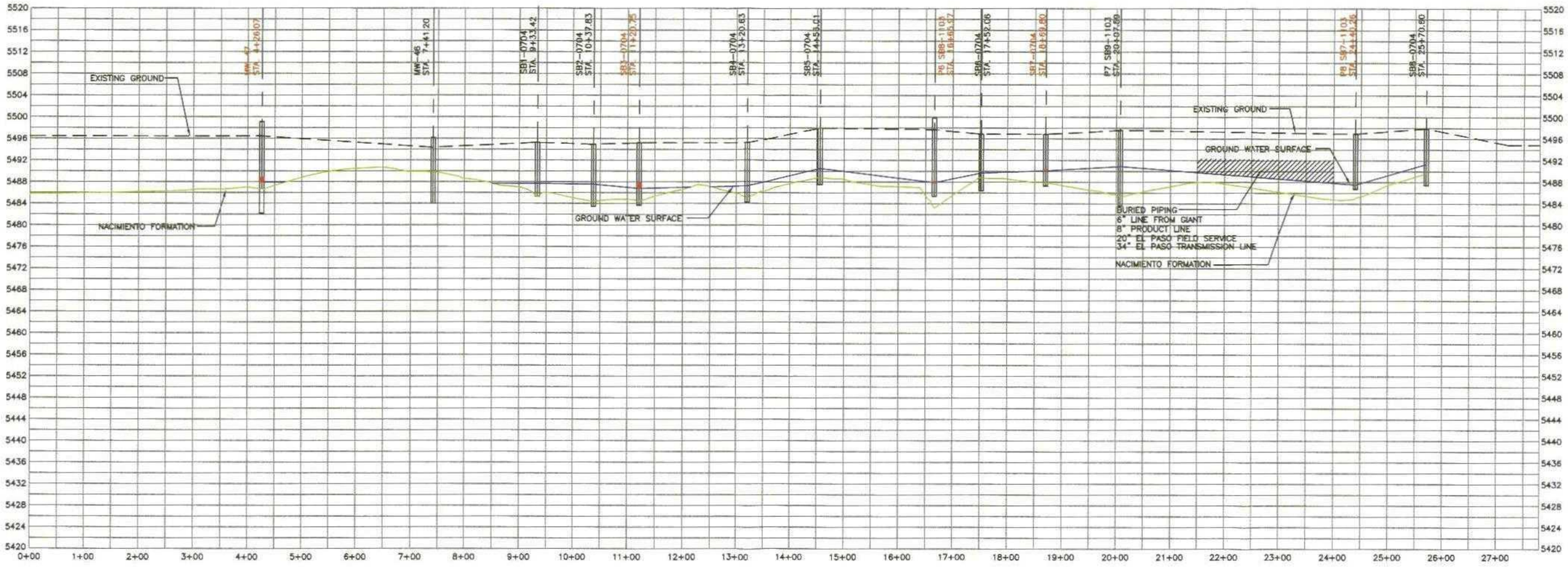
MALCOLM PIRNIE	GIANT REFINERY BLOOMFIELD, NEW MEXICO CORRECTIVE ACTION PLAN	NORTH BOUNDARY SOIL BORING LOCATION MAP SCALE:1"=200'	MALCOLM PIRNIE, INC. NOVEMBER 2004 FIGURE 3

LEGEND:

- BARRIER WALL LOCATION
- 5492 EXISTING NACIMIENTO FORMATION 2' CONTOUR INTERVAL
- 5500 EXISTING NACIMIENTO FORMATION 10' CONTOUR INTERVAL
- SOIL BORING
- RECOVERY / MONITORING WELL
- SOIL BORING WHERE SEPARATE PHASE HYDROCARBON (SPH) WAS DETECTED
- MONITORING WELL WHERE SEPARATE PHASE HYDROCARBON (SPH) WAS DETECTED

(1) CONTOURS SHOWN ON PLAN REPRESENT THE JULY 2004 CONTOUR MODEL. A REVISED FIGURE 4 WILL BE SUBMITTED AT A LATER DATE, SHOWING NOVEMBER 2004 CONTOURS ONCE THE NEW CONTOUR MODEL IS AVAILABLE.

MALCOLM PIRNIE	GIANT REFINERY BLOOMFIELD, NEW MEXICO CORRECTIVE ACTION PLAN	REVISED NACIMIENTO FORMATION SURFACE CONTOUR MAP (1) OCTOBER 2004 SCALE:1"=200'	MALCOLM PIRNIE, INC. NOVEMBER 2004 FIGURE 4



(1) ELEVATION OF THE FORMATION SHOWN IS FROM THE JULY 2004 CONTOUR MODEL. A REVISED FIGURE 5 WILL BE SUBMITTED, SHOWING THE OCTOBER 2004 BORINGS AND NOVEMBER 2004 CONTOURS ONCE THE NEW CONTOUR MODEL IS AVAILABLE.

SECTION A-A'

LEGEND:

SB3-0704 — SOIL BORING WHERE SEPARATE PHASE HYDROCARBON (SPH) WAS DETECTED

MW-47 — MONITORING WELL WHERE SEPARATE PHASE HYDROCARBON (SPH) WAS DETECTED

100 0 200

SCALE: 1" = 200'

MALCOLM PIRNIE

GIANT REFINERY
BLOOMFIELD, NEW MEXICO

CORRECTIVE ACTION PLAN

NORTH BOUNDARY BARRIER CROSS SECTION A-A' (1)

SCALE:1"=200'

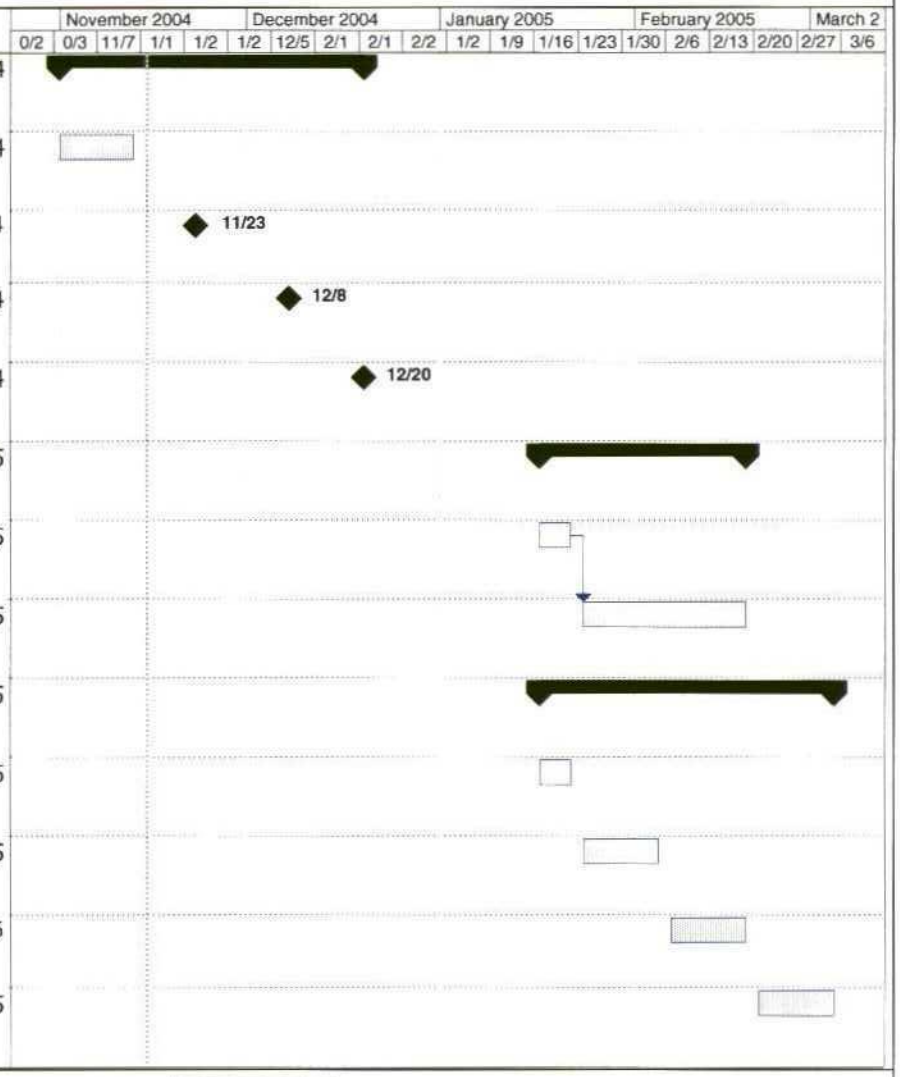
MALCOLM PIRNIE, INC.

NOVEMBER 2004

FIGURE 5

FIGURE 6
Giant Refining Company
Bloomfield Refinery
Estimated Corrective Action Implementation Schedule

ID	Task Name	Duration	Start	Finish
1	**Contractor Selection Process**	35 days	Mon 11/1/04	Mon 12/20/04
2	Prepare Construction Documents	10 days	Mon 11/1/04	Fri 11/12/04
3	Pre-Bid Site Walk	0 days	Tue 11/23/04	Tue 11/23/04
4	Bid Due Date	0 days	Wed 12/8/04	Wed 12/8/04
5	Contract Award	0 days	Mon 12/20/04	Mon 12/20/04
6	**Construction of Containment Barrier**	25 days	Mon 1/17/05	Fri 2/18/05
7	Contractor Mobilization	5 days	Mon 1/17/05	Fri 1/21/05
8	Barrier Wall Construction	20 days	Mon 1/24/05	Fri 2/18/05
9	**Fluids Collection System**	35 days	Mon 1/17/05	Fri 3/4/05
10	Review Additional Monitoring Data	5 days	Mon 1/17/05	Fri 1/21/05
11	Design Fluids Collection System	10 days	Mon 1/24/05	Fri 2/4/05
12	Engage Installation Contractor	10 days	Mon 2/7/05	Fri 2/18/05
13	Install Collection System	10 days	Mon 2/21/05	Fri 3/4/05



Project: Estimated CA Schedule_1109
Date: Mon 11/15/04

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

Bloomfield Refinery CAP
November 8, 2004

PRECISION ENGINEERING, INC.
P.O. BOX 422 • LAS CRUCES, NM 88004
PH: (505) 523-7674
FAX 505-523-7248 • e-mail: werpei@aol.com

November 11, 2004

Mr. Randy Schmaltz
Giant Refining Company
Bloomfield Refinery
#50 County Road 4990
Bloomfield, New Mexico 87413

Re: Hammond Ditch Conditions
File No 04-043

Mr. Schmaltz,

Attached are the boring logs advanced along the Hammond Ditch. Included are the logs from the November 2003 drilling, the July 2004 drilling and the October 2004 drilling programs. Using the data the conceptual model of the Nacimiento Formation surface has been updated. Along with the boring data are included some physical properties of the on-site materials. These include gradation and hydraulic conductivity of the materials. Below is a brief geologic summary of the site for your use.

The Giant Refining Company, Bloomfield Refinery is situated on a bluff approximately one hundred (100) feet above the current channel of the San Juan River. There are three (3) major geologic units at the site. The lower most is known as the Nacimiento Formation of Cretaceous Age. The unit has been investigated to a depth of approximately one hundred (100) feet at the site and is comprised of mudstone, siltstone and argillaceous sandstones. Literature concerning the Formation in the area suggests that it is on the order of nine hundred (900) feet in total thickness and is comprised of similar rock types throughout the total thickness. Hydraulic conductivity testing of the formation is attached and confirms our physical findings that the Formation is essentially impervious to water migration under the head encountered at the site. The Nacimiento formation has a weakly defined joint pattern at the site and where exposed at the bluff face does show some erosion along the joints. Drilling in the area indicates that within a few feet of the exposed face the jointing is very tight and does not transmit water. Free water is not encountered in the Nacimiento Formation at the site.

Immediately overlying the Nacimiento Formation is a unit that is comprised of well rounded boulder, cobble, gravel and sand known as the Jackson Lake Terrace. Although the unit is named it, as yet, does not carry formation status because of its relatively limited extent. The material was emplaced as a result of high energy fluvial deposition. As a result the material is relatively clean (devoid of clay or silt size material) and is able to transmit water readily. There is some carbonate and sulfate salt accumulation in the gravels at scattered locations allowing vertical cuts to be made. Any disturbance of the materials or if moisture is added to the soils breaks the bonds and the slope face will collapse. The steepest natural slopes in the area have a horizontal to vertical ratio of 1.5:1. Any excavation in these gravels would require artificial support if not filled with a heavy supporting slurry.

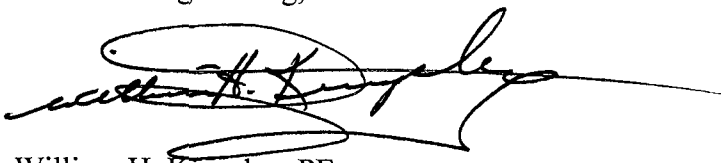
Where present, overlying the Jackson Lake Terrace at this site is a silty fine sand eolian origin. The sand has a significant amount of material in the silt as well as clay size range. It should be noted that along the Hammond Ditch this unit is typically very thin or absent in most locations.

Historically, water was absent at the site. Development of the site and the areas to the south of the site has produced a weak water table across the top of the Nacimiento Formation. The water ranges from absent to approximately two (2) feet in thickness and rests directly on top of the Nacimiento Formation. The Formation is essentially impervious to the water at the heads encountered and flows laterally across the Nacimiento surface through the Jackson Lake Terrace gravels and sands. The Nacimiento Formation surface grossly follows the present day ground surface profile. Water tends to generally flow on the surface from Southeast to Northwest. The surface model developed from boring logs at the site suggests there is a relative high ridge that runs through the site and that water flows from the high area into natural drainages along the face of the bluff to the north or flows somewhat southwesterly into the drainage running parallel the County Road 4990. Depth to the water along the Hammond Ditch ranges from approximately seven and one half (7-½) feet to approximately ten (10) feet. The maximum thickness of the water is on the order of one (1) foot. Some degree of hydrocarbon contamination is encountered at nearly all boring locations.

With this letter is a profile along the Hammond Ditch using the latest model of the Nacimiento surface.

If you need additional information please contact our office.

Sincerely,
Precision Engineering, Inc.



William H. Kingsley, PE

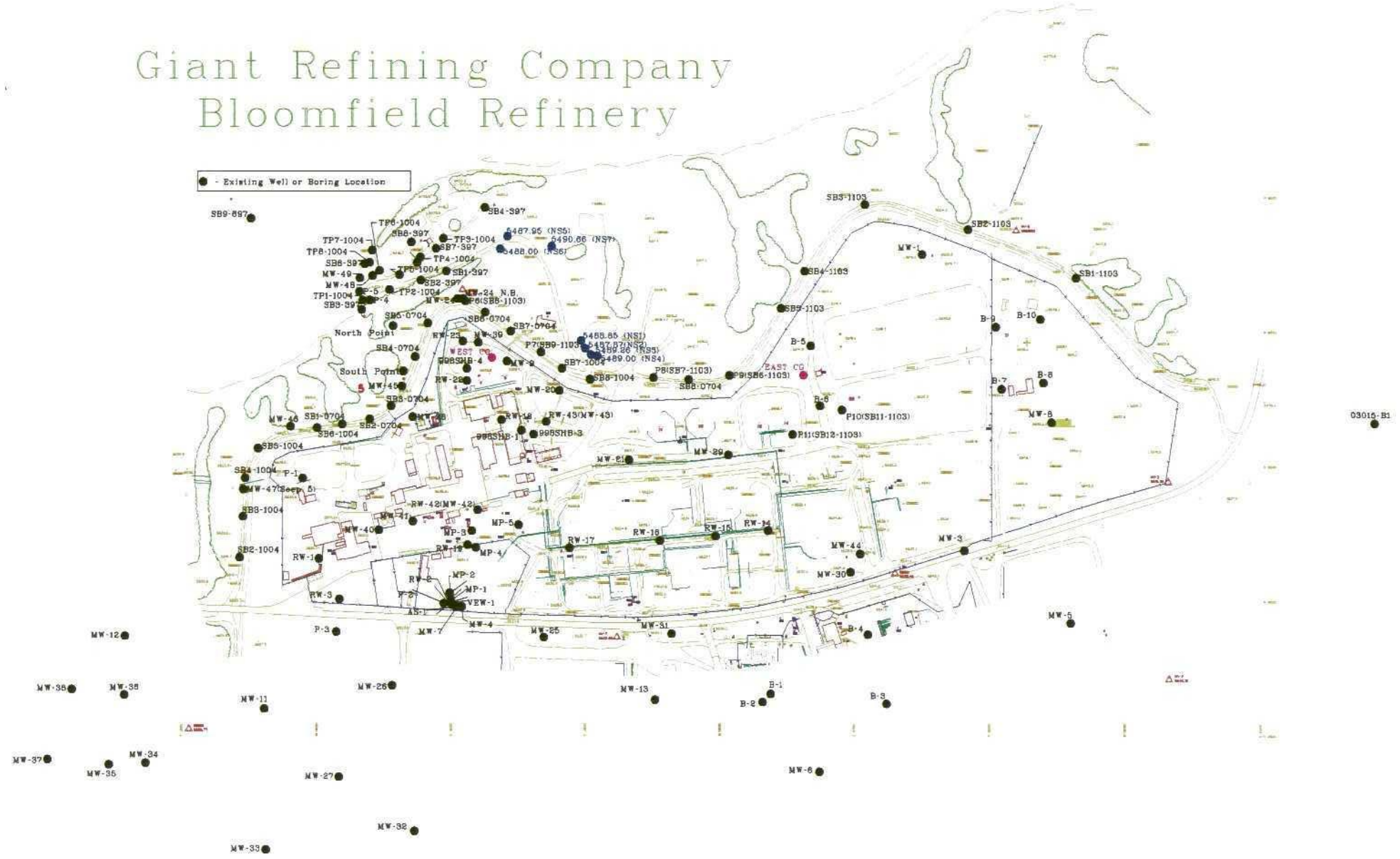
Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

Project Bloomfield-Hammond Ditch File No. 03-122 Date November 2, 2004

			Sieve Analysis %Passing														Atterberg Limits		Moisture	Unit Wt.	Classification	
Boring No.	PEI Lab No.	Depth ft.	3"	2"	1½"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#140	#200	LL	PI	%M	PCF	USCS	AASHTO
	46450	5.0-5.4							100	100	99	97	74	31	10	8.7		N/P	3.8		SP-SM	A-3
	46451	11.0-11.5				100	90	86	85	82	81	73	48	21	6	4.7		N/P	15.6		SP	A-1-b
	46452	9.0-10.0							100	100	71	57	45	37	28	23.8		N/P	5.6		SM	A-1-b
	46458	10.0-11.0				100	89	73	68	64	62	55	25	9	3	2.5		N/P	19.2		SP	A-1-b
	46464	Surface								100	100	100	96	92	80	65.2		N/P	8.6		ML	A-4
	46465	Sruface							100	100	100	99	96	92	79	71.3		N/P	14.8		ML	A-4
	46461	Surface	95	95	93	88	86	83	81	79	78	75	64	52	29	23.7		N/P	2.5		SM	A-2-4
	46462	Surface	96	80	76	64	57	49	44	40	38	31	22	16	8	7.0		N/P	0.9		GP-GM	A-1-a
	46463	Surface	94	86	76	64	54	43	38	32	29	23	14	9	6	5.3		N/P	1.1		GP-GM	A-1-a
	46456	12-12.5				Hydraulic Conductivity: 6.0×10^{-7} cm/sec													13.3	118.7		
	46454	9.5-10.5				Hydraulic Conductivity: 1.2×10^{-9} cm/sec													13.8	117.1		

C:\AAFWFILE\projects\2003\03-122 Bloom\[Grain Size Summary Hammond Ditch.xls]S1 Prepared By:

Giant Refining Company
Bloomfield Refinery



Sheet: 1 OF 1
Bore Point: End of Hammond Ditch Road adjacent to fence bend in cut section
Water Elevation: Not Encountered
Boring No.: SB1-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

Log of Test Borings

File #: 03-122
Site: Bloomfield Refinery
Elevation: Exisiting
Date: 11/4/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-5.25			5.0	**Gravel**, very sandy, cobble and bouldersize rock very common. **Jackson Lake Terrace**				
	5.25-7.5	SPT			**Nacimiento Formation** **Sandstone,** very weathered, light brown, moist, dense				
	T.D.			7.5					

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** KM/NS

C:\AAFWFILE\projects\2003\03-122 Bloom\[B1 1103.xls]Sheet1

Sheet: 1 OF 1
Bore Point: Near N.E. corner of evaporation lagoon on Hammond Ditch Road
Water Elevation: Not Encountered
Boring No.: SB2-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield Refinery
Elevation: Exisiting
Date: 11/4/03

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-5.0			5.0	**Gravel**, very sandy, cobble and bouldersize rock, light brown, moist. **Jackson Lake Terrace**				
	5.0-7.5	SPT			**Nacimiento Formation** **Sandstone**, very weathered, green grey, clayey, (N/P), moist, medium dense (possible trace of water at top of the Nacimiento Formation)				
	T.D.			7.5					

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: KM/NS

C:\AAFWFILE\projects\2003\03-122 Bloom\[B2 1103.xls]Sheet1

Sheet: 1 OF 1
Bore Point: 80' west of straight on curves

Water Elevation: 6.6'
Boring No.: SB3-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

Log of Test Borings

File #: 03-122
Site: Bloomfield Refinery

Elevation: Exisiting
Date: 11/4/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-8.5				**Gravel**, sandy, cobble and bouldersize rock, light brown, (~ old grade?), water bearing at 6.6'. **Jackson Lake Terrace**				
				5.0					
				7.5					
	7.5-9.0	SPT			**Nacimiento Formation** **Sandstone**, weathered, yellow/red -brown, medium-grained, clean, some black inclusions moist, relatively impervious, not water bearing, top of water after 1 hour				
	T.D.			9.0					

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger LOGGED BY: KM/NS

C:\AAFWFILE\projects\2003\03-122 Bloom\[B3 1103.xls]Sheet1

Sheet: 1 OF 1
Bore Point: 385' West of SB3-1103 along Hammond Ditch Road
Water Elevation: Not Encountered
Boring No.: SB4-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield Refinery
Elevation: Exisiting
Date: 11/4/03

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-8.5				**Gravel**, sandy, cobble and bouldersize material common, moist, dense, very difficult to drill 7.5-8.5', dry from 7.5-8.5' **Jackson Lake Terrace**				
				5.0					
				7.5					
	8.5-9.0				**Nacimiento Formation**				
	9.0-10.5	SPT			**Sandstone,** weathered, yellow-brown to light brown, moist-damp, hard				
				10.0					
	T.D.			10.5					

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger LOGGED BY: KM/NS

C:\AAFWFILE\projects\2003\03-122 Bloom\[B4 1103.xls]Sheet1

Sheet: 1 OF 1
Bore Point: West side outfall, north side of Hammond Ditch Road

Water Elevation: Not Encountered
Boring No.: SB5-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

Log of Test Borings

File #: 03-122
Site: Bloomfield Refinery

Elevation: Exisiting
Date: 11/4/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-2.5				**Sand**, fine, silty (Qe), brown, moist, loose				
				2.5					
	2.5-8.75				**Gravel**, sandy, cobbles and boulders common, light brown, moist, very dense **Jackson Lake Terrace**				
				5.0					
				7.5					
	8.75-10.25	9-19-20			**Nacimiento Formation** **Sandstone**, weathered, yellow-brown to light brown, argillaceous, some black inclusions				
				10.0	medium-grained				
	T.D.			10.25	(no water bearing zones)				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger — LOGGED BY: KM/NS

C:\AAFWFILE\projects\2003\03-122 Bloom\[B5 1103.xls]Sheet1

Sheet: 1 OF 1
Bore Point: 275' west of SB5 on Hammond Ditch Road, west side of road
Water Elevation: Not Encountered
Boring No.: SB6-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield Refinery
Elevation: Exisiting
Date: 11/4/03

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-3.5				**Sand**, fine, silty (Qe), brown, damp-moist, loose				
	3.5-8.0			5.0	**Gravel**, sandy, cobble and boulder size material common, light brown, difficult to drill, water bearing. **Jackson Lake Terrace**				
	8.0-10.5	17-26-49		10.0	**Nacimiento Formation** **Sandstone**, weathered, yellow-brown to light brown, argillaceous, laminar, damp-moist, very dense				
	T.D.			10.5	Installed 2" hand slotted PVC (slotted 48")				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: KM/NS

C:\AAFWFILE\projects\2003\03-122 Bloom\[B6 1103.xls]Sheet1

Sheet: 1 OF 1
Bore Point: 230' west of SB6 on Hammond Ditch Road, adjacent to siphon on west side of road
Water Elevation: 9.0'
Boring No.: SB7-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield Refinery
Elevation: Exisiting
Date: 11/4/03

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-2.5				**Sand**				
				2.5					
	2.5-10.0				**Gravel**, sandy, cobbles and boulders, very dense, tan, moist, difficult to drill, water bearing at 9.0', (free product). **Jackson Lake Terrace**				
				5.0					
				7.5					
				10.0					
	10.5-12.0				**Nacimiento Formation** **Sandstone**, weathered, yellow-brown, laminar banded (yellow, brown,red), damp-moist, hard				
	T.D.			12.0	Installed 2" hand slotted PVC (slotted 48")				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: KM/NS

C:\AAFWFILE\projects\2003\03-122 Bloom\[B7 1103.xls]Sheet1

Sheet: 1 OF 1
Bore Point: West side of Hammond Ditch Road, 100' east of overhead pipe rack
Water Elevation: Not Encountered
Boring No.: SB8-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield Refinery
Elevation: Existing
Date: 11/5/03

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-7.5			5.0	**Gravel**, sandy, cobbles and boulders, light brown, moist, very dense, difficult drilling, water bearing. **Jackson Lake Terrace**				
	7.5-10.0	85 (12")		10.0	**Nacimiento Formation** **Sandstone**, weathered, not water bearing, very argillaceous, some claystone fragments, hydrocarbon odor at 9.0'				
	10-11.0				**Sandstone**, weathered, medium grained, slightly argillaceous, yellow-brown, damp-moist, very dense, laminar banded, some red laminae				
	T.D.			11.0	Installed 2" hand slotted PVC (slotted 48")				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: KM/NS

C:\AAFWFILE\projects\2003\03-122 Bloom\[B8 1103.xls]Sheet1

Sheet: 1 OF 1
Bore Point: 260' west of pipe rack crossing on west side of Hammond Ditch Road
Water Elevation: Not Encountered
Boring No.: SB9-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield Refinery
Elevation: Existing
Date: 11/5/03

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-12.0				**Gravel**, sandy, silty, cobbles and boulders, light brown, hydrocarbon odor below 11.0' **Jackson Lake Terrace**				
				5.0					
				10.0					
				12.0					
	12-14.0				**Nacimiento Formation** **Sandstone**, light brown-yellow brown, damp-moist, very dense, very argillaceous, laminar banded				
	T.D.			14.0	Installed 2" Hand Slotted PVC (slotted 48")				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: KM/NS

C:\AAFWFILE\projects\2003\03-122 Bloom\[B9 1103.xls]Sheet1

Sheet:
Bore Point: NO BORING
Water Elevation:
Boring No.: SB10-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation:
Date:

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, ETC.)	%M	LL	PI	CLASS.
					NO BORING				
				2					
				5.0					
				7.5					
				10.0					
				15.0					
				20.0					

NO BORING

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER LOGGED BY:

A:\[B10 0704.xls]Sheet1

Sheet: 1 OF 1
Bore Point: SW corner of fresh-water pond
Water Elevation: Not Encountered
Boring No.: SB11-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield Refinery
Elevation: Exisiting
Date: 11/6/03

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-7.0			5.0	**Sand**, silty, slightly clayey, brown, moist, loose, (Qe), more clay with depth > 4'				
	7.0-10.0			7.0 10.0	**Clay**, sandy, light brown, moist-wet, firm				
	10.0-15.0			15.0	**Gravel**, medium to coarse, sandy, cobbles and boulders are abundant, brown, moist				
	15.0-20.0			20.0	**Same as above**, with occasional sand lens < 8-10" thick				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: KM/NS

Sheet: 1 OF 2
Bore Point: SW corner of fresh-water pond
Water Elevation: Not Encountered
Boring No.: SB11-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield Refinery
Elevation: Exisiting
Date: 11/6/03

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	22.5-24.0			22.0	**Nacimiento Formation** **Sandstone**, weathered, very light brown, moist-not water bearing, dense				
	T.D.			24.0	Installed 2" hand slotted PVC (slotted 60")				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: KM/NS

C:\AAFWFILE\projects\2003\03-122 Bloom\[B11 1103.xls]Sheet2

Sheet: 1 OF 1
Bore Point: 26' from Tank 14, 25' from centerline of elbow on most easterly pipe on S. side of Tank 14
Water Elevation: Not Encountered
Boring No.: SB12-1103

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield Refinery
Elevation: Exisiting
Date: 11/6/03

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-3.5				**Sand**, very fine, silty, light brown, damp, (Qe)				
	3.5-7.0			5.0	**Gravel**, sandy, brown, cobbles/boulders common, damp-moist, dense, difficult drilling				
	7.0-11.0			7.0 10.0	**Sand**, medium, clean, light brown, damp, loose, occasional fine gravel				
	11.0-17.5			15.0	**Gravel**, sandy, clean, cobbles and boulders boulders are abundant, brown, damp, very dense, difficult to drill				
	17.5-20.0				**Nacimiento Formation** **Sandstone**, weathered, yellow-brown, very dense, not water bearing				
	T.D.			20.0	Installed 2" hand slotted PVC (slotted 60")				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: KM/NS

C:\AAFWFILE\projects\2003\03-122 Bloom\[B12 1103.xls]Sheet1

Sheet: 1 of 8
Bore Point: See plan
Water Elevation: 6.90
Boring No.: SB1-0704

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5495.28
Date: 7/6/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-2		*-**-*-* *-**-*-* *-**-*-* *-**-*-*		**Sand**, silty, brown, moist				
	2-8.0		o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o	2.5 5.0 7.5	**Cobbles**, gravel, silty, sand, brown, moist Black with hydrocarbon odor				
	8.0-9.0		= = = = = = = =		***Nacimiento Formation*** T.D. 8.0				
				10.0 15.0 20.0	Placed 2" PVC, 4' hand slotted screen, backfilled with cuttings 17.5' N of canal edge				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: WHK

Sheet: 2 of 8
Bore Point: See plan
Water Elevation: 6.85
Boring No.: SB2-0704

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5494.96
Date: 7/6/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-2.5		*-**-*-* *-**-*-* *-**-*-* *-**-*-* *-**-*-*	2.5	**Sand**, fine, silty, brown, moist, moderately dense				
	2.5-9.0		o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o	5.0 7.5	**Cobbles**, very dense, cobbles to 12", grey, dry				
	9.0-10.0		* * * * * * * * * *	10.0	**Sand**, black, water bearing, hydrocarbon odor, loose				
	10.0-11.5		= = = = = = = = = = = =		**Nacimiento Formation** T.D. 11.5				
				15.0 20.0	Placed 2" PVC, 4' hand slotted screen, backfilled with cuttings 16' N of canal edge				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: WHK

Sheet: 3 of 8
Bore Point: See plan
Water Elevation: 6.79
Boring No.: SB3-0704

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5495.21
Date: 7/6/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-4.0		*-**-*-*		**Sand**, fine, silty, brown, damp, loose				
			*-**-*-*						
			*-**-*-*						
			*-**-*-*						
			*-**-*-*	2.5					
			*-**-*-*						
			*-**-*-*						
			*-**-*-*						
	4.0-8.5		o*o*o*o		**Cobbles**, gravelly, grey, dry, dense-very dense				
			o*o*o*o	5.0					
			o*o*o*o						
			o*o*o*o						
			o*o*o*o						
			o*o*o*o						
			o*o*o*o	7.5					
			o*o*o*o						
			o*o*o*o						
	8.5-10.0		* * * * *		**Sand**, fine, black, water bearing, loose				
			* * * * *						
			* * * * *	10.0					
	10.0-11.5		= = = =		**Nacimiento Formation**, mudstone, moist, not water bearing below 10.5, grey-black, hard T.D. 11.5				
			= = = =						
			= = = =						
					Placed 2" PVC, 4' hand slotted screen, backfilled with cuttings **SPH 6.78 (total .1')**				
				15.0					
				20.0					

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: WHK

Sheet: 4 of 8
Bore Point: See plan
Water Elevation: 7.50
Boring No.: SB4-0704

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5495.21
Date: 7/6/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-2.75		*-**-*-* *-**-*-* *-**-*-* *-**-*-* *-**-*-* *-**-*-*	2.5	**Sand**, silty, some fine gravel, brown, moist, loose				
	2.75-8.0		o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o	5.0 7.5	**Cobbles**, gravelly, grey, dry, very dense				
	8.0-9.5		o*o*o*o * * * * * * * * * *		**Sand**, fine, some fine gravel, clayey, grey				
	9.5-11.0		= = = = = = = = = = = =	10.0	**Nacimiento Formation**, mudstone, very sandy, grey, moist-wet				
				15.0 20.0	T.D. 11.0 Placed 2" PVC, 4' hand slotted screen, @ 10.5' backfilled with cuttings SPH 7.49 (total .1')				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: WHK

Sheet: 5 of 8
Bore Point: See plan
Water Elevation: 6.95
Boring No.: SB5-0704

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5497.98
Date: 7/6/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-2.5		*-**-*-*		**Sand**, fine, silty, brown, damp-moist				
			*-**-*-*						
			*-**-*-*						
			*-**-*-*						
			*-**-*-*	2.5					
	2.5-8.5		o*o*o*o		**Cobbles**, gravelly, grey, dry, very dense				
			o*o*o*o						
			o*o*o*o						
			o*o*o*o						
			o*o*o*o	5.0					
			o*o*o*o						
			o*o*o*o						
			o*o*o*o						
			o*o*o*o						
			o*o*o*o	7.5					
			o*o*o*o						
			o*o*o*o						
	8.5-9.25		* * * * *		**Sand**, fine, some fine gravel, grey, moist				
			* * * * *		~~fresh hydrocarbon odor~~				
	9.25-10.5		= = = =	10.0	**Nacimiento Formation**, mudstone, very sandy,				
			= = = =		grey, moist-wet				
					T.D. 10.5				
					Placed 2" PVC, 4' hand slotted screen, backfilled with cuttings				
				15.0					
				20.0					

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: WHK

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Sheet: 6 of 8
Bore Point: See plan
Water Elevation: 6.68
Boring No.: SB6-0704

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5496.86
Date: 7/6/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-1.0		*-**-*-* *-**-*-*		**Sand**, fine, silty, brown, damp, loose				
	1.0-6.5		o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o	2.5 5.0	**Cobbles**, some gravel, grey, dry, very dense				
	6.5-8.0		* * * * * * * * * * * * * * *	7.5	**Sand**, fine, black, strong hydrocarbon odor, wet, water bearing @ 7.0'				
	8.0-10.5		= = = = = = = = = = = = = = = = = = = =	10.0	**Nacimiento Formation**, sandstone, green-grey very dense,				
				15.0 20.0	T.D. 10.5 Placed 2" PVC, 4' hand slotted screen, backfilled with cuttings				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER LOGGED BY: WHK

Sheet: 7 of 8
Bore Point: See plan
Water Elevation: 6.35
Boring No.: SB7-0704

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File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5496.86
Date: 7/7/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-1.5		*-**-*-* *-**-*-* *-**-*-*		**Sand**, fine, silty, brown, damp, loose				
	1.5-8.5		o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o	2.5 5.0 7.5	**Cobbles**, grey, damp, very dense				
	8.5-9.0		* * * * *		**Sand**, fine, black,				
	9.0-10.5		= = = = = = = = = = = =	10.0	**Nacimiento Formation**, mudstone, sandstone, green-grey				
				15.0 20.0	T.D. 10.5 Placed 2" PVC, 4' hand slotted screen, backfilled with cuttings				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: WHK

Sheet: 8 of 8
Bore Point: See plan
Water Elevation: 5.92
Boring No.: SB8-0704

Precision Engineering, Inc.
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Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5497.91
Date: 7/7/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-5.0		*-**-*-*		**Sand**, fine, silty, brown, moist, loose				
			*-**-*-*						
			*-**-*-*						
			*-**-*-*						
			*-**-*-*	2.5					
			*-**-*-*						
			*-**-*-*						
			*-**-*-*						
			*-**-*-*						
			*-**-*-*	5.0					
	5.0-8.5		o*o*o*o		**Cobbles**, gravelly, grey, dry-damp, very dense				
			o*o*o*o						
			o*o*o*o						
			o*o*o*o						
			o*o*o*o	7.5					
			o*o*o*o						
			o*o*o*o						
	8.5-9.0		* * * * *		**Sand**, clayey, fine, green-grey-black,				
	9.0-11.0		= = = =		**Nacimiento Formation**, mudstone, moist,				
			= = = =	10.0	green-grey				
			= = = =						
					T.D. 10.5				
					Placed 2" PVC, 4' hand slotted screen, backfilled with cuttings				
				15.0					
				20.0					

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: WHK

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Sheet: 1 of 8
Bore Point:
Water Elevation:
Boring No.: SB1-1004

Precision Engineering, Inc.
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Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation:
Date:

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
				2.5	**Not Drilled**				
				7.5					
				10.0					
				15.0					
				20.0					

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: KM

Sheet: 2 of 8
Bore Point: 21' 7" W of canal edge
Water Elevation: 8.0' below ground surface
Boring No.: SB2-1004

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File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5498.87
Date: 10/28/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-3.0		*-**-*-* *-**-*-* *-**-*-* *-**-*-* *-**-*-* *-**-*-*	2.5	**Sand**, fine to coarse, silty, damp, tan				
	3.0-5.0		***o*** o*o*o*o o*o*o*o o*o*o*o	5.0	**Cobbles**, gravel, sand, silty, tan, damp				
46450	5.0-5.4		******** ********		**Sand**, fine to coarse, dry, clean, tan, moderately dense	3.8		N/P	SP-SM A-3
	6.0-7.0		******** ********		**Gravel**, sand, medium, dry, tan,				
	7.0-11.5		******** ******** ******** ******** ******** ******** ********	7.5 10.0	Sand, medium, gravel, dark grey, hydrocarbon odor, moist wet at 8'				
46451	11.0-11.5		******** ********		**Sand**, medium, gravel, dark grey, moist	15.6		N/P	SP/A-1-b
46456	11.5-12.0 12.0-12.5		= = = = = = = =		**Nacimiento Formation** mudstone, dry Sample Number HC 1				
				15.0 20.0	Total depth bottom of well 12' 5' of hand slotted screen no water for first 8 hours				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: KM

C:\AAFWFILE\projects\2003\03-122 Bloom\[B2 1004.xls]Sheet1

Bore Point: 17' 7" W of canal edge
Water Elevation: 7.2' below ground surface
Boring No.: SB3-1004

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505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5496.72
Date: 10/28/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-1		*_**_*_* *_**_*_*		**Silt**, sandy, very fine to fine, brown, moist				
	1-8.0		o*o*o*o (×14)	2.5 5.0 7.5	**Cobbles**, gravel, sand, fine, silty, moist, brown				
	8-10.5		**o**o** (×5)	10.0	**Sand**, fine to coarse, gravel, dark grey, wet, hydrocarbon odor				
	10.5-11.5		******** ********		**Sand**, medium, argillaceous, damp				
	12.0		= = = =		**Nacimiento Formation**, mudstone				
				15.0 20.0	Total depth 11' 9" 5' of hand slotted screen 8' 5" top of pipe no water for first 8 hours				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER LOGGED BY: KM

C:\AAFWFILE\projects\2003\03-122 Bloom\[B3 1004.xls]Sheet1

Sheet: 4 of 8
Bore Point: 16' 2" W of canal edge
Water Elevation: 8.5' below ground surface
Boring No.: SB4-1004

Precision Engineering, Inc.
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Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation:
Date: 10/28/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-6.0		*-**-*-*		**Silt**, sandy, very fine to fine, brown, damp				
			*-**-*-*						
			*-**-*-*						
			*-**-*-*						
			*-**-*-*	2.5					
			*-**-*-*						
			*-**-*-*						
			*-**-*-*						
			*-**-*-*						
			*-**-*-*	5.0					
			*-**-*-*						
			*-**-*-*						
	6.0-9.0		o*o*o*o		**Cobbles**, gravel, sand, fine to medium, silty, brown, damp				
			o*o*o*o						
			o*o*o*o	7.5					
			o*o*o*o						
			o*o*o*o						
			o*o*o*o						
	9.0-10.5		********		**Sand**, medium to coarse, grey, moist hydrocarbon odor				
			********	10.0					
			********						
	10.5-11.0		= = = =		**Nacimiento Formation**, mudstone				
					Total depth 10' 1/2"				
					5' of hand slotted screen				
				15.0					
				20.0					

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: KM

C:\AAFWFILE\projects\2003\03-122 Bloom\[B4 1004.xls]Sheet1

Sheet: 5 of 8
Bore Point: 16' 10" W of canal edge
Water Elevation: 8.7' below ground surface
Boring No.: SB5-1004

Precision Engineering, Inc.
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505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5497.21
Date: 10/28/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-6.0		*-**-*-*		**Silt**, sandy, very fine to fine, brown, moist				
			*-**-*-*						
			*-**-*-*						
			*-**-*-*						
			*-**-*-*	2.5					
			*-**-*-*						
			*-**-*-*						
			*-**-*-*						
			*-**-*-*						
			*-**-*-*	5.0					
			*-**-*-*						
			*-**-*-*						
	6.0-9.0		o*o*o*o		**Cobbles**, gravel, sand, fine to medium, silty,				
			o*o*o*o		brown, moist				
			o*o*o*o	7.5	hydrocarbon odor				
			o*o*o*o						
			o*o*o*o						
			o*o*o*o						
46452	9.0-10.0		********		**Sand**, medium, brown, wet	5.6		N/P	SM/A-1-b
			********	10.0					
46453	10.0-10.5		= = = =		**Nacimiento Formation**, mudstone, moist	16.1			
46454	9.5-10.5				Sample Number HC 2				
					Total depth 10' 7"				
					5' of hand slotted screen				
				15.0	no water for first 8 hours				
				20.0					

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: KM

Sheet: 6 of 8
Bore Point: 22' 7" W of canal edge
Water Elevation: Not Encountered
Boring No.: SB6-1004

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5496.45
Date: 10/28/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-0.5		*-**-*-*		**Silt**, sandy, very fine to fine, brown, damp				
	0.5-7.0		o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o	2.5 5.0	**Cobbles**, gravel, sand, very fine to medium, silty, brown, damp				
	7.0-7.5		********	7.5	**Sand**, medium to coarse, brown, occasional gravel, damp, slight hydrocarbon odor				
46455	7.5-8.5		= = = = = = = = = = = =		**Nacimiento Formation**, mudstone, moist very compact, grey to black	9.3			
				10.0					
				15.0	Total depth 8' 6" 5' of hand slotted screen				
				20.0					

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: KM

C:\AAFWFILE\projects\2003\03-122 Bloom\[B6 1004.xls]Sheet1

Sheet: 7 of 8
Bore Point: 12' 11" N of canal edge
Water Elevation: 8.6' below ground surface
Boring No.: SB7-1004

Precision Engineering, Inc.
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Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5497.37
Date: 11/1/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-0.5		*-**-*-*		**Silt**, sandy, very fine to fine, brown, damp				
	0.5-9.0		o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o	2.5 5.0 7.5	**Cobbles**, gravel, sand, fine to coarse, silty, brown, moist **Sand**, fine to coarse, brown, occasional gravel, wet, slight hydrocarbon odor				
	9.0-9.5		******** ********	10.0	**Sand**, fine to coarse, grey, occasional wet, slight hydrocarbon odor				
46457			= = = = = = = =		**Nacimiento Formation**, mudstone, moist gray to black	11.8			
				15.0 20.0	Total depth 10' 2" 5' of hand slotted screen does not produce water in the first 8 hours				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: KM

C:\AAFWFILE\projects\2003\03-122 Bloom\[B7 1004.xls]Sheet1

Sheet: 8 of 8
Bore Point: 11' N of canal edge
Water Elevation: 9.8' below ground surface
Boring No.: SB8-1004

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-122
Site: Bloomfield
Giant Refining
Elevation: 5499.02
Date: 10/27/04

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-0.5		*-**-*-*		**Silt**, sandy, very fine to fine, brown, damp				
	0.5-10.0		o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o o*o*o*o	2.5 5.0 7.5 10.0	**Cobbles**, gravel, sand, fine to coarse, silty, brown, moist				
46458	10.0-11.0		******** ********		**Sand**, fine to coarse, grey, strong hydrocarbon odor, water bearing	19.2		N/P	SP/A-1-b
46459 46460	11.0-12.5 12-12.5		= = = = = = = = = = = =		**Nacimiento Formation**, argillaceous sandstone moist, gray to green gray Sample number HC3	16.5 5.5			
				15.0 20.0	Total Depth 12.5' 5' of hand slotted screen				

SIZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER — LOGGED BY: KM