

11-21-1985



*From the desk of Scott Crouch*

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Hope:

I reference this document in the revised CMI work plan, as it has a very good discussion on the site hydrogeology and includes permeability tests.

I was not certain if you would have this in your files, so here is a copy just in case.

*Scott*



 ENTERED



**DISCHARGE PLAN APPLICATION FOR  
GIANT REFINING COMPANY  
CINIZA REFINERY  
GALLUP, NEW MEXICO**

*November 21, 1985*

*Prepared for:*

*Giant Industries, Inc.  
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**REGULATORY INDEX**

**WQCC REGULATION**

**SECTION OF DISCHARGE PLAN**

1-202.B

TO BE SUBMITTED

3-106.A

THIS DOCUMENT

3-106.C

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3-107.A

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## 1.0 EXECUTIVE SUMMARY

Giant Refining Company (Giant) operates an 18,000 BBL/day petroleum refinery at Ciniza, New Mexico, approximately 17 miles east of the city of Gallup in McKinley County, New Mexico in Sections 28 and 33 of Township 15N, Range 15W. This refinery has been in operation under various owners since 1957, and has been owned and operated by Giant since 1982. The refinery discharges approximately 160,000 gallons per day of process and non-process wastewater, with an average total dissolved solids content ranging from 2000 to 3000 mg/l.

Wastewater from process units which contacts feedstocks or products is routed to an twin-cell API separator, from which it flows to a series of evaporation ponds with natural clay liners. Other wastewater which does not contact hydrocarbons (boiler blowdown, water-softener backwash) flows through a neutralization tank prior to discharge directly to the evaporation ponds.

The uppermost aquifer beneath the Refinery is the Sonsela Sandstone Bed, which lies at a depth of 70 to 140 feet and contains ground water with an average total dissolved solids (TDS) content of 950 mg/l. Ground water in the Sonsela is under considerable artesian pressure. An additional zone of ground water exists in a thin, discontinuous lens of sand (Ciniza sand) which is interbedded with the shales of the Chinle Formation, 40 feet above the Sonsela. This ground water is also under artesian conditions and has an average TDS of 2240 mg/l. Neither the Sonsela nor the Ciniza sand ground-water zones are likely to be affected by refinery discharges, because:

- o The shales and clays of the Chinle Formation have permeabilities ( $10^{-8}$  to  $10^{-9}$  ft/sec) which are less than those specified for engineered clay liners under RCRA interim standards ( $10^{-7}$  ft/sec)
- o Boreholes drilled within 20 feet of the perimeters of evaporation ponds, which have been in use for 13 years, show no evidence of pond leakage

- o Artesian pressure prevents downward movement of contaminants by advection

Giant currently maintains a network of 10 ground-water monitoring wells at Ciniza, and regularly samples these wells according to a schedule required by RCRA and NMHWM regulations. Previous sampling has shown no evidence of ground water contamination due to refinery activities, and subsequent sampling and analysis will serve to immediately detect any migration of contaminants into the Ciniza sand or the Sonsela.

In order to further reduce the waste burden of its effluents, Giant is planning to install an aerated, biological-treatment lagoon to treat the discharge from the API separator. This treatment lagoon is anticipated to reduce the biological oxygen demand of the final effluent by 60%, and also to reduce the levels of organic constituents.

## 2.0 LOCATION, PHYSIOGRAPHY AND CLIMATE

### 2.1 LOCATION AND MAILING ADDRESS

The Giant Refining Company's Ciniza Refinery facilities and wastewater-management system are located approximately 17 miles east of the city of Gallup, in McKinley County, New Mexico. The refinery location and local topography are shown in Figure 2-1. The refinery plant is sited in Sections 28 and 33 of T. 15 N., R 15 W. (New Mexico Prime Meridian). Access to the site is provided by Interstate 40 (Ciniza exit) and old Route 66 (Figure 2-1). All correspondence regarding this Discharge Plan should be sent to:

o Mr. Carl D. Shook  
Refinery Manager  
Ciniza Refinery  
Route 3, Box 7  
Gallup, New Mexico 87301

Copies of all correspondence should be forwarded to:

o Mr. Carlos Guerra, Esq. General Counsel Giant Industries, Inc. 7227 N. 16th Street Phoenix, Arizona 85020	o Geoscience Consultants, Ltd 500 Copper Avenue, N.W. Suite 325 Albuquerque, New Mexico 87102
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### 2.2 PHYSIOGRAPHY

The Ciniza site lies on the southeastern margin of the San Juan Basin on the northern flank of the Zuni Mountains. The site slopes gently (approximately 100 feet per mile) to the northeast and the area is drained by the intermittent South Fork of the Puerco River. The Ciniza refinery is located on the southern margin of the topographic valley of the Puerco River, which joins the Little Colorado River near Holbrook, Arizona.

### 2.3 CLIMATE

The region is semiarid, with an average rainfall of about 10 to 12 inches per year. Yearly (lake) evaporation is on the order of 50 to 55 inches per year (United States Soil Conservation Service, 1972). Temperatures range from maximum of over 100<sup>0</sup>F in the summer months to minimum of 0<sup>0</sup>F or less in the winter. The mean annual temperature is 48<sup>0</sup>F. Precipitation is highly seasonal, with most of the volume occurring as rainfall during the months of July



through September. Rainfall is typically in the form of brief, intense thundershowers which are fed by moist air derived from the Gulf of Mexico. Precipitation is initiated by orographic cooling of moist air-masses as they rise on the slopes of the Zuni Mountains to the south, or Mount Taylor to the east.

### 3.0 BRIEF HISTORY OF OPERATION

The Ciniza Refinery was constructed by El Paso Natural Gas Company, at essentially its present capacity of 18,000 BBLS per day, in 1957. El Paso operated the refinery until 1964, when it was sold to Shell Oil Company.

Shell operated the Ciniza Refinery from 1964 through 1982, with no major changes in capacity or process. In 1982, the refinery was purchased by its present owner, Giant Industries, Inc. and operated by Giant Refining Company a division of Giant Industries, Inc.

The refinery currently produces regular, unleaded and unleaded premium gasoline, JP4 and JetA aircraft fuels, diesel, kerosine, naptha and minor amounts of other petroleum products.

The majority of feedstock crude arrives by pipeline from the San Juan Basin oil and gas fields. Products are primarily shipped by tank trucks, which are either common carriers, trucks owned or leased by Giant, or trucks operated by the product customers. Some diesel product is shipped via rail.

## 4.0 DESCRIPTION OF PHYSICAL ENVIRONMENT AT SITE

### 4.1 LOCAL GEOLOGY

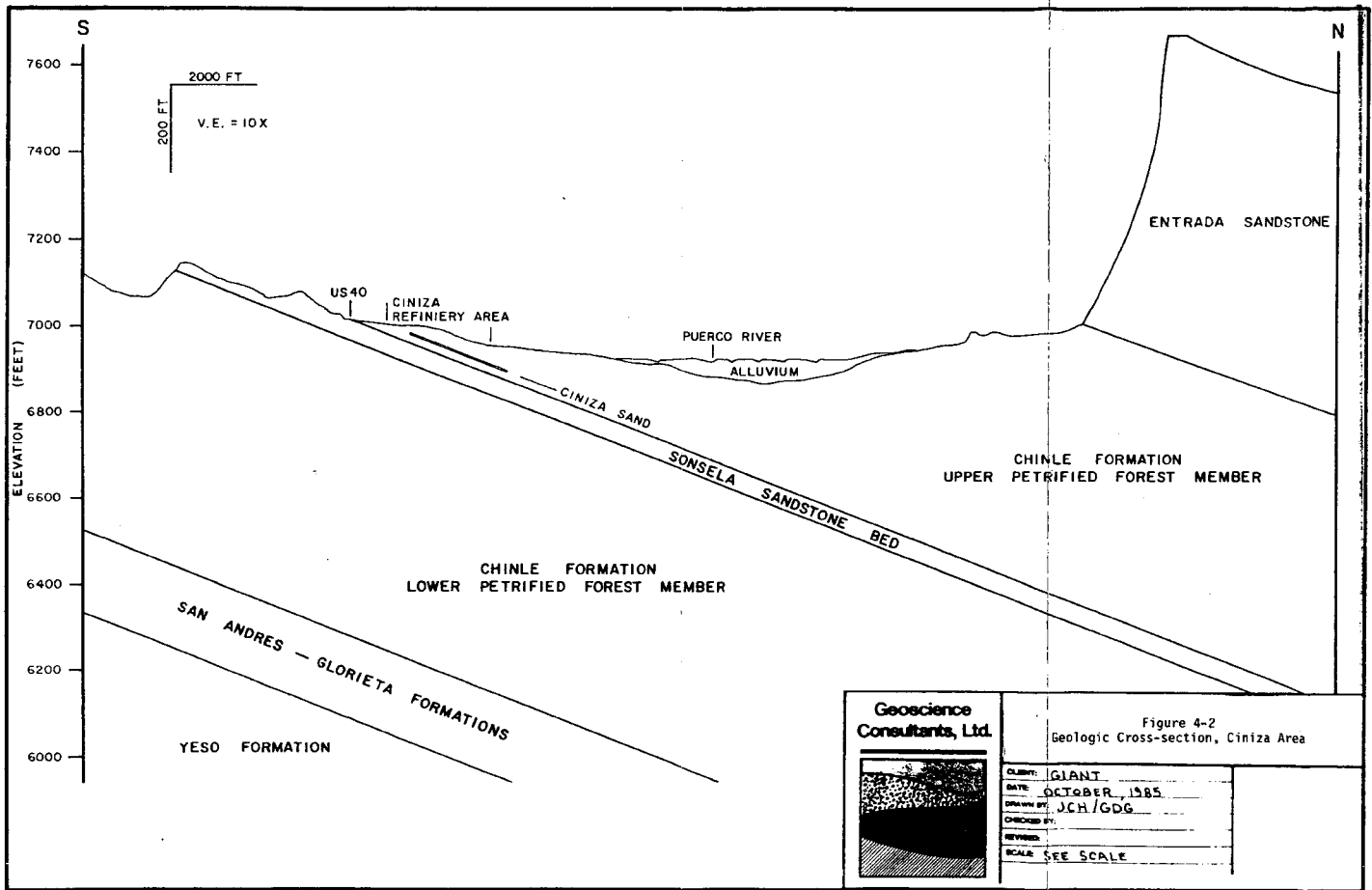
The Ciniza Refinery site lies on the southeastern margin of the San Juan Basin, on the northern flank of Zuni Uplift (Figure 4-1). Bedrock (Chinle Formation) strikes approximately N. 40 E., and structure is expressed as a gentle, homoclinal northwesterly dip of 1.5 to 2.5 degrees. No significant faults are observed or inferred on or near the refinery site. Figure 4-2 is a cross-section showing the structure and stratigraphy of the bedrock deposits beneath the refinery area. Figure 4-3 is a generalized stratigraphic column for the Ciniza area. Logs of boreholes from monitor wells and exploratory holes are included in Appendix A.

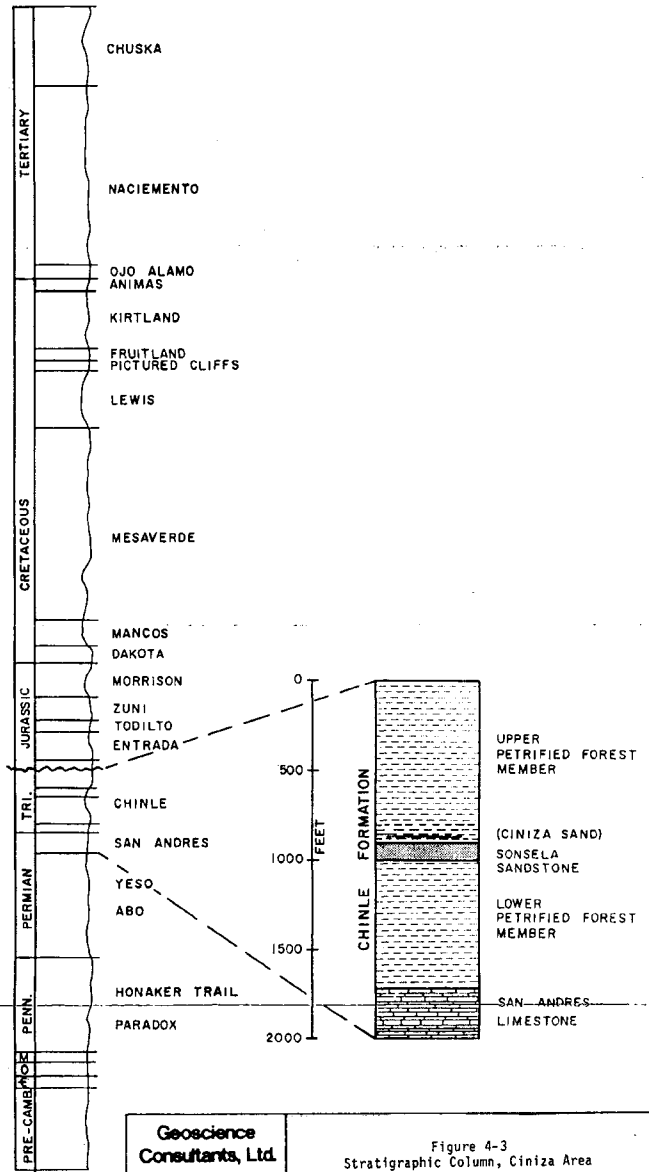
The refinery is underlain by outcrops of the upper part of the Petrified Forest Member of the Chinle Formation. The Petrified Forest is composed of volcanigenic siltstones, claystones and shales with localized and discontinuous sand bodies, deposited in a low-energy fluvial and flood-plain environment. Shales and claystones of the Petrified Forest comprise the overlying confining bed (aquitard) for the artesian Sonsela aquifer and for the confined ground water in the "Ciniza sand". These variegated blue, gray, brown, red and purple mudrocks weather into very fine clays, which swell slightly and become extremely plastic and slippery when water-saturated. Figure 4-4 includes photographs of drill cores from the Refinery site, illustrating the lithologies typically present in this area.

The upper and lower parts of the Petrified Forest Member are separated by the Sonsela Sandstone Bed. This sandstone is typically light yellow to greenish, fine to medium grained, cross-bedded and contains local interbeds of conglomerate and shale (Figure 4-5). Regionally, this unit varies in thickness from 40 to nearly 300 feet, but is about 60 to 100 feet thick in the Ciniza area. The Sonsela is recognized as the uppermost aquifer in this area.









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Figure 4-3  
Stratigraphic Column, Ciniza Area



CLIENT: GIANT  
DATE: OCTOBER, 1985  
DRAWN BY: JCH/GDG  
CHECKED BY:  
REVISED:  
SCALE: NONE

01