GW - 1

WORK PLANS

1986

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary

September 26, 1986

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. David G. Boyer
Hydrogeologist/Environmental Bureau Chief
State of New Mexico
Energy and Minerals Department
Oil Conservation Division
P. O. Box 2088
State Land Office Building
Santa Fe, NM 87501-2088

RE: Bloomfield Refinery Remedial Action Plan

Dear Mr. Boyer:

In your letter of July 30, 1986, you identified several items of additional information, some requiring significant further investigative work on the part of Bloomfield Refining Company (BRC), as being necessary before finalizing the remedial action plan submitted to Mr. Stamets in our June 30, 1986, transmittal. The following response is organized in the same numerical format as the specific requests in your July 30 letter:

1. **Monitoring Well Water Levels and Chemical Analyses** - Attachment 1 contains the most recent data from the groundwater monitor wells including groundwater elevations and chemical data. The groundwater elevations data are presented as a cumulative tabulation of readings beginning on February 24, 1984, through September 2, 1986. The analytical data are from samples collected on June 23-25, 1986, and therefore represent the most recent results.

   As regards products or hydrocarbon thickness in the monitoring wells, we had not been asked prior to your letter of July 30 to provide this information but believe that based on non-quantitative observations of wells and well samples to date, such measurements would be pertinent to MW-4 only. No measurable thickness has been observed at any of the other monitoring wells. BRC would appreciate receiving any standardized procedures or recommended devices for quantifying product thickness in a monitoring well.

2. **Drillers Logs** - Well logs for monitoring wells 7 to 10 are contained in Attachment 2.

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3. **Geophysical Cross Section B-B'** - The ER subsurface cross section B-B' was inadvertently omitted from the Engineering Science report transmitted to you in our June 2, 1986, letter. Figure 2.11 from that report contains the B-B' cross section and is enclosed as Attachment 3.

4. **Geophysical Data Interpretation** - Interpretation of the geophysical data gathered to date at the site is obviously very complex. We believe that the ER field data must be viewed very critically and interpreted only in conjunction with other more direct physical data such as that obtained from the groundwater monitoring wells.

   Overall, the ER data taken indicates that the subsurface geology underlying the refinery and its immediate vicinity is generally homogeneous. The ER subsurface cross sections taken and presented in the Engineering Science subsurface report show the homogeneous nature of the subsurface with a southwest and northwest dip in the top of the Nacimiento Formation.

   Profiles were conducted throughout the refinery and in its immediate vicinity to aid in subsurface interpretations. The profile zones were selected based upon the monitoring well data, sounding data, and outcrops along the San Juan River bluff. The shallow profile zones (10 and 20 feet) were selected to aid in the interpretations of the unconsolidated sediment zone. The deeper profile zones were selected to aid in the interpretations of the cobble and pebble zone just above the top of the Nacimiento and in the very top of the Nacimiento Formation itself.

   The profile maps for each of the depth zones explored were shown as computer generated plots in Figures 2.13 through 2.19 of the ES Subsurface report. With the assistance of our consultant, Engineering Science, we offer the following additional interpretation of the geophysical data generated from the resistivity survey conducted at the site:

   - Low resistivity values are indicated southwest of the process units as shown on the 10, 20, 30, and 40 ft. profile maps. The 30-foot zone contains some clay in the top of the Nacimiento Formation, so the lower values here may be attributed in part to the clay. However, MW-4, which is located in

the vicinity of these low values, has yielded samples containing hydrocarbons. This provided the basis for our original location of RW-1 as shown in Figure 1 of our proposed Remedial Action Plan.

- Relatively low resistivity readings in the area generally north and west of the evaporation ponds were obtained at the 60 ft. and shallower depths as shown in the respective profile maps. MW-1, however, which is in the area north of the ponds and completed to a total depth of 25 feet, yields groundwater samples which are consistently clear of free hydrocarbons. Furthermore, these samples have shown no significant amounts of dissolved hydrocarbons. Given the absence of any corroborative physical data from the monitoring well in this area, we have no reason to suspect a significant hydrocarbon presence here.

- No significant groundwater impacts or evidence of subsurface hydrocarbons are evident from the 80 and 100-foot ER profile maps.

- A southwest trending resistivity high of 320 ohm-feet is located east of the El Paso Pipeline. This high may be the result of sandstone lenses at these depths.

- All available evidence supports the contention that any petroleum hydrocarbons that may exist are confined to the upper layer of sands, silts, and cobbles overlying the Nacimiento Formation.

- There is no indication that the first major potable water aquifer, the Ojo Alamo, has been impacted by subsurface hydrocarbons at the refinery.

5. **Hydrologic Model Results** - Groundwater level response to pumping at the Bloomfield Refinery was simulated using a groundwater model called PLASM. Documentation for this model is provided in "Selected Digital Computer Techniques for Groundwater Resource Evaluation" by Prickett and Londquist, Technical Bulletin No. 55, Illinois State Water Survey.

Significant parameters used by the model include transmissivity, storage factor, initial head, and pumping discharge. These parameters were developed from existing water level data from monitoring wells and from slug test data. A 200' x 200' grid network having eight rows and eight columns was used to represent the groundwater continuum for a selected portion of the site. Groundwater levels were represented by nodes formed by the intersection of row lines with column lines of the network grid.

The natural flow (flux) of groundwater underneath the refinery site was estimated using Darcy's equation as shown in Attachment 4. Using this calculated flux, the model's prediction of groundwater levels was calibrated to water levels measured in monitoring wells to an accuracy of plus or minus 1 foot.

The calibrated model was employed to test the groundwater response to recovery well pumpage using a 2-well, 3-well, or 4-well system. The wells were placed to receive an optimal amount of flow within the study area. A maximum pumping rate of 3 gpm was estimated based on calculations using Jacob's equation as shown in Attachment 4. This pumping rate was uniformly applied to each well within the well systems tested for pumping durations of thirty days to approximately two years.

Model results showed some drawdown definition over the study area using a 2-well recovery system and improved drawdown with a 3-well system. Results suggest that definition is not improved enough with a 4-well system to warrant the additional well.

Location, Design and Schedule of Recovery Well System - The model's predictive response is based on estimates and interpretation of the various geophysical data input gathered to date. As the initial phase of recovery and in an effort to gather important information pertinent to the final design of the system, it is recommended that a single test recovery well be installed. This will permit confirmation or adjustment of the results predicted by the model which can be incorporated into the system's final design. Likewise, the initial recovery well will provide important information and data regarding above ground handling of the material recovered.

On this basis, we propose locating the initial well as shown on the site map contained in Attachment 5. Based on model predictions, drawdowns should be fairly local at the single pumped well. Since product has been detected in MW-4, location near this well is logical.

As regards schedule, we believe that installation of the initial recovery well can be completed in eight working weeks after OCD approval of the remedial plan. We plan to discuss well design details with the selected contractor and submit these to OCD once they are finalized.

6. **Off-Site Investigation** - In an effort to identify the extent of any hydrocarbon migration that may have occurred to the south and west, we propose that two off-site groundwater monitoring wells be installed. The site map contained in Attachment 6 identifies the proposed location of these wells which has been determined from our interpretation of the ER data.

   Since the proposed monitoring wells are located on property not owned by BRC, we will obviously need to obtain the appropriate approvals from property owners before beginning installation. We understand that the property directly to the south is owned by the federal government and that the property to the west is owned by an individual. After OCD approval of the proposed locations, BRC will move to secure approvals from the Bureau of Land Management and the individual who owns the property to the west to locate monitoring wells at these sites.

   We project that both wells could be completed within eight working weeks after receiving OCD approval of location and approval from the respective property owners to complete the wells. Additionally, in an effort to complete the initial recovery well and the proposed new monitoring wells in a cost efficient manner, we would plan to schedule the drilling of these wells at the same time. We would appreciate OCD's assistance in achieving this.

We trust that the preceding information satisfies the conditions which you stated were necessary to preclude enforcement action. If you have any problems or questions concerning the above, please contact Mr. Chris Hawley. We look forward to your response.

Sincerely,

BLOOMFIELD REFINING COMPANY

David J. Younggren
Vice President Finance
and Administration

enclosures

DJY:dam

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary

June 30, 1986

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. R. L. Stamets
Director
Energy & Minerals Department
Oil Conservation Division
State of New Mexico
State Land Office Building
P. O. Box 208
Santa Fe, NM 87501

Dear Mr. Stamets:

Enclosed is a Remedial Action Plan for Bloomfield Refinery prepared by our consultant, Engineering Science. You will note this provides for initiation of recovery activities by October 1, 1986, as requested in your letter of March 4, 1986.

Sincerely yours,

David J. Younggren
Vice President Finance
and Administration

enclosure

DJY:dam

115 Inverness Drive East • Englewood, Colorado 80112-5116 • 303/799-3800 • TWX 910-935-0791

ENGINEERING-SCIENCE

2901 NORTH INTERREGIONAL • AUSTIN, TEXAS 78722 • 512/477-9901

CABLE ADDRESS: ENGINSCI
TELEX: 77-6442

June 26, 1986

Mr. David J. Younggren
Vice President of Finance/Administration
Gary Energy Corporation
115 Inverness Drive East
Englewood, CO 80112-5116

Dear Mr. Younggren:

Enclosed find two copies of a remedial action plan for the Bloomfield, New Mexico, refinery. The plan was prepared by Engineering-Science, Inc. (ES) pursuant to meeting requirements as set forth in a letter to Bloomfield Refining from New Mexico OCD dated March 4, 1986. This plan is due for receipt by R.L. Stamets, Director OCD, no later than July 1, 1986. Thank you for your attention to this matter.

Sincerely,

James E. Rumbo, P.E.
Project Engineer

Enclosures

dg

June 1986

REMEDIAL ACTION PLAN FOR BLOOMFIELD REFINERY BLOOMFIELD, NEW MEXICO

PREAPARED FOR

BLOOMFIELD REFINING

PREPARED BY

ENGINEERING-SCIENCE
AUSTIN, TEXAS 78722 - 512/477-9901

ES

REMEDIAL ACTION PLAN FOR BLOOMFIELD REFINERY
BLOOMFIELD, NEW MEXICO

INTRODUCTION

This remedial action plan has been developed pursuant to requirements set forth in a letter dated March 4, 1986 from the State of New Mexico Energy and Minerals Department Oil Conservation Division (OCD) to Bloomfield Refining Corporation (BRC). A methodology is presented to remove subsurface hydrocarbon material using two recovery wells to be installed on the BRC site located adjacent to Sullivan Road in Bloomfield, New Mexico.

RECOVERY WELLS

Ground water has been shown through previous studies to be affected by the water levels in Hammond Ditch which passes through the BRC site (see Figure 1). Ground water, underneath the BRC facility, is subject to water table conditions, and is recharged by the ditch as evidenced by increasing or decreasing monitoring well water levels for commensurate increases or decreases in Hammond Ditch water levels. Consequently, hydrocarbon recovery alternatives should focus on influences of the ditch as they may impact recovery efficiency. Both trenches and recovery wells were considered as recovery options. However, recovery wells were selected since they offer quicker potential product delivery through control of ground water levels via cones of depression.

Well Placement

Technical information including electrical resistivity survey results and monitoring well slug test results were employed to estimate the most appropriate locations for the wells. Generalized criteria for well placement were:

(1) Maximization of head offered by water in Hammond Ditch

(2) Minimization of well interference

(3) Maximization of recovery potential per well type

Figure 1 shows the appropriate recovery well locations (RW-1, RW-2) relative to the BRC facilities.

FIGURE 1
BLOOMFIELD REFINERY FACILITY MAP

Actual installed well locations may be different from those indicated, pending results of a ground water modeling study. A finite difference model (Ref. 1) developed by T.A. Prickett and C.G. Lonnquist at the Illinois State Water Survey (1971) will be used to evaluate alternative recovery schemes including alternative pumping rates and alternative well locations in an effort to optimize hydrocarbon recovery. Data input will consist of the alternative pumping rates, monitoring well characteristics as demonstrated by slug test results, discretized alternative well locations, monitoring well water levels, and water levels in Hammond Ditch.

Saline or brackish water can produce low resistivity readings but will show relatively high conductivity readings when compared with nonsaline waters. Therefore, conductivity measurements will be made to clarify electrical resistivity results by showing whether or not saline water exists in areas of suspected hydrocarbon material.

Well Configuration

Recovery wells installed at the BRC site will use either a one-pump or two-pump recovery system. To illustrate the apparatus connected with each of these systems, Figures 2 and 3 have been provided (from "Ground Water Monitoring Review," Spring, 1983).

Figure 2 depicts a typical one-pump recovery well arrangement that could be used at the BRC site. In this arrangement, only one pump is required. A mechanical float, utilized to keep the pumping level near the pump intake, facilitates hydrocarbon recovery. This system is cheaper than the two-pump system, shown in Figure 3, because a single pump is used and elaborate level control equipment is not required.

The two-pump system, although more expensive, offers the advantage of increased flexibility in pumping. With this system, one pump is used to draw down ground water while a separate pump is used to collect hydrocarbon material in a separate phase. Since there may be a difference between the speed at which water is collected and the speed at which hydrocarbon material is collected, level controls are installed to adjust pumping rates appropriately for each pump to maximize recovery efficiency.

Both systems have advantages and disadvantages that must be weighed with regard to the intended application at BRC. Therefore, selection

FIGURE 2
SCHEMATIC OF ONE-PUMP SYSTEM UTILIZING A SUBMERSIBLE PUMP AND FLOAT CONTROLS

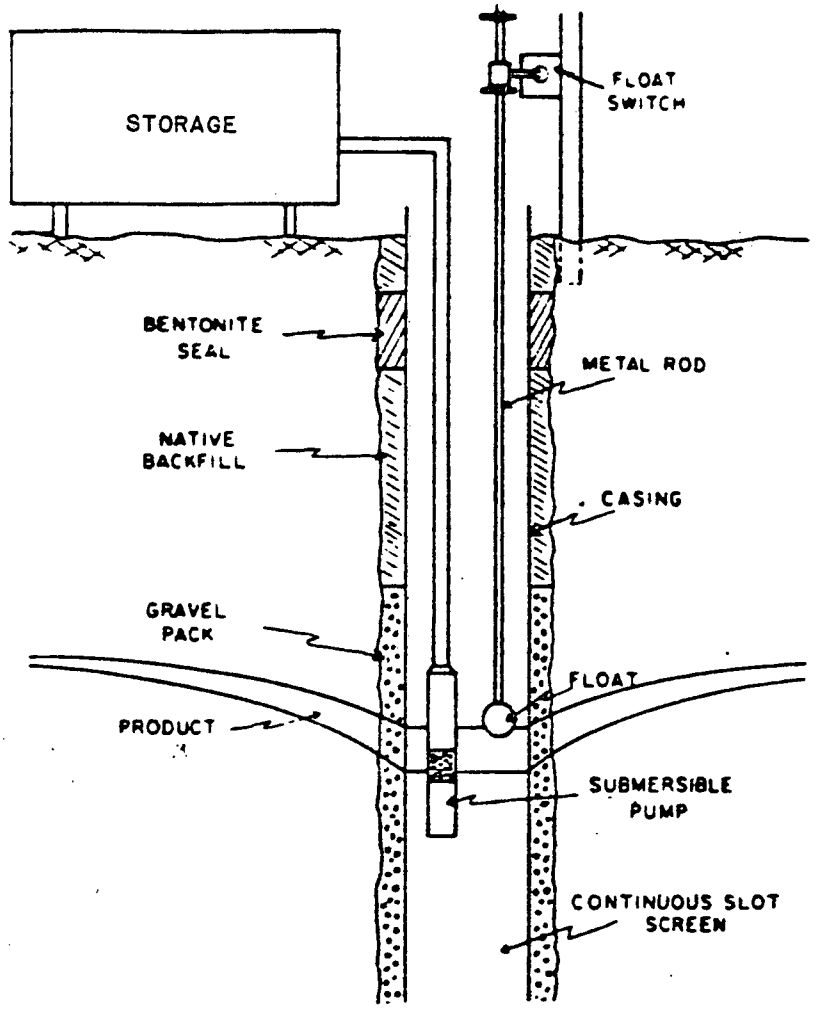
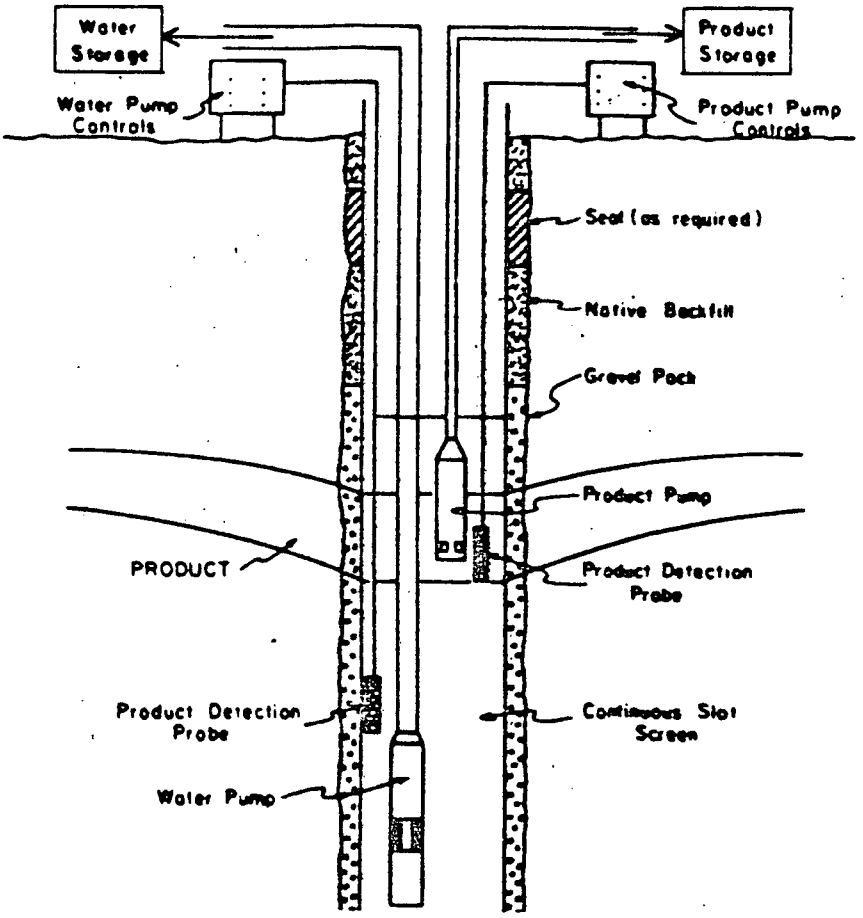


FIGURE 3
SCHEMATIC OF TWO-PUMP SYSTEM



between these two systems will be made only after a comparison of hardware, expected performance characteristics, and costs.

Disposal

Depending on the type of well system adopted, the hydrocarbon material and ground water will be disposed in one of two ways. If a one pump system is employed, discharged water/product mixtures will be stored adjacent to the well location in a 300-barrel fiberglass storage tank. When the tank is sufficiently full, a vacuum truck will be utilized to transfer the contents to the refinery's API separator for processing. If a two-pump arrangement is adopted for recovery wells, two separate storage facilities will be used: one for product and one for ground water. Stored ground water will be transferred via vacuum truck to the refinery's API separator for processing. Recovered product will be returned to the refinery crude oil tankage for reprocessing into marketable products as required.

SCHEDULE OF OPERATIONS

BRC will undertake implementation of recovery efforts in two phases. During phase 1, extending from July 1, 1986 to August 30, 1986, BRC will firmly establish the location of two recovery wells through collection of chloride data from monitoring wells and by sponsoring a ground water modeling study. BRC will also provide for hardware procurement and obtain required contractors for recovery well installation through solicitation for bids from area drillers. During phase 2, extending from September 1, 1986 to October 1, 1986, BRC will have the two recovery wells with appurtenances installed. The wells will be developed and will be in operation by October 1, 1986.

REFERENCE

(1) Prickett, T.A. and Lonnquist, C.G., "Selected Digital Computer Techniques for Ground Water Resource Evaluation," Technical Paper No. 55, Illinois State Water Survey, Urbana, Illinois, 1971.

ATTACHMENT 1

- Groundwater Elevations 2/24/84 Thru 9/2/86

- Monitoring Well Analytical Data From Samples Collected June 23 - 25, 1986

BLOOMFIELD REFINING COMPANY

GROUNDWATER ELEVATIONS

	DATE	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
		5515.77	5519.45	5535.85	5524.30	5545.10	5551.23
	2/24/84	5498.91	5500.44	5501.74	5499.46	5502.26	DRY
	2/28/85	5499.67	5500.55	5502.15	5499.30	5502.75	DRY
	3/13/85	5499.14	5500.82	5502.55	5499.32	5503.50	?
WATER ON	4/11/85	5498.99	5500.62	5502.73	5499.30	5503.67	
	5/31/85	5499.67	5500.97	5502.74	5499.80	5503.64	
	6/17/85	5499.80	5500.99	5502.63	5499.80	5503.40	
	6/26/85	5499.94	5500.98	5502.49	5499.73	5503.24	
	7/10/85	5500.20	5500.99	5502.48	5499.80	5503.30	
	8/2/85	5501.00	5501.25	5502.48	5499.78	5503.37	
	9/17/85	5500.34	5501.05	5502.25	5499.80	5503.00	
	10/9/85	5500.03	5500.87	5502.42	5499.70	5503.30	
WATER OFF	10/24/85	5499.23	5500.43	5502.28	5499.54	5503.10	
	11/8/85	5498.72	5500.05	5502.20	5499.60	5503.09	
	12/17/85	5498.35	5499.85	5501.85	5499.40	5502.90	▽
	1/8/86	5498.59	5500.08	5501.85	5499.35	5502.77	DRY
	1/24/86	5498.75	5500.22	5502.04	5499.36	5502.76	"
	2/20/86	5498.93	5500.62	5502.43	5499.35	5503.30	"
	3/21/86	5499.10	5500.65	5502.89	5499.30	5504.23	"
	3/26/86	5499.07	5500.65	5502.91	5499.31	5504.24	"
	4/4/86	5499.07	5500.57	5502.98	5499.21	5504.57	"
DIKE REMOVED 4/15 WATER ON 4/21	4/18/86	5498.85	5500.43	5502.98	5499.42	5504.42	"
	5/5/86	5499.43	5500.57	5502.92	5499.32	5504.27	"
	5/21/86	5500.05	5500.82	5502.85	5499.40	5504.35	"
	6/4/86	5500.41	5500.93	5502.95	5499.40	5504.17	"
SAMPLE	6/23/86	5501.21	5501.18	5503.05	5499.45	5504.13	"
	7/8/86	5501.84	5501.27	5502.96	5499.44	5503.87	"
	8/4/86	5500.25	5501.13	5502.92	5499.67	5503.77	"
	9/2/86	5500.23	5501.32	5502.94	5499.72	5503.58	"

GROUNDWATER ELEVATIONS

	DATE	MW-7	MW-8	MW-9	MW-10	HAMMOND AT SULLIVAN	HAMMOND AT WALKWAY
		5524.09	5531.12	5519.70	5516.86	5504.82	5522.95
	3/21/86	5498.02	5501.95	5498.15	5497.65	—	—
	3/26/86	5498.02	5501.97	5498.20	5497.66	—	—
DIKE REMOVED 4/15	4/4/86	5498.77	5501.86	5498.22	5497.60	5496.50	5498.24
	4/18/86	5497.92	5501.82	5497.90	5497.69	—	5496.35
WATER ON 4/21	5/5/86	5497.28	5501.79	5498.62	5497.83	5498.08	5499.03
	5/21/86	5498.86	5501.83	5499.00	5498.05	5498.25	5499.42
	6/4/86	5498.35	5501.89	5499.17	5498.15	5498.23	5499.63
SAMPLE	6/23/86	—	5502.04	5499.47	5498.11	—	—
	7/8/86	5497.87	5502.22	5499.50	5498.17	5497.89	5499.95
	8/4/86	5498.77	5502.12	5499.40	5498.37	5497.94	5499.67
	9/2/86	5498.95	5502.21	5499.55	5498.53	5498.24	5500.15

ASSAIGAI
ANALYTICAL
LABORATORIES

TO: Bloomfield Refinery
Attn: Chris Hawley
PO Box 159
Bloomfield, NM 87413

DATE: 23 July 1986
1030

SAMPLE ID: MW - 1

ANALYTE	ANALYTICAL RESULTS	
CN	0.1	mg/l
TDS	2960	mg/l
Cl	994.7	mg/l
SO 4	630	mg/l
Phenols	0.017	mg/l
TOC	24	mg/l
Sb	<0.01	mg/l
As	0.077	mg/l
Be	<0.01	mg/l
Cd	<0.010	mg/l
Cr	<0.050	mg/l
	<0.050	mg/l duplicate
Cu	<0.03	mg/l
Pb	0.065	mg/l
Hg	<0.002	mg/l
Ni	<0.06	mg/l
Se	0.035	mg/l
Ag	<0.050	mg/l
Tl	<0.01	mg/l
Zn	0.020	mg/l
Benzene	ND	
Toluene	ND	
Xylenes	ND	
Ethylbenzene	ND	
Ba	<0.01	mg/l
Fe	<0.04	mg/l
Mn	0.25	mg/l
Al	2.07	mg/l
B	<0.01	mg/l
Co	<0.05	mg/l
Mo	<0.01	mg/l
F	0.54	mg/l
No 3 as N	0.1	mg/l
1,2-DCE	ND	
1,1-DCE	ND	
1,1,2,2-TCE	ND	
1,1,2-TCE	ND	

Field by CH 6/23/86
pH 7.25
Conductivity 4600

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ASSAIGAI ANALYTICAL LABORATORIES

TO: Bloomfield Refinery
Attn: Chris Hawley
PO Box 159
Bloomfield, NM 87413

DATE: 23 July 1986
1030

SAMPLE ID: MW - 2

ANALYTE	ANALYTICAL RESULTS
CN	0.1 mg/l
TDS	3650 mg/l
Cl	1204.6 mg/l
SO 4	1750 mg/l
Phenols	0.023 mg/l
TOC	27 mg/l
Sb	<0.01 mg/l
As	0.094 mg/l
Be	<0.01 mg/l
Cd	<0.010 mg/l
Cr	<0.050 mg/l
Cu	<0.03 mg/l
Pb	<0.05 mg/l
Hg	<0.002 mg/l
Ni	<0.06 mg/l
Se	0.070 mg/l
Ag	<0.050 mg/l
Tl	<0.01 mg/l
Zn	0.020 mg/l
Benzene	ND
Toluene	ND
Xylenes	ND
Ethylbenzene	ND

Field by CH 6/23/86

pH 7.17

Conductivity 5400

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ASSAIGAI ANALYTICAL LABORATORIES

TO: Bloomfield Refinery
Attn: Chris Hawley
PO Box 159
Bloomfield, NM 87413

DATE: 23 July 1986
1030

SAMPLE ID: MW - 3

ANALYTE	ANALYTICAL RESULTS
CN	0.25 mg/l
TDS	5362 mg/l
Cl	1584 mg/l
SO 4	1950 mg/l
Phenols	0.006 mg/l
TOC	17 mg/l
Sb	<0.01 mg/l
As	0.15 mg/l
Be	<0.01 mg/l
Cd	0.015 mg/l
Cr	<0.050 mg/l
Cu	<0.03 mg/l
Pb	0.070 mg/l
Hg	<0.002 mg/l
Ni	0.08 mg/l
Se	0.10 mg/l
Ag	<0.050 mg/l
Tl	<0.01 mg/l
Zn	0.018 mg/l
Benzene	ND
Toluene	0.003 mg/l
Xylenes	0.030 mg/l
Ethylbenzene	ND

Field: by CH 6/23/86

pH 7.10

Conductivity 6900

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ASSAIGAI ANALYTICAL LABORATORIES

TO: Bloomfield Refinery
Attn: Chris Hawley
PO Box 159
Bloomfield, NM 87413

DATE: 23 July 1986
1030

SAMPLE ID: MW - 4

ANALYTE	ANALYTICAL RESULTS
CN	0.5 mg/l
TDS	2266 mg/l
Cl	989.7 mg/l
SO 4	12.5 mg/l
Phenols	0.430 mg/l
TOC	130 mg/l
Sb	<0.10 mg/l
As	0.070 mg/l
Be	<0.1 mg/l
Cd	<0.010 mg/l
Cr	<0.050 mg/l
Cu	<0.03 mg/l
Pb	0.066 mg/l
Hg	<0.002 mg/l
Ni	<0.06 mg/l
Se	0.080 mg/l
Ag	<0.050 mg/l
Tl	<0.1 mg/l
Zn	0.019 mg/l
Volatiles	
Acrolein	ND
Acrylonitrile	ND
Benzene	3.1 mg/l
Bromoform	ND
Carbon Tetrachloride	ND
Chlorobenzene	ND
Chlorodibromomethane	ND
Chloroethane	ND
2-Chloroethylvinyl ether	ND
Chloroform	ND
Dichlorobromomethane	ND
1,1-Dichloroethane	ND
1,2-Dichloroethane	ND
1,1-Dichloroethylene	ND
1,2-Dichloropropane	ND
1,2-Dichloropropylene	ND
Ethylbenzene	0.070 mg/l

Field by CLA 6/24/86

pH 6.85

Conductivity 3800

SAMPLE ID: MW - 4

ANALYTE	ANALYTICAL RESULTS
Methyl Bromide	ND
Methyl Chloride	ND
Methylene Chloride	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	0.290 mg/l
1,2-Transdichloroethylene	ND
1,1,1-Trichloroethane	ND
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Vinyl Chloride	ND
Acid Compounds	
2-Chlorophenol	ND
2,4-Dichlorophenol	ND
2,4-Dimethylphenol	0.058 mg/l
4,6-Dinitro-o-cresol	ND
2,4-Dinitrophenol	ND
2-Nitrophenol	0.108 mg/l
4-Nitrophenol	0.302 mg/l
P-chloro-m-cresol	ND
pentachlorophenol	ND
Phenol	ND
2,4,6-Trichlorophenol	ND
Base Neutrals	
Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzidine	ND
Benzo(a)anthracene	0.016 mg/l
Benzo(a)pyrene	ND
3,4-Benzofluoranthene	ND
Benzo(g,h,i)perylene	ND
Benzo(k)fluoranthene	ND
Bis(2-chloroethoxy)methane	ND
Bis(2-chlroroethyl)ether	ND
Bis(2-chloroisopropyl)ether	ND
Bis(2-ethylhexyl)phthalate	ND
4-Bromophenyl phenyl ether	ND
Butylbenzyl phthalate	ND
2-Chloronapthalene	ND
4-Chlorophenyl phenyl ether	ND
Chrysene	0.023 mg/l

SAMPLE ID: MW - 4

ANALYTE	ANALYTICAL RESULTS
Dibenzo(a,h)anthracene	ND
1,2-Dichlorobenzene	ND
1,3-Dichlorobenzene	ND
1,4-Dichlorobenzene	ND
3,3-Dichlorobenzidine	ND
Diethyl phthalate	ND
Dimethyl phthalate	ND
Din-n-butyl phthalate	ND
2,4-Dinitrotoluene	ND
2,6-Dinitrotoluene	ND
Di-n-octyl phthalate	ND
1,2-Diphenylhydrazine	ND
Fluoranthene	ND
Fluorene	ND
Hexachlorobenzene	ND
Hexachlorobutadiene	ND
Hexachlorocyclopentadiene	ND
Hexachloroethane	ND
Indeno(1,2,3-cd)pyrene	ND
Isophorone	ND
Naphthalene	0.019 mg/l
Nitrobenzene	ND
N-nitrosodimethylamine	ND
N-nitrosodie-n-propylamine	ND
N-nitrosodiphenylamine	ND
Phenanthrene	ND
Pyrene	ND
1,2,4-Trichlorobenzene	ND
Ba	3.54 mg/l
Fe	12.0 mg/l
Mn	3.5 mg/l
Al	1.93 mg/l
B	<0.01 mg/l
Co	<0.05 mg/l
Mo	<0.01 mg/l
F	0.21 mg/l
NO 3 as N	<0.01 mg/l

ND = None Detected

ASSAIGAI
ANALYTICAL
LABORATORIES

TO: Bloomfield Refinery
Attn: Chris Hawley
PO Box 159
Bloomfield, NM 87413

DATE: 23 July 1986
1030

SAMPLE ID: MW - 5

ANALYTE	ANALYTICAL RESULTS
CN	0.2 mg/l
TDS	3778 mg/l
Cl	1339.6 mg/l
SO 4	1800 mg/l
Phenols	0.007 mg/l
TOC	21 mg/l
Sb	<0.01 mg/l
As	0.087 mg/l
Be	<0.01 mg/l
Cd	<0.010 mg/l
Cr	<0.050 mg/l
Cu	<0.03 mg/l
Pb	0.055 mg/l
Hg	<0.002 mg/l
Ni	<0.06 mg/l
Se	0.071 mg/l
Ag	<0.050 mg/l
Tl	<0.01 mg/l
Zn	0.02 mg/l
Benzene	ND
Toluene	ND
Xylenes	ND
Ethylbenzene	ND
Ba	<0.01 mg/l
Fe	0.05 mg/l
Mn	0.025 mg/l
Al	2.75 mg/l
B	<0.01 mg/l
Co	<0.05 mg/l
Mo	<0.01 mg/l
F	0.30 mg/l
No 3 as N	12.5 mg/l
1,2-DCE	ND
1,1-DCE	ND
1,1,2,2-TCE	ND
1,1,2-TCE	ND

Field by CH 6/23/86
pH 7.18
Conductivity 5400

7300 Jefferson, N.E. • Albuquerque, New Mexico 87109 • (505) 345-8964

ASSAIGAI ANALYTICAL LABORATORIES

TO: Bloomfield Refinery
Attn: Chris Hawley
PO Box 159
Bloomfield, NM 87413

DATE: 23 July 1986
1030

SAMPLE ID: MW - 7

ANALYTE	ANALYTICAL RESULTS
CN	0.25 mg/l
TDS	6406 mg/l
Cl	79.9 mg/l
SO 4	2400 mg/l
Phenols	0.006 mg/l
TOC	4 mg/l
Sb	<0.01 mg/l
As	0.36 mg/l
Be	<0.01 mg/l
Cd	0.030 mg/l
Cr	0.052 mg/l
Cu	<0.03 mg/l
Pb	0.24 mg/l
Hg	<0.002 mg/l
Ni	0.07 mg/l
Se	0.65 mg/l
Ag	0.060 mg/l
Tl	<0.01 mg/l
Zn	0.016 mg/l
Volatiles	
Acrolein	ND
Acrylonitrile	ND
Benzene	ND
Bromoform	ND
Carbon Tetrachloride	ND
Chlorobenzene	ND
Chlorodibromomethane	ND
Chloroethane	ND
2-Chloroethylvinyl ether	ND
Chloroform	ND
Dichlorobromomethane	ND
1,1-Dichloroethane	ND
1,2-Dichloroethane	ND
1,1-Dichloroethylene	ND
1,2-Dichloropropane	ND
1,2-Dichloropropylene	ND
Ethylbenzene	ND

Field by CA 6/25/86

pH 11.08

Conductivity 8100

7300 Jefferson, N.E. • Albuquerque, New Mexico 87109 • (505) 345-8964

SAMPLE ID: MW - 7

ANALYTE	ANALYTICAL RESULTS
Methyl Bromide	ND
Methyl Chloride	ND
Methylene Chloride	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	ND
1,2-Transdichloroethylene	ND
1,1,1-Trichloroethane	ND
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Vinyl Chloride	ND
Acid Compounds	
2-Chlorophenol	ND
2,4-Dichlorophenol	ND
2,4-Dimethylphenol	ND
4,6-Dinitro-o-cresol	ND
2,4-Dinitrophenol	ND
2-Nitrophenol	ND
4-Nitrophenol	ND
P-chloro-m-cresol	ND
pentachlorophenol	ND
Phenol	ND
2,4,6-Trichlorophenol	ND
Base Neutrals	
Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzidine	ND
Benzo(a)anthracene	0.001 mg/l
Benzo(a)pyrene	ND
3,4-Benzofluoranthene	ND
Benzo(g,h,i)perylene	ND
Benzo(k)fluoranthene	ND
Bis(2-chloroethoxy)methane	ND
Bis(2-chlroroethyl)ether	ND
Bis(2-chloroisopropyl)ether	ND
Bis(2-ethylhexyl)phthalate	ND
4-Bromophenyl phenyl ether	ND
Butylbenzyl phthalate	ND
2-Chloronapthalene	ND
4-Chlorophenyl phenyl ether	ND
Chrysene	0.002 mg/l

SAMPLE ID: MW - 7

ANALYTE	ANALYTICAL RESULTS
Dibenzo(a,h)anthracene	ND
1,2-Dichlorobenzene	ND
1,3-Dichlorobenzene	ND
1,4-Dichlorobenzene	ND
3,3-Dichlorobenzidine	ND
Diethyl phthalate	ND
Dimethyl phthalate	ND
Din-n-butyl phthalate	ND
2,4-Dinitrotoluene	ND
2,6-Dinitrotoluene	ND
Di-n-octyl phthalate	ND
1,2-Diphenylhydrazine	ND
Fluoranthene	ND
Fluorene	ND
Hexachlorobenzene	ND
Hexachlorobutadiene	ND
Hexachlorocyclopentadiene	ND
Hexachloroethane	ND
Indeno(1,2,3-cd)pyrene	ND
Isophorone	ND
Naphthalene	ND
Nitrobenzene	ND
N-nitrosodimethylamine	ND
N-nitrosodie-n-propylamine	ND
N-nitrosodiphenylamine	ND
Phenanthrene	ND
Pyrene	ND
1,2,4-Trichlorobenzene	ND

ND = None Detected

ASSAIGAI
ANALYTICAL
LABORATORIES

TO: Bloomfield Refinery
Attn: Chris Hawley
PO Box 159
Bloomfield, NM 87413

DATE: 23 July 1986
1030

SAMPLE ID: MW - 8

ANALYTE	ANALYTICAL RESULTS
CN	<0.01 mg/l
TDS	2910 mg/l
Cl	839.7 mg/l
SO 4	1500 mg/l
Phenols	0.005 mg/l
TOC	13 mg/l
Sb	<0.01 mg/l
As	0.072 mg/l
Be	<0.01 mg/l
Cd	<0.010 mg/l
Cr	<0.050 mg/l
Cu	<0.03 mg/l
Pb	0.055 mg/l
Hg	<0.002 mg/l
Ni	0.86 mg/l
Se	0.21 mg/l
Ag	<0.050 mg/l
Tl	<0.01 mg/l
Zn	0.020 mg/l
Volatiles	
Acrolein	ND
Acrylonitrile	ND
Benzene	ND
Bromoform	ND
Carbon Tetrachloride	ND
Chlorobenzene	ND
Chlorodibromomethane	ND
Chloroethane	ND
2-Chloroethylvinyl ether	ND
Chloroform	ND
Dichlorobromomethane	ND
1,1-Dichloroethane	ND
1,2-Dichloroethane	ND
1,1-Dichloroethylene	ND
1,2-Dichloropropane	ND
1,2-Dichloropropylene	ND
Ethylbenzene	ND

Field by Clt 6/23/86

pH 7.26

Conductivity 4400

7300 Jefferson, N.E. • Albuquerque, New Mexico 87109 • (505) 345-8964

SAMPLE ID: MW - 8

ANALYTE	ANALYTICAL RESULTS
Methyl Bromide	ND
Methyl Chloride	ND
Methylene Chloride	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	ND
1,2-Transdichloroethylene	ND
1,1,1-Trichloroethane	ND
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Vinyl Chloride	ND
Acid Compounds	
2-Chlorophenol	ND
2,4-Dichlorophenol	ND
2,4-Dimethylphenol	ND
4,6-Dinitro-o-cresol	ND
2,4-Dinitrophenol	ND
2-Nitrophenol	ND
4-Nitrophenol	ND
P-chloro-m-cresol	ND
pentachlorophenol	ND
Phenol	ND
2,4,6-Trichlorophenol	ND
Base Neutrals	
Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzidine	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
3,4-Benzofluoranthene	ND
Benzo(g,h,i)perylene	ND
Benzo(k)fluoranthene	ND
Bis(2-chloroethoxy)methane	ND
Bis(2-chlroroethyl)ether	ND
Bis(2-chloroisopropyl)ether	ND
Bis(2-ethylhexyl)phthalate	ND
4-Bromophenyl phenyl ether	ND
Butylbenzyl phthalate	ND
2-Chloronapthalene	ND
4-Chlorophenyl phenyl ether	ND
Chrysene	ND

SAMPLE ID: MW - 8

ANALYTE	ANALYTICAL RESULTS
Dibenzo(a,h)anthracene	ND
1,2-Dichlorobenzene	ND
1,3-Dichlorobenzene	ND
1,4-Dichlorobenzene	ND
3,3-Dichlorobenzidine	ND
Diethyl phthalate	ND
Dimethyl phthalate	ND
Din-n-butyl phthalate	ND
2,4-Dinitrotoluene	ND
2,6-Dinitrotoluene	ND
Di-n-octyl phthalate	ND
1,2-Diphenylhydrazine	ND
Fluoranthene	ND
Fluorene	ND
Hexachlorobenzene	ND
Hexachlorobutadiene	ND
Hexachlorocyclopentadiene	ND
Hexachloroethane	ND
Indeno(1,2,3-cd)pyrene	ND
Isophorone	ND
Naphthalene	ND
Nitrobenzene	ND
N-nitrosodimethylamine	ND
N-nitrosodie-n-propylamine	ND
N-nitrosodiphenylamine	ND
Phenanthrene	ND
Pyrene	ND
1,2,4-Trichlorobenzene	ND

ND = None Detected

ASSAIGAI ANALYTICAL LABORATORIES

TO: Bloomfield Refinery
Attn: Chris Hawley
PO Box 159
Bloomfield, NM 87413

DATE: 23 July 1986
1030

SAMPLE ID: MW - 9

ANALYTE	ANALYTICAL RESULTS
CN	0.4 mg/l
TDS	1718 mg/l
Cl	1009.7 mg/l
SO 4	114 mg/l
Phenols	0.372 mg/l
TOC	180 mg/l
Sb	<0.01 mg/l
As	<0.05 mg/l
Be	<0.01 mg/l
Cd	<0.010 mg/l
Cr	<0.050 mg/l
Cu	<0.03 mg/l
Pb	0.059 mg/l
Hg	<0.002 mg/l
Ni	0.25 mg/l
Se	0.040 mg/l
Ag	<0.050 mg/l
Tl	<0.01 mg/l
Zn	0.015 mg/l
Volatiles	
Acrolein	ND
Acrylonitrile	ND
Benzene	4 mg/l
Bromoform	ND
Carbon Tetrachloride	ND
Chlorobenzene	ND
Chlorodibromomethane	ND
Chloroethane	ND
2-Chloroethylvinyl ether	ND
Chloroform	ND
Dichlorobromomethane	ND
1,1-Dichloroethane	ND
1,2-Dichloroethane	ND
1,1-Dichloroethylene	ND
1,2-Dichloropropane	ND
1,2-Dichloropropylene	ND
Ethylbenzene	0.71 mg/l

Field by CH 6/24/86

pH 6.98

Conductivity 2500

7300 Jefferson, N.E. • Albuquerque, New Mexico 87109 • (505) 345-8964

SAMPLE ID: MW - 9

ANALYTE	ANALYTICAL RESULTS
Methyl Bromide	ND
Methyl Chloride	ND
Methylene Chloride	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	1.7 mg/l
1,2-Transdichloroethylene	ND
1,1,1-Trichloroethane	ND
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Vinyl Chloride	ND
Acid Compounds	
2-Chlorophenol	ND
2,4-Dichlorophenol	ND
2,4-Dimethylphenol	0.150 mg/l
4,6-Dinitro-o-cresol	ND
2,4-Dinitrophenol	ND
2-Nitrophenol	ND
4-Nitrophenol	ND
P-chloro-m-cresol	ND
pentachlorophenol	ND
Phenol	0.170 mg/l
2,4,6-Trichlorophenol	ND
Base Neutrals	
Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzidine	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
3,4-Benzofluoranthene	ND
Benzo(g,h,i)perylene	ND
Benzo(k)fluoranthene	ND
Bis(2-chloroethoxy)methane	ND
Bis(2-chlroroethyl)ether	ND
Bis(2-chloroisopropyl)ether	ND
Bis(2-ethylhexyl)phthalate	ND
4-Bromophenyl phenyl ether	ND
Butylbenzyl phthalate	ND
2-Chloronapthalene	ND
4-Chlorophenyl phenyl ether	ND
Chrysene	ND

SAMPLE ID: MW - 9

ANALYTE	ANALYTICAL RESULTS
Dibenzo(a,h)anthracene	ND
1,2-Dichlorobenzene	ND
1,3-Dichlorobenzene	ND
1,4-Dichlorobenzene	ND
3,3-Dichlorobenzidine	ND
Diethyl phthalate	ND
Dimethyl phthalate	ND
Din-n-butyl phthalate	ND
2,4-Dinitrotoluene	ND
2,6-Dinitrotoluene	ND
Di-n-octyl phthalate	ND
1,2-Diphenylhydrazine	ND
Fluoranthene	ND
Fluorene	ND
Hexachlorobenzene	ND
Hexachlorobutadiene	ND
Hexachlorocyclopentadiene	ND
Hexachloroethane	ND
Indeno(1,2,3-cd)pyrene	ND
Isophorone	ND
Naphthalene	ND
Nitrobenzene	ND
N-nitrosodimethylamine	ND
N-nitrosodie-n-propylamine	ND
N-nitrosodiphenylamine	ND
Phenanthrene	ND
Pyrene	ND
1,2,4-Trichlorobenzene	ND

ND = None Detected,

ASSAIGAI
ANALYTICAL
LABORATORIES

TO: Bloomfield Refinery
Attn: Chris Hawley
PO Box 159
Bloomfield, NM 87413

DATE: 23 July 1986
1030

SAMPLE ID: MW - 10

ANALYTE	ANALYTICAL RESULTS
CN	<0.01 mg/l
TDS	2820 mg/l
Cl	569.8 mg/l
SO 4	165 mg/l
Phenols	0.186 mg/l
TOC	76 mg/l
Sb	<0.01 mg/l
As	0.053 mg/l
Be	<0.01 mg/l
Cd	<0.010 mg/l
Cr	<0.050 mg/l
Cu	<0.03 mg/l
Pb	0.059 mg/l
Hg	<0.002 mg/l
Ni	<0.25 mg/l
Se	0.040 mg/l
Ag	<0.050 mg/l
Tl	<0.01 mg/l
Zn	0.015 mg/l
Volatiles	
Acrolein	ND
Acrylonitrile	ND
Benzene	ND
Bromoform	ND
Carbon Tetrachloride	ND
Chlorobenzene	ND
Chlorodibromomethane	ND
Chloroethane	ND
2-Chloroethylvinyl ether	ND
Chloroform	ND
Dichlorobromomethane	ND
1,1-Dichloroethane	ND
1,2-Dichloroethane	ND
1,1-Dichloroethylene	ND
1,2-Dichloropropane	ND
1,2-Dichloropropylene	ND
Ethylbenzene	ND

Field by CH 6/24/86
pH 7.08
Conductivity 4400

7300 Jefferson, N.E. • Albuquerque, New Mexico 87109 • (505) 345-8964

SAMPLE ID: MW - 10

ANALYTE	ANALYTICAL RESULTS
Methyl Bromide	ND
Methyl Chloride	ND
Methylene Chloride	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	ND
1,2-Transdichloroethylene	ND
1,1,1-Trichloroethane	ND
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Vinyl Chloride	ND
Acid Compounds	
2-Chlorophenol	ND
2,4-Dichlorophenol	ND
2,4-Dimethylphenol	ND
4,6-Dinitro-o-cresol	ND
2,4-Dinitrophenol	ND
2-Nitrophenol	ND
4-Nitrophenol	ND
P-chloro-m-cresol	ND
pentachlorophenol	ND
Phenol	ND
2,4,6-Trichlorophenol	ND
Base Neutrals	
Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzidine	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
3,4-Benzofluoranthene	ND
Benzo(g,h,i)perylene	ND
Benzo(k)fluoranthene	ND
Bis(2-chloroethoxy)methane	ND
Bis(2-chlroroethyl)ether	ND
Bis(2-chloroisopropyl)ether	ND
Bis(2-ethylhexyl)phthalate	ND
4-Bromophenyl phenyl ether	ND
Butylbenzyl phthalate	ND
2-Chloronapthalene	ND
4-Chlorophenyl phenyl ether	ND
Chrysene	ND

SAMPLE ID: MW - 10

ANALYTE	ANALYTICAL RESULTS
Dibenzo(a,h)anthracene	ND
1,2-Dichlorobenzene	ND
1,3-Dichlorobenzene	ND
1,4-Dichlorobenzene	ND
3,3-Dichlorobenzidine	ND
Diethyl phthalate	ND
Dimethyl phthalate	ND
Din-n-butyl phthalate	ND
2,4-Dinitrotoluene	ND
2,6-Dinitrotoluene	ND
Di-n-octyl phthalate	ND
1,2-Diphenylhydrazine	ND
Fluoranthene	ND
Fluorene	ND
Hexachlorobenzene	ND
Hexachlorobutadiene	ND
Hexachlorocyclopentadiene	ND
Hexachloroethane	ND
Indeno(1,2,3-cd)pyrene	ND
Isophorone	ND
Naphthalene	ND
Nitrobenzene	ND
N-nitrosodimethylamine	ND
N-nitrosodie-n-propylamine	ND
N-nitrosodiphenylamine	ND
Phenanthrene	ND
Pyrene	ND
1,2,4-Trichlorobenzene	ND

ND = None Detected

TO: Bloomfield Refinery
Attn: Chris Hawley
PO Box 159
Bloomfield, NM 87413

DATE: 23 July 1986
1030

NOMINAL DETECTION LIMITS

ANALYTE	
CN	0.01 mg/l
TDS	1 mg/l
Cl	1.0 mg/l
SO 4	1.0 mg/l
Phenols	0.002 mg/l
TOC	0.1 mg/l
Sb	0.01 mg/l
As	0.05 mg/l
Be	0.01 mg/l
Cd	0.010 mg/l
Cr	0.050 mg/l
Cu	0.03 mg/l
Pb	0.050 mg/l
Hg	0.002 mg/l
Ni	0.06 mg/l
Se	0.010 mg/l
Ag	0.050 mg/l
Tl	0.01 mg/l
Zn	0.01 mg/l
Benzene	0.001 mg/l
Toluene	0.001 mg/l
Xylenes	0.001 mg/l
Ethylbenzene	0.001 mg/l
Ba	0.01 mg/l
Fe	0.04 mg/l
Mn	0.005 mg/l
Al	0.05 mg/l
B	0.01 mg/l
Co	0.05 mg/l
Mo	0.01 mg/l
F	0.1 mg/l
No 3 as N	0.01 mg/l
1,2-DCE	0.001 mg/l
1,1-DCE	0.001 mg/l
1,1,2,2-TCE	0.001 mg/l
1,1,2-TCE	0.001 mg/l

Dectection limits for Volatiles, Base/Neutrals and Acid Compounds all 0.001 mg/l

REFERENCE:"Test Methods for Evaluting Solid Waste, Physical/Chemical Methods",USEPA, SW 846, EMSL-Cincinnati, 1982.

An invoice for services is enclosed. Thank you for contacting Assaigai Laboratories.

Sincerely,

Jennifer V. Smith, Ph.D.
Laboratory Director

ATTACHMENT 2

Well Logs For Monitoring Wells 7 - 10

BLOOMFIELD REFINING COMPANY

Well Log For Monitoring Well No. 7

Drilling Date: February 26 & 27, 1986

Depth in Feet	Description
0-1	Gravel fill
1-5	Brown sandy silt and clay with small gravels
5-10	Brown sandy silt and clay, more firm and sticky
10-15	Lighter brown sandy silt and sticky clay
15-20	Lighter brown sandy silt and clay, larger cobbles and pebbles
20-25	Sand with cobbles and pebbles
25-30	Sand
30-35	Greenish clay with pebbles, top of Nacimiento estimated at 32 feet
35-40	Greenish clay, few pebbles
40-45	Green to gray clay, smooth drilling
45-50	Green to gray clay, smooth drilling
50-65	Sticky gray to green clay

Elevation of Top of Pipe: 5524.09 feet

Total Depth of Casing: 62.11 feet

Description of Casing: Bottom of casing has a 2 foot stainless steel blank section for a silt trap, followed by a 10 foot section of 6" I.D. stainless steel screen, in turn followed by 6" I.D. schedule 40 PVC casing to the top of pipe. Sand was added to 45 feet below grade, bentonite to 41 feet below grade, and grout to the surface.

BLOOMFIELD REFINING COMPANY

Well Log For Monitoring Well No. 8

Drilling Date: February 28, 1986

Depth in Feet	Description
0-20	Light brown sandy clay, similar to that found on the ground surface
20-34	Cobbles and pebbles
34	Green-gray clay and sandstone, intermixed with small pebbles and sand. Top of Nacimiento.

Elevation of Top of Casing: 5531.12 feet

Total Depth of Casing: 34.94 feet

Description of Casing: Bottom of casing has a 2 foot stainless steel blank section for a silt trap, followed by 20 feet of 6" I.D. stainless steel screen, followed by 6" I.D. schedule 40 PVC to the surface. The screened section of the hole was sanded to within 7 feet of the surface, a bentonite seal (1/2 bucket) was added and concrete was used for a surface seal.

BLOOMFIELD REFINING COMPANY

Well Log for Monitoring Well No. 9

Drilling Date: March 3, 1986

Depth in Feet	Description
0-5	Fill material, some rock
5-10	Sticky reddish brown silty clay
10-15	Lighter color silty clay, some pebbles
15-20	Lighter color silty clay, some pebbles
20-25	Cobbles, pebbles, sand
25-30	Cobbles, greenish clay, top of Nacimiento

Elevation of Top of Casing: 5519.70 feet

Total Depth of Casing: 33.99 feet

Description of Casing: Bottom of casing has a 2 foot stainless steel blank section for a silt trap followed by 20 feet of 6" I.D. stainless steel screen, followed by 6" I.D. schedule 40 PVC to the surface. The screened section of the hole was sanded to within 7 feet of the surface, a bentonite seal (1/2 bucket) was added and concrete was used for a surface seal.

BLOOMFIELD REFINING COMPANY

Well Log for Monitoring Well No. 10

Drilling Date: March 4, 1986

Depth in Feet	Description
0-5	Topsoil, roadbase, reddish brown sandy clay
5-10	Reddish brown silty, sandy clay
10-15	Cobbles, pebbles
15-20	Gravel, cobbles, pebbles
20-25	Greenish clay at 23 feet, top of Nacimiento
25-30	Greenish clay, Nacimiento
30-35	Nacimiento, color changed from yellow-green to blue-gray

Elevation of Top of Casing: 5516.86 feet

Total Depth of Casing: 33.93 feet

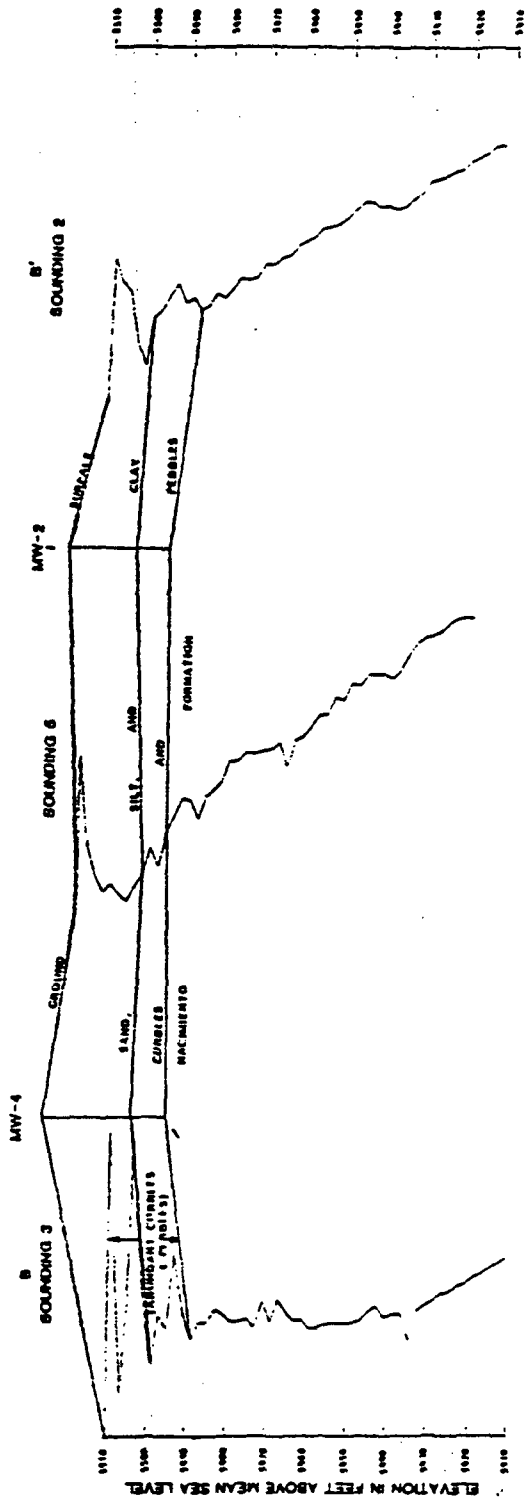
Description of Casing: Bottom of casing has a 2 foot stainless steel blank section for a silt trap, followed by 20 feet of 6" I.D. stainless steel screen, followed by 6" I.D. schedule 40 PVC to the surface. The screened section of the hole was sanded to within 7 feet of the surface, a bentonite seal (1/2 bucket) was added and concrete was used for a surface seal.

ATTACHMENT 3

ER Subsurface Cross Section B-B'

FIGURE 11

ER SUBSURFACE CROSS SECTION B-B′



Attachment 4

Jacob's Equation

$$Q = \frac{K(H^2-h^2)}{458 \ln(R_O/r_w)}$$

where:

K	=	coefficient
H	=	saturated thickness (ft)
h	=	allowable drawdown (ft)
R_O	=	radius of influence (ft)
r_w	=	radius of the well (ft)

Darcy's Equation

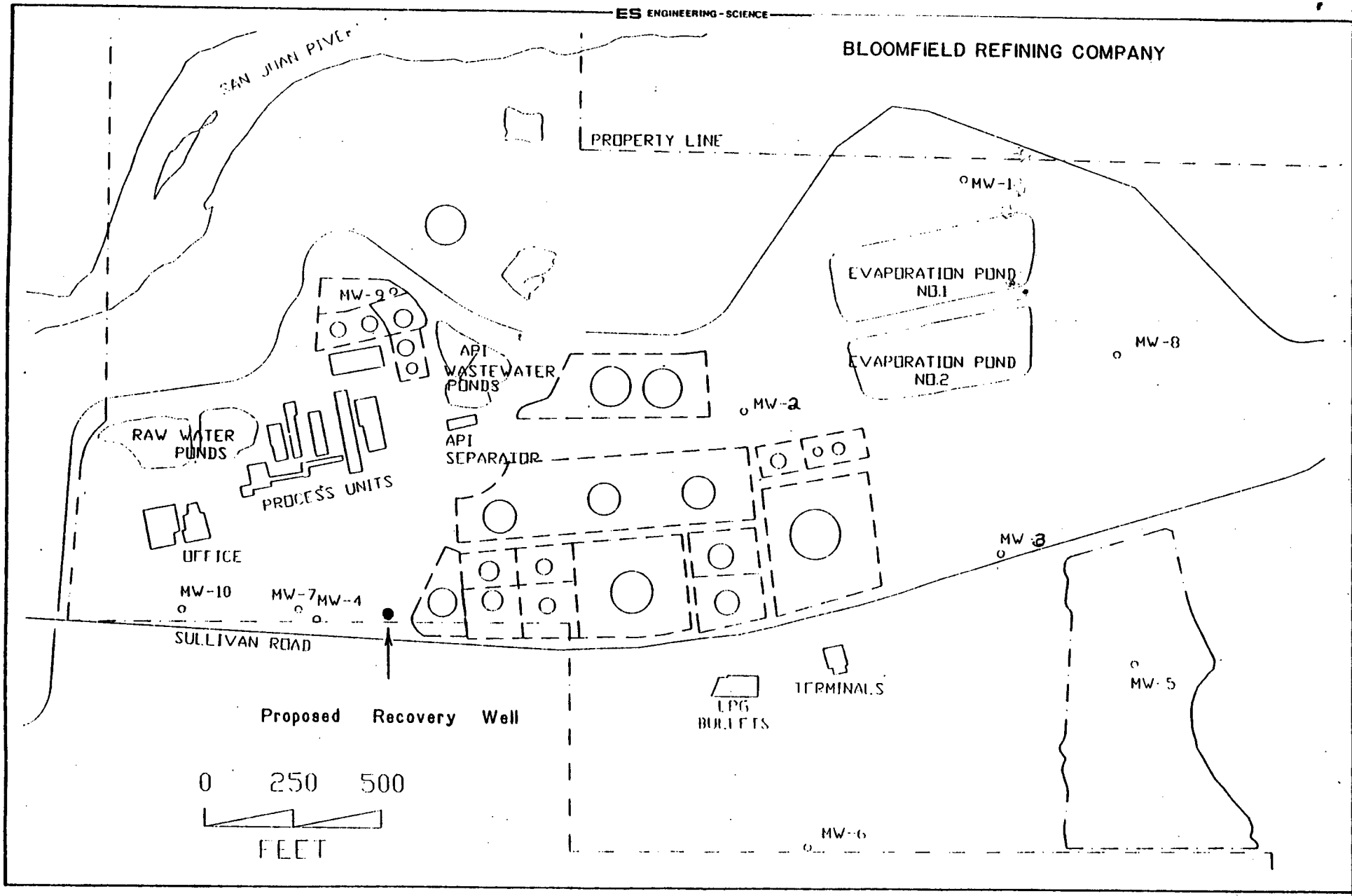
$$Q = \frac{TiW}{n}$$

where:

T	=	transmissivity (gpd)
i	=	hydraulic gradient (ft/ft)
W	=	Width (ft)
n	=	porosity (%)

ATTACHMENT 5

Proposed Recovery Well Location


ES ENGINEERING - SCIENCE
BLOOMFIELD REFINING COMPANY
SAN JUAN RIVER
PROPERTY LINE
MW-1
MW-9
EVAPORATION POND NO.1
EVAPORATION POND NO.2
MW-8
API WASTEWATER PONDS
MW-2
RAW WATER PONDS
API SEPARATOR
PROCESS UNITS
OFFICE
MW-10
MW-7
MW-4
MW-3
SULLIVAN ROAD
Proposed Recovery Well
LPG BULLETS
TERMINALS
MW-5
MW-6
0 250 500
FEET

ATTACHMENT 6

Proposed Off-Site Monitoring Wells

Proposed Monitoring Well Locations

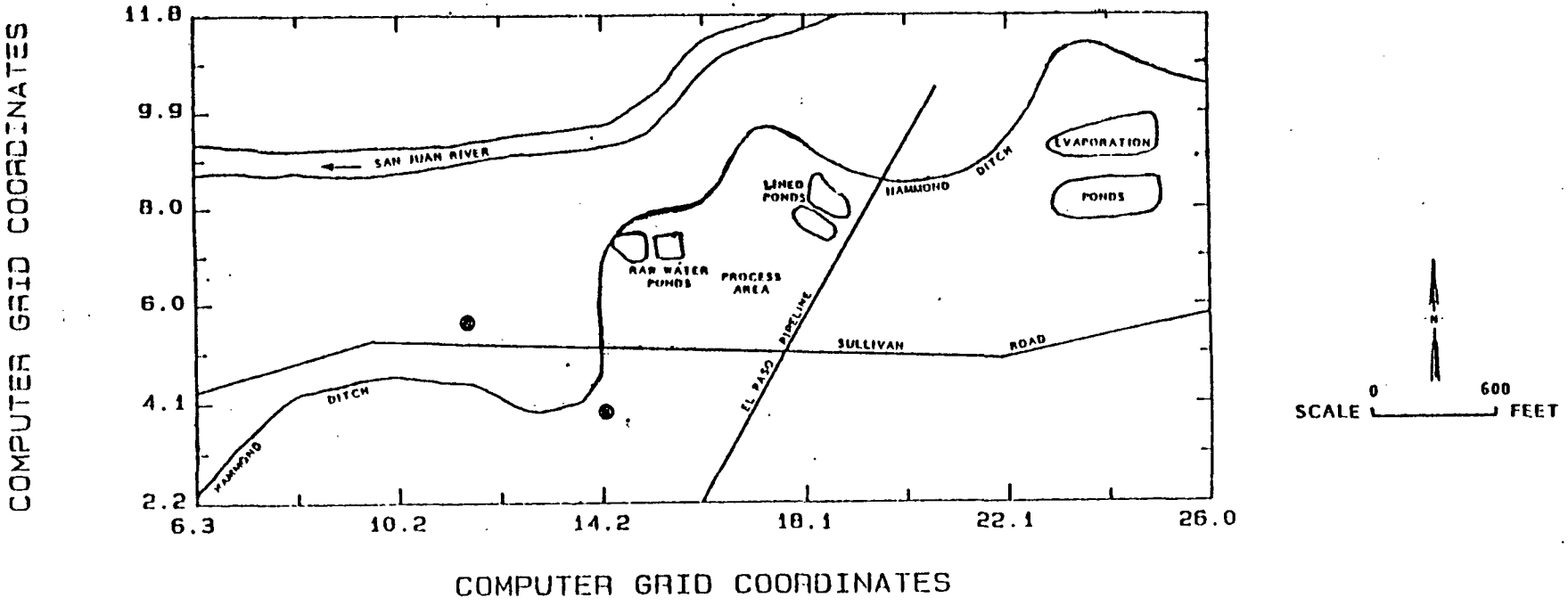


FIGURE 3.1
BLOOMFIELD REFINING COMPANY
GROUNDWATER ELEVATIONS ON APRIL 4 AND MAY 23, 1986