3R - 258

REPORTS

$\frac{DATE}{July 2002}$

AESE

August 12, 2002

Mr. William Olson New Mexico Oil Conservation Division 1220 South Street, Frances Drive Santa Fe, New Mexico

RECEIVED

AUG 14 2002

ENVIRONMENTAL BUREAU OIL CONSERVATION DIVISION

RE: Case #3R258 Bloomfield Crude Station

Dear Mr. Olson,

Please find enclosed *Ground Water Sampling, Bloomfield Crude Station, Bloomfield, New Mexico, July 2002.* The report documents Giant's annual ground water sampling program for 2002. A ground water potentiometric surface map for the sampling event is included as Figure 3. It shows concentrations of contaminants found in each well. MW-2 contains free-phase hydrocarbons and was not sampled. Since a relationship between contaminants in MW-7 and free-phase hydrocarbon in MW-2 is questionable, no isopleth maps for contaminants were produced.

Please give me a call if you have any questions or require additional information.

Respectfully Submitted, A. E. Schmidt Environmental

Calily & Love

Ashley L. Lowe cc: Mr. Denny Foust, NMOCD Aztec District Office; Mr. Tim Kinney, Ms. Jacque Cumbie, and Mr. David Kirby, Giant Industries, Inc.

> A. E. SCHMIDT ENVIRONMENTAL 906 San Juan Boulevard, Suite D Farmington, New Mexico 87401 (505) 566-9116

Ground Water Sampling Bloomfield Crude Station Bloomfield, New Mexico

July 2002

Prepared For

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AUG 1 4 2002

ENVIRONMENTAL BUREAU OIL CONSERVATION DIVISION

Giant Industries, Inc. Bloomfield, New Mexico

Project 6171



A. E. Schmidt Environmental 906 San Juan Boulevard, Suite D Farmington, NM 87401 505-566-9116

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Introduction

A. E. Schmidt Environmental (AESE) collected ground water samples on May 5, 2002 as part of annual ground water investigations conducted at Giant Industries, Inc.'s (Giant) former Crude Station in Bloomfield, New Mexico. The following describes methods and results from sampling and analysis of ground water from five monitoring wells at the Bloomfield Crude Station.

The former Bloomfield Crude Station is located on the southwest corner of Blanco Boulevard and Fifth Street in the city of Bloomfield, San Juan County, New Mexico. The site occupies approximately 5.5 acres within the N ¹/₂, NW ¹/₄, NW ¹/₄ of Section 22, Township 29 North, Range 11 West. A regional location map is shown in Figure 1.

A 55,000 barrel crude oil storage tank was previously located at the site within an earthen berm, which occupied approximately 100,000 square feet on the west side of the former crude station. Tank 967-D and berms were removed during late 1995 through early 1996. The current physical setting at the site is an open excavated area where approximately 12,924 cubic yards of hydrocarbon impacted soil was removed and replaced by 6,048 cubic yards of clean backfill in August 2000. A site map presented as Figure 2 shows the boundary of the former excavation. West of the former tank site is a City of Bloomfield Electrical Substation and two well sites (Jan Redding #1 and Cook #1E) owned and operated by Manana Gas. To the west of the electric substation and Manana well sites, a vacant lot exists. What appears to be a monument may indicate a previous well site that has been plugged and abandoned. Historical research of this area indicate that several oil and possibly gas wells, may have once been operational on this lot, such as Bishop #1, Bishop #3, Hare #1 and Kittell #1 (Figure 2).

The former crude station has been the focus of a subsurface investigation where activities have included numerous soil borings and sampling, installation of seven ground water monitoring wells, excavation and offsite land farming of hydrocarbon impacted soil, and ground water sampling. The area of focused investigation is where the former crude oil storage tank numbered 967-D was located. A more detailed historical account can be found in a report previously submitted to the New Mexico Oil Conservation Division (NMOCD) titled *Comprehensive Report for the Bloomfield Crude Station*, dated January 2000. A chronology of site operations and investigations is found in the Golden Environmental Management report *Monitoring Well Installation, Ground Water Sampling and Bioventing Pilot Test Bloomfield Crude Station, Bloomfield, New Mexico*, dated July 2001.

Methodology

On May 10, 2002 ground water samples and depth-to-ground water measurements were collected from on-site monitoring wells. AESE also checked for the presence of free phase crude oil. Samples were collected from five monitor wells. Giant abandoned monitoring well MW-1 during excavation of the tank pad in August 2000. Samples were not collected from MW-2 due to presence of free phase crude oil and the absence of ground water. AESE recommended

abandonment of MW-7 in a previous report submitted to the NMOCD, because it is not directly downgradient of Giant's former tank or its bermed area. The NMOCD denied this request until Manana Gas is given time to investigate. Therefore, at the request of the NMOCD MW-7 was sampled for Giant on June 26, 2002 and July 1, 2002.

Using the previous quarter's analytical results, sampling began at the cleanest well and progressed to those containing higher concentrations of contaminants. Prior to sampling, depth to ground water and total depth of each well were measured with a Keck oil/water interface probe. Presence of any free phase crude oil was also investigated using the interface probe. The interface probe was decontaminated with AlconoxTM soap and rinsed with de-ionized water prior to each measurement. The volume of water in the wells was calculated, and a minimum of three casing volumes of water was purged from each well using a disposable bailer. As water was extracted, pH, electric conductivity and temperature were monitored. The wells were purged until these properties had stabilized, indicating that the purge water was representative of aquifer conditions. The data were recorded on *Well Development and Purging Data* forms presented in Appendix A.

Once each monitoring well was purged, ground water samples were collected by filling two 40milliliter (mL) glass vials. The pre-cleaned and pre-preserved vials were filled and capped with no air inside to prevent degradation of the sample. Samples were labeled with the time and date of collection, as well as the origin of the sample. They were immediately sealed and packed on ice. The samples were shipped to Pinnacle Laboratories, Inc. (Pinnacle) in Albuquerque, New Mexico in a sealed cooler via Greyhound Bus Line. Proper chain-of-custody procedures were followed with logs documenting the project name and number, sampling point, location, field ID number, date, time, sample type, number of containers, analyses required and sampler's signatures (Appendix B). Pinnacle analyzed the samples for benzene, toluene, ethylbenzene and total xylenes (BTEX) by USEPA Method 8021.

A one-gallon plastic bottle was filled with ground water for analysis of major cations and anions, total dissolved solids (TDS) and an ion balance by various EPA methods. These samples were labeled, stored on ice and transported to Inter-Mountain Laboratories in Farmington, New Mexico for analysis. AESE documented the project name, sampling location, field identification number, date, time, sample type, analysis required and sampler's signatures during chain-of-custody procedures (Appendix B).

Free phase crude oil was present in MW-2. An on-going effort to remove the floating product has involved manual bailing of product from the monitoring well using a disposable bailer. Any product removed from the well is collected in a 55-gallon drum on the site. Product and some water are bailed from the well until there is no measurable amount of free phase product in the well. Once the product has been removed, water depth is measured a second time. This process is carried out on a weekly basis.

Results

Depth-to-water measurements taken from September 1994 to July 2002 are shown in Table 1. Water depth ranged from 22.38 feet beneath the top of the well casing (BTOC) in MW-7 to 15.13 feet BTOC in MW-3. A layer of free phase crude oil 0.81 feet thick was found above the water in MW-2. Free phase crude oil was not detected in any of the other wells during this sampling event. Ground water elevations were calculated, and an inferred ground water elevation contour map is presented as Figure 3. Since depth-to-ground water in MW-7 was measured at a later date, ground water elevation in MW-7 was not used in determining position of ground water elevation contours for the entire site shown in Figure 3. The ground water elevation for MW-2 was corrected using a product density of 0.7 that of water to properly reflect the estimated elevation. Based on the contours, ground water movement appears to be to the southwest and the hydraulic gradient is 0.015 feet per feet.

Laboratory analytical results for BTEX are presented in Table 2, and complete reports from Pinnacle Laboratories are included in Appendix B. Ground water from MW-3, MW-4 and MW-5 is below detectable levels for BTEX. BTEX levels in ground water from MW-6 have declined since the last sampling event in 2001, with only ethylbenzene and xylenes detected at trace amounts. The concentration of ethylbenzene in the ground water sample for MW-6 is 0.53 micrograms per liter (μ g/L). Total xylenes in the MW-6 sample are 1.4 μ g/L. Analytical results from the ground water sample collected at MW-7 indicate the presence of benzene at a concentration of 2000 μ g/L. Ethylbenzene is 140 μ g/L, and total xylenes are 1100 μ g/L. Toluene is not detected in MW-7. This is uncharacteristic of hydrocarbon impacted ground water at the site based on comparison of historical dissolved phase hydrocarbon concentrations from MW-2. The most recent laboratory results are compared to historical analytical results in Appendix C. Overall, detectable levels of BTEX have dropped in ground water at the site over time.

The results of general chemistry analyses are shown in Table 3. Results indicate high conductivity in all of the samples, ranging from 1870 microhms per centimeter (µmhos/cm) to 6880 µmhos/cm. Total dissolved salts (TDS) are also high, with levels between 1570 milligram per liter (mg/L) in MW-7 and 4810 mg/L in MW-5. All of the samples have concentrations greater than the New Mexico Water Quality Control Commission (NMWQCC) domestic water supply standard for TDS of 1000 mg/L. These results indicate a poor quality for potable use. The samples from all wells also exceed the NMWQCC water supply standard for sulfate. The standard for sulfate is 600 mg/L. The sample taken from MW-5 contained 1200 mg/L of chloride. The elevated levels of these parameters are indicators of the typically poor quality of shallow ground water at the site. General chemistry of ground water in MW-7 differs from ground water in the other wells on site. Most chemical properties are lower in value for ground water in MW-7 and a separate source of hydrocarbon impact may be associated with this well. The complete laboratory analytical reports from Inter-Mountain Laboratories are included in Appendix B. Historical general chemistry of ground water sampled at the Bloomfield Crude Station is included in Appendix C. MW-7 has continually displayed lower values of

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conductivity, sulfate, calcium, magnesium and sodium compared to other well samples from the site.

Product Recovery

The thickness of free phase crude oil measured on May 10, 2002 in MW-2 was consistent with the thickness measured in 2001. The product thickness was 0.81 feet. AESE initiated product removal through weekly hand bailing on May 13, 2002 and continued through June 26, 2002. Table 4 displays data collected during weekly product recovery efforts. The thickness of free phase crude oil floating on top of ground water in MW-2 has been reduced from 0.81 feet to 0.05 feet. As the thickness is reduced, manual bailing is becoming less effective. AESE has recovered a total of approximately 25.1 quarts of product and waste water. Removal of free phase product has been an on-going effort since May 1995. A comprehensive summary of hydrocarbon monitoring and recovery is presented in Appendix D.

Conclusions

The ground water sampling and analyses for 2002 indicate the contaminant plume in the ground water at Giant's former Crude Station has not changed substantially since this investigation began in 1994. Laboratory analyses of ground water samples from MW-3, MW-4 and MW-5 remain below the detectable levels for BTEX. Ground water in the vicinity of MW-2, MW-6 and MW-7 has been impacted by BTEX; although, only ethylbenzene and xylenes were detected in MW-6, and these amounts were below standards. Ground water from MW-7 contains amounts of benzene, ethylbenzene and xylenes that are above NMWQCC standards. Toluene was not detected in MW-7, which is uncharacteristic of onsite ground water from MW-2 based on a comparison of historical dissolved phase hydrocarbon concentrations from the 1994 and 1995 analytical results. Floating free phase hydrocarbon is still present in MW-2. Efforts to remove the product have resulted in reduction of product thickness from 2.47 feet to 0.05 feet over seven years.

The NMWQCC standards for sulfate and total dissolved solids are exceeded at all monitoring wells. The NMWQCC standard for chloride in water is exceeded in upgradient well MW-3. The elevated levels of these parameters are indicators of the typically poor quality of the shallow ground water at the site. Ground water properties in MW-7 differ from the general chemistry of ground water sampled from other monitoring wells. Values are lower in almost every measured parameter. This, as well as the unusual absence of toluene in BTEX analyses, may suggest a different source of hydrocarbon impact for MW-7.

The potentiometric surface has decreased since last year, but general direction and flow gradient remain static. Ground water flow is to the southwest at 0.015 ft/ft.

Product recovery at MW-2 has resulted in the reduction of free phase product in the well. However, the level of product may be too low for manual bailing on a weekly basis to be effective. Reducing the frequency of product removal or a different method may be necessary.

Recommendations

After compiling the most recent analytical results and comparing these with historical results, the following remedial action and monitoring plan is recommended:

- Implement bioventing at the site to reduce the hydrocarbon concentrations in soil below NMOCD standards. A successful bioventing pilot test has already been completed at the site and is documented in *Monitoring Well Installation, Ground Water Sampling and Bioventing Pilot Test Bloomfield Crude Station Bloomfield, New Mexico*, dated July 2001. A *Bioventing Plan*, dated July 2002 is presently being submitted to the NMOCD for review.
- Continue implementing the product recovery plan to remove free phase hydrocarbon from the ground water in the vicinity of MW-2. Future product recovery may be achieved with a passive skimmer to be emptied when necessary. Following removal of product, sample MW-2 annually until BTEX levels are below NMWQCC ground water standards, then sample quarterly for closure.
- Conduct annual ground water sampling for BTEX at monitoring wells MW-3, MW-4, and MW-5.
- Conduct quarterly sampling for BTEX at MW-6 until the ground water is below standards for four consecutive quarters.

Table 1: Ground Water Elevation Data

Well Number	Casing Elevation (ft)	Date	Depth to Water (ft)	Depth to Product (ft)	Product Thickness (ft)	Groundwater Elevation (ft)
MW-1*	na	na	na	na	na	na
MW-2**	5485.33	5/13/2002	15.51	14.7	0.81	5470.39
MW-3	5488.61	5/10/2002	15.13	np	np	5473.49
MW-4	5486.18	5/10/2002	15.54	np	np	5470.64
MW-5	5481.61	5/10/2002	15.74	np	np	5465.87
MW_6	5486.18	5/10/2002	18.05	np	np	5468.13
MW-7†	5491.86	6/26/2002	22.38	np	np	5469.48

Notes:

Measuring points are marked by a notch in top of well casing na: not applicable

np: indicates there was no free phase product present

Groundwater Elevation = (Surveyed Well Casing Elevation) - (Depth to Water)

Water level elevation is given in feet above mean sea level

* MW-1 was abandoned by Giant in 2000

** MW-2 water level is corrected for product thickness using a specific gravity of 0.7 that of water † MW-7 was not sampled on May 10, 2002 because it was recommended for abandonement. Upon request of the NMOCD, it was sampled on June 26, 2002

Table 2: Ground Water Analytical Results

Well	Benzene (µg/L)	Toluene (μg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)
MW-3	<0.5	<0.5	<0.5	<1.0
MW-4	<0.5	<0.5	<0.5	<1.0
MW-5	<0.5	<0.5	<0.5	<1.0
MW-6	<0.5	<0.5	0.53	1.4
MW-7*	2000	<2.5	140	1100
NMWQCC Standards	10	750	750	620

NMWQCC = New Mexico Water Quality Control Commission *MW-7 was analyzed at a dilution factor of 5 for toluene, ethylbenzene and total xylenes; MW-7 was analyzed at a 500 dilution for benzene.

Table 3: Ground Water General Chemistry Results

Analyte	Units	MW-3	MW-4	MW-5	MW-6	MW-7	NMWQCC
Lab pH	s.u.	7	6.9	6.5	6.8	6.8	6-9
Conductivity	µmhos/cm	4440	5140	. 6880	4460	1870	No Std.
TDS	mg/L	3820	4420	4810	3560	1570	1000
Alkalinity as CaCO3	mg/L	358	358	567	669	432	No Std.
Bicarbonate as HCO3	mg/L	437	437	692	816	527	No Std.
Carbonate as CO3	mg/L	<1	<1	<1	<1	<1	No Std.
Hydroxide	mg/L	<1	<1	<1	<1	<1	No Std.
Chloride	mg/L	46	47	1200	55	20	250
Sulfate	mg/L	2520	2930	1230	1900	700	600
Calcium	mg/L	446	449	661	319	258	No Std.
Magnesium	mg/L	43	47	55.3	33	27.8	No Std.
Potassium	mg/L	0.6	2.6	4.9	2.5	2.2	No Std.
Sodium	mg/L	705	873	855	830	151	No Std.

Notes:

s.u. = standard units

µmhos/cm - microhms per centimeter

mg/L = milligrams per liter

NMWQCC = New Mexico Water Quality Control Commission Standard

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Table 4: Product Recovery

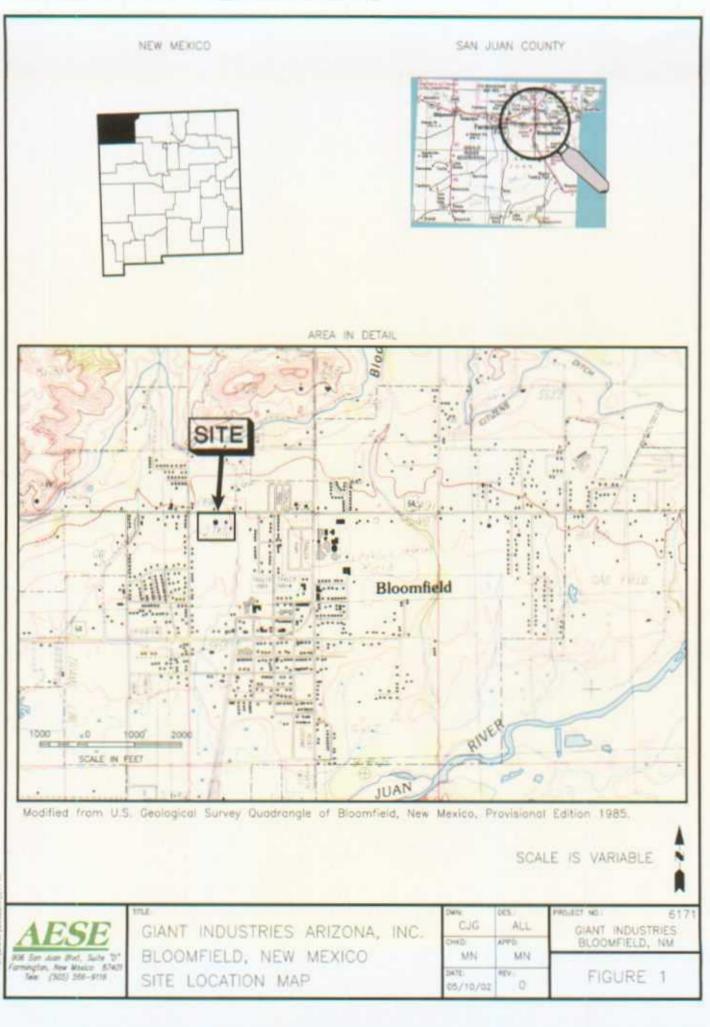
DATE	DEPTH TO PRODUCT (ft)	INITIAL DEPTH TO WATER (ft)	PRODUCT LEVEL (ft)	DEPTH TO WATER AFTER BAILING (ft)	VOLUME REMOVED (Product + Waste Water) (qts)
May 13, 2002	14.70	15.51	0.81	18.27	5.52
May 22, 2002	14.64	15.29	0.65	18.01	4.98
May 30, 2002	14.70	15.14	0.44	18.04	4.26
June 5, 2002	14.76	15.00	0.24	15.66	4.35
June 13, 2002	14.75	14.91	0.15	15.33	2.58
June 19, 2002	14.70	14.78	0.08	15.01	2.23
June 26, 2002	14.68	14.73	0.05	14.53	1.19
TOTAL					25.1

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Figure 1: Regional Location Map





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Figure 2: Site Map

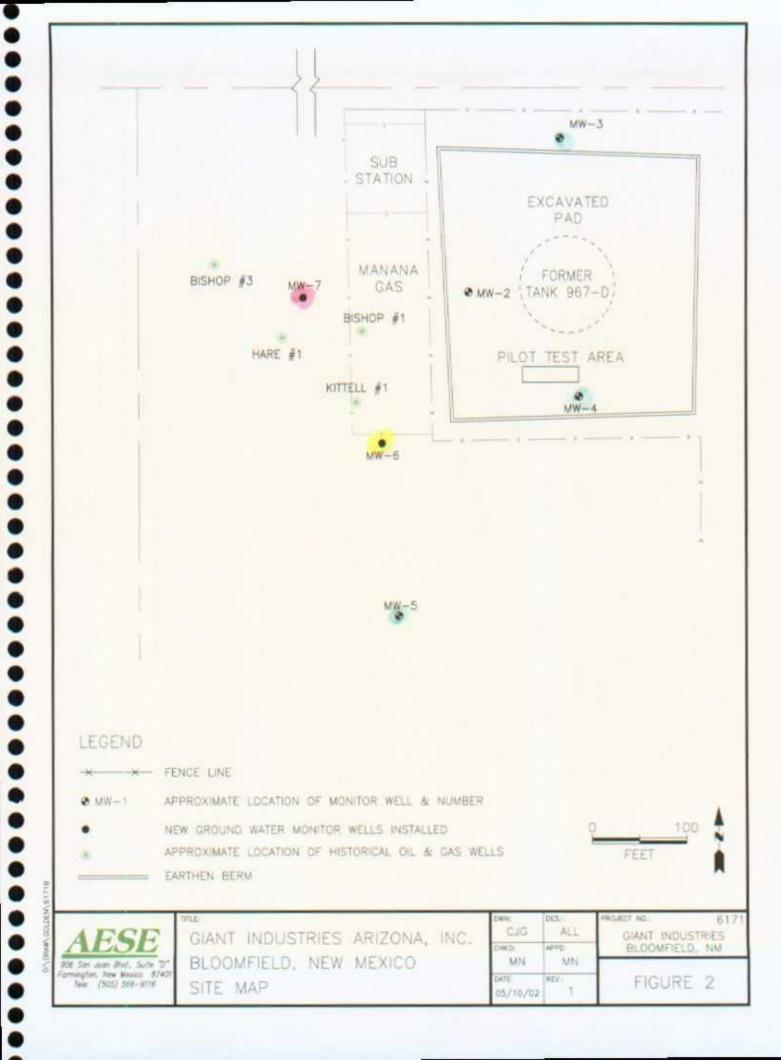


Figure 3: Ground Water Elevation Contour Map

MW - 3 TOC = 5488.61EL = 5473.49 Ð B = <0.5 -SUB T = <0.5 E ≕ <0.5 STATION X = <1.0 EXCAVATED PAD MANANA FORMER 5473 MW-GAS TANK 967-D . TOC = 5491.86TOC = 5485.33EL = 5469.48EL = 5470.39 B = 2000CONTAINS PHASE-SEPARATED 5₄₇₂ . T = <2.5 HYDROCARBON E = 140 X = 1100Ð MW-4 5471 TOC = 5486.1<u>8</u> EL = 5470.64 ٠ MW-6B = <0.5 T = <0.5 TOC = 5486.18F = < 0.554×0 EL = 5468.13 X = <1.0B = < 0.5T = < 0.5E = 0.53= 1.45469 M₩-5 5468 TOC = 5481.61 EL = 5465.87 B = <0.5 T = <0.5 5467 LEGEND E = <0.5 X = <1.05466 FENCE LINE -¥___ APPROXIMATE LOCATION OF MONITOR WELL & NUMBER 100 NEW GROUND WATER MONITOR WELLS INSTALLED n EARTHEN BERM FEET APPROXIMATE GROUND WATER GRADIENT /--POTENTIOMETRIC SURFACE OF GROUND WATER ON MAY 10, 2002 TOC TOP OF CASING ELEVATION (ft) ΕL GROUND WATER ELEVATION (ft) NOTE: ISOPLETH MAPS FOR CONTAMINATES WERE NOT PRODUCED DUE TO LACK OF DATA POINTS В BENZENE (ug/L) Т TOLUENE (ug/L) * DEPTH-TO-GROUNDWATER IN MW-7 Ε ETHYLBENZENE (ug/L) WAS MEASURED ON JUNE 26, 2002 & WAS D:\DRAW\GOLDEN\6171 TOTAL XYLENES (ug/L) EXCLUDED FROM POTENTIOMETRIC SURFACE CALCULATIONS Х TITLE: DES .: PROJECT NO .: DWN 6171 CJG MN GIANT INDUSTRIES ARIZONA, INC. GIANT INDUSTRIES 11 APPD: CHKD: BLOOMFIELD, NM BLOOMFIELD, NEW MEXICO MN 906 San Juan Blvd., Suite "D" MN armington, New Mexico 87401 DATE: REV.: FIGURE 3 Tele: (505) 566-9116 SITE MAP 1 05/10/02

Appendix A

Well Development and Purging Data

Poler Name Final Nackan Proge - of	AESE well Number MW	MW-2	Development Pureine	WELL D	EVELOI	MEN	I AND	WELL DEVELOPMENT AND PURGING DATA	DATA	
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Water Removal Data	Data								·				
Date Time Punn	Development Method munn Railer	Removal Rate (gal/min)	Intake Depth (fect)	Ending Water Depth (feet)	Water Volu (gal	Water Volume Removed (gallons)	Product Volume Removed (gallons) Increment Commitative	ne Removed ons) Cumulative	Temperature		Conductivity (mmhos/cm)	Dissolved Oxygen (mo/L)	Comments
24.8 20	+					35 02	+		18 4	5.76	3040		Cipar water
						48			16.91	6.19	29.70		
						-12			0.91	10.48	2440		
						926			1 1 1 1	6.60	0630		
d(in)	gal/ft					107			1.1	10.71	2880		
2	0.16					117			14.10	14.78	2900		
4	0.65					126			14.5	6.82	2910		clear water
6	1.47					134			14.8	6.92	2920		
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06 San.	ALJE 906 San Juan Blvd.Stc.D	0	Well Number	ł	MW-3		Purging	ment	VELL	DEVEL	,OPME	INE IN) YUKI	WELL DEVELOPMENT AND FURGING DATA
armingt 05.566.	Farmington, NM 87401 505.566.9116(9120fax)		Serial No.	WDPD.										Page <u>2</u> of <u>3</u>
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J Subn Peris	Submersible Peristaltic		 Double Stainles 	Li Double Check Valve Stainless-steel Kemmerer		Gravel Pack Drilling Fluids Total	s Illin al				Ĩ.	□ Other Water Disposal	al	
U Other Water R	U Other Water Removal Data)ata									·			
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							144			15.0	6.93	2930		
┼─┼							6L1			14.8	6.96	2920		
							861			14.9	6.97	2910		
	d(in)	gal/fi					230			15.0	6.96	2920		
	2	0.16					247			15,0	6.97	2920		
	4	0.65					267			15.0	6.97	2930		
6 1.47	6	1.47					288			1. 1. 1.	16.90	2920		

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Date 05/09/02

Reviewer

Date

906 San Juan Blvd.Stc.D Farmington, NM 87401 505.566.9116(9120fax) Serial No. <u>WI</u> Project Name Client Company Site Name Development Criteria	wDPD	Project Manager Site Address				AIA
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		205	3443	0 10.47	light	brown color
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		40.1		150 1.51	2410	
++		445		6.97	2910 sample	
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								194				6.79	3420		light yellow color	
								228 328			15.9	6.93	3410		CLENS	
		d(in) 2	gal/ft					394			15.8	0.92	3400			
		14	0.65					523			15.5	6.90	3410		yellowish prowincelicr	
		9	1.47					586			15.5	6.88	3400			·
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г шир П Centrifugal П Submersible	baner Double Check Valve	/alve Theck Valve		Well Casing Gravel Pack	Cubic Feet	cet Gallons	_	Kemoved		Temperature Meter	Meter	
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d(in) gal/ft								,				
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hailers. Used both to bail and 1100 oz. Used clean sample			804	12.	6.47		
hailers. Used both to bail and 1100 oz. Used clean sample	6 1.47		580	1.	6.46		
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906 San Juan Blvd.Ste.D Farmington, NM 87401 505.566.9116(9120fax)	Blvd.Stc.D IM 87401 (9120fax)		Serial No.	WDPD-			20 5 -	2				N			Page 2 of 2
Project Name	Ð						Project I	Project Manager						Project No.	No.
Client Company	any							× I						Phase Task No.	ask No.
Site Name							Site Address	Iress							
Development Criteria	Criteria asing Volu ttion of Inc	imes of dicator	Water Re Parameter	anoval rs	¥ E E K	Water Volume Ca Initial Depth of ^V Initial Depth to V Height of Water	Water Volume Calculation Initial Depth of Well (feet) Initial Depth to Water (feet) Height of Water Column in	leulation Well (feet) Water (feet) Column in Well (feet)	il (feet)				Instruments PH Meter DO Monitor	Ø	Scrial No. (if applicable)
Matheda a	f Danielo					iameter (i	Diameter (inches): Well	cell	Grave	╞		C			
Methods of Development Pump Ba Centrifugal Cantrifugal Centrifued Submersible Canton C	f Develo al ble		ant Bailer D Bottom Valve D Double Check Stainless-steel	snt Bailer D Bottom Valve D Double Check Valve Stainless-steel Kemmerer		Item Well Casing Gravel Pack Drilling Fluids Total	<u><u></u> <u></u> <u></u> <u></u></u>	Water Volum Cubic Feet	Water Volume in Well Cubic Feet Gallons		Gallons to be Removed	s o o Š	Conductivity Meter Temperature Meter Other Water Disposal	Meter Meter al	
Other	loval Da	ta													
	∣ 중 숲⊢	ment d	Removal Rate	Intake Depth	Ending Water Depth	Water	after 1	┝──┼	부분		Temperature		Conductivity	Dissolved Oxygen	
Date	dum	Bailer	(Bal/ma)	(1661)	(leet)	Increment	11 Cumulative		Increment Cumutative	lative	15.6 15.6	6.47	4500 USDO	(mg/L)	plenty of recharge
							STT S				15.6	10.47	aash		
							906			+	av av	14 10 48	4500		
		gal/A					970				5.6	6.48	4500		clear
	+	0.16					1034			-		6.47	4500		
	6 4	1.47					11107			<u> </u>	200	6.47 12 U7	4500		
Circle the date and time that the development criteria are met.	d time that the	developm	ent criteria ai	re met.		-									sample

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DATA <u> </u>	applicable)	Comments (ay water - strangede prewnight branning to branning	ail 1 simple
WELL DEVELOPMENT AND PURGING DATA Page 1 of Martin Nee Project No. 6207 Phase Task No.	tor Scrial No. (if applicable) ity Meter inter i	Dissolved Oxygen (mg/L) (for Pr.Clu	Clean one
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WELL DEVE Martin Nee	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Alme Removed Temperat allons) Temperat Cumulative (°C) 32.02 [9, [8] 232 02 [9, [8] 232 02 [9, [7] 232 02 [9, [7] 232 07 17 202 17	casing (#2"), Eter
Development Purging Project Manager	ite Address alculation Well (fect) Water (feet) r Column in V es): Well 5 Cubic Feet	ume Removed allons) Cumulative	all well lack on ba
MW-6		Water Depth (fcct)	er. Kr.d. to remove. 5 Water, strong ottor, Xanver.
Well Number W well Number W of Serial No. WDPD- Bloomfield Crude	cs of Water Removal actor Parameters i d dry ment Bailer C Bottom Valve Double Check Valve Stainless-steel Kemmerer	ata ata od Bailer (gal/min) gal/fh 0.16 0.55 1.47	velopment criteria are nuct. Wer VUV Witrel Wichter Gray Mat Datalene Settingstremponary Internet Filestico
AESE 906 San Juan Blvd.Stc.D Farmington, NM 87401 505.566.9116(9120fax) Project Name <u>B10</u> Client Company <u>G1</u>	e ent Criteria ent Criteria 5 Casing Vo lization of Other <u>of</u> fugal ersible altic	□ Other Other Water Removal Data Date Date Time Date Time Date 12:00 05/10/02 12:00 05/10/02 12:00 06(in) gal/fi 07/14/02 2 0.16 4 0.16 1.47	Chele line date and time that the development criteria are net. Continents Well COVER VENU MIRCH TO REMOVE. Small Bailer WAS filled WI Mark aray Water, strong abor, blac Developer's Signature (s) Can Muy Satur Cartan USAVZIIIF94WAWEILIDEV doc CODOCUMENTS and SettingsAndminLocal SetingsAremporary Informent Files/Content IESAVZIIIF94WAWEILIDEV doc
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$\underbrace{SE}_{\text{an Blvd Ste.D}} \text{ well Number } \underbrace{MW - 7}_{\text{or 2} (b \ 2 \ b)} \underbrace{\text{Development}}_{\text{Purging}} \underbrace{\text{Well DEVELOPMENT AND PURGING DATA}}_{\text{Purging}}$	ame Bloomfield Crude Station Project Manager Martin Nee Project No. 6/71 Ampany Giart Project No. 6/71 Phase Task No. Site Address Bloomfield, NM	evelopment Criteria evelopment Criteria ET 2 to 5 Casing Volumes of Water Removal Initial Depth of Well (feet) 33, 430, 87DC Initial Depth to Water (feet) 22, 378, 87DC Cl-PH Meter Initial Depth to Water (feet) 1, 05, Cl-PH Meter Initial Depth to Water Column in Well (feet) 1, 05, Diameter (inches): Well 2, Gravel Pack	Methods of Development $x \ O.l \psi$ Water Volume in WellGallons to beConductivity MeterPumpBailerBailerItemCubic FeetGallonsRemovedCentrifugalCarbon ValveWell CasingI. $7bSX \ 3 - 53 \ 3n \ X \ blue \ 2dl C $	Water Kemoval Data Removal Data Date Time Development Removal Index Development Combination Oppent Index Development Removal Index Development Removal Index Development Removal Index Development Removal Index Development Index Development
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an Juan Blvd.Ste.D	Well Number	-MW	r+ '		Development Purging		/ELL I)EVEL(OPME	NT AND	Purg	WELL DEVELOPMENT AND PURGING DATA
	Serial No.	WDPD-										Page Z of Z
Project Name Bloomfield		Crude S	Station	-F	Project Manager		Martin Nee	Nee			Project No.	0. 6171
Client Company Giant	Ŧ										Phase Task No.	sk No.
Site Name				Sil	Site Address	-	mfield	Bloomfield, NM				
Development Criteria 23 to 5 Casing Volumes of Water Renoval 23 Stabilization of Indicator Parameters 20 Other	of Water Re or Parameter	moval S	Wate Initis Initis	Water Volume Calculation Initial Depth of Well (feet) Initial Depth to Water (feet) Height of Water Column in Well (feet)	alculation Well (feet Water (fee	t) m Well (fe	et)			Instruments [J-PH Meter [] DO Monitor	Set	Scrial No. (if applicable)
			Dian	Diameter (inches): Well	es): Well		Gravel Pack					
ods of Developme	nt Pit				Water V	ĕŀ	\vdash	Gallons to be	2	Conductivity Meter	Meter	
rump Centrifugal	Baller Debottom Valve	/alve hoot Value		Well Casing	Cubic reet	Callons		Kemovea		Defemberature Meter	Meter	
	□ Stainless-steel Kemmerer	steel Kemm		Drilling Fluids						Other		
□ Other				Total					- Wa	Water Disposal		
Water Removal Data												
Development Method Data Time Pumn Raiter	Removal Rate (cal/min)	Intake Depth (fect)	Ending Water Depth (feet)	Product Volume Removed (gallons) Increment Cumulative	me Removed (ons) ('umulative	Water Volume Removed (gallons) Increment Commutative	Volume Removed (gallons) ut Comutative	Temperature	Id	Conductivity (mmhos(cm)	Dissolved Oxygen (me/l.)	Commente
	┼╌┼╾					28	292	21.2	6.78	1350		
						32	356	21.2	6.78	0/21		DA
6/20/00/2551												Suple
d(in) gal/ft												
2 0.16												
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6 1.47												
Circle the date and _{lithe} that the development criteria are met. Comments not	pment criteria are Col DA	; mei. 1 nC 7_										
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		<u>с</u>										

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AESE	Well Number	ar <u>MW-7</u>		Development Purging		ELLE	EVEL	DPMEN	T AND	PURGI	WELL DEVELOPMENT AND PURGING DATA
900 San Juan Blyd. Ste. J. Farmington, NM 87401 505.566.9116(9120fax)	t) 1 3) Serial No.	WDPD-									Page <u>2</u> Of <u>2</u>
Project Name	Bloomfield	Crude Station	tion	Project Manager	ger .	M. N	Nee			Project No.	1219
Client Company	Giant									Phase Task No.	k No.
Site Name				Site Address	•	Bloomfidd	WW F				
Development Criteria	olumes of Water I	čemova l	Water Volum Initial Depti	Water Volume Calculation Initial Depth of Well (feet)				Instruments	Instruments G_PH Meter	Seri	Serial No. (if applicable)
□ Stabilization of □ Other	□ Stabilization of Indicator Parameters	ters	Initial Dept Height of W	Initial Depth to Water (feet) Height of Water Column in Well (feet)	t) n Well (fee	()		Ы Д	DO Monitor		
			Diameter (incn	icnes): weil		Uravel Pack					
Methods of Development Pump Ba	elopment Bailer		Item	Water Volu Cubic Feet	Water Volume in Well Cubic Feet Gallons		Gallons to be Removed	ъ Ę	년 ⁷ Conductivity Meter	eter	
🗖 Ĉentrifugal	Bottom Valve	Valve	Well Casing	$\left \right $	+			Щ Тe	E Temperature Meter	eter	
C Submersible	Double Double	Double Check Valve Stainless_steel Kemmerer	Gravel Pack	ide utility and an and an	25622-65			Cther	hor		
			9					Wate	Water Disposal		
D Other									•		
Water Removal Data	Jata										
Devel	Development Removal Method Rate	Intake Depth (feet)	Ending Product Vo Water Depth (g	Product Volume Removed (gallons) Increment Cimulative	Water Volume Removed (gallons) Increment Cimulative	e Removed ms) Cumulative	Temperature (°C)	ia.	Conductivity (mmhos/cm)	Dissolved Oxygen (mp/L)	Comments
						295	18,1	2	(380		
					32	327	18,0	6.57	1380		sample
56:6 20/1/2							ť	· ·			-
(in) d(in)	gal/ft										
2	0.16										
4	0.65										
9	1.47										
Circle the date and time that the development criteria are met.	the development criteria	are met.									
Comments											

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WELL DEVELOPMENT AND PURGING DATA	Project No. 6/7/ Phase Task No.		ts Scrial No. (if applicable) leter fonitor	 Conductivity Meter Temperature Meter Other Other Water Disposal 		Conductivity Dissolved Conductivity Oxygen Connents (mgL) Oxygen Connents (mgL) Oxygen Connents (mgL) Contains particles 14-20 Gray Color 3370 Gray Color 1380 Gray Color 1380 I380 blackish color 1380 l380 blackish color 1380 Date Date
LOPMENT	lee	WI	Instruments In PH Meter			т <i>b. 18</i> <i>b. 18</i> <i>b. 22</i> <i>b. 22</i> <i>b. 22</i> <i>b. 52</i> <i>b. 55</i> <i>b. 56</i> <i>b. 55</i> <i>b. 56</i> <i>b. 55</i> <i>b. 56</i> <i>b. 56</i>
	Martin N	Bloomfield, A	33. 429 'BTDC 33. 429 'BTDC [ell (feet) 10, 107' ", Gravel Pack	me in Well Gallons to be Gallons Removed $z = 4,85 \times 64 = \overline{3} 0,4$	·	moved Water Volume Removed Temperature (galloug) $e.Z$ Temperature (e.C.) Italive Increment Cumulative (°C) (°C) Italive $1, 25 e.Z$ $25 e.Z$ 20.9 (°C) Italice $1, 1$ $1, 25 e.Z$ $19, 1$ $19, 1$ Italice $1, 26 e.Z$ $18, 4$ $18, 4$ 32.2 $18, 4$ Italice $13, 20$ $13, 20$ $18, 4$ 32.2 $18, 2$ Italice $32 L$ $12 E Z$ $18, 2$ $18, 2$ 32.2 $18, 2$ Italice $32 L$ $12 E Z$ $18, 2$ $18, 1$ $18, 2$ Italice $23 L$ $26 Z$ $18, 2$ $18, 1$ $18, 1$ $18, 1$ $18, 1$ $18, 1$ $18, 1$ $12 E Z$ $18, 1$ $18, 1$ $18, 1$ $12 E Z$ $12 L Z$
Development Purging	Project Manager	Site Address	Water Volume Calculation Initial Depth of Well (feet) 33.4 Initial Depth to Water (feet) 23.4 Height of Water Column in Well (feet) Diameter (inches): Well 2^{41} Gra	Water Volume in WellCubic FeetGallonsR $1.6 17 \times 3 = 4.851$ ck $1.6 17 \times 3 = 4.851$ ck $1.6 17 \times 3 = 4.851$ rotal $7.6 \times 3 = 4.851$ Total $7.6 \times 3 = 4.851$		Mume Real
25.69 101020 -7	Station		Water Volume C Initial Depth of Initial Depth to Height of Wate Diameter (inch	X, 1b Item Well Casi Gravel Pa terer Drilling F		h Water Depth (a (feet) Increment (feet) Depth (b (feet) Depth (b the depth (b) of the Kaure
ber <u>Mh/</u>	Crude		ater Removal rameters	ailer Bailer Double Check Valve Stainless-steel Kemmerer		ce Deput
A Ste.D 87401 20fax) Serial No.	Bloomfield		evelopment Criterla LT to 5 Casing Volumes of Water Removal Castabilization of Indicator Parameters Other Other		val Data	n pp
AESE 906 San Juan Blvd. Ste. D Farmington, NM 87401 505.566.9116(9120fax)	Project Name Client Company	Site Name	Development Criteria Dovelopment Criteria D Stabilization of D Other	Methods of Development Pump Centrifugal Submersible Peristaltic	Water Removal Data	Date Time Development Method Date Time Pump Baile 0710102 515% V V 0710102 615% V V 0710102 610 83U V 0710102 610 84U 0.6 0.10 2 0.11 9 0.10 6 1.4 0.6 0.11 6 1.4 0.6 0.11 6 1.4 0.6 0.11 715 504 0.11 715 504 Developer's Signature (s) 0.5

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Appendix B

Analytical Laboratory Reports

2709-D Pan American Freeway NE Albuquerque, New Mexico 87107 Phone (505) 344-3777 Fax (505) 344-4413

Pinnacle Lab ID number May 16, 2002 205068

AESE 906 SAN JUAN BLVD. SUITE D FARMINGTON, NM 87401

GIANT INDUSTRIES P.O. BOX 159 BLOOMFIELD, NM 87401

Project NameBLOOMFIELD CRUDE ST.Project Number6207

Attention: MARTIN NEE/TIM KINNEY

On 05/13/02 Pinnacle Laboratories, Inc., (ADHS License No. AZ0592 pending), received a request to analyze **aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (505)344-3777.

H. Mitchell Rubenstein, Ph. D. General Manager

MR: jt

Enclosure

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: AESE	PINNACLE ID	: 205068
: 6207	DATE RECEIVED	: 05/13/02
: BLOOMFIELD CRUDE ST.	REPORT DATE	: 05/16/02
		DATE
CLIENT DESCRIPTION	MATRIX	COLLECTED
MW-3	AQUEOUS	05/10/02
MW-4	AQUEOUS	05/10/02
MW-5	AQUEOUS	05/10/02
MW-6	AQUEOUS	05/10/02
TRIP BLANK	AQUEOUS	05/07/02
	: BLOOMFIELD CRUDE ST. CLIENT DESCRIPTION MW-3 MW-4 MW-5	: 6207 DATE RECEIVED : BLOOMFIELD CRUDE ST. REPORT DATE CLIENT DESCRIPTION MATRIX MW-3 AQUEOUS MW-4 AQUEOUS MW-5 AQUEOUS MW-6 AQUEOUS

File: '205068; COVEREP



GAS CHROMATOGRAPHY RESULTS

TEST CENT PROJECT # PROJECT NAME	: EPA 8021 M : AESE : 6207 : BLOOMFIEL				PINNACLE I.I	D.: 205068
SAMPLE			DATE	DATE	DATE	DIL.
•	NT I.D.	MATRIX	SAMPLED	EXTRACTED	ANALYZED	
MW-	3	AQUEOUS	05/10/02	NA	05/14/02	1
02 MW-4	1	AQUEOUS	05/10/02	NA	05/14/02	1
05 MW-	5	AQUEOUS	05/10/02	NA	05/14/02	1
RAMETER	DET. LIMI	Т	UNITS	MW-3	MW-4	MW-5
NZENE	0.5		UG/L	< 0.5	< 0.5	< 0.5
TOLUENE	0.5		UG/L	< 0.5	< 0.5	< 0.5
ETHYLBENZENE	0.5		UG/L	< 0.5	< 0.5	< 0.5
TAL XYLENES	1.0		UG/L	< 1.0	< 1.0	< 1.0
SURROGATE: BROMOFLUOROI RROGATE LIM)		105	104	102

EMIST NOTES:



GAS CHROMATOGRAPHY RESULTS

- EST	: EPA 8021 MOE	DIFIED				
	: AESE				PINNACLE I.D	.: 205068
POJECT #	: 6207					
PROJECT NAME	: BLOOMFIELD	CRUDE ST.				
APLE		· · ·	DATE	DATE	DATE	DIL.
DE CLIENT I.D.		MATRIX	SAMPLED	EXTRACTED) ANALYZED	FACTOR
MW-6 TRIP BLANK		AQUEOUS	05/10/02	NA	05/14/02	1
5 TRIP BLANK		AQUEOUS	05/07/02	NA	05/14/02	1
ARAMETER	DET. LIMIT		UNITS	MW-6	TRIP BLANK	
BEZENE	0.5		UG/L	< 0.5	< 0.5	
	0.5		UG/L	< 0.5	< 0.5	
THYLBENZENE	0.5		UG/L	0.53	< 0.5	
AL XYLENES	1.0		UG/L	1.4	< 1.0	
SUBROGATE:						
ROMOFLUOROBENZEN	Ξ(%)			98	<u>,</u> `110	
	(80 - 120)			· . • ·		
	· · · ·					

MIST NOTES:



GAS CHROMATOGRAPHY RESULTS REAGENT BLANK

	r -			
EST	: EPA 8021 MODIFIED	PINNACLE I.D.	: 205068	
LANK I. D.	: 051402	DATE EXTRACTED	: N/A	
	: AESE	DATE ANALYZED	: 05/14/02	
ROJECT #	: 6207	SAMPLE MATRIX	: AQUEOUS	
ROJECT NAME	: BLOOMFIELD CRUDE ST.			
AMETER	UNITS			
EEENE	UG/L	<0.5		
OFJENE	UG/L	<0.5		
THYLBENZENE	UG/L	<0.5		
OTAL XYLENES	UG/L	<1.0		
UBROGATE: RUMOFLUOROBENZENE (%) UBROGATE LIMITS:	(80 - 120)	101		
HEMIST NOTES:		· · · · · · · · · · · · · · · · · · ·		

GAS CHROMATOGRAPHY QUALITY CONTROL LCS/LCSD

= 2	: EPA 8021 M	DIFIED			PINNACLE	I.D.	:	205068	
ATCH #	: 051402				DATE EXTR	RACTED	:	N/A	
	: AESE				DATE ANAL	YZED	:	05/14/02	
R elect #	: 6207				SAMPLE M	ATRIX	:	AQUEOUS	
ROJECT NAME	: BLOOMFIEL	D CRUDE S	sπ.		UNITS		:	UG/L	
	SAMPLE	CONC	SPIKED	%	DUP	DUP		REC	RPD
APAMETER	RESULT	SPIKE	SAMPLE	REC	SPIKE	% REC	RPD	LIMITS	LIMITS
ENZENE	<0.5	20.0	19.6	98	19.1	96	3	(80 - 120)	20
DENE	<0.5	20.0	19.8	99	19.6	98	1	(80 - 120)	20
TULBENZENE	<0.5	20.0	20.1	101	20.0	100	0	(80 - 120)	20
	<1.0	60.0	62.1	104	61.6	103	1	(80 - 120)	20

IIST NOTES:

P

(Spike Sample Result - Sample Result)

covery =

Spike Concentration

X 100

Average Result

– X 100

<u>.</u> ...

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GAS CHROMATOGRAPHY QUALITY CONTROL MS/MSD

SMSD #	: EPA 8021 M	DDIFIED			PINNACLE	I.D.	:	205068	
SMSD #	: 205068-01				DATE EXTR	RACTED	:	N/A	
.I O IT	: AESE				DATE ANAL	YZED	:	05/14/02	
ROLECT #	: 6207				SAMPLE M	ATRIX	:	AQUEOUS	
	: BLOOMFIELI	CRUDE S	IT.		UNITS		:	UG/L	
	SAMPLE	CONC	SPIKED	%	DUP	DUP		REC	RPD
RAMETER	RESULT	SPIKE	SAMPLE	REC	SPIKE	% REC	RPD	LIMITS	LIMITS
NZENE	<0.5	20.0	20.2	101	19.5	98	4	(80 - 120)	20
	<0.5	20.0	20.0	100	19.4	97	3	(80 - 120)	20
BENZENE	<0.5	20.0	20.4	102	19.8	99	3	(80 - 120)	20
TAL XYLENES	<1.0	60.0	63.1	105	61.1	102	3	(80 - 120)	20

IST NOTES:

P

(Spike Sample Result - Sample Result) --- X 100

overy =

Spike Concentration

 / (Sample Result - Duplicate Result) X 100

PD (Relative Percent Difference) =

Average Result

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を見る	:SIB19M											147.6	N					6	5	
25.2 2 - 3	RCRA Metals by TCLP (Method 1311)																		1	{ @
	RCRA Metals (8)											RELINQUISHED BY:	Time:	١	Dale.		BI			5
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の方という	General Chemistry:												Signature:	ted N		Company	ΞĊΕΙ		18	
	Polynuclear Aromatics (610/8310/8270-SIMS)											B	Sig	Driv		3	BE	S S		
	Base/Neutral/Acid Compounds GC/MS (625/8270)		:								·	1.			02		N		ŀ	Γ
	Herbicides (615/8151)				·							RELINQUISHED BY:		00.0	05/13/02	•	X		1	
ESI	Pesticides/PCB (608/8081/8082)		i									1. K. M. S.		3	2	•		Ν		
g	8260 (Landfile Volatile Organics			-								2.02 M	ë	\neg	1	Ĩ				ŀ
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SIS	8260 (Full) Volatile Organics												2	NA IS	1		Page 1		Ν	ŀ.
Ň	8260 (TCL) Volatile Organics											SIN		3	i e		RECEIVED BY	l ·		
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灑	(M8015) Gas/Purge & Trap	-										Ē			Ì					
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1.12	(MOD.8015) Diesel/Direct Inject					-+	-+		_			E	11 WEEK	SDWA						
12. (1)	Petroleum Hydrocarbons (418.1) TRPH	1.20		3.483			1252	19994	1978) 1978)	16152	c	EQ	Ē		}					
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		9.19	10:15	11:21	1218	63						PRIOR AUTHORIZATION IS RE	(RUSH) 24hr	CERTIFICATION REQUIRED	METHANOL PRESERVATION	COMMENTS:				
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i i i i i i i i i i i i i i i i i i i	AESE 906 San 1 Tarming 1 Tarming 505-566 Giant Po Box Po Box Blicomfie				l	الد						NHC		iek			SAMPLERECEIPT			
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PROJECT MANAGER:	COMPANY: ADDRESS: <u>90</u> PHONE: <u>50</u> FAX: <u>50</u> BILL TO: <u>50</u> COMPANY: <u>50</u> ADDRESS: <u>20</u>	-MM	MW-4	-MM	MM-b) 1						E	NO.	PROJ. NAME:		SHIPPED VIA:		VO'GONTAINE	GUSTODY SEALS	
lő	COMI ADDF FAX: BILL COMI ADDF		\leq	4		\vdash	{						PROJ. NO.:	ŝ.	P.O. NO.:	3991		S I		
	1.25%	I 1	1	·)	1	1			- 1)			2	문	L C C	5	M. A.	¥4.	武之能	\mathbf{x}_{i}

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Pinnacle Lab ID number July 03, 2002 206098

AESE 906 SAN JUAN BLVD. SUITE D FARMINGTON, NM 87401

GIANT INDUSTRIES 111 COUNTY ROAD 4990 BLOOMFIELD, NM 87413

Project NameBLOOMFIELD CRUDE STNProject Number6207

Attention: ASHLEY LOWE/TIM KINNEY

On 06/27/02 Pinnacle Laboratories, Inc., (ADHS License No. AZ0592 pending), received a request to analyze **aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (505)344-3777.

H. Mitchell Rubenstein, Ph. D. General Manager

MR: jt

Enclosure

8 - 01	MW-7	AQUEOUS	06/26/02
1D #	CLIENT DESCRIPTION	MATRIX	COLLECTED
ACLE		· · · · · · · · · · · · · · · · · · ·	DATE
ECT NAME	: BLOOMFIELD CRUDE STN	REPORT DATE	: 07/03/02
JECT #	: 6207	DATE RECEIVED	: 06/27/02
NT	: AESE	PINNACLE ID	: 206098

PIN

Confidential

File: '206098; COVEREP

GAS CHROMATOGRAPHY RESULTS

	: EPA 8021 MOD	NFIED					
ENT	: AESE				PINNACLE I.D.	.: 206098	
JECT #	: 6207						
ECT NAME	: BLOOMFIELD	CRUDE STN					
E E			DATE	DATE	DATE	DIL.	
CLIENT I.D.		MATRIX	SAMPLED	EXTRACTED	ANALYZED	FACTOR	
MW-7		AQUEOUS	06/26/02	NA	06/28/02	5	
METER	DET. LIMIT		UNITS	MW-7			
ENE	0.5		UG/L	2000-D100			
LENE	0.5		UG/L	< 2.5			
TLBENZENE	0.5		UG/L	140			
RL XYLENES	1.0		UG/L	1100			
PROGATE:							
MOFLUOROBENZENE	: (%)			107			
ROGATE LIMITS	(80 - 120)				* ≹ *		
				· • • • •			

EMIST NOTES:

This sample was analyzed at a 100X dilution on 06/28/02 for this compound.

GAS CHROMATOGRAPHY RESULTS REAGENT BLANK

EST LOK I. D. LENT ROJECT # ROJECT NAME METER	: EPA 8021 MODIFIED : 062802 : AESE : 6207 : BLOOMFIELD CRUDE STN UNITS	PINNACLE I.D. DATE EXTRACTED DATE ANALYZED SAMPLE MATRIX	: 206098 : N/A : 06/28/02 : AQUEOUS
ENZENE	UG/L	<0.5	
DLUENE	UG/L	<0.5	
THELBENZENE	UG/L	<0.5	
T XYLENES	UG/L	<1.0	
JRROGATE: ROGELUOROBENZENE (%) JREOGATE LIMITS:	(80 - 120)	98	
HEMIST NOTES:			
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GAS CHROMATOGRAPHY QUALITY CONTROL LCS/LCSD

ST 1000 # 1611T	: EPA 8021 M : 062802 : AESE	ODIFIED			PINNACLE DATE EXTR DATE ANAL	RACTED	:	206098 N/A 06/28/02	
OJECT #	: 6207				SAMPLE M	ATRIX	:	AQUEOUS	
	: BLOOMFIELI	D CRUDE S	TN		UNITS		:	UG/L	
	SAMPLE	CONC	SPIKED	%	DUP	DUP		REC	RPD
RAMETER	RESULT	SPIKE	SAMPLE	REC	SPIKE	<u>%</u> REC	RPD	LIMITS	LIMITS
ENE	<0.5	20.0	18.7	94	18.5	93	1	(80 - 120)	20
ENE	<0.5	20.0	19.3	97	19.1	96	1	(80 - 120)	20
HYLBENZENE	<0.5	20.0	19.9	100	19.7	99	1	(80 - 120)	20
TAL XYLENES	<1.0	60.0	60.3	101	59.7	100	1	(80 - 120)	20

MIST NOTES:

very =

(Spike Sample Result - Sample Result)

Spike Concentration

Decent Difference) =

/ (Sample Result - Duplicate Result)

Average Result

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GAS CHROMATOGRAPHY QUALITY CONTROL MS/MSD

D#	: EPA 8021 M0 : 206102-01 : AESE	DIFIED			PINNACLE DATE EXTR DATE ANAL	RACTED	: :	206098 N/A 06/28/02	
JECT #	: 6207				SAMPLE M	ATRIX	:	AQUEOUS	
	: BLOOMFIELI	CRUDE S	TN		UNITS		:	UG/L	
	SAMPLE	CONC	SPIKED	%	DUP	DUP		REC	RPD
AMETER	RESULT	SPIKE	SAMPLE	REC	SPIKE	% REC	RPD	LIMITS	LIMITS
N E	<0.5	20.0	20.0	100	20.2	101	1	(80-120)	20
NE	<0.5	20.0	20.8	104	20.7	104	0	(80 - 120)	20
BENZENE	<0.5	20.0	21.5	108	21.1	106	2	(80 - 120)	20
AL XYLENES	<1.0	60.0	65.4	109	64.2	107	2	(80 - 120)	20

UST NOTES:

/ery =

(Spike Sample Result - Sample Result)

Spike Concentration

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Relative Percent Difference) =

Average Result

(Sample Result - Duplicate Result)

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American .		ental Networ	•				CH		CUSTODY
CLIENT: AESE	- 406 San. Farminan	Juan Blvd, SkiD 5 on, <u>NM 87401</u> 50 206098	705-566-9	116 tel		PARAMETERS	ng ta di	7	
P .O. NUMBER Bill To Giant ITim AEN(NM) Accession #:	Kinney	206098		120 100	\$\$			PAGE _	_/ Ur _ <u>/</u>
AEN(NM) Accession #:	PO Box 159 Bloomfield, NA			Jag V	* /				
GLIENT SAMPLEID		STOATEAND FINES	MAIRDA				BOTTL	E TYPE & NO.	NET PRICE
MW-7	01	6/26/02 135	water				1994 - 1 1	2	
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		06/27/02 08:45	AMPLES RELINQU	ISHED BY (SIG	SNATURE)	DATE AND TIME		MARKS ON SAMP Bottle Intact Preserved Chilled	LE RECEIPT Custody Seals Custody Seals Seals Intact See Remarks
SAMPLES RECEIVED BY		DATE AND TIME				DATE AND TIME	105	MARKS ON SAMP Bottle Intact Preserved Chilled	LE RECEIPT Custody Seals Seals Intact See Remarks
PROJ #: 62 Name B Shipped Va: G	207 Icomfield 1 izynowia Bu 2709-D Pan Ame	C rude Stn 1/5798 AEN Inc rican Freeway, NE • Alt	Rec'd 12 .: American El Duguergue, Ne	vironment w Mexico	tal Network 87107 • (50	(NM), Inc. (5) 344-3777 •	DISTRIBU Fax (505	JTION: White - AEN	(NM), Canary - Originato

2506 West Main Street Farmington, NM 87401

Date: 5/23/02

Client: Giant Bloomfield / AESE Bal

Lab ID: 0302W02155 - 2158

Project: Bloomfield Crude Station

Dear Client:

The samples were received for analysis at Inter-Mountain Laboratories (IML), Farmington, New Mexico. Enclosed is the result of the analyses.

Comment:

The enclosed report has been independently reviewed for compliance with IML-Farmington's Quality Assurance Plan and Data Quality Objectives. IML has examined all of the data in the report and has made every effort possible to make sure it is complete, accurate, and compliant. Quality Assurance data, if not included, is on file and available upon request.

Unless otherwise noted, all results were obtained by approved methods. Practical Quantification Limits (PQLs) are based on statistically derived determinations, and upon any dilutions necessary to obtain proper method response without matrix interference.

William Lipps / Laboratory Director/IML-Farmington, NM

Client:	Giant Refining Co.
Project:	BLOOMFIELD CRUDE STATION
Sample ID:	MW-3
Lab ID:	0302W02158
Matrix:	Water
Condition:	Cool/Intact

 Date Received:
 05/13/02

 Date Reported:
 05/23/02

 Date Sampled:
 05/10/02

 Time Sampled:
 1015

	Analytical				•	Analysis						
Parameter	Result	Units	, est	Units	PQL	Method	Date Time	Init.				
General Parameters	-	•		•								
РН	7.0	s.u.			0.1	EPA 150.1	05/13/02 1145	RB				
Electrical Conductivity	4,440	s.u.			0.1	EPA 150.1	05/13/02 1145	RB				
Solids - Total Dissolved	3,820	mg/L			10	2540 C	05/14/02 1515	AB				
Alkalinity (CaCO3)	358	mg/L			1	SM 2320B	05/20/02 1225	AB				
Hardness (CaCO3)	1,290	mg/L			1	EPA 200.7						
Major Cations												
Calcium	446	mg/L	22.26	meq/L	0.2	EPA 200.7	05/13/02 1416	WL				
Magnesium	43.0	mg/L	3.54	meq/L	0.2	EPA 200.7	05/13/02 1416	WL				
Potassium	0.6	mg/L	0.02	meq/L	0.2	EPA 200.7	05/13/02 1416	WL				
Sodium	705	mg/L	30.67	meq/L	0.2	EPA 200.7	05/13/02 1416	WL				
Major Anions												
Bicarbonate (HCO3)	437	mg/L	7.16	meq/L	1	SM 2320B	05/20/02 1225	AB				
Carbonate (CO3)	<1	mg/L	<0.01	meq/L	1	SM 2320B	05/20/02 1225	AB				
Chloride	46	mg/L	1.30	meq/L	1	EPA 300.0	05/20/02 1317	ZW				
Hydroxide (OH)	<1	mg/L	<0.01	meq/L	1	SM 2320B	05/20/02 1225	AB				
Sulfate	2,520	mg/L	52.43	meq/L	5	EPA 300.0	05/20/02 1317	ZW				
Anion/Cation Balance QC Information	n						-					
Anion Sum			63.25	meq/L	0.01	SM 1030						
Cation Sum			56.49	meq/L	0.01	SM 1030						
Cation/Anion Balance			3.73	%	0.01	SM 1030						

Reference: EPA - "Methods for Chemical Analysis of Water and Wastes (MCAWW)" - EPA/600/4-79-020 - March, 1983. SM - "Standard Methods for the Examination of Water and Wastewater", APHA-AWWA-WEF, 19th Edition, 1995. EPA - "Methods for the Determination of Metals in Environmental Samples" - Supplement I - 600/R-94-111 - May, 1994.

Reviewed By:

	Analytical	Analysis
Condition:	Cool/Intact	Time Sampled: 1015
Matrix:	Water	Date Sampled: 05/10/02
Lab ID:	0302W02157	Date Reported: 05/23/02
Sample ID:	MW-4	Date Received: 05/13/02
Project:	BLOOMFIELD CRUDE STATION	
Client:	Giant Refining Co.	
		Farmington, NM 87

2506 West Main Street

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	Analytical				:. ·		Analysis					
Parameter	Result	Units		Units	PQL	Method	Date Time	Init.				
General Parameters												
РН	6.9	s.u.			0.1	EPA 150.1	05/13/02 114	5 RB				
Electrical Conductivity	5,140	s.u.			0.1	EPA 150.1	05/13/02 114	6 RB				
Solids - Total Dissolved	4,420	mg/L			10	2540 C	05/14/02 151	5 AB				
Alkalinity (CaCO3)	358	mg/L			1	SM 2320B	05/20/02 1/225	5 AB				
Hardness (CaCO3)	1,310	mg/L			1	EPA 200.7						
Major Cations												
Calcium	449	mg/L	22.41	meq/L	0.2	EPA 200.7	05/13/02 1413	WL WL				
Magnesium	47.0	mg/L	3.87	meg/L	0.2	EPA 200.7	05/13/02 1413	WL				
Potassium	2.6	mg/L	0.07	meq/L	0.2	EPA 200.7	05/13/02 1413	WL WL				
Sodium	873	mg/L	37.98	meq/L	0.2	EPA 200.7	05/13/02 1413	WL				
Major Anions	73											
Bicarbonate (HCO3)	437	mg/L	7.16	meq/L	1	SM 2320B	05/20/02 1225	AB				
Carbonate (CO3)	<1	mg/L	<0.01	meq/L	1	SM 2320B	05/20/02 1225	AB				
Chloride	47	mg/L	1.32	meq/L	1	EPA 300.0	05/20/02 1303	ZW				
Hydroxide (OH)	<1	mg/L	<0.01	meq/L	1	SM 2320B	05/20/02 1225	AB				
Sulfate	2,930	mg/L	60.99	meq/L	5	EPA 300.0	05/20/02 1303	ZW				
Anion/Cation Balance QC Inform	nation											
Anion Sum			69.44	meq/L	0.01 -	SM 1030						
Cation Sum			64.32	meq/L	- 0.01	SM 1030						
Cation/Anion Balance			3.83	%	0.01	SM 1030						

Reference: EPA - "Methods for Chemical Analysis of Water and Wastes (MCAWW)" - EPA/600/4-79-020 - March, 1983. SM - "Standard Methods for the Examination of Water and Wastewater", APHA-AWWA-WEF,19th Edition, 1995. EPA - "Methods for the Determination of Metals in Environmental Samples" - Supplement I - 600/R-94-111 - May, 1994.

Reviewed By:

Giant Refining Co.	
BLOOMFIELD CRUDE STATION	
MW-5	Date Received: 05/13/02
0302W02156	Date Reported: 05/23/02
Water	Date Sampled: 05/10/02
Cool/Intact	Time Sampled: 1121
	MW-5 0302W02156 Water

	Analytical					Analysis						
Parameter	Result	Units		Units	PQL	Method	Date Time	Init.				
General Parameters												
РН	6.5	s.u.			0.1	EPA 150.1	05/13/02 1145	RB				
Electrical Conductivity	6,880	s.u.			0.1	EPA 150.1	05/13/02 1145	RB				
Solids - Total Dissolved	4,810	mg/L			10	2540 C	05/14/02 1515	AB				
Alkalinity (CaCO3)	567	mg/L			1	SM 2320B	05/20/02 1225	AB				
Hardness (CaCO3)	1,880	mg/L			1	EPA 200.7						
Major Cations												
Calcium	661	mg/L	32.98	meq/L	0.2	EPA 200.7	05/13/02 1411	WL				
Magnesium	55.3	mg/L	4.55	meq/L	0.2	EPA 200.7	05/13/02 1411	WL				
Potassium	4.9	mg/L	0.13	meq/L	0.2	EPA 200.7	05/13/02 1411	WL				
Sodium	855	mg/L	37.20	meq/L	0.2	EPA 200.7	05/13/02 1411	WL				
Major Anions												
Bicarbonate (HCO3)	692	mg/L	11.34	meq/L	1	SM 2320B	05/20/02 1225	AB				
Carbonate (CO3)	<1	mg/L	<0.01	meq/L	1	SM 2320B	05/20/02 1225	AB				
Chloride	1,200	mg/L	33.88	meq/L	1	EPA 300.0	05/20/02 1250	ZW				
Hydroxide (OH)	<1	mg/L	<0.01	meg/L	1	SM 2320B	05/20/02 1225	AB				
Sulfate	1,230	mg/L	25.69	meq/L	5	EPA 300.0	05/20/02 1250	ZW				
Anion/Cation Balance QC Information												
Anion Sum			70.90	meq/L	0.01	SM 1030						
Cation Sum			74.86	meq/L	0.01	SM 1030						
Cation/Anion Balance			2.72	%	0.01	SM 1030						

Reference: EPA - "Methods for Chemical Analysis of Water and Wastes (MCAWW)" - EPA/600/4-79-020 - March, 1983. SM - "Standard Methods for the Examination of Water and Wastewater", APHA-AWWA-WEF,19th Edition, 1995. EPA - "Methods for the Determination of Metals in Environmental Samples" - Supplement I - 600/R-94-111 - May, 1994.

Reviewed By:

2506 West Main Street Farmington, NM 87401

	Farmington, NM 87401
Giant Refining Co.	
BLOOMFIELD CRUDE STATION	
MW-6	Date Received: 05/13/02
0302W02155	Date Reported: 05/23/02
Water	Date Sampled: 05/10/02
Cool/Intact	Time Sampled: 1218
	BLOOMFIELD CRUDE STATION MW-6 0302W02155 Water

2506 West Main Street

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Parameter	Result	Units	-	Units	PQL	Method	Date	Time	Init.
General Parameters									
PH	6.8	s.u.			0.1	EPA 150.1	05/13/0	2 1145	RB
Electrical Conductivity	4,460	s.u.			0.1	EPA 150.1	05/13/0	2 1145	RB
Solids - Total Dissolved	3,560	mg/L			10	2540 C	05/14/0	2 1515	AB
Alkalinity (CaCO3)	669	mg/L			1	SM 2320B	05/20/02	2 1225	AB
Hardness (CaCO3)	932	mg/L			1	EPA 200.7			
Major Cations									
Calcium	319	mg/L	15.92	meq/L	0.2	EPA 200.7	05/13/02	2 1409	WL
Magnesium	33.0	mg/L	2.71	meq/L	0.2	EPA 200.7	05/13/02	2 1409	WL
Potassium	2.5	mg/L	0.06	meq/L	0.2	EPA 200.7	05/13/02	2 1409	WL
Sodium	830	mg/L	36.11	meq/L	0.2	EPA 200.7	05/13/02	2 1409	WL
Major Anions									
Bicarbonate (HCO3)	816	mg/L	13.37	meq/L	1	SM 2320B	05/20/02	2 1225	AB
Carbonate (CO3)	<1	mg/L	<0.01	meq/L	1	SM 2320B	05/20/02	2 1225	AB
Chloride	55	mg/L	1.55	meq/L	1	EPA 300.0	05/20/02	2 1236	ZW
Hydroxide (OH)	<1	mg/L	<0.01	meq/L	1	SM 2320B	05/20/02	2 1225	AB
Sulfate	1,900	mg/L	39.57	meq/L	5	EPA 300.0	05/20/02	2 1236	ZW
Anion/Cation Balance QC Information	ı					,			
Anion Sum			54.47	meq/L	0.01	SM 1030	-		
Cation Sum			54.80	meq/L · 🔨	0.01	SM 1030			
Cation/Anion Balance			0.30	%	0.01	SM 1030			
•									

Reference: EPA - "Methods for Chemical Analysis of Water and Wastes (MCAWW)" - EPA/600/4-79-020 - March, 1983. SM - "Standard Methods for the Examination of Water and Wastewater", APHA-AWWA-WEF,19th Edition, 1995.

EPA - "Methods for the Determination of Metals in Environmental Samples" - Supplement I - 600/R-94-111 - May, 1994.

Reviewed By:

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555 Absaraka Sheridan, Wyoming 82801 Telephone (307) 674-7506		Relinquished by: (Signature)	Relinquished by: (Signature)	(Jehly X	Relinquished by: (Signature)			· · ·							MW-3	MW-4		MM-6	Sample No./ Identification	Sampler. (Signature)	Cllent/Project Name AESE/Giant	Inter-Mountain Laboratories, Inc.	3
P	/			Source										1 1	estie/oz	5/10/02	oslio/oz	05/10/02	Date	5			
Inter-N 1633 Terra Avenue Sheridan, Wyoming 82801 Telephone (307) 672-8945				7	2						7				9.19	10:15	11:21	12:18	Time				
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tories,		Time B	Time R		Time R														Matrix	· ·	rude S	IODY	
BS, ThC. 2506 West Main Street Farmington, NM 87401 Telephone (505) 326-4737	R	Received by laboratory: (Signature)	Received by: (Signature)		Received by: (Signature)										-				No. of		tation	' REC	· "
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D 11183 State Hwy. 30 College Station, TX 7 Telephone (979) 776	t i	(Ure)							HS	HAND	REC-										ALYSE	H.	
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☐ 11183 State Hwy. 30 College Station, TX 77845 Telephone (979) 776-8945	M											~								Remarks	ANALYSES / PARAMETERS		
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2506 West Main Street Farmington, NM 87401

Date: 7/25/02

Client: A.E.S.E/GIANT INDUSTRIES

Lab ID: 0302W02659

Project: BLOOMFIELD CRUDE STATION

Dear Client:

The samples were received for analysis at Inter-Mountain Laboratories (IML), Farmington, New Mexico. Enclosed is the result of the analyses.

Comment:

The enclosed report has been independently reviewed for compliance with IML-Farmington's Quality Assurance Plan and Data Quality Objectives. IML has examined all of the data in the report and has made every effort possible to make sure it is complete, accurate, and compliant. Quality Assurance data, if not included, is on file and available upon request.

Unless otherwise noted, all results were obtained by approved methods. Practical Quantification Limits (PQLs) are based on statistically derived determinations, and upon any dilutions necessary to obtain proper method response without matrix interference.

William Lipps // Laboratory Director/IML-Farmington, NM

										Main Stre
Client:	Giant Refining Co.							Farmiı	ngton,	NM 874
	BLOOMFIELD CRUD	E STATION		•	•					
Project:	•	ESTATION				•	Dete D			
Sample ID:	MW-7							eceived:		
Lab ID:	0302W02659							eported:		
Matrix:	Water						Date S	ampled:	07/0	1/02
Condition:	Cool/Intact						Time S	ampled:	0935	5
		Analytical	Sugar and the second			92.0		Anal	ysis	2010
Para	meter	Result	Units.		Units	PQL	Method	Date 1	Time	lnit.
General Param	neters									
РН		6.8	s.u.			0.1	EPA 150.1	07/01/02	1105	AB
Electrical Conduct	livity	1,870	µmhos/cm			10	SW-846 9050A	07/01/02	1105	AB
Solids - Total Diss		1,570	mg/L			10	2540 C	07/01/02	1330	AB
Alkalinity (CaCO3) [.] .	432	mg/L			1	SM 2320B	07/02/02	0840	AR
Hardness (CaCO3	3)	758	mg/L	<i></i>		1	EPA 200.7			
Major Cations								•		
Calcium		258	mg/L	12.87	meq/L	0.2	EPA 200.7	07/23/02	1506	JG
Magnesium		27.8	mg/L	2.28	meq/L	0.2	EPA 200.7	07/23/02	1506	JG
Potassium		2.2	mg/L	0.06	meq/L	0.2 .	EPA 200.7	07/23/02	1506	JG
Sodium		151	mg/L	6.57	meq/L	0.2	EPA 200.7	07/23/02	1506	JG
Major Anions										
Bicarbonate (HCC)3)	527	mg/L	8.64	meg/L	1	SM 2320B	07/02/02	0840	AR
Carbonate (CO3)		<1	mg/L	<0.01	meq/L	1	SM 2320B	07/02/02		AR
Chloride		20	mg/L	0.56	meq/L	1	EPA 300.0	07/08/02	1613	AR
Hydroxide (OH)		<1	mg/L	<0.01	meq/L	1	SM 2320B	07/02/02	0840	AR
Sulfate	•	700	mg/L	14.59	meq/L	5	EPA 300.0	07/08/02	1613	AR
Anion/Cation I	Balance QC Informatio	n						-		
Anion Sum				16.58	meq/L	0.01	-SM 1030			
Cation Sum				21.78	meq/L	0.01	SM 1030			
Cation/Anion Bala	ince			4.39	%	0.01	SM 1030			

Reference: EPA - "Methods for Chemical Analysis of Water and Wastes (MCAWW)" - EPA/600/4-79-020 - March, 1983. SW-846 - "Test Methods for Evaluating Solid Waste: Physical/Chemical Methods", United States Environmental Protection Agency, Final Update 1, July 1992.

SM - "Standard Methods for the Examination of Water and Wastewater", APHA-AWWA-WEF, 19th Edition, 1995.

Reviewed By: m

555 Absaraka Sheridan, Wyoming 82801	Relinquished by: (Signature)	Relinquished by:(Signature)	Relinquished by: (Signature)						/	/	MW-7 07			Sampler: (Slonature)	_	Inter- Mountain Laboratories, Inc.
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Inter-Mountain Laboratories, Inc.											6592	Lab Number		Chain of Cu	Proj B/s	CHAIN
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ES, INC.	Received by laboratory: (Signature)	Received by: (Signalbre)	Received by: (Signature)							~.					Station	DY REC
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Appendix C

Comprehensive Summary of Ground Water Analysis

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Summary of Ground Water Analytical Results for BTEX - September 1994 Through June 2002

NMWQCC Standards		Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L) 750	Total Xylenes (μg/L)
		10	750	750	620
MW-1*	Sep-94	NS	NS	NS	NS
	Apr-95	NS	NS	NS	NS
	Sep-99	NS	NS	NS	NS
	Dec-99	NS	NS	NS	NS
	May-01	NS	NS	NS	NS
	May-02	NS	NS	NS	NS
	Sep-94	640	600	82	690
	Apr-95	220	280	53	430
N 4117 O	Sep-99	NSP	NSP	NSP	NSP
MW-2	Dec-99	NSP	NSP	NSP	NSP
	May-01	NSP	NSP	NSP	NSP
	May-02	NSP	NSP	NSP	NSP
	Sep-94	ND	ND	ND	ND
	Apr-95	ND	ND	ND	ND
MW-3	Sep-99	ND	ND	ND	ND
	Dec-99	ND	ND	ND	ND
	May-01	ND	ND	ND	ND
	May-02	ND	ND	ND	ND
	Sep-94	2.1	ND	ND	1.2
	Apr-95	ND	ND	ND	ND
	Sep-99	ND	ND	ND	ND
MW-4	Dec-99	ND	ND	ND	ND
	May-01	ND	ND	ND	ND
	May-02	ND	ND	ND	ND
	Sep-94	NS	NS	NS	NS
	Apr-95	ND	ND	ND	ND
NAXX/ 2	Sep-99	ND	ND	ND	ND
MW-5	Dec-99	ND	ND	ND	ND
	May-01	ND	ND	ND	ND
	May-02	ND	ND	ND	ND
MW-6**	May-01	12	15	13	83
	May-02	ND	ND	0.53	1.4
MAN 744	May-01	2,400	ND	380	2,800
MW-7**	June-02	2,000	ND	140	1,100

Notes:

μg/L = micrograms per liter ND = not detected NS = not sampled NSP = not sampled due to product in well *MW-1 was not screened within the aquifer **MW-6 and MW-7 were installed in May 2001 NMWQCC = New Mexico Water Quality Control Commission

Sodium No Std (mg/L) 1,030 830 NSP 828 NSP 855 900 NSN NSN NS 705 907 873 924 234 861 661 711 Potassium (mg/L) No Std NSP NSP NSP NS NS 2.5 0.6 4.2 2.6 6.6 5.6 1.4 4.9 6.3 1.6 Magnesium (mg/L) No Std 25.6 40.4 43 <u>53</u> 52.5 47 63.2 55.3 <u>53.3</u> 33 SZ SZ SZ 30 NSP NSP 37 51 Calcium (mg/L) No.Std. NSP 423 446 439 500 634 700 325 NSP 439 534 319 661 296 258 NSN NSN SS Sulfate. (mg/L) 2,520 2,470 2,930 1,230 1,230 2,680 1,390 2,780 1,920 1.900 600 NSP 245 NSP 642 NSN NS Chloride (mg/L) 1,050 NSP 1,320 NSP 250 SZ SZ SZ 47 966 48 78 46 80 55 <u>52</u> 20 Hydroxide (mg/L) No Std NSP NSP NSN NSN NS 0 $\overline{\vee}$ $\overline{\nabla}$ $\overline{\vee}$ $\overline{\nabla}$ $\overline{\vee}$ 0 0 $\overline{\nabla}$ v $\overline{\vee}$ $\overline{\mathsf{v}}$ 0 Carbonáte No Std (mg/L) (co3) NSP NSP NS NS NS $\overline{\nabla}$ 0 $\overline{\vee}$ $\overline{\vee}$ v $\overline{\vee}$ ∇ 0 Ģ ∇ $\overline{\vee}$ $\overline{\vee}$ Bicarbonate (HCO₃) No Std (mg/L) 1,170 NSP NSP 816 NSZ ZSZ <u>559</u> 437 703 437 945 923 692 903 635 597 732 527 Absorption No Std Sodium 11.785 NSP Ratio 0.883 8.147 NSP 8.84 SZ SZ LZ z Z z Z ΓL Ł Z Z (CaCO₃) Hardness No Std (mg/L) 1,220 1,290 1,310 1,460 2,010 1,880 ,550 NSP NSP 932 843 SN SN NS NT ΓL ΥŢ Alkalinity (CaCO₃) No Std (mg/L) NSP 757 521 459 576 358 490 358 567 740 699 600 (mg/L) 4,810 TDS 1,000 3,049 NSP 3,413 3,960 3,820 4,389 4,630 4,420 4,410 5,230 4,580 3,560 1,710 NSP NS NS NS Conductivity (mmhos/cm) No Std 4,920 NSP 4,500 4,440 5,420 4,250 5,090 6,000 7,000 6,880 5,470 4,460 2,160 NSN NSN NSP Eab (su) PH 6.6 NSP NSP 6.9 6-9 NS NS NS 7.0 6.9 6.7 6.5 7.3 6.9 6.8 6.7 1.1 7.1 2002 1994 1994 2002 1994 2002 2002 NMWQCC Standards 2001 2001 1994 2001 2002 2001 1994 2002 2001 2001 2001 MW2 MW3 MW5 MW6 IWM MW4

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2002

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s.u. = standard units

µmhos/cm = micromhos per centimeter

mg/L = milligrams per liter

NMWQCC = New Mexico Water Quality Control Commission

No Std = no standard NS = not sampled; MW-1 was not screened within the aquifer

NSP = no sample collected due to product in well NT =

Summary of Ground Water Analytical Results for General Water Chemistry - 1994, 2001 and 2002

Summary of Ground Water Analytical Results for Polynuclear Aromatic Hydrocarbons (EPA 610) - September 1994

Units: µg/L	MW-3	MW-2	MW-4
	and a state of the second s		a a chun a sha an
Naphthalene	<0.5	8.9	< 0.50
Acenaphthylene	<1.0	<1.0	<1.0
Acenaphthene	< 0.50	< 0.50	< 0.50
Fluorene	< 0.10	1.2	<0.10
Phenanthrene	< 0.05	1.8	< 0.05
Anthracene	< 0.05	< 0.05	< 0.05
Fluoranthene	< 0.10	1.2	<0.10
Pyrene	< 0.10	< 0.10	< 0.10
Benzo(a)Anthracene	< 0.10	< 0.10	<0.10
Chrysene	< 0.10	0.17	<0.10
Benzo(b)Fluoranthene	>0.10	< 0.10	<0.10
Benzo(k)Fluoranthene	< 0.10	<0.10	<0.10
Benzo(a)Pyrene	<0.10	< 0.10	<0.10
Dibenzo(a,h)Anthracene	<0.20	< 0.20	<0.20
Benzo(g,h,I)Perylene	<0.10	< 0.10	<0.10
Indeno(1,2,3-CD)Pyrene	< 0.10	<0.10	<0.10
1-Methylnaphthalene	< 0.30	5.9	< 0.30
1-Methylnaphthalene	< 0.30	5.8	< 0.30

Notes:

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 $\mu g/L = micrograms per liter$

Summary of Ground Water Analytical Results for Priority Pollutant Metals - September 1994

Metal	NMWQCC Standards	MW-2	MW-3	MW-4
Silver (mg/L)	0.05	< 0.01	< 0.01	< 0.01
Arsenic (mg/L)	0.1	< 0.005	< 0.005	< 0.005
Beryllium (mg/L)	No Std	< 0.004	< 0.004	< 0.004
Cadmium (mg/L)	0.01	< 0.0005	< 0.0005	< 0.0005
Chromium (mg/L)	0.05	0.010	< 0.01	< 0.01
Copper (mg/L)	1	0.012	< 0.01	< 0.01
Mercury (mg/L)	0.002	< 0.0002	< 0.0002	< 0.0002
Nickel (mg/L)	0.2	< 0.02	< 0.02	< 0.02
Lead (mg/L)	< 0.05	< 0.002	< 0.002	< 0.002
Antimony (mg/L)	No Std	< 0.05	< 0.05	< 0.05
Selenium (mg/L)	0.05	< 0.005	< 0.005	< 0.005
Thallium (mg/L)	No Std	< 0.005	< 0.005	< 0.005
Zinc (mg/L)	10	0.032	0.023	0.026

Notes:

mg/L = milligrams per liter NMWQCC = New Mexico Water Quality Control Commission No Std = no standard

Appendix D

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Comprehensive Summary of Phase Separated Hydrocarbons and Recovery

Summary of Phase-Separated Hydrocarbon Monitoring and Recovery in Ground Water Monitoring Well MW-2 - May 1995 – June 2002

Date	Product		Product Thickness (ft)	Volume Removed (gal)
May 4, 1995	NA	NA	NA	9 (includes purge water)
Sept 30, 1999	15.00	17.48	2.47	2.75
Nov 16, 1999	14.65	17.00	2.35	2.0
Dec 14, 1999	14.66	16.76	2.10	5.0
May 11, 2001	14.69	16.77	1.96	2.5
May 21, 2001	15.10	15.65	0.55	0
May 23, 2001	15.13	15.69	0.56	0
July 3, 2001	15.48	16.32	0.84	0
July 9, 2001	15.54	16.43	0.89	1.1
May 13, 2002	14.70	15.51	0.81	1.4
May 22, 2002	14.64	15.29	0.65	1.2
May 30, 2002	14.70	15.14	0.44	1.1
June 5, 2002	14.76	15.00	0.24	1.1
June 13, 2002	14.75	14.91	0.15	0.6
June 19, 2002	14.70	14.78	0.08	0.6
June 26, 2002	14.68	14.73	0.05	0.3
Total Gallons o	37.55			