GW - 32

REPORTS

YEAR(S):

1990- EPA PLANS

GIANT REFINING CO.

Route 3, Box 7
Gallup, New Mexico
87301

505
722-3833

June 11, 1990

David Boyer
Director
New Mexico Oil Conservation Division
P.O. Box 2088
State Land Office Building
Santa Fe, New Mexico 87504

RECEIVED

JUN 15 1990

OIL CONSERVATION DIV.
SANTA FE

RE: RFI Workplans

Dear Mr. Boyer:

The enclosed documents are the EPA approved work plans for the Ciniza Refinery RCRA Facility Investigation. Sampling for the first phase of the investigation will begin on June 25, 1990.

If you have any questions, contact me at (505) 722-3833, ext. 217.

Sincerely,

Claud Rosendale
Environmental Manager
Ciniza Refinery

cc: w/enclosures: Jack Ellvinger; Bureau Chief-NMEID
Kim Bullerdick; Corporate Counsel-Giant Industries, Inc.

PUBLIC NOTICE

NEW MEXICO ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE BUREAU
P.O. BOX 968
SANTA FE, NEW MEXICO 87504-0968

Public Notice No. 24 **August 28, 1988**

Notice of Proposed Issuance of a Final Permit
For a Facility Under the New Mexico
Hazardous Waste Act

Under authority of the Resource Conservation and Recovery Act (RCRA), the Environmental Improvement Division (EID) of the New Mexico Health and Environment Department and the U.S. Environmental Protection Agency (EPA) Region VI, propose to issue a final permit to Giant Refining Company, Route 3, Box 7, approximately 17 miles east of Gallup, NM 87301, for the land application treatment of hazardous waste. The EID permit is to be issued under authority of the New Mexico Hazardous Waste Act (§ 74-4-1 *et. seq.*, NMSA 1978, as amended 1987) and the EPA permit under the authority of the Hazardous and Solid Waste Amendments of 1984. The facility has been assigned EPA identification number NMD000333211.

The proposed EID permit contains conditions for the land application treatment of hazardous refinery waste at the existing facility. Petroleum refining has been conducted at this location for more than thirty years and wastes have been land applied since 1981. The EPA permit will address the investigation and, if necessary, the cleanup of past spills and disposal sites as well as other HSWA regulations.

The draft proposed permits and the administrative records may be reviewed at either the E.I.D. Central Office library at the Harold Runnels Building, 1190 St. Francis Drive, Santa Fe, New Mexico, the E.I.D. District I Field Office, 106 W. Hill, Gallup, New Mexico, or the EPA library, 1445 Ross Avenue, Dallas, Texas.

The addresses of the E.I.D. and EPA representatives for either reviewing or obtaining a copy of the administrative record or any part thereof at 35 cents a page, or for commenting or public participation, are:

Mr. C. Kelley Crossman
Permitting Supervisor
Hazardous Waste Bureau (EID)
P.O. Box 968
Santa Fe, New Mexico 87504-0968

Mr. Sam Becker, P.E., Chief,
Hazardous Waste Compliance Branch
U.S. EPA (6H-C)
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Any person, including the applicant, who wishes to comment on the decision to issue a permit may do so by submitting comments, along with the commentor's name and address, to both addressees above. All written comments submitted on the decision to issue the permit must be received by October 14, 1988 to be considered in formulating a final decision.

Any person, including the applicant, who wishes to request a public hearing concerning the proposed action(s), may do so by submitting a written request to both addressees above. Any request for a hearing shall state the nature of the issues proposed to be raised in the hearing. All requests must include the requestor's name and address. Requests for a hearing must be received by October 3, 1988 to be considered. A public hearing is scheduled for 1:30 pm on October 5, 1988 at the McKinley County Courthouse, Commission Room, 200 West Hill, Gallup, NM. If no requests for a public hearing are received by October 3, 1988, the EID reserves the right to cancel the scheduled hearing.

If, after consideration of all written comments, this proposed action becomes the final decision, the EID and the EPA will each issue the company an operating permit. These permits will govern the handling and disposal of regulated hazardous wastes at the refinery.

This notice satisfies the requirements of the Resource Conservation and Recovery Act, as amended, 42 U.S.C. 6901, *et. seq.* and 40 CFR 124.10. The final permit, if issued by the EPA, will implement the requirements of the HSWA, amending the Federal Solid Waste Disposal Act, as amended. The State of New Mexico and the EPA have entered into a joint permitting agreement whereby RCRA permits may be issued in the State, in accordance with the Hazardous Waste Management Regulations of the State of New Mexico and the HSWA, until the State receives interim or final authorization under RCRA to administer the requirements of HSWA. In order for the applicant to have a fully effective RCRA permit, both the New Mexico EID and the EPA must issue a permit. EPA may participate in any public hearing if one is held.

FACT SHEET

INTENT TO PERMIT THE LAND APPLICATION TREATMENT OF HAZARDOUS WASTES UNDER THE RESOURCESCONSERVATION AND RECOVERY ACT (RCRA)

FACILITY NAME:	Giant Refining Company Ciniza Refinery
EPA I.D. NUMBER:	NMD 000333211
LOCATION:	Route 3, Box 7 Gallup, New Mexico 87301
ACTIVITY:	Hazardous Waste Land Treatment
LANDOWNER:	Giant Refining Company
FACILITY OPERATOR:	Giant Refining Company John J. Stokes, Refinery Manager

Reasons Supporting Decision To Issue A Permit

In November, 1983, the Part B RCRA permit application was received from Giant Refining Company. Giant is requesting a permit pursuant to the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6901, *et.seq.*) and the New Mexico Hazardous Waste Act (Sections 74-1-1 *et. seq.* NMSA, 1978, as amended 1987).

Giant is a refiner of crude petroleum oil into fuels, kerosene and asphalt products. Giant applied for and received interim status under RCRA in October, 1980 to operate a land application treatment landfarm for the refinery wastes below. These wastes have been treated, subject to RCRA Interim Status standards, since that time.

EPA Hazardous Waste Number	Wastes Types	Annual Quantity
D001	Ignitable hazardous wastes	50 Tons
K049	Slop Oil Emulsion Solids	200 Tons
K050	Heat Exchanger Cleaning Sludge	15 Tons
K051	API Separator Sludge	1000 Tons
K052	Leaded Tank Bottoms	5 Tons

The Division proposes to issue a permit based on the provisions of HWMR-5 and under the Act stated above for the operation of a hazardous waste land application treatment facility.

The administrative record for this decision consist of permit application (Part A and Part B), a fact sheet, information contained in the permit application and related correspondence. The Administrative records may be reviewed at either the Environmental Improvement Division (EID) Central Office library at the Harold Runnels Building, 1190 St. Francis Drive, Santa Fe, New Mexico or the E.I.D. District I field office, 106 W. Hill, Gallup, New Mexico.

COMMENT PERIOD

All persons, including the applicant, who believe that the tentative decision to issue an operating permit is inappropriate, must raise all ascertainable issues and submit all available arguments and factual grounds supporting their position by October 14, 1988. Comments should be sent to the EID, at the address below.

PROCEDURES FOR REQUESTING A HEARING:

A public hearing may be held if the EID receives by October 3, 1988, written notice of opposition to the proposed decision and a request for a hearing. Any request for a hearing shall be in writing and state the nature of the issue proposed to be raised in the hearing. Requests for a hearing must be submitted to the EID and must include the requestor's name and address. A public hearing has been scheduled for 1:30pm, October 5, 1988 at the McKinley County Courthouse, Commission Room, 200 W. Hill, Gallup, NM. The EID reserves the right to cancel the hearing if no written requests are received by October 3.

All correspondence should be sent to the following address:

Mr. C. Kelley Crossman, Permitting Supervisor
Hazardous Waste Bureau (EID)
P.O. Box 968
Santa Fe, N.M. 87504-0968

PUBLIC NOTICE

New Mexico Health and Environment Department
Environmental Improvement Division
P.O. 968
Santa Fe, New Mexico 87504-0968
(505) 827-2929

July 11, 1986

NOTICE OF PROPOSED ISSUANCE UNDER THE NEW MEXICO HAZARDOUS WASTE ACT OF A LAND TREATMENT DEMONSTRATION PERMIT TO GIANT REFINING COMPANY

The Environmental Improvement Division (EID) of the New Mexico Health and Environment Department proposes to issue a permit to Giant Refining Company to demonstrate the land treatment of hazardous waste at their Ciniza Refinery located 17 miles east of Gallup, New Mexico on Interstate Highway 40. The EID permit is to be issued under authority of the New Mexico Hazardous Waste Act, Section 74-4-1 et. seq., NMSA 1978. The United States Environmental Protection Agency (EPA) has reviewed the requirements for land treatment demonstrations and the requirements of the Hazardous and Solid Waste Amendments of 1984 (HSWA)and determined that such demonstrations are not subject to the requirements of the (HSWA). The facility has been assigned EPA identification number NMD000333211.

The proposed permit contains conditions for the application of not more than 963.7 tons of hazardous waste to 4.8 acres during a one year period. The facility refines crude oil and markets gasoline, diesel, asphalt, and residual fuel oil. During the normal refinery operation various toxic hazardous wastes are generated. These hazardous wastes will be applied to a 4.8 acre land treatment area where Giant Refining Company proposes to demonstrate that hazardous constituents in the waste can be completely degraded, transformed, or immobilized in the treatment zone.

The permit conditions for the operation of the facility are open to comment from the public. Persons wishing to comment upon the permit application, the proposed permit conditions, or who wish to request a public hearing should submit such comments and requests in writing to the Environmental Improvement Division, Hazardous Waste Section, PO Box 968, Santa Fe, New Mexico 87504-0968, ATTENTION: Boyd Hamilton. Requests for a public hearing shall state the nature of the issues proposed to be raised in the hearing. These comments and/or requests must be received no later than September 2, 1986 to be considered.

The Environmental Improvement Division's administrative record is on file at the Ground Water and Hazardous Waste Bureau, 1190 St. Francis Drive, Santa Fe, New Mexico and may be inspected and copied at any time between 8:00 a.m. and 5:00 p.m. In addition, copies of the the draft permit and the Fact Sheet are available for review at the New Mexico Environmental Improvement Division District Office, 4215-4219 Montgomery Blvd. N.E., Albuquerque, New Mexico, telephone (505) 841-6580; or at the New Mexico Environmental Improvement Division Field Office, 106 W. Hill, Gallup, New Mexico, telephone (505) 722-4160, between the hours of 8:00 a.m. and 4:00 p.m. Monday through Friday. Requests for mailing of copies of the draft permit and the Fact Sheet can be made by writing to the New Mexico Environmental Improvement Division, Hazardous Waste Section, PO Box 968, Santa Fe, New Mexico 87504-0968, ATTENTION: Boyd Hamilton, or by calling (505) 827-2929.

All written comments submitted on the proposed permit will be considered in formulating a final decision. The EID will notify the applicant and each person who submitted a written comment during the public comment period of the final permit decision and/or of any scheduled public hearing.

FACT SHEET

GIANT REFINING COMPANY

PERMIT NO. NMD000333211-1

The New Mexico Environmental Improvement Division proposes to issue a short-term Land Treatment Demonstration permit under the New Mexico Hazardous Waste Act, Section 74-4-1 et. seq., NMSA 1978, authorizing the Giant Refining Company-Ciniza Refinery to apply hazardous waste to 4.8 acres located at the Ciniza Refinery 17 miles east of Gallup, New Mexico on Interstate Highway 40. The facility refines crude oil and markets gasoline, diesel, asphalt, and residual fuel oil. During the normal refinery operation various toxic hazardous wastes are generated. As proposed in the Land Treatment Demonstration Permit, conditions restrict Giant Refining Company to apply not more than 963.7 tons of hazardous wastes to 4.8 acres during the one year demonstration period. The applied wastes may include any of the following listed or classes of wastes:

EPA Hazardous Waste No.	Waste Description	Hazard Code
D007	E. P. Toxic Waste - Chromium	(E)
K049	Slop oil emulsion solids from the petroleum refining industry.	(T)
K050	Heat exchanger bundle cleaning sludge from the petroleum refining industry.	(T)
K051	API Separator sludge from the petroleum refining industry.	(T)
K052	Tank bottoms (leaded) from the petroleum refining industry.	(T)

The proposed Land Treatment Demonstration Permit is for a one year period. All of the applicable regulatory requirements in the New Mexico Hazardous Waste Management Regulations for this demonstration have been incorporated into or satisfied by the permit.

In making any final decision on the draft permit, the Director of the Environmental Improvement Division shall give due consideration to all comments received during the public comment period.

Persons wishing to comment on the permit application, the draft permit and/or who wish to request a public hearing may do so in writing by submitting such comments and/or requests to the New Mexico Environmental Improvement Division. Requests for a public hearing shall state the nature of the issues proposed to be raised in the hearing. Written comments and requests for a hearing must be received by September 2, 1986 to be considered.

GIANT
REFINING COMPANY
ROUTE 3, BOX 7 • GALLUP, NEW MEXICO 87301
(505) 722-3833 • TWX 910-981-0504

RECEIVED
MAY 26 1986
OIL CONSERVATION DIVISION
SANTA FE

Sampling of MW Series, On site SO7 MW-3 Drilling

May 22, 1986

Mr. Peter Pache
Program Manager
Hazardous Waste Section
New Mexico Environmental Improvement Division
P.O. Box 968
Santa Fe, NM 87504-0968

RE: Ground Water Monitoring at Ciniza Refinery Land Treatment Unit - Your letter of 4/23/86

Dear Mr. Pache:

Pursuant to your letter of April 23, 1986, Giant Refining Company would like to outline our position on the three major points addressed in your letter and select one of the four options presented with a schedule for implementation. Furthermore, we would like to thank you for your assistance in finally resolving this issue which has been in limbo for almost two years.

With respect to your discussion on the hydrogeology of the site, Giant agrees that the geohydrology of the Ciniza site is complex and may be open to differences in interpretation; however, the interpretations we have presented to NMEID, NMOCD and USEPA Region VI are simple, conservative, reasonable and consistent with respect to both site-specific and regional data.

In September, 1985, Geoscience Consultants, Ltd. (GCL) conducted a drilling program at the Ciniza site to better characterize the geohydrologic regime in the Chinle shale zone above the Sonsela aquifer. For the first time, continuous cores were available and detailed stratigraphic correlation was possible. In the first borehole (SMX-1), confined ground water was first encountered at a depth of approximately 60 feet (6815' elevation) in a thin sand lens, later given the field name "Ciniza sand". Several other sand strata above the Ciniza sand were dry. Following the discovery of this previously unrecognized geohydrologic unit, GCL staff formulated a simple, well-accepted predictive hypothesis to explore for this unit in subsequent boreholes. Since the Chinle units overlying the Sonsela were deposited without a major time break (geologically) it is only reasonable to assume that the structural dip of the units would be coincident. Therefore, the Ciniza sand is most likely parallel to the known attitude of the underlying Sonsela, allowing one to predict the elevation (and hence, depth) of the Ciniza sand at any point where the same was present. Using 2 degrees as a representative Sonsela dip, we predicted a Ciniza sand elevation of 6846' at the southeast corner of the land treatment area; drilling confirmed this projection (6852' in SMW-1; 6848' in SMW-2).

A structure contour map (Plate 3, NMOCD Discharge Plan Application) shows that the structure of the Ciniza sand is quite consistent in the area investigated, dipping northwest at approximately 2.5 degrees.

Ms. Jami Bailey (NMOCD) has prepared an alternative interpretation, in which she states that "Regional dip, based on Sonsela Sandstone elevation calculations was a minor consideration in the projection because regional dip does not appear to affect to the same degree these upper sands in this limited area." (March 27, 1986, letter from NMOCD to Giant, pp. 1 and 2). On this basis, Ms. Bailey concludes that wells SMW-1, SMW-2 and SMW-3 are completed in a "third sand" while SMW-4, SMW-5 and SMW-6 are completed in a "fourth sand". We strongly disagree with Ms. Bailey's rejection of regional dip in her correlations. Her use of "correlations" which implicitly reject regional structure as a basis for disregarding structure is a circular argument not consistent with the regional or site-specific lithology and structure of the Chinle Formation.

The cross-sections which accompany Ms. Bailey's March 27 letter further demonstrate this inconsistency. Although the absence of a horizontal scale on these sections makes quantitative examination impossible, her work implies a southerly dip for "Sand #1", and a northerly dip for "Sand #3" (Cross-Section A-A'). No explanation is provided for this improbable geologic situation. Using "structure" derived from these cross-sections, Ms. Bailey then proceeds to speculate that the "#4 sand" may contact the Sonsela to the southeast. Work by GCL (Plate 3, and Figure 4-1, p. 17, NMOCD Discharge Plan Application) indicates that the Ciniza sand's dip is slightly (1/2 degree) steeper than the Sonsela; any speculative connection would therefore be to the northwest.

With respect to the definition of uppermost aquifer, we still maintain that the monitoring of the Sonsela meets every aspect of 40CFR265 subpart F and Section 206.C.1 of NMHWR. Our basis for this has been discussed at length in our February 28, 1985, submission to the EPA Region VI and NMEID in response to items 3 and 4 of EPA's December 4, 1984, letter. As you mention in page 4 of your letter, Giant has always acted in good faith to comply with all of the requirements of the RCRA program. As you know, our facility was the only facility in New Mexico to have ground water monitoring wells in place by the November, 1981 deadline. Giant continues this philosophy of sound environmental management of all of their facilities. With respect to the Ciniza refinery we fully agree with, and wish to re-emphasize the point made in your letter that:

> "There is no evidence that any hazardous waste constituents have migrated out of the land treatment unit. The Chinle clay/shale provides an excellent natural barrier to migration of wastes. Additionally, the isolated location of the refinery means that were a good release of contaminants to occur, there would be a good cushion of time in which to remediate the situation before any population was threatened."

For the reasons discussed above, Giant agrees to undertake your option #1 of a replacement for MW-3 in the Sonsela and semi-annual monitoring of SMW-4, SMW-5, SMW-6 and OW-24 for:

- pH
- Conductivity
- Lead
- Chromium
- GC/MS purgeable screen

All the parameters required under NMHWMR Section 206.C.1c.(2) will be analyzed in the new well (replacement of MW-3) following development and stabilization. This well will then replace MW-3 in the ongoing semi-annual RCRA monitoring program. The old MW-3 will then be plugged and abandoned. With the exception of the additional wells to be monitored as described above, the original sampling and analysis plan as has been followed since 1981 (according to the original part B application) will continue.

This new well will be installed near MW-3 on or before July 20, 1986, and sampled on or before August 8, 1986.

The analyses from that sampling will be made available to NMEID by September 15, 1986. It is our intention to drill this well with a hollow stem auger and continuous sampler (if possible) to assure the best possible lithologic control. If drilling conditions are not favorable to this type of method; the use of an air rotary method is contemplated. Enclosed is an anticipated construction diagram and specifications for the MW-3 replacement well and a site plan showing the approximate location. Sampling and analysis of the new well will be carried out identically to the other MW-series wells. Sampling, sample preservation/custody procedures and reporting of results for SMW-4, SMW-5, SMW-6 and OW-24 will be carried out identically to and concurrently with the MW-series wells.

Analytical parameters will be examined to determine if they are increasing (or decreasing, in the case of pH) significantly over 3 monitoring periods, in SMW-4, SMW-5, SMW-6 or OW-24 signaling the need to investigate potential releases from the land treatment unit.

This plan is a sound approach that takes into account the hydrogeologic complexities at the site while meeting the letter and the intent of 40CFR 265 Subpart F and NMHWMR Section 206.C.1.

We look forward to your concurrence with this plan of action and the resolution of this issue. Please notify us within two weeks of receipt of this letter if you see any problems with this approach so that we may proceed with the schedule as presented.

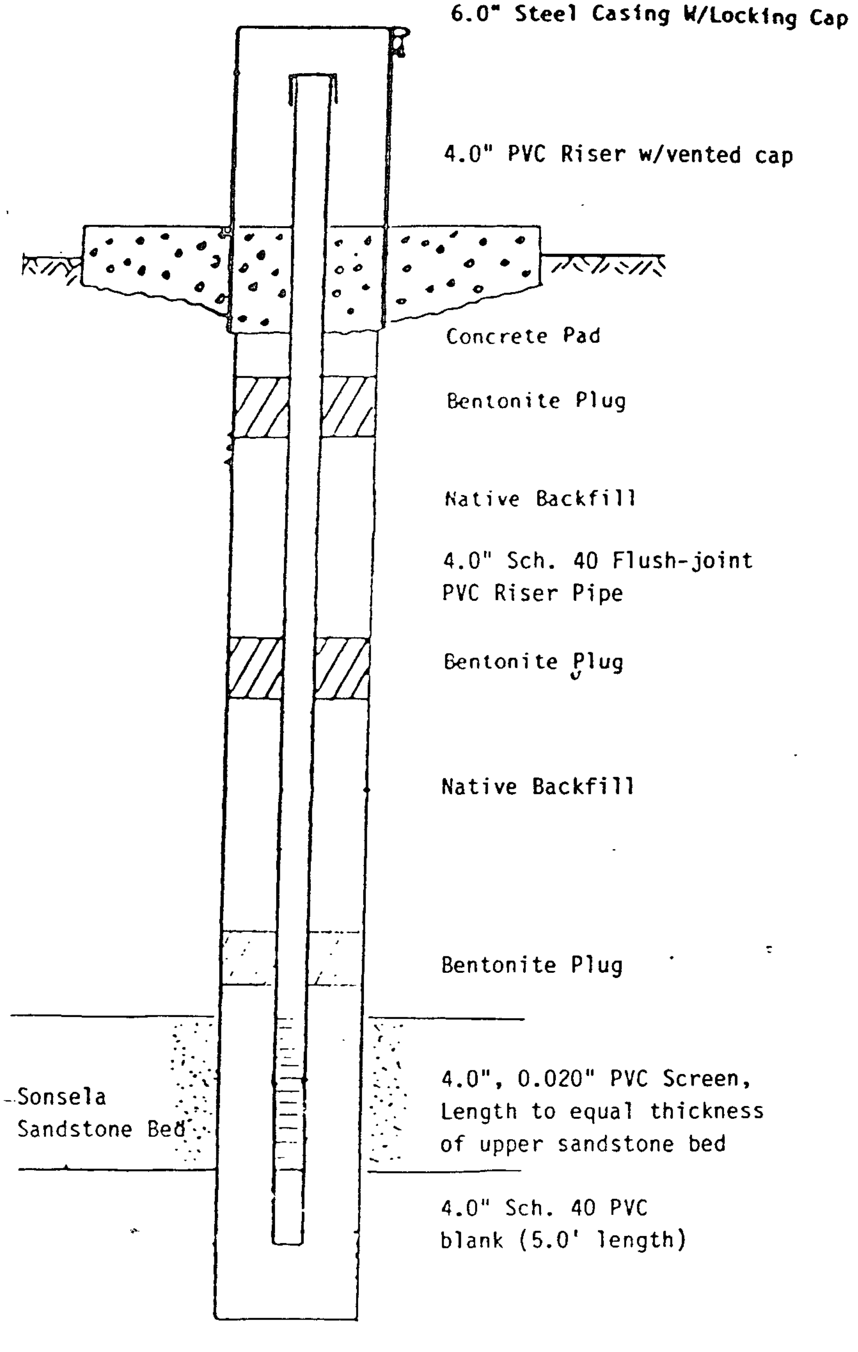
Very truly yours,
GIANT REFINING COMPANY

Carl D. Shook
Vice President Refining Operations

CDS/ds/GIANT/SHOOK/SHOOK027.LTR

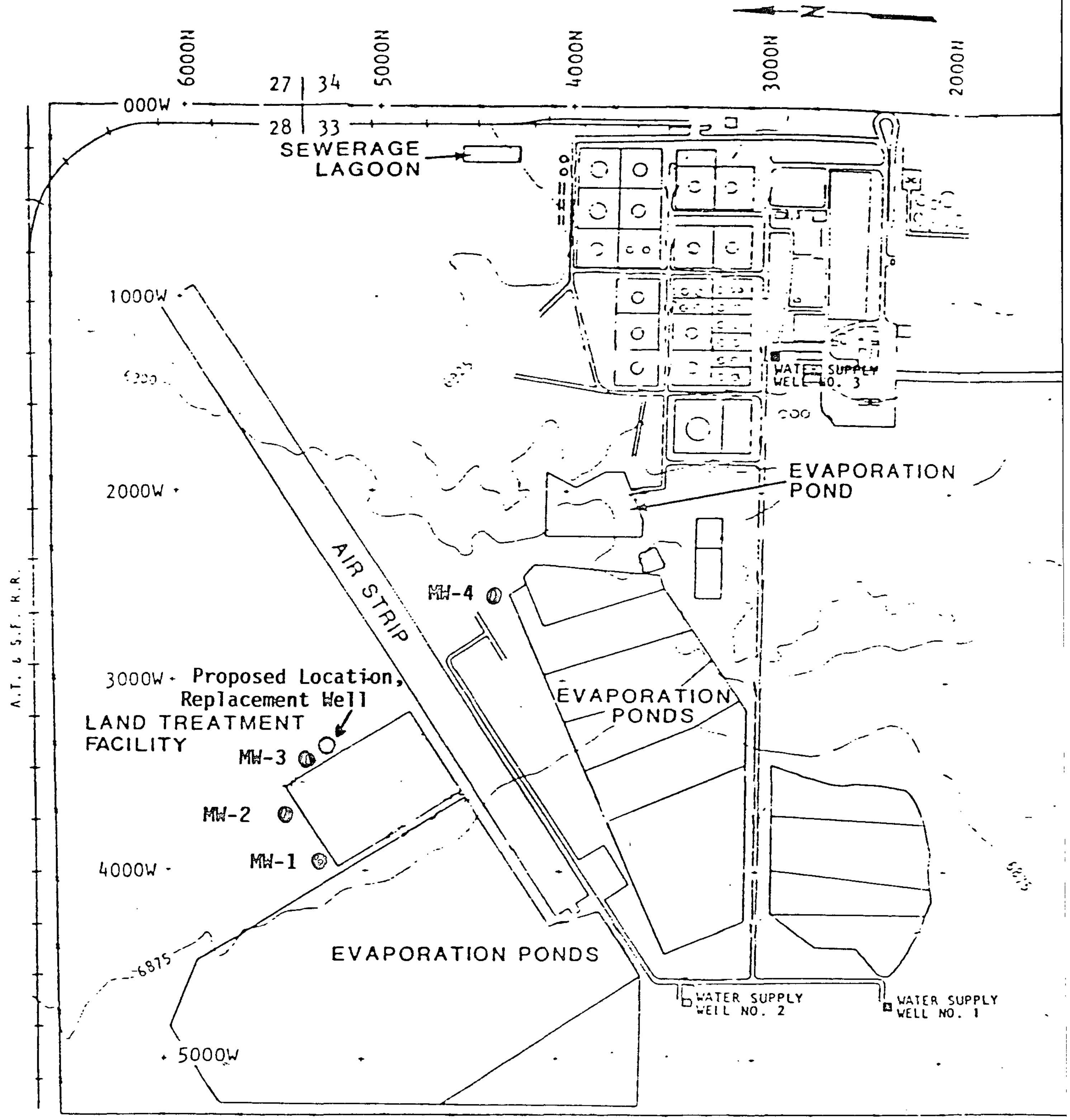
Enclosures

cc: Ernest Rebuck, GW/HW Bureau Chief
Dave Boyer, NMOCD
Carlos Castillo, EPA Region VI
Alberto Gutierrez, GCL
Carlos Guerra, Giant Industries, Inc.



GENERAL SPECIFICATIONS FOR

NEW MONITOR WELL MW-3



PROPOSED LOCATION FOR
REPLACEMENT WELL FOR MW-3

HEALTH & ENVIRONMENT DEPARTMENT

STATE OF NEW MEXICO

ENVIRONMENTAL IMPROVEMENT DIVISION
P.O. Box 968, Santa Fe, New Mexico 87504-0968
(505) 827-0020

TONEY ANAYA
GOVERNOR

DENISE FORT
DIVISION DIRECTOR

REGISTERED MAIL

23 April 1986

Carl D. Shook
Giant Refining Company
Route 3, Box 7
Gallup, New Mexico 87301

Dear Mr. Shook:

This letter is in regards to ground-water monitoring at the land treatment unit at the Ciniza Refinery. We outline here our understanding of: 1) the hydrogeology beneath the land treatment unit; 2) the ground-water monitoring requirements under the Hazardous Waste Management Regulations (HWMR-2) and Giant's systems installed to meet those requirements; 3) the definition of "Aquifer", and; 4) your options for ensuring that the ground-water monitoring system meets the intent of the regulations and is adequate for the land treatment demonstration.

Within 30 calendar days of receipt of this letter, you must choose one of the four options presented in this letter, and must submit to us a plan and schedule for implementing the required additional monitoring. If you do not do so, we will initiate formal enforcement action.

Attached is the Comprehensive Monitoring Evaluation (CME) report that was prepared subsequent to our inspection at your facility on February 12-13, 1985. The attachments to that report are not included, because they consist of documents that either were submitted by yourself, or that have been provided to you previously.

Hydrogeology

Our present conception of the hydrogeology under the facility is based on the CME, on reports by Dames and Moore and by GeoScience, on the literature, and on discussions with Dave Boyer and Jami Bailey of the Oil Conservation Division, as well as the letter from OCD which was sent to you on April 5, 1986.

It appears that at least four thin lenses of sand/sandstone are embedded within the Chinle shale between the surface and the top of the Sonsela sandstone. The upper two sands are dry. The third sand outcrops under the refinery ponds south of the land treatment unit, and water from these ponds is probably the source of water within within the third sand. Wells SMW-1, SMW-2, and SMW-3 ("upgradient" wells) are all completed in this third sand. The fourth sand apparently joins the Sonsela southeast of the land treatment unit, and water in this unit is most likely derived from the Sonsela. There is no evidence that the fourth sand outcrops into any of the refinery surface impoundments. Wells SMW-4, SMW-5 and SMW-6 ("downgradient" wells) are completed in the fourth sand.

The four sands appear to be limited in extent: the third sand probably does not extend as far as the northern boundary of the land treatment unit. The fourth sand, however, probably does extend across the entire length of the land treatment unit. It appears that no hydrologic connection exists between the third and fourth sands.

Except for capillary fringes around the third and fourth sands, the Chinle has a very low soil moisture content for several tens of feet beneath the surface. Immediately above the Sonsela Sandstone, however, the Chinle is saturated and will yield water to wells at a rate of approximately 0.5 gpm.

The Sonsela is the first (uppermost) unit in the area which is noted in the literature as an aquifer. Although not a high-quality aquifer (relatively high TDS and relatively low yield) it is used in the area for livestock watering and irrigation. The Sonsela is under artesian pressure and may be the source of water in the Chinle immediately above.

Wells MW-1, MW-2, and MW-4 are completed in the Sonsela. MW-3 was also to have been completed in the Sonsela, and well logs indicate that it was. As explained in the CME, however, it is EID's opinion that MW-3 is not screened across the Sonsela; most likely it is screened in the Chinle shale above the Sonsela. This conclusion is based on the water level of MW-3 relative to the other MW wells, the recharge rate of MW-3, and the fluoride concentrations of water samples from MW-3, which differ significantly from fluoride concentrations in the other MW wells.

Beneath the Sonsela sandstone lie several hundred more feet of Chinle shale. Beneath the Chinle is the San Andres-Glorieta sandstone aquifer, a high-quality, high-yield aquifer which is the primary source of drinking water in the area.

Ground-Water Monitoring Requirements and Systems

In accordance with EPA requirements, notification of the land treatment area as a hazardous waste treatment unit and submittal of a Part A application was done within the allowed timeframes. This conferred Interim Status upon the land treatment unit, and it became subject to regulations under 40 CFR 265, Subpart F. These regulations require a minimum of one upgradient and three downgradient wells, completed within the uppermost aquifer beneath the unit, and capable of immediately detecting any migration of hazardous wastes from the unit into the ground water. Detection of contaminants is to be accomplished by comparing the values for indicator parameters in the downgradient wells against the background value for those parameters. The background value is determined from quarterly samples taken from the upgradient well during the first year of monitoring. When New Mexico adopted the Hazardous Waste Management Regulations, the unit also became subject to equivalent requirements under Section 206.C.1 of HWMR.

Dames and Moore was hired to study the hydrogeology of the area, and then to install monitoring wells around the land treatment area. The MW wells were completed by November 1981, also within the timeframe allowed under EPA's regulations. Samples were taken and analyzed in accordance with the regulations.

Review of the MW system led EPA to dispute whether the intent of the regulations had actually been met. EPA contended that the saturated zone of the Chinle above the Sonsela was the uppermost aquifer, and that it was the formation in which the monitoring system should be installed. Giant countered that the Chinle shale did not meet any normal definition of "aquifer". Because the State received Final Authorization to implement the RCRA program in January 1985, EPA referred the matter to the State.

The Hazardous and Solid Waste Amendments of 1984 required that all hazardous waste facilities subject to ground-water monitoring certify that their monitoring was in compliance with the regulations by November 8, 1985. If they did not so certify, the facility would lose Interim Status and would be required to close.

In September 1985, the SMW wells were installed and sampled in accordance with Section 206.C.1 requirements. According to information provided to Ann Claassen by Geoscience (Alberto Guiterrez) over the phone, these wells were installed so that Giant could unquestionably certify compliance on November 8. It was Geoscience's belief that the SMW wells had been installed in the very uppermost water-yielding unit beneath the facility. After November 8, 1985, Ms. Claassen was told by Geoscience (Jim Hunter) that the certification was based on the MW wells, and that the SMW wells were simply an additional "early detection" system.

Unfortunately, it now appears that neither the MW nor the SMW series is adequate to meet the minimum requirements of 206.C.1. Because MW-3 is not completed within the Sonsela, the MW series is short of the "three downgradient" minimum requirement. The upgradient and the downgradient SMW wells are completed in two different sands which are charged by very different sources of water. This system can not, therefore, be utilized to compare downgradient to upgradient water quality as required by the regulations.

Definition of Aquifer

We understand Giant's position to be thus: the Sonsela is the uppermost aquifer and is therefore the unit which must be monitored under 206.C.1. Although there are units above the Sonsela which are saturated and which yield water to wells, these units are not "aquifers". You point to the definition of an aquifer as a formation which yields <u>significant</u> quantities of water to wells, and contend that the yields of units above the Sonsela are not "significant", primarily because they do not produce enough water to support a four-person household. It is in fact unlikely that these units would be developed for any kind of water use.

Rather than discussing the meaning of aquifer, we would like to discuss the intent of the ground-water monitoring regulations. A basic premise of the Hazardous Waste Program is that hazardous waste units should be designed and managed so that there is no escape of hazardous waste constituents from the unit. It therefore is desirable to have a system which detects contaminant migration as soon as possible. EPA directed monitoring within the uppermost aquifer not because they thought the uppermost aquifer was the water most likely to be utilized, but because they wanted the earliest possible signal that the unit was leaking contaminants to ground water.

It appears that the regulation writers had little appreciation for the typical depth to water in the West (not to mention for vadose-zone monitoring). But as EPA has become aware of the vast amount of contamination that can occur between the surface and the uppermost drinking-water source, they have tended to interpret "aquifer" in a manner which best meets the original intent of the ground-water monitoring regulations. I believe that EPA will eventually come out with a very clear policy which considers any water-bearing formation to be an aquifer for purposes of applying the RCRA regulations, and they will expect the States to adhere to that definition.

If we understand Giant's position correctly, the definition of aquifer is an important issue because of the effect it willl have on potential need for clean-up, should contaminants migrate out of the land treatment unit. For example, if contaminants were detected in the third sand, then Giant would be required to restore water in that sand, even though the water would never be used for anything. You should be aware that, under the no-migration philosophy of RCRA, any contamination -- soil and water -- would have to be cleaned up. Clean-up requirements are not contingent on whether the aquifer is used for drinking or other purposes, but simply on the fact that the contamination exists. If the Sonsela were deemed the uppermost aquifer, and contamination from the land treatment unit were detected in it, then Giant would be faced with clean-up of all soil and water beween the land treatment unit and the Sonsela, as well as the Sonsela itself. It therefore clearly is to your advantage to monitor a unit above the Sonsela.

Giant's Options for Compliance

The situation at the Ciniza Refinery is clearly quite complex. In the strictest application of the regulations, it appears that there was not in fact a fully-compliant ground-water monitoring system in place on November 8, 1985, and therefore that the facility should lose Interim Status, the land treatment unit be closed, and all future hazardous wastes shipped off-site. (Any such action would be taken by EPA, since the 1984 Amendments have not yet been incorporated into New Mexico law and regulation.) New Mexico 's position is that such action would not be appropriate, if Giant is willing to undertake one of the options given in this section. Our reasons include:

i) Since the inception of the RCRA program, the Ciniza Refinery owner (formerly Shell Oil and now Giant) has acted in good faith to comply with the regulations. Much money and effort has been expended to define the hydrogeology and to implement an acceptable ground-water monitoring program. The refinery was in fact the only facility in New Mexico which had wells in place by the November 1981 deadline. The fact that there is not presently a system which precisely meets the regulatory requirements in no way appears to reflect any intentional effort to circumvent the regulations, but simply reflects the complexity of the hydrogeology combined with some errors by contractors.

ii) There is no evidence that any hazardous waste constituents have migrated out of the land treatment unit. The Chinle clay/shale provides an excellent natural barrier to migration of wastes. Additionally, the isolated location of the refinery means that were a release of contaminants to occur, there would be a good cushion of time in which to remediate the situation before any population was threatened.

iii) The Loss of Interim Status provision of the 1984 Amendments grew out of Congress's frustration that, four years into the RCRA program, many facilities had not installed ground-water monitoring systems and many facilities were contaminating the ground water. In light of the above two comments, we do not believe that it was Congress's intent to close down a facility such as Ciniza.

In order to bring Giant's ground-water monitoring program into complete compliance with the regulations, we are requesting that you implement one of the following options:

1. Another well in the Sonsela, with supplemental "early detection" monitoring.

As explained in the definition of "aquifer" section, we do not think it is to Giant's advantage to utilize the Sonsela as the uppermost aquifer. However, if you still wish to insist on the point, then the EID is willing to accept the MW series as the official ground-water monitoring system under the following conditions:

a. A new well must be installed near the location of MW-3 and must be completed within the Sonsela. After development of the new well, samples must be taken from it and from MW-1, MW-2 and MW-4. The samples must be analyzed for all parameters required under 206.C.1c.(2). If the analytical values for the new well fall within the range of values for the other wells, then the new well can simply be incorporated into the ongoing semi-annual sampling program. If the results indicate that the new well has a different water quality from the other MW wells, further investigations will be necessary to determine the reason for the difference.

b. In addition to semi-annual monitoring of the MW series, Giant should monitor SMW-4, SMW-5, SMW-6, OW-4 and OW-24 for pH, conductivity, TOC, TOX, lead and chromium. (Instead of TOC and TOX, we would accept purgeable screens by GC/MS.) The results of these samples would not be compared against some upgradient background level, but would simply be compared against previous samples from the same well. If any of parameters appear to increasing over time (or decreasing, in the case of pH) within a given well, this would signal the need to control releases from the land treatment unit, before contamination reaches the Sonsela.

2. Upgradient wells in the fourth sand, with backup monitoring in the Sonsela.

As explained under the section on hydrogeology, the problem with the SMW series is that the "upgradient" wells are completed in the third sand, while the "downgradient" wells are completed in the fourth sand. While the third sand may be the very uppermost occurence of saturation, use of the third sand for a monitoring system is inappropriate for two reasons. First, it is not clear that the third sand extends far enough that downgradient wells could be installed that were also outside of the land treatment unit. Second, because the third sand outcrops into refinery effluent ponds, it is impossible to site upgradient wells that are not affected by the facility. A RCRA monitoring system compares downgradient to upgradient quality, and thus theoretically would detect the impact of the land treatment unit separate from the effect of the ponds. But we are concerned that the high levels of contaminants in the third sand (due to the effluent pond) would mask any increase that was contributed from the land treatment unit.

Therefore, the uppermost saturated zone which is suitable for a monitoring system is the fourth sand. If Giant chooses this option, at least one upgradient well must be installed that is completed in the fourth sand. This well (or wells) must be sampled and analyzed as required under 206.C.1.c.(2) for a full year of quarterly samples (this would include replicate analyses of pH, conductivity, TOC, and TOX). Samples from this(these) well(s) will provide the data to establish the background water quality against which subsequent semi-annual samples will be compared.

Because of the complex network of thin sands beneath the land treatment area, there is some concern that contaminants might migrate along a preferential path that would escape detection by a monitoring system in the fourth sand. Therefore, under this option, Giant must also continue to monitor the existing MW wells.

3. Wells in the Chinle, with supplemental "early detection" monitoring.

The potential danger with option 2 is that more shallow wells might simply reveal more complexities and still leave us questioning whether upgradient and downgradient wells have been completed in a single, continuous unit. Installation of wells into the saturated portion of the Chinle shale, right above the Sonsela, would provide monitoring of a continuous system, and would also provide earlier warning of ground-water contamination than would the MW series.

If Giant chooses this option, at least one upgradient and three downgradient wells must be installed and completed within the saturated portion of the Chinle Shale immediately above the Sonsela aquifer. A full year of quarterly monitoring in accordance with 206.C.1.c.(2) must be conducted for all the new wells, and then a program of semi-annual monitoring in accordance with 201.C.1.c.(3), (4) and (5) until a Part B permit is issued.

Also under this option, Giant must monitor SMW and OW wells exactly as specified under part "b." of option 1.

4. Giant's proposal.

Because of the complexity of the situation at Giant, there may be other acceptable alternatives. EID is willing to entertain Giant's proposal of an option different from the above three if the proposal is clear, detailed, in compliance with the regulations, and addresses all of our concerns as expressed in this letter. If Giant does submit such a proposal, and EID finds it unacceptable, we will notify you of such. Within 15 days of such notification, Giant must submit a plan in conformance with one of the three above options.

In order to respond to this letter, please send us a letter that states which option you are choosing. Attached to the letter should be a plan for implementing the option that includes: siting, construction, and completion specifications for new wells; a sampling and analysis plan for the entire monitoring system; a revised ground-water assessment plan outline; and a schedule for the implementation plan. Your response is due 30 calender days after receipt of this letter. If you have any questions, please contact us at 827-2929.

Sincerely,

Peter H. Pache
Program Manager
Hazardous Waste Section

PP:AC:ac

cc: Ernest Rebuck, GW/HW Bureau Chief
Dave Boyer, Oil Conservation Division
Carlos Castillo, EPA Region VI
Alberto Guiterrez, Geoscience

GIANT
REFINING COMPANY
ROUTE 3, BOX 7 • GALLUP, NEW MEXICO 87301
(505) 722-3833 • TWX 910-981-0504

February 28, 1986

Mr. Peter H. Pache
State of New Mexico
Environmental Improvement Division
Hazardous Waste Section
P.O. Box 968
Santa Fe, NM 87504-0968

Subject: Annual ground water monitoring report for January 1 to December 31, 1985, Facility EPA I.D. Number FNMD 00033321

Dear Mr. Pache:

We are submitting a ground water monitoring Annual Report for the calendar year January 1 to December 31, 1985. Attached are summary sheets of the testing done on our four monitoring wells MW-1, MW-2, MW-3 and MW-4. MW-4 is up-gradient.

Six shallow monitoring wells were added around the land treatment area in the fall of 1985 for early detection. The testing done on these wells is also tabulated on the attached sheets. The shallow wells are SMW-1, SMW-2, SMW-3, SMW-4, SMW-5 and SMW-6. SMW-1, SMW-2 and SMW-3 are up-gradient to the land treatment area.

The TOX levels have remained below detection levels in 1985. The other constituent tests in the MW monitoring wells have been below the required limits.

The ground water velocity is estimated to be 8.2 ft/yr in the LTA vicinity. It is the same as estimated last year. The velocity is calculated by:

$$V = KI/n = (0.4 \text{ ft/day})(0.009 \text{ ft/ft})/0.16 = 0.02 \text{ ft/day} = 8.2 \text{ ft/yr}.$$

Our monitoring shows no evidence of migration of hazardous constituents from our land treatment area. Some 1986 testing is included in the tabulations for your information.

Sincerely,

Carl D. Shook

RECEIVED
[illegible] 3 1986
HAZARDOUS WASTE SECTION

CDS:ds

Attachment

cc: 11.01.C.07.E
Alberto Gutierrez - Geoscience Consultants, Ltd.

1985 ANNUAL REPORT

MONITORING WELL MW-1 CONSTITUENT	IPDWS/ NM ST. DS	MW-1 1-13-85	MW-1 10-14-85	MW-1 2-11-86	SMW-1 10-10-85	SMW-1 1-23-86
ARSENIC, MG/L	.05/.1				0.080	<0.050
BARIUM "	1.0				6.0	<0.005
CADMIUM "	0.05				<0.060	0.090
CHROMIUM "	0.05				<0.050	0.065
FLOURIDE "	1.6				0.28	0.42
LEAD "	0.05	.009			0.116	0.10
MERCURY "	0.002	<.002			<0.002	<0.002
NITRATE - N "	10				0.1	<0.01
SELENIUM "	0.01/0.05				0.066	<0.010
SILVER "	0.05				<0.050	<0.050
CHLORIDE "	250	47			1489.0	1340
COPPER "	1.0					
IRON "	1.0	.077			0.45	<0.04
MANGANESE "	0.2	.024			0.16	<0.02
PHENOLS "	0.005	<.001			<0.001	<0.001
SULFATE "	600	150				1704
TDS "	1000					
*TOX "	0.05	<.01	<0.01	<0.01	<0.01	<0.01
*TOC "		7.4	2.0	3.0	8.0	10.1
ZINC "	10					
*pH	6 - 9	8.8	8.5	8.4	7.6	7.7
ALUMINUM, MG/L	5.0					
COBALT "	0.05					
MOLYBDENUM "	1.0					
NICKEL "	0.2					
*E. C. MICROMOHS/CM	-	1100	1003	1162	5600	5845
SODIUM, MG/L	-	234				1692
CYANIDE "	0.2					
OIL & GREASE "						
TURBIDITY, FTU					78	175
ENDRIN "					<0.0002	
METHOXYCHLOR "					<0.1	
LINDANE "					<0.004	
TOXAPHENE "					<0.005	
2,4,-D "					<0.01	
2,4,5,-TP "					<0.01	
GROSS ALPHA pCi/l					0± 187	
GROSS BETA "					0± 1097	
RADIUM "					<5	
STATIC WATER ELEV.		6869.9	6870.7	6870.9	6855.2	6855.2
BOTTOM ELEV.		6746.5	6746.5	6746.5	6831.7	6831.7
TOP OF CASING ELEV.		6876.2	6876.2	6876.2	6878.2	6878.2

* AVE. OF FOUR REPLICATES

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MONITORING WELL MW-2 CONSTITUENT		IPDWS/ NM ST. DS	MW-2 1-13-85	MW-2 10-14-85	MW-2 2-11-86		SMW-2 10-10-85	SMW-2 1-23-86	
ARSENIC	MG/L	.05/.1					0.10	<0.050	
BARIUM	"	1.0					4.0	<0.005	
CADMIUM	"	0.05					0.10	0.13	
CHROMIUM	"	0.05					<0.050	0.067	
FLOURIDE	"	1.6					0.34	0.55	
LEAD	"	0.05	0.010				0.19	0.28	
MERCURY	"	0.002	<0.002				<0.002	<0.002	
NITRATE - N	"	10					2.0	0.1	
SELENIUM	"	0.01/0.05					0.13	0.010	
SILVER	"	0.05					<0.050	<0.050	
CHLORIDE	"	250	56.0				1985.0	1985.0	
COPPER	"	1.0							
IRON	"	1.0	0.037				0.62	<0.04	
MANGANESE	"	0.2	0.017				2.0	<0.02	
PHENOLS	"	0.005	<.001				<0.001	<0.001	
SULFATE	"	600	157.0				3473.0	1985	
TDS	"	1000							
* TOX	"	0.05	<0.01	<0.01	<0.01		<0.01	<0.01	
* TOC	"		5.8	3.0	2.0		9.0	9.9	
ZINC	"	10							
* pH		6 - 9	8.8	8.9	8.4		7.7	7.6	
ALUMINUM	MG/L	5.0							
COBALT	"	0.05							
MOLYBDENUM	"	1.0							
NICKEL	"	0.2							
* E. C. MICROMHOS/CM		-	1180	1003	1191		5845	7318	
SODIUM	MG/L	-	195				2660.0	1690	
CYANIDE	"	0.2							
OIL + GREASE	"								
TURBIDITY, FTU							27	92	
ENDRIN	"						<0.0002	- - -	
METHOXYCHLOR	"						<0.1	- - -	
LINDANE	"						<0.004		
TOXAPHENE	"						<0.005		
2,4,-D	"						<0.1		
2,4,5,-TP	"						<0.01		
GROSS ALPHA	pCi/l						0 ± 206		
GROSS BETA	"						1010 ± 1148		
RADIUM	"						<5		
STATIC WATER ELEV.			6869.7	6869.7	6870.7		6849.7	6849.7	
BOTTOM ELEV.			6740.6	6740.6	6740.6		6824.9	6824.9	
TOP OF CASING ELEV.			6878.3	6878.3	6878.3		6879.5	6879.5	

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MONITORING WELL MW-3 CONSTITUENT	IPDWS/ NM ST. DS	MW-3 1-13-85	MW-3 10-14-85	MW-3 2-11-86	MW-3	SMW-3 10-10-85	SMW-3 1-23-86	SMW-3
ARSENIC, MG/L	.05/.1					0.063	<0.050	
BARIUM "	1.0					1.7	<0.050	
CADMIUM "	0.05					<0.010	<0.020	
CHROMIUM "	0.05					<0.050	0.055	
FLOURIDE "	1.6					0.43	0.72	
LEAD "	0.05	0.010				<0.050	<0.05	
MERCURY "	0.002	<0.002				<0.002	<0.002	
NITRATE - N "	10					0.2	0.8	
SELENIUM "	0.01/0.05					0.10	<0.010	
SILVER "	0.05					<0.050	<0.050	
CHLORIDE "	250	57.0				42.0	43.99	
COPPER "	1.0							
IRON "	1.0	0.020				<0.04	<0.04	
MANGANESE "	0.2	0.029				0.02	<0.02	
PHENOLS "	0.005	<.001				<0.001	<0.001	
SULFATE "	600	120.0				1784.0	3766	
TDS "	1000							
* TOX "	0.05	<0.01	<0.01	<0.01		0.01	<0.01	
* TOC "		8.2	2.0	4.0		6.1	7.7	
ZINC "	10							
* pH	6 - 9	8.7	8.7	8.3		8.0	7.8	
ALUMINUM, MG/L	5.0							
COBALT "	0.05							
MOLYBDENUM "	1.0							
NICKEL "	0.2							
* E. C. MICROMOHS/CM	-	1100	1001	1161		3075	3690	
SODIUM, MG/L	-	140.0				440.0	832	
CYANIDE "	0.2							
OIL + GREASE "								
TURBIDITY, FTU						7.5	120	
ENDRIN "						<0.0002		
METHOXYCHLOR "						<0.1		
LINDANE "						<0.004		
TOXAPHENE "						<0.005		
2,4,-D "						<0.1		
2,4,5,-TP "						<0.01		
GROSS ALPHA pCi/l						97± 225		
GROSS BETA "						43 ± 1130		
RADIUM "						<5		
STATIC WATER ELEV.		6809.5	6849.6	6856.4		6847.6	6845.9	
BOTTOM ELEV.		6752.3	6752.3	6752.3		6836.6	6836.6	
TOP OF CASING ELEV.		6880.8	6880.8	6880.8		6880.1	6880.1	

* AVE. OF FOUR REPLICATES

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MONITORING WELL MW-4 CONSTITUENT		MW-4				SMW-4		
	IPDWS/ NM ST. DS	1-13-85	10-14-85	2-11-86		10-10-85	1-23-86	
ARSENIC, MG/L	.05/.1					<0.050	<0.050	
BARIUM "	1.0					<1.0	<0.0050	
CADMIUM "	0.05					<0.010	<0.010	
CHROMIUM "	0.05					<0.050	<0.05	
FLOURIDE "	1.6					0.61	1.0	
LEAD "	0.05	0.006					<0.05	
MERCURY "	0.002					<0.002	<0.002	
NITRATE - N "	10					0.1	<0.01	
SELENIUM "	0.01/0.05					<0.020	<0.010	
SILVER "	0.05					<0.050	<0.050	
CHLORIDE "	250	16.0				51.0	57.98	
COPPER "	1.0							
IRON "	1.0	0.086				1.2	<0.04	
MANGANESE "	0.2	0.038				0.08	<0.02	
PHENOLS "	0.005	<0.002				<0.001	<0.001	
SULFATE "	600	120.0				192.0	167	
TDS "	1000							
*TOX "	0.05	<0.01	<0.01	<0.01		<0.01	<0.01	
*TOC "		10.8	2.0	1.0		1.7	2.9	
ZINC "	10							
*pH	6 - 9	8.6	8.2	8.2		8.4	8.1	
ALUMINUM, MG/L	5.0							
COBALT "	0.05							
MOLYBDENUM "	1.0							
NICKEL "	0.2							
*E. C. MICROMHOS/CM	-	1200.	1000	1191		1200	1328	
SODIUM, MG/L	-	277.0				320.0	556	
CYANIDE "	0.2							
OIL + GREASE "								
TURBIDITY, FTU						86	15	
ENDRIN "						<0.0002		
METHOXYCHLOR "						<0.1		
LINDANE "						<0.004		
TOXAPHENE "						<0.005		
2,4,-D "						<0.1		
2,4,5,-TP "						<0.01		
GROSS ALPHA pCi/l						0 ± 48		
GROSS BETA "						72 ± 281		
RADIUM "						<5		
STATIC WATER ELEV.		6873.3	6873.7	6873.8		6844.3	6841.3	
BOTTOM ELEV.		6746.5	6746.5	6746.5		6746.5	6746.5	
TOP OF CASING ELEV.		6879.8	6879.8	6879.8		6879.8	6879.8	

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GIANT REFINING COMPANY

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MONITORING WELL / CONSTITUENT		IPDWS/ NM ST. DS	SMW-5 10-10-85	SMW-5 1-23-86	SMW-6 10-10-85	SMW-6 1-23-86
ARSENIC	MG/L	.05/.1	0.064	<0.050	<0.050	<0.050
BARIUM	"	1.0	<1.0	<0.005	<1.0	<0.005
CADMIUM	"	0.05	<0.010	<0.010	<0.010	<0.010
CHROMIUM	"	0.05	<0.050	<0.05	<0.050	<0.05
FLOURIDE	"	1.6	0.69	0.80	0.63	0.80
LEAD	"	0.05	<0.050	<0.05	<0.050	<0.05
MERCURY	"	0.002	<0.002	<0.002	<0.002	<0.002
NITRATE - N	"	10	0.1	<0.01	0.2	<0.01
SELENIUM	"	0.01/0.05	0.022	<0.010	0.020	<0.010
SILVER	"	0.05	<0.050	<0.050	<0.050	<0.050
CHLORIDE	"	250	54.0	79.98	70.0	75.98
COPPER	"	1.0				
IRON	"	1.0	1.8	0.33	0.62	0.30
MANGANESE	"	0.2	0.05	<0.02	0.17	<0.02
PHENOLS	"	0.005	<0.001	<0.001	<0.001	<0.001
SULFATE	"	600	189.0	111	261.0	164
TDS	"	1000				
*TOX	"	0.05	<0.01	<0.010	<0.01	<0.010
*TOC	"		6.0	5.9	5.0	5.4
ZINC	"	10				
*pH		6 - 9	8.7	8.4	8.4	8.0
ALUMINUM	MG/L	5.0				
COBALT	"	0.05				
MOLYBDENUM	"	1.0				
NICKEL	"	0.2				
*E.C.	MICROMOHS/CM	-	1150	1120	1275	1515
SODIUM	MG/L	-	342.0	620	348.0	424
CYANIDE	"	0.2				
OIL + GREASE	"					
TURBIDITY	FTU		66	49	51	117
ENDRIN	"		<0.0002		<0.0002	
METHOXYCHLOR	"		<0.1		<0.1	
LINDANE	"		<0.004		<0.004	
TOXAPHENE	"		0.005		<0.005	
2,4,-D	"		<0.1		<0.1	
2,4,5,-TP	"		<0.01		<0.01	
GROSS ALPHA	pCi/l		0 ± 51		4.8 ± 53	
GROSS BETA	"		0 ± 273		153 ± 283	
RADIUM	"		<5		<5	
STATIC WATER ELEV.			6844.0	6843.8	6827.4	6829.4
BOTTOM ELEV.			6795.1	6795.1	6805.4	6805.4
TOP OF CASING ELEV.			6874.0	6874.0	6876.2	6876.2

* AVE. OF FOUR REPLICATES

GIANT CINIZA REFINERY

COMPREHENSIVE MONITORING EVALUATION
FEBRUARY 12-13, 1985

Ann Claassen
Hazardous Waste Section
NM Environmental Improvement Division
Santa Fe, New Mexico

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Introduction

On February 12 and 13, 1985, a Comprehensive Monitoring Evaluation (CME) was conducted by the Environmental Improvement Division (EID) at Giant Ciniza Refinery, EPA ID No. NMD00033321. The Environmental Protection Agency (EPA) was also present in an oversight capacity.

Appendix A is the inspection report for the Compliance Evaluation (CEI) portion of the inspection. The remainder of this report deals with the ground-water monitoring evaluation, based on literature and file review, observations during the inspection, and analytical results from samples taken during the inspection.

Facility Description

The Giant Ciniza refinery is located just north of Interstate 40, about 17 miles east of Gallup, New Mexico (figure 1). The refinery was built in 1957 and was originally owned by the El Paso Natural Gas Company. Shell Oil Company purchased the refinery in 1964 and the present owner, Giant Refining Company, purchased it in 1982.

The Ciniza refinery has capacity to process about 18,000 barrels of oil per day. Refinery products are gasoline (leaded and unleaded), diesel, jet fuel, propane, kerosine, and naptha. Hazardous wastes generated by the facility are API separator sludge, slop oil tank bottoms, leaded tank bottoms, heat exchanger cleaning sludge, cooling water filter sludge, and degreasing solvents.

In October of 1980, use of a land treatment area was initiated for the treatment and disposal of refinery hazardous wastes (figure 2). The land treament area consists of three cells, known as the North, Middle and South sections. Each cell has an area of 2.35 acres. Giant estimates that between November 1980 and September 1983, 1371 barrels of oily waste, including API separator sludge out of the old sludge pits, were applied to the land treatment area. Table 1 provides information on quantity of wastes applied to the land treatment area.

Regional Description

Giant Ciniza refinery sits at the southern edge of the San Juan Basin, within the Zuni Uplift area (figure 3). The refinery is within a valley composed of extensive Chinle formation outcropping. The Chinle, of Triassic age, lies discomformably on the Permian age San Andres limestone. It is overlain by the late Jurassic Entrada sandstone, which forms striking red cliffs to the north of the refinery. At the base of these cliffs is the South Forkof the Puerco River, which runs east to west and provides surface drainage for the area.

The climate of the area is arid -- annual rainfall is about 10 inches and is offset by annual potential evapotranspiration of about 33 inches. Most of the precipitation falls as summer thundershowers. Table 2 shows that average precipitation slightly exceeds potential evaporation in the months of December and January. This climate supports a sparse vegetation of sagebrush and native grasses.

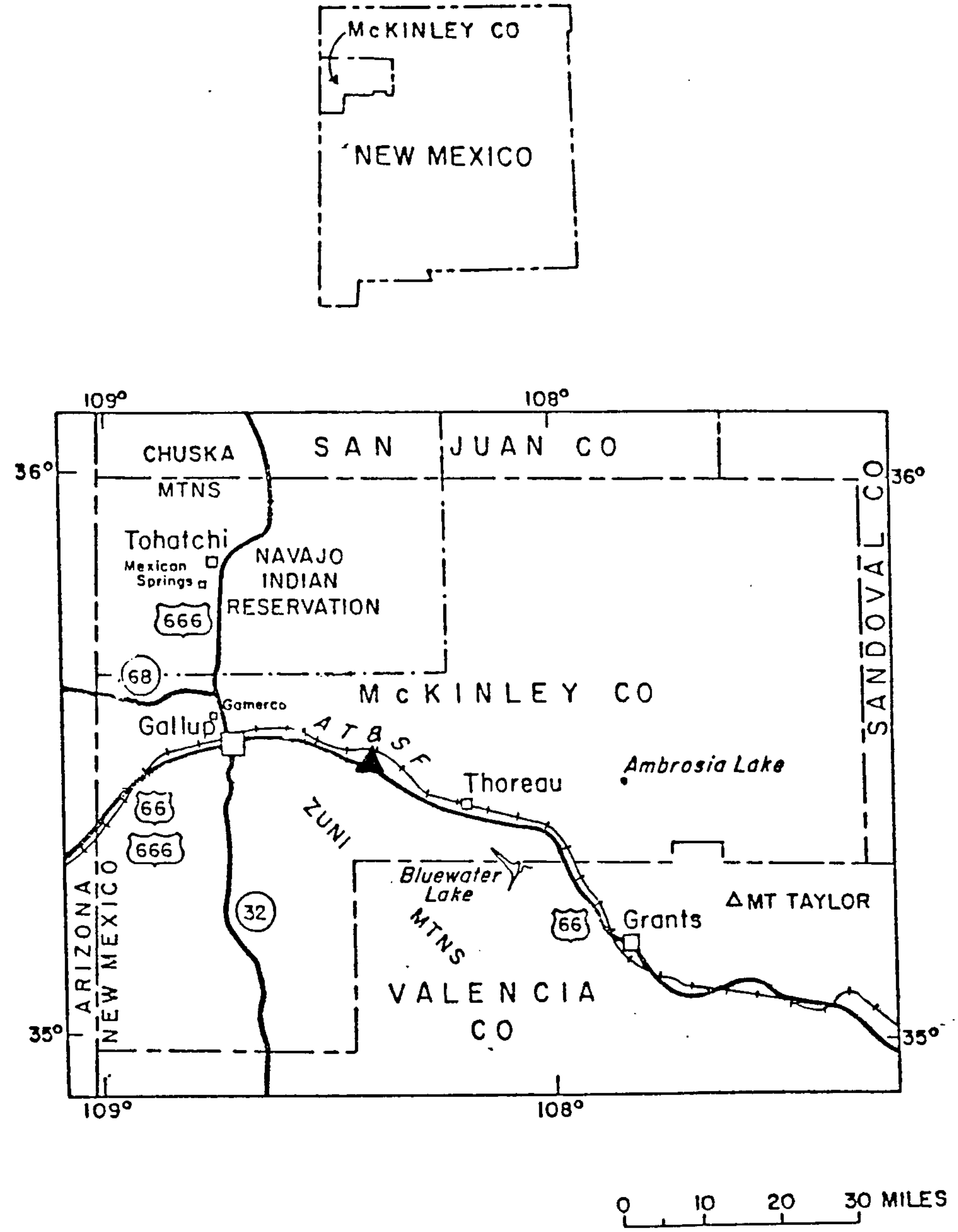
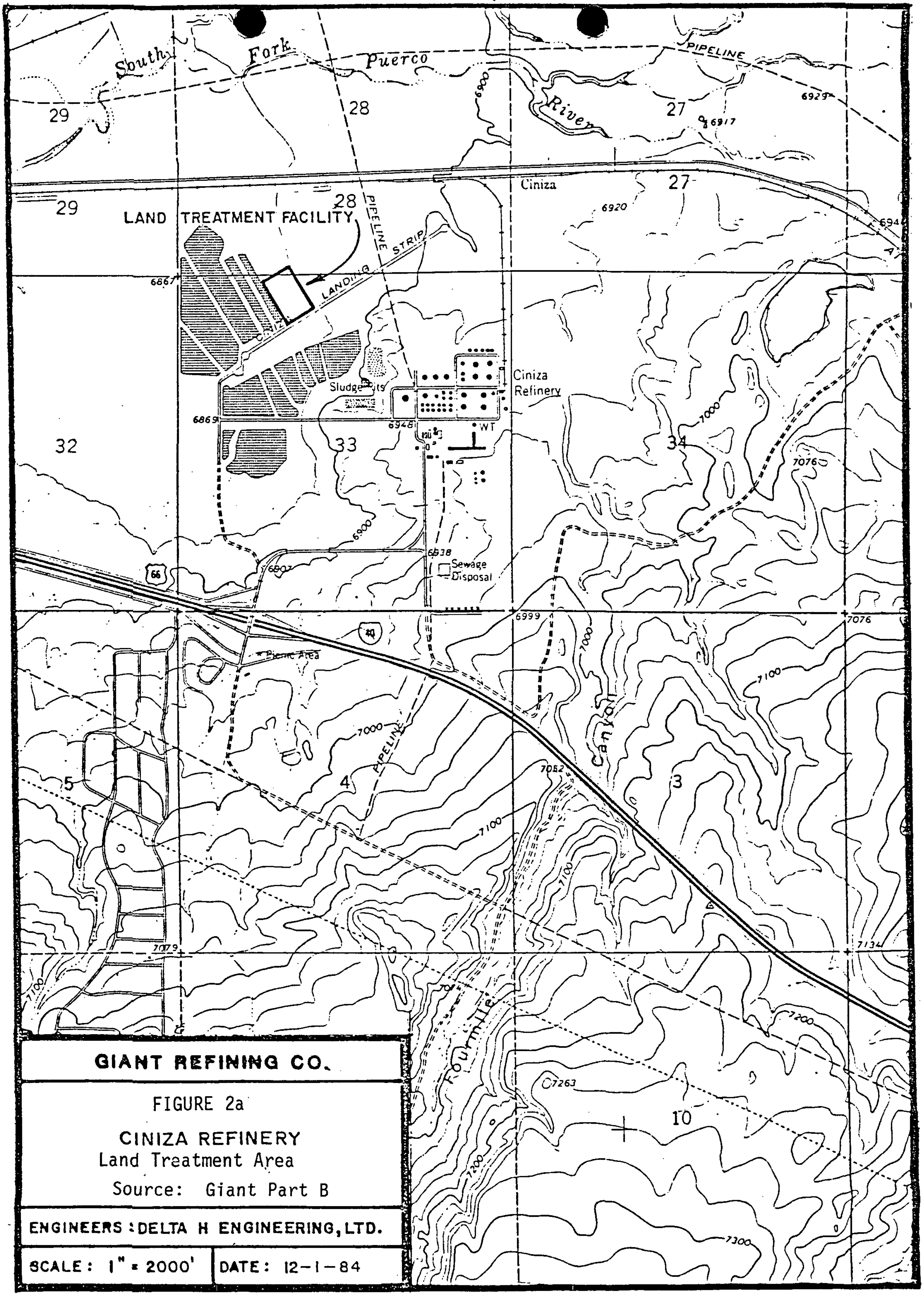


FIGURE 1
Location of Giant Ciniza Refinery (▲)

NOTE: Route 66 is now Interstate 40

Source: Mercer and Cooper, 1970.



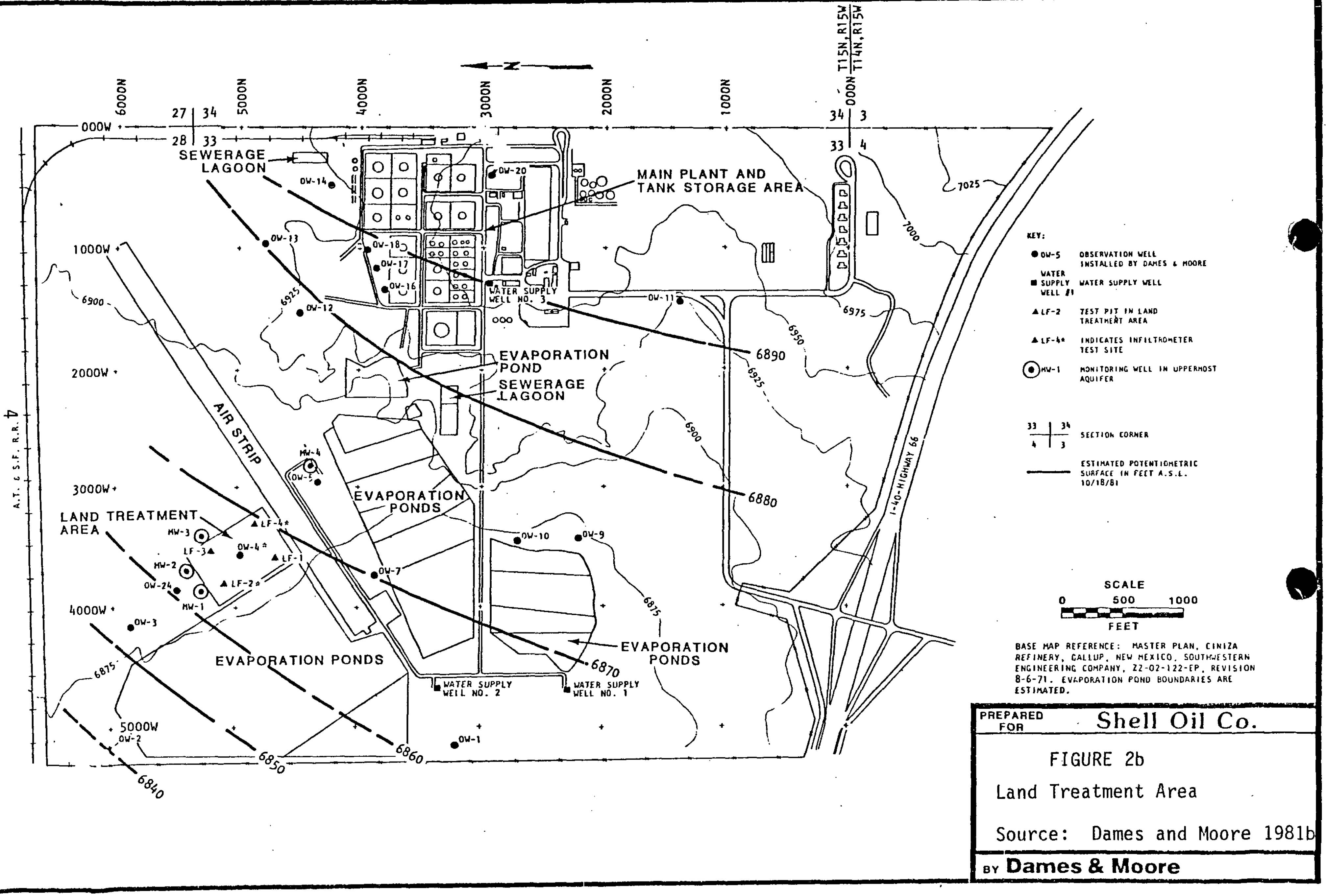
GIANT REFINING CO.

FIGURE 2a

CINIZA REFINERY
Land Treatment Area
Source: Giant Part B

ENGINEERS : DELTA H ENGINEERING, LTD.

SCALE : 1" = 2000' | DATE : 12-1-84



PREPARED FOR Shell Oil Co.

FIGURE 2b

Land Treatment Area

Source: Dames and Moore 1981b

BY Dames & Moore

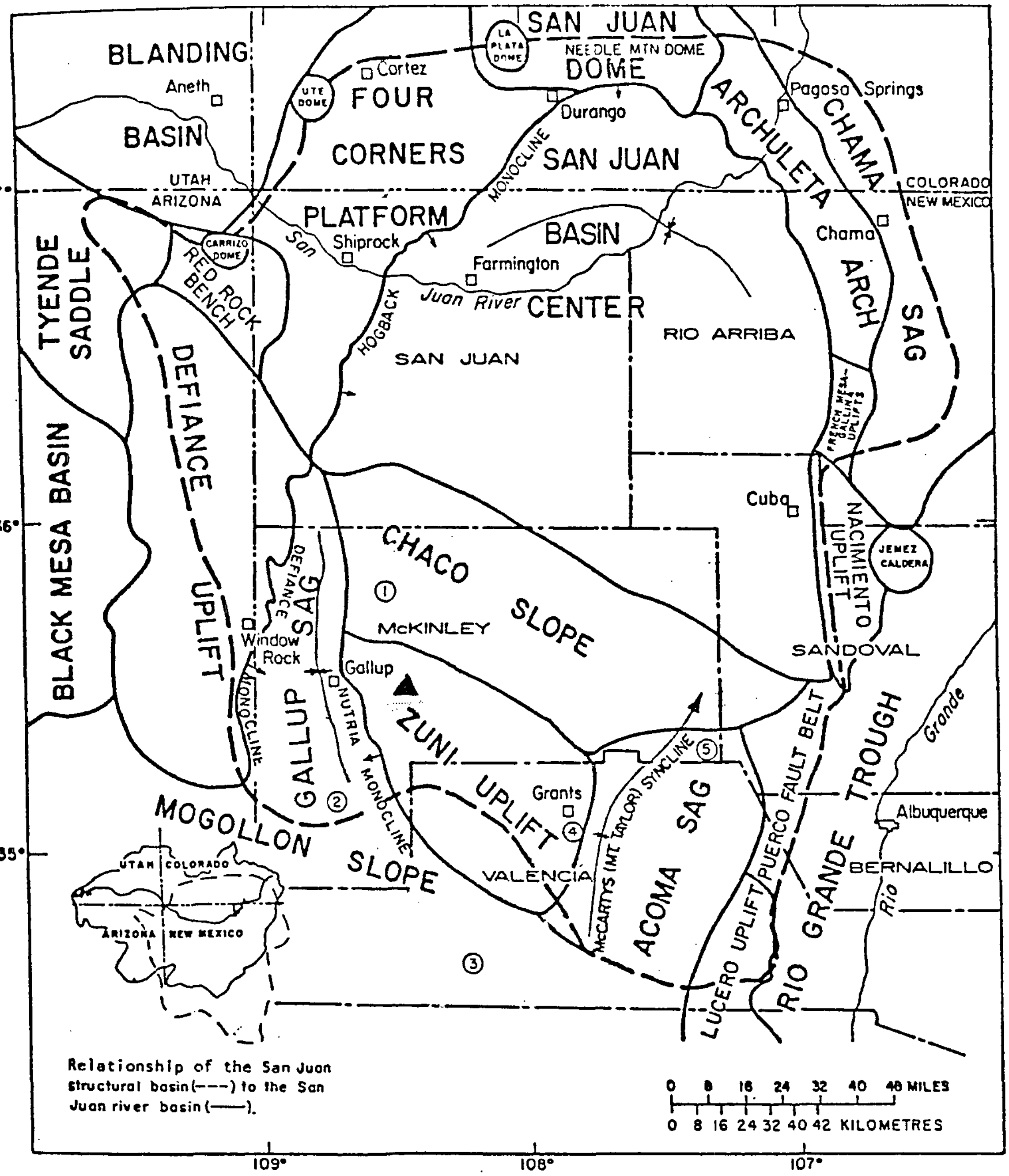
TABLE 1

LAND TREATMENT HAZARDOUS WASTES
GENERATION: CINIZA REFINERY, NEW MEXICO[a]

EPA ID	WASTE NAME	HAZARD CODE	PROCESS SOURCE	ESTIMATED ANNUAL QUANTITY, TONS	ESTIMATED ANNUAL RANGE, TONS
D007	Cooling Water Filter Sludge	T	Cooling Tower	6.3	4.8-7.8
K049	Slop OilEmulsion Solids	T	Tank Farm	0.4	0.3-0.6
K050	Heat Exchange Bundle Cleaning Sludge	T	Process Area	0.2	0.15-0.5
K051	API Separator Sludge	T	API Separator	250	200-350
K052	Leaded Tank Bottoms	T	Tank Farm	0.8	0.5-2.25

[a]Quantities are estimated from waste application log; November 1980 through November 1983 and represent total (oil, solids, water) weights.

Source: Giant Part B Application.



EXPLANATION

Boundary of structural components

Approximate boundary of San Juan structural basin

Axis of syncline

Monocline

▲ Giant Ciniza Refinery

FIGURE 3.
Location of Giant Ciniza Refinery within the San Juan Basin.

Source: Hiss, 1975.

TABLE 2
LOCAL WEATHER DATA

Station Gallup 5E County McKinley Index No. 3420
Latitude 35°F Longitude 108°32' Elevation 6600 ft

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Precip													
Years of record	30	28	29	30	32	28	32	32	35	34	33	33	24
Mean (inches)	.56	.50	.61	.43	.43	.52	1.83	1.65	.99	1.17	.62	.68	9.58/ 9.99
Temp													
Years of record	29	30	27	28	29	28	29	29	33	313	33	33	18
Mean	28.6	33.0	36.6	46.8	55.6	64.8	70.7	68.4	61.8	50.6	37.9	29.4	46.6/ 48.7
PE	.38	.50	.84	2.05	3.82	5.81	7.11	5.92	3.89	2.03	.70	.39	33.44
Surplus	.18	.00										.29	.47
Deficit		.00	.23	1.62	3.39	5.29	5.28	4.27	2.90	.86	.08		23.92

PE = Pan Evaporation

Source: Giant Part B Application.

A number of reports provide information on the regional geology and hydrology, including Stone et al., 1983; Mercer and Cooper, 1970; Hiss, 1975; and Shoemaker, 1971. The report most germane to Ciniza is Shoemaker, 1971, which investigated the area surrounding Fort Wingate Army Depot. Fort Wingate is about 7 miles west of Ciniza. Figure 4 is Shoemaker's north-south geologic section through the Fort Wingate area, and should closely approximate a cross-section through the Ciniza area.

Stone et al. (1983) describe the Chinle formation as being composed of mudstone, sandstone, and limestone. Shoemaker (1971) adds to this list siltstone, claystone, and shale. As indicated on Figure 4, the Chinle Formation is composed of the Shinarump Member, rocks above the Shinarump Member, the Sonsela Sandstone Bed, and rocks above the Sonsela. The rocks above the Shinarump are sometimes grouped together as the Petrified Forest Member.

Both Shoemaker (1971) and Mercer and Cooper (1970) indicate that the Chinle rocks above the Sonsela do not yield water to wells in the area, and that the Sonsela Sandstone yields small quantities of poor-quality water. The major water supply for the area is the San Andres-Glorieta aquifer (a single aquifer spanning the San Andres Limestone and the Glorieta Sandstone). Within the general area there are some livestock watering and irrigation wells which tap the shallow alluvium along the Puerco River. Both yield and quality of this alluvial aquifer are highly variable.

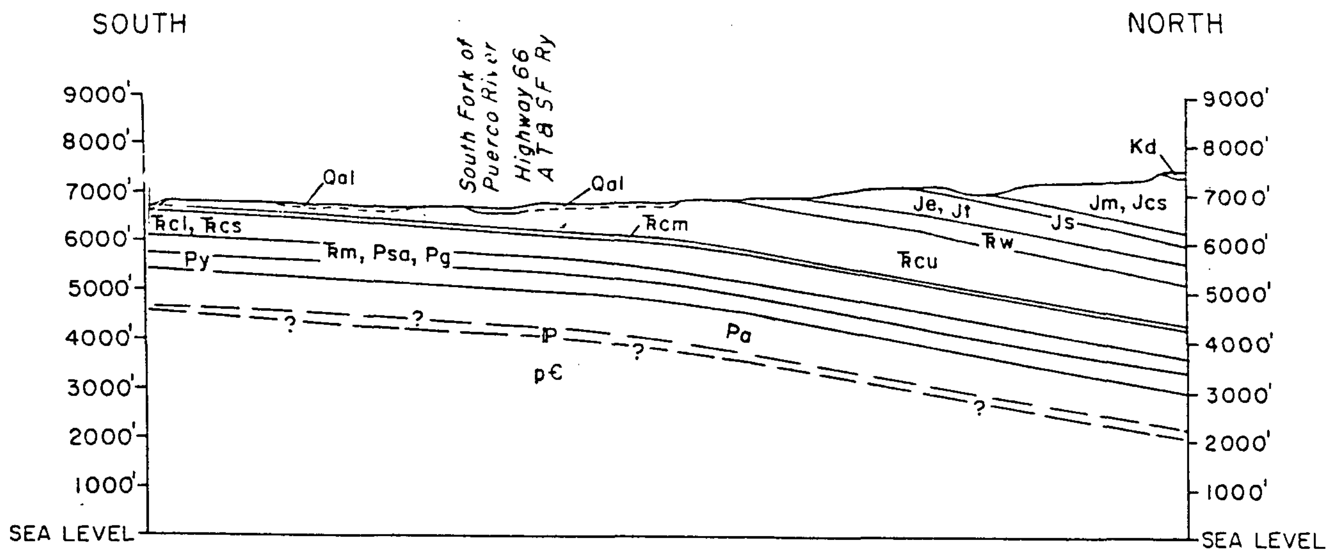
Ciniza Site Geology and Hydrology

In 1980, Shell Oil Company hired Dames and Moore, Inc. to perform an investigation of the geology and hydrology at the Ciniza refinery, in order to have adequate information for compliance with the new RCRA regulations. Dames and Moore drilled 17 observation wells to depths ranging from 45 to 163 feet, and screened the wells over various zones. Water samples from 16 of the wells were analyzed for a variety of parameters, The results of the investigation are given in Dames and Moore, 1981a, which document is available in the files of both EID and EPA.

Logs of the observation wells show that the lithology under the land treatment area generally consists of a layer of clay which grades into shale with interbeds of sand and limestone. At approximately 100 feet, there is a sandstone layer which contains water under artesian pressure. Dames and Moore designated this sandstone layer as the uppermost aquifer. Giant's present consultants, GeoScience, Inc., have identified this sandstone layer as the Sonsela Sandstone. Dames and Moore also acknowledged the presence of an unconfined aquifer within the shale above the sandstone; a number of observation wells are screened in this shale and do produce water sufficient for sampling.

The deeper lithology of the Ciniza area is provided by a log of one of the water supply wells, reproduced in Appendix B.

The 1981 water analyses by Dames and Moore from wells in the land treatment vicinity show total dissolved solids levels within a range of 700-900 mg/l (specific conductivity 1000-1300 umhos/cm), and pH values from 7.8 to 8.7. Manganese and iron were elevated above secondary drinking water standards in a couple of these wells.



EXPLANATION

QUATERNARY

- Qal — Alluvium

CRETACEOUS

- Kc — Crevasse Canyon Formation
- Kg — Gallup Sandstone
- Km — Mancos Shale
- Kd — Dakota Sandstone

JURASSIC

- Jm — Morrison Formation
- Jcs — Cow Springs Sandstone
- Js — Summerville Formation
- Jt — Todilto Limestone
- Je — Entrada Sandstone

TRIASSIC

- TRw — Wingate Sandstone
- TRcu — Chinle Formation, rocks above Sonsela Sandstone Bed
- TRcm — Chinle Formation Sonsela Sandstone Bed
- TRcl — Chinle Formation, rocks between Sonsela Sandstone Bed and Shinarump Member
- TRcs — Chinle Formation, Shinarump Member
- TRm — Moenkopi (?) Formation

PERMIAN

- Psa — San Andres Limestone
- Pg — Glorieta Sandstone
- Py — Yeso Formation
- Pa — Abo Formation

PENNSYLVANIAN (?)

- IP — Pennsylvanian (?) rocks

PRECAMBRIAN (?)

- p€ — Precambrian (?) rocks

— — — Contact between geologic formations, dashed where approximate.

Source: Shoemaker, 1971.

FIGURE 4.
Geologic Cross-Section near the Fort Wingate Area, 7 miles west of Giant Ciniza Refinery.

Ground-water Monitoring System

Having completed the initial investigation, Shell Oil directed Dames and Moore to install monitoring wells for the land treatment area that would compy with RCRA interim status requirements. One upgradient and three downgradient wells were installed in mid-October of 1981. It is worthwhile noting that the Ciniza refinery was the only hazardous waste facility in New Mexico which installed a RCRA monitoring system within the timeframe required under the regulations.

Well logs and well construction are described in Dames and Moore (1981b), attached as Appendix C. The well casings are 5" PVC, and are screened across the sandstone layer which was designated as the uppermost aquifer by Dames and Moore. According to the well construction diagram, appropriate packing and sealing procedures appear to have been employed. Each well is fitted with external protective casing, a surface concrete pad, and a locking cap.

Dames and Moore, 1981b includes a ground-water sampling and analysis plan and a ground-water assessment outline. The sampling and analysis plan is explicit and complete; it address procedures for sample collection, preservation, shipment and chain-of-custody. The assessment outline discusses the general need for more wells if a significant increase is detected, but does not present any specific steps to be taken. A more detailed assessment outline was later submitted by Giant and is included as Appendix D.

The 2/12/85 sampling was the first one conducted by Giant's new consultants, GeoScience. A new sampling and analysis plan has been developed by GeoScience and is included as Appendix E. That plan is explicit and complete, with the exception of the table indicating sample containers and analytical methods. That table was copied from an EID sampling plan for another facility, and reflects EID procedure and State Lab analytical methods specific to that CME. The table needs to be amended to reflect exactly the sample containers used by Giant and the analytical methods used by their laboratory.

CME Sampling

Appendix F contains the sampling and analysis plan prepared by EID for the CME. This plan was adhered to in the field. Giant's samples were collected by their consultant, GeoScience (James Hunter) in accordance with their sampling plan (Appendix E).

Because the monitoring wells have slow recharge rates, Giant had pumped all the wells on the Thursday before our visit (February 7). On Tuesday, February 12, all the wells were again pumped with a submersible pump. Water level measurements were taken on each well prior to pumping by both EID (using steel tape and chalk) and Giant (using an electric probe). EID also sounded the total depth of each well. The well was then pumped for about 15 minutes at about 10 gpm. The three downgradient wells were totally drawn down by this amount of pumping. Conductivity readings of the water were taken by Giant. Water level and conductivity measurements are given in table 3.

On the next day, we returned to actually sample the wells. The slow recharge of the downgradient wells is shown by the fact that none of those wells had recovered to

TABLE 3.
Field Measurements

Parameter	MW-1				MW-2				MW-3				MW-4				OW-11			
	2/12/85		2/13/85		2/12/85		2/13/85		2/12/85		2/13/85		2/12/85		2/13/85		2/12/85		2/13/85	
	Giant	EID	Giant	EID	Giant	EID	Giant	EID	Giant	EID	Giant	EID	Giant	EID	Giant	EID	Giant	EID	Giant	EID
Measuring Point [a]	76.90	→	→	→	78.61	→	→	→	81.30	→	→	→	80.42	→	→	→	123	→	→	→
Depth to Water, ft	5.38	*4.42	6.08	6.01	8.17	8.25	8.58	8.55	37.46	37.31	71.25	71.01	6.08	6.09	6.50	6.48	20.71	20.64	20.67	20.68
Water Elevation [b]	71.52	*72.48	70.82	70.89	70.44	70.36	70.03	70.06	43.84	43.99	10.05	10.29	74.34	74.33	73.92	73.94	102.3	102.4	102.3	102.3
Total Depth [c]	130.4	134	-	-	138	141	-	-	129	134	-	-	120	123	-	-	64	-	-	-
Temperature °C	8	-	5	6.5	-	-	6.5	8	-	-	7	10	-	-	8	7	-	-	8	9
"	-	-	-	6.5	-	-	-	8	-	-	-	9	-	-	-	7	-	-	-	9
"	-	-	-	7.0	-	-	-	9	-	-	-	9	-	-	-	8	-	-	-	9
"	-	-	-	7.0	-	-	-	8	-	-	-	9	-	-	-	8	-	-	-	9
Conductivity, μmhos/cm	1100/1375	-	1100	770	1375	-	1025	880	-	-	975	820	1100	-	1050	820	1600	-	1400	1200
"	-	-	-	800	-	-	-	880	-	-	-	820	-	-	-	840	-	-	-	1200
"	-	-	-	800	-	-	-	820	-	-	-	820	-	-	-	850	-	-	-	1210
"	-	-	-	790	-	-	-	820	-	-	-	810	-	-	-	850	-	-	-	1200
pH	-	-	-	9.0	-	-	-	9.0	-	-	-	8.95	-	-	-	9.05	-	-	-	8.25
"	-	-	-	9.0	-	-	-	9.1	-	-	-	9.0	-	-	-	9.05	-	-	-	8.2
"	-	-	-	9.5	-	-	-	9.1	-	-	-	8.9	-	-	-	8.85	-	-	-	8.35
"	-	-	-	9.1	-	-	-	9.1	-	-	-	8.9	-	-	-	8.9	-	-	-	8.25

TABLE 3. Field Measurements (cont.)

NOTES

* Giant's measurement of 5.38 was checked by EPA. It seems likely that the EID value was misrecorded, and should have been 5.42. his would make the water level elevation 6871.48.

a. Top of casing elevation in feet above MSL. Elevation is the given value plus 6800 feet.Taken from Table 7.0 in Appendix G., except for OW-11, which was taken from Dames and Moore, 1981a.

b. Elevation of the water level in feet above MSL. Elevation is the given value plus 6800 feet.

c. EID values were sounded in the field using steel tape and are the depth from the top of casing to the bottom of the well. Giant values were derived from Table 7.0 in Appendix G.

their original level. In particular, MW-3 was still 34 feet below its level of the previous day.

Samples were obtained by bailing with a 3 1/2" teflon bailer and cotton rope. Giant collected samples as follows:

sample container	preservative	parameters to be analyzed
one 1-liter cubitainer	ice	major ions, pH, conductivity
one 1-liter cubitainer	ice and HNO_3	lead and mercury
one 4-oz amber glass bottle	ice	total organic carbon
one 500-ml glass bottle	ice	phenol
two 40- ml VOA vials	ice	total organic halogens

EID and EPA also collected samples at each well. EPA took duplicate samples at well OW-11.

Giant had a blank which had been spiked by the laboratory with lead and mercury. Some of this spike was transferred to an EID cubitainer for analysis by the State Laboratory. Temperature and conductivity were taken in the field by both Giant and EID, Giant using a La Matte Chemical conductivity meter. EID also took pH measurements in the field. Field results are shown on table 3.

Sample Results

Sample results from the February CME are given in Table 4. They generally show good agreement amongst Giant, EPA and EID, except as discussed below. No primary drinking water standards are exceeded by the data, indicating that the water would not present a health risk if used for drinking. However, the water is above the NM recommendations for conductivity and sodium, and is above the EPA secondary standard for total dissolved solids. Values also exceed EPA and NM secondary standards for iron, manganese and pH. Secondary standards are set for aesthetic and economic reasons (e.g., iron stains laundry and plumbing and imparts a bad taste), not because a health risk is indicated.

The data show no indication of a significant difference in quality between the upgradient well (MW-4) and the downgradient wells, except that the upgradient well is perhaps higher in salts. There was some concern that the upgradient well might be affected by the facility, since it is downgradient of the main facility area. OW-11 was selected for sampling because it appeared to be in a position least likely to be affected by the facility. The results for OW-11 show that it is higher than the monitoring wells in salts. The nitrate level in OW-11 is much higher than the monitoring wells. This may indicate that OW-11 is affected by septic tank discharge.

EID lab results for pH are consistantly several tenths below the Giant and EPA results. The EID field results were nearly the same as Giant and EPA lab values. It appears that the EID lab pH meter was improperly calibrated.

Giant's values for TOC are generally higher than EID's and EPA's. Since Giant's field procedure was similar to that of EPA and EID, these higher values probably reflect analytical bias. Because of the importance of this parameter for indicator purposes, Giant should submit some blanks and spikes to their laboratory to determine whether there is an analytical problem.Giant's values for iron are nearly an order of

TABLE 4.
Sample Results

PARAMETER	STANDARD a/ EPA	STANDARD a/ EID	MW-1 GIANT b/	MW-1 EPA b/	MW-1 EID b/	MW-2 GIANT b/	MW-2 EPA b/	MW-2 EID b/	MW-3 GIANT b/	MW-3 EPA b/	MW-3 EID b/	MW-4 GIANT b/	MW-4 EPA b/	MW-4 EID b/	OW-11 GIANT b/	OW-11 EPA d/ b/	OW-11 EID b/
FIELD TEMP. °C	–	–	5	–	7	6.5	–	8	7	–	9	8	–	7.5	8	–	9
FIELD pH	(6.5-8.5)	(6.5-8.5)	–	–	9.1	–	–	9.1	–	–	8.9	–	–	9.0	–	–	8.3
FIELD CONDUCTIVITY c/	–	–	1100	–	790	1025	–	850	975	–	820	1050	–	840	1400	–	1200
LAB CONDUCTIVITY c/	–	(1000)	1100	1034	1000	1180	1075	1000	1100	1096	1150	1200	1116	1190	1600	1567 / *9318	160
LAB pH	(6.5-8.5)	(6.5-8.5)	8.8	8.89	*8.31	8.8	8.98	*8.24	8.7	8.79	*8.03	8.6	8.78	*8.31	8.2	8.58 / 8.45	*7.93
CALCIUM e/ mg/l	–	(200)	–	–	0.0 / 2.5	–	–	1.8 / 3.0	–	–	11.6 / 6.7	–	–	4.6 / 3.0	–	–	6.4 / 5.1
MAGNESIUM e/ mg/l	–	(125)	–	–	18.1 / 0.63	–	–	<0.1 / 0.71	–	–	<0.1 / 1.4	–	–	<0.1 / 0.58	–	–	<0.1 / 0.52
SODIUM mg/l	–	(200)	234	214	*43.7	195	217	265	140	207	258	277	230	285	359	299 / 306	382
POTASSIUM mg/l	–	(1000)	–	–	8.58	–	–	4.29	–	–	3.90	–	–	1.56	–	–	3.12
BICARBONATE mg/l	–	(700)	–	–	379.3	–	–	408.1	–	–	415.1	–	–	522.5	–	–	595.8
CHLORIDE mg/l	(250)	(250)	47	49	52.2	56	61	59.8	57	61	60.0	16	20	22.8	105 / 102	125 / 122	111.
SULFATE mg/l	(250)	(250)	150	147	157.5	157	154	166.7	120 / 130	146	153.2	120	145	150.2	167	163 / –	173.5
FLUORIDE mg/l	2.4	2.4	–	0.675	0.84	–	0.818	0.86	–	1.67	–	–	0.54	0.40	–	0.512 / 0.675	0.32
NITRATE-N mg/l	10	10	–	<.001	0.01	–	0.164	0.11	–	0.023	0.12	–	0.018	0.28	–	5.59 / 5.65	6.58
AMMONIA-N mg/l	–	–	–	<.001	–	–	0.114	–	–	<0.001	–	–	0.015	–	–	0.014	–
TDS f/ mg/l	(500)	(1000)	–	657	725	–	683	743	–	679	718	–	740	778	–	1006 / 1011	1038

TABLE 4. (cont.)
Sample Results

PARAMETER		STANDARD [a]		MW-1			MW-2			MW-3			MW-4			OW-11		
		EPA	EID	GIANT [b]	EPA [b]	EID [b]	GIANT [b]	EPA [b]	EID [b]	GIANT [b]	EPA [b]	EID [b]	GIANT [b]	EPA [b]	EID [b]	GIANT [b]	EPA [b] [d]	EID [b]
METALS [g]																		
ALUMINUM	μg/l	–	–	–	–	160	–	–	700	–	–	150	–	–	940	–	–	130
ARSENIC	μg/l	50	50	–	<10	<5	–	<10	<5	–	<10	<5	–	<10	<5	–	<10 / <10	<5
Barium	μg/l	1000	1000	–	<20	<100	–	26.5	<100	–	<20	<100	–	21	<100	–	27 / 22	<100
BERYLLIUM	μg/l	–	–	–	<20	<100	–	<20	<100	–	<20	<100	–	<20	<100	–	<20 / <20	<100
BORON	μg/l	–	–	–	–	650	–	–	650	–	–	1200	–	–	310	–	–	290
CADMIUM	μg/l	10	10	–	<20	<100	–	<20	<100	–	<20	<100	–	<20	<100	–	<20 / <20	<100
CHROMIUM	μg/l	50	50	–	<20	<100	–	<20	<100	–	<20	<100	–	<20	<100	–	26 / <20	<100
COPPER	μg/l	(1000)	–	–	<20	<100	–	<20	<100	–	<20	120	–	<20	<100	–	<20 / <20	<100
IRON	μg/l	(300)	(300)	77	345	210	37	709	460	20	816	<100	86	1000	410	78	834 / 466	190
LEAD	μg/l	50	50	9	<30	<100	10	<30	<100	10	*49	<100	6	<30	<100	4	<30 / <30	<100
MANGANESE	μg/l	(50)	(50)	24	33	<50	17 / 16.9	<20	<50	29	94	<50	38	37	50	12	24 / <20	<50
MERCURY	μg/l	2.0	2.0	<2	<0.2	<0.5	<2	<0.2	<0.5	<2	<0.2	<0.5	<2	<0.2	<0.5	<2	<0.2 / <0.2	<0.5
NICKEL	μg/l	–	–	–	<20	<100	–	<20	<100	–	<20	<100	–	<20	<100	–	<20 / <20	<100
SELENIUM	μg/l	10	10	–	<10	<5	–	<10	<5	–	<10	<5	–	<10	<5	–	43.6 / 40	40
SILICON	μg/l	–	–	–	–	1400	–	–	1200	–	–	2200	–	–	1200	–	–	950

TABLE 4. (cont.)
Sample Results

PARAMETER	STANDARD [a] EPA	STANDARD [a] EID	MW-1 GIANT [b]	MW-1 EPA [b]	MW-1 EID [b]	MW-2 GIANT [b]	MW-2 EPA [b]	MW-2 EID [b]	MW-3 GIANT [b]	MW-3 EPA [b]	MW-3 EID [b]	MW-4 GIANT [b]	MW-4 EPA [b]	MW-4 EID [b]	OW-11 GIANT [b]	OW-11 EPA [d] [b]	OW-11 EID [b]
SILVER µg/l	50	50	–	<20	<100	–	<20	<100	–	<20	<100	–	<20	<100	–	<20	<100
STRONTIUM µg/l	–	–	–	–	<100	–	–	<100	–	–	<100	–	–	<100	–	–	<100
ZINC µg/l	(5)	–	–	45	<100	–	24.5	<100	–	97	<100	–	20	<100	–	24	<100
ORGANICS																	
TOC [f] mg/l	–	–	7.4	<1	2.8	5.8	1.0	11.0	8.2	3.0	3.1	10.8	1.0	1.4	9.9	3.1 / 3.6	5.2
TOX [f] mg/l	–	–	<.01	.0092	–	<.01	.0255	–	<.01	<.001	–	<.01	.0078	–	<.01	.0178 / <.001	–
PHENOLS mg/l	(0.001)	–	<1.0	<.0025	–	<1.0	<.0025	–	<1.0	<.0025	–	<1.0	<.0025	–	*1.8	<.0025	–
VOLATILES [h] µg/l	–	–	–	[i]	ND	–	[i]	ND	–	[i]	ND	–	[i]	ND	–	[i]	ND
ACETONE µg/l	–	–	–	7.54	–	–	5.6	–	–	2.5	–	–	5.2	–	–	4.0 / 7.0	–
METHYLENE CL⁻ µg/l	–	–	–	8.38	–	–	4.4	–	–	<2	–	–	<2	–	–	<2 / <2	–
ETHANOL µg/l	–	–	–	34	–	–	5.8	–	–	16.2	–	–	10.0	–	–	24.1 / 15.7	–
TSS [f] mg/l	–	–	–	4	–	–	14	–	–	9	–	–	12	–	–	5 / 6	–
TURBIDITY NTU	1	1	–	5	–	–	17	–	–	14	–	–	29	–	–	7 / –	–

TABLE 4. Sample Results (cont.)

NOTES

* Result believed to be inaccurate due to analytical or reporting error.

a. EPA standards are the Interim Drinking Water Standards promulgated under the Safe Water Drinking Act. Standards in parentheses are secondary standards (based on potential aesthetic and/or economic problems, not health risk). EID standards are from "Regulations Governing Water Supplys", adopted by the New Mexico Environmental Improvement Board. Standards in parentheses are not enforceable, and are taken from "New Mexico Public Water Supplies Chemical Data, 1974", published by the New Mexico Environmental Improvement Agency, which includes recommendations of the World Health Organization and other miscellaneous sources.

b. Giant's samples were collected by their consultant, GeoScience, Inc., and were analyzed by Assaigai Analytical Laboratories in Albuquerque, NM. EPA samples were collected by EPA and analyzed at the EPA laboratory in Houston, Tx. EID samples were collected by EID and analyzed at the New Mexico State Laboratories in Albuquerque, NM.

c. Field conductivity is in units of micromhos/cm at the field temperature. Lab conductivity is in units of micromhos/cm at 25 ^oC.

d. EPA collected two sets of samples of samples from this well and submitted them to the lab as separate samples.

e. These parameters were analyzed both by the water chemistry section (top value) and the metals section (bottom value) of the State Laboratories.

f. TDS = total dissolved solids. TOC = total organic carbon. TOX = total organic halogens. TSS = total suspended solids.

g. In addition to the results shown, EID analyzed for cobalt, molybdenum, tin, vanadium, and yttrium and found no detctable levels of these constituents (<100 ug/l). EPA analyzed for antimony and thallium, and found no detectable concentrations (<10 ug/l and <5 ug/l, respectively).

h. EID analysis was a purgeable screen by GC/MS. ND = not detected. EPA analysis was for volatiles by EPA Methods 624 and 625.

i. No organics detected except methylene chloride and/or acetone and ethanol.

magnitude lower than EPA's. EID's values are within the same order of magnitude, but about half the EPA value. Iron concentrations are not subject to regulation under RCRA/HWMR-2, but further investigation of the source or error would be warranted, since these same sources of error might affect values for other metals which are subject to regulation.

EPA detected part-per-billion levels of acetone, ethanol, and methylene chloride in their samples. It is most likely that those results are due to laboratory contamination, for the following reasons: 1) no volatile organics were detected in the EID samples; 2) acetone, methylene chloride, and ethanol are all common solvents used in analytical laboratories; 3) acetone was detected in EPA's field blank.

Table 5 shows Giant and EID results for the lead and mercury spikes. EID's value for lead is a little high and Giant's value a little low, but both are within 20% of the actual value. The mercury concentration was right at the level of detection for Giant's Lab, and they reported that value. The EID lab found a slightly lower concentration, which declined over time. This probably was due to mercury adsorption onto the walls of the container, and emphasizes the need for immediate analysis of mercury samples.

Discussion of Potential Problems

WATER QUALITY

Sample results for the monitoring wells since 1981 are given in Appendix G. That Appendix also includes EID sample results from an inspection in 1984. The sample data indicates that the water is higher in salts (conductivity) than is generally desirable for drinking or irrigation. But in other respects, the water is generally of good quality.

Initial values for iron and manganese were high, but these have declined over time. It is possible that drilling equipment contaminated the boreholes with iron and manganese.

Occassional values for lead are near or at the primary drinking water standard of 0.05 mg/l, but the results do not indicate any kind of trend. Lead was not detected by EID or EPA in 1984 nor in 1985. In most cases where a relatively high lead value was detected, it was detected on the same order of magnitude in all wells. The relatively high values detected in the past may therefore reflect analytical bias.

Based on the Student t-test, there was a significant increase in conductivity in the monitoring wells compared to the first year. Giant argued that an assessment program was not mandated because the increase was seen in the upgradient as well as the downgradient wells. Giant also questioned the statistical procedure.

EID believes that the increase in conductivity is not indicative of a release of hazardous wastes into the ground water for the following reasons:

1) Conductivity is an indication of ion levels. The hazardous waste constituents which could cause increases in conductivity are metal salts. (Organic

TABLE 5. Results for the Lead/Mercury Spike Sample.

LEAD, mg/l

Analysis Date	Spike	Giant Analysis	EID Analysis
NA	0.042		
2/22/85		0.039	
2/22/85		0.037	
2/18/85			0.049
3/29/85			0.049

MERCURY, mg/l

Analysis Date	Spike	Giant Analysis	EID Analysis
NA	0.002		
2/22/85		0.002	
2/20/85			0.0013
3/12/85			0.0004
3/27/85			0.0003
4/2/85			0.0003

compounds tend to be non-ionic). No increase of metals is indicated by the data.

2) Conductivity is most related to concentrations of the major ions -- sodium, potassium, calcium, magnesium, chloride, sulfate, carbonate and bicarbonate. Values for sodium, chloride and sulfate show no increase over the data period (analyses for the other ions are not required). Also, there is little correlation between the sodium/chloride/sulfate total and conductivity, as shown in figure 5. This suggests that the conductivity values are more dependent on laboratory analytical bias than on the actual concentrations of the various parameters which contribute to conductivity.

3) EID analyses show that bicarbonate is the major anionic species in the water monitored by Giant. The carbon dioxide-carbonate-bicarbonate system is effected by changes in temperature and pressure, by agitation of the sample, and so forth. Because bicarbonate is such a large proportion of the ions, differences in conductivity may be due primarily to sample handling effects on bicarbonate levels.

It appears that conductivity is a poor indicator parameter for Giant. Total dissolved solids would be less susceptible to variations caused by factors other than actual ion concentrations.

Early <u>TOX</u> concentrations were high in Giant's samples, but TOX levels have declined over time. Giant has provided documentation which indicates that the initial high levels of TOX were due to the glue used on the PVC casing of the wells (Appendix H). No halogenated hydrocarbons were detected in 1984 and 1985 EID samples.

A few samples from MW-1 have showed <u>mercury</u> levels of 0.0002 and 0.0003 mg/l. The detection level for mercury is 0.0002, and mercury is notorious for being difficult to analyze. Analyses of waste from Giant do not show significant levels of mercury. Given all this, EID does not consider the mercury levels to be indicative of any contamination problem. We mention the matter only because EPA had raised the issue when reviewing Giant's Part B. [With AA analyses, it is not unusual for signal noise to cause an apparent value near the detection level, especially with such a low detection level as that of mercury.]

WATER LEVELS

Water level data for Giant's monitoring wells are presented in table 3 and Appendix F. There is a large discrepancy in well MW-3, which consistently shows a water level about 15 feet below that of MW-1 and MW-2. The well logs indicate that all three wells are screened across a sandstone layer which is approximately at the same elevation at all three wells. It is hard to imagine what dynamic could cause a 15 foot head difference within that sandstone layer over the distance which separates the wells. It is more likely that MW-3 is in fact screened over a different aquifer. That MW-3 samples a different aquifer is supported by the chemical data, which consistently show fluoride levels much higher in MW-3 than in MW-1, MW-2 and MW-4.

The lower water level in MW-3 suggests that it is completed in the water table aquifer in the Chinle shale (the Sonsela sandstone is under artesian pressure). This

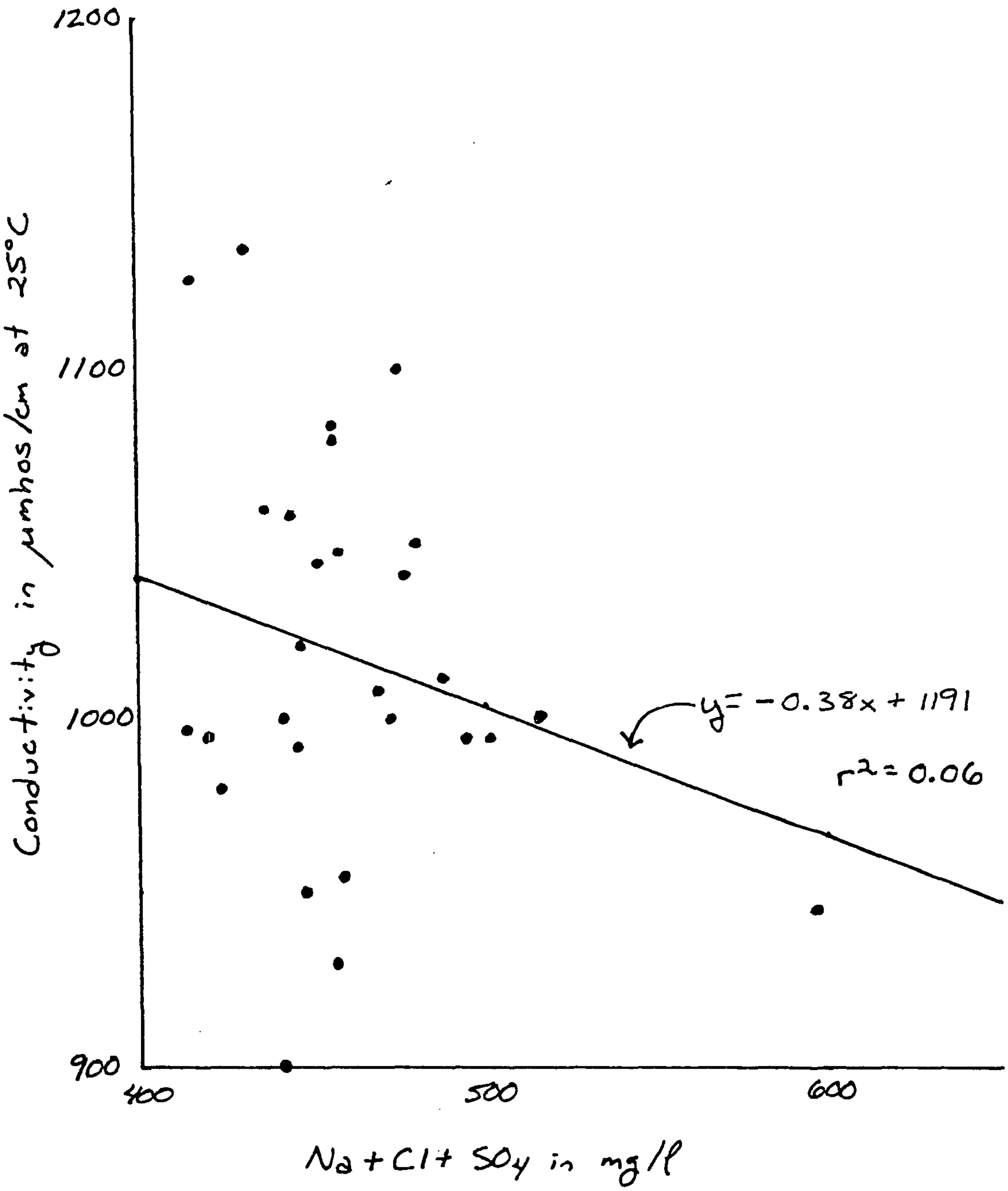


FIGURE 5
Correlation Between Conductivity Values and Sodium + Chloride + Sulfate, Giant Ciniza Refinery Ground-Water Monitoring Wells.

As shown by this "scattergram", there is essentially no correlation. Linear regression gives a correlation coefficient value of only 0.06 (for absolute correlation, r^2 = 1.00). Removing the apparent outlier point (597,945) actually reduces the correlation (r^2 = 0.01).

conclusion is supported by the very slow recharge rate for MW-3, suggesting that it is being recharged from a low-permeability formation like the Chinle shale.

Geophysical methods should be utilized to define exactly where MW-3 is screened, and what the formation is that it is screened over. As discussed below, there is disagreement over what the uppermost aquifer actually is. If it is decided that the Sonsela sandstone is the uppermost aquifer for purposes of monitoring, then another downgradient well should be installed and completed in the Sonsela.

UPPERMOST AQUIFER

Giant's ground-water monitoring system is designed to monitor the Sonsela Sandstone, which was designated by Shell's consultants, Dames & Moore, as the uppermost aquifer. However, the Chinle shale above the Sonsela is saturated, which has lead EPA to argue that Giant is not monitoring the uppermost aquifer. Giant has countered that the saturated Chinle shale does not meet the definition of an aquifer because it does not yield "significant" amounts of water. They argue further that the Chinle shale acts like a clay liner, and point to EPA's statement that it was not intended that saturated clay liners be monitored. Giant's position regarding this question is given in Appendix I.

EID agrees that, in the absence of further EPA guidance on the definition of "aquifer", Giant's position has merit. However, it is the author's belief that the purpose of ground-water monitoring is to detect, as soon as possible, any migration of contaminants from the land disposal unit into ground water. That is why RCRA/HWMR-2 requires monitoring of the "uppermost aquifer" rather than "the uppermost aquifer likely to be used as a water supply".

Clearly, any contaminants which migrate down from the land treatment area will first affect the water in the Chinle shale. Before contamination shows up in the Sonsela, there may be a great amount of contamination in the shale. Therefore, from a technical standpoint, a greater degree of environmental protection is afforded by monitoring the very first zone of saturation, even if that zone is unlikely to be utilized as a water supply. Whether this is also a legal requirement for Giant remains to be resolved.

ENVIRONMENTAL RISK

It is worth pointing out that the risk to the environment and public health from the land treatment unit is at present relatively low. Giant is in a remote area. There are a few homes for refinery employees just south (upgradient) of the refinery. The next nearest development is 2-1/2 miles away, offgradient from the refinery. The land treatment area has been in use only since late 1980. It is separated from the Sonsela Sandstone by 100 feet of clay and shale, material which is not only of low permeability, but is also highly absorptive of most refinery wastes constituents. Several hundred feet of this material lie between the land treatment area and the major water supply aquifer in the area (San Andres-Glorieta).

A separate question is the degree to which non-regulated units, such as the evaporation ponds, may have caused contamination. This question should be addressed under the 3004(u) provisions of the 1984 Amendments.

Post-CME Developments

Since the time of the CME, EID has had a number of discussions with Giant about the status of their monitoring system with regard to the uppermost aquifer question and our concerns about MW-3. Giant finally decided to install "early detection" wells. They drilled a number of cores around the land treatment area and defined a sandstone lense about 40 feet above the Sonsela Sandstone. Based on soil moisture analyses and visual observation, Giant is convinced that this sandstone lense is the uppermost water-bearing zone. Three upgradient and three down-gradient wells were completed in this sandstone. Appendix J is Giant's report on the new wells.

References

Dames and Moore, 1981a. Ground Water and Soils Investigation, Ciniza Refinery, Near Gallup, New Mexico, For Shell Oil Company. Prepared by Dames and Moore, Albuquerque, New Mexico, for Shell Oil Company, Gallup, New Mexico, March 11.

Dames and Moore, 1981b. Ground-Water Monitoring Plan, Ciniza Refinery, Near Gallup, New Mexico, For Shell Oil Company. Prepared by Dames and Moore, Albuquerque, New Mexico, for Shell Oil Company, Gallup, New Mexico, November 24.

Giant Refining Company, 1984. Part B Application for a Hazardous Waste Permit for the Ciniza Refinery Land Treat Area. Prepared by Delta H Engineering, Santa Fe, NM.

Hiss, W.L., 1975. Evaluation and Proposed Study of Potential Ground-water Supplies, Gallup Area, New Mexico. Open-file Report 75-522, US Geological Survey, Albuquerque, New Mexico.

Mercer, Jerry W., and James B. Cooper, 1970. Availability of Ground Water in the Gallup-Tohatchi Area, McKinley County, New Mexico. Open-file Report 70-001, US Geological Society, Albuquerque, New Mexico.

Shoemaker, John W., 1971. Water Resources of Fort Wingate Army Depot and Adjacent Areas, McKinley County, New Mexico. Open-file Report 71-001, US Geological Survey, Water Resources Division, Albuquerque, New Mexico.

Stone, W.J., et al., 1983. Hydrogeology and Water Resources of San Juan Basin, New Mexico. Hydrologic Report 6, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico.