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YEAR(S):



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DISCHARGE PLAN
NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO
REFINERY

July 31, 1985

Prepared for:

David Griffin
Navajo Refining Company
P.O. Drawer 159
Artesia, New Mexico 88210

Prepared by:

Geoscience Consultants, Ltd.
500 Copper Ave N.W.
Suite 325
Albuquerque, New Mexico 87102

Geoscience Consultants, Ltd.



July 31, 1985

RECEIVED

AUG 8 1985

Mr. Richard Stamets
Energy and Minerals Department
Oil Conservation Division
P.O. 2088
Sante Fe, New Mexico 87501

OIL CONSERVATION DIVISION

RE: Discharge Plan Application For Navajo Refining Company Artesia New Mexico Facility

Dear Mr. Stamets:

On behalf of Navajo Refining Company, Geoscience Consultants, Ltd. is pleased to submit the Discharge Plan Application for Navajo's Artesia New Mexico facility. A substantial change in the regulation of the surface impoundments under The Resource Conservation and Recovery Act (RCRA) has necessitated a corresponding change in the proposed methods for wastewater management. Section 7.0 of this document addresses the effect of these proposed regulations on the discharge plan.

A second substantial development has also occurred in the past few weeks. Chemical analyses conducted by the New Mexico Environmental Improvement Division has resulted in NMEID classifying Pond Evaporation Lagoon #1 as a hazardous waste surface impoundment. It is not economically realistic for Navajo to maintain Pond #1 as a hazardous waste surface impoundment; therefore, Navajo has elected to close this surface impoundment pursuant to RCRA. To address both these issues, biological treatment of wastewaters generated at the facility will be implemented prior to 1988. Biological treatment will substantially improve the character of the effluent discharged at Navajo.

Section 7.0 outlines the options that Navajo will be pursuing toward biological treatment of wastewaters. We anticipate that technical staff from NMOCD, NMEID and the Navajo will be working closely together within the next few months to determine a schedule for the implementation of wastewater treatment at Navajo's Artesia facility as well as closure plans for Pond #1. We would like to meet with NMOCD and NMEID in September concerning this matter.

Headquarters

500 Copper Avenue N.W.; Suite 325 Albuquerque, New Mexico 87102 (505) 842-0001 Washington Area Office

5513 Twin Knolls Rd., Suite 216 Columbia, Maryland 21045 (301) 596-3760 Please note that Figures 4-7 and 4-9 have been revised and are submitted with this document; other figures submitted with the original submission remain unchanged. If you should have any questions regarding this submission or require more information please contact me.

Very Truly Yours, GEOSCIENCE CONSULTANTS, LTD.

Randall T. Hicks Vice President

RTH/pe/STAME001.LTR

Enclosures

cc: Mr. David Griffin, Navajo Refining Company

Peter Pache, NMEID

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REGULATORY INDEX

WQCC REGULATION REQUIRED IN DISCHARGE PLAN	SECTION IN DISCHARGE PLAN
1–201	1.0
1–202	To be submitted
3-105.F	7.1.1
3-106.C.1	5.3, Appendix D
3-106.C.2	6.0, 7.0, 8.0
3-106.C.3	4.3, 4.4
3-106.C.4	4.5
3-106.C.5	Figure 5.1
3-106.C.6	4.1, 4.2, 4.3
3-106.C.7	9.0
3-106.C.8	Not Applicable
3–107	8.0
3.108.B	1.0
3.108.B.3	5.2

1.0 EXECUTIVE SUMMARY

Navajo Refining Company, P.O. Drawer 159, Artesia, New Mexico, 88210 proposes to implement biological treatment of wastewater at the Artesia Refinery and discharge approximately 405,200 gallons per day of oil refinery wastewater to the Pecos River. The refinery is located in Section 9,T. 17S. R. 26 E. and the 85 acre evaporation ponds are located in Section 12, T.17 S, R. 26 E. Wastewater from the process units flows through an oil/water separator to remove hydrocarbons discharged with the wastewater. The refinery's effluent has a total dissolved solids content of 2000-4000 mg/l. The ground water near the evaporation ponds is at a depth of 8 feet with a background total dissolved solids content of about 15,000 mg/l. In the refinery area the "shallow aquifer" (upper Queen Formation), which is at a depth of 150 to 250 feet below land surface, exhibits nearly 100 feet of artesian head. The total dissolved solids content of the ground water in this aguifer is about 500-1000 mg/l. About 15 feet below land surface a 2 to 5 foot thick water-bearing unit is present in the Refinery area. This unit exhibits some artesian pressure and has a total dissolved solids content of about 1500 mg/l. Biological treatment of wastewater will substantially improve the quality of wastewater at the facility.

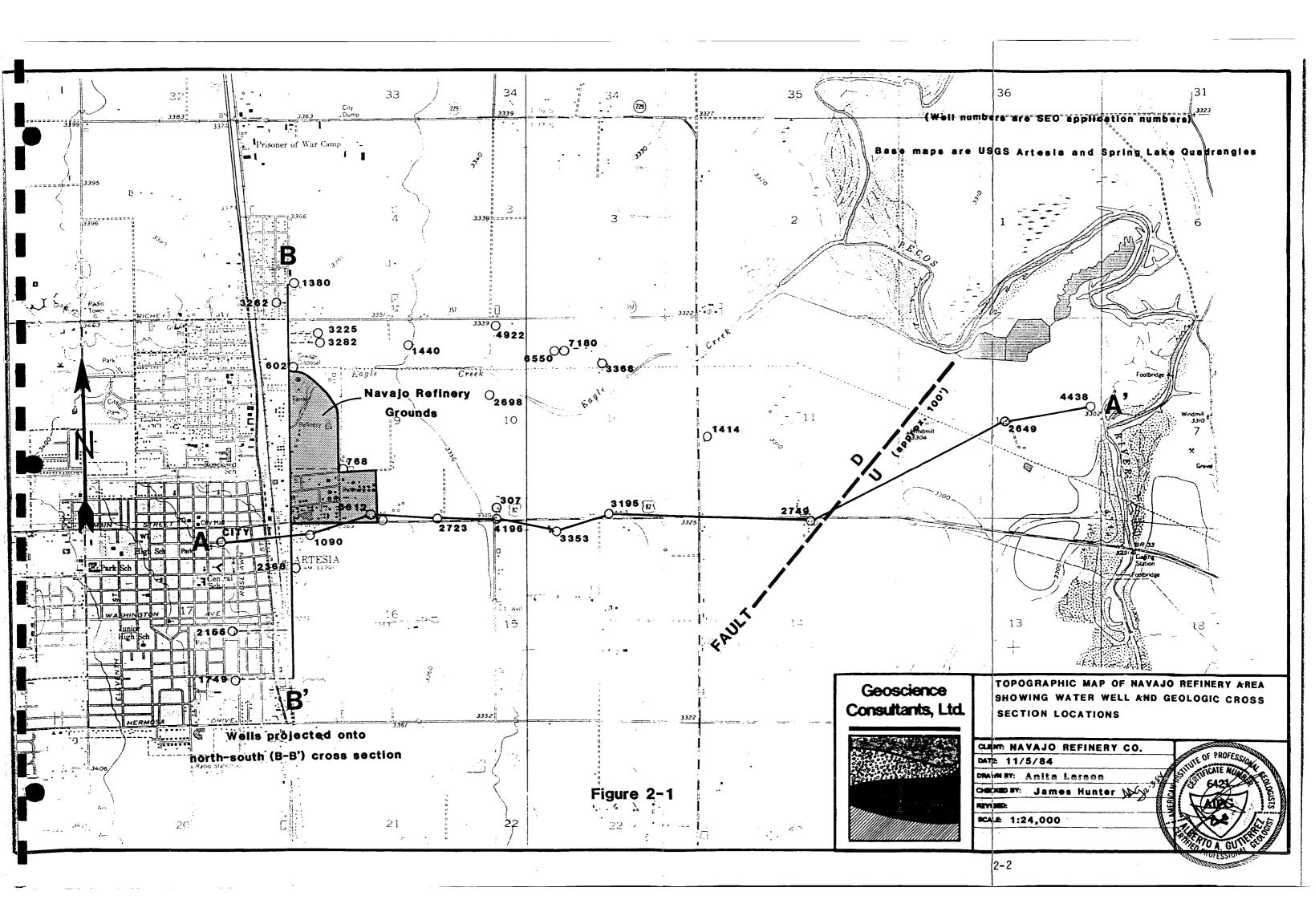
2.0 LOCATION AND PHYSIOGRAPHY

2.1 LOCATION

The Navajo Refining Company's plant facilities and wastewater management system are located in and near the town of Artesia, in Eddy County, New Mexico. The refinery's processing plant and much of the waste management system is located within the city limits, in the west 1/2 of Section 9, T. 17 S., R. 26 E. The associated wastewater evaporation facilities are located in Sections 1, 2, 9, 10, 11, and 12 of T. 16 S., R. 26 E., and in part of the west 1/2 of Section 6, T. 16 S., R. 27.E. (Figure 2-1).

2.2 PHYSIOGRAPHY

Artesia lies in the Eastern Plains of New Mexico; a broad, flat plateau with a local elevation of 3300 to 3400 feet above sea level. Topography in the Artesia area slopes gently (15 to 20 feet per mile) to the east, and is drained by the nearby Pecos River (Figure 2-1). The region is semiarid, with rainfall averaging less that 11 inches per year. Soils are typically of the Arno, Harkley, Pima and Karro associations, developed by deep weathering of bedrock or old alluvium (USSCS, 1971).



3.0 BRIEF HISTORY OF OPERATION

The refinery began operations in the 1920's. The technology, size and ownership of the facility have changed numerous times since commencement of crude processing. Until 1969, the North Division and the South Division were operated by Conoco. Navajo then purchased both units and began to further integrate the operation into a single refinery capable of processing New Mexico sour crude (an asphalt-based crude with a high sulfur content) in the South Division and New Mexico intermediate crude (a paraffinbased crude produced mainly from the Abo Formation) in the smaller North Division.

Since the 1970's Navajo has constructed over 50 monitor wells and product-recovery wells to address the environmental concerns at the facility. The installation of four product-recovery trenches has resulted in a significant reduction in the total amount of hydrocarbons which exist in soil. Hydrocarbon product recovery will continue and, if necessary, be expanded to insure environmental protection.

Ground-water monitor wells are also in place throughout the refinery to assist in delineating soil contamination by hydrocarbons, for RCRA monitoring of landfarms and other RCRA disposal facilities, and to monitor the integrity of the waste conveyance and evaporation facilities. In addition to ground water monitoring, Navajo maintains a strict manifest and record-keeping system. This system helps to insure that all waste is handled and disposed of properly. This system is in compliance with all applicable RCRA regulations.

4.0 DESCRIPTION OF PHYSICAL ENVIRONMENT AT SITE

Four water-bearing units are present beneath the Navajo Refining Company facility:

- o The San Andres Formation
- o The upper Queen Formation
- o Alluvium in the Pecos River Valley
- o Small, discontinuous perched-water aquifers in the Seven Rivers Formation

The San Andres and upper Queen formations are the principal aquifers of the Artesia area (Welder, 1983). The San Andres, locally called the deep or artesian aquifer, has been extensively developed for industrial, municipal and agricultural purposes. This unit is under considerable artesian pressure. The upper Queen in the Artesia area is principally used for individual domestic wells, but some larger capacity wells completed in this unit are employed for irrigation. Unlike the "shallow" aquifer in the Roswell area, water-bearing sand units in the upper Queen exhibit artesian head. Adjacent to the Pecos River a third water-bearing unit is present: the Pecos River Valley alluvium. This unit is not currently utilized in this area for any purpose because of its poor water quality. Within the Seven Rivers Formation isolated permeable sands and fractured evaporites will produce small quantities of poor quality water. These isolated units may show a few feet of artesian head. One such unit is present about 15 feet below the Refinery. The evaporation ponds and portions of the conveyance ditch lie on the flood plain of the Pecos River and Eagle Draw. However, numerous flood control structures upstream from Navajo have eliminated most of the flooding potential of the facility.

4.1 GEOLOGY

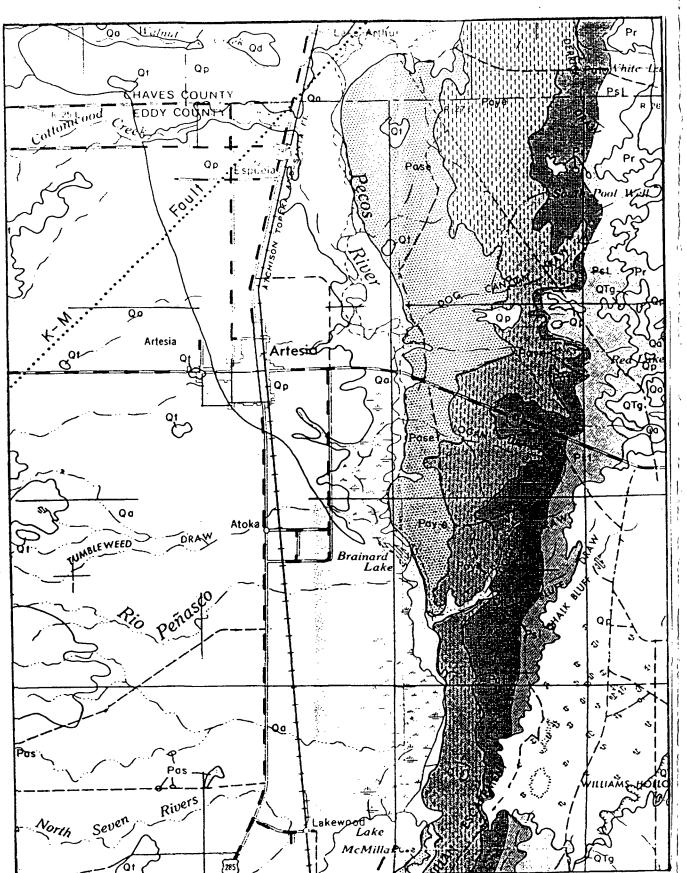
The town of Artesia and the Navajo site are underlain by thin (20 feet or less) layer of soils, alluvium and weathered bedrock, which generally conceals subcrops of the Artesia Group (Permian). As seen in the explanation of Figure 4-1, the Artesia Group consists of carbonates, evaporites and shales deposited in a backreef environment. The Artesia area is located on the northwestern shelf of the Permian Basin and basinward (southeasterly) stratigraphic dips of 1 to 3 degrees are typical.

Structure in the Artesia area is expressed as gentle (1-3 degree) southeasterly dips, with few other features. One fault (inferred from subsurface data) is mapped in the area. This fault trends about N. 40 E. through sections 11, 12 and 14 (Figure 4-1), and is apparently a normal fault with the northwest block downthrown. This structure parallels the other major structural elements of this area, such as the Y-O and K-M "buckles" or fault zones (Kelley, 1971).

In Section 12, the fault appears to pass beneath the Navajo Refining Company's evaporation ponds near the Pecos River. Although the fault may cut across all known and potential aquifers, there are several reasons why the fault is not a potential conduit for ground water contamination. First, faults in evaporites (Queen, Seven Rivers) typically "heal" or self-seal by flowage and recrystallization of gypsum and anhydrite. Second, the net hydrostatic head of the shallow and deep artesian aquifers is upward and would prevent any downward flow.

4.2 GEOMORPHOLOGY AND SOILS

The Artesia region is located on a broad, gently sloping plateau which has developed as a result of <u>in-situ</u> weathering of flat-lying carbonate and evaporitic bedrock. Localized areas of valley fill (Pecos River Valley and major arroyos) form the only other significant substrate for soil formation. Within soil series formed on a particular substrate, soil properties vary as a result of differing grain size, land slope and available moisture. Figure 4-2 shows the distribution and properties of soil types in the Artesia area. The Navajo plant site is located



SEDIMENTARY ROCKS

0a 06 0e 01 0d 011, 01 0p Qc

QTg

Gatuna Formation Red, tan, and buff sand, gravel, and mudsto

TKe 🐍 **Cub Mountain Formation**

Kmv

Olive-drab to black shale, grayish san

Km

(And

Dakota Sandstone

No. Chinle Formation

Te .

Santa Rosa Formation

Pđ

Dewey Lake Formation

Pri

Rustler Formation

Pel

Salado Formation

Pc Pcs

EXPLANATION

Pal. ansill Formation Poy Poye Yates Formation

Pos Pose

Seven Rivers Formation
Pas timestone and dolomite southward

Paq Pagg Pag

Queen and Grayburg Formations
Pag, Queen formation; dolomice and sond tone southwest, gryburm and must tone northwest
Pag. Grayburg formation; sandstone and dolomice
southwest; sypalim, red sandstone, and local dolomice
northwest
Page, Queen and Grayburg Formations undivided in
north and locality

etajo. Goat Seep Formation

Pbc

Bell Canyon Formation Basin-facies timestone

35 67

Yeso Formation

Precambrian rocks, undivided Granite, syanite, and gneiss

IGNEOUS ROCKS

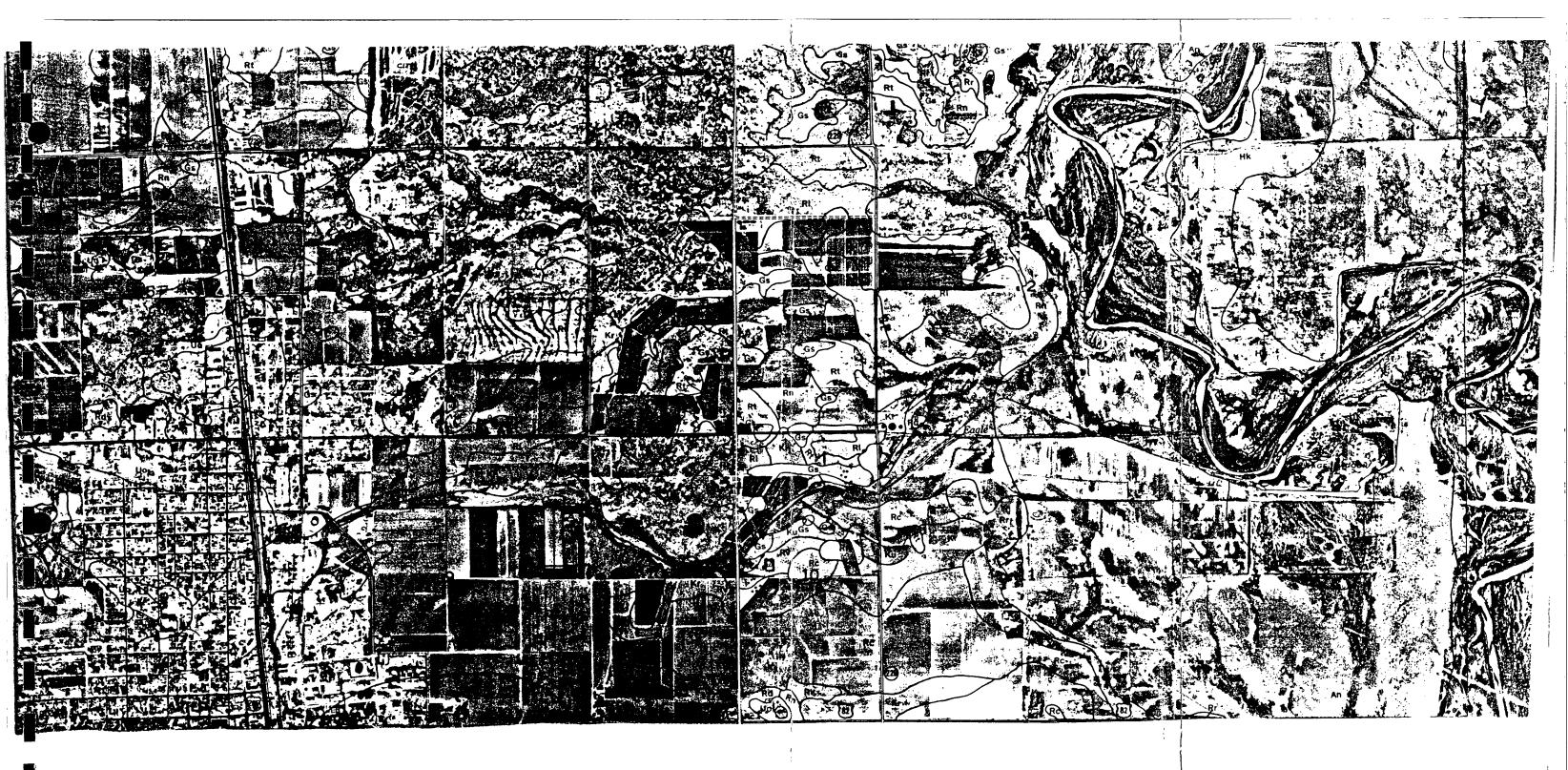
Teb

Sierra Blanca Volcanic Group

Dikes, sills, stocks, and laccoliths

Figure 4-1 Geologic Map of Artesia area

TERTIARY



			Classif	ication		Perc	entage passi	ng sieve-	Permea- bility	Available water	Leaction	Electrical Conductivity (Ec x 103)	Corrosivity (Untreated Steel pipe)	Shrink-swell potential
Soil series and map symbols	Depth to bedrock, hard caliche, or gypsum	Depth from surface	USBA texture	Unified	AASHO	No. 4 (1.7 mm.)	No. 10 (2.0 mm.)	No, 200 (0.074 mm.)		capacity	}	,	steer pipe,	
Arno: AH, Ak, An (For Harkey part of AH and Ak, Harkey series).	More than 60. see	0-14 14-60	Silty clay loam Silty Clay	CH CT	A-6 A-7	100 100	100 100	90-95 90-95	0.05-0.20 0.05-0.20	0.18-0.20 0.15-0.17	7.9-8.4 7.9-8.4	4.0-8.4 8.0-12.0	High High	Moderate High
Harkey: Ha. H#	More than 60.	0-87	Very fine sandy Loam, Loam and silt loam.	ML	A-4	100	100	60-75	0.8-2.5	0.17-0.19	7.4.7.8	2.0-12.0	Moderate to high	Low
Karro: KA, KL, Kr, Ku, KY	More than 60.	0-20 24-60	toam Clay loam	ML-CL CL	A-4 A-6	100 100	100 100	60-75 70-80	0.8-2.5 0.8-2.5	0.16-0.18 0.18-0.20	7.9-8.4 7.9-8.4	4.0-10.0 8.0-15.0	High High	Moderate Moderate
Pina: PM, Pe, Pn, Pv	More than 60.	0-60	Silt loam to silty clay loam	CL	A-6	100	100	85-95	0.2-0.8	0.18-0.20	7.4.7.8	0-4.0	Moderate	Moderate

Figure 4-2 Characteristics and distribution of soils in Artesia area.

in an area of Karro Loams (USSCS, 1971). These soils are developed on deeply weathered calcareous rocks, and are moderately permeable. Much of the refinery site area has been filled, graded and leveled, leaving little natural soil in place.

The effluent ditch (Figure 2-1) parallels Eagle Creek, and is constructed in soils of the Pima Series. These dark, calcareous loams develop on carbonate bedrock and carbonate-rich alluvial material. They are moderately permeable and have a high water-holding capacity.

The evaporation ponds are built on soils of the Arno Series which develop on fine, silty alluvium in the Pecos River Valley. These soils have low permeability and high waterholding capacity.

4.3 REGIONAL GEOHYDROLOGY

The Artesia area is located in the Roswell-Artesia artesian water basin (Welder, 1983). The two principal ground water reservoirs are the artesian San Andres aguifer, and two shallow aguifers (Queen Formation and valley alluvium). Local, perched water-bearing units with small storage capacity also occur in isolated stratigraphic traps. With the exception of some wells located in valley alluvium immediately adjacent to the Pecos River, all wells in the Artesia area exhibit some degree of artesian head. Deep (800-1200 feet) artesian wells are completed in the Grayburg-San Andres formations, and have static water levels 50 to 80 feet below ground level. The deep aquifer is confined by shales and evaporites of the lower Queen Formation. Shallow aguifer wells (150-250 feet) produce from the upper sands of the Queen Formation, and are confined by aquitards of anhydrite, gypsum and shale in the overlying Seven Rivers Formation (Figure 4-3). Water levels in shallow wells range from 40 to 60 feet below ground level.

Regionally, some wells tap the shallow, perched "gyp water" reservoirs in stratigraphic traps in the upper Seven Rivers Formation. These waters are effectively isolated from both major aquifers. Even in very shallow wells (20 feet) these perched zones exhibit 3 to 5 feet of artesian head.

The regional potentiometric surfaces of the deep and shallow aquifers are shown in Figures 4-4 and 4-5. The two potentiometric surfaces have very similar elevations (about 3300' msl), with the deep artesian aquifer's surface slightly above the shallow aquifer's surface.

Both aquifers produce water for irrigation, industrial and domestic purposes. Water quality is variable from 500 to over 5000 ppm total dissolved solids, and in general the more saline waters are found at greater depths and/or to the east.

4.4 GROUND WATER HYDROGEOLOGY

The deep artesian aquifer is the major source of ground water in the Artesia area and supports most of the large local agricultural industry. Artesian water, of quality ranging from 500 to over 5000 ppm TDS, is found in the San Andres and Grayburg formations (Permian) at depths of 850 to 1250 feet below the surface (Kelley, 1971). This aquifer system is recharged along San Andres outcrops in the Sacramento Mountains west of Artesia. In the early 1900's many wells in this aquifer flowed 1000 to 3000 gallons per minute (gpm), but extensive withdrawals have lowered the head to about 50 to 80 feet below the land surface (Figure 4-4). The artesian aquifer is confined by the impermeable (or very slightly permeable) carbonates, shales and evaporites which comprise much of the overlying Queen and Seven Rivers formations (Figure 4-3). Its potentiometric surface is typically slightly above the shallow aquifer's upper surface (Welder, 1983).

The shallow aquifer, which has been described as a "water table" aquifer, is in fact a second artesian aquifer. With the exception of wells drilled immediately adjacent to the Pecos River nearly all shallow aquifer wells exhibit 100 to 150 feet of artesian head. Shallow wells typically produce from sands in the upper Queen Formation at depths of 150 to 250 feet. These sands are confined by the thick anhydrites and shales (aquitards) of the overlying Seven Rivers Formation. Relatively impermeable shales and evaporites several hundred feet thick separate the upper Queen sands from the underlying San Andres.

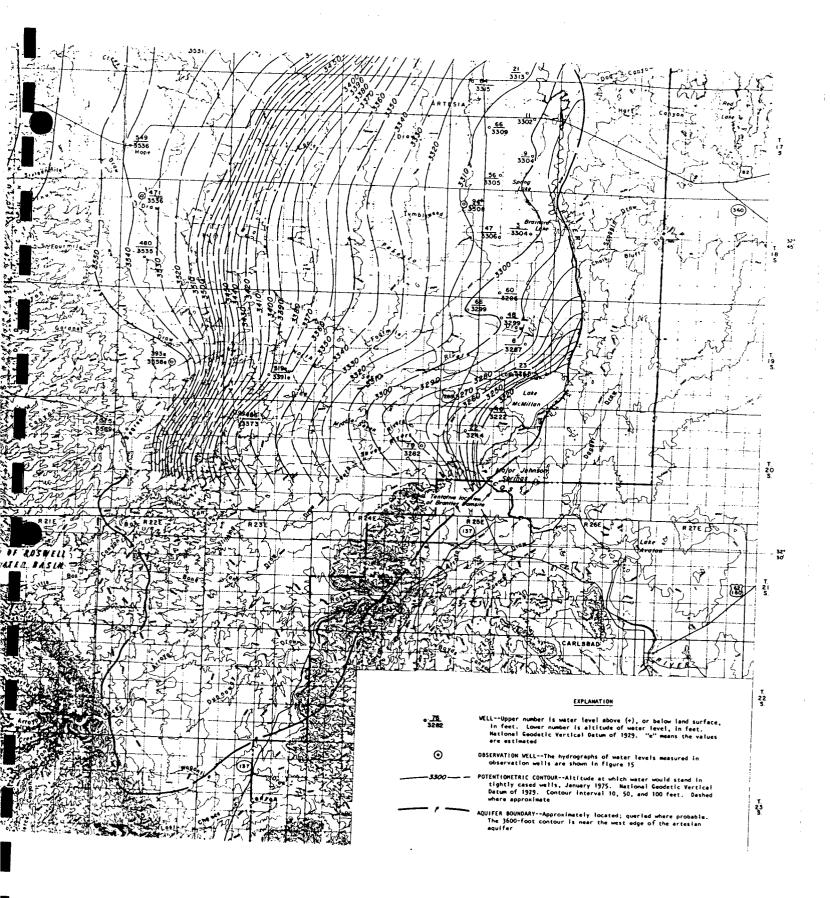


Figure 4-4 Potentiometric surface of deep aquifer (Welder, 1983)

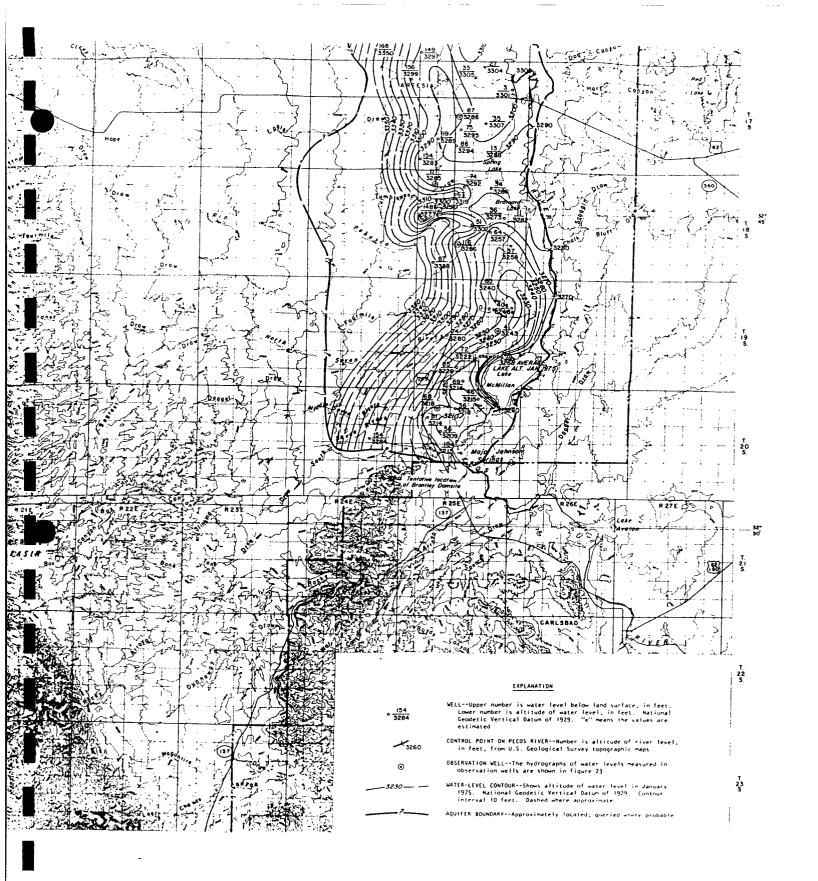


Figure 4-5 Potentiometric surface of shallow aquifer (Welder, 1983)

Analysis of driller's and geophysical logs (Appendix A) shows that the Navajo site is underlain by evaporites, carbonates and shales of the Seven Rivers Formation. These rocks are nearly impermeable, with the exception of local, isolated bodies of sand and fractured anhydrite. Only minor amounts of ground water is found in or produced from the Seven Rivers Formation. Cross sections illustrating the hydrogeologic relationships of the shallow aquifer are shown in Figure 4-3.

At depths of approximately 200 to 250 feet, the uppermost sands of the Queen Formation are encountered. These sands contain and produce usable amounts of ground water, and constitute most of the shallow aquifer in this area. These sands are 10 to 50 feet thick, and lie at the top of about 700 feet of relatively impermeable carbonates and evaporites which comprise the bulk of the Queen.

A map of the shallow-aquifer potentiometric surface (Figure 4-5) shows that it typically slopes gently to the east and southeast, and follows the regional stratigraphic dips. South of the Artesia area, where extensive agricultural development exists, the potentiometric surface forms a trough due to significant withdrawals from the shallow aquifer. The shallow-aquifer's potentiometric surface is generally slightly below the artesian aquifer's potentiometric surface, indicating that any interconnection (along faults or poorly completed wells) would cause flow upward from the deep to the shallow aquifer. The configuration of the shallow aquifer is locally complicated by large, seasonal irrigation withdrawals. Although considerable local variation is observed, the shallow aquifer generally provides water of quality adequate for domestic and irrigation use (500-1500 ppm TDS).

In some areas there is evidence for the existence of an isolated, discontinuous perched-water aquifer, which lies on top of clay or anhydrite lenses above the confined shallow aquifer. Very shallow (10-30 feet), low-production wells may have tapped this "gyp water" in the past and used the production for stock. Many of these wells have been abandoned for a variety of reasons including exhaustion of water or poor quality. These small, stratigraphically-trapped accumulations of ground

water are highly variable in areal extent, volume, saturated thickness and quality. One such confined body of water underlies part of the Navajo facilities.

The configuration of the perched-water unit under the Navajo site is revealed by over 40 monitor wells, installed by Navajo Refining Company. Lithologic drillers logs show that water is encountered in weathered and fractured anhydrite (so called gypsum sand) at depths of 15 to 30 feet, and typically rises to levels 3 to 5 feet above the saturated unit (Appendix A). This water-bearing unit is confined above by layers of gypsum, anhydrite and caliche, and below by a continuous layers of clay and anhydrite. Figures 4-6 and 4-7 illustrate the geometry and hydrology of the plant site area.

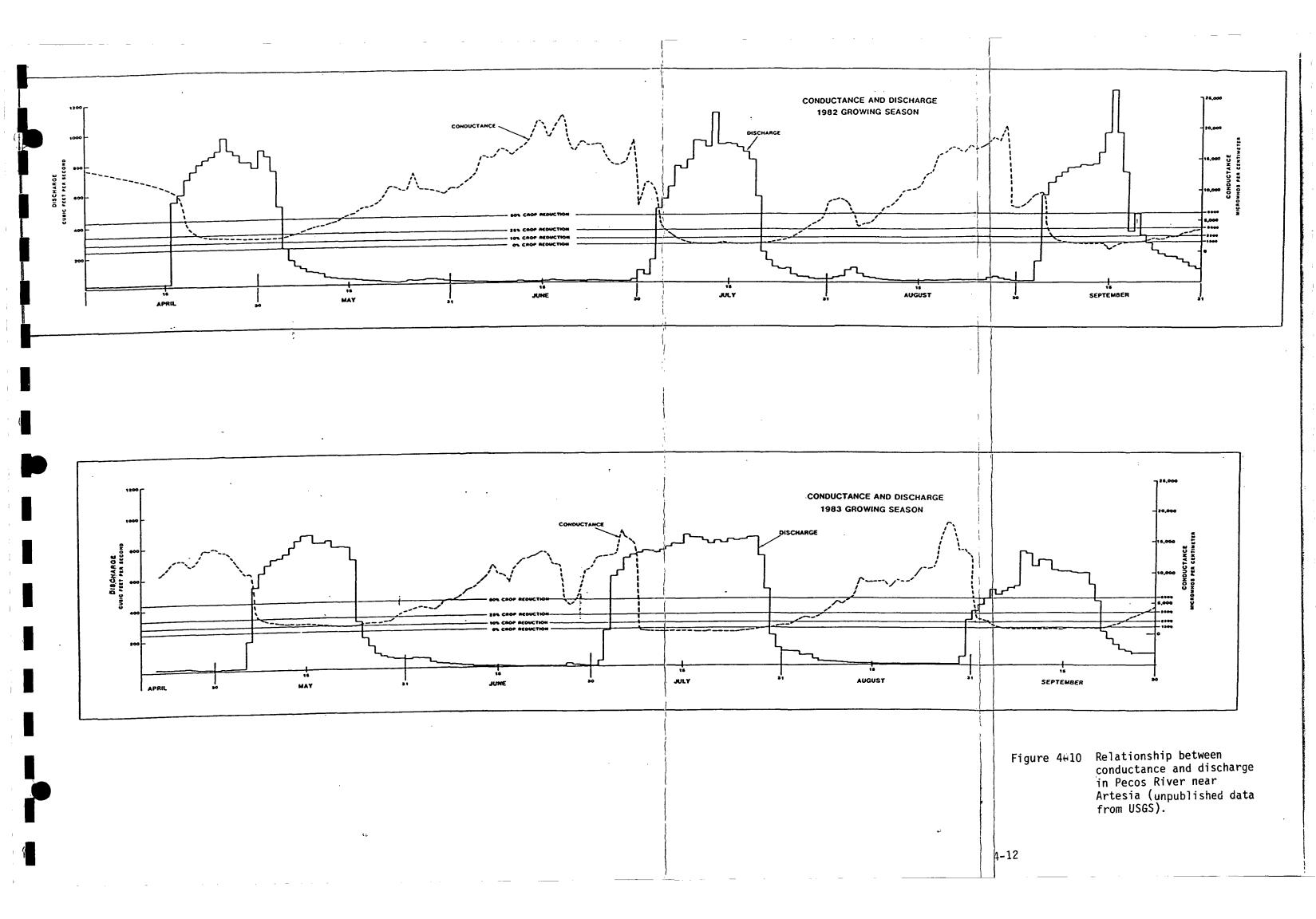
These Figures show that this perched gypsum/anhydrite/sand unit is comprised of several water-bearing zones at different depths. The water-bearing zones are generally less than 5 feet thick and are typically hydraulically connected. However, wells #19 and #34, and #29, #37, #39 and #40 show that anomalies in the potentiometric surface are present due to complex hydraulic connections in some areas of the plant.

Navajo Refining Company maintains 3 evaporation ponds near the Pecos River, which are connected to the plant site by a conveyance channel paralleling Eagle Creek (Figure 2-1). These ponds, and the portions of the conveyance channel in Sections 12, 11 and the E 1/2 of 10 are located in Pecos valley alluvium. Monitor wells installed by Navajo show that ground water in the valley alluvium is typically 6 to 12 feet below the surface. Although the alluvium is generally silty sand, some 6 inch monitor wells can maintain a pumping rate of 10-15 gpm indicating the presence of lenses of higher permeability material. Figures 4-8 and 4-9 show the configuration of the water surface in this unit. As expected, flow is sub-parallel to the Pecos River Valley, generally flowing toward the River. The water level in this unit should respond to the fluctuations of flow in the River (Figure 4-10). Therefore, during periods of high flow the hydraulic gradient is from the river to the

4-11

2000

FEET



alluvium and the Pecos River loses water. During low flow periods the gradient is reversed.

4.5 SURFACE WATER HYDROGEOLOGY AND FLOODING POTENTIAL

Artesia lies in the eastern plains of New Mexico on a broad, mature plateau developed on flat-lying bedrock. The city is at an average elevation of 3380 feet (msl) on an essentially featureless plain which slopes eastward at about 3 feet per mile (0.35 degrees). Surface drainage is typically controlled by small, ephemeral creeks and arroyos which flow eastward into the Pecos River. These small drainages are subparallel and spaced at about 0.75 to 1.5 miles.

The major drainage in the immediate Artesia area is Eagle Creek which runs from west to east through the city, northeast through the Navajo Refinery and then eastward to the Pecos (Figure 2-1). Eagle Creek's channel has been rectified (artificially formed and straightened) from west of Artesia to the Pecos. Discussions with the City of Artesia Engineer (Mr. John Brown) indicate that there is no historical record of Eagle Creek overflowing its banks. However, such an overflow could occur in a 100 year event (5.0 inches of precipitation). To deal with this problem, the city is continuing its efforts at rectifying Eagle Creek and plans to construct a check dam several miles west of Artesia within 2 years. These measures will effectively remove Artesia and the Refinery from the 100-year floodplain.

The evaporation ponds and parts of the conveyance ditch lie in the geologic floodplain of the Pecos River. In the past, large releases from upstream reservoirs coupled with high rainfall events have resulted in minor damage to the conveyance ditch. The ponds are located on alluvial material next to the Pecos. Pond perimeters are 16 to 18 feet above the river channel, and the largest pond is protected by a 5-foot high dike. Analysis of historic records of Pecos floods (Patterson, 1965; USGS unpublished data 1946-1983) shows that a maximum stage height of 17.4 feet was reached on September 30, 1932. Is is unlikely that this level will ever be equalled, owing to the construction of several flood-control dams (Alamogordo, Los Esteros) on the upper Pecos. No discharge event since

1941 has exceeded the 13.76 foot stage (25,200 cfs on October 8, 1954) and no discharge since 1960 has exceeded 7000 cfs. Modern "floods" in the Pecos are now controlled releases of water for irrigation, and these discharges are deliberately controlled to prevent any actual or potential flooding of lands and structures adjacent to the Pecos. Any release or rainfall event large enough to flood the evaporation ponds would effectively dilute the effluent to a level far below stream or ground water standards.

4.6 GROUND WATER QUALITY

Four separate hydrogeologic units are present at the Navajo facility:

- o the artesian aquifer (San Andres)
- o the shallow aquifer (upper Queen)
- o the Pecos River Valley alluvium, and
- o the perched water in the terrace regolith and surficial deposits.

The well-defined pressure regime in the confined aquifers (San Andres and the upper Queen) demonstrates that these units cannot be degraded by surficial sources (Section 4.4). Therefore, water quality data for these units was not collected for this study. Published data on the water quality of these units are available (NMEID, 1980).

The water chemistry of the two surficial water-bearing units which have the potential of being affected by Navajo's operation is summarized in Appendix B. The water quality in the Pecos River Valley alluvial sand/silt aquifer is well defined near the evaporation ponds and is consistent with surface water quality data from the Pecos River (Figure 4-10). Comparison of ground water quality with water quality in the evaporation ponds reveals that, in terms of the major cations/anions and metals, the water quality in the lagoons is better than or equal to ground water quality (Appendix B). Both are unsuitable for use as irrigation, domestic or industrial purposes. Even though some monitor wells have an odor characteristic of hydrocarbons, in all wells sampled except for well #13 neither phenols, toluene nor benzene are present in concentrations above ground water standards.

Four monitoring well points were installed near the evaporation lagoons to further define the background water quality of the aquifer and to

determine if any contamination was present downgradient from the impoundments. The results of the analyses are shown in Appendix B. These results are consistent with previous data which demonstrate that the water quality in the area of the evaporation lagoons is very poor and in some areas exceeds 10,000 mg/l TDS.

Directly downgradient from the impoundments several monitor wells exhibit water quality significantly better than 10,000 mg/l TDS. This change may be due to leakage of better quality pond fluid into the aquifer. No listed organic contaminants were detected in samples from the well points. However, alphatic hydrocarbons were detected by NMOCD in upgradient well and by Geoscience in well point #2. The source of these organic compounds is not known but is presumably a background condition.

These water quality data demonstrate that no degradation of ground water has occurred in the area of the evaporation ponds.

Water quality in the perched terrace/regolith water-bearing unit is also well defined (Appendix B). The water quality in this unit is better than the Pecos Valley alluvium. It should be noted that the ground water in this perched water-bearing zone under the refinery is under some artesian pressure. Direct contamination of this ground water is therefore unlikely. The lithologic logs of the monitor wells (Appendix A) indicate that the soil in the aquitards above the unit is locally contaminated from surficial spills. Therefore, the ground water in some wells may in fact be unaffected by spills and other discharges from the wastewater management system. High hydrocarbon or TDS content in samples from these wells could be a result of artesian water in the well bore coming into contact with contaminated soil. Many wells have been installed to identify zones of hydrocarbon contamination and four oil recovery systems have been installed to recover product and therefore, mitigate the hydrocarbon contamination (Figure 4-7).

This shallow, perched-water unit appears to be of limited areal extent, and does not seem to be utilized by any supply wells. It is not connected with any of the other aquifers, and it is very unlikely that any possible hydrocarbon contamination would affect any other ground water.

5.0 PROCESS DESCRIPTION AND WASTEWATER CHARACTERISTICS

5.1 OVERVIEW

A petroleum refinery is a complex combination of interdependent operations engaged in separating crude molecular constituents, molecular cracking, molecular rebuilding, and solvent finishing to produce petroleum derived products. There are a number of distinct processes utilized by the industry for the refining crude petroleum and its fractionation products. An EPA survey of the petroleum refining industry, conducted during 1977, indentified over 150 separate processes being used and indentified many more process combinations that may be employed at any individual refinery.

Each process is itself a series of unit operations which cause chemical and/or physical changes in the feedstock or product. In the commercial synthesis of a single product from a single feedstock there are sections of the process associated with the preparation of the feedstock, the chemical reaction, the separation of reaction products, and the final purification of the desired product.

At the Navajo Refining Company Artesia, New Mexico facility the major refining processes are:

- 1) Crude Oil Fractionation (with vacuum fractionation)
- 2) Fluidized Catalytic cracking
- 3) Alkylation
- 4) Reforming
- 5) Desulferization

Associated with these processes are several auxiliary activities which do not directly result in conversion of crude oil to product nor result in complex chemical changes in the product but instead separate impurities from the feedstocks and products, or are required for other aspects of

the operation and maintenance of refinery. These auxiliary units are:

- 1. Boilers
- 2. Cooling towers
- 3. Storage tanks
- 4. Water purification facilities
- 5. Desalting units
- 6. Drying and sweetening units

Figure 5-1 shows the location of these process and auxiliary units at the refinery. The North Division of the refinery processes New Mexico intermediate crude whereas the South Division processes sour crude. The Artesia facility can refine a total of about 36,000 barrels of crude per day with the South Division producing about five-sixths of the total. Figure 5-2 is a process diagram which shows the interrelationship between the two divisions and the location of discharge points.

Each process or auxiliary unit operation has different water usages associated with it and the nature and quantity of waste water produced by the units varies according to the process involved. The final aqueous effluent of the Artesia Refinery is a blend of 19 process and auxiliary waste streams (Table 5-1) as well as some additional wastewater produced during general cleanup at the facility. The relative flow volumes from the different units are:

Cooling Towers	60%
Boiler Blowdown	20%
Desalter	8%
Process Units and Water Softener	12%

Based upon four Wier measurements taken over the course of several days, the total effluent discharge is approximately 0.627 cfs or about 405,200 gallons per day.

A brief description of each process and its wastewater characteristics is given below.

TABLE 5-1 PROCESS UNITS AND WASTEWATER TREATMENT/DISPOSAL UNITS

LOCATION	PROCESS UNIT	SOURCE NUMBER	DISPOSAL/ TREATMENT SYSTEM
South Division	Cooling Tower		outh division Separator
South Division	Boilers	syst stor over	ire control em water age ponds flow directly conveyance h
South Division	Crude Unit Desalter (D-130)		outh division separator
South Division	Crude Unit Overhead Accumulator (D-140)		outh division separator
South Division	Crude Unit Stabilizer (D-202)		outh division separator
South Division	Alkylation Unit Regenerator	zati Sout	lky neutrali- on then to h division API rator
South Division TCC Unit	Cooling Tower and Vacuum Unit		outh division separator
South Division	Crude Unit Straig Run Gasoline stabilizer (W-5	API	outh Division separator
North Division	Crude Unit Desalters (D-1, D-2	oil/	orth division water rator

North Division	Cooling Tower	10	To North division oil/water separator
North Division	Crude Unit Overhead Accumulator (D-5)	11	To North division oil/water separator
North Division	Low Pressure Boiler	12	To North division oil/water separator
North Division	Crude Unit Overhead Accumulator (D-4)	13	To North division oil/water separator
North Division	Desulfurizers (D-15)	14	To North division oil/water separator
North Division	Fluidized Cat. Cracker Unit Cooling Tower	15	To North division oil/water separator
North Division	Sour Water Stripper Bottom	16	To desalters, excess to North division oil/water separator
North Division	High pressure Boilers	18	To North division oil/water separator
North Division	FCC overhead acc- umulator Unit (DA- 301)	17	To North division oil/water separator

5.2 MAIN PROCESS UNIT DESCRIPTIONS AND WASTEWATER CHARACTERISTICS

5.2.1. Crude Oil Fractionation

Fractionation serves as the basic refining process for the separation of crude petroleum into intermediate fractions of specific boiling-point ranges. Fractionation is a thermal distillation process which, at the south crude unit, yields gas, straight run gasoline, naptha, kerosene, diesel, atmospheric gas oil and reduced crude (Figure 5-2). Reduced crude is transferred to the associated vacuum unit where it is further fractionated into asphalt and vacuum gas oil.

In the North Crude Unit, where New Mexico intermediate crude is refined, the product streams consist of gas, straight run gasoline, naptha, kerosene, diesel and topped crude. Wastewater produced from the crude units contains ammonia, sulfides, chlorides, oil, and phenols. process description flow sheet (Figure 5-2) shows the location of all wastewater discharges for this and other units. Table 5-1 summarizes the type of effluent produced at each unit and shows the treatment units to which the streams are discharged. Six wastestreams originate in the crude units: the bleedstream from the overhead accumulators #4, #5, #8, #11 and #13 and the effluent from the vacuum distillation unit (co-mingled with blowdown from the TCC cooling tower, #7). Like all wastestreams that have contacted crude or product (contact wastewater) and contain oil, these streams are treated in the oil/water separators prior to release into the conveyance ditch and the evaporation ponds. A chemical characterization of wastestreams #4, #5, #8, #11 and #13 is shown in Table 5-2.

5.2.2. Catalytic cracking

Fluidized catalytic cracking process is employed at Navajo. Catalytic cracking involves at least four types of reactions:

- 1) Thermal decomposition
- 2) Primary catalytic reactions at the catalyst surface
- 3) Secondary catalytic reactions between the primary products
- A) Removal of products which may be polymerized from further reactions by adsorption onto the surface of a fluidized bed of catalyst as coke.

TABLE 5-2
CHEMICAL ANALYSES OF SELECTED WASTE
STREAMS AT NAVAJO REFINERY (AFTER BRANVOLD, 1984)
(VALUES IN MG/L EXCEPT WHERE NOTED)

WOCC 3-103 Standards	CRUDE UNIT PROCESS (#4, #11, #13)	CAT. CRACKER PROCESS BEFORE SOUR MATER STRIPPER	SOUR WATER STRIPPER EFFLUENT (#17)	ALKY. NEUTRALIZING SEMER (#6)	ND & SD DESALTERS (#3, #9)
As					
Ra					
Cd					
	<0.1	45 A			
Cr CN	<0.1	(0.1	<0.1	7.8	
	10.1	<0.1	1.0>	<0.1	<1.0
F	1.3	0.5			
fb			0.4	10.8	
Hg					
NO2					
Se					
Ag					
U					
C1					
Cu Fe					
re Mn	<0.1	3.9	17.0	7.8	
SO*					
TDS	0.45				
Zn	805	2160	560	2872	2524
рН	(0.1	<0.1	0.12	18.8	2021
A1	6.3	9.0	9.5	3.6	
B					
Cc					
Ma					
Ni					
Phenols -	9.9	710	250	4.04	
TSS		7.10	230	0.26	
Cond.					
COD	1202	8379	1702	8870	
NH4	78	2320	256	41	600
S	64	180	7.7		5.0
			. • •	1.4	<1.0

Table 5-2 (continued)

BOILERS

MBCC 3-103	S.D.	N.D.	N.D.
PARAMETERS	BOILER Blondown	HIGH PRESSURE BOILER	LOW Pressure
	(#2)	(#18)	BOILER (#12)
As	.004	.005	.003
Ba	(.1	<.1	⟨.1
Cd	<.01	<.01	<.01
Cr	<.05	<.05	<.05
CN	•		
F	3.1	2.2	1.5
Pb	.18	.14	.05
Hg			
NO ₃	.2	.1	.05
Se A-			
Ag V	<.05	<.05	<.05
Cl	<.05	<.05	<.05
Cu	127	73	44
Fe	<.03 1.9	<.03	<.03
Kn	.07	0.65	0.25
SO	1549	<.03	<.03
TDS	4220	1242	693
In	.06	2873 <.01	1807
pH	11.6	11.6	<.01
Al	<1.0	<1.0	11.2
₿		1110	<1.0
Со	<.01	.02	.01
Mo	<.5	⟨.5	.01 <.5
Ni	<.05	<.05	₹.05
Phenols			1775
TSS	20	0	0
Cond.	6000	5000	2800
COD	116	0	0
NH.			
S			

Table 5-2 (continued)

COOLING TOWERS

MBCC 3-103	N.D. COOLING	S.D.	S.D.	N.D.
STANDARDS	TOWER	ALKY	TCC COOLING	FCC
	BLONDOWN	COOLING TOWER	TOWER	COOLING TOWER
		BLONDOWN	BLOWDOWN	BLONDONN
	(\$10)	(#1)		(\$16)
۸	664	/ 664	044	604
As	.004	⟨.001	.011	.001
Ba	(.1	<.1 . 01	<.1	<.1 () 1
Cd C-	<.01	<.01	<.01	<.01
Cr	.06	1.05	<.05	0.22
CN F			2.2	
	1.6	4.4	2.2	1.6
Pb	.05	.05	<.05	.05
Hg	•		•	-
N 03	.5	.75	.2	.3
Se				
Ag	<.05	<.05	<.05	<.05
U	⟨.05	⟨.05	⟨.05	<.05
Cl	48	53	44	47
Cu	<.03	<.03	<.03	₹.03
Fe	.05	.5	⟨.05	<.05
Mn	<.03	.07	<.03	(.03
S 0	1077	1461	1236	1067
TDS*	1906	2732	1694	1973
Zn	.48	28	<.01	.17
pН	7.6	6.9	7. 7	8.0
Al	<1.0	<1.0	1.0	<1.0
B				
Co	<.01	.01	.02	.01
Ko	<.5	₹.5	<.5	⟨.5
Ri	<.05	<.07	<.05	<.05
Phenols				
TSS	13	0	67	C
Cond.	0	()	108	1800
COD	1850			15
NH4	0			

The catalysts are in the form of powder for the fluidized unit. The catalyst is usually heated and lifted into the reactor area by the incoming oil feed which, in turn, is vaporized upon contact. Vapor from the reactor pass upward through cyclone separators which remove most of the entrained catalyst. These vapors then enter the fractionator, where the desired products are removed and heavier fractions recycled to the reactor.

The major wastewater constituents resulting from catalytic cracking operations are oil, sulfides, phenols, cyanides, and ammonia. These produce an alkaline wastewater with high BOD and COD concentrations. Sulfide and phenol concentrations in the wastewater can be significant.

The wastestreams produced by the FCC unit are #15 and #17. Both #8 wastestreams are contact wastewater and are sent directly to the oil/water separators as shown in Table 5-1. A characterization of the effluent from the catalytic cracking process before and after sour water stripping is displayed in Table 5-2.

5.2.3. Alkylation

Alkylation is the reaction of an isoparaffin (usually isobutane) and an olefin (butylenes) in the presence of hydroflouoric acid as a catalyst at carefully controlled temperatures and pressures to produce a high octane alkylate for use as a gasoline blending component. The reaction products are separated in a catalyst recovery unit, from which the catalyst is recycled.

The wastewater from the alkylation unit is an acidic solution containing some suspended solids, oil, dissolved solids, fluoride and phenols. The waste stream (#6) is discharged to the neutralizing sewer and is treated to raise the pH prior to discharge to the API oil/water separator (see Table 5-1). An analysis of this comingled wastestream is shown in Table 5-2.

5.2.4. Reforming

Reforming converts low octane naphtha, naphthene-rich stocks to high-octane gasoline blending stock, aromatics for petrochemical use, and isobutane. At Navajo the reformers do not produce a waste stream. Feed stocks are usually hydrotreated for the removal of sulfur and nitrogen compounds prior to charging to the reformer (see Section 5.3.6), since the extremely expensive platinum catalysts used in the unit are readily contaminated and ruined by the sulfur and nitrogen compounds. The predominant reaction during reforming is the dehydrogenation of naphthenes. Important secondary reactions are the isomerization, cyclization and cracking of paraffins. All reactions result in high octane products.

5.2.5 Desulfurizers

Desulfurizing is primarily used to remove sulfur compounds, and other impurities from gasoline, kerosene, jet fuels and diesel fuel. The wastewater typically consists of sulfides or phenolic compounds. This waste stream (#14) is routed to oil water separator.

5.3 AUXILIARY PROCESS UNIT DESCRIPTIONS AND WASTEWATER CHARACTERISTICS

5.3.1 Boilers

Steam is consumed throughout the refining process and is generated in boilers at the North and South Divisions. To assure proper operation of the boilers, a certain amount of boiler water must be discharged (blowdown) and treated water added as make-up. Boiler blowdown is used as a water source for the fire protection system (Table 5-1) prior to direct discharge into the conveyance ditch. Analyses of the boiler blowdown wastestreams (#2, #17 and #12) are shown in Table 5-2. A characterization of the fire water pond is also included in Appendix B.

5.3.2 Cooling Towers

Water used for cooling process streams throughout the facility is cooled by cooling towers located in both the North and South Divisions and comprises most of the water usage at the facility. A significant amount of water is lost by evaporation in the cooling towers resulting in an increased concentration of dissolved solids in the cooling water over time. To prevent scaling, corrosion and biological growth in the towers, inhibitors such as chromate are added to the cooling water. Blowdown from cooling towers pass through the oil water separator to permit contact of chromate with the oil in the separator. This precipitates much of the metal due to reduction of the metal. Analyses of cooling tower blowdown (#1, #10 and #15) is displayed in Table 5-2.

5.3.3 Water Purification System

Pure water must be supplied to several of the boiler units as well as some process systems. Backwash from the purification system contains dissolved solids removed from the water supply system. The water purification system is basically a water softener and produces a periodic waste stream enriched in dissolved solids. The waste is never in contact with product and is discharged directly into the conveyance ditch in the South Division and to the Oil Water separator in the North Division.

5.3.4 Desalters

All produced crude contains some formation (connate) water and suspended solids. Because South Eastern New Mexico crude is generally found in marine formations, this water is highly saline. Desalters remove the saline fluid and suspended solids from the crude by passing crude (with some added water) through an electrostatic field which acts to agglomerate the dispersed brine droplets.

Wastewater can contain high dissolved solids, phenols and (depending upon crude type) ammonia and sulfides. This contact waste water is discharged to the oil-water separator. This waste stream is a significant contributer to the total effluent volume. A characterization of desalter effluent (streams #3 and #9) is shown in Table 5-2.

5.3.5 Washdown and Stormwater

A certain amount of wash water is intermittently utilized for general clean-up of the facility. This activity occurs within the concrete lined process areas. In areas where the clean up may result in oil-contaminated water, the areas drain to the oil water separator sewer. At the heat-exchanger bundle cleaning area the concrete pad drains directly into a sump which is constructed similar to an oil water separator thence into the conveyance ditch and thence to the evaporation ponds.

5.3.6 Storage Tanks

Storage of crude and product typically permits some separation of any water or suspended solids entrained in the fluid. These wastes, removed from the tank bottoms, contain emulsified oil, phenols, iron, sulfide and other consituents which depend upon the nature of the material stored in a particular tank. This liquid is removed to the oil water separators by vacuum trucks. The volume of effluent from this unnumbered source is also small.

5.3.7 Produced Water from Oil Recovery System

The oil recovery system pumps water from below the oil-water interface in order to create a gradient toward the skimmer pump in the trench. This water is discharged directly into the conveyance ditch.

6.0 PRESENT WASTE MANAGEMENT SYSTEM

The Navajo Artesia Refinery generates, treats and disposes of liquid and solid wastes. RCRA solid wastes, which include oil-water separator sludges, heat exchanger bundle cleaning sludges, slop oil emulsion solids and, when produced, leaded tank bottoms are disposed of at the RCRA landfarms on the refinery site pursuant to U.S. EPA regulatory provisions. These waste treatment facilities are fully addressed in EPA permitting documents and are not discussed further in this discharge plan. The wastewater management system presently employed by Navajo is composed of four units: the evaporation ponds, the conveyance ditch, and the two oil-water separators. A general description of each unit is provided below.

6.1 OIL/WATER SEPARATORS

All wastewater delivered to the oil-water separators flow by gravity from the discharge points through subsurface pipelines. At the separators the flow velocity is reduced and the density difference between the water and entrained oil permits separation of the two phases. The oil is then skimmed from the water and pumped back to the processing units. Chromate and other metals which are discharged into the separator are removed from solution by the reducing effect of the hydrocarbons. The effluent is discharged to the conveyance ditch. The sludges are removed to the RCRA landfarm.

Periodically, blow sand and suspended solids in the effluent will enter the separator and oil droplets may adhere to the solid. This phenomenon results in a sand/oil particle which may have the same density as water. These oily particles can flow through the unit and into the conveyance ditch. Upsets in the plant can also result in a short-term oily discharge from the separators. Much of the oil and grease discharged into the ditch will settle into the soft, bottom sediments. Over time this oil, grease and sediment has formed a very fine-grained asphaltic "liner" for the ditch.

6.2 Conveyance Ditch

The conveyance ditch originates at the oil-water separators and terminates at the evaporation ponds in Section 1,6 and 12 (T. 17 S., R. 26 E.) approximately three miles east of the refinery. As Figure 2-1 shows, the ditch is sub-parallel to Eagle Creek until it nears the Pecos River, where the ditch then turns south toward the evaporation ponds. The ditch is generally about 3-4 feet wide and less than 1 foot deep. Throughout its course, it is bermed to prevent any influx of stormwater or excess irrigation water.

In the refinery area several wastestreams discharge directly into the ditch. These streams (eg. boiler blowdown) are not contact wastewater and, therefore, need not be routed to the oil/water separators.

6.3 Evaporation Ponds

Originally, three ponds were built to evaporate the wastewater generated at the refinery. At the present time, the berm between the lower ponds (2 and 3) has been removed resulting in a two-pond system. The ponds cover an area of approximately 85 acres and are generally less than 3 feet deep. The ponds are bermed to prevent any storm water runoff from entering the impoundment.

All of the wastewater discharged by the refinery is disposed of in these ponds. The effluent in these ponds is a very good representation of the overall quality of the discharges from the facility. Upsets in the refinery and minor modifications of the operation could result in a variable quality of discharge. The ponds, however, have a long enough retention time to adequately homogenize the effluent. Analyses of the fluid in the ponds is shown in Appendix B.

7.0 FUTURE WASTEWATER MANAGEMENT

Recent NMEID chemical analyses of sludges from the wastewater conveyance ditch and Evaporation Pond #1 show concentrations of heavy metals which would classify this material as a hazardous waste. Evaporation Pond #1 is now considered a hazardous waste surface impoundment by the NMEID.

Managing the evaporation lagoons as hazardous waste surface impoundments is not economically realistic and Navajo intends to close Pond #1 pursuant to RCRA. After 1988 neither the conveyance ditch nor the evaporation ponds will be employed to manage wastewater discharged directly from the oil/water separators. If the conveyance or other evaporation ponds are utilized, the wastewater managed by these units will be biologically treated and be of significantly better quality than is presently being discharged. Biological treatment of wastewater is also consistent with proposed RCRA regulations (Appendix C).

7.1 WASTEWATER MANAGEMENT OPTIONS FOR WASTEWATERS DISCHARGED TO THE OIL WATER SEPARATORS

All waste streams which are presently discharged to the oil/water separators will be subject to biological treatment prior to discharge to the land surface (eg. evaporation ponds, land application of treated effluent, NPDES discharge to Pecos River). Two options for treatment are presented below. One of these options will be implemented prior to 1988.

7.1.1 OPTION 1: Discharge of Treated Effluent To Artesia POTW
In addition to primary oil seperation provided by the existing oil water separators, an air floatation unit will be employed for additional treatment prior to discharge to the City of Artesia Publicly Owned Treatment Works. The pre-treated effluent will be further treated at the POTW to meet the City of Artesia's NPDES permit restrictions and their NMEID ground water discharge plan requirements.

Pipelines will be used to transfer effluent between generation points and treatment process units in the refinery area as well as between the

refinery and the POTW. No ground water monitoring is necessary nor proposed.

7.1.2 OPTION 2: Biological Treatment and Discharge to Pecos River In the unlikely event that discharge to Artesia's POTW is not possible, Navajo will design and construct a new wastewater management system which include a biological treatment unit for refinery wastes.

Prior to discharge to the biologic treatment unit the refinery waste will receive primary oil/water separation followed by secondary floatation treatment. Options for biological treatment include:

- o aerated lagoons
- o trickling filters
- o oxidation ditch
- o activated sludge
- o rotating biological contactors

Biologic treatment of waste will substantially alter the character of the final refinery effluent.

7.2 BOILER BLOWDOWN WASTEWATER MANAGEMENT

The existing fire water pond presently receives all boiler blowdown from the south division. The naturally-lined pond is located upgradient from the oil recovery trench RW-4. The area downgradient from the Fire Water Pond contains oil-contaminated soil and ground water under Artesian conditions.

If any leakage from the naturally-lined Fire Water ponds does occur:

- o It would generally improve the quality of the soil water
- o It could not affect the Artesian ground water in this area
- o All leakage will be captured by RW-4 recovery well/trench.

Future discharges from the Fire Water Pond will be co-mingled with the biologically-treated effluent and discharged with the treated effluent or discharged directly to the Artesia POTW.

7.3 WATER SOFTENER WASTEWATER MANAGEMENT

Discharges from the water softener will be co-mingled with the

biologically-treated effluent discharged to Navajo's wastewater management system or discharged directly to the Artesia POTW.

8.0 MONITORING AND REPORTING

Ground water analyses show that utilization of the evaporation lagoons and conveyance ditch has not resulted in significant degradation of ground water (Appendix C and Section 4.7). Continued use of the impoundments and ditch prior to biological wastewater treatment in 1988, will not affect ground water which is presently being used. Therefore, no ground water monitoring is planned. However, additional monitoring may occur as a result of closure activities for Evaporation Pond #1.

9.0 BASIS FOR DISCHARGE PLAN APPROVAL

- o Ground water sampling and analyses performed to date show that ground water quality in the area of the conveyance ditch and evaporation ponds has not been significantly affected by over 20 years of discharges.
- O Discharges into the present wastewater management system for the next three years will not result in concentrations in excess of the Standards of Section 3-103 or the presence of any toxic pollutant at any place of withdrawal of water for present or reasonably fuseable future use.
- o By 1988 Navajo Refining Company will utilize biological treatment of effluent presently discharged from the oil water separators. This will significantly improve the quality of wastewater.
- o In the next few months Navajo, NMOCD, AND NMEID will be working together to develop a schedule for implementation of biological treatment of wastewater.

2DISCHS7.RPT

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APPENDICES FOR NAVAJO REFINING COMPANY ARTESIA, NEW MEXICO

July 31, 1985

Prepared for:

Dave Griffin Navajo Refining Company P.O. Drawer 159 Artesia, New Mexico 88210

Prepared by:

Geoscience Consultants, Ltd.
500 Copper Avenue, NW
Suite 325
Albuquerque, New Mexico 87102

APPENDIX A WELL LOGS

PREVIOUSLY SUBMITTED

APPENDIX B
WATER QUALITY ANALYSES

WATER QUALITY OF MONITOR WELLS NEAR EVAPORATION PONDS



ANALYTICAL LABORATORIES, INC.

TO: Geo Science

500 Copper Ave. N.W.

Albuquerque, NM

DATE: 8 November 1984

1080, 1040

ANALYTE

SAMPLE ID/ANALYTICAL RESULTS

i 1	11184 1330 Well 28	103184 1432 Well 45	103184 1240 Well 46
Benzene	<0.005 mg/l	<0.005 mg/l	$\langle 0.005 \text{ mg/l} \rangle$
Toluene	<0.005 mg/1	<0.005 mg/l	<0.005 mg/1
Ethylbenzene Xylenes	<0.005 mg/l <0.005 mg/l	<0.005 mg/1	<0.005 mg/l
Ayrenes	(0.003 шg/1	<0.005 mg/l	<0.005 mg/1
	103184 1520 Well 47	103184 1550 Fire Pond	* ;
enzene	<0.005 mg/l	<0.005 mg/l	
oluene	<0.005 mg/l	<0.005 mg/l	
Ethylbenzene	<0.005 mg/1	<0.005 mg/1	
Xylenes	<0.005 mg/1	<0.005 mg/1	
	Well 3	Well 5	Well 12
	WCII J	Well	Well 12
NO 3 as N	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
■ NH 4	<0.01 mg/1 1.16 mg/1		
NH 4 CN	<0.01 mg/1 1.16 mg/1 <0.01 mg/1	<0.01 mg/1 2.5 mg/1 <0.01 mg/1	<0.01 mg/1
NH 4 CN Benzene	<pre><0.01 mg/1 1.16 mg/1 <0.01 mg/1 <0.005 mg/1</pre>	<0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.00 mg/1	<0.01 mg/1 0.25 mg/1
NH 4 CN Benzene Toluene	<pre><0.01 mg/1 1.16 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1
NH 4 CN Benzene Toluene Xylenes	<pre><0.01 mg/1 1.16 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>
NH 4 CN Benzene Toluene	<pre><0.01 mg/1 1.16 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1
NH 4 CN Benzene Toluene Xylenes	<pre><0.01 mg/1 1.16 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>
NH 4 CN Benzene Toluene Xylenes Echylbenzene	<pre><0.01 mg/1 1.16 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>
NH 4 CN Benzene Toluene Xylenes Ethylbenzene	<pre><0.01 mg/1 1.16 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>
NH 4 CN Benzene Toluene Xylenes Echylbenzene NO 3 as N NH 4 CN	<pre><0.01 mg/1 1.16 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>
NH 4 CN Benzene Toluene Xylenes Echylbenzene NO 3 as N NH 4 CN Benzene	<pre><0.01 mg/1 1.16 mg/1 <0.01 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>
NH 4 CN Benzene Toluene Xylenes Echylbenzene NO 3 as N NH 4 CN Benzene Toluene	<pre><0.01 mg/1 1.16 mg/1 <0.01 mg/1 <0.005 mg/1 </pre>	<pre> <0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.01 mg/1 10.6 mg/1 0.4 mg/1 0.711 mg/1 0.588 mg/1</pre>	<pre><0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1</pre>
NH 4 CN Benzene Toluene Xylenes Echylbenzene NO 3 as N NH 4 CN Benzene	<pre><0.01 mg/1 1.16 mg/1 <0.01 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.01 mg/1 10.6 mg/1 0.4 mg/1 0.711 mg/1</pre>	<pre><0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.007 mg/1 </pre>

CUSTOMER Navajo Refining Co ADDRESS Box 526 CITY Artesia, NM 88210 ATTENTION Ed Kinney IVOICE NO. 104223

额点计

K. NMCY

REPORT OF ANALYSIS

the second secon		
SAMPLES RECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.O. #20030	
TYPE OF ANALYSIS Water		
Sample <u>Identification</u>	Type of Analysis mg/liter	11/21/80 10
Navajo Well #1	Acidity 179 Alkalinity, "P" (As CaCO ₃) < 1 Barium 0.1 Biochemical Oxygen Demand 44	
0/206	Cadmium 0.05 Chemical Oxygen Demand 145 Chloride 8313	5800
	Chromium 0.002 Chromium 6+ < 0.01 Copper 0.001 Fluoride 0.9	08
,69	Hardness (as CaCO ₃) 5760 Iron 0.05 Lead 0.006	-
	Magnesium 850 Nickel 0.02 pH Units 7.8 Phenols 0.015	
	Phenols 0.015 Alkalinity , "M" 700 Solids, Total Dissolved 19700 Sulfate 4920	15800
	Sulfide 0.21 Zinc < 0.1	

Sample Analysis by: B.P.
Date and Time of Analysis: BOD₅ - 4/24/81 @ 1600 hrs.
pH: 4/30/81 @ 1400 hrs.
Method of Analysis: BOD₅ - 5 day incubation

4/30/81

pH: electrode



APPROVED BY Elmer D. Martinez, Director of Quality PAGE 5 OF 13 PAGE

ADDRESS CITY OICE NO.

Navajo Refining Col 19 Drawer 159 Artesia, NM 88210 Ed Kinney 104223



CUSTOMER ORDER NUMBER SAMPLES RECEIVED 4/24/81 P.O. # 20030 the training of Water TYPE OF ANALYSIS Sample Type of 11/21/80 14/2/17 Identification Analysis mg/liter Navajo Well # 3 Acidity 32 Alkalinity, "P" (as CaCO₃) < 1.0 < 0.1 Biochemical Oxygen Demand 40 Cadmium 0.009 Chemical Oxygen Demand 73 2200 1180 Chloride 2652 Chromium < 0.001 < 0.01 Chromium 6+ < 0.001 Copper 5,0 3.2/ Fluoride 1.6 Hardness (as CaCO₃) 2760 Iron 0.01 Lead < 0.001 Magnesium 250 < 0.01 Nickel pH Units 7.4 Pheno1s < 0.001 Alkalinity, "M" 356 Solids, Total Dissolved 7640 6777 7730 Sulfate 2720 Sulfide 0.10 Zinc

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

 ${\tt Method\ of\ Analysis:\ BOD_5\ -\ 5\ day\ incubation}$

pH:electrode



Elmer D. Martinez, Director of Quality Assurance
PAGE 6 OF 13 PAGE
4/30/81

Navajo Refining Com CUSTOMER Drawer 159 ADDRESS CITY Artesia, NM 88210 ATTENTION Ed Kinney OICE NO. 104223



SAMPLES RECEIVED 4/24/81	CUSTO	OMER ORDER NUMBER P.O. # 200	30	
TYPE OF ANALYSIS Water				
Sample <u>Identification</u>		Type of Analysis	mg/liter	11/21/80 19/6
Navajo Well # 5	iki ji Sana Sana	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand	36 < 1.0 0.1 24 0.05 176	8600 41
165		Chloride Chromium Chromium 6+ Copper Fluoride	7089 0.002 < 0.01 0.001 0.44	0.96
		Hardness (as CaCO ₃) Iron Lead Magnesium Nickel pH Units Phenols Alkalinity, "M"	4660 0.04 0.007 650 < 0.01 7.7 < 0.001 506	
la de la companya de		Solids, Total Dissolved	16,800	21.100 7

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

Sulfate

Sulfide

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



Elmer D. Martinez, Director of Quality Assurance PAGE 7 OF 13 PAGE 4/30/81

4290

0.13

< 0.1

*CUSTOMER

Navajo Refining Co

Drawer 159

Artesia, NM 88210

OICE NO.

CITY

Ed Kinney 104223 SAMPLES RECEIVED 4/24/81 CUSTOMER ORDER NUMBER P.

ER P.O. # 20030

TYPE OF ANALYSIS Water

Sample Identification	Type of Analysis	mg/liter	11/21/80	10/9/11
Navajo Well # 7	Acidity	36		
- -	Alkalinity, "P" (as CaCO ₃)	< 1.0		-
•	Barium	< 0.1	t	
	Biochemical Oxygen Demand	38		
	Cadmium	0.04		
	Chemical Oxygen Demand	136		1
	Chloride	3570	3400	802
	Chromium	0.002	-	1
	Chromium 6+	< 0.01		1
	Copper	0.004		ı
	Fluoride	0.3	0.92	0.46
1+	Hardness (as CaCO ₂)	3160		1
, 0	Iron	0.05		1
•	Lead	0.001		
· · · · · · · · · · · · · · · · · · ·	Magnesium	370		
	Nickel	< 0.01		
	pH Units	8.0		
	Phenols	< 0.001		
	Alkalinity, "M"	596		
•	Solids, Total Dissolved	14,200	21,500	28:05
A Secretary of the second	Sulfate	5600		1
	Sulfide	0.05	•	1 .
and the state of t	Zinc	< 0.1		1 .
ang ang karangan an Mangkanda karangan ang karangan	, , , , <u> </u>			1

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



CUSTOMER ADDRESS CITY ATTENTION

CUSTOMER Navajo Refining Co

Artesia, NM 88210

VOICE NO. 104223

REFORT OF AMALYSIS

SAMPLES RECEIVED 4/

4/24/81

CUSTOMER ORDER NUMBER

P.O. # 20030

TYPE OF ANALYSIS

Water

Sample Identification		Type of Analysis		mg/liter	11/21/80
Navajo Well # 9		Acidity		36	, ,
-		Alkalinity, "P" (as CaCO ₃)	<	1.0	
	4	Barium	<	0.1	
		Biochemical Oxygen Demand		36	
		Cadmium		0.01	
·		Chemical Oxygen Demand		88	
•		Chloride		2703	2200
•		Chromium		0.002	
		Chromium 6+	<	0.01	
		Copper		0.006	
	/	Fluoride		0.7	1.8
	105	Hardness (as CaCO ₂)		3120	
5 · · · · · · · ·	,00	Iron		0.01	
		Lead		0.001	
		Magnesium		370	
		Nickel	<		
		pH Units		7.7	
•		Pheno1s	<	0.001	
		Alkalinity, "M"		322	_
	•	Solids, Total Dissolved		10,400	9820
		Sul fate		4160	
		Sulfide		0.03	
State Landing Commence	•	Zinc	<	0.1	

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



CUBIOMER Navajo Refining Col ly ADDRESS Drawer 159 CITY Artesia, NM 88210 ATTENTION Ed Kinney

104223

VOICE NO.

REFORT OF ANALYSIS

SAMPLES RECEIVED	4/24/81	CUSTOMER ORDER NUMBER	P.O. # 20030	· .
TYPE OF ANALYSIS	Water			ı

Sample Identification	Type of Analysis		mg/liter	11/21/60	142/2
Navajo Well # 12	Acidity		55	•	
	Alkalinity, "P" (as CaCO ₃)	<	1.0		
	Barium	<	0.1		
	Biochemical Oxygen Demand		38		İ
•	Cadmium		0.07		ł
en grande en	Chemical Oxygen Demand		256		
	Chloride Chloride		8058	6700	7300
	Chromium		0.002	~ .	Ī
· A	Chromium 6+	<	0.01		
Agent a sy	Copper		0.002	_	
	Fluoride		0.9	2.5	1:49
10	Hardness (as CaCO ₃)		8920		
A	Iron		0.04		
	Lead		0.007		
	Magnesium		1330		
	Nickel		0.02		ı
•	pH Units		7.6		
,	Phenols .		*<0.001		
•	Alkalinity, "M"		545		700
	Solids, Total Dissolved		28,900	29.000	2784
	Sulfate		11,500		
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Sulfide		0.05	•	
· · · · · · · · · · · · · · · · · · ·	Zinc	<	0.1		

* Data will follow on 5/6/81.

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 10 OF 13 PAGE

CUSTOMER ADDRESS CITY ATTENTION

VOICE NO.

Navajo Refining Cor Drawer 159 Artesia, NM 88210 Ed Kinney 104223



SAMPLES RECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.O. # 2003	20		
SAMPLES RECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.0. # 2003	50		
TYPE OF ANALYSIS Water				
				ļ
Sample	Type of			
Identification	Analysis	mg/liter	1/-	11/2
100,000,000	7.11.15.15	mg/liter	11/21/80	16/8/77
Navajo Well # 13	Acidity	11		
)	Alkalinity, "P" (as CaCO ₃)	< 1.0		
	Barium	0.1		
en '	Biochemical Oxygen Demand	22		
	Cadmium	0.002		
	Chemical Oxygen Demand	48		
	Chloride	357	380	123
	Chromium	0.002	-	
	Chromium 6+	< 0.01		
	Copper	0.001		
	Fluoride	1.2	3.5	1-47
	Hardness (as CaCO ₃)	1570		
10	Iron	0.02		
,20	Lead	0.003		
	Magnesium	79		
	Nickel	< 0.01		
	pH Units	7.4		
	Pheno1s	< 0.001		
·	Alkalinity, "M"	146		
	Solids, Total Dissolved	3200	3060	290/
Block of Charles of the Control of the	Sulfate	1810		
	Sulfide	0.04	. ' '	
The state of the s	Zinc	< 0.1	s 1	ď • .

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: $BOD_5 - 5$ day incubation

pH:electrode



APPROVED BY Elmer D. Martinez, Director of Quality Assurance PAGE 11 OF 13 PAGE

CUSTOMER
ADDRESS
CITY

Navajo Refining Con

Drawer 159

Artesia, NM 88210

voice no. 104223

SAMPLES RECEIVED

4/24/81

CUSTOMER ORDER NUMBER

P.O. # 20030

TYPE OF ANALYSIS

Water

Sample Identification	Type of Analysis		mg/liter
Navajo Well # 16	Acidity		13
	Alkalinity, "P'	' (as CaCO ₂) <	1.0
•	Barium	٧ <	0.1
	Biochemical Oxy	/gen Demand	44
	Cadmium		0.002
	 Chemical Oxyger 	n Demand	152
	Chloride		1173
	Chromium	<	0.001
	Chromium 6+	<	0.01
	Copper	<	0.001
	Fluoride		0.44
.67	Hardness (as Ca	(CO ₂)	1610
	Iron	<	0.01
•	Lead		0.002
	Magnesium		140
	Nickel	<	0.01
•	pH Units		7.7
	Phenols		0.016
•	Alkalinity, "M"		425
	Solids, Total D	issolved	4, 770
La transfer and the second	Sul fate	`	1,890
and the second s	Sulfide		0.10

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 12 OF 13 PAGE

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CUSTOMER ADDRESS CITY

Navajo Refining Cor

Drawer 159

Artesia, NM 88210

ATTENTION

Ed Kinney 104223

ANALYSIS

SAMPLES RECEIVED

4/24/81

CUSTOMER ORDER NUMBER

P.O. # 20030

TYPE OF ANALYSIS

Water

Sample Identification	Type of Analysis		mg/liter
Navajo Well # 17	Acidity Alkalinity, "P" (as CaCO ₃)	<	17 1.0
	Barium		0.1
	Biochemical Oxygen Demand		42
	Cadmium		0.03
	Chemical Oxygen Demand		88
•	Chloride		4692
	Chromium		0.002
	Chromium 6+	<	0.01
:	Copper	<	0.001
.6	Fluoride	-	0.3
. 12	Hardness (as CaCO ₃)		4470
,	Iron		0.03
· ·	Lead		0.005
	Magnesium		470
•	Nickel		0.01
	pH Units	<	7.6
	Phenols Alkalinity, "M"		0.001
	Solids, Total Dissolved		198
	Sulfate		11,200 2,930
	Sulfide		0.03
	Zinc		0.03
	← 1110		,0.1

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: $BOD_5 - 5$ day incubation

pH:electrode



CUSTOMER ADDRESS CITY TTENTION OICE NO

Navajo Refining Cor Drawer 159 Artesia, NM 88210

104223

Ed Kinney

6 1981

10/3/7

1430

0.32

6/62

NAVAJO REFINING CO.

SAMPLES RECEIVED 4/24/81 CUSTOMER ORDER NUMBER P.O. # 20030

TYPE OF ANALYSIS

Water

Sample Identification		Type of Analysis		mg/liter
Well Water		Acidity		13
		Alkalinity, "P" (as CaCO ₃)	<	1
		Barium	<	0.1
		Biochemical Oxygen Demand		3 8
		Cadmium		0.002
		Chemical Oxygen Demand		88
		Chloride		1632
		Chromium		0.002
•		Chromium 6+	<	0.01
		Copper		0.004
		Fluoride	-	0.25
		Hardness (as CaCO ₃)		2400
•	6	Iron		0.06
	-53/	Lead		0.005
	0	Magnesium		310
	V	Nickel	<	0.01
		pH Units		7.8
		Pheno1s		0.022
	-	Alkalinity, "M"		205
		Solids, Total Dissolved		6860
		Sulfate		2830
		Sulfide		0.03
fright of the state of the		Zinc		0.2

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: $BOD_5 - 5$ day incubation

pH:electrode



Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 1 OF 13 PAGE

Controls for Environmental Pollution, Inc. P.O. Box 5351 • 1925 Rosina • Santa Fe, New Mexico 87502

CUSTOMER Navajo Refining Co. any Drawer 159
Artesia, NM 88210
ATTENTION Ed Kinney
NVOICE NO. 104223

SAMPLES RECEIVED 4/24/81

CUSTOMER ORDER NUMBER P.O

P.O. #20030

TYPE OF ANALYSIS

Water

Sample Identification

Type of Analysis

mg/liter

Navajo Well #12

Pheno1s

< 0.001



4/30/81 APEDINER D. Hartinez, Director of Quality
PAGE OF 1 PAGE Assurance

WATER QUALITY OF MONITOR WELLS IN REFINERY AREA

ASSAIGAI

ANALYTICAL LABORATORIES, INC.

TO: Geo Science 500 Copper Ave. N.W. Albuquerque, NM

DATE: 8 November 1984 1080, 1040

ANALYTE

SAMPLE ID/ANALYTICAL RESULTS

	11184	103184	103184
	1330	1432	
	Well 28		1240
	WEII ZO	Well 45	Well 46
Benzene	(0 005 mg/1	(0,005, /)	(0.00-
Toluene	<0.005 mg/1	$\langle 0.005 \text{ mg/l} \rangle$	<0.005 mg/l
Ethylbenzene	<0.005 mg/l	$\langle 0.005 \text{ mg/l} \rangle$	<0.005 mg/l
_	<0.005 mg/1	<0.005 mg/1	<0.005 mg/l
Xylenes	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l
1	103184	103184	
	1520		
ı		1550	
_	Well 47	Fire Pond	
enzene	<0.005 mg/1	<0.005 mg/1	
Toluene	<0.005 mg/l	<0.005 mg/l	
Ethylbenzene	<0.005 mg/l	<0.005 mg/l	
Xylenes	<0.005 mg/l	<0.005 mg/1	
•		(0.00) mg/I	
	Well 3	Well 5	Well 12
NO 3 as N	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
NH 4	1.16 mg/1	2.5 mg/1	0.25 mg/1
CN T	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
Benzen <i>e</i>	<0.005 mg/l	<0.005 mg/1	<0.005 mg/1
Toluene	<0.005 mg/l	<0.005 mg/1	
Xylenes	<0.005 mg/1		<0.005 mg/1
Ethylbenzene	<0.005 mg/1	<pre><0.005 mg/1</pre>	<0.005 mg/l
	/0.000 m8/T	<0.005 mg/1	<0.005 mg/1
•	Well 13	Pond 1	Pond 3
NO 3 as N	<0.01 mg/l	<0.01 mg/1	<0.01 mg/1
NH 4	5.6 mg/l	10.6 mg/1	13.87 mg/1
CN T	0.09 mg/1	0.4 mg/1	0.2 mg/1
Benzene	0.254 mg/1	0.711 mg/1	0.027 mg/1
Toluene	0.345 mg/1	0.711 mg/1 0.588 mg/1	
Xylenes	0.389 mg/1	0.500 mg/1 0.591 mg/1	<0.005 mg/l
Ethylbenzene	<0.100 mg/1		<0.005 mg/1
	/0.100 mg/1	0.240 mg/l	<0.005 mg/l

ASSAIGAI

ANALYTICAL LABORATORIES, INC.

TO: Geo Science

Attn: Randy Hicks 500 Copper N.W.

Albuquerque, NM 87105

DATE: 3 December 1984

1111

ANALYTE	SAMPLE IDENT	FICATION/ANALY	YTICAL RESULTS
	Fire Pond	Well 47	Well 28
	10/31/83	10/31/84	11/1/84
	1550	1520	1330
Phenols	20.0 ug/1	33.0 ug/1	20.0 /1
C1		122.0 mg/1	20.0 ug/1
SO	_	1400.0 mg/1	101.0 mg/1
TDS	3664.0 mg/1		2150.0 mg/1
TSS	96.0 mg/1	2728.0 mg/1	5192.0 mg/1
NO		13588.0 mg/1	720.0 mg/1
NH	2.18 mg/1	1.79 mg/1	1.63 mg/1
Cr	1.0 mg/1	0.3 mg/1	0.3 mg/1
CN	<0.01 mg/1		<0.01 mg/1
ON	<0.01 mg/1	<0.01 mg/l	<0.01 mg/1
	Well 45	Well	
	10/31/84		NOMINAL DETECTION
	1432	1240	LIMIT
Phenols	16.0 ug/1	13.0 ug/1	0.01 ug/1
Cl	495.0 mg/1	446.0 mg/1	1.0 mg/1
SO	1650.0 mg/1	2100.0 mg/1	1.0 mg/1 1.0 mg/1
TDS	3836.0 mg/1	3988.0 mg/1	1.0 mg/1 1.0 mg/1
TSS	2004.0 mg/1	4084.0 mg/1	1.0 mg/1 1.0 mg/1
NO	0.10 mg/1	0.80 mg/1	
NH	11.6 mg/1	1.0 mg/1	0.1 mg/l
Cr	<0.01 mg/1	<0.01 mg/1	0.1 mg/1
CN	<0.01 mg/1	<0.01 mg/1 <0.01 mg/1	0.01 mg/1
	(0 • 01 mg/1	/ο•οι mg/r	0.01 mg/1

REFERENCE: "Standard Methods for the Examination of Water and Wastewater", 15th Edition, APHA, N.Y., 1980.

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

Sincerely,

Jennifer V. Smith, Ph.D.

Laberatory Director

TEL Weathering Area

Geraghty 8	k Miller	Inc Upgradient Well	Downgradient Wells		
	-	35	36	37	38
рН		7.28	7.27	7.57	7.37
Spec Cond		3942	9462	9462	7899
ТОС	(*)				
TOX Ug/1		318	125	223	170
Chloride	(*)				
Iron		4.6	0.89	0.14	0.73
Manganese		1.34	1.34	1.26	0.789
Phenols		0.001	0.001	0.001	0.001
Sodium	(*)				
Sulfate	(*)				
Arsenic		0.07	0.03	0.02	0.02
Barium		0.1	0.1	0.1	0.1
Cadmium		0.001	0.001	0.001	0.001
Chromium		0.003	0.002	0.001	0.001
Fluoride		1.45	1.34	2.05	1.60
Lead		0.001	0.001	0.001	0.001
Mercury		0.0004	0.0004	0.0004	0.0004
Nitrate		0.1	0.1	0.1	0.1
Selenium		0.01	0.01	0.01	0.01
Silver		0.01	0.01	0.01	0.01
Pest & Herb	b	-	-	-	-
Radio	(**)	-	-	-	-
Coliform		1	1	2700	1

Chemical data from TEL Weathering area monitoring wells taken 12-1-82. Table 5.

^{*} Results pending, re-analysis by laboratory.
** Radioactivity activity results were omitted due to high TDS.

Geraghty &	& Miller, Inc. Upgradient		Downgradient Wells		
		Well 31	32	33	34
рН		7.31	7.41	7.41	7.30
Spec Cond.		25544.5 2489	2693	3590	2563
TOC mg/1	(*)	2101			
TOX ug/l		41.5	102.3	64.5	26
Chloride	(*)				
Iron		0.06	0.01	0.01	1.81
Manganese		1.08	0.311	0.521	0.567
Phenols		0.001	0.001	0.001	0.001
Sodiu		100	35.4	44.4	88.5
Sulfate	(*)				
Arsenic		0.01	0.01	0.01	0.01
Barium		0.1	0.1	0.1	0.1
Cadmium		0.001	0.001	0.001	0.001
Chromium		0.001	0.001	0.001	0.004
Fluoride		1.15	1.28	2.70	1.28
Lead		0.002	0.001	0.001	0.005
Mercury		0.0004	0.0004	0.0004	0.0004
Nitrate		0.1	0.1	0.1	0.1
Selenium		0.01	0.01	0.01	0.01
Silver		0.01	0.01	0.01	0.01
Pest & Herb	•	ND	ND	ND	ND
Radio	(**)	-	· _	-	-
Coliform	(*)				

^{*} Results pending, re-analysis by laboratory.
** Radioactivity results were omitted due to high TDS.

Chemical data from the Colony Landfarm monitoring wells taken 12-2-82. Table 4.

QUALITY OF WATER IN EVAPORATION PONDS

ASSAIGAI

ANALYTICAL LABORATORIES, INC.

TO: Geo Science 500 Copper Ave. N.W.

ANALYTE

NO 3 as N

Benzene

Toluene

Xylenes

Ethylbenzene

NH 4

CN

Albuquerque, NM

DATE: 8 November 1984

<0.01 mg/1

13.87 mg/l

0.027 mg/1

<0.005 mg/1

<0.005 mg/1

<0.005 mg/1

0.2 mg/1

1080, 1040

SAMPLE ID/ANALYTICAL RESULTS

<0.01 mg/1

 $10.6 \, \text{mg}/1$

0.711 mg/1

0.588 mg/l

0.591 mg/1

0.240 mg/1

0.4 mg/l

	11184	103184	103184
	1330	1432	1240
	Well 28	Well 45	Well 46
Benzene	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l
Toluene	<0.005 mg/l	<0.005 mg/1	<0.005 mg/l
Ethylbenzene	<0.005 mg/1	<0.005 mg/1	(0.005 mg/l)
Xylenes	<0.005 mg/1	$\langle 0.005 \text{ mg/1} \rangle$	<0.005 mg/1
	103184	103184	•
	1520	1550	
	Well 47	Fire Pond	
enzene	<0.005 mg/l	<0.005 mg/l	
foluene	<0.005 mg/l	<0.005 mg/l	ę
Ethylbenzene	<0.005 mg/l	<0.005 mg/l	
Xylenes	<0.005 mg/1	<0.005 mg/l	
	Well 3	Well 5	Well 12
NO 3 as N	<0.01 mg/1	<0.01 mg/1	<0.01 mg/l
NH 4	1.16 mg/1	2.5 mg/1	0.25 mg/1
CN	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
Benzene	<0.005 mg/l	<0.005 mg/1	<0.005 mg/1
Toluene	<0.005 mg/1	$\langle 0.005 \text{ mg/l} \rangle$	<0.005 mg/1
Xylenes	<0.005 mg/l	<0.005 mg/l	<0.005 mg/1
Ethylbenzene	<0.005 mg/1	<0.005 mg/1	<0.005 mg/1
	Well 13	Pond 1	Pond 3

<0.01 mg/1

5.6 mg/l

0.09 mg/1

0.254 mg/1

0.345 mg/1

 $0.389 \, \text{mg/l}$

<0.100 mg/l

TO: Geo Science 500 Copper Ave. N.W. Albuquerque, NM

DATE: 8 November 1984 1080, 1040 Page 2 of 2

ANALYTE

SAMPLE ID/ANALYTICAL RESULTS

	Pond #1 floating film	NOMINAL DETECTION LIMIT
NO 3 as N NH 4 CN Benzene Toluene Xylenes Ethylbenzene	0.617 mg/1 0.467 mg/1 0.463 mg/1 0.201 mg/1	0.01 mg/1 0.1 mg/1 0.01 mg/1 0.005 mg/1 0.005 mg/1 0.005 mg/1 0.005 mg/1

EFERENCE: "Standard Methods for the Examination of Water and Wastewater", 15th Edition, APHA, N.Y., 1980.

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

Sincerely,

Jennifer V. Smith, Ph.D.

Laboratory Director

ATTENTION ER Navajo Refining Com

ADDRESS Drawer 159

CITY Artesia, NM 88210

Ed Kinney

104223



SAMPLES RECEIVED 4/24/8	oust.	OMED ODDED NUMBER	D 0 # 2002	n
SAMPLES RECEIVED 4/24/8	<u>, 1</u> 00310	OMER ORDER NUMBER	P.O. # 2003	J
Sample Identificatio	on	Type of Analysis		mg/liter
Navajo East F		Acidity Alkalinity, "P" Barium Biochemical Oxy Cadmium Chemical Oxygen Chloride Chromium Chromium 6+ Copper Fluoride Hardness (as Cal Iron Lead Magnesium Nickel pH Units Phenols	gen Demand Demand	10 < 1 < 0.1 72 0.002 225 1632 0.1 < 0.01 0.002 5.8 1160 0.1 < 0.001 110 < 0.001 7.2 < 0.001

Alkalinity, "M"

Sul fate

Sulfide

Zinc

Solids, Total Dissolved

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 2 OF 13 PAGE

214

4920

1520

0.36 < 0.1

COUSTOMER Navajo Refining Com y ADDRESS Drawer 159
CITY Artesia, NM 88210
ATTENTION Ed Kinney
VOICE NO. 104223



SAMPLES RECEIVED 4/24/81 CUSTOMER ORDER NUMBER P.O. # 20030

TYPE OF ANALYSIS Water

Sample Identification	Type of Analysis		mg/liter
Navajo Middle Pond	Acidity	_	29
	Alkalinity, "P" (as CaCO ₃)	< <	1 0.1
	Barium Ricchemical Owngon Demand		
	Biochemical Oxygen Demand		116 0.002
	Cadmium Chomical Oyugan Damand		363
·	Chemical Oxygen Demand Chloride		1468
	Chromium		0.1
	Chromium 6+	<	
	Copper	<	
· ·	Fluoride		7.4
	Hardness (as CaCO ₃)		1060
	Iron		0.06
.40	Lead	<	0.001
	Magnesium		96
•	Nickel	<	0.01
	pH Units		7.4
	Pheno1s		0.027
	Alkalinity, "M"		349
•	Solids, Total Dissolved		4020
The state of the s	Sulfate		1050
Company of the second of the s	Sul fide		13.4
发酵的 分别,这个人	Zinc	<	0.1

Sample Analysis by: BP.

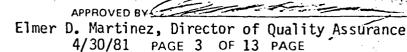
Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode





ADDRESS
CITY
ATTENTION

VOICE NO.

Navajo Refining Col ay Drawer 159 Artesia, NM 88210 Ed Kinney 104223



SAMPLES RECEIVED

4/24/81

CUSTOMER ORDER NUMBER

P.O. # 20030_

TYPE OF ANALYSIS

Water

	Type of Analysis		mg/li t er
Navajo West Pond	Acidity		13
	Alkalinity, "P" (as CaCO ₃)	<	1
	Barium		0.2
	Biochemical Oxygen Demand		116
•	Cadmium		0.003
	Chemical Oxygen Demand		102
	Chloride	,	918
	Chromium	_	0.04
	Chromium 6+		0.01
	Copper	<	0.001
ι .	Fluoride		6.6
100	Hardness (as CaCO ₃)		760
102	Iron		0.06
· · ·	Lead		0.002
	Magnesium		60
	Nickel		0.01
	pH Units		7.7
	Phenols		0.04
	Alkalinity, "M"		173
	Solids, Total Dissolved		2930
	Sulfate		8 85
	Sulfide		25.1
Control of the Contro	Zinc	_	Λ 1

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



CHEMICAL ANALYSES OF GROUND WATER AND SURFACE WATER
NEAR THE EVAPORATION LAGOONS
SAMPLES TAKEN 4/85



TO: Geo Sclence

Attn: Randy Hicks

500 Copper N.W. Suite 325

Albuquerque, NM 87102

DATE: 2 May 1985

0441 REVISED

ANALYTE

SAMPLE ID/ANALYTICAL RESULTS

Navajo Pt (2) 43 60

854110701

Navajo 49 854110721

Pecos River 854100910

TDS Benzene

14000.0 umhos/6m. 12564.0 mg/1 .<0.001 mg/1

8300.0 umhos/6m 7620.0 mg/1 <0.001 mg/1

 $9000 \cdot 0$ umhos/am 7314.0 mg/1 <0.001 mg/1

Navajo Pt 4)#2al 8504111037

Navajo Pecos River 854111120

Navajo Pedos River 854111135

EC TDS

4800.0 umhos/om 3852.0 mg/1 <0.001/mg/13

8220.0 mg/1

10000.0 umhos/om 10000.0 umhos/om 8782.0 mg/1 <0.001 mg/1 <0.001 mg/1

NOMINAL DETECTION LIMITS:

E C TDS 0.1 umhos/om l mg/1

Benzene

0.001 mg/1

REFERENCE: Standard Methods for the Examination of Water and Wastewater", 15th Edicion, APHA, N.74, 1980.

An involce for services is englosed. Thank you for contacting Assaigai Laboratories

Sinderely,

Jewnifer Vy. Smith, Ph.D. Laboratory Director



TO: GeoScience

Actn: Randy Hicks 500 Copper N.W. Suite 325

Albuquerque, NM 87102

DATE: 23 July 1985

0441

Sample ID

Navajo Pt 2 854110701

Navajo 9 854110721

854100910

Navajo Pt 4 8504111037

Navajo Peços River 854111120

Analysis of Chromatographs

No benzene or other hydrocarbons present

No benzene or other hydrogarbons present

No benzene or other hydrogarbons present

No benzene, coluene or etnyl benzene present; Xylenes masked by presence of apliphacis nydrocarbons

No benzene or other hydrogarbons present

Navajo Pegos River 854111135... No benzene or other hydrogarbons present

An involve for services is enclosed. Thank you for contacting Assaigat Laboratories.

Singerely.

ednifer W. Smith, Ph.D. Laboratory Director

science Itants, Ltd.	500 Copper Avenue N	CLIENI LAB	
	Albuquerque, New Mexico 87102 DATE	RECEIVED ANALYZED	
Wanana wa	WATER QUA	LITY ANALYS	
	Sample Location Pt # 2 by Date 4/11/85 Time 2005	ecos Collected	By I Henrit
	, , ., ,	G CONDITION	
	Samp. Type Well Water Color Class Odor/Taste Nove/Saline Water Level B'2/4" ACT F	pH Cond Temp low Rate	
	Datum Casing Top E	levation	
	Remarks on sampling and preser	•	uled 2 JOA's
	too small for reg, ha		
	EC 140,000 um/cm WATER	R CHEMISTRY	
[] Ca [] Mg [] K [] Na [] Si	1 liter plastic cool to 4° C	As	plastic HNO3 to pH 2 _mg/l [] Agmg/l _mg/l [] Semg/l _mg/l [] Femg/l _mg/l [] Mnmg/l _mg/l [] Hgmg/l OA bottles
		Benz wb	4
(use	_ 250 ml glass TOX mg/l 6.25 mg N _a SO ₄ if free Cl is present)	Pheno1	
	, ,	Gr A1	mg/l [] Gr Betmg/l
Remar	rks on Analyses:		
	CHAIN OF CUS		
Shipp	ped or delivered to lab by	Time	
	ereby certify that to the best of) were obtained to accordance er) sampling and analysis plan and are		
(Owne deliv	er) sampling and analysis plan and are very to the laboratory.	safely cont	tainerized and labeled for
Signar Addre	ature RECE	IVING LABOR	RATORY ASSAIGN
Attn:	All Samples received inta		
Date 1	Received 4-15-85 Time 10:10	amaged Any	

	·	
	00 Copper Avenue N	CLIENI
Su	uite 220 buquerque, New Mexico 87102	DATE RECEIVED
	baqasiqas, iisti moxiss si ist	DATE ANALYZED
	PT ZONMAP WATE	R QUALITY ANALYSIS
	To the state of th	
	Sample Location (Pt 4) Date 4/11/85 Time	~ 1000' SE of Pongs 37 Collected By Litertin
	SAN	MPLING CONDITIONS
	Samp. Type Well water	pH
	Color Turked Odor/Taste Fait HC	Cond <u>6600</u> Temp <u>75° C</u>
	Water Level 6'7.1/2"	Temp /s c Flow Rate Elevation
	Datum <u>pipe for</u>	
	Remarks on sampling and pr	reservation
		WATER CHEMISTRY
. /	EC 6/4 - 48,000	
[] Ca	1 liter plastic cool to 4° C mg/l [] HCO3mg/l	500 ml plastic HNO3 to pH 2 [] As mg/l [] Ag mg/l
[] Mg	mg/1 [] CO ₃ mg/1	[] Bamg/l
[] K [] Na	mg/l [] Clmg/l mg/l [] Fmg/l	
[] Si	$\frac{\text{mg/1}}{\text{mg/1}} = \frac{\text{mg/1}}{\text{mg/1}}$ $\frac{\text{mg/1}}{\text{mg/1}} = \frac{\text{mg/1}}{\text{mg/1}}$	
W 1027		Z_ VOA bottles
[] NO2	500 ml plastic H ₂ SO ₄ to pH 2	M Benz mg/1 Tolmg/1 SCAN Mg/1 SCAN Mg/1 Mg
[] NH4	mg/l [] TOCmg/l mg/l [] TKNmg/l	U UREA FORMALDEMINE
25	50 ml glass TOX mg/l	250 ml glass H3PO4 CuSO4mg/e
(use 6.2	25 mg NaSO4 if free	[] Thenotmg/ t
C1	is present)	
		[] Gr Almg/l [] Gr Betmg/l
Remarks	on Analyses:	•
	CHAIN O	OF CUSTODY
Shipped.	on delivered to leb by	$\mathcal{F}_{\mathcal{C}}$
Simpped	or delivered to lab by	Time
	y certify that to the best	of my knowledge water samples (amt/size
(Owner)	sampling and analysis plan and	dance with's lare safely containerized and labeled for
delivery	to the laboratory.	
Signature		RECEIVING LABORATORY ASSAIGAT
Address Attn:		
7 - T	All Samples received	intact.
Data Da	List samples missing	or damaged
nate Kece	eived 4-15-85 Time	JUI O MM

_		
eoscience onsultants, Ltd.	500 Copper Avenue N.(Suite 220 Albuquerque, New Mexico 87102	LAB DATE RECEIVED
	Albuquerque, New Mexico of 102	DATE ANALYZED
Muummau	WATE	R QUALITY ANALYSIS
	Sample Location <u>NAUALC</u> Date 4/11/25 Time 02	27 Collected By A Heurt
		IPLING CONDITIONS
i i	Samp. Type Color Odor/Taste Water Level Datum Guard Pipe Top	Temp /5°C Flow Rate
	Remarks on sampling and pr	reservation Bailed w/ cleaned
	PVC bailer	
		WATER CHEMISTRY
	mg/l [] CO ₃ mg/l mg/l [] Cl mg/l mg/l [] F mg/l	As
[] NH	14mg/1 [] TKNmg/1	M OKEH LOKUMENETING
(use	250 ml glass TOX mg/l 6.25 mg N _a SO ₄ if free Cl is present)	Theno1mg/1 - mg/e
_		◆ [] Gr Al mg/l [] Gr Bet mg/l
Remar	ks on Analyses:	
	CHAIN	F CUSTODY
Shipp	ed or delivered to lab by	Jantine Time
(Owne	reby certify that to the best) were obtained to accord	of my knowledge water samples (amt/size
Signat Addres Attn:	ture Too	RECEIVING LABORATORY ASSAKGA1
noull.	A11 C - 1 · · ·	

All Samples received intact.

List samples missing or damaged

Date Received 45 Jime 10:00 AN

eoscience sultants, Ltd.	500 Copper Avenue N.) Suite 220	CLIENI	
	Albuquerque, New Mexico 87102	DATE RECEIVED DATE ANALYZED	
Winner.	WATER	QUALITY ANALYSIS	
	Sample Location <u>Pecos Re</u> Date <u>4/11/25</u> Time 11.	ice, Al of Ponds	
	'	LING CONDITIONS	······································
	Samp. Type River Water Color Turbed	рН	
	Odor/Taste	Cond	
	Water Level Datum	Temp Flow Rate Elevation	
	Remarks on sampling and pre	servation	
			
	EC 100,000	ATER CHEMISTRY	
	$m_{\alpha}/1$ [] $H(\Omega)_{\alpha}$ $m_{\alpha}/1$	500 ml plastic HNO3 t mg/l [] Agmg/l [] Ag	ma/l
[] Mg [] K [] Na	mg/1 [] C1mg/1	[] Cdmg/l [] Fe _ [] Crmg/l [] Mn	mg/1 mg/1
ŢĮ St	img/1 [] SO ₄ mg/! OS <u>8782</u> mg/1 [] TSSmg/1	[] Pbmg/1 [] Hg _	mg/1
, ,	500 ml plastic HoSOA to pH 2	VOA bottles M Benz ND mg/l [] Tol	mg/1
[] NO [] NH	03mg/l [] TOCmg/l 44mg/l [] TKNmg/l	[] Xy1mg/1 [] SCAN	M OKEH FORMILDELTION
	_ 250 ml glass TOX mg/l	250 ml glass H ₃ PO ₄ CuSO Thenolmg/l	4mg/e
(use	<pre>6.25 mg NaSO4 if free Cl is present)</pre>		-
		[] Gr Almg/l [] Gr	Betmg/1
Remar	ks on Analyses:		
	CHAIN OF	CUSTODY	
Shipp	ped or delivered to lab by	r/ /	
	Date reby certify that to the best	Time	es (amt/size
) were obtained to accorder) sampling and analysis plan and	ance with	's
deliv	ery to the laboratory.	1	
Addre	ss	RECEIVING LABORATORY	41641
Attn:	All Samples received		
Date	List samples missing of Received 4-15-81 Time 0!		
	Assort and Live Comme		

Leoscience onsultants, Ltd.		CLIENI LAB DATE RECEIVED DATE ANALYZED
	WATER	QUALITY ANALYSIS
	Sample Location Pecca R	mer @ Pipline Crossing S Collected By of Henter
	• •	LING CONDITIONS
_		
	Color Slightly Tinhid Odor/Taste Water Level Datum	PH
-	Remarks on sampling and pre	servation Collected sample from
	Pear Rine, v 50' Sourstream	, ,
_		
		ATER CHEMISTRY
	X 1 1 1 1 1 1 1 1 1	500 ml plastic HNO3 to pH 2 As
=		[] Gr Almg/l [] Gr Betmg/l
Remai	rks on Analyses:	
- 1	CHAIN OF	
Shipp	ped or delivered to lab by	Juntu Time
	reby certify that to the best	of my knowledge water samples (amt/size
(Owned	very to the laboratory.	ance with's are safely containerized and labeled for \$\int A\$
	ature S	RECEIVING LABORATORY ASSA16A1
Attn:		intact
	All Samples received List samples missing of	or damaged
- Date	Received 4-15-85 Time	200 an

eoscience Consultants, Ltd.	500 Copper Avenue N	CLIENI ()
		DATE RECEIVED
		DATE ANALYZED
		QUALITY ANALYSIS
	Sample Location Decas K Date 4/1/85 Time 112	tollected By & Huntin
	SAMP	PLING CONDITIONS
	Samp. Type Ruer Water Color	pH Cond
_	Odor/Taste	Temp
	Water Level	Flow RateElevation
_	Remarks on sampling and pre	eservation
	, ,	
•		
		NATER CHEMISTRY
■ v	FC 100,000 1 liter plastic cool to 40 C	500 mT plastic HNO ₃ to pH 2
	$m_{\alpha}/1$ [] HCO_{α} $m_{\alpha}/1$	[As mq/1] Aq mq/1
[] Mg	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	[] Bamg/l [] Semg/l [] Cdmg/l [] Femg/l [] Crmg/l [] Mnmg/l
[] Na	mg/l [] C1 mg/l mg/l [] F mg/l mg/l [] S04 mg/l	[] Crmg/l [] Mnmg/l [] Pbmg/l [] Hgmg/l
• • •	S G S G S G S G S G S G S G S G S G S G S S	
	500 ml plastic H ₂ SO ₄ to pH 2	VOA bottles M Benz wy mg/l [] Tolmg/l
[] NO [] NH	3mg/l [] TOCmg/l 4mg/l [] TKNmg/l	[] Xy1mg/1 [] SCAN UREA FORMALDELY!
	250 ml glass TOX mg/l	250 ml glass H3PO4 CuSO4mg/e
(use	6.25 mg NaSO4 if free	[] (nenot ing/ i
	C1 is present)	
		[] Gr Almg/l [] Gr Betmg/l
Remar	ks on Analyses:	
<u></u>	CHAIN OF	CUSTORY
_		()
Shipp	ed or delivered to lab by	Time
I her	reby certify that to the best	of my knowledge water samples (amt/size
		ance withs are safely containerized and labeled for
deliv	ery to the laboratory.	A
		RECEIVING LABORATORY ASSAICAL
Addres Attn:		
	All Samples received in List samples missing of	
Date F	Received 4-15-85 Time	10:00 Am

APPENDIX C
PROPOSED CHANGES IN RCRA REGULATIONS

Dated: December 26, 1984
Valdas V. Adamkus,
Regional Administrator,
[FR Doc. 85–3330 Filed 2–8–85; 8:45 am]
BILLING CODE 6560-60-48

40 CFR Part 261 (WH-FRL-2776-3)

Hazardous Waste Management System; Identification and Listing of Hazardous Waste

AGENCY: Environmental Protection Agency.

ACTION: Notice of availability of data and request for comment.

SUMMARY: On November 12, 1980, the **Environmental Protection Agency** proposed to amend the listings of two of the hazardous wastes generated by the petroleum refining industry which the Agency promulgated in final form in that same issue of the Federal Register. EPA has collected additional information on these wastes and is making these data available for public comment. EPA also is clarifying that any final listing would apply only to wastes from primary wastewater treatment processes, and not to any wastes from secondary vastewater treatment such as sludges from biological oxidation.

pates: EPA will accept public comment on this notice until March 13, 1985.

ADDRESSES: Comments should be addressed to the Docket Clerk, Office of Solid Waste (WH-562), U.S.

Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460.

Communications should identify the regulatory docket "Petroleum Refining—Section 3001." The public docket for this

proposed rulemaking is located in Room

Agency, 401 M Street, SW., Washington.

S-212A, U.S. Environmental Protection

D.C. 20460, and is available for viewing from 9:00 a.m. to 4:00 p.m., Monday through Friday, except legal holidays.

FOR FURTHER INFORMATION CONTACT:

RCRA Hotline, toll-free at (800) 424–9346 or at (202) 382–3000. For technical information contact Robert Scarberry,

Office of Solid Waste (WH-562B), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, D.C., 20460,

SUPPLEMENTARY INFORMATION: .

I. Background

(202) 475-6725.

On May 19, 1980, as part of its final and interim final regulations lementing Section 3001 of RCRA, A published (in interim final form) a list of hazardous wastes (Subpart D of 40 CFR Part 261), which included five

wastes generated by the petroleum refining industry (§ 261.32, 45 FR 33123). Among the listed petroleum refining industry wastes were "Dissolved air flotation (DAF) float from the petroleum refining industry (K048)" and "API separator sludge from the petroleum refining industry (K051)." These wastes are generated as a result of primary treatment of wastewater from petroleum refineries. These particular listings were promulgated in final form in 45 FR 74884, November 12, 1980.

A rulemaking petition was submitted by Envirex, Inc. which argued that any petroleum refining sludge resulting from primary or secondary oil/solids/water separation would be similar in composition regardless of the equipment or method used in the separation step. After evaluating the rulemaking petition, the Agency proposed that the K048 and K051 listings be amended to read: "Secondary (emulsified) oil/solids/ water separator sludge in the petroleum refining industry" and "Primary oil/ solids/water separation sludge in the petroleum refining industry", respectively.

II. Availability of Data

Since the close of the comment period for the proposed amendment, the Agency has obtained additional data characterizing sludges from API separators and DAF units as well as sludges from other methods of primary wastewater treatment. The supplemental data obtained consists of metal and organic analyses which were performed on primary treatment sludges from the following sources:

- Storm runoff ponds
- Primary settling ponds
- Flocculation tanks
- Sumps
- Emulsion tanks
- Induced air flotation tanks
- Evaporation ponds
- Equalization ponds
- Clarifiers
- Cleaning chemicals pits
- Ponds with an oil skimmer

The sludges from these sources have levels of total chromium and lead similar to those levels which are characteristic of sludge from API separators and DAF units. In addition, the organic analyses on these primary wastewater treatment sludges, as well as organic analyses on the sludges from API separators and DAF units, indicate the presence of toxic organic constituents including benzene and

toluene at maximum concentrations of 4600 and 11,000 ppm, respectively. Benzo(a)pyrene, chrysene, and pyrene also are present in these sludges at maximum concentrations ranging from 600 to 1700 ppm.

Copies of these new data are available for public inspection in the RCRA Docket, Room S212A. Comments are solicited only on the new data. These comments must be received by EPA on or before March 13, 1985 to ensure their consideration.

III. Clarification of Scope of Listing

As described above, the Agency proposed to amend the descriptions of the K048 and K051 listings in response to a rulemaking petition submitted by Envirex, Inc. (See 45 FR 74893, November 12, 1980). The petitioner argued that the May 19 listing descriptions were under-inclusive since they were specific to particular types of equipment, namely the DAF and API separator. According to the petitioner, any petroleum refining sludge resulting from primary and secondary oil/solids/ water separation will be comparably composed regardless of the type of equipment used in the separation step. The petitioner pointed out that other processes such as induced air flotation, parallel plate flotation separators, and dual media filtration separators, perform the same function as the DAF and form a similar solids residue. Likewise, the API separator is only one of the many equipment types which function as a primary oil/solids/water separator (other processes producing similar sludges include corrugated plate separators, inclined plate separators, storm equalization lagoons, and ballast waterholding tanks).

After reviewing and evaluating the rulemaking petition, the Agency concluded that the listings should be modified to reflect the hazardous character of the wastes themselves, rather than the type of equipment or process generating the waste. The Agency has agreed that the May 19 listing was too narrow in specifying API separator sludge and DAF float, thereby omitting other petroleum wastes with similar compositions generated from processes and equipment other than API separators and DAF units. In the November 12, 1980 notice, the Agency proposed to adjust the scope of the K048 and K051 listings by amending the listing descriptions to those recommended by the petitioner: "Secondary (emulsified) oil/solids/ water separator sludge in the petroleum refining industry" and "Primary oil/ solids/water separation sludge in the

¹ Envirex, Inc. is a manufacturer of sewage, water and waste treatment, and water conditioning equipment for many uses, including applications in the petroleum refining industry.

petroleum refining industry," respectively.

Among other things, the comments received on the November 12, 1980 proposed amendment expressed confusion regarding the scope of the K048 listing. In particular, the commenters were uncertain of the Agency's definition of "Secondary (emulsified) oil/solids/water separator sludge". In regard to the K048 listing, the background listing document * specifies the latter of two consecutive primary wastewater treatment methods as secondary treatment (e.g., API separator followed by DAF). This use of the term secondary treatment is confusing because biological oxidation of wastewaters is commonly referred to as secondary wastewater treatment, as compared to primary wastewater treatment consisting of physical processes such as sedimentation, flocculation, flotation, and filtration. No discussion of sludge from biological treatment of wastewaters (e.g., activated sludge, trickling filters, etc.) is present in either the background listing document or the Envirex petition. Furthermore, neither of these documents includes sludges from physical oil/solids/water separation processes which follow biological treatment of wastewaters in the K048 listing. To clarify the scope of the K048 and K051 listings, therefore, the Agency intends to consolidate the listings to read, "Sludge from primary wastewater treatment in the Petroleum Refining industry" in a final rule action.3

List of Subjects in 40 CFR Part 261

Hazardous materials, Waste treatment and disposal, Recycling. Dated: February 5, 1985.

Jack W. McGraw,

BILLING CODE 6500-50-M

Acting Assistant Administrator.
[FR Doc. 85-3331 Filed 2-8-85; 8:45 am]

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

42 CFR Parts 4, 59a, 63 and 64

National Library of Medicine Programs

AGENCY: Public Health Service, HHS.

*The background listing document and the Envirex rulemaking petition are available in the public docket at the address cited above. **ACTION:** Notice of proposed rulemaking.

SUMMARY: The Public Health Service, HHS, proposes to revise the regulations for the programs of the National Library of Medicine. The proposed revisions would: (1) Permit the Regional Medical Libraries to recover part or all of the costs of providing photocopies of biomedical materials, (2) improve readability of the regulations, (3) update references to statutory authorities and uniform administrative requirements, and (4) revoke Part 63 (Trainceships) which is obsolete.

DATES: Written comments must be received on or before April 12, 1985.

ADDRESS: Comments should be sent to: NIH Regulations Officer, National Institutes of Health, Building 31, Room 3B03, 9000 Rockville Pike, Bethesda, Maryland 20205. All comments received are available to the public at the above address from 9:00 a.m. to 5:00 p.m., Monday through Friday, except on Federal holidays.

FOR FURTHER INFORMATION CONTACT: Lowell D. Peart, at the above address or (301) 498–4606.

SUPPLEMENTARY INFORMATION: On November 21, 1979, the Public Health Service published a notice of intent to develop regulations in the Federal Register (44 FR 66852) covering 42 CFR Parts 4, 59a, 63, and 64. These regulations, which all concern, in whole or part, the National Library of Medicine, were proposed for revision as part of the Department's efforts to simplify and update its regulations.

The regulations would be clarified and condensed by eliminating regulatory provisions that are obsolete or are already set forth in the HHS uniform requirements for the administration of financial assistance in 45 CFR Part 74.

The following substantive changes would be made.

 Section 59a.16(b)(2) of the proposed rules would liberalize the current § 59a.37(b)(2) to permit the Regional Medical Libraries receiving NLM support to charge reasonable fees: (1) For copies to recover expenses and (2) for such other expenses (other than free loan services) as may be appropriate. The present regulations explicitly prohibit Regional Medical Libraries from recovering costs for photocopying. Other than eliminating this prohibition, we are proposing no other new provisions related to cost recovery in these proposed rules. The Department is currently studying the NLM's fee setting policy. However, since NLM fee setting policies are not established through regulations, any recommendations

arising from the Department's study will not require a change to these regulations.

- Part 63 would be revoked because NIH no longer has general traineeship authority and the only remaining NLM program is unfunded with no expectation of being funded.
- Part 84 would be revised to eliminate reference to National Institutes of Health Training Grants, as that authority has been superseded by National Research Service Awards, which are covered in 42 CFR Part 66. Also, provisions such as § 64.7 which cover matters now governed by 45 CFR Part 74 would be removed. The reference to review by an advisory council in former § 64.3 has been removed because the programs which require it are no longer in the regulations and section 393 of the Public Health Service Act, which authorizes NLM training grants, does not require it.

The following statements are provided for the information of the public:

- 1. These regulations revise existing regulations to improve readability. remove obsolete provisions, and permit certain fees to be recovered. The economic impact of this is expected to be minor. For these reasons, the Secretary has determined that this rule is not a "major rule" under Executive Order 12291, and a regulatory impact analysis is not required. Further, these regulations will not have a significant economic impact on a substantial number of small entities, and therefore do not require a regulatory flexibility analysis under the Regulatory Flexibility Act of 1980.
- 2. Catalog of Federal Domestic
 Assistance number program affected by
 this proposed rule is:

13.879 Medical Library Assistance

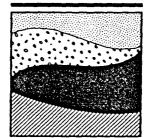
3. Sections 4.5, and 59a.4, 59a.14, 59a.16, 64.4, and 64.7 of these proposed rules contain information collection requirements. As required by Section 3504(h) of the Paperwork Reduction Act of 1980 [44 U.S.C. 3504(h)], we have submitted a copy of these proposed rules to the Office of Management and Budget for its review of these information collection requirements. Organizations and individuals desiring to submit comments on the information collection requirements should direct them to the agency official designated for this purpose whose name appears in this preamble, and to the Office of Information and Regulatory Affairs, OMB, New Executive Office Building (Room 3208), Washington, D.C. 20503, Attn: Desk Officer for HHS.

The Agency also is concerned, however, with econdary sludges from biological treatment of clinery wastewaters. To this end, we are currently evaluating these wastes as part of the petroleum refining industry studies program to determine whether they also should be listed as hazardous.

APPENDIX D

FEBRUARY 18, 1985 SUBMISSION TO NMOCD

Geoscience Consultants, Ltd.



February 18, 1985

Mr. Richard Stamets NMOCD P.O. Box 2088 Santa Fe. New Mexico 87501

Re: Effluent Flow and Chemical Characteristics of Waste Streams Regulated by Discharge Plan

Dear Mr. Stamets:

Navajo Refining Company, Inc. and Geoscience Consultants, Ltd. are pleased to submit our report on effluent characteristics. Our previous submission described the process at the Artesia Refinery and presented chemical data on many individual waste streams. Section 1.0-6.0 of the Discharge Plan also presented chemical analyses of the evaporation pond fluids which represent the best composite sample of the effluent streams.

In the initial meeting of September 17, 1984 it was decided that all waste streams which are disposed of in the evaporation ponds would be governed by this Discharge Plan. These streams are:

- o Effluent from the oil/water separator
- o Effluent from the water softener
- o Boiler blow down
- o Effluent from the oil recovery system
- Liquid effluent from the heat exchanger bundle cleaning area
- o Other liquid effluent which may be periodically discharged into the conveyance ditch

The chemical data on these waste streams were presented in Sections 1.0-6.0 of the Discharge Plan and are presented with this submission. Note that samples from the evaporation ponds were analised for benzene, toluene, xylene and ethylbenzene. Analyses of individual waste streams were included for information only. Regulatory decisions should consider the quality of the final effluent as characterized by analyses of the effluent flowing to the evaporation ponds.

The flow data is shown in the Table. At the present time no data are available for flow rates at the downstream end of the ditch.

If you or your technical staff have any questions about this submission please contact me at our Albuquerque office.

Sincerely, GEOSCIENCE CONSULTANTS, LTD.

Randall T. Hicks Vice President

RTH/mg

cc: Mr. Dave Griffin, Navajo Mr. Joel Carson, Losee, Carson, Dickerson M. David Boyer, NMOCD (2 copies)

WATER USAGE

	CITY	WELL	TOTAL
June, 1984	23,695 X 10 ³ gal	5,400x10 ³ gal	29,095,000 gal
July, 1984	19,799	5,015	24,814,000
August, 1984	24,073	5,400	29,473,000
Sept., 1984	20,509	6,170	26,679.000
Oct., 1984	15,936	10,030	25,966,000
Nov., 1984	12,042	17,745	29,787,000
Dec., 1984	12,213	20,445	32,658,000
Jan., 1985	13,887	14,659	28,546,000

EFFLUENT FLOW DATA

DATE	GPD	РН
6-6-84	342,720	12.0
6-7-84	361,440	12.5
6-8-84	361,440	11.0
6-9-84	361,440	13.0
6-11-84	361,440	12.0
6-12-84	Cleaning ditch north of the FCC	13.5
6-13-84	303, 384	11.0
6-14-84	342,720	13.0
6-15-84	342,720	13.5
6-18-84	342,720	9.5
6-20-83	361,440	9.0
6-21-84	342,720	9.0
6-22-84	342,720	10.0
6-23-84	381,440	9.5
6-25-84	361,440	8.5
6-26-84	342,720	9.0
6-27-84	419,040	9.5
6-28-84	380,160	10.5
6-29-84	361,440	11.0
6-30-84	380,160	11.5
7-2-84	342,720	12.5
7-3-84	342,720	10.0
7-5-84	342,720	9.5
7-6-84	380,160	9.5

DATE	GPD	РН
7-8-84	361,440	9.5
7-10-84	361,440	9.0
7-11-84	342,720	10.0
7–12–84	303,840	10.5
7–15–84	342,720	8.5
7–19–84	380,160	7.5
7-20-84	380,160	9.5
7-23-84	380,160	12.5
7-24-84	361,440	11.0
7–25–84	380,160	12.5
7–27–81	380,160	11.0
7–30–84	361,440	9.0
8-2-84	342,720	9.0
8-3-84	380,160	9.0
8-6-84	342,720	9.0
8-7-84	342,270	10.0
8-8-84	361,440	11.0
8-9-84	361,440	9.0
8-14-84	380,160	8.0
8-15-84	380,160	8.5
8-16-84	419,040	8.0
8-17-84	380,160	8.0
8-20-84	380,160	7.5
8-21-84	380,160	7.5
8–22–84	380,160	8.0

	ETTEGENT TEGN DITT	
DATE	GPD	РН
8-23-84	380,160	10.0
8-24-84	361,440	9.0
8-27-84	361,440	9.5
8-28-84 8-29-84	380,160 361,440	8.5 10.0
8-30-84	380,160	8.0
8-31-84	380,160	7.5
9-5-84	380,160	7.0
9-6-84	380,160	8.0
9-7-84	380,160	8.0
9-10-84	380,160	8.5
9-11-84	361,440	9.5
9-12-84	380,160	11.0
9-13-84	380,160	9.5
9-14-84	361,440	11.0
9-17-84	342,720	11.5
9-18-84	361,440	9.0
9-19-84	380,160	7.0
9-20-84	361,440	9.0
9-21-84	342,720	9.0
9-24-84	342,720	8.5
9-25-84	361,440	8.5
9-26-84	342,720	10.5
9-27-84	342,720	11.0
10-1-84	361,440	10.0
10-2-84	342,720	9.5

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10-8-84 361,440 8.0 10-9-84 342,720 9.5 10-11-84 342,720 10.5 10-12-84 342,720 10.0 10-15-84 361,440 11.5 10-16-84 419,040 7.5 10-17-84 398,880 8.5 10-18-84 398,880 7.5 10-19-84 419,040 7.5 10-22-84 398,880 10.5 10-23-84 419,040 8.5 10-25-84 398,880 9.0 10-29-84 419,040 8.0 10-30-84 398,880 9.5 10-31-84 398,880 9.5 11-1-84 398,880 9.0 11-2-84 342,720 8.0 11-2-84 380,160 5.5 11-6-84 303,384 4.0	10-4-84	342,720	11.0
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10-19-84 419,040 7.5 10-22-84 398,880 10.5 10-23-84 419,040 8.5 10-24-84 419,040 7.0 10-25-84 398,880 9.0 10-26-84 398,880 11.0 10-29-84 419,040 8.0 10-30-84 398,880 9.5 10-31-84 398,880 9.0 11-1-84 398,880 6.0 11-2-84 342,720 8.0 11-5-84 380,160 5.5 11-6-84 303,384 4.0	10-17-84	398,880	8.5
10-22-84 398,880 10.5 10-23-84 419,040 8.5 10-24-84 419,040 7.0 10-25-84 398,880 9.0 10-26-84 398,880 11.0 10-29-84 419,040 8.0 10-30-84 398,880 9.5 10-31-84 398,880 9.0 11-1-84 398,880 6.0 11-2-84 342,720 8.0 11-5-84 380,160 5.5 11-6-84 303,384 4.0	10-18-84	398,880	7.5
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10-24-84 419,040 7.0 10-25-84 398,880 9.0 10-26-84 398,880 11.0 10-29-84 419,040 8.0 10-30-84 398,880 9.5 10-31-84 398,880 9.0 11-1-84 398,880 6.0 11-2-84 342,720 8.0 11-5-84 380,160 5.5 11-6-84 303,384 4.0	10-22-84	398,880	10.5
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10-30-84 398,880 9.5 10-31-84 398,880 9.0 11-1-84 398,880 6.0 11-2-84 342,720 8.0 11-5-84 380,160 5.5 11-6-84 303,384 4.0	10-26-84	398,880	11.0
10-31-84 398,880 9.0 11-1-84 398,880 6.0 11-2-84 342,720 8.0 11-5-84 380,160 5.5 11-6-84 303,384 4.0 11-7-84 303,384 4.0	10-29-84	419,040	8.0
11-1-84 398,880 6.0 11-2-84 342,720 8.0 11-5-84 380,160 5.5 11-6-84 303,384 4.0 11-7-84 303,384 4.0	10-30-84	398,880	9.5
11-2-84 342,720 8.0 11-5-84 380,160 5.5 11-6-84 303,384 4.0	10-31-84	398,880	9.0
11-5-84 380,160 5.5 11-6-84 303,384 4.0	11–1–84	398,880	6.0
11-6-84 303, 384 4.0	11-2-84	342,720	8.0
11-7-84	11-5-84	380,160	5.5
11-7-84 303,384 7.5	11-6-84	303, 384	4.0
	11-7-84	303,384	7.5

DATE	GPD	РН
11-8-84	380,160	8.5
11-9-84	380,160	7.0
11-10-84	342,720	8.0
11-11-84	342,720	9.5
11-12-84	380,160	9.0
11-13-84	342,720	8.5
11-14-84	303,840	8.5
11-20-84	380,160	7.0
11-21-84	380,160	9.0
11-22-84	342,720	10.0
11-23-84	342,720	9.0
11-26-84	380,160	8.5
11-27-84	398,880	10.0
11-28-84	419,040	10.5
11-29-84	419,040	8.0
11-30-84	380,160	10.0
12-3-84	398,880	11.5
12-4-84	398, 880	10.5
12-5-84	380,160	13.0
12-6-84	419,040	9.0
12-7-84	398,880	8.0
12-10-84	380,160	6.5
12-11-84	419,040	11.5
12-12-84	398,880	9.0
12-13-84	419,040	9.0

DATE	GPD	РН
12-14-84	398,880	9.5
12-17-84	380,160	6.0
12-18-84	342,720	7.5
12-19-84	419,040	8.0
12-20-84	380,160	11.5
12-21-84	380,160	10.0
12-26-84	342,720	9.0
12-27-84	342,720	11.0
1-2-85	380,160	9.5
1-3-85	361,440	6.0
1-4-85	361,440	8.8
1-7-85	342,720	9.5
1-8-85	303,384	10.5
1-9-85	342,720	10.0
1–10–85	342,720	12.0
1–11–85	303, 384	9.0
1-14-85	342,720	10.0
1-15-85	303,384	8.5
1-16-85	380,160	6.5
1-17-85	342,720	7.5
1-18-85	361,440	8.5
1-21-85	361,440	7.0
1-22-85	342,720	7.0
1-23-85	342,720	8.0
1-24-85	419,040	6.5

DATE	GPD	РН
1-25-85	361,440	7.5
1-28-85	380,160	7.0
1-29-85	380,160	7.0
1-30-85	361,440	6.0
1-31-85	342,720	7.5
2-1-85	361,440	8.5
2-4-85	342,720	7.0
2-5-85	242,720	9.0
2-6-85	361,440	9.5

TABLE 5-2
CHEMICAL ANALYSES OF SELECTED WASTE
STREAMS AT NAVAJO REFINERY (AFTER BRANVOLD, 1984)
(VALUES IN MG/L EXCEPT WHERE NOTED)

MDCC 3-103 STANDARDS	CRUDE UNIT PROCESS (#4, #11, #13)	CAT. CRACKER PROCESS BEFORE SOUR WATER STRIPPER	SOUR WATER STRIPPER EFFLUENT (#17)	ALKY. NEUTRALIZING SEWER (#6)	ND & SD DESALTERS (#3, 49)
As					
Ea					
Cq					
Cr	<0.1	<0.1			
CN	(0.1		(0.1	7.8	i,
	••••	<0.1	<0.1	<0.1	<1.0
f	1.3	0.5			\1.V
fb		V.J	0.4	10.8	
Hg					
NO ₃					
Se					
Ag				•	
U				•	
CI					
Cu					
Fe	<0.1	3.9			
Kn	•	3.7	17.0	7.8	
SO ⁴					
TDS	805	2160			
Zn	(0.1	<0.1	560	2872	2524
рH	6.3	9.0	0.12	18.8	
Al		7.0	9.5	3.6	
F					
Co					
No					
Ni					\$ 5 € 1
Fhenols -	9.4	710	354		
TSS			250	0.26	
Cond.					
COD	1202	8379	1702	007.0	
NH4	78	2320	256	8670	600
S	64	180	7.7	(1	5.0
				1.4	<1.0

(

Table 5-2 (continued)

BOILERS

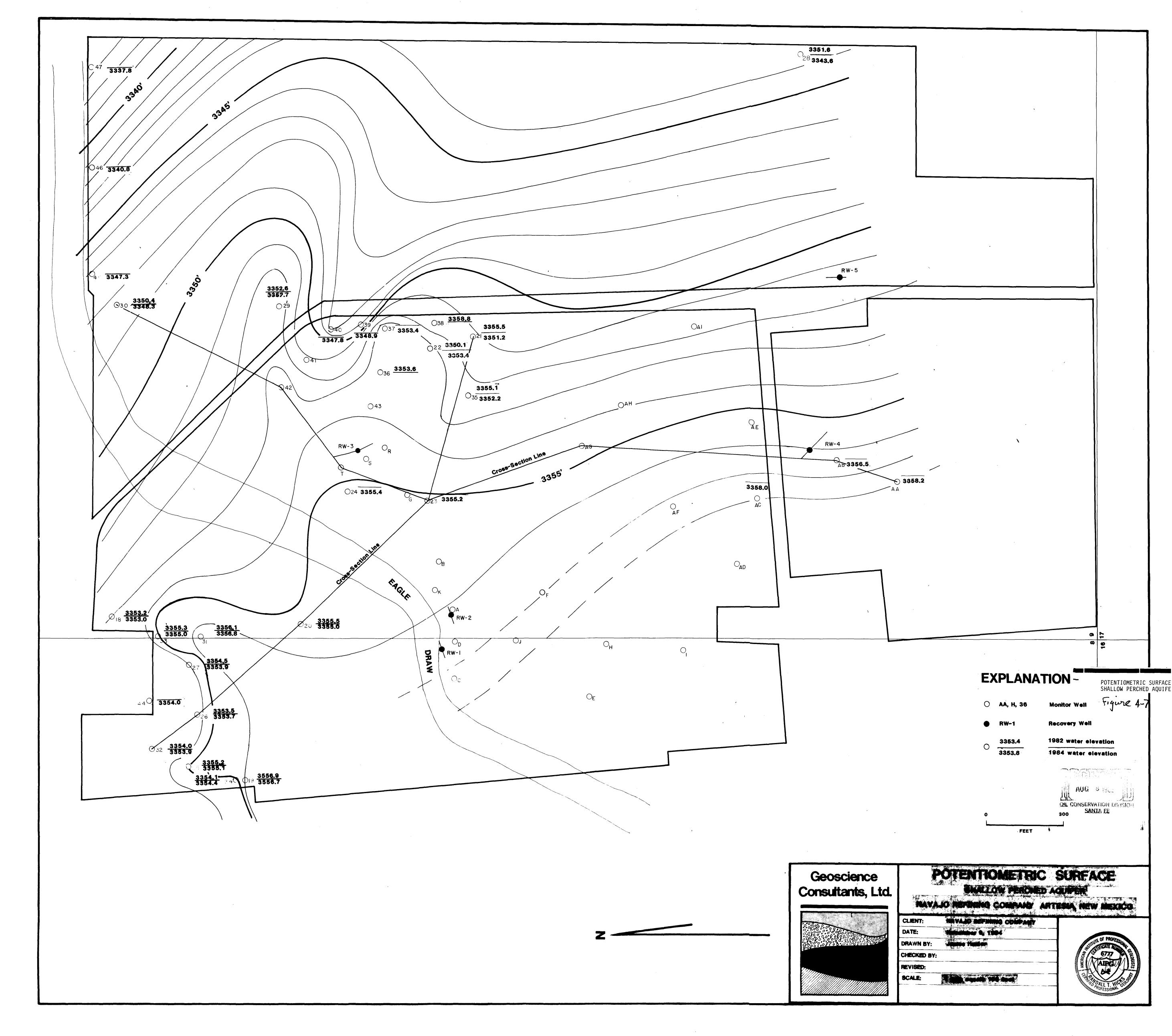
MGCC 3-103	S.D.	K. D.	N.D.
FARAMETERS	BOILER	НЭІН	
	BLONDOKN		FOK.
	2000000	PRESSURE	PRESSURE
	(#2)	BOILER	BOILER
		(#18)	(#12)
As	.004	.005	.003
Ba	<.1 · ·	(.1	<.1
Cd	<.01	(.01	<.01
Cr	<.05	<.05	<.05
CN	•		/.03
F	3. i	2.2	1.5
fb	.18	.14	.05
Hg		••.	• 47
KO2	.2	.1	45
Se		• •	.05
Ag	<.05	<.05	/ AE
U	<.05	<.05	<.05
C1	127	73	<.05
Cu	⟨.03	<.03	44
fe	1.9	0.65	(.03
Ka	.07	⟨.03	0.25
S0	1549	1242	<.03
TDS	4220	2873	693
Zn	.06	<.01	1807
ρН	11.6	11.6	(.01
AI	<1.0	<1.0	11.2
₿		11.0	<1.0
Co	<.01	.02	
flo	₹.5	.02 <.5	.01
Ni	⟨.05	<.05	<.5
Fhenols		7.03	<.05
TSS	20	0	•
Cond.	6000	5000	0
COD	116	0	2800
NH.		v	0
\$			

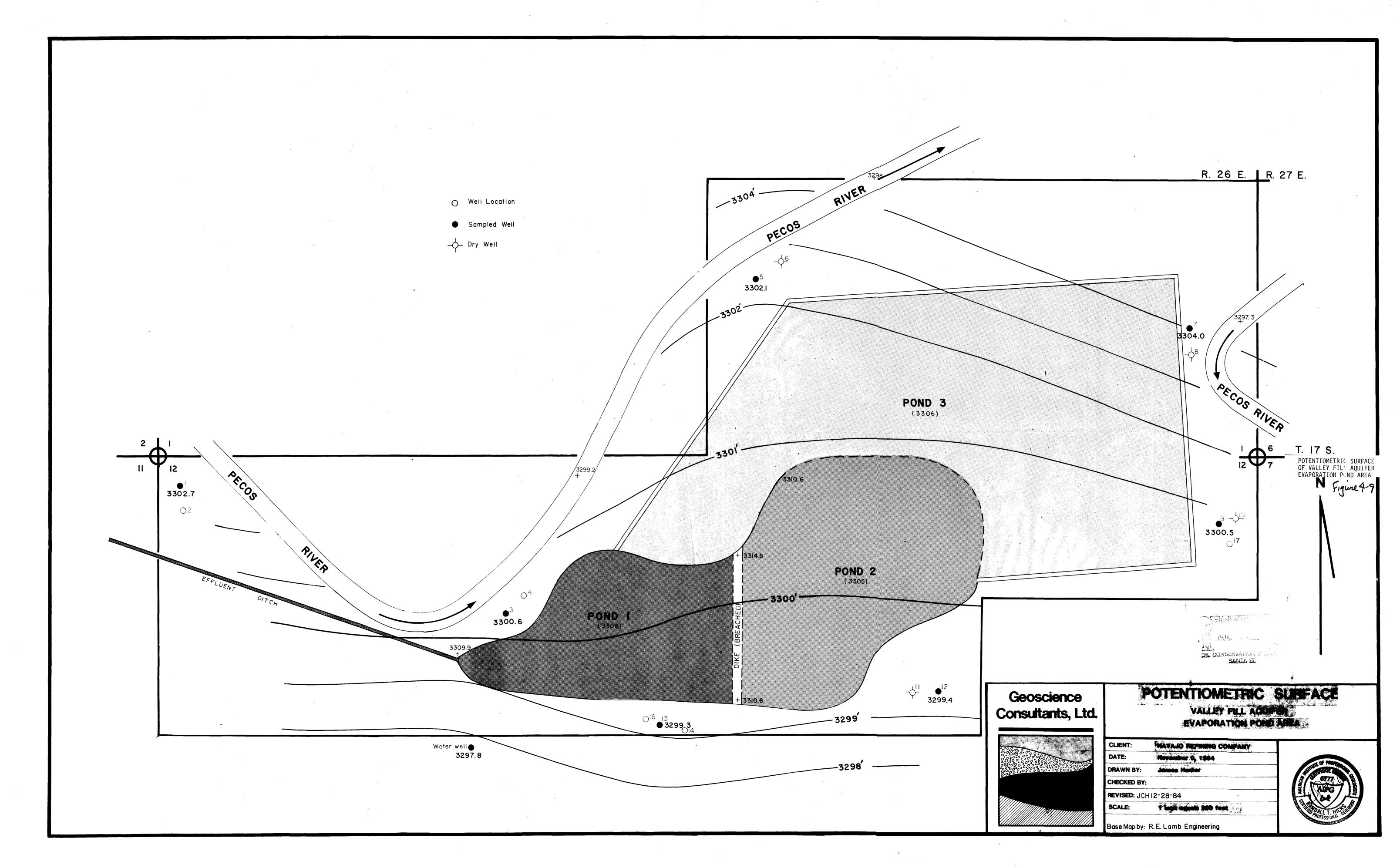
,

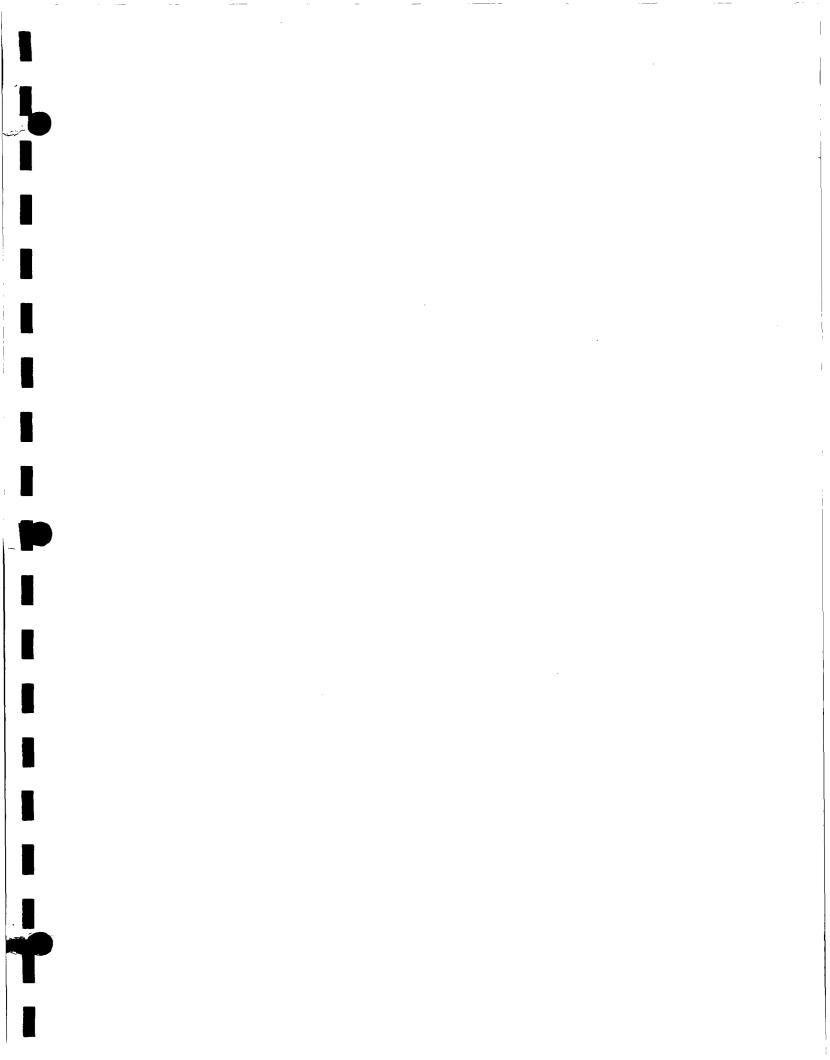
Table 5-2 (continued)

COOLING TOWERS

WQCC 3-103 Standards	N.D. COOLING TONER BLONDOWN	S.D. ALKY COOLING TOKER BLONDOWN	S.D. TCC COOLING TOKER	N.D. FCC COOLING TONER
	(#10)	(#1)	BLOWDOWN	BLOWDOWN (#16)
As	.004	<.001	•	
Ba	(.1	<.1	.011	.001
Cd	<.01		<.1	1.>
Cr	.06	<.01	<.01	<.01
CN	,	1.05	<.05	0.22
F	1.6	4.4		
Pb	.05	4.4	2.2	1.6
Hg		.05	₹.05	.05
N O ₃	.5	75		
Se	••	.75	. 2	-3
Ag	<.05	4 60		
บ	₹.05	<.05	<.05	<.05
Cl	48	(.05	<.05	<.05
Cu	⟨.03	53	44	47
Fe	.05	(.03	(.03	<.03
Mn	<.03	.5	<.05	<.05
SO	1077	.07	<.03	<.03
IDS4	1906	1461	1236	1067
In	.48	2732	1694	1973
pH	7.6	28	<.01	.17
Al	<1.0	6.9	7.7	8.0
B	11.0	(1.0	1.0	<1.0
Co	<.01			
Ko	⟨.5	.01	.02	.01
Ki	⟨.05	₹.5	<.5	⟨.5 .
Fhenols	1.03	<.07	<.05	<.05 🚚 🥕
TSS	13			•
Cond.	0	0	6?	c
COD	1850	(i	108	1800
NH.				15
-	0			







Geoscience Consultaats, Ltd.



HAND DELIVERED

March 5, 1985

Dave Boyer NMOCD P.O. Box 2088 Santa Fe, New Mexico 87501

RE: Responses to Comments:

Dear Mr. Boyer:

Please find enclosed our responses to several of your comments. We would like to discuss some of your comments with you prior to our submission of the final response.

Our responses, which follow the same numbering as your comments, are presented below. The effluent data is summarized in the attached report

If you have any questions regarding these responses let me know.

Sincerely, GEOSCIENCE CONSULTANTS, LTD.

Randall T. Hicks Vice President

Enclosure RTH/pg



RESPONSE TO NMOCD FEBRUARY 7, 1985 COMMENTS

DISCHARGE PLAN ISSUES

- 1) The attached letter of agreement assures that Navajo will comply with Section 1-203.A. of the WQCC regulations. A spill protection plan for the refinery is scheduled for submission on June 17, 1985.
- 2) We concur that the WQCC Regulations do not specifically exempt discharges regulated by RCRA or the New Mexico Hazardous Waste Regulations. However, it was never the intention of Navajo Refining Company to cover the RCRA regulated discharges under this discharge plan or any discharge plan. Our September 13, 1984 letter to Mr. Ramey included a preliminary outline for the discharge plan which provided for a brief description of the waste management systems regulated under RCRA. This discharge plan addresses only the discharges which are disposed in the evaporation ponds.

Enclosed is a copy applicable portions of of Navajo's RCRA Part B Application. We urge NMOCD to carefully examine this document to determine if this application meets or exceeds WQCC regulatory standards for the RCRA facilities at Navajo. Only one copy of the RCRA Part B application is enclosed. It is submitted for your information only and should not be considered part of this discharge plan.

- 3 and 4) Enclosed is a plan to conduct further hydrogeologic studies at the refinery area to determine if:
 - a) The water quality of Pecos Valley sand/silt aquifer is greater than 10,000 mg/l
 - b) Any potential leakage from the evaporation ponds will affect ground water with a concentration less than 10,000 mg/l.
 - c) The conveyance ditch has integrity and is protecting ground water

HYDROGEOLOGY

- 1) yes
- 2 and 9) Enclosed are <u>legible</u> copies of water well logs provided to Geoscience by the Roswell State Engineer's Office for the one mile perimeter around the refinery. Some of illegible sections of the well logs were, in fact, our own notes. These notes are now reproduced in the copies.
 - 3) Examination of the enclosed well logs will show that no wells for domestic industrial or agricultural purposes (for which data exist) had been completed in either the

Pecos Valley sand/silt aquifer or the shallow perched confined water bearing unit within the area covered by the well logs.

- 4) Kelly, V.C., 1971. Sec References Cited of Sections 1.0-6.0.
- 5) Enclosed is a completed copy of the U.S. Soil Conservation Service Soil Survey of Eddy County from which Figure 4-2 was derived. It is available at most SCS offices. All soil data are derived from Table 4 of this publication.
- 6) The Queen Formation dips slightly to the east and the depth to the top of the Queen will vary. Figure 4-3 of the discharge plan shows the depth to the top of the Queen.
- 7) Noted
- 8) The Bower sand is locally identified by the oil industry as the bottom water sand within the Seven Rivers Formation. The sand is discontinuous and is identified only in the subsurface. The cross section in the discharge plan (Figure 4-3) show the extent in this sand. The wells completed in this sand demonstrate that the ground water in this unit is under artesian pressure.
- 10) Logs for these monitor wells do not exist. Details of the product recovery system will be provided in the plans and specifications to the discharge plan.
- 11) Enclosed
- 12) All of the wells drilled in the refinery area exhibit artesian conditions. This is demonstrated in the lithologic logs which identify the water-bearing units. There are not enough data to determine the source of the demonstrated artesian head in the unit.
- 13) The anomalies may be due to monitor wells tapping different water-bearing units under slightly different pressure conditions.
- 14) Reserved
- 15) Enclosed
- 16) See enclosed plan for hydrogeologic studies.
- 17) The correct pond level for Pond # 3 is 3305. Levels will vary seasonally.

18 and 19) Reserved

20) To be provided

- 21) To be provided
- 22) Revised figure 4-9 (hand delivered to NMOCD on January 25, 1984) shows the location of well 16 north and west of well # 13. A log for well #16 is in our copy of Appendix A. An additional copy of this well log is found in the enclosure.
- 23) Map will be provided. Contingencies will be presented in the final discharge plan.

WATER QUALITY

- 1) These aquifers cannot be affected by the discharge due to the demonstrated artesian conditions in these units. We have provided detailed site specific water quality data on "ground water most likely to be affected by the discharge" (see 3-106.C.3, WQCC regulations). Regional water quality data for these artesian aquifers is available in several reports cited in the discharge plan.
- 2) See enclosed plan for further hydrogeologic studies
- 3) See enclosed plan for further hydrogeologic studies
- 4) "well water" should read "water well". It's location is given in figure 4-9. No completion data are available for this well.
- 5 and 6) Reserved
 - 7) Enclosed
 - 8) Addressed in February 25, 1985 submission

PLANT PROCESSES

- 1) No
- 2 and 4) Plans and specifications will be submitted to the NMOCD engineer (WQCC Regulations 1-202) after Discharge Plan Approval. Phosphates are used in the boilers. Steam generation should volatilize many organic species. All ground water quality data for the refinery area is given in the discharge plan.
 - 3) The TEL pond is not part of this discharge plan and is presently being closed under RCRA.
 - 5) To be provided
 - 6) Total chromium. The analyses for CN has not been repeated. The data is correct to the best of our knowledge.

- 7) Waste stream # 19 on Figure 5-2 should read #18. Unnumbered waste streams have not and will not be characterized.
- 8) No

DESCRIPTION OF HYDROGEOLOGIC STUDIES TO BE CONDUCTED AT NAVAJO REFINING COMPANY

EVAPORATION PONDS

In order to demonstrate that ground water with a TDS concentration of 10,000 mg/l or less will not be affected by potential leakage (discharges) from the unlined evaporation ponds, Navajo will demonstrate:

- 1) That the observed high TDS levels near the evaporation ponds are not a manifestation of a localized body of poor quality water.
- 2) That leakage will not result in exceedence of standards for any ground water in other areas or in other (lower) aquifers.
- 3) That high TDS ground water is a natural condition and not due to past practices of Navajo Refining Company.
- 4) That stream standards for the Pecos River will not be exceeded.

In order to make this demonstration the following tasks will be completed:

- Two well points will be installed down gradient and one monitor well up gradient from the evaporation ponds. If required a third drivepoint will be installed down gradient from the ponds.
- 2) Water from these wells will be analyzed for specific conductance and TDS.
- 3) The water level in the wells will be measured and the flow regime determined
- 4) Water samples from the Pecos River (at low flow) will be analyzed

Figure 1 shows the proposed location of 1-1/4 inch well points, the 4" monitor well and the Pecos River sampling points for this demonstration.

The existing wells in the area of the evaporation pond are fully adequate for monitoring the potential effects of the evaporation ponds on ground water. The new well shown in figure 1 will monitor the ground water up gradient from the ponds. This well program is consistent with the requirement for a demonstration under 3-109.C.1. The existing wells may not establish the precise direction of flow of ground water in the Pecos River Valley silt/sand aquifer because the heads could be affected by fluctuations of the river level. More widely-spaced well data are necessary to establish the regional flow directions. The flow direction will be established and are expected to demonstrate that ground water with less than 10,000 mg/l TDS cannot be affected by any discharge from the ponds.

A one well, two well point program will be initiated in March. A fully penetrating well (30-35 feet deep) adjacent to the existing, up gradient wells is should demonstrate the existence of a confining layer below the sand/silt aquifer and confirm the poor water quality above and below the confining layer. This well will also replace the existing up gradient well. Two well points will be completed down gradient from the ponds to specifically determine the ground water flow regime.

Sampling of the Pecos River will also be conducted during a low flow period (January-April) to demonstrate that past practices have not caused, and potential future wastewater disposal practices will not result in, an exceedence of stream (surface water) standards. The flow direction in the sand/silt aquifer must be established in order to determine if and where the ground water which flows beneath the ponds

discharges to surface water. It is at this ground water discharge point that surface water samples must be taken upgradient samples will also be analized.

The data from this task should corroborate the existing data and demonstrate that:

- 1) The water quality in the Pecos River Valley silt/sand is greater than 10,000 mg/l TDS and
- 2) Stream standards will not be exceeded due to to the wastewater disposal practices of Navajo

FIRE WATER PONDS

A well down-gradient from the fire water ponds to monitor potential effects of seepage from the pond is not necessary. The existing monitor wells demonstrate artesian conditions and potential pond leakage should not affect the discharge plan approval process.

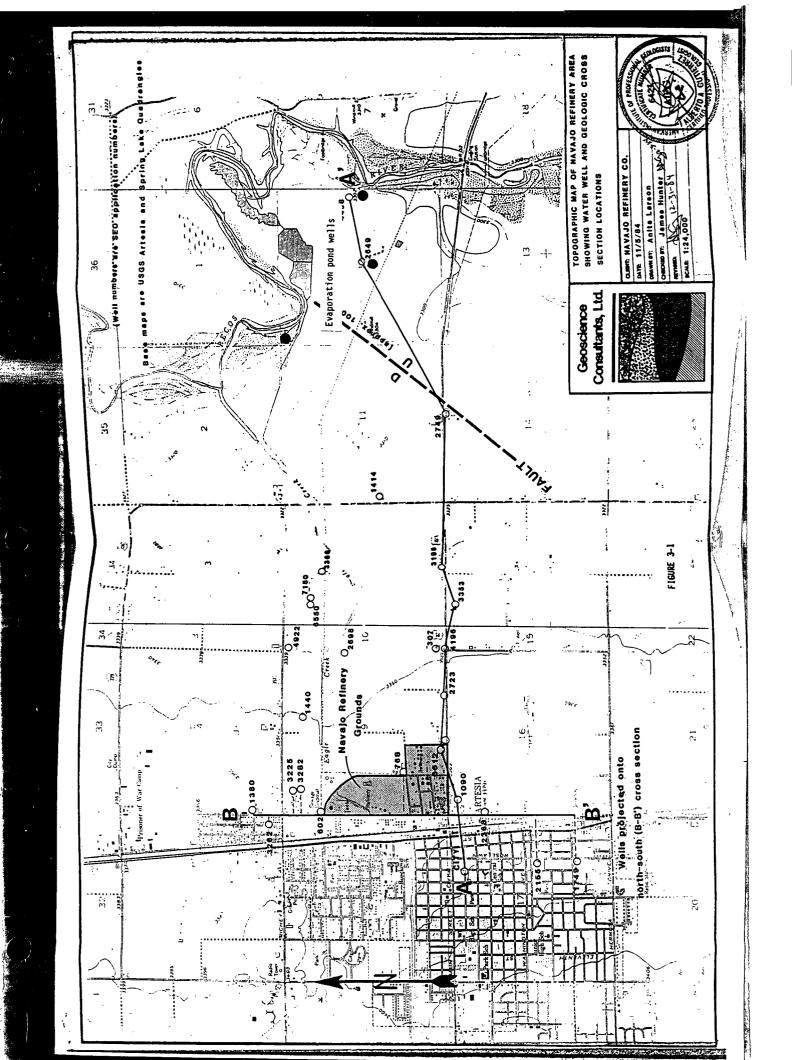


Table III-7
Sample Means for All Monitoring Parameters
Through Fourth Quarter

Parameter	<u>Unit</u>			ell Number	
		31	32	33	34
la d'antes		upgradient	downgradient	downgradient	downgradient
Indicator	Std Units	7.39	7.29	7.37	7.31
pH Socialist Conductors		2535	2753	3600	2143
Specific Conductance	umho/cm	2535 53	2753 57	140	42
Total Organic Carbon	mg/l				
Total Organic Halogen	mg/l	0.048	0.100	0.288	0.112
Total Dissolved Solids	mg/l	1776	2529	2711	1614
Groundwater Quality					
Chloride	mg/l	119	160	179	157
Iron	mg/l	0.43	0.18	0.56	0.55
Manganese	mg/l	1.35	0.40	0.30	0.26
PhenoIs	mg/l	0.002	0.005	0.001	0.002
Sodium	mg/l	88	37	41	. 101
Sulfate	mg/i	- 539	1034	1414	415
Primary Drinking Water		s.		<i>,</i>	
Arsenic	mg/I	0.005	0.005	0.005	0.009
Barium	mg/l	0.10	0.05	0.05	0.10
Cadmium	mg/I	0.0005	0.0005	0.0005	0.0005
Chromium	mg/l	0.0009	0.0014	0.0009	0.0015
Fluoride	mg/l	1.04	1.30	2.78	1.17
Lead	mg/l	0.0029	0.0030	0.0030	0.0036
Mercury	mg/l	0.06	0.06	0.06	0.11
Nitrate (as N)	mg/l	0.005	0.006	0.006	0.005
Selenium	mg/l	0.005	0.006	0.006	0.005
Silver	mg/l	0.005	0.005	0.005	0.005.
Endrin	mg/l	0.0001	0.0001	0.0001	0.0001
Lindane	mg/l	0.002	0.002	0.002	0.002
Methyoxychlor	mg/l	0.05	0.05	0.05	0.05
Toxaphene	mg/I	0.0025	0.0025	0.0025	0.0025
2,4-D	mg/I	0.05	0.05	0.05	0.05
2,4,5-TP Silvex	mg/I	0.005	0.005	0.005	0.005
Turbidity	Jackson Units	112	31	95	98
Coliform	col/100 ml	0.5	50	0.5	50,000

^{*}Note: When analytical result reported as less then detection limit, value assumed to be one half of detection limit.

Table III-3

North Colony Landfarm

First Quarter Groundwater Monitoring Results
(Sampled II-1-82 and I2-1-82)

Parameter	<u>Unit</u>		We	II Number	
***************************************		31 upgradient	32 downgradient	33	34 downgradient
Indiantar		opgradieni	downgradien i	downgi ddiein	downgradiem
Indicator pH	Std. Units	7.31*	7.41	7.41	7.30
Specific Conductance	umho/cm	254 5 *	2693	3590	2563*
•	mg/I	63*(49)	240(8)	625(14)	25(64)
Total Organic Carbon		0.042*	0.102	0.065	0.026
Total Organic Halogen	mg/l	1434	2014	2812	1684
Total Dissolved Solids	mg/l	1454	2014	2012	1804
Groundwater Quality					
Chloride	mg/l	89(105)	116(125)	163(170)	173(180)
Iron	mg/l	0.06	<0.01	<0.01	1.81
Manganese	mg/l	1.08	0.311	0.521	0.567
Phenois	mg/I	<0.001	<0.001	<0.001	<0.001
Sodium	mg/I	100(86)	35.4(36)	44.4(39)	88.5(92)
Sulfate	mg/l	423(540)	1049(1120)	1428(1310)	613(430)
	_				
Primary Drinking Water		•			
Arsenic	mg/l	<0.01	<0.01	<0.01	<0.01
Barium	mg/l	0.1	<0.1	<0.1	0.1
Cadmium	mg/l	<0.001	<0.001	<0.001	<0.001
Chromium	mg/l	<0.001	<0.001	<0.001	0.004
Fluoride	mg/l	1.15	1.28	2.70	1.28
Lead	mg/l	0.002	0.001	0.001	0.005
Mercury	mg/l	<0.0004	<0.0004	<0.0004	<0.0004
Nitrate (as N)	mg/l	0.1	0.1	<0.1	<0.1
Selenium	mg/l	<0.01	<0.01	<0.01	<0.01
Silver	mg/l	<0.01	<0.01	<0.01	<0.01
Pesticides & Herbicides	**	ND	ND	ND	ND
Radioactivity		samples no	ot analyzed due	to high TDS	
Turbidity	Jackson Units	75	40	30	190
Coliform	col/100 ml	1	200	I	200,000

^{*} average of four replicates

values in parentheses are the results of resampling (12-1-82) and reanalysis.

Table III-4
North Colony Landfarm
Second Quarter Groundwater Monitoring Results
(Sampled 2-24-83)

Parameter	<u>Unit</u>		We	II Number	
		31 upgradient	32 downgradient	33 downgradient	34 downgradient
Indicator		opgi daiei ii	downgradien	downgradiem	downgradiem
pH	Std Units	7.0	6.7	6.8	7.1
Specific Conductance	umho/cm	2135*	2300	3030	1900
Total Organic Carbon	mg/l	88 *	10	20	20
Total Organic Halogen	mg/I	0.038*	0.037	0.017	0.043
Total Dissolved Solids	mg/l	1810	3290	2790	1510
Groundwater Quality					
Chloride	mg/I	120	150	150	140
Iron	mg/l	0.88	0.09	0.30	0.03
Manganese	mg/l	1.5	0.439	0.234	0.260
Phenois	mg/l	0.006	<0.001	0.001	0.005
Sodium	mg/l	81	33	40	43
Sulfate	mg/I	690	990	1450	440
Primary Drinking Water	•			•	
Arsenic ·	mg/l	<0.01	<0.01	<0.01	<0.01
Barium	mg/l	0.2	<0.1	<0.1	1.0
Cadmium	mg/l	<0.001	<0.001	<0.001	<0.001
Chromium	mg/l	0.002	0.004	0.002	0.001
Fluoride	'mg/ l	1.3	1.7	3.5	1.4
Lead	mg/l	<0.001	<0.001	<0.001	<0.001
Mercury	mg/l	<0.0004	<0.0004	<0.0004	<0.0004
Nitrate (as N)	mg/l	<0.1	<0.1	<0.1	<0.1
Selenium	mg/I	<0.01	<0.01	<0.01	<0.01
Silver	mg/l	<0.01	<0.01	<0.01	<0.01
Pesticides & Herbicides		ND	ND	ND	ND
Radioactivity		samples no	t analyzed due	to high TDS	
Turbidity	Jackson Units	175	40	110	75
Coliform	col/100 ml	-1	1	.1	:1

^{*} average of four replicates

Table III-5
North Colony Landfarm
Third Quarter Groundwater Monitoring Results
(Sampled 7-14-83)

	<u>Unit</u>	21	20		
		31 upgradient	32 downgradient	33 downgradient	<u>34</u> downgradient
Indicator		opgi dalem	downiga duteriti	downgradieni	downgradiem
pH	Std Units	7.56*	7.59	7.46	7.47
Specific Conductance	umho/cm	3040*	3900	5100	2400
Total Organic Carbon	mg/I	37*	14	21	25
Total Organic Halogen	mg/l	<0.05*	0.184	0.748	0.336
Total Dissolved Solids	mg/i	2130	2730	3570	1680
Groundwater Quality					
Chloride	mg/l	130	200	200	140
Iron	mg/l	<0.01	0.32	0.74	0.09
Manganese	mg/I	0.814	0.335	0.165	0.085
Phenols	mg/l	_ <0.001	<0.001	<0.001	<0.001
Sodium	mg/l	86	37	40	61
Sulfate	mg/l	520	1000	1480	330
Primary Drinking Water					
Arsenic	mg/l	<0.01	<0.01	<0.01	-0.01
Barium	mg/l	0.1	<0.1	<0.1	0.1
Cadmium	mg/l	<0.001	<0.001	<0.001	<0.001
Chromium	mg/l	<0.001	<0.001	<0.001	<0.001
Fluoride	mg/l	0.82	1.1	2.5	1.0
Lead	mg/l	0.003	0.003	0.005	0.003
Mercury	mg/l	<0.0004	<0.0004	<0.0004	<0.0004
Nitrate (as N)	mg/l	<0.1	<0.1	0.1	0.3
Selenium	mg/l	<0.01	<0.01	<0.01	<0.01
Silver	mg/l	<0.01	<0.01	<0.01	<0.01
Pesticides & Herbicides		ND	ND	ND	ND
Radioactivity		samples no	ot analyzed due	to high TDS	
Turbidity	Jackson Units	75	40	220	40
Coliform	col/100 ml	1	i	i	1

^{*} average of four replicates

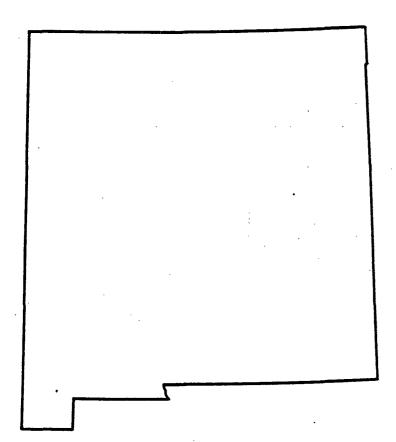
Table III-6
North Colony Landfarm
Fourth Quarter Groundwater Monitoring Results
(Sampled 10-3-83)

		•	•		
<u>Parameter</u>	<u>Unit</u>		W	ell Number	,
		31	32	33	34 downsradiont
la 4° a = 4 a a		upgradient	downgradient	downgradient	downgradient
Indicator	Ca J-1 1-24-	7.40	7 //	7 02	7 3/
pH	Std Units		7.44	7.82	7,36
Specific Conductance	umho/cm	2076	2120	2680	1710
Total Organic Carbon	mg/l	26*	12	20	75
Total Organic Halogen	mg/l	0.063*	0.077	0.321	0.044
Total Dissolved Solids	mg/l	1730	2050	1670	1580
Groundwater Quality					
Chloride	mg/l	150	210	210	150
Iron	mg/l	0.77	0.30	1.2	0.28
Manganese	mg/l	1.99	0.502	0.272	0.115
Phenols	mg/l	<0.001	<0.001	<0.001	<0.001
Sodium	mg/l	[*] 85	43	44	62
Sulfate	mg/l	520	1010	1400	260
Primary Drinking Water					
Arsenic	mg/i	<0.01	<0.01	<0.01	0.02
Barium	mg/l	<0.1	<0.1	<0.1	<0.1
Cadmium	mg/l	<0.001	<0.001	<0.001	<0.001
Chromium	mg/l	<0.001	<0.001	<0.001	<0.001
Fluoride	mg/I	0.9	1.1	2.4	1.0
Lead	mg/i	0.006	0.006	0.007	0.006
Mercury	mg/l	<0.0004	<0.0004	<0.0004	<0.0004
Nitrate (as N)	mg/l	<0.1	<0.1	<0.1	<0.1
Selenium	mg/l	<0.01	0.01	0.01	<0.01
Silver	mg/l	<0.01	<0.01	<0.01	<0.01
Pesticides & Herbicides		ND	, ND	ND /	ND
Radioactivity		samples no	ot analyzed due	to high TDS	
Turbidity	Jackson Units	123	26	19	88
Coliform	col/100 ml	1	1	1	1

^{*} average of four replicates



Water Resources Data New Mexico Water Year 1982



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT NM-82-1 Prepared in cooperation with the State of New Mexico and with other agencies

RIO GRANDE BASIN

08396500 PECOS RIVER NEAR ARTESIA, NM (Surveillance program station)

LOCATION.--Lat 32°50°27°, long 104°19°23°, in NWiNWi sec.18, T.17 S., R.27 E., Eddy County, Hydrologic Unit 13060007, on left bank 250 ft (76 m) upstream from bridge on State Highway 83, 4.3 mi (6.9 km) east of Artesia, 7.0 mi (11.3 km) upstream from Rio Penasco, 17 mi (27.4 km) upstream from McMillan Dam, and at mile 503.9 (810.8 km). Prior to Apr. 3, 1981, at site 250 ft (76 m) downstream.

DRAINAGE AREA.--15,300 mi2 (39,630 km2), approximately (contributing area).

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.—September 1905 to June 1909, August 1909 to current year. Monthly discharge only for some periods, published in WSP 1312 and 1712. Records for Aug. 22-31, 1934, and October 1936 to April 1937, published in WSP 763 and 828, respectively are not reliable and should not be used. Prior to February 1936, published as "near Dayton."

REVISED RECORDS.--WSP 1312 and 1512: 1913, 1915, 1917-18(M), 1920, 1923, 1931-36. WSP 1712: 1906(M), 1908-11(M), 1919, 1921-23(M), 1929, 1931-32(M), 1935-36(M), 1937, 1939(M), 1941(M). See also PERIOD OF RECORD.

GAGE.—Water-stage recorder. Datum of gage is 3,291.92 ft (1,003.376 m) National Geodetic Vertical Datum of 1929.

See MSP 1923 or 2123 for history of changes prior to Apr. 5, 1941. Apr. 5, 1941 to Apr. 2, 1981, water-stage recorder at site 250 ft (76 m) downstream at same datum.

REMARRS.--Water-discharge records fair. Flow regulated by Santa Rosa Lake (station 08382810) since Arpil 1980, by Lake Sumner (station 08384000) since August 1937, and by Two Rivers Reservoir (station 08390600) since July 1963. Diversions and ground-water withdrawals for irrigation of about 154,000 acres (620 km²), 1959 determination, above station.

AVERAGE DISCHARGE.--46 years, 244 ft3/s (6.910 m3/s), 176,800 acre-ft/yr (218 hm3/yr).

EXTREMES FOR PERIOD OF RECORD.—Maximum discharge probably occurred May 30, 1937, when a discharge of 51,500 ft³/s (1,460 m³/s) was measured by slope-area method at a point 15 mi (24.1 km) upstream, gage height, 14.7 ft (4.48 m), site and datum then in use; no flow at times in 1934, 1946-47, 1953-54, 1957, 1964-65.

EXTREMES OUTSIDE PERIOD OF RECORD.—Greatest flood since at least 1893 occurred Oct. 2, 1904, discharge not determined; the peak inflow to Lake McMillan, which includes Rio Penasco and Fourmile Draw, was estimated at 82,000 ft³/s (2,320 m³/s). The second highest flood occurred July 25, 1905, discharge below Rio Penasco, 50,300 ft³/s (1,420 m³/s), based on gain in storage and spill from Lake McMillan. The floods in August 1893and October 1904 damaged McMillan Dam and washed out Avalon Dam.

EXTREMES FOR CURRENT YEAR.—Maximum discharge, 2,070 ft 3 /s (58.6 m 3 /s) at 2230 hours Sept. 15, gage height, 10.15 ft (3.094 m) from floodmarks, no other peak above base of 2,000 ft 3 /s (57 m 3 /s); minimum, 1.3 ft 3 /s (0.037 m 3 /s) Sept. 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982 PEAN VALUES

DAT	CCT	MOY	DEC	JAN	FEB	MAR	APR	PAY	AUL	JUL	ALG	SEP
1	56	96	59	23	58	. 49	23	885	.24	70	25	2.1
1 2 3	53	95	62	53	57	49	24	84.3	19	55	30	1.3
3	87	88	62	23	56	48	24	754	16	154	37	4.9
4	57	83	62	53	56	42	25	517		483	57	129
5	95	77	62	52	56	40	25	246	11	537	87	564
6 7	117	92	é Z	51	56	39	24	177	10	620	56	654
7	109	104	- 62	51	56	39	23	143	11	760	34	684
8	269	93	62	51	56	40	24	117	6.6	740	32	713
8 9	182	83	61	51	55	41	24	1Ce	7.3	800	22	744
.10	104	71	¢C	30	56	40	22	58	7.7	930	18	750
11 12	168	67	éC	50	59	38	26	21	6.4	920	15	758
12	153	64	6 C	50	59	36	27	ćó	11	8 8 C	3.3	755
13	127	64	4C	\$C	. 59	39	25	58	7.5	1160	6.C	769
14	107	64	- 6 C	50	. 58	41	28	30	3.5	900	6.0	842
15	95	65	- 60	115	5,8	39	26	51	5.3	911	5.6	973
16	88	65	40	120	59	35	550	50	5.7	900	6-C	1240
17	· 78	64	59	126	59	35	662	48	13	878	6.5	966
18	73	60	58	110	55	36	715	38	8.6	849	5.5	710
19	71	55	58	62	51	35	752	35	9.2	798	6_C	324
20	69	58	58	64	49	34	805	35	E.1	549	4.0	454
21	67	58	57	. 69	49	32	832	26	18.3	190	4.5	307
22	67	59	56	77	49	31	35C	22	8.1	146	3.5	256
23	72	56	55	-€ 9	48	32	875	19	14	106	3.5	203
24	60	54	55	fo	48	29	965	20	11	87	4.0	181
25	åé	53	54	78	49	26	385	27	£.6	92	4.0	166
26	97	53	54	74	49	25	502 :	25	€.9	55	7.0	165
27	. 101	50	54	69	49	25	818	27	E.0	3.6	30 (148
26	94	52	54	65	49	26	812	3.5	£.9	39	35	128
29	102	54	53	61		24	815	36	7.8	31	20	99
3C 31	103	56	53	60		21	77C	29	12	25	10	82
31	93		53	58		50	•••	25		22	7.0	
TCTAL	3180	2053	1805	2095	1518	1086	12345	4685	305.5	14665	594.5	13772.3
MEAR	163	65.4	58.2	67.6	54.2	35.0	412	151	16.2	473	19.2	459
MAX	269	104	62	150	59	49	965	865	24	1100	£7	1240
MIN	53	5 C	53	50	4.6	50	22	19	5.3	5.2	3.5	1.3 2732G
AC-FT	6310	· 407C	358C	41eC	3010	215C	24490	925C	600	2909C	1180	2732G

A -- -- --

CAL YR 1981 TGTAL 33C69.8 PEAN 90.6 MAX 788 MIN 3.C AC-FT 6559C MTR YR 1982 TGTAL 581C4.3 MEAN 159 MAX 1240 MIN 1.3 AC-FT 1152DC

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. °C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982 ONCE-DAILY
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL DAY 11200 11900 6400 10000 8510 11200 11300 8890 5300 6190 9170 10100 10100 11200 16900 1600 5780 4600 13 14 9900 10200 11800 5340. 18700 1180 7630 1100 1110 >690 11800 9.240 22 10.00 12300 25 27 ອເລຣີ 9120 10000 7460 MEAN MIN WTR YR 1982 MEAN MAX

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. °C), RECORDER MAXIMUM, MINIMUM, AND MEAN, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

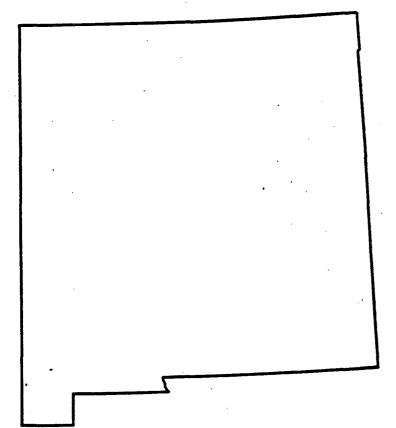
DAY	MAX	MIN	Mean	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		PEBRUARY	•		MARCH			APRII	. .		MAY	
1							14800	13000	14000			
1 2 3 4 5							14800	12700	13400			
							14400		· 13300			
ă							14400	12500	13400			
- 2							14300	12200	13200			
3							74300	12200	13200			
6							13100	12100	12500			
7							13400	12100	12700	•		
8							14000	11800	12700			
9							13500	11700	12400			
6 7 8 9 10							12700	10800	11700			
							12700	20000	22.00			
11							12100	10400	11200			
12							11400	10000	10800			
13							10700	2600	9710			
14							10100	2100	9400			
15							10700	2500	8920	•		
13							10/00	2500	8920			
16							9000	4370	5870			
17							4310	3790	4020			
18							3820	2850	3560			
19							2940	2700	2810			
20							2780	2690	2730			
			•				2,00	2070	2.50			
21							2720	2580	2660			
22							2640	2560	2590			
23							2580	2550	2560			
24							2710	2540	2610			
25			•				2790	2570	2680			
								-3.4		*		
26							2700	2580	2620			
27												
28												
29												
30												
31												
MONTH							14800	2100	8230			
C1444 4 51												-



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Water Resources Data New Mexico Water Year 1983

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U.S. GEOLOGICAL SURVEY WATER-DATA REPORT NM-83-1 Prepared in cooperation with the State of New Mexico and with other agencies

08396500 PECOS RIVER NEAR ARTESIA, MM (Surveillance program station)

LOCATION. -- Lat 32°50'27", long 104°19'23", in NWkNWk sec.18, T.17 S., R.27 E., Eddy County, Hydrologic Unit 13060007, on left bank 250 ft upstream from bridge on State Highway 83, 4.3 mi east of Artesia, 7.0 mi upstream from Rio Penasco, 17 mi upstream from McMillan Dam, and at mile 503.9.

DRAINAGE AREA. -- 15,300 mi², approximately (contributing area)

WATER-DISCHARGE RECORDS

PERIOD OF RECORD. -- September 1905 to June 1909, August 1909 to current year. Honthly discharge only for some periods, published in WSP 1312 and 1712. Records for Aug. 22-31, 1924, and October 1936 to April 1937, published in WSP 763 and 828, respectively are not reliable and should not be used. Prior to February 1936, published as "near Dayton."

REVISED RECORDS.--WSP 1312 and 1512: 1913, 1915, 1917-18(H), 1920, 1923, 1931-36. WSP 1712: 1906(H), 1908-11(H), 1919, 1921-23(H), 1929, 1931-32(H), 1935-36(H), 1937, 1939(H), 1941(H). See also PERIOD OF RECORD.

GAGE.--Water-stage recorder. Datum of gage is 3,291.92 ft National Geodetic Vertical Datum of 1929. See WSF 1923 or 2123 for history of changes prior to Apr. 5, 1941. Apr. 5, 1941 to Apr. 2, 1981, water-stage recorder at site 250 ft downstream at same datum.

MRKS.--Records fair. Flow regulated by Santa Rosa Lake (station 08382810) since April 1980, by Lake Summer (atation 08384000) since August 1937, and by Two Rivers Reservoir (station 08390600) since July 1963. Biversions and ground-water withdrawals for irrigation of about 154,000 acres, 1959 determination, above

AVERAGE DISCHARGE. -- 47 years, (1937-83), 243 ft3/s, 176,100 acre-ft/yr.

3

1

SITEMES FOR PERIOD OF RECORD. -- Maximum discharge probably occurred May 30, 1937, when a discharge of 51,500 ft 3/s was measured by slope-area method at a point 15 mi upstream, gage height, 14.7 ft, site and datum then in use; so flow at times in 1934, 1946-47, 1953-54, 1957, 1964-65.

determined: the pesk inflow to Lake McHillan, which includes Rio Penasco and Fourmile Draw, was estimated at 82,000 ft /s. The second highest flood occurred July 25, 1905, discharge below Rio Penasco, 50,300 ft /s, based on gain in storage and spill from Lake McHillan. The floods in August 1893 and October 1904 damaged McHillan Dam and washed out Avalon Dam. EXTREMES OUTSIDE PERIOD OF RECORD .-- Greatest flood since at least 1893 occurred Oct. 2, 1904, discharge not

EXTERMES FOR CURRENT YEAR. -- Hamimum discharge, 895 ft 3/s Hay 16, gage height, 6.59 ft, no peak above base of 2,000 ft 3/s; minimum, 0.17 ft 3/s Aug. 21.

DISCHARGE, IN CUBIC FEET PEP SECOND, WATER TEAR OCTOBER 1982 TO SEPTEMBER 1983 MEAN VALUES

_				•				•			*	
DAT	OCT	ROA	DEC.	JAH	TEB	MAR	AFR	TAM	JUM	JUL	AUG	SEP
1	73	71	73	63	61	45	26	14	74	7.9	98	363
2	202	66	68	62	60	48	22	20	77	50	96	405
ā	645	62	69	59	59	47	24	21	75	24.2	92	440
Ā	429	59	66	65	58	46	29	24 .	68	591	90	492
Š	231	51	62	64	- 60	42	32	23	45	630	76	458
-			٧.	• •	•	~-			42	737	,,	450
6	193	58	56	64	62	38	33	189	38	716	56	487
7	157	57	57	64	68	40	44	544	34	730	33	518
8	129	61	55	65	68	37	47	637	31	740	26	521
•	113	55	56	68	66	. 35	53	685	28	760	26	746
10	97	49	61	68	63	34	64	721	26	750	19	727
11	88	49	62	. 69	62	34	69	7 29	22	742	13	656
12	74	51	73	69	61	34	68	750	16	760	10	690
ii	69	53	73 73	69	60					780		
14	62	53 52	72	65	58	34	58		13		11	683
15						34	51	825	15	803	11	622
4.7	62.	51	74	62.	57	34	50	872	18	792	10	614
16	· 78	46	74	61	56	31	58	873	17	860	12	614
17	77	44	68	. 60	51	27	56	822	15	843	8.0	607
18	77	46	67	39	48	28	39	816	14	837	5.8	595
19	78	47	64	58	46	27	31	839	12	819	5.7	600
20	81	47	62	58	46	27	23	794	11	806	5.4	5,27
21	81	47	60	61	45	27	. 20	802	11	818	4.7	4 24
22	78	47	38	. 64	45	29	19	796	15	802	5.3	219
23	74	45	58		45	25						
24	72			65 69			21	715	11	832	5.5	166
25	70	44	58		45	23	21	313	9,0	815	4.7	135
••	70	43	56	70	46	24	23	203	9.0	821	5.1	100
26	72	43	36	70	46	29	23	, 153	10	8 2 9	6.7	88
27	75	50	59	70	44	32	15	109	20	839	8.1	76
-11	78	57	57	69	43	33	15	92	10	720	7.4	74
29	78	64	57	66		34	15	81	13	500	5.6	74
10	73	77	65	63	***	31	12	71	10	202	65	75
31	71		61	61		30		69		119	302	
TAL	38 37	1592	1959	2006	1531	1039	1061	14400	767.0	20555.9	1124.0	12798
TIAN	1.24	53.1	63.2	64.5	54.7	33.5	35.4	465			36.3	4 27
*41	645	33.1 77		70	68			873	25.6	663 860	30.3 30.2	746
*is	62	43	74			48	69		77 9.0	7.9		74
4:- 77			33	58 3970	43	23 2060	12	- 14 28560		40770	4.7 2230	25380
-	7610	3160	3890	3970	3040	2000	2100	10300	1520	40770	4430	72300
TAN YR	1982 TOTAL	38451.3	HEAR	160 MAX	1240	MIN 1.3	AC-FT	115900				
old All	1983 TOTAL	62663.9	HEAR	172 HAX	873	MIN 4.7	AC-FT	1 24 300				

SFECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983 ONCE-DAILY DAY OCT ROA DEC MAL PEB MAR APB MAT TUM JUL AUC SEP 5000 6070 10200 13200 1890 7160 8520 8540 12300 14500 4830 2940 2180 2720 3990 6180 6900 8230 8530 10100 12500 14400 5190 13300 2830 6230 13400 1940 6830 8660 **B720** 9890 13200 13300 11900 5330 5060 2300 1530 6720 6900 8430 8700 10300 10900 1590 5 1680 6800 6830 8450 8700 10400 10900 10700 4810 17600 2900 1520 1860 7190 6070 6890 8260 8580 10400 9950 11000 1120 1980 71.40 7200 7330 8410 8550 10800 10200 4020 6470 6470 15300 3940 1090 2270 6760 8290 3670 1280 4680 10900 9120 8280 1060 5660 2710 6880 7540 8580 8430 11200 9470 3090 6960 1250 1100 10 2740 6890 8230 8110 8410 11300 9890 3040 7950 1170 5140 1160 4060 7210 8050 8360 11300 9710 2920 8160 1150 5970 1050 7380 8050 8580 8740 11400 9640 2920 8890 6770 997 12 4630 7460 5280 5480 7310 7560 7480 11500 11700 9500 13 7950 8460 2890 9920 1130 1010 14 7450 8080 8790 8440 2850 8820 11900 1100 981 15 1060 5890 7670 7330 7940 8800 11600 8800 2940 10500 8660 1050 16 17 5590 1070 7670 6970 7960 9000 11700 8660 2870 10300 1060 9000 9490 9770 9840 9260 11700 12800 7790 5380 6940 8550 12100 8270 2690 1170 9020 1090 5280 5220 7870 7900 7080 7300 8530 8780 12400 12400 8620 9310 2630 2450 1010 960 8110 9160 1090 1110 19 20 9970 12400 13000 980 8950 1080 5210 8320 7550 8870 2430 21 4940 8740 9920 12700 10800 2420 13500 970 8860 1110 8360 7810 8370 9890 9730 5110 8300 12100 11500 2400 14200 960 1300 23 5280 8280 8150 8430 9970 12100 12700 2430 13800 960 11200 1430 11000 24 5530 8180 8320 8430 10100 12700 13200 2740 11700 960 1910 8050 13400 2790 11100 25 5500 8460 8120 9820 13100 12200 1030 2030 26 5490 7800 8500 8050 9950 13200 12100 2850 6250 1010 15400 2780 3280 5310 7570 7540 8360 8340 8140 8140 12500 10900 12800 14700 2960 3080 5640 6990 1080 1470 27 10000 18500 3020 18000 3410 9950 28 5400 8240 10900 14600 10900 1530 13800 3680 8310 3180 30 5380 7120 8210 8330 10900 15100 4270 11400 1650 14200 4350 12900 31 11300 4570 1730 5670 8610 8430 9070 MEAN 4410 7410 7600 8320 9160 11500 10900 4870 4220 8520 1740 WTR YR 1983 7300 18500 960 HEAN MAX MIN TEMPERATURE WATER (DEC.* WATER TEAR OCTOBER 1982 TO SEPTEMBER 1983 OHCE-DAILT DAY OCT NOV. DEC FER JUM JUL SEP JAN MAR APR MAT AUG 1 25.0 17.5 10.0 . 5 8.0 18.0 12.0 17.0 19.0 30.0 24.0 29.0 26.0 26.0 3.0 9.0 18.0 20.5 14.0 9.5 14.0 25.0 25.0 28.0 30.0 22.0 19.0 .o 18.5 15.0 30.5 30.5 26.5 10.0 7.5 27.5 28.5 19.0 9.0 .0 7.0 13.5 20.5 29.5 9.0 5 13.5 . 3.5 8.0 21.0 6.5 12.0 20.0 5.0 7.0 24.5 23.0 15.0 6.0 5.5 8.5 10.0 21.0 23.0 25.0 23.5 30.0 27.0 27.0 10.0 27.5 19.0 11.0 18.0 6.0 6.5 8.5 21.0 12.0 12.5 19.0 8.0 21.0 27.0 26.0 28.5 25.0 25.5 17.5 9.0 18.0 16.0 20.5 22.0 26.5 18.0 25.0 19.0 15.5 9.0 21.0 15.5 21.0 10 5.0 27.0 14.0 11 18.0 14.0 5.0 9.5 12.5 15.0 21.0 31.0 27.0 31.0 20.5 25.0 26.0 8.0 9.0 19.0 29.0 27.5 15.0 13.0 19.5 12 5.0 9.0 6.5 21.0 15.0 19.0 28.5 27.5 30.0 24.0 25.0 14 13.0 9.5 5.0 9.5 10.0 21.0 11.0 18.5 22.5 25.0 26.0 8.0 8.5 20.5 27.0 29.0 15 20.5 8.0 15.0 17.0 18.0 24.5 25.5 26.5 16 16.0 9.0 5.0 11.0 11.0 16.0 22.0 19.0 30.0 28.0 23.0 8.5 30.0 10.0 28.0 17 15.5 6.0 9.5 12.0 15.0 21.0 25.5 7.5 10.0 18.0 22.0 20.0 32.0 30.5 24.0 13.0 17.0 19 21.5 7.5 11.0 15.0 12.0 15.0 31.0 28.Q 30.0 11.0 13.0 19.0 25.0 28.0 26.0 20 16.0 22.0 27.0 21 18.5 14.5 7.0 ₹9.0 11.0 18.0 27.0 29.0 13.0 15.5 20.0 17.5 12.5 7.5 10.0 17.0 15.0 28.0 26.5 13.0 18.5 23 18.0 9.0 13.0 14.5 24.0 26.0 25.0 22.0 24 16.0 8.5 10.5 5.5 13.0 12.0 23.5 24.0 23.0 26.5 25.0 20.0 7.0 27.5 25 11.0 12.0 14.5 18.0 21.5 31.0 15.5 6.5 25.0 26 15.0 5.0 9.0 9.0 10.5 16.0 18.0 24.5 27.0 25.5 27.0 25.0 27.0 20.5 29.0 30.5 26.0 27 7.5 23.0 17.0 4.5 4.0 13.0 11.0 6.5 4.0 12.0 11.5 15.0 25.0 25.0 21.0 28.0 26.0 28 15.0 23.0 29 18.0 9.0 3.0 10.0 20.0 23.0 18.5 23.0 31.0 29.5 25.0 29.0 29.5 27.5 22.5 25.0 29.0 11.0 3.0 8.0 21.5 30 17.0 31 16.5 2.0 11.0 23.0 19.5 27.0 24.3 7.5 20.0 27.5 18.0 11.5 6.5 11.0 16.0 16.5 27.0 MEAN

MIN

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17.5

MEAR

WTR YR 1983

MAX

32.0



Water Resources Data New Mexico Water Year 1982

U.S. GEOLOGICAL SURVEY WATER-DATA REPORT NMI-82-1
Prepared in cooperation with the State of New Muxico
and with other regardles

RIO GRANDE BASIN

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08396500 PECOS RIVER NEAR ARTESIA, NM (Surveillance program station)

LOCATION.--Lat 32°50'27", long 104°19'23", in NW\nW\natural sec.18, T.17 S., R.27 E., Eddy County, Hydrologic Unit 13060007, on left bank 250 ft (76 m) upstream from bridge on State Highway 83, 4.3 mi (6.9 km) east of Artesia, 7.0 mi (11.3 km) upstream from Rio Penasco, 17 mi (27.4 km) upstream from McMillan Dam, and at mile 503.9 (8]0.8 km). Prior to Apr. 3, 1981, at site 250 ft (76 m) downstream.

DRAINAGE AREA.--15,300 mi² (39,630 km²), approximately (contributing area).

WATER-DISCHARGE RECORDS

PERIOD OF RECORD. -- September 1905 to June 1909, August 1909 to current year. Monthly discharge only for some periods, published in WSP 1312 and 1712. Records for Aug. 22-31, 1934, and October 1936 to April 1937, published in WSP 763 and 828, respectively are not reliable and should not be used. Prior to February 1936, published as "near Dayton."

REVISED RECORDS.--WSP 1312 and 1512: 1913, 1915, 1917-18(M), 1920, 1923, 1931-36. WSP 1712: 1906(M), 1908-11(M), 1919, 1921-23(M), 1929, 1931-32(M), 1935-36(M), 1937, 1939(M), 1941(M). See also PERIOD OF RECORD.

GAGE.--Water-stage recorder. Datum of gage is 3,291.92 ft (1,003.376 m) National Geodetic Vertical Datum of 1929. See WSP 1923 or 2123 for history of changes prior to Apr. 5, 1941. Apr. 5, 1941 to Apr. 2, 1981, water-stage recorder at site 250 ft (76 m) downstream at same datum.

REMARKS.--Water-discharge records fair. Flow regulated by Santa Rosa Lake (station 08382810) since Arpil 1980, by Lake Sumner (station 08384000) since August 1937, and by Two Rivers Reservoir (station 08390600) since July 1963. Diversions and ground-water withdrawals for irrigation of about 154,000 acres (620 km²), 1959 determination, above station.

AVERAGE DISCHARGE.--46 years, 244 ft 3 /s (6.910 m 3 /s), 176,800 acre-ft/yr (218 hm 3 /yr).

EXTREMES FOR PERIOD OF RECORD. -- Maximum discharge probably occurred May 30, 1937, when a discharge of 51,500 ft³/s (1,460 m³/s) was measured by slope-area method at a point 15 mi (24.1 km) upstream, gage height, 14.7 ft (4.48 m), site and datum then in use; no flow at times in 1934, 1946-47, 1953-54, 1957, 1964-65.

EXTREMES OUTSIDE PERIOD OF RECORD.--Greatest flood since at least 1893 occurred Oct. 2, 1904, discharge not determined; the peak inflow to Lake McMillan, which includes Rio Penasco and Fourmile Draw, was estimated at 82,000 ft³/s (2,320 m³/s). The second highest flood occurred July 25, 1905, discharge below Rio Penasco, 50,300 ft³/s (1,420 m³/s), based on gain in storage and spill from Lake McMillan. The floods in August 1893and October 1904 damaged McMillan Dam and washed out Avalon Dam.

EXTREMES FOR CURRENT YEAR.—Maximum discharge, 2,070 ft 3 /s (58.6 m 3 /s) at 2230 hours Sept. 15, gage height, 10.15 ft (3.094 m) from floodmarks, no other peak above base of 2,000 ft 3 /s (57 m 3 /s); minimum, 1.3 ft 3 /s (0.037 m 3 /s) Sept. 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982 MEAN VALUES

DAY	CCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	AUL	JUL	ALG	SEP
1	56	96	59	53	58	49	23	885	24	7 C	25	2.1
2	53	95	62	. 53	57	49	24	845	19	5 5	30	1.3
2 3 4	87	8.8	62	53	56	48	24	754	16	154	37	4.9
4	57	83	62	53	56	42	25	517	13	483	57	129
5	95	77	62	52	56	40	25	246	11	537	87	564
6	117	92	. 62	51	56	39	24	177	10	620	56	654
7 8	109	104	62	51	56	39	23	143	11	760	34	684
	269	93	62	51	56	40	24	117	6.3	74C	32	713
ç	182	83	61	51	55	41	24	166	7.3	800	2.2	744
10	104	71	60 .	50	56	40	22	9.8	7.7	930	18	750
11	168	67	60	50	59	38	26	٤ 1	6.4	920	15	758
12	153	64	60	50	59	36	27	66	11	880	8.0	755
13	127	64	éC	5 C	59	39	25	58	7.5	1100	6.0	769
14	107	64	6 C	50	58	41	28	50	5.5	900	6.C	842
15	95	65	60	115	58	39	26	51	5.3	911	5.0	973
16	88	65	60	120	59	35	55C	50	5.7	900	6.C	1240
17	78	64	59	126	59	35	662	48	13	878	6.5	966
18	73	60	5 E	110	5.5	36	715	38	8.6	849	5.5	710
19	71	5.5	58	62	51	35	752	3.5	9.2	798	6.C	324
20	69	58	58	64	49	34	805	32	ε.1	549	4.0	
21	67	58	57	69	49	32	832	26	٤.3	190	4.5	307
22	67	59	56	77	49	31	35C	22	8.1	146	3.5	256
23	72	56	5.5	£ 9	4.8	32	875	19	14	106	3.5	203
24	80	54	5 5	80	48	29	965	20	11	87	4.C	181
2 5	86	53	54	78	49	26	888	27	€.6	92	4.0	166
20	97	53	54	74	49	25	802	25	6.9	55	7.C	165
27	101	50	54	69	49	25	818	27	8.0	36	30	148
35	94	5 2	54	65	49	26	812	32	6.9	39	35	128
29	102	5 4	53	61		24	815	36	7.8	31	20	99
30	103	56	53	60		21	770	29	18	25	10	82
31	93		5,3	58		20		ž ś	'	22	7.C	
TOTAL	3160	2053	1805	2095	1518	1036	12345	4685	305.5	14665	594.5	13772.3
MEAN	103	65.4	58.2	67.6	54.2	35.0	412	151	10.2	473	19.2	459
MAX	269	104	62	120	59	49	965	5 8 5	24	1100	87	1240
MIN	53	5 C	53	50	4 é	20	22	19	5.3	22	3.5	1.3
AC-FT	6310	407C	3580	41 é C	3010	2150	24490	925Ć	606	29090	1180	27320

CAL YR 1981 TCTAL 33069.8 MEAN 90.6 MAX 788 MIN 3.0 AC-FT 65590 MTR YR 1932 TCTAL 58104.3 MEAN 159 MAX 1240 MIN 1.3 AC-FT 115200

PERIOD OF RECORD. -- Water years 1937 to current year.

PERIOD OF DAILY RECORD .--

SPECIFIC CONDUCTANCE: July 1937 to current year.
WATER TEMPERATURES: April 1949 to current year.
SUSPENDED SEDIMENT DISCHARGE: January 1949 to current year.

REMARKS .-- Continuous water-temperature and specific conductance recorder since July 1981.

EXTREMES FOR PERIOD OF DAILY RECORD.-SPECIFIC CONDUCTANCE: Maximum daily, 28,800 micromhos June 24, 1977; minimum daily, 111 micromhos Aug. 31, 1982.
WATER TEMPERATURES: Maximum, 36.0°C July 27, 1966, July 25, 1969; minimum, 0.0°C on many days during winter months of most years.

SEDIMENT CONCENTRATIONS: Maximum daily, 21,300 mg/L Aug. 1, 1962; minimum daily, 0 mg/L on several days in December, 1982

SEDIMENT LOADS: Maximum daily, 193,000 tons (166,000 tonnes) Sept. 26, 1955; minimum daily, 0 tons (0 tonnes) on many days during July 1953, July and August 1954, July 1957, July to October 1964, December, 1982.

EXTREMES FOR CURRENT YEAR .--

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SPECIFIC CONDUCTANCE: Maximum daily, 25,200 micromhos Aug. 29; minimum daily, 111 micromhos Aug. 31.

WATER TEMPERATURES: Maximum, 35.5°C Sept. 1; minimum, 2.0°C Jan. 15.

SEDIMENT CONCENTRATIONS: Maximum daily, 6,350 mg/L Apr. 17; minimum daily, 0 mg/L on several days in December.

SEDIMENT LOADS: Maximum daily, 11,300 tons (10,300 tonnes) Apr. 17; minimum daily, 0 ton (0 tonne) on several days in December.

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			CHEMICAL	ANALYSES	, WATER	YEAR OC	TOBER 1	981 TO	SEPTEMB	ER 1982			
DATE	TIME	STREAM- FLOW, 1NSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (STAND- ARD UNITS) (00400)	AR UNIT	B TE ND- A D S) (D	MPER- TURE, AIR EG C) 0020)	TEMPER- ATURE (DEG C) (00010)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM- ICAL (HIGH LEVEL) (MG/L) (00340)	HARI NESS (MG/ AS CACO	; 'L)3)
DEC 02	1300	60	10000	10300	8.	2	7.7	13.0	8.5		< 94	26	553
APR 01 16 26	1100 1600 1600	22 866	14500 10400 2870	13400 2870		_	7.1 7.5	21.0	14.0 16.0	8.3 8.2		-	255 599
AUG 31	1215	7.3		7500	8.	2	8.3	28.0	28.0		32	2 19	957
DATE	HARD- NESS, NONCAR- BONATE (MG/L CACO3) (00902)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	DIS-	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	SODIUM AD- SORP- TION RATIO	SI DI SOL (MG AS	UM, B S- IT VED (/L K) H	ICAR- ONATE FLD MG/L AS CO3)	CAR-BONATE ITFLD (MG/L AS CO3) (99445)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	DIS- SOLVEI (MG/L AS CL)	(MG/ AS I	/ED /L ?)
DEC 02	2483	650	250	1300	11	1	0			2100	2500		. 8
APR 01	3105	710	360	2200	17		8 1	80	.00	2600	4000		.9
16 26	1499	520	73	150	1.		4.2 2	00	.00	1500	190	-	.7
AUG 31	1869	520	160	1100	11	1	2			1800	1800		.7
D A	D: SG (1) DATE S: (00 EC 02	IICA, SU IS- CO DLVED TU MG/L AS S IO2) (7 9.8	NSTI- ENTS, NO DIS- OLVED (MG/L) A 0301) (0	ITRO- (GEN, NO 2+NO3) OTAL SIMG/L (SN) A 0630) (0	2+NO3 DIS- A OLVED MG/L S N) 0631) (NITRO- GEN, MMONIA TOTAL (MG/L AS N) 00610)	NITRO GEN, ORGANI TOTAL (MG/L AS N) (00605	C G TO (M AS) (00	EN, PH TAL T G/L (N) A 600) (0	HOS- CORUS, CORUS, COTAL SCOMG/L (MS P) AS 0665) (0	1S- OI LVED (G/L P) (0671) (.060	ARBON, RGANIC TOTAL (MG/L AS C) D0680)	
	01 16	8.0		<.10	.15	.300		_		.280	.090	8.8	
A	26 UG	9.9	2510	.13	.16	.120	2.6		2.8	090	.030	13	

.12

.20

.130

1.1

1.4

.090

.050

5.3

TEMPERATURE WATER (DEG.º C), RECORDER MAXIMUM, MINIMUM, AND MEAN, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MAX	MIN	MEAN	XAM	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1 2 3 4 5		FEBRUARY			MARCH		17.5 20.5 17.5 22.5 22.0	APRIL 14.5 11.5 10.0 11.5 11.0	16.5 16.0 14.0 16.5 16.5		MAY	
6 7 8 9 10							18.5 18.5 21.5 20.0 22.0	11.5 12.5 11.5 13.5 13.5	15.0 15.5 16.5 17.0 18.0	·		
11 12 13 14 15							23.5 24.5 26.0 22.5 24.0	13.0 16.0 16.5 17.0 13.5	18.5 20.5 21.5 20.0 18.5			
16 17 18 19 20							20.0 17.5 17.5 16.5 16.5	15.5 15.5 10.0 15.0 15.5	18.0 16.5 15.5 16.0 16.0			
21 22 23 24 25							15.5 14.0 12.5 12.0 14.0	14.0 12.5 11.5 11.5	14.5 13.5 12.0 11.5 12.5			
26 27 28 29 30 31 MONTH							14.5 26.0	14.0 10.0	14.0			
DAY	MAX	MTN	MENN	WIV							****	MDAN
		MIN	MEAN	MAX	MIN	MEAN	XAM	MIN	MEAN	XAM	MIN	MEAN
	112176	JUNE	MEAN	MAX	JULY	MEAN	MAX	MIN AUGUST	MEAN	MAX	SEPTEME	
1 2 3 4			MEAN .	MAX		MEAN	MAX		MEAN	35.5 32.0 31.5		29.0 27.0 24.5
1 2 3 4 5			MEAN .	MAX		MEAN		AUGUST		35.5 32.0 31.5 	24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 5 6 7 8			MEAN .	MAX		MEAN		AUGUST		35.5 32.0 31.5	24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 5			MEAN	MAX		MEAN		AUGUST		35.5 32.0 31.5 	24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10			MEAN	MAX		MEAN		AUGUST		35.5 32.0 31.5 	24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10			MEAN	MAX		MEAN		AUGUST		35.5 32.0 31.5 	24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10		JUNE	MEAN	MAX		MEAN		AUGUST		35.5 32.0 31.5 	24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15			MEAN	MAX		MEAN		AUGUST		35.5 32.0 31.5 	SEPTEMB 24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15		JUNE	MEAN	MAX		MEAN		AUGUST		35.5 32.0 31.5	24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18		JUNE	MEAN	MAX		MEAN		AUGUST		35.5	24.0 24.5 22.0 	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20		JUNE	MEAN	MAX		MEAN		AUGUST		35.5 32.0 31.5	24.0 24.5 22.0 	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18		JUNE	MEAN	MAX		MEAN		AUGUST		35.5	24.0 24.5 22.0 	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23		JUNE	MEAN	MAX		MEAN		AUGUST		35.5 32.0 31.5	24.0 24.5 22.0 	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20		JUNE	MEAN	MAX		MEAN		AUGUST		35.5 32.0 31.5	24.0 24.5 22.0 	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26		JUNE	MEAN	MAX		MEAN		AUGUST		35.5	SEPTEMB 24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27		JUNE	MEAN	MAX		MEAN		AUGUST		35.5	SEPTEMB 24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26		JUNE	MEAN	MAX		MEAN		AUGUST		35.5 32.0 31.5	SEPTEMB 24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30		JUNE	MEAN	MAX		MEAN		AUGUST		35.5	SEPTEMB 24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29		JUNE	MEAN	MAX		MEAN		AUGUST		35.5	SEPTEMB 24.0 24.5 22.0	29.0 27.0 24.5

SUSPENDED-SEDIMENT DISCHARGE, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN- TRATION (MG/L)	Loads (T/Day)	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY)		LOADS (T/DAY)	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY)
1 · 2 3 4	22 22 22 39 58	3.3 3.1 9.2 8.9	NO 31 27 43 42	VEMBER 8.0 6.9 10 9.4	DEG 6 21 12 7	.96 3.5 2.0	J. · 5 7 9 6	.72 1.0 1.3	FEE 4 3 3 2	.63 .46 .45		MARCH .93 .66 .78
5 6 7 8 9	63 65 68 470 417	16 21 20 341 205	38 31 30 32 23	7.9 7.7 8.4 8.0 5.2	3 1 1 0 0	.50 .17 .17 .00	7 4 6 6 9	.98 .55 .83 .83	2 8 5 4 2	.30 1.2 .76 .60	4 4 7 6	.43 .42 .42 .76
10 11 12 13 14	1050 1150 2020 1560 453	465 522 834 535 131	26 30 18 15	5.2 4.7 5.2 3.1 2.6	1 1 3 2 0	.16 .49 .32	7 9 7 7 6	.95 1.2 .95 .95	3 5 6 4 5	.80 .96 .64	7 12 13 19 18	1.2 1.3 2.0 2.0
15 16 17 18 19	254 176 76 61 48	65 42 16 12 9.2.	26 20 21 24	2.6 4.6 3.5 3.4 3.6	0 0 1 0 1	.00 .00 .16 .00	8 7 8 9	2.5 2.3 2.6 2.7 1.8	5 6 9 5 4	.78 .96 1.4 .74	32 14 14 21	3.0 1.3 1.4 2.0
20 21 22 23 24	53 50 47 49	9.9 9.6 9.0 9.1	27 14 12 10 13	2.2 1.9 1.5 1.9	0 2 4 5 5	.00 .31 .60 .74	10 9 12 13 9	1.7 1.7 2.5 3.1 2.1	5 3 4 8 5	.66 .40 .53 1.0	18 14 21 24 13	1.7 1.2 1.8 2.1
25 26 27 28 29 30 31 TOTAL	92 75 75 95 96 38	15 24 20 19 26 27 9.5 3447.8	10 9 10 8 8	1.3 1.4 1.2 1.4 1.2 1.2 1.2	9 7 3 7 5 2 1	1.3 1.0 .44 1.0 .72 .29 .14 17.23	8 6 7 7 10 7	1.7 1.6 1.1 1.2 1.2 1.6 1.1 45.63	5	.66 .53 .26 .66	11 11 13 31 28 16	.84 .74 .74 .91 2.0 1.6 .86 39.31
Day	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY)
DAY 1 2 3 4 5	CONCENTRATION (MG/L)		CONCEN- TRATION	LOADS (T/DAY) MAY 5540 4880 4190 1940 531	CONCEN- TRATION (MG/L)	(T/DAY) UNE	CONCEN- TRATION (MG/L)	LOADS (T/DAY) JULY 4.2 5.8 368 6860 6600	CONCEN- TRATION (MG/L)		CONCEN- TRATION (MG/L)	(T/DAY) PTEMBER .12
1 2 3 4	CONCENTRATION (MG/L) 19 25 24 40	(T/DAY) APRIL 1.2 1.6 1.6 2.7	CONCENTRATION (MG/L) 2320 2140 2060 1390	(T/DAY) MAY 5540 4880 4190 1940	CONCEN- TRATION (MG/L) 37 36 33 58	(T/DAY) JUNE 2.4 1.8 1.4 2.0	CONCENTRATION (MG/L) 22 39 363 5260	(T/DAY) JULY 4.2 5.8 368 6860	CONCENTRATION (MG/L) AU 48 70 72 59	(T/DAY) GUST 3.2 5.7 7.2 9.1	CONCENTRATION (MG/L) SEE 22 17 15 664	(T/DAY) PTEMBER .12 .06 .20 693 6520 6410
1 2 3 4 5 6 7 8	CONCENTRATION (MG/L) 19 25 24 40 26 60 25 44	(T/DAY) APRIL 1.2 1.6 1.6 2.7 1.8 1.7 3.7 1.6 2.9	CONCENTRATION (MG/L) 2320 2140 2060 1390 800 550 454 279 234	(T/DAY) MAY 5540 4880 4190 1940 531 263 175 88 67	CONCEN- TRATION (MG/L) 37 36 33 58 53 46 31 31 22	(T/DAY) JUNE 2.4 1.8 1.4 2.0 1.6 1.2 .92 .72 .43	CONCENTRATION (MG/L) 22 39 363 5260 4550 3750 3220 2650 2150	(T/DAY) JULY 4.2 5.8 368 6860 6600 6280 6610 5290 4640	CONCENTRATION (MG/L) AU 48 70 72 59 79 54 34 142 38	(T/DAY) GUST 3.2 5.7 7.2 9.1 19 8.2 3.1 12 2.3	CONCEN- TRATION (MG/L) SEI 22 17 15 664 4280 3630 2910 3330 4710	(T/DAY) PTEMBER .12 .06 .20 693 6520 6410 5370 6410 9460
1 2 3 4 5 6 7 8 9 10 11 12 13	CONCENTRATION (MG/L) 19 25 24 40 26 26 60 25 44 28 22 18 22 25	(T/DAY) APRIL 1.2 1.6 1.6 2.7 1.8 1.7 3.7 1.6 2.9 1.7 1.5 1.3 1.7 1.9	CONCENTRATION (MG/L) 2320 2140 2060 1390 800 550 454 279 234 155 82 48 39 34	(T/DAY) MAY 5540 4880 4190 1940 531 263 175 88 67 41 18 8.6 6.1 4.6	CONCEN- TRATION (MG/L) 37 36 33 58 53 46 31 31 22 39 53 38 21 21	(T/DAY) JUNE 2.4 1.8 1.4 2.0 1.6 1.2 .92 .72 .43 .81 .92 1.1 .43 .31	CONCENTRATION (MG/L) 22 39 363 5260 4550 3750 3220 2650 2110 2660 3770 2220 3790	(T/DAY) JULY 4.2 5.8 368 6860 6600 6280 6610 5290 4640 5300 6610 8960 6590 9210	CONCENTRATION (MG/L) AU 48 70 72 59 79 54 34 142 38 27 36 31 44 54	GUST 3.2 5.7 7.2 9.1 19 8.2 3.1 12 2.3 1.3 1.5 .67 .71 .87	CONCEN- TRATION (MG/L) SEI 22 17 15 664 4280 3630 2910 3330 4710 2820 2660 2580 2650 2790	(T/DAY) PTEMBER .12.06 .20 693 6520 6410 5370 6410 9460 5710 5320 5260 5500 6340
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	CONCENTRATION (MG/L) 19 25 24 40 26 26 60 25 44 28 22 18 22 25 23 5800 6350 4270 3460	(T/DAY) APRIL 1.2 1.6 1.6 2.7 1.8 1.7 3.7 1.6 2.9 1.7 1.5 1.3 1.7 1.9 1.6 9780 11300 8240 7030	CONCENTRATION (MG/L) 2320 2140 2060 1390 800 550 454 279 234 155 82 48 39 34 40 38 35 37 29	MAY 5540 4880 4190 1940 531 263 175 88 67 41 18 8.6 6.1 4.6 5.5 5.1 4.5 3.8 2.7	CONCEN- TRATION (MG/L) 37 36 33 58 53 46 31 31 22 239 53 38 21 21 22 23 27 38 26	(T/DAY) JUNE 2.4 1.8 1.4 2.0 1.6 1.2 .92 .72 .43 .81 .92 1.1 .43 .31 .31 .31 .31 .35 .95 .88 .65	CONCENTRATION (MG/L) 22 39 363 5260 4550 3750 3220 2650 2150 2110 2660 3770 2220 3790 3900 3310 3090 2500 1650	(T/DAY) JULY 4.2 5.8 368 6860 6600 6280 6610 5290 4640 5300 6610 8960 6590 9210 9590 8040 7330 5730 3560	CONCENTRATION (MG/L) AU 48 70 72 59 79 54 34 142 38 27 36 31 44 54 35 41 34 41 36	(T/DAY) GUST 3.2 5.7 7.2 9.1 19 8.2 3.1 12 2.3 1.3 1.5 67 71 87 47 66 60 61 .58	CONCEN- TRATION (MG/L) SEI 22 17 15 664 4280 3630 2910 3330 4710 2820 2600 2580 2650 2790 2400 2450 2650 2210 1100	(T/DAY) PTEMBER .12 .06 .20 .693 .6520 .6410 .5370 .6410 .5460 .5710 .5320 .5260 .5500 .6340 .6310 .8200 .6910 .4240 .962
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	CONCENTRATION (MG/L) 19 25 24 40 26 26 60 25 44 28 22 18 22 25 23 5800 6350 4270 3460 3240 3080 2700 2410 2130	(T/DAY) APRIL 1.2 1.6 1.6 2.7 1.8 1.7 3.7 1.6 2.9 1.7 1.5 1.3 1.7 1.9 1.6 9780 11300 8240 7030 7040 6920 6200 5690 5550	CONCENTRATION (MG/L) 2320 2140 2060 1390 800 550 454 279 234 155 82 48 39 34 40 38 35 37 29 33 31 30 36 37	(T/DAY) MAY 5540 4880 4190 1940 531 263 175 88 67 41 18 8.6 6.1 4.6 5.5 5.1 4.5 3.8 2.7 2.9 2.2 1.8 1.8	CONCEN- TRATION (MG/L) 37 36 33 58 53 46 31 31 22 39 53 38 21 21 22 23 27 38 26 13	(T/DAY) JUNE 2.4 1.8 1.4 2.0 1.6 1.2 .92 .72 .43 .81 .92 1.1 .43 .31 .31 .31 .31 .35 .88 .65 .28 .31 .48 .60 .50	CONCENTRATION (MG/L) 22 39 363 5260 4550 3750 3220 2650 2110 2660 3770 2220 3790 3900 3310 3090 2500 1650 1350 838 662 480 460	(T/DAY) JULY 4.2 5.8 368 6860 6600 6280 6610 5290 4640 5300 6610 8960 6590 9210 99590 8040 7330 5730 3560 2000 430 261 137 108	CONCENTRATION (MG/L) AU 48 70 72 59 79 54 34 142 38 27 36 31 44 54 35 41 36 37 43 66 63 53	(T/DAY) GUST 3.2 5.7 7.2 9.1 19 8.2 3.1 12 2.3 1.3 1.5 67 771 .87 .47 .66 .60 .61 .58 .40 .52 .62 .60 .57	CONCEN- TRATION (MG/L) SEI 22 17 15 664 4280 3630 2910 3330 4710 2820 2650 2790 2400 2450 2650 2790 2410 1100 1220 871 1430 1640 1020	(T/DAY) PTEMBER .12.06 .20 693 6520 6410 9460 5710 5320 5260 5500 6340 6310 8200 6910 4240 962 1500 722 988 899 498

RIO GRAND RIVER NEAR WATER-QUALI	ARTESIA,	Continued	(

	SPECIFIC	CONDUCT	ANCE (MICE	ROMHOS/CM			NATER YEAR	OCTOBER	1981 TO	SEPTEMBER	1982	
			***			E-DAILY		****	77.11	7111	• 110	ann
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	YAM	JUN		AUG	SEP
1	8650	6130	9810	9900	10200	11000	13700	2780	10600		8220	7430
2	8580	6400	10100	10000	10300	11100	14200	2830	11200		8510	8100
3	8890	6610	10100	9960	10200	11200	14300	2820	11900			9270
4	5750	6580	9350	10100	10300	11300	14000	3070	12800		6550	9690
5	5780	7030	9270	10000	10200	11300	13800	3190	15600	3010	3940	3080
6	9220	6350	8840	10100	10200	11300		3510	15200		4390	2020
7	9200	6320	9180	10200	10200	11100		3710	15400		4650	1690
8	5300	6190	9170	10100	10100	11200		4090	16900		5780	1550
9	5260	6720	9440	10100	10100	11100		4370	16400		6930	1520
10	5230	7150	9870	10200	9920	11100		4600	15800	1380	7030	1350
11	5210	7550	9850	10400	9870	11500		4790	16700	1310	7950	1270
12	4070	8000	9890	10100	10600	11700		5190	17300	1230	9500	1120
13	4060	8350	9900	10100	10200	11800		5340	18700	1180	9810	1090
14	5360	8390	9940	9820	10100	11500		5930	21100	1400	9880	1030
15	6070	8700	9700	9830	10200	11600		6370	20600	1170	10500	350
_												
16	6690	8880	9750	9850	9940	11500		6870	18700		12400	920
17	7090	8980	9620	11200	9690	12100		7760	20600		12700	970
18	7080	8250	10000	11200	10000	12100		7630	22200		15600	930
19	7720	9080	10000	9240	10100	11800		8140	17600		15900	1260
20	8030	9070	10100	9310	10100	12000		8910	16400	1230	16700	1380
21	8290	9280	10100	10900	10300	12200		~10700	17900		16400	1430
22	8320	9220	10100	10500	10300	12100		10700	17200	1570	16000	2000
23	8330	9510	·10200	9750	10800	12000		10200	17400	1770	17000	1820
24	8400	9480	10200	8340	10700	12700		10200	17600	1770	16400	1940
25	7680	9700	10100	8310	10800	12800		13000	15000	2080	16700	2230
26	7140	9670	10100	8730	10800	12900		10400	14000	2760	18200	2150
27	6430	9910	10400	9120	11000	12900	2840	10300	14100		19300	2730
28	6440	9900	10400	9150	10900	13100	2820	10100	14800		18700	2900
29	5820	9850	10300	9620		12900	2800	9930	18300		25200	3120
30	5800	9670	10400	10000		13400	2830	9680	7430		7460	3530
31	6090		10100	10200		13800	2030	10700	7430		7180	
31	0090		10100	10200		13000		10,00		,,,,,	,100	
MEAN	6840	8230		9880	10300	11900	7780	7030	16200	3070	11700	2660
WTR YR	1982	MEAN	8790	MAX	25200		MIN	350				

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. °C), RECORDER MAXIMUM, MINIMUM, AND MEAN, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY,	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MA	x	MIN	MEAN
1 2 3 4		FEBRUAR	Y		MARCH		14800	APRII 13000	14000			MVA	
2							14800	12700	13400				
3							14400	12200	13300				
4							14400	12500	13400				
5							14300	12200	13200				
6							13100	12100	12500				
6 7							13400	12100	12700				
8							14000	11800	12700				
8 9							13500	11700	12400				
10							12700	10800	11700		•		
11			`				12100	10400	11200				
12							11400	10000	10800				
13							10700	2600	9710				
14							10100	2100	9400				•
15							10700	2500	8920				
16							9000	4370	5870				
17							4310	3790	4020				
18							3820	2850	3560				
19							2940	2700	2810				
20							2780	2690	2730				
21							2720	2580	2660			•	
22							2640	2560	2590				
23							2580	2550	2560				
24							2710	2540	2610				
25							2790	2570	2680				
26							2700	2580	2620				
27													
28							******						
29													
30													
31													
MONTH							14800	2100	8230				

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. °C), RECORDER MAXIMUM, MINIMUM, AND MEAN, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	XAM	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEME	BER
1		• • • • •								7480	6880	7210
2			4							8530	7230	7930
3 ·	•									9630	7430	8920
4 5												
6						•						
7												
8												
9												
10												
11												
12												
13												
14 15												
16												
17												
18												
19 20												
21			•									
22			•									
23												
24												
25												
26												
27												
28		•										
29			•									
30 31							7180	6980	7120			
МОМТН							7180	6980	7120	9630	6880	8020
		•					7200	0300	,,,,,	,000	0000	0020
		TEMPE	RATURE WATER	(DEG.°		R YEAR O E-DAILY	CTOBER 198	1 TO SEPT	EMBER 198	2		
DAY .	OCT	VOV	DEC	JAN	FEB	MAR	APR	YAM	JUN	JUL	AUG	SEP
1	21.0	11.5	11.0	10.5	5.5	9.0	17.0	17.0	27.5	29.0	29.0	33.0
2	20.5	15.5	10.5	10.0	6.0	12.0	18.5	17.0	27.0	24.5	25.0	25.0
3	23.0	15.0	11.0	11.0	5.0	15.5	17.0	17.5	24.0	31.0	31.0	29.5
4	23.0	14.0	9.0	8.5	5.5	18.0	19.5	20.0	25.5	25.5	27.0	28.0
5	23.5	12.0	10.0	6.0	4.0	10.0	20.0	18.0	24.0	26.0	30.5	30.5
6	21.5	13.0	8.0	11.0	3.0	9.0	13.0	22.0	25.0	25.0	32.0	25.0
7	22.0	14.0	7.5	7.5	6.0	7.0		19.0	28.0	29.0	29.5	24.0
8	20.0	13.5	8.0	5.0	7.0	16.0		24.5	29.0	25.0	25.0	25.0
9	19.0	15.0	11.5	5.5	7.5	14.0		24.5	22.0	25.5	30.0	24.0
10	18.0	11.5	9.0	7.0	6.0	15.0		20.0	28.0	27.0	25.0	24.0
11	19.0	10.5	9.5	3.0	6.0	21.0		20.0	31.0	27.5	29.0	23.0
12	19.5	10.0	10.5	5.0	8.0	17.0		21.0	24.0	26.0	31.0	23.5
13	18.0	12.5	12.0	3.0	10.0	16.0		21.5	22.0	25.0	29.0	23.0
14	24.0	12.0	9.5	3.0	11.0	18.0		22.5	29.0	26.5	29.0	23.5
15	20.5	12.0	10.5	2.0	15.5	17.0		24.5	30.0	26.0	27.5	22.5
16	25.0	15.0	11.0	3.0	12.0	20.0		20.5	25.0	27.5	31.5	22.5
1.7	24.0	14.5	12.0	5.0	14.0	17.0		27.0	26.5	26.0	29.0	21.5
18	23.5	15.0	9.5		15.5	17.5		24.0	27.0	26.0	23.5	21.5
19	16.0	13.0	9.0	5.0	15.0	21.0		27.0	26.0	28.0	26.5	21.0
20	20.0	14.0	9.0	7.0	14.5	19.0		27.5	23.0	30.0	28.0	23.0
21	17.0	11.0	8.0	9.0	11.5	12.0		26.5	28.0	30.5	28.5	20.0
22	18.0	9.5	9.0	9.0	11.0	18.0		25.0	30.0	28.0	27.0	21.0
23	16.0	15.0	11.5	7.0	18.0	20.0		21.0	29.0	27.0	30.0	22.5
24 25	14.5 16.0	11.0 11.0	11.0 10.0	7.0 7.5	14.0 11.0	15.0 14.0		24.0 26.0	27.0	27.0	28.5	24.0
	10.0	11.0	10.0	1.3	11.0	14.0		20.0	27.5	25.0	30.0	21.0
26	17.0	11.5	9.5	7.5	11.5	12.0		27.0	28.0	31.5	24.0	25.0
27	17.0	14.0	9.0	12.0	9.0	13.5	18.0	27.5	24.5	31.5	24.0	22.5
28	18.5	12.0	8.0	8.5	9.5	13.0	20.0	28.0	33.5	30.5	32.0	24.5
29	19.0	12.0	9.0	12.0		18.0	19.5	27.0	25.0	27.0	28.5	21.0
30	20.0 14.0	10.0	10.0	9.0		17.0	18.0	23.5	28.0	31.0	32.0	22.0
31 MEAN	19.5	12.5	10.0 10.0	6.0 7.0	9.5	19.5 15.5	18.0	28.0 23.0	27.0	28.0 27.5	31.0	24.0
WTR YR		MEAN	18.5	MAX	33.5			2.0	27.0	21.3	28.5	24.0
	-				23.3		=					

TRACE ELEMENT ANALYSES, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DIS- SOLVED (UG/L AS AS) (01000)	BORON, DIS- SOLVED (UG/L AS B) (01020)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD) (01027)	CADMIU DIS- SOLVE (UG/L AS CD (01025	REC D ERA (UG) AS	M, CH AL MI OV- DI BLE SO /L (U CR) AS	UM, TO S- RE LVED ER G/L (U CR) AS	COV- DI ABLE SO G/L (U CU) AS	PER, S- LVED G/L CU) 040)
DEC 02	1300	2	1	560	1	. <	ı	20	20	5	3
01 26	1100 1600	 8	 2	830 120	<u></u>	<	- 1	40	10	 40	3
AUG 31	1215			580		-	-				
DATE DEC	IRON DI: SOL (UG, AS 1	S- REC /ED ERA /L (UC FE) AS	PAL LEA COV- DI ABLE SOL S/L (UG PB) AS	S- REC VED ERA /L (UG PB) AS	CAL MERC COV- D' BLE SOI G/L (UC HG) AS	IS- N LVED T G/L (HG) A	ELE- IUM, OTAL UG/L S SE) 1147)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN) (01092)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)	
02	•	130	3	2	.1	.2	3	2	30	20	
APR 01 26		80 540	 19	 10	.1	.1	 3	 1	 110	40	
AUG 31		50	· ·								
		RADIOCH	IEMICAL AN	ALYSES, W	ATER YEAR	R OCTOBE	R 1981	TO SEPTE	MBER 1982		
DATE APR	TI!	DI SOI (UC 1E AS UNA	PHA, ALP IS- SUS LVED TOT S/L (UG S AS	HA, BET P. DI AL SOL /L (PCI AS	A, BE' S- SU VED TO' (PC A) 37) CS-	TA, B SP. TAL S I/L (S A 137) Y	ROSS ETA, DIS- OLVED PCI/L S SR/ T-90) 80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90) (80060)	RADIUM 226, DIS- SOLVED, RADON METHOD (PCI/L) (09511)	URANIUM NATURAL DIS- SOLVED (UG/L AS U) (22703)	
26	. 160	00 5	3 11	0 <2	25	80 <	24	77	.07	4.7	
	DATE	PESTI TIME	PCB, TOTAL (UG/L) (39516)	ALDRIN, TOTAL (UG/L) (39330)	CHLOR-DANE, TOTAL (UG/L) (39350)	DDD, TOTAL (UG/L (39360	DD TOT	DE, D PAL TO	DT, AZI TAL TO G/L) (U	DI- NON, PTAL UG/L)	
	AUG 31	1215	<.10	<.01							
DATE AUG	DI- ELD TOT:	- ENI RIN SULE AL TOT /L) (UC	OO- FAN, ENDR	IN, ETHI	ON, CH TAL TO	PTA- C LOR, EP TAL T G/L) (EPTA- HLOR OXIDE OTAL UG/L)	LINDANE TOTAL (UG/L)	MALA- THION, TOTAL (UG/L) (39530)	METH- OXY- CHLOR, TOTAL (UG/L) (39480)	
31	. <	.01 <	.01 <	.01 <	.01 <	.01	<.01	<.01	<.01	<.01	
	DATE AUG	METHYL PARA- THION, TOTAL (UG/L) (39600)	METHYL TRI- THION, TOTAL (UG/L) (39790)	PARA- THION, TOTAL (UG/L) (39540)	TOX- APHENE, TOTAL (UG/L) (39400)	TOTAL TRI- THION (UG/L (39786	THA TOT (UC	LE CR- PO ANE CH CAL TO G/L) (UG	TAL 1 /L) (U 250) (39	REX, POTAL IG/L) 1755)	
	31	< .01	<.01	<.01	< 1	<.0	1 <	.10	<.10	<.01	

MICROBIOLOGICAL ANALYSES, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

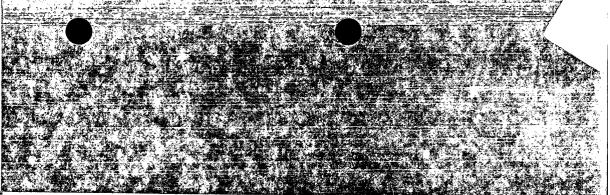
	COLI-	STREP-
	FORM,	TOCOCCI
	FECAL,	FECAL,
	0.7	KF AGAR
	UMMF	(COLS.
	(COLS./	PER
DATE	100 ML)	100 ML)
	(31625)	(31673)
DEC		•
02	130	280
APR		
01	73	390
16		500
26	340	
AUG		
31	K35	K110

INSTANTANEOUS SUSPENDED SEDIMENT AND PARTICLE SIZE, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

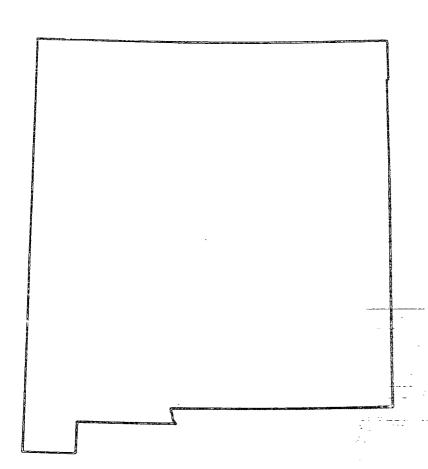
DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	TEMPER- ATURE (DEG C) (00010)	SEDI- MENT, SUS- PENDED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY) (80155)	SED. SUSP. FALL DIAM. FINER THAN .002 MM (70337)	SED. SUSP. FALL DIAM. % FINER THAN .004 MM (70338)
10 12 APR	1049 1007	163 157	18.0 19.5	1120 1950	493 827	57	75
01 16 18 22 24	1200 1022 1720 0836 1105	22 648 728 860 980	15.5 18.0 17.0 12.0 12.5	17 6690 3860 2720 2090	1.0 11700 7590 6320 5530	46 48 40	65 60 53
26 30 MAY	1600 1738	866 775	16.0 18.0	2520 1880	5890 3930	31	39
02 04 08 JUL	1543 1737 1737	830 600 117	17.0 20.0 24.5	2090 1170 245	4680 1900 77	30 36 	38 56
04 13 18 AUG	0930 1033 1104	13 7.5 8.6	25.5 25.0 26.0	5370 2220 2520	188 45 59	44 38 22	58 51 32
08 SEP	0915	31	25.0	294	25		
07 08 22 25	1045 1700 1831 0950	695 735 225 169	24.0 25.0 21.0 21.0	2760 2990 1730 854	5180 5930 1050 390	29 	38
DATE	SED. SUSP. FALL DIAM. FINER THAN .016 MM	SED. SUSP. FALL DIAM. % FINER THAN .062 MM	SED. SUSP. FALL DIAM. % FINER THAN .125 MM	SED. SUSP. FALL DIAM. % FINER THAN .250 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .125 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .250 MM
OCT 10 12	SUSP. FALL DIAM. FINER THAN	SUSP. FALL DIAM. FINER THAN	SUSP. FALL DIAM. % FINER THAN	SUSP. FALL DIAM. FINER THAN	SUSP. SIEVE DIAM. % FINER THAN	SUSP. SIEVE DIAM. % FINER THAN	SUSP. SIEVE DIAM. % FINER THAN
OCT 10 12 APR 01	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	SUSP. FALL DIAM. % FINER THAN .062 MM (70342)	SUSP. FALL DIAM. % FINER THAN .125 MM (70343)	SUSP. FALL DIAM. % FINER THAN .250 MM (70344)	SUSP. SIEVE DIAM. % FINER THAN. .062 MM (70331) 99 99	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332)	SUSP. SIEVE DIAM. % FINER THAN .250 MM
OCT 10 12 APR 01	SUSP. FALL DIAM. % FINER THAN .016 MM (70340)	SUSP. FALL DIAM. % FINER THAN .062 MM (70342)	SUSP. FALL DIAM. % FINER THAN .125 MM (70343)	SUSP. FALL DIAM. % FINER THAN. 250 MM (70344)	SUSP. SIEVE DIAM. % FINER THAN. .062 MM (70331) 99 99 70 97 99 98 96	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332)	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333)
OCT 10 12 APR 01 16 22 24 30 MAY	SUSP. FALL DIAM. FINER THAN .016 MM (70340) 95 87 89 80 62	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. % FINER THAN .125 MM (70343)	SUSP. FALL DIAM. & FINER THAN .250 MM (70344)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 99 99 70 97 99 98 96 94	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100 100 100 100	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333)
OCT 10 12 APR 01 18 22 24 30 MAY 02 04	SUSP. FALL DIAM. FINER THAN .016 MM (70340) 95 87 89 80 62	SUSP. FALL DIAM. % FINER THAN .062 MM (70342)	SUSP. FALL DIAM. % FINER THAN .125 MM (70343)	SUSP. FALL DIAM. & FINER THAN .250 MM (70344)	SUSP. SIEVE DIAM. % FINER THAN. .062 MM (70331) 99 99 70 97 99 98 96	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100 100 100	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333)
OCT 10 12 APR 01 18 22 24 30 MAY 02 04 08 JUL 04	SUSP. FALL DIAM. FINER THAN .016 MM (70340) 95 87 89 80 62 60 77	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. 8 FINER THAN .125 MM (70343)	SUSP. FALL DIAM. & FINER THAN .250 MM (70344)	SUSP. SIEVE DIAM. % FINER THAN.062 MM (70331) 99 99 70 97 99 98 96 6	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100 100 100 100 100 100	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333)
OCT 10 12 APR 01 16 18 22 24 26 30 MAY 02 04 08 JUL 04	SUSP. FALL DIAM. FINER THAN .016 MM (70340) 95 89 80 62 60 77 85	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. 8 FINER THAN .125 MM (70343)	SUSP. FALL DIAM. 8 FINER THAN .250 MM (70344)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 99 99 70 97 99 98 96 94 96 98	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100 100 100 100 100 100 100 100 100 100 100 100 100 100	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333)
OCT 10 12 APR 01 16 18 22 24 30 MAY 02 04 08 JUL 04 13 18 AUG 08	SUSP. FALL DIAM. FINER THAN .016 MM (70340) 95 89 80 62 60 77 85	SUSP. FALL DIAM. & FINER THAN .062 MM (70342)	SUSP. FALL DIAM. 8 FINER THAN .125 MM (70343)	SUSP. FALL DIAM. 8 FINER THAN .250 MM (70344)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 99 99 70 97 99 98 96 94 96 98	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100 100 100 100 100 100 100 100 100 100 100 100 100 100	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333)







Water Resources Data New Mexico Water Year 1981



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT NM-81-1 Prepared in cooperation with the State of New Mexico and with other agencies

RIO GRANDE BASIN

08396500 PECOS RIVER NEAR ARTESIA, NM (Surveillance program station)

LOCATION.--Lat 32°50'27", long 104°19'23", in NW\NW\ sec.18, T.17 S., R.27 E., Eddy County, Hydrologic Unit 13060007, on left bank 250 ft (76 m) upstream from bridge on State Highway 83, 4.3 mi (6.9 km) east of Artesia, 7.0 mi (11.3 km) upstream from Rio Penasco, 17 mi (27.4 km) upstream from McMillan Dam, and at mile 503.9 (810.8 km). Prior to Apr. 3, 1981, at site 250 ft (76 m) downstream.

DRAINAGE AREA.--15,300 mi² (39,630 km²), approximately (contributing area).

WATER-DISCHARGE RECORDS

PERIOD OF RECORD. -- September 1905 to June 1909, August 1909 to current year. Monthly discharge only for some periods, published in WSP 1312 and 1712. Records for Aug. 22-31, 1934, and October 1936 to April 1937, published in WSP 763 and 828, respectively are not reliable and should not be used. Prior to February 1936, published as "near Dayton."

REVISED RECORDS. -- WSP 1312 and 1512: 1913, 1915, 1917-18(M), 1920, 1923, 1931-36. WSP 1712: 1906(M), 1908-11(M), 1919, 1921-23(M), 1929, 1931-32(M), 1935-36(M), 1937, 1939(M), 1941(M). See also PERIOD OF RECORD. GAGE. -- Water-stage recorder. Datum of gage is 3,291.92 ft (1,003.376 m) National Geodetic Vertical Datum of 1929. See WSP 1923 or 2123 for history of changes prior to Apr. 5, 1941. Apr. 5, 1941 to Apr. 2, 1981, water-stage recorder at site 250 ft (76 m) downstream at same datum.

recorder at site 250 ft (76 m) downstream at same datum.

REMARKS.--Water-discharge records fair. Flow regulated by Santa Rosa Lake (station 08382810) since Arpil 1980, by

Lake Sumner (station 08384000) since August 1937, and by Two Rivers Reservoir (station 08390600) since July 1963. Diversions and ground-water withdrawals for irrigation of about 154,000 acres (620 km²), 1959

determination, above station.

determination, above station.

AVERAGE DISCHARGE.--45 years, 246 ft³/s (6.967 m³/s), 178,200 acre-ft/yr (220 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge probably occurred May 30, 1937, when a discharge of 51,500 ft³/s (1,460 m³/s) was measured by slope-area method at a point 15 mi (24.1 km) upstream, gage height, 14.7 ft (4.48 m), site and datum then in use; no flow at times in 1934, 1946-47, 1953-54, 1957, 1964-65.

EXTREMES OUTSIDE PERIOD OF RECORD.--Greatest flood since at least 1893 occurred Oct. 2, 1904, discharge not determined; the peak inflow to Lake McMillan, which includes Rio Penasco and Fourmile Draw, was estimated at 82,000 ft³/s (2,320 m³/s). The second highest flood occurred July 25, 1905, discharge below Rio Penasco, 50,300 ft³/s (1,420 m³/s), based on gain in storage and spill from Lake McMillan. The floods in August 1893and October 1904 damaged McMillan Dam and washed out Avalon Dam.

October 1904 damaged McMillan Dam and washed out Avalon Dam.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,080 ft³/s (30.6 m³/s) Aug. 13, gage height, 7.21 ft (2.198 m), no peak above base of 2,000 ft³/s (57 m³/s); minimum, 2.8 ft³/s (0.079 m³/s) July 27.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981 MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1 .	149	77	66	42	45	18	9.3	13	712	36	38	26
2	132	81	65	39	43	19	12	11	733	75	18	79
3	124	78	66	41	43	25	13	14	740	49	13	60
	103	82	64	42	44	31	10	107	742	113	13	44
	92	81	62	43	45	36	9.4	82	755	71	20	57
6	78	72	62	43	47	33	11	48	788	46	18	382
7	69	66	59	42	46	35	15	358	732	27	21	477
R	65	64	55	44	47	30	15	192	718	19	26	446
9	62	62	49	45	47	19	12	114	685	14	153	279
10	64	57	49	45	45	30	17	73	597	158	168	202
11	62	54	49	45	44	24	18	45	528	230	112	165
12	59	51	49	44	44	18	12	27	441	169	231	144
13	60	48	49	44	42	16	14	17	408	175	744	124
14	58	45	49	43	38	23	20	12	169	94	648	111
15	53	44	49	43	31	30	17	11	96	51	427	99
16	47	50	48	43	36	30	22	10	62	34	286	84
17	46	57	48	46	27	30	20	15	47	23	302	79
18	46	59	49	48	28	25	19	21	33	24	388	73
19	47	65	49	50	3.3	21	19	20	26	18	272	76
20	47	65	48	51	33	19	26	14	23	14	265	73
21	48	64	48	52	34	18	29	1 4	24	15,	261	66
22	48	62	48	52	39	20	23	13	29	8.8	185	69
23	48	59	48	52	39	21	20	12	24	10	136	69
24	47	57	48	52	39	16	24	7.8	20	6,7	107	68
25	52	62	47	53	37	11	31	9.3	15	4.0	71	68
26	62	65	47	52	34	14	18	10	61	4.1	60	62
27	64	65	46	51	31	14	16	7.8	99	3,0	49	58
28	59	66	45	48	27	14	25	6.7	56	4.9	38	56
29	59	67	45	47		12	19	6.0	36	155	35	63
30	66	67	45	46		ii	15	226	33	139	31	64
31	74		43	46		10		602		77	29	
TOTAL	2090	1892	1594	1434	1088	673	530.7	2118.6	9432	1867.5	5165	3723
MEAN	67.4	63,1	51.4	46.3	38.9	21.7	17.7	68.3	314	60.2	167	124
MAX	149	82	66	53	47	36	31	602	788	230	744	477
MIN	46	44	43	. 39	27	10	9.3	6.0	15	3.0	13	26
AC-FT	4150	3750	3160	2840	2160	1330	1050	4200	18710	3700	10240	7380

CAL YR 1980 TOTAL 59053.5 MEAN 161 1070 AC-FT 117100 MAX MIN 4.1 YR 1981 TOTAL 86.6

Continued

PERIOD OF RECORD.--Water years 1937 to current year. PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: July 1937 to current year.
WATER TEMPERATURES: April 1949 to current year.
SUSPENDED SEDIMENT DISCHARGE: January 1949 to current year.

REMARKS. -- Continuous water-temperature and specific conductance

recorder since July 1981.
EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum daily, 28,800 micromhos June 24, 1977; minimum daily, 464 micromhos Sept. 23, 1974.

WATER TEMPERATURES: Maximum, 36.0°C July 27, 1966, July 25, 1969; minimum, 0.0°C on many days

during winter months of most years.

SEDIMENT CONCENTRATIONS: Maximum daily, 21,300 mg/L Aug. 1, 1962; minimum daily, no flow on many days during July 1953, July and August 1954, July 1957, July to October 1964.

SEDIMENT LOADS: Maximum daily, 183,000 tons (166,000 tonnes) Sept. 26, 1955; minimum daily, 0 tons (0 tonnes) on many days during July 1953, July and August 1954, July 1957, July to October 1964. EXTREMES FOR CURRENT YEAR .--

SPECIFIC CONDUCTANCE: Maximum daily, 18,800 micromhos Mar. 27; minimum daily, 600 micromhos July 29.
WATER TEMPERATURES: Maximum, 35.5°C July 19, 20, 21, Aug. 2; minimum, 3.0°C Nov. 25, Dec. 22, Jan. 20.
SEDIMENT CONCENTRATIONS: Maximum daily, 13,800 mg/L Aug. 13; minimum daily, 4 mg/L Dec. 17, Feb. 17.
SEDIMENT LOADS: Maximum daily, 29,300 tons (26,600 tonnes) Aug. 13; minimum daily, 0.29 ton (0.26 tonne)

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981

			CHEMICA	L ANALYSE	S, WATER	YEAR OCT	POBER 198	30 TO SEE	TEMBER 19	981		
DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	PH (UNITS) (00400)	TEMPER- ATURE, AIR (DEG C) (00020)	TEMPER- ATURE (DEG C) (00010)	SOLVI (MG/I	- (HIC ED LEVEL L) (MG/I	ND, M- HARI NESS H (MG, L) AS L) CACC	D- NE S NON /L BON. (M: O3) CA	RD- SS, CAR- ATE G/L CO3)	HARD- NESS NONCAR- BONATE (MG/L AS CACO3) (95902)
NOV 19	1100	65	9400	8.0	8.0	7.0	10.	. 9	68 24	400	2200	
JAN								-				
30 MAR	1430	46	9500	8.5	14.0	8.0) 11.	. 8	66 24	400	2200	
19	1400	30	13600	8.7	26.0	12.0	13.	.1	99 3	500		3500
MAY 27	1225	19	15400	8.0	37.0	29.0	9.	.9 1	130 3:	300		3200
JUL 23 SEP	1330	9.3	11200	8.3	40.0	33.0	7.	.6 1	180 2	500		2400
16	1400	86	6200	8.5	28.0	25.0) -	2	330 1.	700		1700
DATE	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	SODIUM AD- SORP- TION RATIO (00931)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	ALKA- LINITY LAB (MG/L .AS CACO3)		DIS- ED SOLV L (MG/ 4) AS C	E, RIDE DISOLVED SOLVED (MG, CL) AS I	E, DI S- SO VED (M /L A F) SI	LVED G/L	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L) (70301)
19 JAN	590	220	1200	11	13	180	1600	2200)	.2	13	5950
30	580	240	1500	13	11	190	2000	2500)	1.2	45.	6990
19	300	680	2200	16	15	84	2600	3800)	.8	1.8	9650
27 JUL	740	360	2500	19	1.3	120	2700	4300)	.7	9.2	10700
23 SEP	590	240	1600	14	20	83	2100	3000)	•7	11	7610
16	430	160	780	8.2	8.2	75	1400	1300)	.7	8.4	4130
	O NO2 TO (M ATE AS	TTRO- (CEN, NO.22+NO.3 (CEN, NO.22+NO.3 (CEN, NO.22+NO.3) (CEN, NO.22+NO	R+NO3 G DIS- AMM DLVED TO MG/L (M S N) AS	EN, GONIA ORG TAL TO G/L (M	ANIC COTAL TO IG/L (M IN) AS	EN, PE TAL : IG/L (N)	PHOS- HORUS, FOTAL S (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P) (00671)	BORON, DIS- SOLVED (UG/L AS B) (01020)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	ORG TO (M AS	BON, ANIC TAL G/L C) 680)
	9	1.1	1.1	.690	1.1	2.9	.080	.070	440	50		5.1
	0	.53	.54	.490	1.2	2.2	.230	.040	600	70		16
1	R 9	.00	.00	.220	1.5	1.7	.130	.000	800	70		15
MA 2 JU	7	.02	.00	.100	1.3	1.4	.150	.070	1100	70		11
	3	<.10	<.10	.190	1.5	1.7	.190	<.010	880	50		7.4
	6		.16					<.010	390	70		8.4

08396500 PECOS RIVER NEAR ARTESIA, NM -- Continued WATER-QUALITY RECORDS

TRACE ELEMENT ANALYSES, WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981

DATE	TIME	ARSENIC TOTAL (UG/L AS AS) (01002)	SOI (UC SA	S- LVED S G/L (AS) A	ORON, DIS- OLVED UG/L S B) 1020)	TO: REC ER.	MIUM FAL COV- ABLE G/L CD)	D SO U) SA	MIUM IS- LVED G/L CD) 025)	CHR MIU TOT REC ERA (UG AS (010	M, AL OV- BLE /L CR)	CHRO MIUM DIS- SOLV (UG/ AS (M, VED VL CR)	COPPI TOTA RECO ERAI (UG, AS (AL OV- BLE /L CU)	COPP DIS SOL (UG AS	VED /L CU)
NOV 19	1100	1		1	440		3		1		20		0		2		2
MAY 27	1225	2	!	2	1100		0		0		3		30		5		1
Date	IRO DI SOL (UG AS (010	N, TO S- RE VED EF /L (U FE) AS	AD, OTAL CCOV- CABLE OG/L G PB)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	ERA (UG	AL COV- BLE (/L HG)	MERC DI SOL (UG AS	S- VED /L HG)	SELI NIUI TOTA (UG, AS :	M, AL /L SE)	SELE- NIUM DIS- SOLVI (UG/I AS SI (0114)	ED E)	ZING TOTA RECO ERAL (UG/ AS Z	AL OV- BLE (L EN)	ZINC DIS SOLV (UG/ AS Z (0109	ED L N)	
NOV 19		50	6	4		.0		.0		2		2		30		40	
MAY 27		70	4	2		. 2		.0		2		2		60		20	
	СНЕМ	ICAL ANA	LYSES	OF BOTT	TAM MO	ERIA	L, WA	TER '	YEAR (остов	ER 19	30 TC) SEF	TEMB	ER 19	81	
	DATE	Time	NO24 TOT. BOT	EN, GE +NO3 T IN IN MAT E/KG (M N) A	ITRO- N,NH4 OTAL BOT. MAT. G/KG S N) 0611)	GEN IN I TOM TER: (MG,	/KG N)	PHO TO IN M (MG, AS	OS- RUS, TAL BOT. AT. /KG P) 668)	ARSE TOT IN B TOM TER (UG AS (010	AL OT- MA- IAL /G AS)	CADMI RECO FM BO FOM M TERI (UG) AS (OV. OT- MA- IAL /G CD)	CHROMIUM RECO FM BO TOM I TER: (UG,	1, OV. OT~ 1A- IAL /G)		
İ	MAY 27	1225	1	15	4.1	(65		170		0		0		1		
	DA	RE FM TOM TE (U	BALT, CCOV. BOT- MA- CRIAL BG/G CO)	COPPER, RECOV. FM BOT- TOM MA- TERIAL (UG/G AS CU) (01043)	FM B TOM TER (UG	COV. SOT- MA- RIAL G/G FE)	LEA REC FM B TOM TER (UG AS (010	OV. OT- MA- IAL /G PB)	MANO NESI RECO FM BO TOM I TERI (UG,	E, OV. OT- MA- IAL /G)	MERCUI RECOI FM BOI TOM MA TERIA (UG/O AS HO (7192)	V. T- F A- 1 AL G G)	ZING RECO FM BC FOM N TERI (UG/ AS Z (0109	OV. OT- MA- MAL (G MN)			
	MAY 27		0	3	-	430		5		250		02		1			
	٠,			CAL ANAL			R YEA						MBER				
DATE		AI 1 SC (U ME A U-	ROSS JPHA, DIS- DLVED DG/L AS NAT)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	DI SOL (PCI AS CS-1	PA, IS- LVED I/L I I37)	GRO BET SUS TOT (PCI AS CS-1 (035	A, P. AL /L 37)	GROS BETS DIS SOL' (PC) AS S YT-	A, S- VED I/L SR/ 90)	GROS BETA SUSP TOTA (PCI, AS S YT-9 (8006	, L S /L R/ O) (RADI 226 DIS SOLVI RADO METI (PCI/	5, 1 5- 1 ED, ON 10D (L)	URANI NATUR DIS SOLV (UG/ AS U	AL ED L	
MAY 27	. 12	25 < 2	270	1.8	< 13	30		2.9	< 130	D	2	. 8		.15	6	.9	
				E ANALYS													
				DATE	TI	IME	2,4, TOT (UG (397	AL /L)	SILV TOTA (UG,	AL /L)							
				MAY 27	12	225		.00		.00							

MICROBIOLOGICAL ANALYSES, WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981

		COLI-	STREP-
		FORM,	TOCOCCI
	•	FECAL,	FECAL,
		0.7	KF AGAR
		UM-MF	(COLS.
	TIME	(COLS./	PER
DATE		100 ML)	100 ML)
		(31625)	(31673)
NOV			
19	1100	7	380
JAN			
30	1430	4	32
MAR			
19	1400	1	260
MAY			•
27	1225	21	10
JUL			
23	1330	0	18
SEP '			
16	1400	230	140

INSTANTANEOUS SUSPENDED SEDIMENT AND PARTICLE SIZE, WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981

DATE NOV	TIME	STREAM FLOW, INSTAN TANEOU: (CFS)	TEM AT	PER- URE G C) 010)		T, DED	SED MEN DI CHAR SU PEN (T/D	T, S- GE, S- DED AY)	SED. SUSP. FALL DIAM. FINEI THAN .002 MM	St F/ D: R % F: Ti	ED. JSP. ALL IAM. INER IAN I MM B38)	SED SUS FAL DIA * FIN THA .016	EP. L M. IER IN IM
19	1100	6	5	7.0		57	1	0		-			
MAR 19	1400	3	n	12.0		61		4.9		_			
31	1410	ĩ.		23.0		99		2.7					
MAY	1010	20	^	10.0		000	F 0.0	^					
07 30	1012 1536	39 43		18.0 23.0		990 750	528 435		48 35		69 50		97 84
31	0812	57	•	22.0	_	800	591		3:		49		82
JUN	1114	74		23.0	2	400	687	0	4	1	55		0.5
02 06	1810	78		24.5		130	666		25		35		85 56
13	1057	40		26.0		.550	171		29		42		67
14	0930	16		25.0		889	40		49		64		83
JUL 10	1130	30	,	23.5		630	376	0	50	,	66		81
10	1851	21		28.5		400	438		5	-	77		96
30	1639	13		30.0		170	337		69		82	1	100
AUG			_		_			_		_			
14 15	1519 1510	62 36		26.0 26.5		400	1600 642		5: 60		69 78		89 93
SEP	1310	50		20.5	·	110	012	·	0.	,	,,		,,
07 10	1838 1419	48 31		21.0 24.0		3520 .860	463 159		4: 58		61 73		84 94
DATE	SI F D % F T	USP. ALL IAM. INER % HAN 2 MM .1	SED. SUSP. FALL DIAM. FINER THAN 25 MM 0343)	SEI SUS FAI DIA * FII THA .250 (7034	SP. LL AM. NER AN MM	SIE	SP. VE AM. NER AN MM	SED. SUSI SIEVI DIAI % FINI THAI .125 (P. 8 E S: M. 1 ER % 1 MM .2	SED. SUSP. LEVE DIAM. FINER THAN 50 MM	SEI SUS SIEV DIA * FIN THA .500 (7033	SP. /E AM. NER AN MM	
NOV 19							73	;	82	96	1	100	
MAR 19							85						
31							70		75	96	1	100	
MAY 07.		100											
30							98		00				
31.							98		00				
JUN													
02. 06.		89	100				98		00				
13.							89		99	100			
14.							95	10	00				
JUL 10.		93	99		100								
10.		100											
30.													
AUG		0.0	100										
14. 15.		98	100				98		00				
SEP													
07 10							95 99		00 00				

08396500

7960 MEAN

9200

7880

MEAN

WTR YR 1981



•	SPECI	FIC CONDU	CTANCE (MICROMHOS/0		DEG.°C),		OCTOBER	1980 то	SEPTEMBER	1981	
DAY	OCT	NOA	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4440	7820	9020	10100	10000	11700	16000	15400	4090	5770	4160	8350
2	4730	7480	8860	10200	10100	11800	16300	16000	3560	5800	4920	8360
3	4950	6580	8630	10200	10100	14700	16300	16500	3300	4060	6020	6160
4	5050	6670	8560	10200	10400	14700	16100	16600	3300	3990	7950	6130
5	5200	6500	8630	10300	10500	13200	16100	3590	3260	3990	10200	5180
6	6150	6580	8710	10200	10600	13300	16100	4530	3210	4510	12900	5180
7	6930	7030	8710	10300	10500	12000	16100	4410	3000	4490	10600	2450
- 8	7220	6980	8780	10300	10500	11900	16400	4350	3070	4510	10600	2450
9	7760	7170	9090	10300	10700	11400	16400	4510	3020	5710	9530	2650
10	8250	7650	9620	10300	10600	11300	16100	4760	3070	4040	3900	3310
11	8170	7880	9710	10300	10900	11500	16200	5260	3090	2600	2860	4060
12	8170	8190	9900	10200	10900	11500	16000	6110	3130	3120	3340	4320
13	8310	8520	9710	10300	10800	13100	16100	8220	3150	2850	3340	4340
14	8310	8520	9530	10300	10800	13100	16000	8140	3130	3370	1940	4870
15	8370	8810	9440	10200	10700	14200	16100	9180	3510	3290	1680	5260
· 16	9040	8810	9520	10300	10800	14100	15900	9180	3840	3280	1740	61.10
17	9450	8970	9620	10300	11500	13000	16000	13800	4330	5430	2170	6540
18	9720	8150	9510	10100	11500	13000	15700	13800	4900	7210	2020	7230
19	9630	8290	9420	10100	12400	13200	15800	12100	6430	8560	2860	7670
20	9630	8970	9450	10000	12300	13200	16000	12400	6390	8210	2700	7820
21	9540	8000	9520	9900	11600	14000	16000	12400	8560	10000	2310	7950
22	9450	8000	9520	9900	11500	14000	15700	14800	8630	12700	2390	8350
23	9630	8120	9620	9900	11300	14000	15700	16400	8280	11200	2790	8350
24	9200	8120	9710	9810	11300	14000	15700	15500	8210	13400	3860	8230
25	9200	8060	10100	9450	11500	13600	15700	15600	9020	14700	4240	8230
26	8880	8060	10000	9450	11500	13600	15400	17300	4490	14700	4720	8160
27	8000	8460	10000	9280	11700	18800	15400	17300	4510	14900	6050	8430
28	7700	8460	10000	9450	11700	18600	15600	15500	4670	14600	6470	8430
29	7700	8970	10100	9630		16000	15600	15900	4670	1080	6820	9180
30	7760	9040	9980	9900		16000	16000	11400	4630	2940	10800	8630
31	7880		10000	10000		16000		11400		2870	10900	

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG.°C), WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981

13700 16000 13 MIN 1080

4680

5380

6410

·11000 18800

10000

MAX

DAY	MAX	. MIN	MEAN	MAX	MIN JULY	MEAN	MAX	MIN AUGUST	MEAN	мах	MIN SEPTEME	MEAN
					• • • •						DD1 X ZIII Z	
1							4100	2800	3570	9300	8100	8580
2							4900	3100	4220	9300	7230	8430
3							3900	3200	3580	7040	5990	6450
4							5100	3900	4470	5930	4970	5330
5								5300	-~-	5050	4970	5010
=								3300		2030	4210	3010
6										5050	4780	4940
7								6100		4760	4170	4460
8								5200		4140	3660	3910
9				7500	7300	7410		2600		3630	3360	3520
10				9680	3640	6300	4500	3000	3330	3340	2910	3180
				2000	3040	0300	4500	3000	3330	3340	2310	2100
11		,		3390	2540	2790	3000	2600	2720	3070	2840	2950
12				3240	2990	3070	2900	1100	2030	3170	2930	3060
13				3310	2840	3080	2600	1100	1930	3420	3100	3250
14				2930	2750	2820	2300	2000	2120	3730	3380	3570
15				3730	2960	3330	2000	1800	1950	4210	3710	3990
23				3730	2900	3330	2000	1800	1930	4210	3/10	3990
16				4500	3710	4090	1900	1700	1760	4410	4160	4230
17				5600	4400	5000	1900	1600	1740			
18				7700	5600	6630	1900	800	1730			
19				8700	7800	8330	2700	800	2150			
20				8600	7600	8090	3000	2700	2880			
									2000			
21					8400		2700	2300	2520			
22							2300	2100	2210	~		
23							3100	2200	2670	·		
24							3700	3100	3430			
25							4000	3500	3730			
26							5100	3800	4340			
27							6000	4800	5530			
28							6400	4800	6000			
29					600		7300	6300	6810			
30				4600	2700	3230	7600	3400	5970			
31				2900	2600	2740	8500	7400	7870			
MONTH				9680	600	4780	8500	800	3510	9300	2840	4680
YEAR	9680	600	4160	2000	000	4,00		000	3310	3300	2040	4000
NOTE:				RECORD EX	CEEDED 2	OR OF YEAR	₹					
						o o. Ilm	•					

	÷				WATER-(QUALITY REC	ORDS			=		
		TEM	PER , W	ATER (DE	C °C) . WA	rer year oc	TORED	1980	TEMBER :	1081		'n
DAY	ОСТ	NOV	DEC	JAN		NCE-DAILY MAR	APR	MAY	JUN	JUL	AUG	,
1	21.0	14.5	7.0	8.0	6.5	15.0	22.0	27.0	21.0	30.5	29.5	SEP
2 3	25.5 21.0	13.0 15.0	11.5 9.0	8.0 9.0	6.5 5.0	15.5 16.5	16.5 16.0	22.5 20.5	23.0	25.5 30.5	25.5 26.0	29.0 28.5
4 5	25.0 19.0	12.5 13.5	8.5 12.5	8.5 9.0	9.0 7.0	11.5 15.0	19.0 18.5	21.0 23.5	24.5	29.5 30.0	27.0 25.0	23.5 24.0
6	20.0	15.0	11.5	10.5	7.0	14.5	14.0	25.0	24.5	28.0	25.5	24.5
7 8	25.5 20.0	13.5 15.5	12.5 13.5	8.0	7.0 7.5	9.5 11.5	13.5	18.0 19.0	26.0 27.5	28.5 33.0	24.0	22.5
9 10	19.0 23.0	19.0 13.5	6.5	8.5 9.0	11.0	9.5 10.5	20.5	23.5 22.5	28.0 28.0	28.5 28.5	25.0 25.0	20.5
11	22.0	14.5	9.5	8.5	11.0	12.5	18.0	19.5	29.0	29.0	25.5	24.0 25.0
12 13	23.0 22.5	15.0 14.0	8.5 7.5	8.0 7.0	5.5 5.0	11.0 16.0	23.0	27.0 25.0	26.5 26.0	25.0 27.5	24.0 23.5	25.0
14 15	23.0 18.0	15.0 14.5	6.0 12.0	5.0 6.5	11.5	15.5 12.5	18.0	26.0 22.5	25.0 22.5	31.0 28.0	26.0 26.5	24.5 24.0
16	19.0	14.0	12.0	7.0	8.0	13.0	22.0	23.0	23.0	29.5	24.0	23.5
17 18	19.0 19.5	13.5	12.5 11.0	6.0 5.0	15.5 15.0	17.5 15.0	23.0	22.0 22.5	25.0	30.0	25.0	27.0 21.5
19 20	14.5	5.0	7.0	3.5	18.0	15.0	19.0	26.5	29.0 28.0	32.0 29.5	25.0 26.0	19.0 25.0
21	19.0	4.0	5.5	3.0	12.0	15.5	21.5	25.0	28.5	35.0	27.0	19.5
22	15.0	9.0 4.0	5.0 3.0	4.5 6.5	7.5 9.0	15.0 11.0	21.5	25.5 27.0	33.0 34.0	29.0 27.0	27.0 25.5	20.0 21.5
23 24	18.5 16.5	4.0 5.5	5.0 6.0	5.0 8.5	11.0 10.5	16.5 18.0	22.5 23.0	27.5 26.5	28.0 28.5	33.5 31.0	23.5 28.5	21.0 21.0
25	17.0	3.0	8.0	7.0	13.0	19.0	26.0	27.0	29.0	29.0	30.0	21.5
26 27	13.0 16.5	4.5 6.0	12.0 7.0	6.5 6.0	17.5 15.0	22.0 22.0	27.5 25.5	24.5 25.0	29.0 28.0	30.5 29.0	23.5 25.0	23.0 24.5
28 29	11.0 7.0	8.0 6.0	10.0 12.5	11.0 9.0	11.0	21.0 15.0	24.0 24.5	24.5 25.5	29.0 25.0	25.0 22.0	24.0 30.0	25.0 26.0
30 31	14.5 13.0	7.0	12.0	10.0		16.0 23.0	26.5	23.0 22.0	25.0	30.0 25.5	23.0 23.5	21.0
MEAN	18.5	11.0	9.0	7.5	10.0	15.0	21.0	24.0	26.5	29.0	25.5	23.0
WTR YR		MEAN	18.5	MAX	35.0	MIN	21.0	3.0	20.5	25.0	23.3	. 23.0
	WATER T	EMPERATUR	E (DEG.°C),	RECORDE	R MAXIMUM	, AND MEAN,	WATER	YEAR OCTOR	ER 1980	то ѕертемві	ER 1981	•
DAY	XAM	MIN JUNE	MEAN	MAX	MIN JULY	MEAN	MAX	MIN AUGUST	MEAN	XAM	min Septemb	MEAN ER
1 2							33.0 35.5	25.0 24.0	28.5 29.5	25.5 29.0	21.5 21.0	23.5 24.5
3							31.0 32.0	26.5 25.0	28.5 28.5	30.0	22.5	26.0
5							34.0	24.5	29.0	24.5 22.5	21.5 21.5	23.0 22.0
6 7				~~-			34.0	24.5	29.0	23.5	20.5	22.0
, 8 9				~			26.5 30.0		25.0 25.5	23.0 21.5	21.5 20.5	22.5 21.0
10				29.5 28.0	25.5 22.5	27.5 25.5	28.0 28.5		25.5 26.5	20.5 22.0	20.0 20.0	20.5 21.0
11 12				29.5	25.0	27.0	26.0		24.5	23.5		22.5
13				29.0 30.0	24.5 25.0	27.0 27.5	26.0 24.0	22.5 22.5	24.0	24.5 25.5	22.5 23.5	23.5 24.5
14 15				31.5 33.5	24.5 25.0	28.0 28.5	24.5 25.5	21.5 24.0	24.0 25.0	25.5 25.0	23.5 23.0	24.5 24.0
16				32.5	24.0	28.0	27.0		25.0	23.5	22.0	23.0
17 18				32.5 34.5	24.0 24.0	27.5 29.0	27.5 27.0	24.5	25.5 25.5			
19 20				35.5 35.5	24.5 24.5	29.5 30.0	27.5 27.5		26.0 25.5			

MONTH 35.5 21.0 27.5 YEAR 20.0 26.0 NUMBER OF MISSING DAYS OF RECORD EXCEEDED 20% OF YEAR NOTE:

24.5 22.5 23.0 23.0 21.5

22.5 23.0 22.5 21.0

25.0 25.0

35.5 34.5 34.5 34.5 34.5

34.0 33.0 28.5 27.5

30.0

32.0

29.5 28.0 27.5 27.5 27.0

27.5 27.5 27.0 25.0 24.5 27.5

28.0

27.5 28.0 29.0 29.5 31.0

31.5 31.5 31.5 32.0

32.5

32.0

35.5

23.5 23.0 22.5 23.0 22.5

22.5 23.5 22.5 22.5 22.5 22.5

21.5

25.5 25.5 26.0 26.0 26.5

27.0 27.0 26.5 26.5 27.0 26.5

26.5

20.0

30.0

23.0

37

RIO GRANDE BASIN 08396500 PECOS RIVER NEAR ARTESIA, NM -- Continued WATER-QUALITY RECORDS

SUSPENDED-SEDIMENT DISCHARGE, WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981

		2021		DINDINI DI	SCHARGE, 1	WILL ILM		. 1300 10 .		1701		
DAY	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) CTOBER	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) VEMBER	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) CEMBER	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) ANUARY	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) BRUARY	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) MARCH
1 2 3 4 5	191 191 175 167 99	77 68 59 46 25	70 21 28 24 38	15 4.6 5.9 5.3 8.3	18 15 11 8 12	3.3 2.7 2.0 1.4 2.0	17 24 21 11 12	1.9 2.5 2.3 1.2 1.4	37 73 11 10 5	4.5 8.5 1.3 1.2	12 20 10 10 14	.58 1.0 .68 .84 1.4
6 7 8 9 10	79 66 27 22 32	17 12 4.7 3.6 5.5	23 22 22 26 18	4.5 3.9 3.8 4.3 2.8	26 27 33 10 12	4.4 4.3 4.9 1.3 1.6	11 10 10 10	1.3 1,1 1.2 1.2 .97	6 8 10 5 6	.76 .99 1.3 .63 .73	11 11 7 14 12	.98 1.0 .57 .72 .97
11 12 13 14 15	34 32 40 40 66	5.7 5.1 6.5 6.3 9.4	18 13 16 46 17	2.6 1.8 2.1 5.6 2.0	20 15 15 14 5	2.6 2.0 2.0 1.9	49 15 35 12 32	6.0 1.8 4.2 1.4 3.7	10 20 17 23 7	1.2 2.4 1.9 2.4 .59	6 8 14 18 14	.39 .39 .79 1.1 .95
16 17 18 19 20	36 37 25 20 22	4.6 4.6 3.1 2.5 2.8	38 25 17 35 31	5.1 3.8 2.7 6.1 5.4	5 4 12 23 24	.65 .52 1.6 3.0 3.1	10 12 10 80 20	1.2 1.5 1.3 11 2.8	7 4 5 11 12	.68 .29 .38 .98	13 18 16 34 32	.91 1.4 1.2 2.8 2.2
21 22 23 24 25	18 17 20 14 27	2.3 2.2 2.6 1.8 3.8	16 41 17 46 16	2.8 6.8 2.7 7.1 2.7	52 129 32 23 22	6.7 17 4.1 3.0 2.8	9 8 12 11 10	1.3 1.1 1.7 1.5 1.4	10 9 12 10 10	.92 .95 1.3 1.1 1.0	107 18 22 19 20	6.1 .97 1.2 1.0
26 27 28 29 30 31	14 23 19 24 20 21	2.3 4.0 3.0 3.8 3.6 4.2	14 17 19 21 48	2.5 3.0 3.4 3.8 8.8	30 24 69 99 26 13	3.8 3.0 8.4 12 3.2 1.5	10 15 8 8 12 10	1.4 2.1 1.0 1.0 1.5	10 9 10	.92 .75 .73	22 27 28 27 57 93	.83 .95 1.1 .87 1.7 2.5
TOTAL		402.0		139.2		111.43		65.17		40.11		39.09
DAY	44	LOADS (T/DAY) APRIL 1.1	29	MAY 1.0	5750	LOADS (T/DAY) JUNE 11100	144	JULY 14	2220	LOADS (T/DAY) UGUST 288	77	LOADS (T/DAY) PTEMBER 5.4
	CONCEN- TRATION (MG/L)	(T/DAY) APRIL	CONCEN- TRATION (MG/L)	(T/DAY) MAY	CONCEN- TRATION (MG/L)	(T/DAY) JUNE	CONCEN- TRATION (MG/L)	(T/DAY) JULY	CONCEN- TRATION (MG/L)	(T/DAY) UGUST	CONCEN- TRATION (MG/L) SEI	(T/DAY) PTEMBER
1 2 3 4	CONCENTRATION (MG/L) 44 22 22 21	(T/DAY) APRIL 1.1 .71 .77 .57	CONCENTRATION (MG/L) 29 25 29 27 20 14 4990 4960	(T/DAY) MAY 1.0 .74 1.1 7.8	CONCEN- TRATION (MG/L) 5750 3400 2860 3510	(T/DAY) JUNE 11100 6730 5710 7030	CONCENTRATION (MG/L) 144 187 1120 408 372 1820 1810 1280 155	(T/DAY) JULY 14 38 148 124	CONCEN- TRATION (MG/L) AV 2220 200 128 127	(T/DAY) UGUST 288 9.7 4.5 4.5	CONCEN- TRATION {MG/L} SEI 77 74 29 290	(T/DAY) PTEMBER 5.4 16 4.7 34
1 2 3 4 5 6 7 8 9	CONCENTRATION (MG/L) 44 22 22 21 19 13 18 22 25	(T/DAY) APRIL 1.1 .71 .77 .57 .48 .39 .73 .89 .81	CONCENTRATION (MG/L) 29 25 29 27 20 14 4990 4960 3980	(T/DAY) MAY 1.0 .74 1.1 7.8 4.4 1.8 4820 2570 1230	CONCENTRATION (MG/L) 5750 3400 2860 3510 2580 3130 2600 2390 2160	(T/DAY) JUNE 11100 6730 5710 7030 5260 6660 5140 4630 3990	CONCENTRATION (MG/L) 144 187 1120 408 372 1820 1810 1280 155	(T/DAY) JULY 14 38 148 124 71 226 132 66 5.9	CONCENTRATION (MG/L) AN 2220 200 128 127 133 56 1360 2080 5760	(T/DAY) UGUST 288 9.7 4.5 4.5 7.2 2.7 77 146 2970	CONCEN- TRATION (MG/L) SEI 77 74 29 290 450 4000 4460 4140 2710	(T/DAY) PTEMBER 5.4 16 4.7 34 69 6100 5740 4990 2040
1 2 3 4 5 6 7 8 9 10	CONCENTRATION (MG/L) 44 22 22 21 19 13 18 22 25 39 35 23 19 18	(T/DAY) APRIL 1.1 .71 .77 .57 .48 .39 .73 .89 .81 1.8 1.7 .75 .72 .97	CONCENTRATION (MG/L) 29 25 29 27 20 14 4990 4960 3980 1820 632 136 58 60	(T/DAY) MAY 1.0 .74 1.1 7.8 4.4 1.8 4820 2570 1230 359 77 9.9 3.0 2.3	CONCENTRATION (MG/L) 5750 3400 2860 3510 2580 3130 2600 2390 2160 2090 1850 1790 1550 889	(T/DAY) JUNE 11100 6730 5710 7030 5260 6660 5140 4630 3990 3370 2640 2130 1710 406	CONCENTRATION (MG/L) 144 187 1120 408 372 1820 1810 1280 155 4630 5430 4850 6140 4950	(T/DAY) JULY 14 38 148 124 71 226 132 66 5.9 1980 3370 2210 2900 1260	CONCENTRATION (MG/L) AN 2220 200 128 127 133 56 1360 2080 5760 8490 7720 9630 13800 10400	(T/DAY) UGUST 288 9.7 4.5 4.5 7.2 2.7 77 146 2970 3850 2330 6050 29300 18200	CONCEN- TRATION (MG/L) SEI 77 74 29 290 450 4000 4460 41.40 2710 1920	(T/DAY) PTEMBER 5.4 16 4.7 34 69 6100 5740 4990 2040 1150 672 451 345 206
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	CONCENTRATION (MG/L) 44 22 21 19 13 18 22 25 39 35 23 19 18 17 42 34 26 26	(T/DAY) APRIL 1.1 .71 .77 .57 .48 .39 .73 .89 .81 1.8 1.7 .75 .72 .97 .78 2.5 1.8 1.3 1.3	CONCENTRATION (MG/L) 29 25 29 27 20 14 4990 4960 3980 1820 632 136 60 30 34 70 71 72	(T/DAY) MAY 1.0 .74 1.1 7.8 4.4 1.8 4820 2570 1230 359 77 9.9 3.0 2.3 1.1 1.2 3.8 5.4 5.4	CONCENTRATION (MG/L) 5750 3400 2860 3510 2580 3130 2600 2390 2160 2090 1850 1790 1550 889 514 299 99 65	(T/DAY) JUNE 11100 6730 5710 7030 5260 6660 5140 4630 3990 3370 2640 2130 1710 406 133 50 13 50 13 5.8 3.0	CONCENTRATION (MG/L) 144 187 1120 408 372 1820 1810 1280 155 4630 4650 6140 4950 2820 2860 1433 210 186	(T/DAY) JULY 14 38 148 124 71 226 132 66 5.9 1980 3370 2210 2900 1260 388 263 8.9 14 9.0	CONCENTRATION (MG/L) AI 2220 200 128 127 133 56 1360 2080 5760 8490 7720 9630 13800 10400 7180 5300 4180 4970 2000	(T/DAY) UGUST 288 9.7 4.5 4.5 7.2 2.7 77 146 2970 3850 2330 6050 29300 18200 8280 4090 3990 6010 1470	CONCENTRATION (MG/L) SEI 77 74 29 290 450 4000 4460 41.40 2710 1920 1310 1050 960 525 347 88 36 47	(T/DAY) PTEMBER 5.4 16 4.7 34 69 - 6100 5740 4990 2040 1150 672 451 345 206 128 24 7.7 9.3 9.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	CONCENTRATION (MG/L) 44 22 21 19 13 18 22 25 39 35 23 19 18 17 42 34 42 26 26 24 33 39 56	(T/DAY) APRIL 1.1 .71 .77 .57 .48 .39 .73 .89 .81 1.8 1.7 .75 .72 .97 .78 2.5 1.8 1.3 1.7 2.6 2.0 2.1 3.6	CONCENTRATION (MG/L) 29 25 29 27 20 14 4990 4960 3980 1820 632 136 58 60 30 34 70 71 72 67 63 73 111	(T/DAY) MAY 1.0 .74 1.1 7.8 4.4 4.4 4.8 4820 2570 1230 359 77 9.9 3.0 2.3 1.1 1.2 3.8 5.4 4.0 3.9 4.1 4.8 5.4 6.6 5.6 5.6 3.1 2.5	CONCENTRATION (MG/L) 5750 3400 2860 3510 2580 3130 2600 2390 2160 2090 1850 1790 1550 889 514 299 99 99 95 43 45 170 228 39 35	(T/DAY) JUNE 11100 6730 5710 7030 5260 6660 5140 4630 3990 3370 2640 2130 1710 406 133 5.8 3.0 2.8 11 18 2.5 1.9	CONCENTRATION (MG/L) 144 187 1120 408 372 1820 1810 1280 155 4630 4850 6140 4950 2820 2860 1433 210 186 97 96 80 100 83 119	(T/DAY) JULY 14 38 148 124 71 226 132 66 5.9 1980 3370 2210 2900 1260 388 263 8.9 14 9.0 3.7 3.9 1.9 2.7 1.5	CONCENTRATION (MG/L) AI 2220 200 128 127 133 56 1360 2080 5760 8490 7720 9630 13800 10400 7180 5300 4180 4970 2000 2300 1650 902 902 536 383	(T/DAY) UGUST 288 9.7 4.5 4.5 7.2 2.7 77 146 2970 3850 2330 6050 29300 18200 8280 4090 3990 6010 1470 1650 1160 451 197 111	CONCENTRATION (MG/L) SEI 77 74 29 290 450 4000 4460 41.40 2710 1920 1310 1050 960 525 347 88 36 47 44 30 33 23 26 30	(T/DAY) PTEMBER 5.4 16 4.7 34 69 6100 5740 4990 2040 1150 672 451 345 206 128 24 7.7 9.3 9.0 5.9 4.3 4.8 5.5 6.4



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT NM-80-1
WATER YEAR 1980

Prepared in cooperation with the State of New Mexico and with other agencies

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The state of

RIO GRANDE BASIN

08396500 PECOS RIVER NEAR ARTESIA, NM (Surveillance program station)

LOCATION.--Lat 32°50'25", long 104°19'23", in NW\NW\ sec.18, T.17 S., R.27 E., Eddy County, Hydrologic Unit 13060007, near left bank on downstream end of bridge pier on State Highway 83, 4.3 mi (6.9 km) east of Artesia, 7.0 mi (11.3 km) upstream from Rio Penasco, 17 mi (27.4 km) upstream from McMillan Dam, and at mile 503.9 (810.8 km). DRAINAGE AREA.--15,300 mi² (39,630 km²), approximately (contributing area).

WATER-DISCHARGE RECORDS

PERIOD OF RECORD. --September 1905 to June 1909, August 1909 to current year. Monthly discharge only for some periods, published in WSP 1312 and 1712. Records for Aug. 22-31, 1934, and October 1936 to April 1937, published in WSP 763 and 828, respectively are not reliable and should not be used. Prior to February 1936, published as "near Dayton." REVISED RECORDS. --WSP 1312 and 1512: 1913, 1915, 1917-18(M), 1920, 1923, 1931-36. WSP 1712: 1906(M), 1908-11(M), 1919, 1921-23(M), 1929, 1931-32(M), 1935-36(M), 1937, 1939(M), 1941(M). See also PERIOD OF RECORD.

GAGE. --Water-stage recorder. Datum of gage is 3,291.92 ft (1,003.376 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 27, 1914, nonrecording gage and Aug. 27, 1914, to Feb. 20, 1936, water-stage recorder at site 6.5 mi (10.5 km) downstream at different datum. Feb. 21, 1936, to Apr. 4, 1941, water-stage recorder at site 600 ft

(183 m) downstream at different datum.

REMARKS.--Water-discharge records fair. Flow partly regulated by Lake Sumner (station 08384000) since August 1937.

Diversions and ground-water withdrawals for irrigation of about 154,000 acres (620 km²), 1959 determination, above

station.

AVERAGE DISCHARGE.--44 years, 250 ft³/s (7.080 m³/s) 181,100 acre-ft/yr (223 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge probably occurred May 30, 1937, when a discharge of 51,500 ft³/s (1,460 m³/s) was measured by slope-area method at a point 15 mi (24.1 km) upstream, gage height, 14.7 ft (4.48 m), site and datum then in use; no flow at times in 1934, 1946-47, 1953-54, 1957, 1964-65.

EXTREMES OUTSIDE PERIOD OF RECORD.--Greatest flood since at least 1893 occurred Oct. 2, 1904, discharge not determined; the peak inflow to Lake McMillan, which includes Rio Penasco and Fourmile Draw, was estimated at 82,000 ft³/s (2,320 m³/s). The second highest flood occurred July 25, 1905, discharge below Rio Penasco, 50,300 ft³/s (1,420 m³/s), based on gain in storage and spill from Lake McMillan. The floods in August 1893 and October 1904 damaged McMillan Dam and washed out Avalon Dam.

EXTREMES FOR CURRENT YEAR.--Maximum discharge 1,670 ft²/s (47.3 m³/s) Sept. 12, gage height, 9.00 ft (2.743 m) no peak above base of 2,000 ft³/s (57 m³/s); minimum, 3.4 ft³/s (0.096 m³/s) June 14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980 MEAN VALUES

DAY	oct	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
i	25	165	54	62	83	49	25	417	23	583	204	14
2	25	149	54	62	92	48	18	194	22	576	125	21
3	22	137	55	62	104	48	18	173	25	593	99	14
4	19	131	56	62	106	51	22	148	19	593	72	ii
5	13	128	56	60	94	48	21	131	17	617	45	9.6
6	12	114	58	59	86	46	20	103	16	641	39	12
7	13	103	59	60	R O	45	21	83	11	655	50	11
8	14	93	59	60	71	42	22	8.3	8.9	718	71	8.9
9	17	87	57	59	72	41	21	71	8.2	740	52	39
10	14	84	55	57	70	41	21	62	7.5	720	49	100
11	13	81	54	56	65	42	21	56	7.5	720	44	240
12	13	78	54	57	68	39	34	105	6.4	715	46	1070
13	13	- 76	57	57	70	39	468	84	4.9	720	50	497
14	15	75	64	57	72	38	638	51	5.2	715	55	537
15	15	70	62	58	72	37	619	44	16	698	44	564
16	15	69	69	57	72	37	619	53	17	705	217	668
17	15	67	72	56	75	36	641	54	7.5	720	107	415
18	411	66	74	51	75	36	680	64	4.7	718	49	216
19	739	64	70	50	74	34	670	132	4.7	715	27	169
20	780	62	66	50	72	30	672	98		710	31	140
20	780	02	00	50	72	30	0/2	Ун	4.7	710	31	140
21	444	59	68	53	74	28	692	64	4.1	725	25	114
22	185	59	68	59	69	25	690	53	4.1	730	35	93
23	314	59	66	74	64	22	718	39	57	750	33	82
24	760	59	66	75	61	19	718	31	419	710	19	68
25	828	57	66	87	58	17	732	30	487	690	12	75
26	873	57	64	84	55	16	808	29	524	700	11	125
27	905	56	64	83	52	14	795	28	540	690	14	248
28	877	55	64	83	51	15	715	27	547	685	12	359
29	393	54	64	83	51	17	735	24	571	730	9.6	235
30	230	55	62	82		16	738	24	595	649	11	173
31	174	•••	62	82		17		27		534	11	
TOTAL	8186	2469	1919	1997	2108	1033	12612	2582	3984.4	21165	1668.6	6327.5
MEAN	264	92.3	61.9	64.4	72.7	33.3	420	83.3	133	683	53.8	211
MAX	905	165	74	87	106	51	808	417	595	750	217	1070
MIN	12	54	54	50	51	14	18	24	4.1	534	9.6	8.9
AC-FT	16240	4900	3810	3960	4180	2050	25020	5120	7900	41980	3310	12550
CAL YR	1979 TOTAL	53623.1	MEAN	147	AX 1170	MIN 3.9	AC-FT	106400				
WIR YR					AX 1070	MIN 4.1	AC-FT					
*** 14	TYOU TOTAL	2 90,121.2	- PEAR	100 F	10/0	474 4°I	AC-LI	131000				

PERIOD OF RECORD.--Water years 1937 to current year.
PERIOD OF DAILY RECORD.-SPECIFIC CONDUCTANCE: July 1937 to current year.
WATER TEMPERATURES: April 1949 to current year.
SUSPENDED SEDIMENT DISCHARGE: January 1949 to current year.

EXTREMES FOR PERIOD OF DAILY RECORD .--

SPECIFIC CONDUCTANCE: Maximum daily, 28,800 micromhos June 24, 1977; minimum daily, 464 micromhos Sept. 23, 1974.
WATER TEMPERATURES: Maximum, 36.0°C July 27, 1966, July 25, 1969; minimum, 0.0°C on many days during winter

WATER TEMPERATURES: Maximum, 36.0°C July 27, 1966, July 25, 1969; minimum, 0.0°C on many days during winter months of most years.

SEDIMENT CONCENTRATIONS: Maximum daily, 21,300 mg/L Aug. 1, 1962; minimum daily, no flow on many days during July 1953, July and August 1954, July 1957, July to October 1964.

SEDIMENT LOADS: Maximum daily, 183,000 tons (166,000 tonnes) Sept. 26, 1955; minimum daily, 0 tons (0 tonnes) on many days during July 1953, July and August 1954, July 1957, July to October 1964.

EXTREMES FOR CURRENT YEAR.—

SPECIFIC CONDUCTANCE: Maximum daily, 26,000 micromhos Mar. 28; minimum daily, 1,160 micromhos July 24, 26.

WATER TEMPERATURES: Maximum, 33.0°C June 13, 23; minimum, 3.0°C Dec. 2, 16-17.

SEDIMENT CONCENTRATIONS: Maximum daily, 5,950 mg/L Sept. 17; minimum daily, 5 mg/L Mar. 15

SEDIMENT LOADS: Maximum daily, 9,380 tons (8,510 tonnes) Oct. 19; minimum daily, 0.20 ton (0.18 tonne) June 18.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS) (00095)	PH FIELD (UNITS) (00400)	TEMPER- ATURE, AIR (DEG C) (00020)	TEMPER- ATURE, WATER (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM- ICAL (HIGH LEVEL) (MG/L) (00340)	HARD- NESS (MG/L AS CACO3) (00900)
OCT 12	0912	13	13800	8.1	24.5	15.5	12	9.0	59	3400
NOV 09	0945	87	4050	8.5	15.5	10.5	63	10.2	35	1500
DEC 05	0845	56	7300	8.5	16.0	5.0	4.8		150	2000
JAN 18	1030	51.	8700	8.6	19.5	9.0	1.1	13.2	49	2100
FEB 26	1000	55								
MAR			8770	8.4	23.0	11.0	2.8	14.4	72	2400
25 APR	0945	17	14900	8.3	23.5	15.0	5.9	11.6	3400	3300
30 MAY	0930	738	2170	8.1	31.0	19.0	560	7.0	2	1100
27 JUN	1030	28	6250	8.2	31.0	25.0	37	8.2	160	2100
24 JUL	1030	419	3600	7.9	39.0	25.5	4000	4.8	180	1600
22	1000	730	1200	8.2	32.0	25.0	420	3.2	32	580
AUG 26	1030	11	7200	8.3	34.5	27.0	17	7.2	41	1500
29	1030	235	2800	8.1	23.0	20.0	460	7.4	64	1000
DATE	HARD- NESS, NONCAR- BONATE (MG/L CACO3) (00902)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	SODIUM AD- SORP- TION RATIO (00931)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	ALKA- LINITY (MG/L AS CACO3) (00410)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)
OCT 12	NESS, NONCAR- BONATE (MG/L CACO3)	DIS- SOLVED (MG/L AS CA)	SIUM, DIS- SOLVED (MG/L AS MG)	DIS- SOLVED (MG/L AS NA)	AD- SORP- TION RATIO	SIUM, DIS- SOLVED (MG/L AS K)	LINITY (MG/L AS CACO3)	DIS- SOLVED (MG/L AS SO4)	RIDE, DIS- SOLVED (MG/L AS CL)	RIDE, DIS- SOLVED (MG/L AS F)
OCT 12 NOV 09	NESS, NONCAR- BONATE (MG/L CACO3) (00902)	DIS- SOLVED (MG/L AS CA) (00915)	SIUM, DIS- SOLVED (MG/L AS MG) (00925)	DIS- SOLVED (MG/L AS NA) (00930)	AD- SORP- TION RATIO (00931)	SIUM, DIS- SOLVED (MG/L AS K) (00935)	LINITY (MG/L AS CACO3) (00410)	DIS- SOLVED (MG/L AS SO4) (00945)	RIDE, DIS- SOLVED (MG/L AS CL) (00940)	RIDE, DIS- SOLVED (MG/L AS F) (00950)
OCT 12 NOV 09 DEC 05	NESS, NONCAR- BONATE (MG/L CACO3) (00902)	DIS- SOLVED (MG/L AS CA) (00915)	SIUM, DIS- SOLVED (MG/L AS MG) (00925)	DIS- SOLVED (MG/L AS NA) (00930)	AD- SORP- TION RATIO (00931)	SIUM, DIS- SOLVED (MG/L AS K) (00935)	LINITY (MG/L AS CACO3) (00410)	DIS- SOLVED (MG/L AS SO4) (00945)	RIDE, DIS- SOLVED (MG/L AS CL) (00940)	RIDE, DIS- SOLVED (MG/L AS F) (00950)
OCT 12 NOV 09 DEC 05 JAN 18	NESS, NONCAR- BONATE (MG/L CACO3) (00902) 3300	DIS- SOLVED (MG/L AS CA) (00915) 500 420	SIUM, DIS- SOLVED (MG/L AS MG) (00925) 520	DIS- SOLVED (MG/L AS NA) (00930) 2100 450	AD- SORP- TION RATIO (00931) 16	SIUM, DIS- SOLVED (MG/L AS K) (00935) 22	LINITY (MG/L AS CACO3) (00410) 130	DIS- SOLVED (MG/L AS SO4) (00945) 3200 1100	RIDE, DIS- SOLVED (MG/L AS CL) (00940) 3700	RIDE, DIS- SOLVED (MG/L AS F) (00950)
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26	NESS, NONCAR- BONATE (MG/L CACO3) (00902) 3300 1400	DIS- SOLVED (MG/L AS CA) (00915) 500 420 430	SIUM, DIS- SOLVED (MG/L AS MG) (00925) 520 110 230	DIS- SOLVED (MG/L AS NA) (00930) 2100 450	AD- SORP- TION RATIO (00931) 16 5.1 9.7	SIUM, DIS- SOLVED (MG/L AS K) (00935) 22	LINITY (MG/L AS CACO3) (00410) 130 130	DIS- SOLVED (MG/L AS SO4) (00945) 3200 1100 2600	RIDE, DIS- SOLVED (MG/L AS CL) (00940) 3700 770 860	RIDE, DIS- SOLVED (MG/L' AS F) (00950)
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR	NESS, NONCAR- BONATE (MG/L CACO3) (00902) 3300 1400 1900	DIS- SOLVED (MG/L AS CA) (00915) 500 420 430	SIUM, DIS- SOLVED (MG/L AS MG) (00925) 520 110 230	DIS- SOLVED (MG/L AS NA) (00930) 2100 450 1000	AD- SORP- TION RATIO (00931) 16 5.1 9.7	SIUM, DIS- SOLVED (MG/L AS K) (00935) 22 7.6 9.5	LINITY (MG/L AS CACO3) (00410) 130 130 170	DIS- SOLVED (MG/L AS SO4) (00945) 3200 1100 2600 1800	RIDE, DIS- SOLVED (MG/L AS CL) (00940) 3700 770 860 2100	RIDE, DIS- SOLVED (MG/L AS F) (00950) .8 .5
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR 25 APR 30	NESS, NONCAR- BONATE (MG/L CACO3) (00902) 3300 1400 1900 2000	DIS- SOLVED (MG/L AS CA) (00915) 500 420 430 480 560	SIUM, DIS- SOLVED (MG/L AS MG) (00925) 520 110 230 220	DIS- SOLVED (MG/L AS NA) (00930) 2100 450 1000 1200	AD- SORP- TION RATIO (00931) 16 5.1 9.7 11	SIUM, DIS- SOLVED (MG/L AS K) (00935) 22 7.6 9.5 11	LINITY (MG/L AS CACO3) (00410) 130 130 170 150	DIS- SOLVED (MG/L AS SO4) (00945) 3200 1100 2600 1800	RIDE, DIS- SOLVED (MG/L AS CL) (00940) 3700 770 860 2100	RIDE, DIS- SOLVED (MG/L' AS F) (00950) .8 .5 .8
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR 25 APR 30 MAY 27	NESS, NONCAR- BONATE (MG/L CACO3) (00902) 3300 1400 1900 2000 2300 3100	DIS- SOLVED (MG/L AS CA) (00915) 500 420 430 480 560 750	SIUM, DIS- SOLVED (MG/L AS MG) (00925) 520 110 230 220 240 340	DIS- SOLVED (MG/L AS NA) (00930) 2100 450 1000 1200 1200 2400	AD- SORP- TION RATIO (00931) 16 5.1 9.7 11	SIUM, DIS- SOLVED (MG/L AS K) (00935) 22 7.6 9.5 11	LINITY (MG/L AS CACO3) (00410) 130 130 170 150 100	DIS- SOLVED (MG/L AS SO4) (00945) 3200 1100 2600 1800 2600	RIDE, DIS- SOLVED (MG/L AS CL) (00940) 3700 770 860 2100 2100 4200	RIDE, DIS- SOLVED (MG/L AS F) (00950) .8 .5 .8
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR 25 APR 30 MAY	NESS, NONCAR- BONATE (MG/L CACO3) (00902) 3300 1400 2000 2300 3100	DIS- SOLVED (MG/L AS CA) (00915) 500 420 430 480 560 750 370	SIUM, DIS- SOLVED (MG/L AS MG) (00925) 520 110 230 220 240 340 49	DIS- SOLVED (MG/L AS NA) (00930) 2100 450 1000 1200 1200 2400	AD- SORP- TION RATIO (00931) 16 5.1 9.7 11 18	SIUM, DIS- SOLVED (MG/L AS K) (00935) 22 7.6 9.5 11 11 21 4.2	LINITY (MG/L AS CACO3) (00410) 130 130 170 150 100 190 96	DIS- SOLVED (MG/L AS SO4) (00945) 3200 1100 2600 1800 2600 970	RIDE, DIS- SOLVED (MG/L AS CL) (00940) 3700 770 860 2100 2100 4200 150	RIDE, DIS- SOLVED (MG/L' AS F) (00950) .8 .5 .8 .9 .6
OCT 12 NOV 09 JAN 18 FEB 26 MAR 25 APR 30 MAY 27 JUN	NESS, NONCAR- BONATE (MG/L CACO3) (00902) 3300 1400 1900 2300 3100 1000 2000	DIS- SOLVED (MG/L AS CA) (00915) 500 420 430 480 560 750 370	SIUM, DIS- SOLVED (MG/L AS MG) (00925) 520 110 230 220 240 340 49 190	DIS- SOLVED (MG/L AS NA) (00930) 2100 450 1000 1200 2400 110 1100 320	AD- SORP- TION RATIO (00931) 16 5.1 9.7 11 18 1.4	SIUM, DIS- SOLVED (MG/L AS K) (00935) 22. 7.6 9.5 11 11 21 4.2 13	LINITY (MG/L AS CACO3) (00410) 130 130 170 150 100 96 97	DIS- SOLVED (MG/L AS SO4) (00945) 3200 1100 2600 1800 2600 970 1600	RIDE, DIS- SOLVED (MG/L AS CL) (00940) 3700 770 860 2100 2100 4200 150 1900	RIDE, DIS- SOLVED (MG/L AS F) (00950) .8 .5 .8 .9 .6 .9
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 APR 30 MAY 27 JUL 22 AUG	NESS, NONCAR- BONATE (MG/L CACO3) (00902) 3300 1400 2000 2300 3100 1000 2000 1500 490	DIS- SOLVED (MG/L AS CA) (00915) 500 420 430 480 560 750 370 540 470	SIUM, DIS- SOLVED (MG/L AS MG) (00925) 520 110 230 220 240 340 49 190 100	DIS- SOLVED (MG/L AS NA) (00930) 2100 450 1000 1200 2400 110 320 55	AD- SORP- TION RATIO (00931) 16 5.1 9.7 11 18 1.4 10 3.5 1.0	SIUM, DIS- SOLVED (MG/L AS K) (00935) 22 7.6 9.5 11 11 21 4.2 13 9.5 2.9	LINITY (MG/L AS CACO3) (00410) 130 130 170 150 100 190 96 97 100 88	DIS- SOLVED (MG/L AS SO4) (00945) 3200 1100 2600 1800 2600 970 1600 1500 470	RIDE, DIS- SOLVED (MG/L AS CL) (00940) 3700 770 860 2100 2100 4200 150 1900 480 74	RIDE, DIS- SOLVED (MG/L' AS F) (00950) .8 .5 .8 .9 .6 .9 .6
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR 25 APR 30 MAY 27 JUN 24 JUN 22	NESS, NONCAR-BONATE (MG/L CACO3) (00902) 3300 1400 2000 2300 3100 1000 2000	DIS- SOLVED (MG/L AS CA) (00915) 500 420 430 480 560 750 370 540	SIUM, DIS- SOLVED (MG/L AS MG) (00925) 520 110 230 220 240 340 49 190	DIS- SOLVED (MG/L AS NA) (00930) 2100 450 1000 1200 2400 110 1100 320	AD- SORP- TION RATIO (00931) 16 5.1 9.7 11 18 1.4	SIUM, DIS- SOLVED (MG/L AS K) (00935) 22. 7.6 9.5 11 11 21 4.2 13	LINITY (MG/L AS CACO3) (00410) 130 130 170 150 100 96 97	DIS- SOLVED (MG/L AS SO4) (00945) 3200 1100 2600 1800 2600 970 1600	RIDE, DIS- SOLVED (MG/L AS CL) (00940) 3700 770 860 2100 2100 4200 150 1900	RIDE, DIS- SOLVED (MG/L AS F) (00950) .8 .5 .8 .9 .6 .9

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

DATE OCT	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L) (70301)	SOLIDS, RESIDUE AT 105 DEG. C, SUS- PENDED (MG/L) (00530)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N) (00605)
12	9.0	9990	10100	35	.71	.73	.270	.260	.54
NOV 09 DEC	15	. 3200	2960	154	.83	.84	.170	.090	.44
05	16	5770	5260	17	1.6	1.6	.340	.260	1.5
JAN 18 FEB	11	6210	5920	12	.83	.83	.230	.260	1.8
26 MAR	14	6070	5990	7	.02	.06	.940	.120	1.2
25 APR	7.8	10700	10400	15	.04	.04	.180	.170	1.1
30	8.4	1810	1720	1250	.09	.10	.140	.110	1.5
MAY 27	12	5920	5410	81	.00	.00	.200	.220	1.3
JUN 24	8.0	3090	2950	1670	.32	.19	.380	.400	2.3
JUL, 22	7.1	945	879	224	.01	.05	.010	.000	2.6
AUG 26 SEP	8.8	4730	4450	19	.00	.00	.350	.070	.75
29	12	2430	2130	748	.63	.59	.120	.060	2.1
			PHOS-						
	NITRO GEN, TOTAL	PHOS- PHORUS, TOTAL	PHORUS, ORTHOPH OSPHATE DISSOL.	BORON, DIS- SOLVED	IRON, DIS- SOLVED	MANGA- NESE, DIS- SOLVED	CARBON, ORGANIC TOTAL	CARBON, ORGANIC DIS- SOLVED	CARBON, ORGANIC SUS- PENDED
DATE	GEN,	PHORUS,	PHORUS, ORTHOPH OSPHATE	DIS-	DIS-	NESE, DIS-	ORGANIC	ORGANIC DIS-	ORGANIC SUS-
	GEN, TOTAL (MG/L	PHORUS, TOTAL (MG/L	PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L	DIS- SOLVED (UG/L	DIS- SOLVED (UG/L	NESE, DIS- SOLVED (UG/L	ORGANIC TOTAL (MG/L	ORGANIC DIS- SOLVED (MG/L	ORGANIC SUS- PENDED (MG/L
ост 12	GEN, TOTAL (MG/L AS N)	PHORUS, TOTAL (MG/L AS P)	PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P)	DIS- SOLVED (UG/L AS B)	DIS- SOLVED (UG/L AS FE)	NESE, DIS- SOLVED (UG/L AS MN)	ORGANIC TOTAL (MG/L AS C)	ORGANIC DIS- SOLVED (MG/L AS C)	ORGANIC SUS- PENDED (MG/L AS C)
OCT 12 NOV 09	GEN, TOTAL (MG/L AS N) (00600)	PHORUS, TOTAL (MG/L AS P) (00665)	PHORUS, ORTHOPH OSPHATE DISSOL, (MG/L AS P) (00671)	DIS- SOLVED (UG/L AS B) (01020)	DIS- SOLVED (UG/L AS FE) (01046)	NESE, DIS- SOLVED (UG/L AS MN) (01056)	ORGANIC TOTAL (MG/L AS C) (00680)	ORGANIC DIS- SOLVED (MG/L AS C) (00681)	ORGANIC SUS- PENDED (MG/L AS C) (00689)
OCT 12 NOV 09 DEC 05	GEN. TOTAL (MG/L AS N) (00600)	PHORUS, TOTAL (MG/L AS P) (00665)	PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671)	DIS- SOLVED (UG/L AS B) (01020)	DIS- SOLVED (UG/L AS FE) (01046)	NESE, DIS- SOLVED (UG/L AS MN) (01056)	ORGANIC TOTAL (MG/L AS C) (00680)	ORGANIC DIS- SOLVED (MG/L AS C) (00681)	ORGANIC SUS- PENDED (MG/L AS C) (00689)
OCT 12 NOV 09 DEC 05 JAN 18	GEN, TOTAL (MG/L AS N) (00600) 1.5	PHORUS, TOTAL (MG/L AS P) (00665) .070	PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010	DIS- SOLVED (UG/L AS B) (01020) 990 280	DIS- SOLVED (UG/L AS FE) (01046) 50	NESE, DIS- SOLVED (UG/L AS MN) (01056)	ORGANIC TOTAL (MG/L AS C) (00680)	ORGANIC DIS- SOLVED (MG/L AS C) (00681)	ORGANIC SUS- PENDED (MG/L AS C) (00689)
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26	GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4	PHORUS, TOTAL (MG/L AS P) (00665) .070 .070	PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010	DIS- SOLVED (UG/L AS B) (01020) 990 280 470	DIS- SOLVED (UG/L AS FE) (01046) 50 20	NESE, DIS- SOLVED (UG/L AS MN) (01056)	ORGANIC TOTAL (MG/L AS C) (00680)	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR ,25	GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 3.4	PHORUS, TOTAL (MG/L AS P) (00665) .070 .070	PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010	DIS- SOLVED (UG/L AS B) (01020) 990 280 470	DIS- SOLVED (UG/L AS FE) (01046) 50 20 60	NESE, DIS- SOLVED (UG/L AS MN) (01056)	ORGANIC TOTAL (MG/L AS C) (00680)	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8 5.6	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR .25 APR 30	GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 3.4 2.8	PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .100 .090	PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020	DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510	DIS- SOLVED (UG/L AS FE) (01046) 50 20 60 30 70	NESE, DIS- SOLVED (UG/L AS MN) (01056)	ORGANIC TOTAL (MG/L AS C) (00680)	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8 5.6 5.2	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR .25 APR 30 MAY 27	GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1	PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .100 .090 .280	PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040	DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510	DIS- SOLVED (UG/L AS FE) (01046) 50 20 60 30 70	NESE, DIS- SOLVED (UG/L AS MN) (01056)	ORGANIC TOTAL (MG/L AS C) (00680)	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8 5.6 5.2 9.5	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7 22 1.9
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 APR 30 MAY 27 JUN 24	GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1	PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .100 .090 .280 .110	PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040 .000	DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510 870	DIS- SOLVED (UG/L AS FE) (01046) 50 20 60 30 70 50	NESE, DIS- SOLVED (UG/L AS MN) (01056) 20 440 20	ORGANIC TOTAL (MG/L AS C) (00680) 8.5 5.3	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8 5.6 5.2 9.5	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7 22 1.9
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR .25 APR 30 MAY 27 JUN 24 JUN 22	GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1 1.3	PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .100 .090 .280 .110 .870	PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .020 .040 .000	DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510 870 100	DIS- SOLVED (UG/L AS FE) (01046) 50 20 60 30 70 50 110	NESE, DIS- SOLVED (UG/L AS MN) (01056) 20 440 20	ORGANIC TOTAL (MG/L AS C) (00680)	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8 5.6 5.2 9.5	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7 22 1.9 .5
OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR ,25 APR 30 MAY 27 JUN 24 JUL	GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1 1.3 1.7	PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .100 .090 .280 .110 .870 .090	PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .020 .040 .000 .040 .000	DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510 870 100 580	DIS- SOLVED (UG/L AS FE) (01046) 50 20 60 30 70 50 110	NESE, DIS- SOLVED (UG/L AS MN) (01056) 20 440 20 20	ORGANIC TOTAL (MG/L AS C) (00680) 8.5 5.3	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8 5.6 5.2 9.5 5.4 2.4 6.6 6.9	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7 22 1.9 .5 1.6

TRACE ELEMENT ANALYSES, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

DATE DEC 05 MAR 25	TIME 0845	ARSENI TOTAL (UG/L AS AS (01002	(C D . SO . (U S) AS	ENIC TO IS- RI LVED EI G/L (I AS) AS	RIUM, DTAL ECOV- RABLE JG/L S BA) L007)	DI SOL (U AS	IUM, S- VED G/L BA) 005)	SO: (Ud AS	RON, IS- LVED G/L B) 020) 470	TOT REC ERJ (UC	41UM PAL COV- ABLE G/L CD) D27)	SO (U/ AS	MIUM IS- LVED G/L CD) 025)	MI TO RE ER (U AS	RO- UM, TAL COV- ABLE G/L CR) 034)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	
APR	0,45	-		•	_		200		0,0				•			20	
30	0930		3	1	800		400		100		1		0		30	10	
JUN 24	1030	1	10	1 .	1000		100		310		0		1		50	10	
DATE	COBAI TOTA RECO ERAI (UG/ AS (AL CO DV- I BLE SO 'L (CO) A	DBALT, DIS- DLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU) (01042)	COPPE DIS- SOLV (UG/ AS C	ED L	IRON TOTA RECO ERAN (UG, AS I	AL OV- BLE (L FE)	IRON DIS SOLV (UG/ AS F	;- /ED 'L 'E)	LEAD TOTA RECO ERAS (UG/ AS I	L OV- ILE 'L 'B)		S- VED /L PB)	MANO NESE TOTA RECO ERAB (UG/ AS M	L DV- LE L N)	
DEC 05		3	0	1		2		300		60		6		2		40	
MAR		-	•	-		-	•	,				•		-		••	
25 APR	•		0			1				50				1			
30 JUN	•	11	0	27		3	190	000	3	10		55		2	9	30	
24	•	18	0	150		44	330	000	1	60		57		4	36	00	
DATE	MANG NESI DIS SOLV (UG)	E, 1 S- I /ED I /L (ERCURY POTAL RECOV- ERABLE (UG/L AS HG)	MERCURY DIS- SOLVED (UG/L AS HG)	SELE NIUM TOTA (UG) AS S	i, AL 'L	SELI NIUN DIS SOLV (UG, AS	M, S− VED /L	SILVE TOTA RECO ERAI (UG/ AS A	L V- SLE 'L	SILVE DIS SOLV (UG) AS A	;~ /ED /L	ERA (UG	AL OV- BLE	ZINC DIS SOLV (UG/ AS Z	ED L	
	(010		71900)	(71890)	(0114		(011		(0107		(0107		(010		(0109		
DEC 05 MAR		20	.1	.0		2		. 4		0		0		40		60	
25		40		.1				2			٠	0				80	
APR 30 JUN		20	.1	.0		0		1	•	0		0		150	3	.50	
24	•	20	.1	.0		2		1		0		0		230		30	
	CHEMICA	L ANA	LYSES C	F BOTTOM	MATERI	AL,	WATE	R YE	AR OCT	OBE	R 1979	OT 6	SEPT	EMBE	R 1980	l	
				ARSENIC TOTAL IN BOT-	CADMI RECO	v.	CHRO MIUI RECO	١,	COPPE RECO	v.	LEAD RECO	ν.	MERC REC	ov.			
				TOM MA-	TOM N	lA-	FM B	OT'-	MOT	ia-	TOM N	IA-	MOT	MA-			
			MINE	TERIAL	TER		TOM I		TER		TER			LIAL	•		
	DA:	P.F.	TIME	(UG/G AS AS)	(UG/ AS (TER:		(UG/ AS ((UG/		(UG				
	DAY.	L		(01003)	(0102		(010)		(0104		AS 1		(719	HG)			
	SEP			,,	,	.,	,0.	,	,020		,		``	,			

.01

DATE SEP 29...

1030

PESTICIDE ANALYSES, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

DATE SEP	TIME	PCB TOTAL (UG/L) (39516)	ALDRIN, TOTAL (UG/L) (39330)	CHLOR- DANE, TOTAL (UG/L) (39350)	DDD, TOTAL (UG/L) (39360)	DDE, TOTAL (UG/L) (39365)	DDT, TOTAL (UG/L) (39370)	DI- AZINON, TOTAL (UG/L) (39570)	DI- ELDRIN TOTAL (UG/L) (39380)
29	1030	.00	.00	.0	.00	.00	.00	.01	.00
	ENDO- SULFAN,	ENDRIN,	ETHION,	HEPTA- CHLOR,	HEPTA- CHLOR EPOXIDE	LINDANE	MALA- THION,	METH- OXY- CHLOR,	METHYL PARA- THION,
DATE	TOTAL (UG/L)	TOTAL (UG/L)	TOTAL (UG/L)	TOTAL (UG/L)	TOTAL (UG/L)	TOTAL (UG/L)	TOTAL (UG/L)	TOTAL (UG/L)	TOTAL (UG/L)
DAIL	(39388)	(39390)	(39398)	(39410)	(39420)	(39340)	(39530)	(39480)	(39600)
SEP	(3)300,	(2)3)07	(3)330,	(33420)	(3)120,	(3)3.07	(37550)	(33.00)	(33000)
29	.00	.00	-00	.00	.00	.00	.00	.00	.00
	METHYL TRI- THION,	PARA- THION,	TOX~ APHENE,	TOTAL TRI-	2,4,5-T	SILVEX,	PER- THANE	NAPH- THA- LENES, POLY- CHLOR.	MIREX,
	TOTAL	TOTAL	TOTAL	THION	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
DATE	(UG/L)	(UG/L)	(UG/L)	(UG/L)	(UG/L)	(UG/L)	(UG/L)	(UG/L)	(UG/L)
SEP 29	(39790)	(39540)	(39400)	(39786)	(39740)	(39760)	(39034)	(39250)	(39755)

MICROBIOLOGICAL ANALYSES, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

DATE	TIME	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
12	0912	53	460
09	0945	20	85
05	0845	1	25
JAN 18	1030	54	58
FEB 26	1000	160	800
MAR 25	0945	7	12
APR 30	0930	230	1600
MAY 27	1030	3	12
JUN 24	1030	14	980
JUL 22	1000	100	130
AUG 26	1030	28	28
SEP 29	1030	2000	5200

INSTANTANEOUS SUSPENDED SEDIMENT AND PARTICLE SIZE, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

	TIME	STREAM- FLOW, INSTAN- TANEOUS	TEMPER- ATURE, WATER	SEDI- MENT, SUS- PENDED	SEDI- MENT DIS- CHARGE, SUS- PENDED	SED. SUSP. FALL DIAM. FINER THAN	SED. SUSP. FALL DIAM. % FINER THAN	SED. SUSP. FALL DIAM. FINER THAN	SED. SUSP. FALL DIAM. % FINER THAN
DATE	IIMG	(CFS) (00061)	(DEG C) (00010)	(MG/L) (80154)	(T/DAY) (80155)	.002 MM (70337)	.004 MM (70338)	.008 MM (70339)	.016 MM (70340)
OCT 28	0810	877	14.0	2470	5850	37	43		61
DEC 05 JAN	0845	56	5.0	55	8.3	64	69	72	75
18 FEB	1030	: 51	9.0	26	3.6				
26 MAR	1000	. 55	11.0	29	4.3		·		
25 APR	0945	17	15.0	34	1.6				
14	0910	638	10.0	2440	4200	33	43		66
27	0900	795	13.0	1830	3930	31	38		54
30	0930	738	19.0	1950	3890	24	33		43
MAY 27 JUN	1030	28	25.0	100	7.6				
24	1030	419	25.5	4720	5340	38	49		73
26 JUL	1112	524	26.0	2470	3500	35	45		65
02	1600 1000	576	27.0	1280	1990	39	49		67
22 AUG	1000	730	25.0	1990	3920	22	25		35
16	1000	217	27.0	2040	1200	26	42		72
26 SEP	1030	11	27.0	33	.98				
12	1300	1070	24.0	2980	8610	35	44		57
18 29	1535 1030	216 235	26.0 20.0	3900 94 5	2270 600	64 42	82 51		98 71
27	1030	233	20.0	343	800	42	31		/1
	SED.	SED.	SED.	cen	CED	0.00	055	000	
		SED.	SED.	SED.	SED.	SED.	SED.	SED.	SED.
	SUSP.	SUSP.	SUSP.	SED. SUSP.	SUSP.	SUSP.	SUSP.	SUSP.	SUSP.
	SUSP. FALL	SUSP. FALL	SUSP. FALL	SUSP. FALL	SUSP. FALL	SUSP. SIEVE	SUSP. SIEVE	SUSP. SIEVE	SUSP. SIEVE
	SUSP. FALL DIAM.	SUSP. FALL DIAM.	SUSP. FALL DIAM.	SUSP. FALL DIAM.	SUSP. FALL DIAM.	SUSP. SIEVE DIAM.	SUSP. SIEVE DIAM.	SUSP. SIEVE DIAM.	SUSP. SIEVE DIAM.
	SUSP. FALL DIAM. & FINER	SUSP. FALL DIAM. % FINER	SUSP. FALL DIAM. % FINER	SUSP. FALL DIAM. % FINER	SUSP. FALL DIAM. % FINER	SUSP. SIEVE DIAM. % FINER	SUSP. SIEVE DIAM. % FINER	SUSP. SIEVE DIAM. % FINER	SUSP. SIEVE DIAM. % FINER
DATE	SUSP. FALL DIAM. & FINER THAN	SUSP. FALL DIAM. FINER THAN	SUSP. FALL DIAM. FINER THAN	SUSP. FALL DIAM. FINER THAN	SUSP. FALL DIAM. FINER THAN	SUSP. SIEVE DIAM. % FINER THAN	SUSP. SIEVE DIAM. % FINER THAN	SUSP. SIEVE DIAM. % FINER THAN	SUSP. SIEVE DIAM. % FINER THAN
DATE	SUSP. FALL DIAM. FINER THAN .031 MM	SUSP. FALL DIAM. % FINER THAN .062 MM	SUSP. FALL DIAM. % FINER THAN .125 MM	SUSP. FALL DIAM. % FINER THAN .250 MM	SUSP. FALL DIAM. FINER THAN .500 MM	SUSP. SIEVE DIAM. % FINER THAN .062 MM	SUSP. SIEVE DIAM. % FINER THAN .125 MM	SUSP. SIEVE DIAM. FINER THAN .250 MM	SUSP. SIEVE DIAM. % FINER THAN .500 MM
ОСТ	SUSP. FALL DIAM. & FINER THAN	SUSP. FALL DIAM. FINER THAN	SUSP. FALL DIAM. FINER THAN	SUSP. FALL DIAM. FINER THAN	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332)	SUSP. SIEVE DIAM. % FINER THAN	SUSP. SIEVE DIAM. % FINER THAN
OCT 28 DEC	SUSP. FALL DIAM. % FINER THAN .031 MM (70341)	SUSP. FALL DIAM. % FINER THAN .062 MM	SUSP. FALL DIAM. % FINER THAN .125 MM	SUSP. FALL DIAM. % FINER THAN .250 MM	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332)	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333)	SUSP. SIEVE DIAM. % FINER THAN .500 MM
OCT 28 DEC 05 JAN	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. % FINER THAN .062 MM (70342)	SUSP. FALL DIAM. % FINER THAN .125 MM (70343)	SUSP. FALL DIAM. % FINER THAN .250 MM	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333)	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334)
OCT 28 DEC 05 JAN 18 FEB	SUSP. FALL DIAM. FINER THAN. 031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. % FINER THAN .125 MM (70343)	SUSP. FALL DIAM. % FINER THAN .250 MM	SUSP. FALL DIAM. % FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 95 85	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100 90 64	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333) 100 97	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334) 100
OCT 28 DEC 05 JAN 18 FEB 26	SUSP. FALL DIAM. % FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. % FINER THAN .125 MM (70343)	SUSP. FALL DIAM. % FINER THAN .250 MM	SUSP. FALL DIAM. FINER THAN. 500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN. .062 MM (70331) 95 85 35	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 90 64 63	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333) 100 97	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334) 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR	SUSP. FALL DIAM. FINER THAN. 031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. FINER THAN .125 MM (70343)	SUSP. FALL DIAM. % FINER THAN .250 MM	SUSP. FALL DIAM. % FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 95 85	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100 90 64	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333) 100 97	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334) 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14	SUSP. FALL DIAM. FINER THAN. 031 MM (70341)	SUSP. FALL DIAM. FINER THAN. O62 MM (70342)	SUSP. FALL DIAM. \$ FINER THAN .125 MM (70343)	SUSP. FALL DIAM. S FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN. .062 MM (70331) 95 85 35 41	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 90 64 63	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333) 100 97 94 96	SUSP. SIEVE DIAM. % FINER THAN .500 MM (70334) 100 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14 27	SUSP. FALL DIAM. FINER THAN. 031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. 8 FINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN. .062 MM (70331) 95 85 35 41	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100 90 64 63 72	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333) 100 97 94 96	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334) 100 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14 27 30	SUSP. FALL DIAM. FINER THAN. 031 MM (70341)	SUSP. FALL DIAM. FINER THAN. O62 MM (70342)	SUSP. FALL DIAM. \$ FINER THAN .125 MM (70343)	SUSP. FALL DIAM. S FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN. .062 MM (70331) 95 85 35 41	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100 90 64 63 72	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333) 100 97 94 96	SUSP. SIEVE DIAM. % FINER THAN .500 MM (70334) 100 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14 30 MAY 27 JUN	SUSP. FALL DIAM. FINER THAN. 031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. 8 FINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN. .062 MM (70331) 95 85 35 41	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100 90 64 63 72	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333) 100 97 94 96	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334) 100 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14 27 MAY 27 JUN 24	SUSP. FALL DIAM. FINER THAN. 031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. \$ FINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. FINER THAN .062 MM (70331) 95 85 35 41 39	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 90 64 63 72	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333) 100 97 94 96	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334) 100 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14 27 30 MAY 27 JUN 24	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. 8 FINER THAN .125 MM (70343)	SUSP. FALL DIAM. \$ FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 95 85 35 41 39 76	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 90 64 63 72 85	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333) 100 97 94 96 96	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334) 100 100 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14 27 30 MAY 27 JUN 24 JUL	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. 8 FINER THAN .125 MM (70343)	SUSP. FALL DIAM. \$ FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 95 85 35 41 39 76	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 90 64 63 72 85	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333) 100 97 94 96 96	SUSP. SIEVE DIAM. % FINER THAN .500 MM (70334) 100 100 100 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14 27 JUN 24 26 JUL 02	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. * FINER THAN .062 MM (70342) 95 92 84 90 95	SUSP. FALL DIAM. 8 FINER THAN .125 MM (70343)	SUSP. FALL DIAM. 8 FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 95 85 35 41 39 76 97	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 90 64 63 72 85 100	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333) 100 97 94 96 96	SUSP. SIEVE DIAM. % FINER THAN .500 MM (70334) 100 100 100 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14 27 30 MAY 27 JUN 24 JUL	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. 8 FINER THAN .125 MM (70343)	SUSP. FALL DIAM. \$ FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 95 85 35 41 39 76	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 90 64 63 72 85	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333) 100 97 94 96 96	SUSP. SIEVE DIAM. % FINER THAN .500 MM (70334) 100 100 100 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14 27 30 MAY 27 JUN 24 26 JUL 02 22	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. * FINER THAN .062 MM (70342) 95 92 84 90 95	SUSP. FALL DIAM. 8 FINER THAN .125 MM (70343)	SUSP. FALL DIAM. 8 FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 95 85 35 41 39 76 97	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 90 64 63 72 85 100	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333) 100 97 94 96 96	SUSP. SIEVE DIAM. % FINER THAN .500 MM (70334) 100 100 100 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14 27 30 MAY 27 JUN 24 26 JUL 02 AUG 16	SUSP. FALL DIAM. & FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342) 95 92 84 90 95 71	SUSP. FALL DIAM. 8 FINER THAN (125 MM (70343)	SUSP. FALL DIAM. \$ FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 95 85 35 41 39 76 97	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 90 64 63 72 85 100	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333) 100 97 94 96 96	SUSP. SIEVE DIAM. % FINER THAN .500 MM (70334) 100 100 100 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14 27 JUN 24 26 JUL 02 22 AUG 16	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. * FINER THAN .062 MM (70342)	SUSP. FALL DIAM. 8 FINER THAN .125 MM (70343)	SUSP. FALL DIAM. \$ FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 95 85 35 41 39 76 97 99	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 90 64 63 72 85 100 100	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333) 100 97 94 96 96	SUSP. SIEVE DIAM. % FINER THAN .500 MM (70334) 100 100 100 100
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR 14 27 JUN 24 JUL 02 JUL 02 AUG 16 SEP	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. 8 FINER THAN (125 MM (70343)	SUSP. FALL DIAM. \$ FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 95 85 35 41 39 76 97 99 85	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 90 64 63 72 85 100 100 92	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333) 100 97 94 96 96 100	SUSP. SIEVE DIAM. % FINER THAN .500 MM (70334) 100 100 100 100

RIO GRANDE BASIN
08396500 PECOS RIVER NEAR ARTESIA, NM -- Continued
WATER-QUALITY RECORDS

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SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980 ONCE-DAILY SEP DAY OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG 7510 10400 2330 1890 14900 11700 2850 7960 BODD 9450 15100 2200 12900 2310 11700 2470 11300 2360 2830 7740 7790 7590 9450 11800 7670 7960 7110 9720 13200 2700 12000 2280 2740 11600 11100 3000 10800 3160 7800 7840 6290 9900 14500 2720 11200 2290 3180 10100 13600 3240 11700 2290 3300 10200 9810 5 10800 3400 7830 7960 6070 2290 10900 10200 3470 7920 8070 6250 10100 13100 3420 13700 3490 11700 3730 7870 6760 9900 13300 3800 13700 2290 3570 11300 8010 14800 3980 7830 8070 7240 10300 12600 4170 13400 2320 3960 13700 4020 14900 4030 7770 8130 7320 10400 12200 4520 13600 2300 12400 12100 5050 13600 2290 7230 7790 4980 10 14100 4270 8060 7500 10500 7770 12300 5470 14200 2300 5340 3850 13100 4400 8200 7820 10400 12400 5530 16700 2290 5370 1460 4510 7890 8260 7770 10500 12 13500 13 15000 4540 7930 8450 7980 10700 12800 4680 14800 2330 5340 1390 15100 4910 7670 8450 8860 10700 3050 4940 18300 2280 6080 1480 21500 2270 2470 5120 5870 1900 15 15000 5210 7690 8320 8230 11100 2170 2280 14800 5300 7790 8320 7800 10900 2310 5220 13400 5770 5530 12700 2020 2510 1920 2230 17 14900 5370 7760 8320 7210 11100 5830 11500 5960 8520 7470 11700 2200 1860 1870 9080 8070 18 19 2140 6110 7730 8720 7510 11400 2170 6270 11200 1700 3110 2040 20 1580 6340 7420 8780 7610 11700 2150 4520 12400 1530 4700 2640 1690 6470 7260 8790 7750 12100 2130 4640 14500 1240 6520 3450 22 1770 6720 6740 7210 7620 8070 12600 2100 4820 16200 1260 6600 3810 13500 5050 18800 1180 5910 4270 23 1960 7460 7840 7850 2140 2140 3560 5840 4900 6980 7960 7830 13900 5560 1910 25 1470 7210 7710 7680 8100 14800 2180 7160 2640 1170 5840 5540 2190 7620 1160 6970 3330 26 1470 7190 7730 8380 15300 2510 1470 7320 7510 7900 8570 16400 2200 8080 2330 1280 7650 4540 1940 2210 8510 2320 1260 9620 1480 7790 28 7490 7620 8910 26000 29 1640 7530 7890 7790 15500 9380 2350 1210 11000 3250 8880 30 1930 7540 7970 7660 7790 14900 2110 10300 2310 1350 10900 3370 10500 1390 31 2250 8080 14000 11200 7680 6940 11300 5780 8230 5290 7730 8090 12200 5450 1850 MEAN WTR YR 1980 MEAN 7160 MAX 26000 MIN 1160 TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980 ONCE-DAILY APR MAY JUN JUL AUG SEP DAY OCT NOV DEC JAN FEB MAR 26.5 27.0 1 24.0 10.0 7.5 5.5 6.0 9.5 11.0 20.0 24.0 27.0 29.0 12.0 21.0 25.0 4.5 7.5 17.0 16.5 24.5 11.0 3.0 6.5 26.5 13.0 6.0 6.5 7.0 18.0 19.0 29.0 27.0 30.0 29.0 27.5 23.5 .4 10.0 7.0 5.5 9.5 10.0 19.0 19.5 24.0 27.5 29.0 26.0 9.0 17.0 24.0 31.0 26.0 24.5 27.0 10.5 10.5 6.0 5.0 11.5 11.0 26.5 27.5 24.5 16.0 9.0 7.0 9.0 13.0 22.0 24.0 29.5 28.0 25.5 18.0 29.0 23.5 26.0 25.0 5.0 5.5 10.5 12.0 18.5 11.0 10.0 5.0 8.0 12.0 20.0 26.0 26.0 27.0 30.0 27.0 27.5 27.5 15.0 14.0 8.0 4.5 15.0 12.5 23.5 26.0 29.0 24.0 28.0 20.0 23.0 10 14.5 11.5 10.0 5.0 3.5 15.0 20.0 25.0 26.5 27.0 11 22.0 13.5 11.5 8.0 4.5 15.0 23.0 22.0 25.0 26.5 21.0 24.5 21.5 11.5 12.5 7.5 7.0 6.0 5.0 13.0 18.0 22.0 28.0 12 16.0 9.0 21.5 10.5 27.5 23.0 24.5 15.0 20.0 20.0 33.0 10.0 10.0 19.0 30.0 28.0 26.0 23.0 10.0 27.5 25.0 15 22.0 11.0 4.0 12.5 12.0 14.0 13.0 21.0 28.5 24.0 16 24.5 10.0 3.0 9.0 12.0 15.0 15.0 19.0 29.5 28.0 27.0 24.5 17 17.0 17.0 7.5 13.0 3.0 9.0 6.5 13.5 13.0 17.5 16.5 29.0 28.0 27.5 25.0 25.5 23.0 18 3.5 10.0 19.0 24.0 31.5 26.0 3 9 24.0 29.0 26.0 26.0 22.5 19.0 23.0 20 16.5 10.0 9.0 7.0 11.5 15.0 28.0 30.0 25.5 25.0 21 17.0 13.5 7.0 7.5 11.0 16.0 18.0 24.5 28.0 26.5 23.5 27.0 13.5 12.5 6.5 5.0 9.5 6.5 5.0 13.0 11.5 24.5 22 16.0 18.0 27.0 26.0 26.5 21.0 10.0 20.5 26.0 27.0 28.5 20.5 33.0 28.5 26.0 28.0 27.0 22.5 25 13.0 11.0 9.0 7.0 10.0 18.0 16.0 26.0 27.0 26.5 27.0 22.0 26 27 15.0 8.0 6.5 4.0 10.5 20.0 15.0 27.5 26.0 27.0 25.5 18.0 8.0 7.5 4.5 11.0 5.0 11.0 12.0 18.0 17.0 25.0 23.0 15.5 13.0 25.0 26.0 18.0 14.0 19.0 23.5 17.5 7.0 26.5 26.5 30.5 29 14.0 4.0 5.0 12.0 18.0 27.5 27.5 27.0 28.0 27.0 18.5 13.0 30 13.5 5.5 5.0 5.0 16.0 20.0 27.5 26.0 29.5 21.5 12.0 5.0 5.0 12.0 29.5 28.0 31.5 MEAN 17.5 23.5 28.0 27.0 26.5 23.0 17.5 10.0 7.0 7.0 9.0 14.0 33.0 WTR YR 1980 MEAN 17.5 MAX MIN

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SUSPENDED-SEDIMENT DISCHARGE, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

DAY	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN- TRATION (MG/L)	LOAUS (T/DAY)	MEAN CONCEN- TRATION (MG/L)	LOADS	MEAN CONCEN- TRATION (MG/L)	LOADS		
1 2 3 4 5	58 29 35 70 47	2.1	NOV 398 310 237 214 198	177 125 88 76 68	21 80 16 20 39	3.1 12 2.4 3.0 5.9		35 1.2 1.8 7.2 .97	108 106 50 76 70	24 26 14 22 18	13 10 8 7 10	1.7 1.3 1.0 .96
6 7 8 9	32 218 22 26 19	1.0 7.7 .83 1.2	180 151 98 125 117	55 42 25 29 27	59 73 38 26 18	9.2 12 6.1 4.0 2.7	6 11 7 9 6	.96 1.8 1.1 1.4	66 72 77 77 32	15 16 15 15	9 6 7 6 10	1.1 .73 .79 .66 1.1
11 12 13 14 15	23 35 56 24 30	.81 1.2 2.0 .97 1.2	125 116 100 90 86	27 24 21 18 16	31 31 41 116 21	4.5 4.5 6.3 20 3.5	7 6 26 18 12	1.1 .92 4.0 2.8 1.9	51 25 23 25 46	9.0 4.6 4.3 4.9 8.9	9 8 8 6 5	1.0 .84 .84 .62
16 17 18 19 20		1.5 .93 6320 9380 5580	159 105 40 44 38	30 19 7.1 7.6 6.4	19 21 14 19 28	3.5 4.1 2.8 3.6 5.0	9 15 47 15 17	1.4 2.3 6.5 2.0 2.3	34 24 34 34 57	6.6 4.9 6.9 6.8	9 10 9 8 8	.90 .97 .87 .73
21 22 23 24 25	2130 1510 1610 3130 3010	2550 754 1830 6420 6730	36 56 178 22 35	5.7 8.9 28 3.5 5.4	19 46 38 31 26	3.5 8.4 6.8 5.5 4.6	11 152 38 56 50	1.6 24 7.6 11 12	28 17 18 22 33	5.6 3.2 3.1 3.6 5.2	11 12 8 9 20	.83 .81 .48 .46
26 27 28 29 30 31 TOTAL	2540 2330 1360 855 617	6550 6210 5520 1440 531 290 60138.26	30 115 34 23 16	4.6 17 5.0 3.4 2.4 972.0	26 15 27 9 10 11 30 	2.6 4.7 1.6 1.7 1.8 5.0	97 70 73 48 99 58	22 16 16 11 22 13 233.77	24 18 22 14	3.6 2.5 3.0 1.9 270.6	15 15 12 16 12 14	.65 .57 .49 .73 .52 .64
DAY	(MG/L)	LOADS (T/DAY) APRIL	(MG/L)	LOADS	TRATION	LOADS (T/DAY)		LOADS (T/DAY)				LOADS (T/DAY) PTEMBER
1 2 3 4 5	16 19 20 31 28	1.1 .92 .97 1.8 1.6	1160 655 513 505 612	1370 343 240 202 216	63 56 64 49 63	3.9 3.3 4.3 2.5 2.9	1600 1300 1600 3950 1690	2520 2020 2560 6320 2820	553 248 130 125 39	305 84 35 24 4.7	40 30 39 25 21	1.5 1.7 1.5 .74
6 7 8 9 10	43 40 40 29 41	2.4	271 45 32 19 35	75 10 7.2 3.6 5.9	72 59 31 36 59	1.8 .74	2080 2950 1890 1700 2650	3600 5220 3660 3400 5150	72 125 99 77 46	7.6 17 19 11 6.1	13 13 17 447 694	.42 .39 .41 75 187
11 12 13 14 15	42 43 1300 2340 2010	3.9 2010	35 93 56 36 37	5.3 26 13 5.0 4.4	61 36 37 107 58	1.2 .62 .49 1.5 2.5	1700 1770 1900 1740 1830	3300 3420 3690 3360 3450	46 51 62 42 55	5.5 6.3 8.4 6.2 6.5	395 2110 1580 1660 1810	256 6840 2080 2430 2760
16 17 18 19 20	2220 1960 2050 2010 2000	3710 3390 3760 3640 3630	28 30 34 156 402	4.0 4.4 5.9 56 106	23 20 16 22 35	1.1 .41 .20 .28 .44	2940 2160 1690 1610 1800	5600 4200 3280 3110 3450	1110 453 40 55 36	797 131 5.3 4.0 3.0	3030 5950 4220 3310 2470	5680 6670 2460 1510 934
21 22 23 24 25	1840 1800 1800 1880 1790	3440 3350 3490 3640 3540	366 330 226 66 45	63 47 24 5.5 3.6	21 19 277 3550 2890	.23 .21 163 4020 3800	1620 2410 1960 1590 1810	3170 4750 3970 3050 3370	35 574 137 51 57	2.4 54 12 2.6 1.8	742 435 259 138 162	228 109 57 25 33
26 27 28 29 30 31 TOTAL TOTAL	1800 1820 	3200 3570	40 75 51 46 49 60 	3.1 5.7 3.7 3.0 3.2 4.4 2868.9 TONS.	2010 1950 2050 1900	3480 2930 2880 3160 3050 	1570 1650 1510 1430 1300 1430	2970 3070 2790 2820 2280 2110 108480	34 26 36 22 24 36	1.0 .98 1.2 .57 .71 1.1 1564.96	338 930 1230 838 435	114 1090 1190 532 203 35470.20

Geoscience Consultants, Ltd.



February 25, 1985

Mr. Richard Stamets NMOCD P.O. Box 2088 Santa Fe, New Mexico 87501

Re: Effluent Flow and Chemical Characteristics of Waste Streams Regulated by Discharge Plan

Dear Mr. Stamets:

Navajo Refining Company, Inc. and Geoscience Consultants, Ltd. are pleased to submit our report on effluent characteristics. Our previous submission described the process at the Artesia Refinery and presented chemical data on many individual waste streams. Section 1.0-6.0 of the Discharge Plan also presented chemical analyses of the evaporation pond fluids which represent the best composite sample of the effluent streams.

In the initial meeting of September 17, 1984 it was decided that all waste streams which are disposed of in the evaporation ponds would be governed by this Discharge Plan. These streams are:

- o Effluent from the oil/water separator
- o Effluent from the water softener
- o Boiler blow down
- o Effluent from the oil recovery system
- o Liquid effluent from the heat exchanger bundle cleaning area
- o Other liquid effluent which may be periodically discharged into the conveyance ditch

The chemical data on these waste streams were presented in Sections 1.0-6.0 of the Discharge Plan and are presented with this submission. Note that samples from the evaporation ponds were analised for benzene, toluene, xylene and ethylbenzene. Analyses of individual waste streams were included for information only. Regulatory decisions should consider the quality of the final effluent as characterized by analyses of the effluent flowing to the evaporation ponds.

The flow data is shown in the Table. At the present time no data are available for flow rates at the downstream end of the ditch.

If you or your technical staff have any questions about this submission please contact me at our Albuquerque office.

Sincerely, GEOSCIENCE CONSULTANTS, LTD.

Randy Hicks PS

Vice President

RTH/mg

cc: Mr. Dave Griffin, Navajo

Mr. Joel Carson, Losee, Carson, Dickerson M. David Boyer, NMOCD (2 copies)

EFFLUENT FLOW DATA

DATE	GPD	РН
6-6-84	342,720	12.0
6-7-84	361,440	12.5
6-8-84	361,440	11.0
6-9-84	361,440	13.0
6-11-84	361,440	12.0
6-12-84	Cleaning ditch north of the FCC	13.5
6-13-84	303,384	11.0
6-14-84	342,720	13.0
6–15–84	342,720	13.5
6-18-84	342,720	9.5
6-20-83	361,440	9.0
6-21-84	342,720	9.0
6-22-84	342,720	10.0
6-23-84	381,440	9.5
6-25-84	361,440	8.5
6-26-84	342,720	9.0
6-27-84	419,040	9.5
6-28-84	380,160	10.5
6-29-84	361,440	11.0
6-30-84	380,160	11.5
7-2-84	342,720	12.5
7-3-84	342,720	10.0
7-5-84	342,720	9.5
7-6-84	380,160	9.5

DATE	GPD	РН
7-8-84	361,440	9.5
7-10-84	361,440	9.0
7–11–84	342,720	10.0
7-12-84	303,840	10.5
7–15–84	342,720	8.5
7-19-84	380,160	7.5
7–20–84	380,160	9.5
7-23-84	380,160	12.5
7-24-84	361,440	11.0
7-25-84	380,160	12.5
7–27–81	380,160	11.0
7-30-84	361,440	9.0
8-2-84	342,720	9.0
8-3-84	380,160	9.0
8-6-84	342,720	9.0
8-7-84	342,270	10.0
8-8-84	361,440	11.0
8-9-84	361,440	9.0
8-14-84	380,160	8.0
8-15-84	380,160	8.5
8–16–84	419,040	8.0
3-17-84	380,160	8.0
3-20-84	380,160	7.5
3-21-84	380,160	7.5
3-22-84	380,160	8.0

DATE	GPD	РН
8-23-84	380,160	10.0
8-24-84	361,440	9.0
8-27-84	361,440	9.5
8-28-84 8-29-84	380,160 361,440	8.5 10.0
8-30-84	380,160	8.0
8-31-84	380,160	7.5
9-5-84	380,160	7.0
9-6-84	380,160	8.0
9-7-84	380,160	8.0
9-10-84	380,160	8.5
9-11-84	361,440	9.5
9-12-84	380,160	11.0
9-13-84	380,160	9.5
9-14-84	361,440	11.0
9-17-84	342,720	11.5
9-18-84	361,440	9.0
9-19-84	380,160	7.0
9-20-84	361,440	9.0
9-21-84	342,720	9.0
9-24-84	342,720	8.5
9-25-84	361,440	8.5
9-26-84	342,720	10.5
9-27-84	342,720	11.0
10-1-84	361,440	10.0
10-2-84	342,720	9.5

DATE	GPD	РН
10-3-84	361,440	10.5
10-4-84	342,720	11.0
10-5-84	342,720	10.0
10-8-84	361,440	8.0
10-9-84	342,720	9.5
10-11-84	342,720	10.5
10-12-84	342,720	10.0
10-15-84	361,440	11.5
10-16-84	419,040	7.5
10-17-84	398,880	8.5
10-18-84	398,880	7.5
10-19-84	419,040	7.5
10-22-84	398,880	10.5
10-23-84	419,040	8.5
10-24-84	419,040	7.0
10-25-84	398,880	9.0
10-26-84	398,880	11.0
10-29-84	419,040	8.0
10-30-84	398,880	9.5
10-31-84	398,880	9.0
11-1-84	398,880	6.0
11-2-84	342,720	8.0
11-5-84	380,160	5.5
11-6-84	303, 384	4.0
11-7-84	303,384	7.5

DATE	GPD	РН
11-8-84	380,160	8.5
11-9-84	380,160	7.0
11-10-84	342,720	8.0
11-11-84	342,720	9.5
11-12-84	380,160	9.0
11-13-84	342,720	8.5
11-14-84	303,840	8.5
11-20-84	380,160	7.0
11-21-84	380,160	9.0
11-22-84	342,720	10.0
11-23-84	342,720	9.0
11-26-84	380,160	8.5
11-27-84	398,880	10.0
11-28-84	419,040	10.5
11-29-84	419,040	8.0
11-30-84	380,160	10.0
12-3-84	398,880	11.5
12-4-84	398,880	10.5
12-5-84	380,160	13.0
12-6-84	419,040	9.0
12-7-84	398,880	8.0
12-10-84	380,160	6.5
12-11-84	419,040	11.5
12-12-84	398,880	9.0
12-13-84	419,040	9.0

DATE	GPD	РН
12-14-84	398,880	9.5
12-17-84	380,160	6.0
12-18-84	342,720	7.5
12–19–84	419,040	8.0
12-20-84	380,160	11.5
12-21-84	380,160	10.0
12-26-84	342,720	9.0
12-27-84	342,720	11.0
1-2-85	380,160	9.5
1-3-85	361,440	6.0
1-4-85	361,440	8.8
1-7-85	342,720	9.5
1-8-85	303,384	10.5
1-9-85	342,720	10.0
1-10-85	342,720	12.0
1-11-85	303, 384	9.0
1-14-85	342,720	10.0
1-15-85	303,384	8.5
1-16-85	380,160	6.5
1-17-85	342,720	7.5
1-18-85	361,440	8.5
1-21-85	361,440	7.0
1-22-85	342,720	7.0
1-23-85	342,720	8.0
1-24-85	419,040	6.5
		i de la companya de la companya de la companya de la companya de la companya de la companya de la companya de

DATE	GPD	PH
1-25-85	361,440	7.5
1-28-85	380,160	7.0
1-29-85	380,160	7.0
1-30-85	361,440	6.0
1-31-85	342,720	7.5
2-1-85	361,440	8.5
2-4-85	342,720	7.0
2-5-85	242,720	9.0
2-6-85	361,440	9.5

TABLE 5-2
CHEMICAL ANALYSES OF SELECTED WASTE
STREAMS AT NAVAJO REFINERY (AFTER BRANVOLD, 1984)
(VALUES IN MG/L EXCEPT WHERE NOTED)

MBCC 3-103 Standards	CRUDE UNIT PROCESS (44, €11, €13)	CAT. CRACKER PROCESS BEFORE SOUR WATER STRIPPER	SOUR WATER STRIPPER EFFLUENT (#17)	alky. Neutralizing Sewer (46)	ND 2 SD DESALTERS (43, 49)
As					
Ea					
Cd					
Cr	<0.1	<0.1	<0.1	7.8	
CH	<0.1	<0.1	<0.1	<0.1	<1.0
	****	,		(0.1	(1.0
F	1.3	0.5	0.4	10.8	
fb			•	••••	
Hg					
KO2					
Se					
Ag				•	
U					
CI					
Cu					
fe	<0.1	3.9	17.0	7.8	
Ma COA					
504					
TDS	805	2160	560	2872	2524
Zn nu	(0.1	<0.1	0.12	18.8	
pH Al	6.3	9.0	9.5	3.6	
8					
Eo .					
Ko					
Ki					
Phenols	9.9	710	250	0.26	
TSS	•••	***	,		
Cond.					
COD	1202	8379	1702	8870	600
NH.	78	2320	25£	<1	5.0
S	64	190	7.7	1.4	₹1.0

Ť

Table 5-2 (continued)

S

BOILERS

MGCC 2-102	S.D.	K.D.	к.о.
PARAMETERS	BOILER	ніен	FOK
	BLONDOWN	PRESSURE	PRESSURE
		BOILER	BOILER
	(#2)	(#18)	(#12)
As	.004	.005	.003
Ba	<.1	<.1	(.1
Cd	<.01	<.01	<.01
Cr	<.05	<.05	<.05
CN	•		
F	3.1	2.2	1.5
fb	.18	.14	.05
Hg			
NO _x	.2	.1	.05
Se			
fig	<.05	<.05	₹.05
ឋ	<.05	<.05	(.05
Cl	127	73	44
Cu	<.03	<.03	<.03
Fe	1.9	0.65	0.25
Kn	.07	<.03	<.03
SO	1549	1242	693
TDS	4220	2873	1897 (.01
Zn	.06	<.01 11.6	11.2
рК	11.6	(1.0	<1.0
Al	<1.0	(1.0	11.0
g Co	<.01	.02	.01
fio	<.5	<.5	⟨.5
Ni Ni	(.05	<.05	<.05
ri Fhenois	1.03	1173	1.00
TSS	20	0	0
Cand.	6000	5000	2890
COD	116	0	0
NH.	•		
· 			

Table 5-2 (continued)

COOLING TOWERS

WOCC 3-103 STANDARDS	N.D. COOLING TOWER RLONDOWN (#10)	S.D. ALKY COOLING TONER BLOWDOWN (#1)	S.D. TCC COOLING TOKER BLOWDOWN	N.D. FCC COOLING TONER BLOMDOKN (#16)
As	.004	<.001		
Ba	<.1	<.1	.011	.001
Cd	<.01		<.1	1. >
Cr	.06	<.01 1.05	<.01	<.01
CN	1	1.43	<.05	0.22
F	1.6	4.4		
Pb	.05		2.2	1.6
Kg	• • •	.05	₹.05	.05
N O3	.5	76		
Se		.75	.2	.3
Ag	<.05	/ 05		
U	⟨.05	<.05	<.05	<.05
C1	48	<.05	<.05	<.05
Cu	⟨.03	53	44	47
Fe	.05	(.03	<.03	<.03
Ma	<.03	.5	(.05/	<.05
S 0	1077	.07	<.03	<.03
TDS4	1906	1461	1236	1067
Zn	.48	2732	1694	1973
На	7.6	28	<.01	.17
Al	<1.0	6.9	7.7	8.0
F	****	<1.0	1.0	<1.0
Co	(.01			
Ko	⟨.5	.01	.02	.01
Ki	₹.05	₹.5	(.5	<.5
Fhenols	1.03	<.07	<.05	<.05
TSS	13			_
Cond.	0	0	67	e
COD	1850	Ü	108	1800
NH.	0			15

QUALITY OF WATER IN EVAPORATION PONDS

ASSAIGAL

ANALYTICAL LABORATORIES, INC.

TO: Geo Science 500 Copper Ave. N.W. Albuquerque, NM

DATE: 8 November 1984 1080, 1040

ANALYTE

SAMPLE ID/ANALYTICAL RESULTS

			_
	11184	103184	103184
	1330	1432	1240
	Well 28	Well 45	Well 46
P • • • •			WELL 40
Benzene	<0.005 mg/l	<0.005 mg/l	(0.005 (0.05
Toluene	<0.005 mg/1	<0.005 mg/l	<0.005 mg/1
Ethylbenzene	<0.005 mg/1	<0.005 mg/1	<0.005 mg/1
Xylenes	<0.005 mg/l	<0.005 mg/1	<0.005 mg/1
		(0.00) mg/I	<0.005 mg/1
	103184	102107	
	1520	103184	
•	Well 47	1550	
•		Fire Pond	
Benzene	<0.005 mg/l	(0, 000	
Toluene	<0.005 mg/1	<0.005 mg/1	
Ethylbenzene		<0.005 mg/1	•
Xylenes	<0.005 mg/1	<0.005 mg/l	
•	<0.005 mg/l	<0.005 mg/l	
	Well 3		
	#611 J	Well 5	Well 12
NO 3 as N	(0 01/1		
NH 4	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
CN T	1.16 mg/1	2.5 mg/l	0.25 mg/1
Benzene	<0.01 mg/1	<0.01 mg/l	<0.01 mg/1
Toluene	<0.005 mg/1	<0.005 mg/1	<0.005 mg/l
Xylenes	<0.005 mg/1	<0.005 mg/1	<0.005 mg/l
Ethylbenzene	<0.005 mg/l	<0.005 mg/1	<0.005 mg/l
_ = 0, _ Deale e	<0.005 mg/l	<0.005 mg/1	<0.005 mg/l
		_	10000 28/1
	Well 13	Pond 1	Pond 3
NO se v			10114
NO 3 as N	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
NH 4 CN	5.6 mg/l	10.6 mg/l	
	0.09 mg/l	0.4 mg/l	13.87 mg/1
Benzene	0-254 mg/l	0.711 mg/1	0.2 mg/1
Toluene	0.345 mg/l	0.588 mg/1	0.027 mg/1
Xylenes	0.389 mg/1	0.591 mg/1	<0.005 mg/1
Ethylbenzene	<0.100 mg/1	0.240 mg/1	(0.005 mg/l)
		0 • 2 4 0 mg/1	<0.005 mg/1

TO: Geo Science 500 Copper Ave. N.W. Albuquerque, NM

DATE: 8 November 1984 1080, 1040 Page 2 of 2

ANALYTE

SAMPLE ID/ANALYTICAL RESULTS

	Pond #Į floating film	NOMINAL DETECTION LIMIT
NO 3 as N NH 4 CN Benzene Toluene Xylenes Echylbenzene	0.617 mg/1 0.467 mg/1 0.463 mg/1 0.201 mg/1	0.01 mg/1 0.1 mg/1 0.01 mg/1 0.005 mg/1 0.005 mg/1 0.005 mg/1 0.005 mg/1

REFERENCE: "Standard Methods for the Examination of Water and Wastewater", 15th Edition, APHA, N.Y., 1980.

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

Sincerely,

Laboratory Director

-customer

Navajo Refining Co!

ADDRESS Drawer 159

city Artesia, NM 88210

ATTENTION E

Ed Kinney

104223



SAMPLES RE	ECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.0. # 200)30
TYPE OF AN	ialysis Water		
	Sample Sample	Type of	
	Identification	Analysis	mg/liter
	Navajo West Pond	Acidity	13
		Alkalinity, "P" (as CaCO ₃)	< 1
		Barium 3'	0.2
		Biochemical Oxygen Demand	116
		Cadmium	0.003
		Chemical Oxygen Demand	102
		Chloride	918
		Chromium	0.04
م موجه	• .•	Chromium 6+	< 0.01
www.		Copper	< 0.001
	,	Fluoride	6.6
	.00	Hardness (as CaCO ₃)	760
art. The	102	Iron	0.06
		Lead	0.002
		Magnesium	60
		Nickel·	0.01
		pH Units	7.7
		Phenols	0.04
_		Alkalinity, "M"	173
		Solids, Total Dissolved	2930
	William Wall Committee Committee	Sul fate	885
	A CANAL STATE OF THE STATE OF T	Sulfide	25.1
		Zinc	< 0.1

Sample Analysis by: BP

Date and Time of Analysis: BOD_S : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: $BOD_5 - 5$ day incubation

pH:electrode



-cogramed Navajo Refining Con

ADDRESS Drawer 159

CITY Artesia, NM 88210

ATTENTION: Ed Kinney INVOICE NO 104223



1				
SAMPLES RECEIVED	4/24/81	 CUSTOMER ORDER NUMBER	P.O.	# 20030

TYPE OF ANALYSIS Water

Sample Identification	Type of Analysis		mg/liter
Navajo Middle Pond	Acidity		29
	Alkalinity, "P" (as CaCO ₃)	<	1
	Barium	<	0.1
	Biochemical Oxygen Demand		116
	Cadmium		0.002
	Chemical Oxygen Demand		363
	Chloride		1468
·	Chromium		0.1
	Chromium 6+	<	0.01
	Copper	<	0.001
	Fluoride		7.4
	Hardness (as CaCO ₃)		1060
	Iron		0.06
.40	Lead	<	0.001
	Magnesium		96
·	Nickel ·	<	0.01
	pH Units		7.4
	Pheno1s		0.027
	Alkalinity, "M"		349
•	Solids, Total Dissolved		4020
	Sulfate		1050
guerto professor. Existe professor de la como de la como de la como de la como de la como de la como de la como de la como de la	Sul fide		13.4
Taran San San San San San San San San San S	Zinc	<	0.1

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



-costomer Navajo Refining Com

ADDRESS Drawer 159

city Artesia, NM 88210

ATTENTION: Ed Kinney INVOICE NO 104223



1		(
SAMPLES RECEIVED	4/24/81	CUSTOMER ORDER NUMBER	P.O. # 20030

TYPE OF ANALYSIS Water

Sample Identification	Type of Analysis		mg/liter
Navajo East Pond	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride	«	10 1 0.1 72 0.002 225 1632
10	Chromium Chromium 6+ Copper Fluoride Hardness (as CaCO ₃) Iron Lead	٠	0.1 0.01 0.002 5.8 1160 0.1 0.001
<u>· </u>	Magnesium Nickel pH Units		110 0.01 7.2
	Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc		214 4920 1520 0.36 0.1

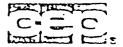
Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode





GOVERNOR

STATE OF NEW MEXICO

ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION

February 7, 1985

POST OFFICE BOX 2088 STATE LAND OFFICE BUILDING SANTA FE, NEW MEXICO 87501 (505) 827-5800

CERTIFIED MAIL RETURN RECEIPT REQUESTED

Mr. Randall T. Hicks, Vice President Geoscience Consultants, Ltd. 500 Copper Avenue, N.W. Suite 220 Albuquerque, New Mexico 87102

Re: Ground Water Discharge Plan (GW-28) for Navajo

Refinery, Artesia

Dear Mr. Hicks:

The New Mexico Oil Conservation Division Environmental Bureau has reviewed your December 7, 1984, discharge plan submittal for the Navajo Refinery. We have some comments and questions on the material submitted and requests for additional clarifying information. Also, in a meeting with you on January 24, 1985, several substantial issues regarding discharge plan coverage and future work efforts were raised. I will discuss these issues first and then provide our specific comments on the material submitted.

Discharge Plan Issues

1. During the meeting of January 24, 1985, the hydrocarbon product recovery system and its relationship to the ground water discharge plan was discussed. You requested that the issues remain separate except that water discharges from the recovery system to the conveyance ditch would be covered under the discharge plan. We are agreeable to your request to cover the product recovery system under WQCC Section 1-203 instead of WQCC Part 3 Regulations. However, such approval is contingent on your written assurance that you will comply with the provisions of Section 1-203.A., and your agreement that the existing compliance schedule or approval of the discharge plan will not exempt you from Section 1-203. If agreed to, use of Section 1-203 will be limited to past petroleum product discharges; action to be taken to

- protect ground water in the event of future spills must be covered in the discharge plan.
- The WQCC Regulations do not provide exemptions for 2. discharges covered under the RCRA regulations. Therefore continuing discharges of RCRA-regulated effluent or leachate (such as to the land farming area) are also subject to the WQCC Regulations. the RCRA land-farm disposal system is performing as designed to protect ground water from heavy metals and toxic organics, it is also likely to be protecting ground water from degradation by non-RCRA contaminants such as chlorides, sulfates and total dissolved solids regulated under WQCC rules. demonstrate this Navajo must submit sufficient technical information on frequency of application, quantities, total volumes, conditions of application, monitoring currently performed, etc. information will be reviewed for WQCC adequacy. needed, additional analyses of samples for some key WQCC constituents may have to be performed as part of the discharge plan. Similar information also should be submitted for any RCRA approved site currently receiving discharges.
- 3. Demonstration that continued use of the 3-mile unlined conveyance ditch does not provide a hazard to ground water will be very difficult. This ditch transfers all refinery wastewater to the evaporation ponds, contains levels of benzene and other constituents in excess of WQCC standards (as evidenced by pond levels exceeding these standards), and contains other pollutants discharged from the oil-water separators. Information provided in the discharge plan indicates that a very shallow aquifer exists at depths betwen 15 and 30 feet beneath the refinery. At a specific conductance of about 2500 umhos/cm (Appendix B), the quality of this so-called "perched" aquifer is good and apparently has provided water for stock (p. 4-11). The potentiometic map (Figure 4-7) shows water movement to the east toward the river. The same geologic conditions and shallow useable ground water are likely to occur in the area of the ditch until the Pecos Valley alluvium is reached. This water must be protected from any ditch discharges that would cause exceedance of ground water standards. The contention (p. 6-2) that the ditch is self-lined due to deposition of asphaltic material has not been demonstrated and no information

on ground water quality along the ditch has been provided. Even if several monitoring wells along the 3-mile length showed no contamination, this would not be assurance that contamination is not occurring in between the monitoring points. The ditch is a possible line source of recharge and investigation of specific hydrologic conditions along its entire length would be time-consuming, expensive, and very possibly inconclusive. Navajo is strongly encouraged to look at other alternatives to the unlined ditch for transfer of effluent to the ponds.

4. Navajo should continue the hydrogelogic studies it is conducting in the vicinity of the evaporation ponds. Alternatives other than pond lining are available for discharge plan approval under Section 3-109.C. of the Regulations.

Specific Comments/Questions

HYDROGEOLOGY:

- 1. Are wells numbered 45, 46, and 47 the waste conveyance monitor wells referred to on p. 3-1?
- 2. Provide a table listing available information (location, owner, date drilled, depth, aquifer or water bearing zone, water level, date measured, use, etc.) for all water wells (except those drilled by Navajo) within one mile of the refinery property, one mile either side of the conveyance ditch, and within one mile of the evaporation ponds (on both sides of the river).
- 3. A statement on p. 4-1 asserts that Pecos Valley alluvium is not used for any purpose in "this area." What is the extent of the referenced area and what is the source of water for the windmill in the NW/4, SW/4 of Section 12, Township 17 South, Range 26 East, and the water well listed on Figure 4-9?
- 4. What is the source of information for the geologic map shown in Figure 4-1?
- 5. Provide a legible copy of Figure 4-2 and provide units for permeability and other listed soil characteristics.

- 6. Clarify whether the depth to the top of the Queen formation is 150 or 200 feet (p. 4-10).
- 7. The depth and aquifer designation for well 6612 is incorrectly drawn on Figure 4-3.
- 8. Describe the characteristics and extent of the Bower Sand shown on Figure 4-3. This sand was not discussed in the discharge plan submittal.
- 9. Several of the well records in Appendix A from the State Engineer's Office have critical information that is illegible. Provide legible logs or tabulate the critical information (eg. depth of well, depth to water upon completion, major water-bearing strata, etc.).
- 10. Logs for Navajo wells #2, 4 to 8, 10 and 11, 14 and 15, A to J, and the product recovery wells are missing. Provide the logs if available or a narrative on construction information, date, depth, use, etc.
- 11. The photocopies of the sample log for wells AA through AI, and R through T are illegible in part. Provide legible log copies.
- 12. What is the source of the apparent artesian head in the perched water unit and shown in Figure 4-6? Do all monitor wells near the refinery exhibit these apparent artesian conditions?
- 13. Is there any apparent source of recharge or discharge (pumping) that could account for the potentiometric anomalies described on p. 4-12 for wells #19 and 34 and 29, 37, 39 and 40?
- 14. What is the hydrologic relationship of Eagle Draw to the perched shallow artesian zone?
- 15. Provide the conductance vs. discharge vs. relationship for the Pecos River near Artesia for October through April 1982 and 1983.
- 16. The potentiometric surface map at the evaporation ponds (Figure 4-9) shows ground water levels several feet above river elevations. Water movement to the north or south could be inferred from differences in these elevations. The time of year the measurements

were made was omitted from the figure. To determine what the actual situation is and verify the accuracy of the statement on p. 4-14 that the gradient is reversed at low flow, additional shallow subsurface information needs to be obtained. This should include comparison of seasonal water levels in the river with those in the pond monitoring wells. Frequent water level measurements by hand or through use of a water level recorder may be needed to make this determination. Seepage from the ponds producing a ground water mound may also contribute to high water levels in pond monitor wells.

- 17. Figure 4-9 shows water levels to be higher in pond 3 than in upstream pond 2. If the dike(s) has been breached, why are the levels unequal?
- 18. Is Navajo's property boundary given by the heavy black line in Figure 4-9? If so, provide the names and show the locations of the property owners immediately adjacent to the ponds.
- 19. Regarding the conveyance ditch, does Navajo own the ditch or have an easement? If an easement, provide the name and location of the property owners.
- 20. Provide a map showing the current 100-year flood plain at the refinery and the maximum 100-year flooding that could occur after the city makes changes in the Eagle Creek drainage. Indicate the status and proposed completion date of the flood control efforts (eg. planning only, money allocated, under construction).
- 21. Figure 4-9 shows that dike levels at the ponds are 10 to 14 feet above the river rather than the 16 to 18 feet given on p. 4-15. Clarify this discrepancy.
- 22. On Figure 4-9, where is monitoring well #16 located? What are its completion details?
- 23. Provide the 100-year flood plan map in the vicinity of the end of the conveyance ditch and the ponds. Show on the map the 1932 flood stage of 17.4 feet and the 13.76 feet stage of 1954. Show the extent and frequency of the largest discharge expected under controlled discharge conditions. What precautions have been taken to protect the conveyance ditch and ponds from such releases?

WATER QUALITY:

- 1. Provide a summary of water quality characteristics of the San Andres and upper Queen aquifers in the refinery area.
- 2. Contrary to the statement on p.4-16, the water quality in the Pecos River Valley alluvial sand/silt aquifer has not yet been sufficiently characterized by Navajo. Background quality cannot be defined until seasonal variations, and ground water flow direction(s) are known. Since pond seepage appears to have affected some close monitoring wells, analyses of water samples from those wells would not be representative of the back- ground water quality.
- 3. Analyses of the Pecos River up and downstream of the ponds and at low flow should be made to characterize river quality and any effect of pond seepage on NM Stream Standards.
- 4. Which "well water" is referred to in the 4/30/81 CEP Analysis labeled "Page 1 of 13 pages?" Where is this well located? What are its depth and completion details? From what zone is it producing?
- On page 4-17, the statement is made that direct 5. contamination of ground water at the refinery is unlikely due to the presence of artesian conditions and that contamination could be occurring due to contact between artesian water in the wellbore and hydrocarbons in the soil. While we believe this could be true for some individual wells, the presence of floating product up to several feet in thickness in at least ten of the wells, as shown in drilling logs, shows that product has indeed moved downward despite apparent artesian conditions. There is also the possibility that the artesian conditions are recent and localized, and contamination predated a rise in water levels and pressures to current This statement needs to be revised to elevations. reflect actual conditions.
- 6. The last paragraph of page 4-17 asserts that the ground water of the shallow, perched-water unit is 1) of limited extent, 2) not utilized by any off-site wells, and 3) not connected with any other aquifer. Navajo has not conclusively demonstrated the correctness of these assertions (see issue 3 above).

Even if the situation is as Navajo suggests, this ground water is to be protected for present and potential future use since it can be used as a water supply and has an existing concentration much less than 10,000 mg/l TDS.

- 7. Provide TOC, Chloride, Sodium, and sulfate data for the TEL and colony areas (see Appendix B).
- 8. Although Navajo will provide additional effluent flow and quality characterization in the February 25, 1985 submittal, the following deficiencies were found in the December 7, 1984, submittal:
 - (a) Where were effluent rates measured? Flow measurements need to be made at the beginning and end of the datch.
 - (b) No analysis was provided for waste stream #14 (Desulfurizers).
 - (c) Table 5-2 does not provide analyses for benezene, toluene, ethylbenzene, xylenes, or the other WQCC organic standards. The presence or likelihood of toxic pollutants has not been discussed.

PLANT PROCESSES:

- 1. Are injection wells used for disposal of any produced water or any refinery generated wastewater?
- 2. In addition to the information provided in Section 5.3.1., provide additional information on the fire pond. Include engineering information (size, depth, volume, liner, discharge rates in and out), range of TDS and flow variation from individual boilers, and use of additives (chromates, phosphates, organics, etc). Provide information on uncontaminated ground water quality in the pond vicinity.
- 3. Discuss the TEL pond, its use, dates of use, type of effluents, closure procedures, and if it is under a RCRA monitoring plan. This information will be useful in interpretation of the subsurface hydrologic data.

- 4. Provide construction details for the oil-water separators. Provide residence times prior to sludge removal, frequency of sludge removal, and residence time after removal.
- 5. Describe the blending operations, additivites used, and storage and drainage for this area.
- 6. In Table 5-2, indicate the type of chromium analysis performed. Is the analysis for CN listed in Table 5-2 for streams #3 and #9 in error?
- 7. Waste stream #18 is not on drawing 5-2 but an unnumbered waste stream is present on the drawing. Clarify the waste stream numbering.
- 8. Does Navajo have any underground storage tanks?

Please provide three copies of all future submittals (including maps and drawings), so that additional copies are available for field office use and public review. If you have any questions regarding these comments or the additional information requested, please contact me at the above address or by telephone at 827-5812.

Sincerely,

Land J Ray S

DAVID G. BOYER

Hydrogeologist

cc: OCD Artesia Field Office

NMEID Hazardous Waste Section

David Griffin Navaio Refining Co

	David	Griffin, Navalo Refining Co.	
SENDER: Complete items 1, 2, 3, and 4. Add your address in the "RETURN TO" space on reverse.	(CONSULT POSTMASTER FOR FEES) 1. The following service is requested (check one).	3. ARTICLE ADDRESSED TO: Mr. Randall T. Hicks Geoscience Consultants, Lt Geoscience Consultants, Lt Geoscience Consultants, Lt Signarene Coopper Ave. N.W. Likestere Coopper Ave. N.W. Likestere Coopper Ave. N.W. Manays obtain signature of addressee or agent I have received the article described above. Signature of addressee or agent No Express Mal. Addressee or agent Signature of addressee or agent No Express Mal. Addressee or agent Steen received the article described above. Signature of addressee or agent No See Sees Appress (Only fragence or agent) A Addressee or agent A Addressee or age	ROVIDED—
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DISCHARGE PLAN
SECTIONS 1.0-6.0
NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO
REFINERY

Prepared for:

David Griffin Navajo Refining Company P.O. Drawer 159 Artesia, New Mexico 88210

December 3, 1984

Prepared by:

Geoscience Consultants, Ltd.
500 Copper Avenue
Suite 220
Albuquerque, New Mexico 87102

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1.0 EXECUTIVE SUMMARY

Navajo Refining Company, P.O. Drawer 159, Artesia, New Mexico, 88210 discharges approximately 405,200 gallons per day of oil refinery wastewater to evaporation ponds. The refinery is located in Section 9, T. 17S. R. 26 E. and the 85 acre evaporation ponds are located in Section 12,T.17 S, R. 26 E. Wastewater from the process units flows through an oil/water separator to remove the bulk of the hydrocarbons discharged with the wastewater. The refinery's effluent has a total dissolved solids content of 2000-4000 mg/l. The ground water near the evaporation ponds is at a depth of 8 feet with a background total dissolved solids content of about 15,000 mg/l. In the refinery area the "shallow aguifer" (upper Queen Formation), which is at a depth of 150 to 250 feet below land surface, exhibits nearly 100 feet of artesian head. The total dissolved solids content of the ground water in this aquifer is about 500-1000 mg/l. About 15 feet below land surface a 2 to 5 foot thick water-bearing unit is present in the Refinery area. This unit exhibits some artesian pressure and has a total dissolved solids content of about 1500 mg/l.

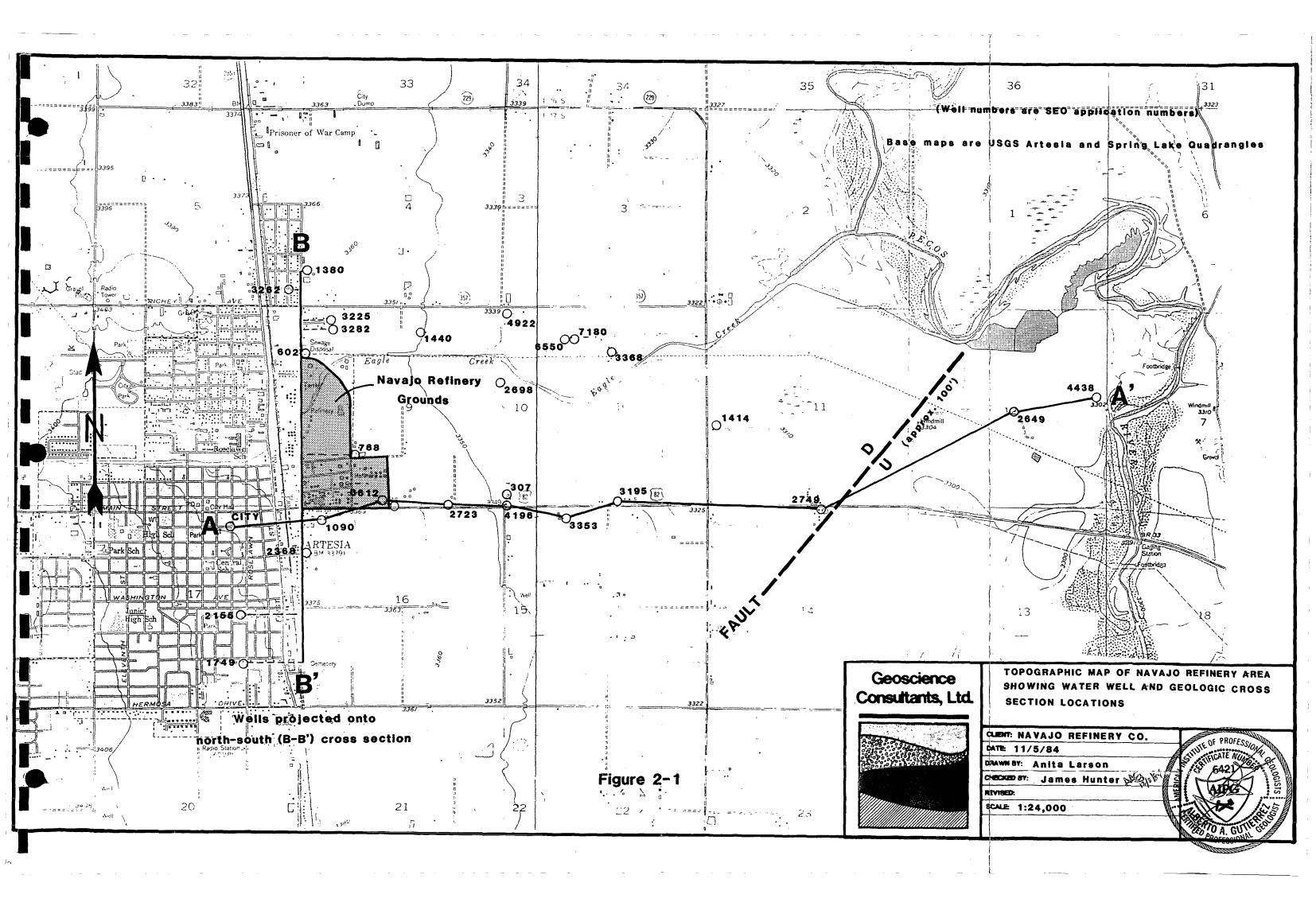
2.0 LOCATION AND PHYSIOGRAPHY

2.1 LOCATION

The Navajo Refining Company's plant facilities and wastewater management system are located in and near the town of Artesia, in Eddy County, New Mexico. The refinery's processing plant and much of the waste management system is located within the city limits, in the west 1/2 of Section 9, T. 17 S., R. 26 E. The associated wastewater evaporation facilities are located in Sections 1, 2, 9, 10, 11, and 12 of T. 16 S., R. 26 E., and in part of the west 1/2 of Section 6, T. 16 S., R. 27.E. (Figure 2-1).

2.2 PHYSIOGRAPHY

Artesia lies in the Eastern Plains of New Mexico; a broad, flat plateau with a local elevation of 3300 to 3400 feet above sea level. Topography in the Artesia area slopes gently (15 to 20 feet per mile) to the east, and is drained by the nearby Pecos River (Figure 2-1). The region is semiarid, with rainfall averaging less that 11 inches per year. Soils are typically of the Arno, Harkley, Pima and Karro associations, developed by deep weathering of bedrock or old alluvium (USSCS, 1971).



3.0 BRIEF HISTORY OF OPERATION

The refinery began operations in the 1920's. The technology, size and ownership of the facility have changed numerous times since commencement of crude processing. Until 1969, the North Division and the South Division were operated by Conoco. Navajo then purchased both units and began to further integrate the operation into a single refinery capable of processing New Mexico sour crude (an asphalt-based crude with a high sulfur content) in the South Division and New Mexico intermediate crude (a paraffin-based crude produced mainly from the Abo Formation) in the smaller North Division.

Since the 1970's Navajo has constructed over 50 monitor wells and product-recovery wells to address the environmental concerns at the facility. The installation of four product-recovery trenches has resulted in a significant reduction in the total amount of hydrocarbons which exist in soil. Hydrocarbon product recovery will continue and, if necessary, be expanded to insure environmental protection.

Ground-water monitor wells are also in place throughout the refinery to assist in delineating soil contamination by hydrocarbons, for RCRA monitoring of landfarms and other RCRA disposal facilities, and to monitor the integrity of the waste conveyance and evaporation facilities.

In addition to ground water monitoring, Navajo maintains a strict manifest and record-keeping system. This system helps to insure that all waste is handled and disposed of properly. This system is in compliance with all applicable RCRA regulations.

4.0 DESCRIPTION OF PHYSICAL ENVIRONMENT AT SITE

Four water-bearing units are present beneath the Navajo Refining Company facility:

- o The San Andres Formation
- o The upper Queen Formation
- o Alluvium in the Pecos River Valley
- o Small, discontinuous perched-water aquifers in the Seven Rivers Formation

The San Andres and upper Queen formations are the principal aquifers of the Artesia area (Welder, 1983). The San Andres also locally called the deep or artesian aquifer has been extensively developed for industrial, municipal and agricultural purposes. This unit is under considerable artesian pressure. The upper Queen in the Artesia area is principally used for individual domestic wells, but some larger capacity wells completed in this unit are employed for irrigation. Unlike the "shallow" aquifer in the Roswell area, water-bearing sand units in the upper Queen exhibit artesian head. Adjacent to the Pecos River a third water-bearing unit is present: the Pecos River Valley alluvium. This unit is not currently utilized in this area for any purpose due to its poor water quality. Within the Seven Rivers Formation

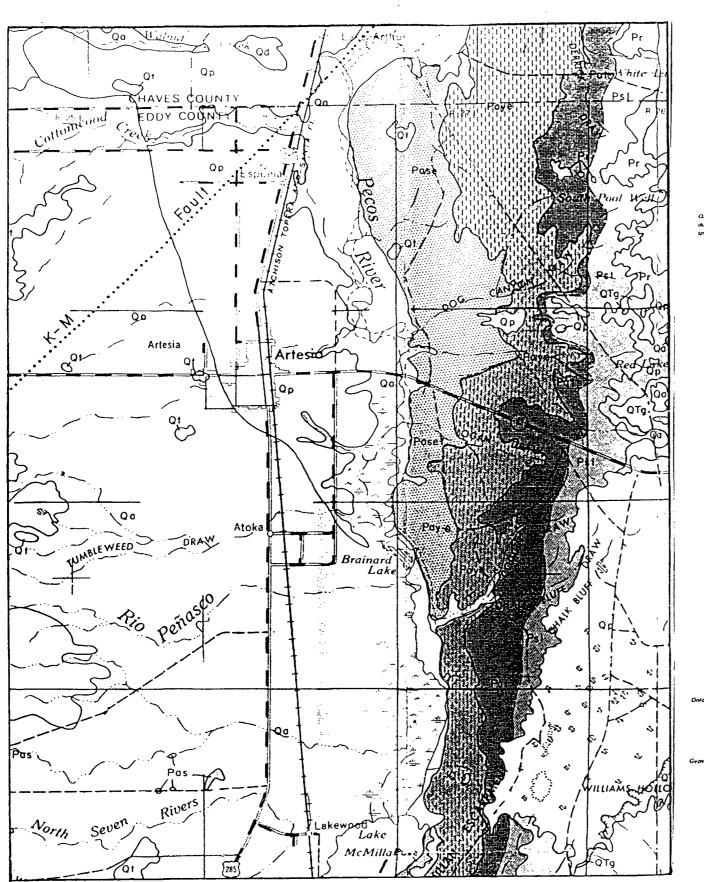
isolated permeable sands and fractured evaporites will produce small quantities of poor quality water. These isolated units may show a few feet of artesian head. One such unit is present about 15 feet below the Refinery. The evaporation ponds and portions of the conveyance ditch lie on the flood plain of the Pecos River and Eagle Draw. However, numerous flood control structures up stream from Navajo have eliminated most of the flooding potential of the facility.

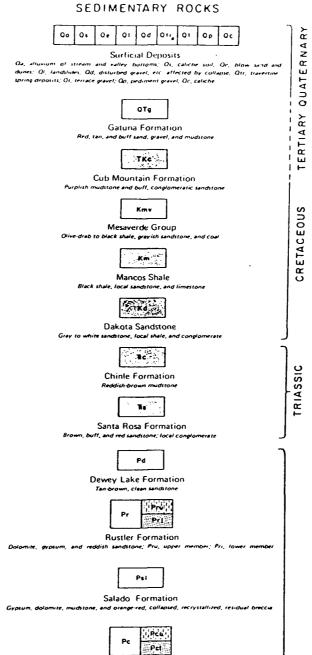
4.1 GEOLOGY

The town of Artesia and the Navajo site are underlain by thin (20 feet or less) layer of soils, alluvium and weathered bedrock, which generally conceals subcrops of the Artesia Group (Permian). As seen in the explanation of figure 4-1, the Artesia Group consists of carbonates, evaporites and shales deposited in a backreef environment. The Artesia area is located on the northwestern shelf of the Permian Basin and basinward (southeasterly) stratigraphic dips of 1 to 3 degrees are typical.

Structure in the Artesia area is expressed as gentle (1-3 degree) southeasterly dips, with few other features. One fault (inferred from subsurface data) is mapped in the area. This fault trends about N. 40 E. through sections 11, 12 and 14 (Figure 4-1), and is apparently a normal fault with the northwest block downthrown. This structure parallels the other major structural elements of this area, such as the Y-O and K-M "buckles" or fault zones (Kelley, 1971).

In Section 12, the fault appears to pass beneath the Navajo Refining Company's evaporation ponds near the Pecos River.





Castile Formation

EXPLANATION

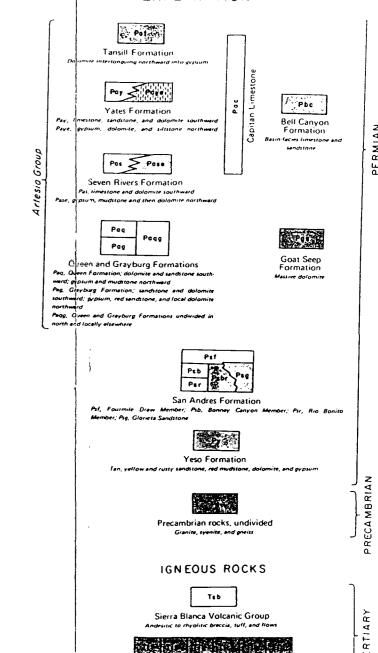


Figure 4-1 Geologic Map of Artesia area

Dikes, sills, stocks, and laccoliths

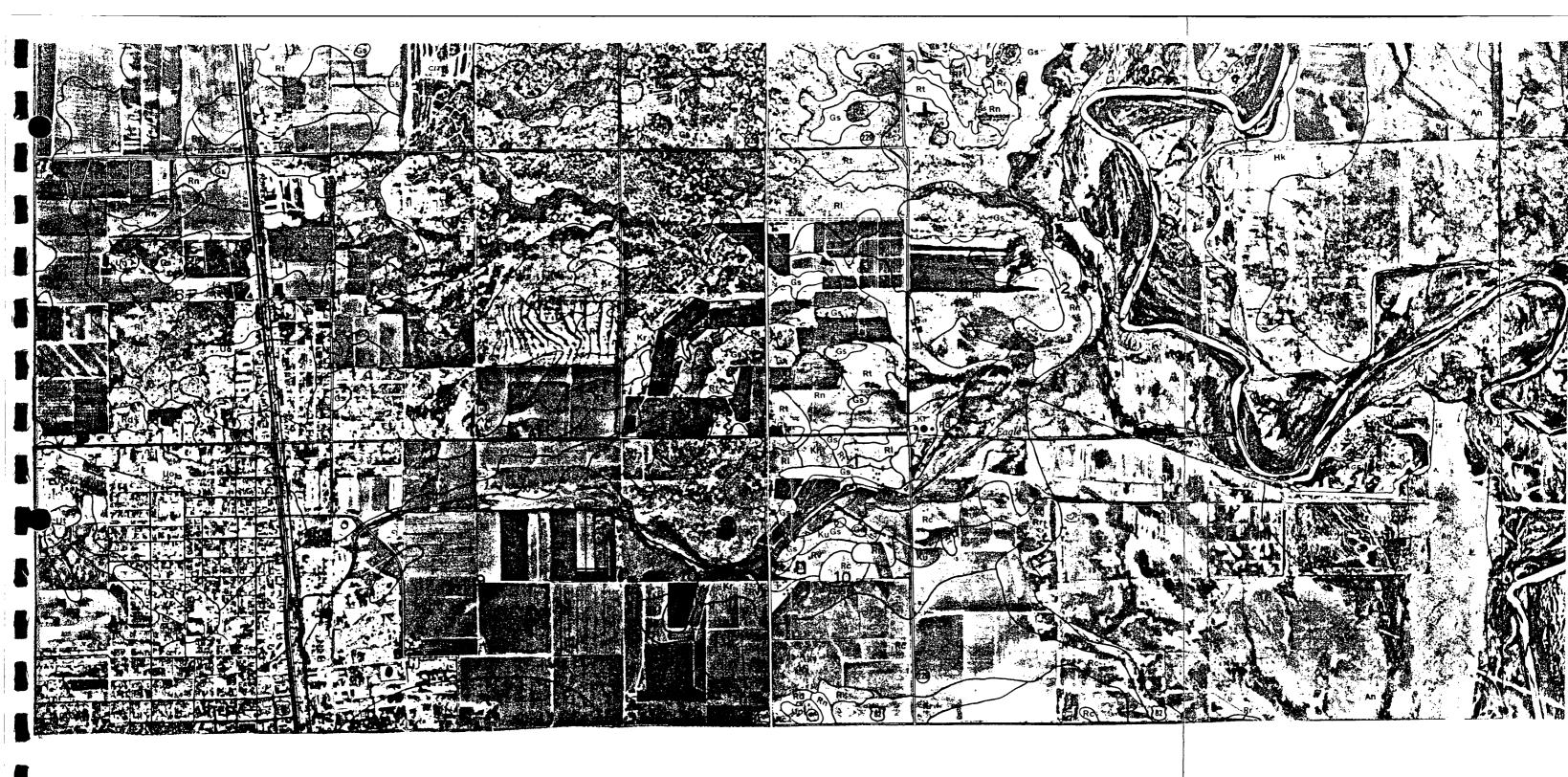
4-3

Although the fault may cut across all known and potential aquifers, there are several reasons why the fault is not a potential conduit for ground water contamination. First, faults in evaporites (Queen, Seven Rivers) typically "heal" or self-seal by flowage and recrystallization of gypsum and anhydrite. Second, the net hydrostatic head of the shallow and deep artesian aquifers is upward and would prevent any downward flow.

4.2 GEOMORPHOLOGY AND SOILS

The Artesia region is located on a broad, gently sloping plateau which has developed as a result of <u>in-situ</u> weathering of flat-lying carbonate and evaporitic bedrock. Localized areas of valley fill (Pecos River Valley and major arroyos) form the only other significant substrate for soil formation. Within soil series formed on a particular substrate, soil properties vary as a result of differing grain size, land slope and available moisture. Figure 4-2 shows the distribution and properties of soil types in the Artesia area. The Navajo plant site is located in an area of Karro Loams (USSCS, 1971). These soils are developed on deeply weathered calcareous rocks, and are moderately permeable. Much of the refinery site area has been filled, graded and leveled, leaving little natural soil in place.

The effluent ditch (Figure 2-1) parallels Eagle Creek, and is constructed in soils of the Pima Series. These dark, calcareous loams develop on carbonate bedrock and carbonate-rich alluvial material. They are moderately permeable and have a high water-holding capacity.



			Classif	ication		Perce	ntage passir	ng sleve-	Permea- bility	Available water	Reaction	Electrical Conductivity (Ec x 103)	Corrosivity (Untreated Steel pipe)	Shrink-swell potential
Soil series and map symbols	Depth to bedrock, hard caliche, or gypsum	Depth from surface	USDA texture	Unified	AASH0	No. 4 (1.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)		capacity		(20 % 10-)	Steel pipe)	
Arno: AH, Ak, An (For Harkey part of AH and Ak, s Harkey series).	More than 60. ee	0-14 14-60	Silty clay loam Silty Clay	CH	A-6 A-7	100 100	100 100	90-95 90-95	0.05-0.20 0.05-0.20	0.18-0.20 0.15-0.17	7.9-8.4 7.9-8.4	4.0-8.4 8.0-12.0	High High	Moderate High
Harkey: Ha, Hk	More than 60.	0-87	Very fine sandy Loam, Loam and silt loam.	ĦL	A-4	100	100	60-75	0.8-2.5	0.17-0.19	7.4-7.8	2.0-12.0	Moderate to high	to ⊭
Karro: KA, KL, Kr, Ku, KV	More than 60.	0-20 24-60	Loam Elay loam	ML-CL CL	A-4 A-6	100 100	100 100	60-75 70-80	0.8-2.5 0.8-2.5	0.16-0.18 0.18-0.20	7.9-8.4 7.9-8.4	4.0-10.0 8.0-15.0	High High	Moderate Moderate
Pima: PM, Pe, Pn, Pv	More than 60.	0-60	Silt loam to silty clay loam	CL	A-6	100	100	85-95	0.2-0.8	0.18-0.20	7.4-7.8	0-4.0	Moderate	Moderate

Figure 4-2 Characteristics and distribution of soils in Artesia area.

The evaporation ponds are built on soils of the Arno Series which develop on fine, silty alluvium in the Pecos River Valley. These soils have low permeability and high waterholding capacity.

4.3 REGIONAL HYDROGEOLOGY

The Artesia area is located in the Roswell-Artesia artesian water basin (Welder, 1983). The two principal ground water reservoirs are the artesian San Andres aquifer, and two shallow aquifers (Queen Formation and valley alluvium). Local, perched water-bearing units with small storage capacity also occur in isolated stratigraphic traps. With the exception of some wells located in valley alluvium immediately adjacent to the Pecos River, all wells in the Artesia area exhibit some degree of artesian head. Deep (800-1200 feet) artesian wells are completed in the Grayburg-San Andres formations, and have static water levels 50 to 80 feet below ground level. The deep aquifer is confined by shales and evaporites of the lower Queen Formation.

Shallow aquifer wells (150-250 feet) produce from the upper sands of the Queen Formation, and are confined by aquitards of anhydrite, gypsum and shale in the overlying Seven Rivers Formation (Figure 4-3). Water levels in shallow wells range from 40 to 60 feet below ground level.

Regionally, some wells tap the shallow, perched "gyp water" reservoirs in stratigraphic traps in the upper Seven Rivers Formation. These waters are effectively isolated from both major aquifers. Even in very shallow wells (20 feet) these perched zones exhibit 3 to 5 feet of artesian head.

The regional potentiometric surfaces of the deep and shallow aquifers are shown in figures 4-4 and 4-5. The two potentiometric surfaces have very similar elevations (about 3300' msl), with the deep artesian aquifer's surface slightly above the shallow aquifer's surface.

Both aquifers produce water for irrigation, industrial and domestic purposes. Water quality is variable from 500 to over 5000 ppm total dissolved solids, and in general the more saline waters are found at greater depths and/or to the east.

4.4 GROUND WATER HYDROGEOLOGY

The deep artesian aquifer is the major source of ground water in the Artesia area and supports most of the large local agricultural industry. Artesian water, of quality ranging from 500 to over 5000 ppm TDS, is found in the San Andres and Grayburg formations (Permian) at depths of 850 to 1250 feet below the surface (Kelley, 1971). This aquifer system is recharged along San Andres outcrops in the Sacramento Mountains west of Artesia. In the early 1900's many wells in this aquifer flowed 1000 to 3000 gallons per minute (gpm), but extensive withdrawals have lowered the head to about 50 to 80 feet below the land surface (Figure 4-4). The artesian aquifer is confined by the impermeable (or very slightly permeable) carbonates, shales and evaporites which comprise much of the overlying Queen and Seven Rivers formations (Figure 4-3). Its potentiometric surface is typically slightly above the shallow aquifer's upper surface (Welder, 1983).

The shallow aquifer, which has been described as a "water table" aquifer, is in fact a second artesian aquifer. With the

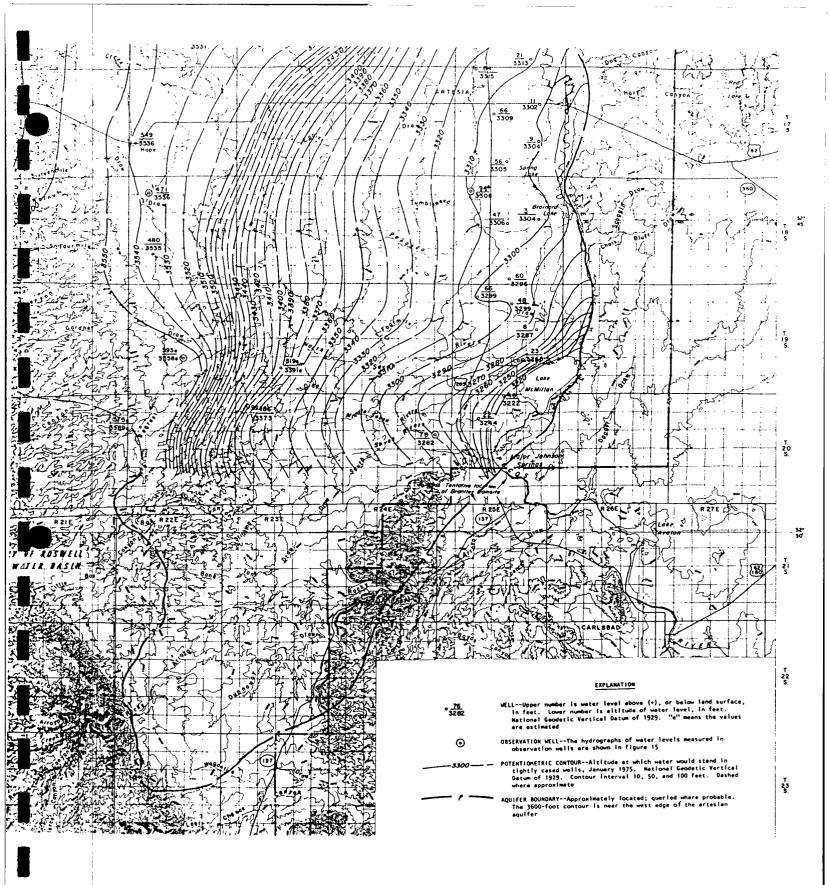


Figure 4-4 Potentiometric surface of deep aquifer (Welder, 1983)

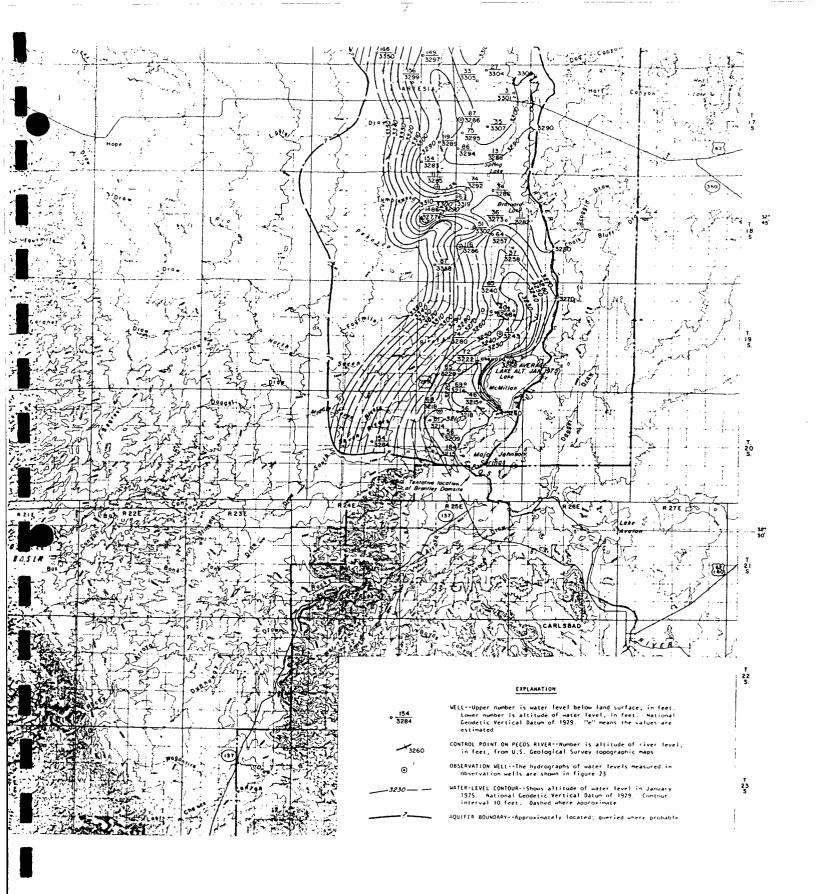


Figure 4-5 Potentiometric surface of shallow aquifer (Welder, 1983)

exception of wells drilled immediately adjacent to the Pecos River nearly all shallow-aquifer wells exhibit 100 to 150 feet of artesian head. Shallow wells typically produce from sands in the upper Queen Formation at depths of 150 to 250 feet. These sands are confined by the thick anhydrites and shales (aquitards) of the overlying Seven Rivers Formation. Relatively impermeable shales and evaporites several hundred feet thick separate the upper Queen sands from the underlying San Andres.

Analysis of driller's and geophysical logs (Appendix A) shows that the Navajo site is underlain by evaporites, carbonates and shales of the Seven Rivers Formation. These rocks are nearly impermeable, with the exception of local, isolated bodies of sand and fractured anhydrite. Only minor amounts of ground water is found in or produced from the Seven Rivers Formation. Cross sections illustrating the hydrogeologic relationships of the shallow aquifer are shown in Figure 4-3.

At depths of approximately 200 to 250 feet, the uppermost sands of the Queen Formation are encountered. These sands contain and produce usable amounts of ground water, and constitute most of the shallow aquifer in this area. These sands are 10 to 50 feet thick, and lie at the top of about 700 feet of relatively impermeable carbonates and evaporites which comprise the bulk of the Queen.

A map of the shallow-aquifer potentiometric surface (Figure 4-5) shows that it typically slopes gently to the east and southeast, and follows the regional stratigraphic dips. South of the Artesia area, where extensive agricultural development

exists, the potentiometric surface forms a trough due to significant withdrawals from the shallow aquifer. The shallow-aquifer's potentiometric surface is generally slightly below the artesian aquifer's potentiometric surface, indicating that any interconnection (along faults or poorly completed wells) would cause flow upward from the deep to the shallow aquifer. The configuration of the shallow aquifer is locally complicated by large, seasonal irrigation withdrawals. Although considerable local variation is observed, the shallow aquifer generally provides water of quality adequate for domestic and irrigation use (500-1500 ppm TDS).

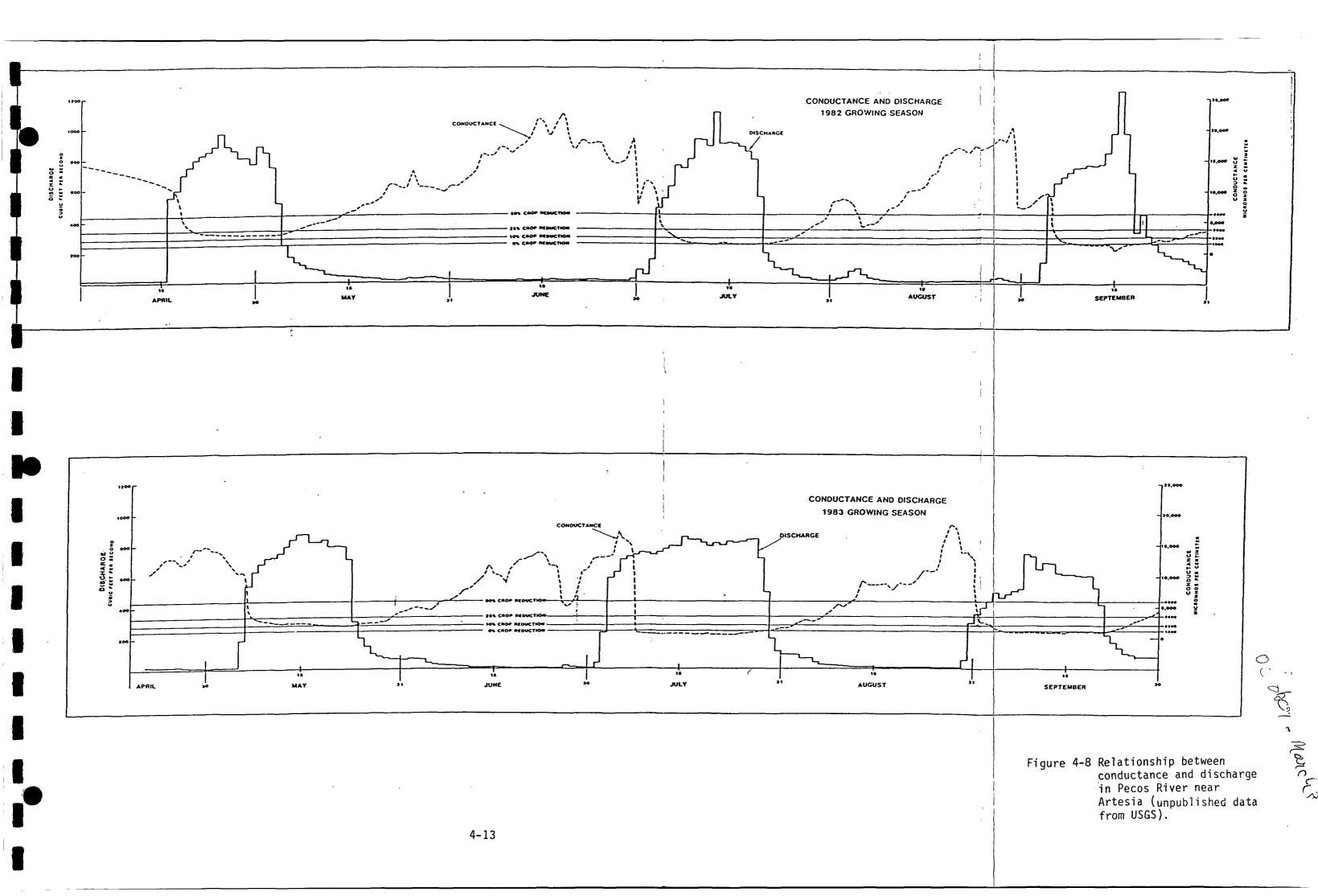
In some areas there is evidence for the existence of an isolated, discontinuous perched-water aquifer, which lies on top of clay or anhydrite lenses above the confined shallow aquifer. Very shallow (10-30 feet), low-production wells may have tapped this "gyp water" in the past and used the production for stock. Many of these wells have been abandoned for a variety of reasons including exhaustion of water or poor quality. These small, stratigraphically-trapped accumulations of ground water are highly variable in areal extent, volume, saturated thickness and quality. One such confined body of water underlies part of the Navajo facilities.

The configuration of the perched-water unit under the Navajo site is revealed by over 40 monitor wells, installed by Navajo Refining Company. Lithologic drillers logs show that water is encountered in weathered and fractured anhydrite (so called gypsum sand) at depths of 15 to 30 feet, and typically

rises to levels 3 to 5 feet above the saturated unit (Appendix A). This water-bearing unit is confined above by layers of gypsum, anhydrite and caliche, and below by a continuous layers of clay and anhydrite. Figures 4-6 and 4-7 illustrate the geometry and hydrology of the plant site area.

These figures show that this perched gypsum/anhydrite/sand unit is comprised of several water-bearing zones at different depths. The water-bearing zones are generally less than 5 feet thick and are typically hydraulically connected. However, wells #19 and #34, and #29, #37, #39 and #40 show that anomalies in the potentiometric surface are present due to complex hydraulic connections in some areas of the plant.

Navajo Refining Company maintains 3 evaporation ponds near the Pecos River, which are connected to the plant site by a conveyance channel paralleling Eagle Creek (Figure 2-1). These ponds, and the portions of the conveyance channel in Sections 12, 11 and the E 1/2 of 10 are located in Pecos valley alluvium. Monitor wells installed by Navajo show that ground water in the valley alluvium is typically 6 to 12 feet below the surface. Although the alluvium is generally silty sand, some 6 inch monitor wells can maintain a pumping rate of 10-15 gpm indicating the presence of lenses of higher permeability material. Figure 4-8 shows the configuration of the water surface in this unit. As expected, flow is sub-parallel to the Pecos River Valley. The water level in this unit does respond to the fluctuations of flow in the River (Figure 4-8). Therefore, during periods of high flow the hydraulic gradient is from the river to the alluvium



and the Pecos River loses water. During low flow periods the gradient is reversed. Figure 4-9 is a potentiometric surface map of the area near the evaporation ponds.

4.5 SURFACE WATER HYDROGEOLOGY AND FLOODING POTENTIAL

Artesia lies in the eastern plains of New Mexico on a broad, mature plateau developed on flat-lying bedrock. The city is at an average elevation of 3380 feet (msl) on an essentially feature-less plain which slopes eastward at about 3 feet per mile (0.35 degrees). Surface drainage is typically controlled by small, ephemeral creeks and arroyos which flow eastward into the Pecos River. These small drainages are subparallel and spaced at about 0.75 to 1.5 miles.

The major drainage in the immediate Artesia area is Eagle Creek which runs from west to east through the city, northeast through the Navajo Refinery and then eastward to the Pecos (Figure 2-1). Eagle Creek's channel has been rectified (artificially formed and straightened) from west of Artesia to the Pecos. Discussions with the City of Artesia engineer (Mr. John Brown) indicate that there is no historical record of Eagle Creek overflowing its banks. However, such an overflow could occur in a 100 year event (5.0 inches of precipitation). To deal with this problem, the city is continuing its efforts at rectifying Eagle Creek and plans to construct a check dam several miles west of Artesia within 2 years. These measures will effectively remove Artesia and the Refinery from the 100-year floodplain.

The evaporation ponds and parts of the conveyance ditch lie

in the geologic floodplain of the Pecos River. In the past, large releases from upstream reservoirs coupled with high rainfall events have resulted in minor damage to the conveyance ditch. ponds are located on alluvial material next to the Pecos. perimeters are 16 to 18 feet above the river channel, and the largest pond is protected by a 5-foot high dike. Analysis of historic records of Pecos floods (Patterson, 1965; USGS unpublished data 1946-1983) shows that a maximum stage height of 17.4 feet was reached on September 30, 1932. Is is unlikely that this level will ever be equalled, owing to the construction of several flood-control dams (Alamogordo, Los Esteros) on the upper Pecos. No discharge event since 1941 has exceeded the 13.76 foot stage (25,200 cfs on October 8, 1954) and no discharge since 1960 has exceeded 7000 cfs. Modern "floods" in the Pecos are now controlled releases of water for irrigation, and these discharges are deliberately controlled to prevent any actual or potential flooding of lands and structures adjacent to the Pecos. release or rainfall event large enough to flood the evaporation ponds would effectively dilute the effluent to a level far below stream or ground water standards.

4.6 GROUND WATER QUALITY

Four separate hydrogeologic units are present at the Navajo facility:

- o the artesian aquifer (San Andres)
- o the shallow aquifer (upper Queen)
- o the Pecos River Valley alluvium, and
- o the perched water in the terrace regolith and surficial deposits.

The well-defined pressure regime in the confined aquifers (San Andres and the upper Queen) demonstrates that these units cannot be degraded by surficial sources (Section 4.4).

Therefore, water quality data for these units was not collected for this study. Published data on the water quality of these units are available (NMEID, 1980).

The water chemistry of the two surficial water-bearing units which have the potential of being affected by Navajo's operation is summarized in Appendix B. The water quality in the Pecos River Valley alluvial sand/silt aquifer is well defined near the evaporation ponds and is consistent with surface water quality data from the Pecos River (Figure 4-8). Comparison of ground water quality with water quality in the evaporation ponds reveals that, in terms of the major cations/anions and metals, the water quality in the lagoons is better than or equal to ground water quality (Appendix B). Both are unsuitable for use as irrigation, domestic or industrial purposes. Even though some monitor wells have an odor characteristic of hydrocarbons, in all wells sampled except for well #13 neither phenols, toluene nor benzene are present in concentrations above ground water standards.

Water quality in the perched terrace/regolith water-bearing unit is also well defined (Appendix B). The water quality in this unit is better than the Pecos Valley alluvium. It should be noted that the ground water in this perched water-bearing zone under the refinery is under some artesian pressure. contamination of this ground water is therefore unlikely. lithologic logs of the monitor wells (Appendix A) indicate that the soil in the aquitards above the unit is locally contaminated from surficial spills. Therefore, the ground water in some wells may in fact be unaffected by spills and other discharges. High hydrocarbon or TDS content in samples from these wells could be a result of artesian water in the well bore coming into contact with contaminated soil. Many wells have been installed to identify zones of hydrocarbon contamination and four oil recovery systems have been installed to recover product and therefore, mitigate the hydrocarbon contamination (Figure 4-7).

This shallow, perched-water unit appears to be of limited areal extent, and does not seem to be utilized by any wells off the plant site. It is not connected with any of the other aquifers, and it is very unlikely that any possible hydrocarbon contamination would affect any other ground water.

5.0 PROCESS DESCRIPTION AND WASTEWATER CHARACTERISTICS

5.1 OVERVIEW

A petroleum refinery is a complex combination of interdependent operations engaged in separating crude molecular
constituents, molecular cracking, molecular rebuilding, and
solvent finishing to produce petroleum-derived products. There
are a number of distinct processes utilized by the industry
for the refining crude petroleum and its fractionation products.
An EPA survey of the petroleum refining industry, conducted
during 1977, indentified over 150 separate processes being used
and indentified many more process combinations that may be
employed at any individual refinery.

Each process is itself a series of unit operations which cause chemical and/or physical changes in the feedstock or product. In the commercial synthesis of a single product from a single feedstock there are sections of the process associated with the preparation of the feedstock, the chemical reaction, the separation of reaction products, and the final purification of the desired product.

At the Navajo Refining Company Artesia, New Mexico facility the major refining processes are:

- 1) Crude Oil Fractionation (with vacuum fractionation)
- 2) Fluidized Catalytic cracking
- 3) Alkylation
- 4) Reforming
- 5) Desulferization

Associated with these processes are several auxiliary activities which do not directly result in conversion of crude

oil to product nor result in complex chemical changes in the product but instead separate impurities from the feedstocks and products, or are required for other aspects of the operation and maintenance of refinery.

These auxiliary units are:

- 1. Boilers
- 2. Cooling towers
- 3. Storage tanks
- 4. Water purification facilities
- 5. Desalting units
- 6. Drying and sweetening units

Figure 5-1 shows the location of these process and auxiliary units at the refinery. The North Division of the refinery processes New Mexico intermediate crude whereas the South Division processes sour crude. The Artesia facility can refine a total of about 30,000 barrels of crude per day with the South Division producing about two-thirds of the total. Figure 5-2 is a process diagram which shows the interrelationship between the two divisions and the location of discharge points.

Each process or auxiliary unit operation has different water usages associated with it and the nature and quantity of waste water produced by the units varies according to the process involved. The final aqueous effluent of the Artesia Refinery is a blend of 19 process and auxiliary waste streams (Table 5-1) as well as some additional wastewater produced during general cleanup at the facility. The relative flow volumes from the different units are:

Cooling Towers	60%
Boiler Blowdown	20%
Desalter	8%
Process Units and Water Softener	12%

Based upon four wier measurements taken over the course of several days, the total effluent discharge is approximately 0.627 cfs or about 405,200 gallons per day.

A brief description of each process and its wastewater characteristics is given below.

5.2 MAIN PROCESS UNIT DESCRIPTIONS AND WASTEWATER CHARACTERISTICS5.2.1. Crude Oil Fractionation

Fractionation serves as the basic refining process for the separation of crude petroleum into intermediate fractions of specific boiling-point ranges. Fractionation is a thermal distillation process which, at the south crude unit, yields gas, straight run gasoline, naptha, kerosene, diesel, atmospheric gas oil and reduced crude (Figure 5-2). Reduced crude is transferred to the associated vacuum unit where it is further fractionated into asphalt and vacuumed gas oil.

In the North Crude Unit, where New Mexico intermediate crude is refined, the product streams consist of gas, straight run gasoline, naptha, kerosene, diesel and topped crude. Wastewater produced from the crude units contains ammonia, sulfides,

chlorides, oil, and phenols. The process description flow sheet (Figure 5-2) shows the location of all wastewater discharges for this and other units. Table 5-1 summarizes the type of effluent produced at each unit and shows the treatment units to which the streams are discharged. Four wastestreams originate in the crude units the bleedstream from the overhead accumulators #4, #5 #8 #11 and #13 and the effluent from the vacuum distillation unit (co-mingled with blowdown from the TCC cooling tower, #7).

TABLE 5-1 PROCESS UNITS AND WASTEWATER TREATMENT/DISPOSAL UNITS

LOCAT	TION	PROCESS UNIT	WASTE STREAD SOURCE NUMB	· · · · · · · · · · · · · · · · · · ·
South	Division	Cooling Tower		To south division API Separator
South	Division	Boilers		To fire control system water storage ponds overflow directly into colveyance ditch
South	Division	Crude Unit Desalter (D-130)		To south division API separator
South	Division	Crude Unit Overhead Accumulator (D-140)		To south division API separator
South	Division	Crude Unit Stabilizer (D-202)		To south division API separator
South	Division	Alkylation Unit Regenerator	6	To API separator
	Division Unit	Cooling Tower and Vacuum Unit		To south division API separator
South	Division	Crude Unit Straig Run Gasoline stabilizer (W-58		To API separator
North	Division	Crude Unit Desalters (D-1, D-2))	To north division oil/water separator
North	Division	Cooling Tower	!	To north division oil/water separator

Table 5-1 Continued

North Division	Crude Unit Overhead Accumulator (D-5)	11	To oil/water separator
North Division	Low Pressure Boiler	12	To North division oil/water separator
North Division	Crude Unit Overhead Accumulator (D-4)	13	North division oil/water separator
North Division	Desulfurizers (D-15)	14	North division oil/water separator
North Division	Fluidized Cat. Cracker Unit Cooling Tower	15	North division oil/water separator
North Division	Sour Water Stripper Bottom	16	To desalters, excess to North division oil/water separator
North Division	High pressure Boilers	17	To North division oil/water separator
North Division	FCC overhead acc- umulator Unit (DA- 301)	18	To north division oil/water separator

Un-numbered waste streams on Figure 5-2 have not been analyzed

Like all wastestreams that have contacted crude or product (contact wastewater) and contain oil, these streams are treated in the oil/water separators prior to release into the conveyance ditch and the evaporation ponds. A chemical characterization of wastestreams #4, #5, #8, #11 and #13 is shown in Table 5-2.

5.2.2. Catalytic cracking

Fluidized catalytic cracking process is employed at Navajo.

Catalytic cracking involves at least four types of reactions:

- 1) Thermal decomposition
- 2) Primary catalytic reactions at the catalyst surface
- Secondary catalytic reactions between the primary products
- 4) Removal of products which may be polymerized from further reactions by adsorption onto the surface of a fluidized bed of catalyst as coke.

The catalysts are in the form of powder for the fluidized unit. The catalyst is usually heated and lifted into the reactor area by the incoming oil feed which, in turn, is vaporized upon contact. Vapors from the reactors pass upward through a cyclone separator which removes most of the entrained catalyst. These vapors then enter the fractionator, where the desired products are removed and heavier fractions recycled to the reactor.

The major wastewater constituents resulting from catalytic cracking operations are oil, sulfides, phenols, cyanides, and ammonia. These produce an alkaline wastewater with high BOD and COD concentrations. Sulfide and phenol concentrations in the wastewater can be significant. The wastestreams produced by the FCC unit are #19 and #15. Both #8 and #19 are also contact wastewater but are sent directly to the oil/water separators as shown in Table 5-1. A characterization of the effluent from the

TABLE 5-2
CHEMICAL ANALYSES OF SELECTED WASTE
STREAMS AT NAVAJO REFINERY (AFTER BRANVOLD, 1984)
(VALUES IN MG/L EXCEPT WHERE NOTED)

WOCC 3-103 Standards	CRUDE UNIT PROCESS (#4, #11, #13)	CAT. CRACKER PROCESS BEFORE SOUR WATER STRIPPER	SOUR WATER STRIPPER EFFLUENT (#17)	ALKY. NEUTRALIZING SEWER (#6)	ND & SD DESALTERS (#3, #9)
As					
Ba					
Cd					
Cr	<0.1	<0.1	<0.1	7.8	
CN	<0.1	₹0.1	<0.1	<0.1	<1.0
				10.1	(1.0
F	1.3	0.5	0.4	10.8	
የ ቴ 			•		
Hg					
NO ₃					
Se Ag					
Hy U					
CI					
Cu					
Fe	<0.1	3.9	17.0	7.8	
Mn		3.7	17.0	7.0	
SO4					
TDS	B05	2160	560	2872	2524
In	<0.1	<0.1	0.12	18.8	2021
рН	6.3	9.0	9.5	3.6	
Al .				•	
B Co					
Mo					
Ni					
Phenols	9.9	710	250	A 21	
TSS	** *	710	230	0.26	
Cond.					
COD	1202	8379	1702	8870	600
NH.	78	2320	256	⟨1	5.0
S	64	180	7.7	1.4	<1.0

Table 5-2 (continued)

BOILERS

WBCC 3-103	S.D.	N.D.	N.D.
PARAMETERS	BOILER Blowdown	HIGH PRESSURE	LO₩ PRESSURE
	(#2)	BOILER (#18)	BOILER (#12)
As	.004	.005	.003
Ba	<.1	<.1	<.1
Cd	<.01	<.01	<.01
Cr	<.05 .	<.05	<.05
CN	•		
F	3.1	2.2	1.5
fЪ	.18	.14	.05
Hg			
NO ₃	.2	.1	.05
Se			
Ag	<.05	<.05	<.05
U	<.05	<.05	<.05
C1	127	73	44
Cu	<.03	<.03	<.03
Fe 	1.9	0.65	0.25
Mn	.07	<.03	<.03
SO .	1549	1242	693
TDS	4220	2873	1807
Zn 	.06	<.01	<.01
pH	11.6	11.6	11.2
A1	<1.0	<1.0	<1.0
B			
Со	<.01	.02	.01
Mo	<.5	<.5	<.5
Ni	<.05	<.05	<.05
Phenois			
TSS	20	0	0
Cond.	6000	5000	2800
COD	116	0	0
NH ₄			
S			

Table 5-2 (continued)

COOLING TOWERS

WOCC 3-103 STANDARDS	N.D. COOLING TOWER BLOWDOWN (#10)	S.D. ALKY COOLING TOWER BLOWDOWN (#1)	S.D. TCC COOLING TOWER BLOWDOWN	N.D. FCC COOLING TOWER BLOWDOWN (#16)
	(810)	1#1/		(#10)
As D-	.004	<.001	.011	.001
Ba	<.1	<.1	<.1	<.1
Cd	<.01	<.01	<.01	<.01
Cr	.06	1.05	<.05	0.22
CN				
F	1.6	4.4	2.2	1.6
Pb	.05	.05	⟨.05	.05
Hg		•		
N O ₃	.5	.75	.2	.3
Se				
Ag	<.05	<.05	<.05	<.05
ប	<.05	(.05	<.05	<.05
Cl	48	53	44	47
Cu	<.03	<.03	<.03	<.03
Fe	.05	.5	<.05	<.05
Mn	<.03	.07	<.03	<.03
SO	1077	1461	1236	1067
TDS4	1906	2732	1694	1973
In	.48	28	<.01	.17
рH	7.6	6.9	7.7	8.0
Al	<1.0	<1.0	1.0	<1.0
B				
Со	<.01	.01	.02	.01
Кo	<.5	<.5	<.5	⟨.5
Ni	⟨.05	<.07	<.05	<.05
Phenols				
TSS	13	0	67	0
Cond.	0	0	108	1800
COD	1850			15
NH4	0			

catalytic cracking process before and after sour water stripping is displayed in Table 5-2.

5.2.3. Alkylation

Alkylation is the reaction of an isoparaffin (usually isobutane) and an olefin (butylenes) in the presence of hydroflouoric acid as a catalyst at carefully controlled temperatures and pressures to produce a high octane alkylate for use as a gasoline blending component. The reaction products are separated in a catalyst recovery unit, from which the catalyst is recycled. The hydrocarbon stream is passed through a caustic and water wash after going to the fractionation section.

The wastewater from the alkylation unit is an acidic solution containing some suspended solids, oil, dissolved solids, fluoride and phenols. The waste stream (#6) is discharged to the neutralizing sewer and is treated to raise the pH prior to discharge to the API oil/water separator (see Table 5-1). An analysis of this coming wastestream is shown in Table 5-2.

5.2.4. Reforming

Reforming converts low octane naphtha, naphthene-rich stocks to high-octane gasoline blending stock, aromatics for petro-chemical use, and isobutane. At Navajo the reformers do not produce a waste stream. Feed stocks are usually hydrotreated for the removal of sulfur and nitrogen compounds prior to charging to the reformer (see Section 5.3.6), since the extremely expensive platinum catalysts used in the unit are readily contaminated and ruined by the sulfur and nitrogen compounds. The predominant reaction during reforming is the dehydrogenation of naphthenes.

Important secondary reactions are the isomerization, cyclization and cracking of paraffins. All reactions result in high octane products.

5.2.5 Desulfurizers

Desulfurizing is primarily used to remove sulfur compounds, and other impurities from gasoline, kerosene, jet fuels and diesel fuel. The wastewater typically consists of sulfides or phenolic compounds. This waste stream (#14) is routed to oil water separator.

5.3 AUXILIARY PROCESS UNIT DESCRIPTIONS AND WASTEWATER CHARACTERISTICS

5.3.1 Boilers

Steam is consumed throughout the refining process and is generated in boilers at the North and South Divisions. To assure proper operation of the boilers, a certain amount of boiler water must be discharged (blowdown) and treated water added as make-up. Boiler blowdown is used as a water source for the fire protection system (Table 5-1) prior to direct discharge into the conveyance ditch. Analyses of the boiler blowdown wastestreams (#2, #17 and #12) are shown in Table 5-2. A characterization of the fire water pond is also included in Appendix B.

5.3.2 Cooling Towers

Water used for cooling process streams throughout the facility is cooled by cooling towers located in both the North and South Divisions and comprises most of the water usage at the facility. A significant amount of water is lost by evaporation in the cooling towers resulting in an increased concentration of dissolved solids in the cooling water over time. To prevent scaling, corrosion and biological growth in the towers, inhibitors such as chromate are added to the cooling water. Blowdown from cooling towers pass through the oil water separator to permit contact of chromate with the oil in the separator. This precipitates much of the metal due to reduction of the metal. Analyses of cooling tower blowdown (#1, #10 and #15) is displayed in Table 5-2.

5.3.3 Water Purification System

Pure water must be supplied to several of the boiler units as well as some process systems. Backwash from the purification system contains dissolved solids removed from the water supply system. The water purification system is basically a water softener and produces a periodic waste stream enriched in dissolved solids. The waste is never in contact with product and is discharged directly into the conveyance ditch in the South Division and to the Oil Water separator in the North Division.

5.3.4 Desalters

All produced crude contains some formation (connate) water and suspended solids. Because SE New Mexico crude is generally found in marine formations, this water is highly saline.

Desalters remove the saline fluid and suspended solids from the crude by passing crude (with some added water) through an electrostatic field which acts to agglomerate the dispersed brine droplets.

Wastewater can contain high dissolved solids, phenols and (depending upon crude type) ammonia and sulfides. This contact waste water is discharged to the oil-water separator. This waste stream is a significant contributer to the total effluent volume. A characterization of desalter effluent (streams #3 and #9) is shown in Table 5-2.

5.3.5 Washdown and Stormwater

A certain amount of wash water is intermittently utilized for general clean-up of the facility. This activity occurs within the concrete lined process areas. In areas where the clean up may result in oil-contaminated water, the areas drain to the oil water separator sewer. At the heat-exchanger bundle cleaning area the concrete pad drains directly into a sump which is constructed similar to an oil water separator thence into the conveyance ditch and thence to the evaporation ponds.

5.3.6 Storage Tanks

Storage of crude and product typically permits some separation of any water or suspended solids entrained in the fluid. These wastes, removed from the tank bottoms, contain emulsified oil, phenols, iron, sulfide and other consituents which depend

upon the nature of the material stored in a particular tank.

This liquid is removed to the oil water separators by vacuum trucks. The volume of effluent from this unnumbered source is also small.

5.3.7 Produced Water from Oil Recovery System

The oil recovery system pumps water from below the oil-water interface in order to create a gradient toward the skimmer pump in the trench. This water is discharged directly into the conveyance ditch.

6.0 PRESENT WASTE MANAGEMENT SYSTEM

The Navajo Artesia Refinery generates, treats and disposes of liquid and solid wastes. RCRA solid wastes, which include oil-water separator sludges, heat exchanger bundle cleaning sludges, slop oil emulsion solids and, when produced, leaded tank bottoms are disposed of at the RCRA landfarms on the refinery site pursuant to U.S. EPA regulatory provisions. These waste treatment facilities are fully addressed in EPA permitting documents and are not discussed further in this discharge plan.

The wastewater management system presently employed by Navajo is composed of four units: the evaporation ponds, the conveyance ditch, and the two oil-water separators. A general description of each unit is provided below.

6.1 OIL/WATER SEPARATORS

All wastewater delivered to the oil-water separators flow by gravity from the discharge points through subsurface pipelines. At the separators the flow velocity is reduced and the density difference between the water and entrained oil permits separation of the two phases. The oil is then skimmed from the water and pumped back to the processing units. Chromate and other metals which are discharged into the separator are removed from solution by the reducing effect of the hydrocarbons. The effluent is discharged to the conveyance ditch. The sludges are removed to the RCRA landfarm.

Periodically, blow sand and suspended solids in the effluent will enter the separator and oil droplets may adhere to the

solid. This phenomenon results in a sand/oil particle which may have the same density as water. These oily particles can flow through the unit and into the conveyance ditch. Upsets in the plant can also result in a short-term oily discharge from the separators. Much of the oil and grease discharged into the ditch will settle into the soft, bottom sediments. Over time this oil, grease and sediment has formed a very fine-grained asphaltic "liner" for the ditch.

6.2 Conveyance Ditch

The conveyance ditch originates at the oil-water separators and terminates at the evaporation ponds in Section 1.6 and 12 (T. 17 S., R. 26 E.) approximately three miles east of the refinery. As Figure 2-1 shows, the ditch is sub-parallel to Eagle Creek until it nears the Pecos River, where the ditch then turns south toward the evaporation ponds. The ditch is generally about 3-4 feet wide and less than 1 foot deep. Throughout its course, it is bermed to prevent any influx of stormwater or excess irrigation water.

In the refinery area several wastestreams discharge directly into the ditch. These streams (eg. boiler blowdown) are not contact wastewater and, therefore, need not be routed to the oil/water separators.

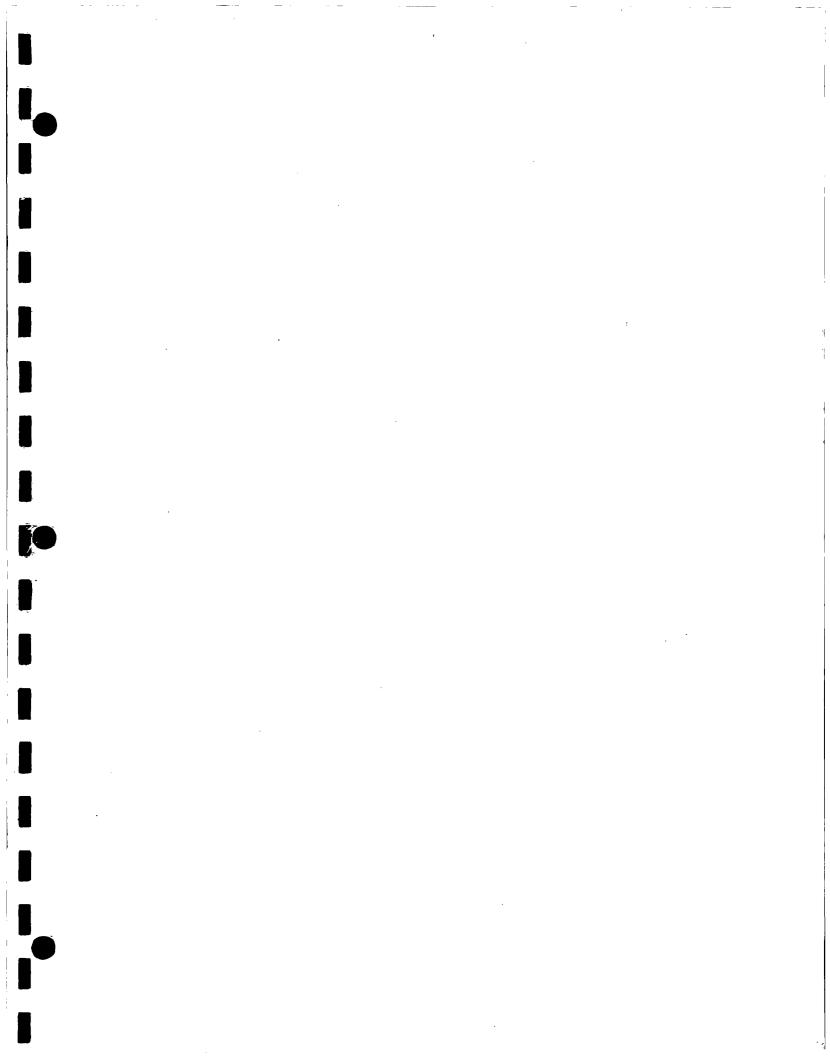
6.3 Evaporation Ponds

Originally, three ponds were built to evaporate the wastewater generated at the refinery. At the present time, the berm between the lower ponds (2 and 3) has been removed resulting in a two-pond system. The ponds cover an area of approximately 85 acres square feet and are generally less than 3 feet deep. The ponds are bermed to prevent any storm water runoff from entering the impoundment.

All of the wastewater discharged by the refinery is disposed of in these ponds. The effluent in these ponds is a very good representation of the overall quality of the discharges from the facility. Upsets in the refinery and minor modifications of the operation could result in a variable quality of discharge. The ponds, however, have a long enough retention time to adequately homogenize the effluent. Analyses of the fluid in the ponds is shown in Appendix B.

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APPENDICES FOR NAVAJO REFINING COMPANY ARTESIA, NEW MEXICO

December 4, 1984

Prepared for:

Dave Griffin Navajo Refining Company P.O. Drawer 159 Artesia, New Mexico 88210

Prepared by:

Gecscience Consultants, Ltd.
500 Copper Avenue NW
Suite 220
Albuquerque, New Mexico 87102

APPENDIX A WELL LOGS

LITHOLOGIC AND COMPLETION LOGS OF NAVAJO'S MONITORING WELLS

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LITHOLOGIC AND COMPLETION LOGS OF NAVAJO'S MONITORING WELLS

FIELD ENCR. LOG

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		Dans Office Ad	o Refinin dress Dr	ашел 159				o	wner's W	ell No		
Č	City and S	StateArt	esda, New	Mexico		.						
Well w	as drilled	under Permit	No	6 143-X- 1	3	and	is located	in the:				
a	<u>. Se</u>	* <u>SE</u> *	<u>NW</u> 4	¼ of Se	ction	<u>/2</u> то	wnship	175	Range	268		_N.M.P.M.
t	b. Tract?	No	_ of Map No.		•	i the				· · · · · · · · · · · · · · · · · · ·		
c	Lot No. Subdiv	ision, recorded	of Block No		0	the County	y.					
d	i. X=		_ feet, Y=		fee	et, N.M. Co	oordinate !	System				Zone in Grant.
(B) I			& W Enter	naises				l iounes No		 575	_	
			7									
			Comp	•								
•		-			-							
Elevati	ion of lan											
Comple	eted well	is 🗆 sh	allow 🗆 a	rtesian.		Depti	h to water	upon comple	tion of w	ell	<u> </u>	ft.
	Donah :	- F		ion 2. PRIN	CIPAL WA	ATER-BEA	ARING ST	RATA		F 41.		
Fr	Depth i	To	Thickness in Feet	1	Description	n of Water	-Bearing F	ormation		(galions	ated Y per mi	
												
						N/A			_			
L				Section	n 3. RECC	ORD OF C	ASING		L_			
	meter	Pounds	Threads		in Feet	I	ength	Type of	Shoe		Perfora	tions
(in	ches)	per foot	per in.	Тор	Botto	m '	(feet)			Fre	om	To
89.	D .	4	P/E	2	21		23	P/E		3		20
ļ				······································	ļ						_	
				······································						<u> </u>		
			Section	on 4. RECO	RD OF M	JDDING A	AND CEM	ENTING				
F:	Depth i	n Feet To	Hole Diameter	Sactof M		Cubic F of Cem		М	ethod of	Placeme	ent	
											*	
		z.				11.14					•	
		Á		<u> </u>		<i>N/A</i>						
		<u> </u>	I	Section	on 5. PLUC	GING RE	CORD		 -			J
	-	ictor										
Pluggi	ng Metho						No.	Depth Top	in Feet Bot	tom		ic Feet Cement
	Vell Plugg ng approv						1 2					
30.			State Eng	ineer Repres	antativa		3					
							1 4 1					

Use OBSERV. # Lo

_ Location No. 17.26.12

			Section 6. LOG OF HOLE
	in Feet	Thickness	Color and Type of Material Encountered
From	То	in Feet	Ooto and type of material Embourness
	21	21	Sand
	- 21		Jana
	2		
			·
	3		
	~		
•		[]	
	ļ]	
	4.		
		 	
		 	
			STATE ENGINEER OFFICE RUPARKS AND ADDITIONAL INFORMATICAL N. M.
	<u> </u>		<u> </u>
		Section 7	7. REMARKS AND ADDITIONAL INFORMATION S
			C.E. A
			EER O
	,		ည် ယ ရေ ဘ
	*		en en en en en en en en en en en en en e

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer.

drilled, repaired or deepe dependent of the state Engineer.

When this form is used as a plugging record, only Section 1(a) and Section and

FIELD ENGA. LOG

Section 1. GENERAL INFORMATION

		<u>OCAVAN</u>	REFINI Box 1		YWP		Owner	's Well No.	16
City and	Post Office Ad- State	Art Art			ico	88210			
Vell was drilled	under Permit	No. RA-6	5775-E		and i	s located	in the:		
							<u> 17 S</u> Ran		
b. Tract !	No	_ of Map No		of	the				
		of Block No I in							
				feet,	N.M. Co	ordinate	System		
	ontractor		e Tidwe	 11			License No	WD-406	Grant.
							88210		
							Cable		
levation of lan	id surface 🍇			at	well is	330 7	ft. Total depth	of well	ft.
ompleted well	is 🗓 sh	nallow 🗆 ar					r upon completion	of well	ft.
Depth i	n Feet	Section Sectio	on 2. PRIN	CIPAL WAT	TER-BEA	RING S	TRATA	Estim	ated Yield
From	To	in Feet	1	Description	of Water-l	Bearing I	Formation		per minute)
10	25	15	R	ed Sand				NA	
28	35	、 7	G	ray Sand	1			NA	
			-	••••	nien-		<u> </u>		
					-				
Diameter	Pounds	Threads		n 3. RECOF					Perforations
Diameter (inches)	per foot	per in.	Тор	Bottom	_ ,	ength feet)	Type of Sho	e 	om To
8 5/8_	28		0	60		60	Texas Patte	rn	NA
		Section	n 4. RECO	RD OF MUI	DDING A	ND CEM	IENTING		<u> </u>
Depth From	in Feet To	Hole Diameter	Saci of M	ks	Cubic Fo	eet		d of Placem	ent_
							····		*
	•				, ,				-
 	<u> </u>	<u> </u>	Sastis	on 5. PLUGO	CINC DE	COPD			
lugging Contra	actor					·			
ddress						No.	Depth in l	Feet Bottom	Cubic Feet of Cement
ate Well Plugg	ed								
ugging approv	red by:		-			3	 		
		State Engir	eer Repres	entative		4			
ate Received	April 6	, 1981	FOR USE	OF STATE	ENGINE		FWL		FSL
File No	RA-6775	-E	·	-	servat		Location No. 179		

	in Feet	Thickness	Section 6. LOG OF HOLE Color and Type of Material Encountered
From	То	in Feet	
0	25	25	Fine red sand
25	28	3	Blue-gray clay
28	35	7	Fine gray sand
35	46	11	Coarse gravel
46	60	14	med to fine gravelly sand
	<u> </u>	·	
	<u> </u>		
	 		
	1	,	ł , , , , , , , , , , , , , , , , , , ,

Section 7. REMARKS AND ADDITIONAL INFORMATION

STATE ENGINEER OFFICE
ROSWELLER M.M.

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Glyle J. Jedwell
Driller

INSTRUCTIONS: This for ould be executed in triplicate, preferably typewritten, and submitted to of the State Engineer. AL ons, except Section 5, shall be answered as completely and accurate drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section

appropriate district office possible when any well is need be completed.

FIELD ENCH LOG

Section 1. GENERAL INFORMATION

					•	ŭ	
No	of Map No		of t	he			
o	of Block No.		of t	he County,			
				N.M. Coordinate			Zone in Grant.
Contractor	1 & W Ente	aprises.			License No	675	
6-16-7	7.7. Com	pleted6	-16 -77	Type tools	cable	Size of hole	<i>890</i> in.
l is S					-	well	<u>0</u> ft.
in Feet To	Thickness in Feet	1	Description o	f Water-Bearing F	ormation		
				N/A			
<u></u>		Sectio	n 3. RECOR	D OF CASING			
Pounds per foot	Threads per in.			Length (feet)	Type of Shoe	Perfor From	ations To
4	P/E	2	20	22	P/e	.3	19
				-			
	Sect	ion A PECO	PD OF MID	DING AND CEM	ENTING		
in Feet	Hole	Saci	(S	Cubic Feet		of Placement	
	- Diameter	0.1.1		or centent	· · · · · · · · · · · · · · · · · · ·	-	
=				N /A			
				//			
<u> </u>	•	Section	on 5. PLUGG	ING RECORD			
od				No.			bic Feet Cement
ged wed by:							
	State En	ineer Repres	entative	- 3 4			
	No	No	Section 4. RECO Pounds per foot per in. Section 4. RECO in Feet Hole Saci To Diameter of Map No. Section 2. PRIN Section 4. RECO in Feet Hole Saci To Diameter of Map No. Section 4. RECO Section 5. Section 6. Se	No of Map No of to contractor feet, Y= feet,	No	No	reet, Y=

Depth	n Fast	Thickness	Section 6. LOG OF HOLF
	To	Thickness in Feet	Color and Type of Material Encountered
From	10		
0	20	20	Sand
		ļ	
			•
		 	
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	1	1	
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Section 7. REMARKS AND ADDITIONAL INFORMATION

TT AUG 31 AM 8 48 STATE ENGINEER OFFICE NO. N. R.O.E.WE.L. N. M.

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller Half

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted the appropriate district office of the State Engineer. Itions, except Section 5, shall be answered as completely and accura spossible when any well is drilled, repaired or deepen. When this form is used as a plugging record, only Section 1(a) and Section a need be completed.

FIELU ENGR. LOG

									LIE	LIG LIG	uk. Lüü
			Section 1						#3		
(A) Owner of	well Nau	aja Refir	ع ومنه) <u>. </u>				Ow	ner's Well N	o	
•	StateAnz	=									
Well was drilled	l under Permit	No. RA-	5143		:	and is lo	cated i	n the:			
a <i>SW</i> _	_ ¼ _NE_ ¼	<u>NW</u> 44_	¼ of Se	ction	12	_ Towns	hip	7 <u>5</u> 1	tange <u>26</u>	ع	N.M.P.M.
	No										
c. Lot N	o	of Block No.			of the_	unty.					
	•									=	
		_ feet, Y=		fe	et, N.M	. Coord	inate S	ystem		<u>.</u>	Grant.
(B) Drilling (Contractor	<u>H</u> & <u>W Ent</u>	erprises					_ License No.	WD-675		
Address									•		
Drilling Began .											890 in.
Elevation of las											
Completed well								ipon completi			
completes was											
Depth	in Feet	Thicknes	ction 2. PRIN	CIPAL W	AIEK-	BEAKI	NG 211	KATA		timated ?	/ield.
From	Ťo	in Feet		Description	on of W	ater-Bea	ring Fo	ormation		ons per n	
				N	/A						
				 					+		
		· -					·	•	 		
			Section	n 3. REC	ORD O	F CASI	NG				
Diameter	Pounds	Threads		in Feet		Leng		Type of S	.haa	Perfor	ations
(inches)	per foot	per in.	Тор	Botto	m	(feet	1)	190000	nioe .	From	То
890	4	P/E	2	23		25	-	P/E		3	22
								, ,		,	
		1		1							
<u> </u>	<u> </u>										
Depth	in Feet	Hole	tion 4. RECO			oic Feet				·····	
From	То	Diameter				Cement		Me	thod of Plac	ement	
				N /A						*	
	-		<u> </u>	N/A	 		十				
<u> </u>	:	 	-								
	=======================================				<u> </u>						
			Section	on S. PLU	GGING	RECO	RD				
Plugging Contr	actor					,			1- P	- 1	
Address Plugging Metho	od				<u>-</u>		No.	Depth_ Top	in Feet Bottom		bic Feet Cement
Date Well Plug	ged					- □	1				
Plugging appro	vea by:						2				· · · · · · · · · · · · · · · · · · ·
		State En	gineer Repres	entative			4				
			FOR USE	OF STA	TE ENC	CINCED	ONLY	,			

Use OBS. \$ 578L. Location No. 17. 26. 12.

Date Received

Section 6. LOG OF HOLE Depth in Feet Thickness Color and Type of Material Encountered To From Sand 0 23 23 = STATE ENGINEER OFFICE Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller Stall

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to be appropriate district office of the State Engineer. I tions, except Section 5, shall be answered as completely and accura possible when any well is drilled repaired or deeper.

When this form is used as a plugging record, only Section 1(a) and Section used be completed.

Section & GENERAL INFORMATION

SANTA FE

		. ^ 4= -			AL INFORM			115		
(A) Owner of v Street or P	vell <u>Navo</u> ost Office Ad	<i>zio Nefini</i> Idress —	ay (a.	wer 15	9		Owner	's Well No		
•		osia, New			·		· · · · · · · · · · · · · · · · · · ·			•
Well was drilled t								200		
		•				-	ZS Ran			
•										
		of Block No d in								
the	· · · · · ·						ystem		Grant.	
-		-	•				_ License No			
Address <u>P. O.</u>	Box 437	Ant	esia, Ne	n Mexic	<u> </u>			····		
Drilling Began _	6-18- 2	Com	pleted6-	18-7;	Type	toolsc	able	Size of h	ole <u>890</u> in.	
Elevation of land	i surface or _				ıt well is		_ ft. Total depth	of well	ft.	•
Completed well	is 🗆 s	hallow 🗀 :	artesian.		Depth	to water	upon completion	of well	Oft.	٠.
		7	tion 2. PRIN	CIPAL W	ATER-BEA	RING ST	RATA			1 1-1/2
Depth in From	n Feet To	Thickness in Feet	1	Description	n of Water-l	Bearing F	ormation		ted Yield per minute)	Depri
										Depth 0-21 St 21 Seet Sand
					N/A	.,				1 T
				<u>.</u>	· ···					21 Seel
		<u> </u>								Sans
	·		Section	n 3. REC	ORD OF CA	ASING				•
Diameter (inches)	Pounds per foot	Threads per in.	Depth Top	in Feet Botto		ength (ect)	Type of Sho	e Fro	erforations m To	}
890	4	7/8	2	21	2	3	P/E	3	20] .
								ŀ]
		Sect	ion 4. RECO	RD OF M	IUDDING A	ND CEM	ENTING	<u>.</u> -,	==	•
Depth From	n Feet To	Hole Diameter	Sac of M		Cubic F of Ceme		Metho	od of Placeme	ent 2	` `
							•	-::	· ≥	1
					3/1				11 6	
					17/11) 로	1
		<u> </u>		- F DI -	iconic pr	coup				د
Plugging Contra	actor			on 3. FLU	IGGING RE	CORD			6.43	•
Address Plugging Metho						No.	Depth in Top	Feet Bottom	Cubic Feet of Cement] .
Date Well Plugg Plugging approv						1 2				-
		State En	gincer Repre	sentative	1	3]
			FOR USE	OF STA	TE ENGINI		Y			B
Date Received							FWL _		FSL	_
	13: 24	·	_		30 1					

STATE ENGINEER OFFICE

WELL RECORD

SAITTA FI

) Owner of							•	
Street or F	well	dress	na (o. Urawer 15	9		Owner	's Well No	
					_ and is located			
a. NE	<u> </u>	<u>SE 4</u>	¼ of Se	ction	Township	175 Ran	ge <u>26E</u>	N.M.P.M
b. Tract N	No	_ of Map No	·	of the		<i>175</i> Ran	*"	
							`.	
				°				
d. X≃ the		_ fcet, Y=		feet, N	.M. Coordinate S	System		Zone ii Grant
) Drilling C	ontractor	# & W E	rterprise	4		_ License No	WD-675	
, 2ge.	0. Bex 43		Anteria	New Mexi	co	_ License No	•	
laress	(20 7	٠,		20 35		able		<i>ջ(၇</i>)
								. •
evation of lan	nd surface or _			at we	ll is	_ ft. Total depth	of well	<u> 22 </u>
ompleted well	is 🗆 si	hallow 🗖	artesian.		Depth to water	upon completion	of well	<u> </u>
		Se	ction 2. PRIN	CIPAL WATE	R-BEARING ST	RATA		
Depth i	in Feet To	Thicknes in Feet		Description of	Water-Bearing P	ormation		ated Yield per minute)
		-			N ZA			····
		-			N/A		-	
		·			·	···.		
		<u></u>					<u> </u>	
		,		on 3. RECORD	OF CASING	·		
Diameter	Pounds	Threads	Depth	in Feet	Length	Tunn of the	[]	Perforations
(inches)	per foot	per in.	Тор	Bottom	(fcet)	Type of Sho	Fre	om To
(inches)		1	Тор 2	Bottom 22	24	P/E	Fro	om <u>To</u>
	per foot	P/E					Fre	
(inches)	per foot	1					Fre	
(inches)	per foot	1					Fre	
(inches)	per foot 4	P/E	2	22	24	P/E	3	21
(inches)	per foot	P/E	tion 4. RECO	22 ORD OF MUDI	24	P/E	Fro 3	21
(inches) 89D Depth	per foot 4	P/E Sec	tion 4. RECO	22 ORD OF MUDI	24 DING AND CEM	P/E	3	21
(inches) 85D Depth	per foot 4	P/E Sec	tion 4. RECO	22 ORD OF MUDI	24 DING AND CEM Cubic Feet of Cement	P/E	Fro 3	21 IB78 JAN 1
(inches) 89D Depth	per foot 4	P/E Sec	tion 4. RECO	22 ORD OF MUDI	24 DING AND CEM	P/E	Fro 3	21 IB78 J.14 16
(inches) 85D Depth	per foot 4	P/E Sec	tion 4. RECO	DRD OF MUDI	DING AND CEM Cubic Feet of Cement	P/E	od of Placem	21 IB78 JAN 18 FF
(inches) 890 Depth From	per foot 4 in Fcet To	Sec. Hole Diameter	2 tion 4. RECO Sac of M	22 ORD OF MUDI	DING AND CEM Cubic Feet of Cement	P/E	od of Placem	21 IB78 J.14 16
(inches) 89D Depth From	per foot 4 in Fcet To	Sec Hole Diameter	tion 4. RECO	DRD OF MUDI	24 DING AND CEM Cubic Feet of Cement N/A NG RECORD	P/E	od of Placem	21 IB78 JAN 18 FF
Depth From	in Fcet To	Sec Hole Diameter	tion 4. RECO	DRD OF MUDI	DING AND CEM Cubic Feet of Cement	P/E LENTING Metho	od of Placem	21 IB78 JAN 18 FH 1:14
Depth From Plugging Contraddress Plugging Metholate Well Plug	in Fcet To ractor	Sec Hole Diameter	tion 4. RECO	DRD OF MUDI	24	P/E IENTING Method	od of Placem	emp78
October 1 September 2 Septembe	in Fcet To ractor	Sec Hole Diameter	tion 4. RECO	DRD OF MUDE	24 DING AND CEM Cubic Feet of Cement N/A NG RECORD No.	P/E IENTING Method	od of Placem	emp78
Depth From Plugging Contraddress Plugging Metholate Well Plug	in Fcet To ractor od gged oved by:	Sec Hole Diameter	tion 4. RECO	on 5. PLUGGI	DING AND CEM Cubic Feet of Cement N/A NG RECORD No. 1 2 3	P/E Depth in Top	od of Placem	emp78

FIELD ENGR. LOG

				Section	1. GENERA	L INFOR	MATION		#9		- 4.7
(A)	Owner of	well Nave	zjo Refin	irg (o.				Own	er's Well No.		
;	Street or I City and S	Post Office Ad State Arte	dress <u>Dra</u> esia, New	wer 159 Mexico							
		under Permit				and i	s located	in the:			
	<u>32 .</u>	* NE *	NE_ *-	¼ of S	ection <u>1</u>	_ <i>12</i> /_ Tov	vnship	<i>175</i> R	ange <u>268</u>		N.M.P.M.
	b. Tract N	No	_ of Map No	o	of	i the					
	c. Lot No). <u>±</u>	of Block No.		of	f the					
		ision, recor s ed								=	
			_ feet, Y=		feet	t, N.M. Co	ordinate	System			_Zone in _Grant.
(B)	Drilling Co	ontractor	& W Ente	rprises				License No	WD-675		
Addre	ρ.	0. Box 43	7 Av	tesia. Ne	w Mexico)			•		٠.
								cable			
								ft. Total dept			-
	leted well		nallow 🗆					upon completion			
Comp	icicu wen			ction 2. PRI							
	Depth i	n Feet	Thicknes	is	Description					nated Yie	
F	rom	То	in Feet		Description	1 Of Water-	Jean Bilk L	Officialion	(gallon	s per min	iute)
						A1 /	· · · · · · · · · · · · · · · · · · ·				
						N/	<u> </u>				
ļ			· · ·				•		1		
L									<u> </u>		
		Daniela	T 75		on 3. RECO			Ι		Perforati	ione
	ameter iches)	Pounds per foot	Threads per in.	Тор	Botton		ngth eet)	Type of St	roe Fr	om	To
_8	90	4	7/8	_2	21	2	3	P/E		}	20
	•				ļ						
								<u> </u>			
				tion 4. RECO				ENTING			
F	Depth i	n Feet To	Hole Diameter		cks Mud	Cubic Fe of Ceme	4	Meti	od of Placen	ent	
										<u>*</u>	
		ŧ				N/	'A			*	
		4									
				Secti	ion 5. PLUG	GING RE	CORD				
Pluggi	_	actor	-			· · · · · · · ·					
	ing Metho					·	No.	Depth i Top	Bottom		Feet ement
Mugg	-						1				
Mugg Date	Well Plugg						1				
Pluggi Date	-		. -	ngineer Repre			3				

Use OBS. 4 EXP2. Location No. 17.26.12.24243

Depth	in Feet	Thickness in Feet	Color and Type of Material Encountered
From	То	in Feet	Color and Type or material Encountries
0	21_	21	Sand
			Julia
			·
	}	<u> </u>	
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_			
	 	 	
		ļ	
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			·
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Section 7. RÉMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true fild correspected of the above described hole. described hole.

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted ** *he appropriate district office of the State Engineer. : :tions, except Section 5, shall be answered as completely and accura s possible when any well is drilled, repaired or deepen, .. When this form is used as a plugging record, only Section 1(a) and Section , need be completed.

FIELD ENGR. LOG

				. GENERA			•	# 12	·
(A) Owner of Street or City and	n 060 44	.a // n/7	ng (o. wer 159 Mexico				Owne	r's Well No	
Well was drilled					and	is located	d in the:		
<u>a. SE</u>	<u> </u>	NE 4	% of Se	ction	? To	wnship_	/7 Rar	nge <u>268</u>	N.M.P.M.
b. Tract	No	_ of Map N	o	o	i the				
c. Lot No Subdiv	o. ====================================	of Block No		0	f the _ County	·.			
				fee	t, N.M. Co	ordinate	System		Zone in Grant.
(B) Drilling C	ontractor	H & W Ens	terprises				License No	WD-675	
Drilling Began .	6-22-7	7 Cor	mpleted <u>6-</u> 2	22-77	Тур	e tools_	cable	Size of h	ole <u>890</u> in.
							ft. Total depth		. •
Completed well	is 🗆 sł	nallow 🗆	artesian.		Deptl	to wate	r upon completion	of well	rt.
		,	ection 2. PRIN	CIPAL WA	ATER-BEA	RING S	TRATA	1 _	
Depth i	n Feet To	Thickne in Feet		Description	n of Water-	Bearing	Formation		ited Yield per minute)
					N/A				
				n 3. RECC	ORD OF C	ASING			
Diameter (inches)	Pounds per foot	Threads per in.	Depth Top	in Feet Bottor		ength (feet)	Type of Sho	Fro	erforations m To
890	4	P/E	2	19		2/	P/E	3	18
				<u> </u>					
				L	l		<u> </u>		
Depth	in Feet	Sec Hole	stion 4. RECO		Cubic F	eet		od of Placeme	
From	То	Diameter	of M	uđ	of Cem	ent			
	<u> </u>	 	_						÷
					N/A_				
<u> </u>		<u> </u>	Section	n 5. PLUG	GING RE	CORD			
Plugging Contri	actor						<u>,</u>		
Address Plugging Metho						No.	Depth in Top	Feet Bottom	Cubic Feet of Cement
Date Well Plugg Plugging approv	•		 ·			1 2			
	<u></u>	State E	ngineer Repres	entative		3			
Date Received	` . :		FOR USE	OF STAT	E ENGINI	ER ONI	.Y		

Use 065. # EYPL Location No. 17, 26.

Depth in Feet Thickness		Thickness in Feet	Color and Type of Material Encountered					
From	To	in Feet	Color and Type of Material Emconitered					
		10	Sand					
	19	19						
	l							
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Section 7. REMARKS AND ADDITIONAL INFORMATION STATE ENGINEER OFFICE RESYLELL, N. M.

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted * * he appropriate district office of the State Engineer. s possible when any well is ctions, except Section 5, shall be answered as completely and accuradrilled, repaired or deepe. . When this form is used as a plugging record, only Section 1(a) and Section 3 need be completed.

Revised June 1972 FIELD ENGA. LOG

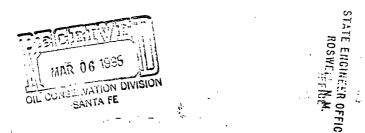
STATE ENGINEER OFFICE WELL RECORD

Section 1. GENERAL INFORMATION

-		Art	•					
				•	and is locate			
						17 5 Ran		
b. Tract	No	of Map No		of	the		·· <u></u>	
		of Block No			the _ County.			<u></u>
		_ feet, Y=			, N.M. Coordinate	System		Zone :
) Drilling C	ontractor	Clyde	e Tidwel	1		License No	<u> พD-406</u>	
dress		x 17, Rout	e 1, Ar	tesia,	New Mexico	88210		· <u></u> ·
illing Began :	3/21/81	Comple	eted3/	/29/81	Type tools _	Cable	Size of h	ole8i
evation of lar	nd surface ⋈ _			at	well is 3307	ft. Total depth	of well	60 <u>f</u>
mpleted wel	lis 🗓 sl	hallow 🗆 art	esian.		Depth to wat	er upon completion	of well	10
		Section	on 2. PRIN		TER-BEARING S			
Depth		Thickness in Feet			of Water-Bearing	***************************************		ated Yield per minute)
From	To		 			•		per intiliate)
10	25	15		d Sand		***************************************	NA NA	
28	35	\ \ 7	GI	ау Ѕап	<u> </u>		NA.	
						•		
		<u> </u>		N		.,	<u> </u>	
Diameter	Pounds	Threads		n 3. RECO in Feet	RD OF CASING Length			Perforations
Diameter (inches)	per foot	per in.	Тор	Botton		Type of Sho	Fro Fro	
8 5/8_	28		0	60	60	Texas Patti	ern f	JA .
	,,							
·		Sectio	n 4. RECO	RD OF MU	IDDING AND CE	MENTING		
Depth From	in Feet To	Hole Diameter	Sack of M		Cubic Feet of Cement	Meth	od of Placeme	r. ent
					1		1505	
						JEN DEBUT	<u>}</u>	
						MAR 08 19	25]]]	
	I					* ·		
			Section	n 5. PLUC	GING RECORD	L CONSERVATION SANTA F	·t.	
ddress					No.	Depth in		Cubic Feet
lugging Meth- ate Well Plug						Тор	Bottom	of Cement
lugging appro	oved by:			-				
		State Engi	neer Repres	entative	4			
			FOR USE	OF STAT	E ENGINEER ON	ILY		
ate Received	April 6	5, 1981	-	•			•	

w'			Rection 6, LOG OF HOLE
Depth i	n Feet To	Thickness in Feet	Color and Type of Material Encountered
0	25	25	Fine red sand
25	28	3	Blue-gray clay
, 28	35	7	Fine gray sand
35	46	11	Coarse gravel
46	60	14	med to fine gravelly sand
-			
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<u>.</u>		. A.	
<u> </u>			
		•	a to g

Section 7. REMARKS AND ADDITIONAL INFORMATION



The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Chyle J. Tidwell Driller

03

INSTRUCTIONS: This for would be executed in triplicate, preferably typewritten, and submitted troof the State Engineer. All ons, expect Section 5, shall be answered as complete and accurate drilled, repaired or deepened. When the size is used as a plugging record, only Section 1, and Sectic

appropriate district office possible when any well is need be completed.

THE D ENGR. LOG

STATE ENGINEER OFFICE WELL RECORD

Section 1. GENERAL INFORMATION

City and State	Street or	Post Office Ad	dress _	ROX	159			Owner	's Well No.	17
b. Tract No. of Map No. of the	City and	State	Art	<u>esia. Ne</u>	w Mexic	o 882	210			
b. Tract No. of Map No. of the c. Lot No. dof Block No. of the Subdivision, recorded in County. d. X feet, Y* feet, Y* feet, N.M. Coordinate System Zone the Gran Gran B) Drilling Contractor Clyric Tiduall License No. WID-405 Box 17, Routh 1, Artesia, New Flexico 88210 Drilling Began 3/29/81 Completed 3/29/81 Type tools Cable Size of hole 8 is completed well is Size of hole 9 is completed well is Size of hole 9 in Feet Tablehold of Water Bearing Formation of well 10 feet Section 2. PRINCIPAL WATER BEARING STRATA Depth in Feet Tablehold Of 18 Red Sand NA Section 3. RECORD OF CASING Diameter Pounds (naches) per fool 18 Red Sand NA Section 3. RECORD OF CASING Diameter Pounds (naches) per fool 19 in Feet Description of Water Bearing Formation (gallons per minute) Section 4. RECORD OF MUDDING AND CEMENTING Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Diameter of Mad Ocenent Method of Placement of Mad Ocenent To Diameter Ocenent To Diameter Of Mad Ocenent To Diameter Ocenent To Dia	Vell was drilled	under Permit	No. <u>RA</u>	6776-E		and is loc	ated i	in the:		
Subdivision, recorded in County. d. X							-	·		
Subdivision, recorded in	b. Tract	No	_ of Map No.		of	the				
Section 3. RECORD OF CASING Diameter (inches) per foot per in. Top Bottom (feet) Type of Shoe Perforations From To Section 4. RECORD OF MUDDING AND CEMENTING Section 5. PLUGGING RECORD										
the Gran B) Drilling Contractor Clyde Tiduell License No. W0-406 Address And 17, Route 1, Artesia, New Mexico 88210 Drilling Began 3/29/81 Completed 3/29/81 Type tools Cable Size of hole 8 is Elevation of land surface No. State Engineer Representative 4 In Top Bottom of Cement Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet Thickness in Feet Description of Water-Bearing Formation (gallons per minute) Section 3. RECORD OF CASING Diameter Pounds (inches) per foot Per in. Top Bottom (feet) Type of Shoe Ferforations (inches) per foot Per in. Top Bottom (feet) Type of Shoe From To Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Note Of Mudding RECORD Section 5. PLUGGING RECORD Plugging Contractor Address Plugging approved by: State Engineer Representative 4 1										
B) Drilling Contractor Clyde Tiduell License No. WB-405 Address Bnx 17, Rnute 1, Artenia, New Mexico 88210 Drilling Began 3/29/81 Completed 3/29/81 Type tools Eahle Size of hole A is elevation of land surface Nr at well is 330.5 ft. Total depth of well 30 ft. Completed well is S shallow artesian. Depth to water upon completion of well 10 ft. Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet In Feet In Feet In Feet In Feet In Feet Sand NA Section 3. RECORD OF CASING Diameter Pounds Threads Per In Top Bottom (feet) Type of Shoe From To B 5/8" 28 0 30 30 Texas Pattern NA Section 4. RECORD OF MUDDING AND CEMENTING Section 4. RECORD OF MUDDING AND CEMENTING Section 5. PLUGGING RECORD Plugging Contractor Of Mud Of Cement Method of Placement Address Only Section 5. PLUGGING RECORD Plugging Contractor Top Bottom of Cement In Top Bottom of Cement In Top Bottom of Cement In Top Bottom of Cement In Top Bottom of Cement In Top Bottom In Feet In Top Bottom In Top Bottom In Top Bottom In Top Bottom In Top Bottom In Top In Top Bottom In Top In Top Bottom In Top In T										
Section 3. RECORD OF CASING Depth in Feet Length (inches) per foot per in. Top Bottom (feet) Top Section 4. RECORD OF MUDDING AND CEMENTING	B) Drilling C	Contractor	Clyde_	Tidwell				License NoU	10-406	
Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet Thickness Description of Water-Bearing Formation Section 3. RECORD OF CASING	Address	Rr	17, Ro	ute 1, A	rtesia,	New Mexi	CO	88210	· · · · · ·	
Section 2. PRINCIPAL WATER-BEARING STRATA	Drilling Began .	3/29/81	Comp	pleted3/	29/81	Type tool	ls	Cable	Size of	hole 8 ir
Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet Thickness in Feet Description of Water-Bearing Formation Estimated Yield (gallons per minute)	Elevation of lar	nd surface 🗷 🗕			at	well is 330	15	_ ft. Total depth o	of well	f
Depth in Feet Thickness in Feet Description of Water-Bearing Formation Estimated Yield (gallons per minute)	Completed well	lis ဩs	nallow 🗆 a	rtesian.		Depth to w	ater 1	upon completion	of well	f
Section 3. RECORD OF CASING Perforations			Sec	tion 2. PRIN	CIPAL WA	TER-BEARING	G STI	RATA		
Section 3. RECORD OF CASING Diameter (inches) per foot per in. Threads (feet) Type of Shoe From To 8 5/8" 28 0 30 30 Texas Pattern NA Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Diameter of Mud Cement Of Cement Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Plugging Contractor Address No. Depth in Feet Cubic Feet Of Cement Of Ceme				I	Description	of Water-Beari	ing Fo	ormation		
Section 3. RECORD OF CASING Diameter				R	ed sand					
Diameter (inches) per foot per in. Threads per in. Top Bottom (feet) Type of Shoe From To 8 5/8" 28			13			• •				·
Diameter (inches)					***************************************					
Diameter (inches)										
Diameter (inches)										
Diameter (inches) per foot per in. Threads per in. Top Bottom (feet) Type of Shoe From To 8 5/8" 28		<u> </u>		Section	n 3. RECOI	RD OF CASIN				
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Sacks Cubic Feet of Mud of Cement Section 5. PLUGGING RECORD Plugging Contractor Address Plugging Method Date Well Plugged Plugging approved by: State Engineer Representative FOR USE OF STATE ENGINEER ONLY			1		·			Type of Shoe		
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet			per III.					Texas Patts		
Depth in Feet							_	1000		
Depth in Feet							_			
From To Diameter of Mud of Cement Method of Placement Section 5. PLUGGING RECORD Plugging Contractor Address Plugging Method Date Well Plugged Plugging approved by: State Engineer Representative FOR USE OF STATE ENGINEER ONLY	*****		Secti	on 4. RECO	RD OF MU	DDING AND (СЕМЕ	ENTING		, L
Section 5. PLUGGING RECORD Plugging Contractor Address Plugging Method Date Well Plugged Plugging approved by: State Engineer Representative FOR USE OF STATE ENGINEER ONLY			4					Method	i of Placen	nent _
Section 5. PLUGGING RECORD							-			<u>.</u>
Section 5. PLUGGING RECORD		*					+-			-
Section 5. PLUGGING RECORD Plugging Contractor Address Plugging Method Date Well Plugged Plugging approved by: State Engineer Representative FOR USE OF STATE ENGINEER ONLY		غ ا		 			+-			
Section 5. PLUGGING RECORD Plugging Contractor Address Plugging Method Date Well Plugged Plugging approved by: State Engineer Representative FOR USE OF STATE ENGINEER ONLY				<u></u>			L_			
No. Depth in Feet Cubic Feet						GING RECOR	D			
No. Top Bottom of Cement	Plugging Contr	actor								
Date Well Plugged						N	0.			
State Engineer Representative 3 4 FOR USE OF STATE ENGINEER ONLY								ı op	portom	or Cement
State Engineer Representative 4 FOR USE OF STATE ENGINEER ONLY	Plugging appro	ved by:				· · · · · ·	$\overline{}$			
FOR USE OF STATE ENGINEER ONLY			State Eng	ineer Represe	ntative	 	_		······································	
FOR USE OF STATE ENGINEER UNLY	·	·		EOB VAL	OF STATE	ENCINEER	2011			
Date Received April 6, 1981	Date Received	April 6	, 1981	FUK UŞE	OF STATE	ENGINEER (UNLY	ſ		
QuadFWLFSL			•					FWL _		FSL
File No. RA-6776-E Use Observation Location No. 125.268.12.1243		RA-6776-E		·	Oh					

Section 6. LOG OF HOLE Depth in Feet Thickness Color and Type of Material Encountered in Feet From To 28 28 ۵ Fine red sand 28 30 2 Red clay

Section 7. REMARKS AND ADDITIONAL INFORMATION

STATE ENGINEER OFFICE

of his har The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

INSTRUCTIONS: This for

EIELD ENGR. LOG

Section 1	CENERAL	INFORMATION	

	well Post Office Ad		EFINING Box 159	COMPANY		Owns	er's Well No	18
City and	State	Ar	tesia, N	UM 88	210			
ell was drilled	under Permit	No. RA	6969		_ and is located	in the: Obse	rvation/	Monitor we
a. <u>Niil</u>	_ ¼ <u>SW</u> ¼	<u>NW</u> ¼	¼ of Sec	ction _9	Township _	175 Ra	nge <u>26 E</u>	N.M.P.1
b. Tract	No	_ of Map No.		of the	:			
c. Lot No	o	of Block No		of the				
Subdiv	vision, recorded	l in		c	ounty.			-
				feet, N	M. Coordinate	System		Zone i
B) Drilling C	Contractor	Hughes D	rilling	Company		License No	WD 749	
ddress		Box 199A	, Route	1, Artes	ia, N M	88210		•
rilling Began .	6/8/82	Comp	leted6/	/8/82	_ Type tools A	ir rotary	Size of 1	nole 7- 7/8 in
levation of lar	nd surface or	casing		at we	U is3364	ft. Total depth	of well	<u> 19</u> f
ompleted well	lis 🕱 sh	iallow 🗆 a	rtesian.		Depth to wate	r upon completion	of well	10 f
•		Sect	ion 2 PRIN		R-BEARING S			-
Depth	in Feet	Thickness						ated Yield
From	To	in Feet			Water-Bearing			per minute) NA
16	19	3	7100	annyori	tic sand	and red sha	le '	
							 	
			Sectio	n 3. RECORD	OF CASING			
Diameter (inches)	Pounds per foot	Threads per in.		in Feet	Length (feet)	Type of Sh	oe Fro	Perforations
6	PVC	per III.	Тор	Bottom	20			om <u>To</u> 15 19
	P 0 6				20			13 13
						,		
		Section	on 4. RECO	RD OF MUDD	ING AND CEN	MENTING		
Depth From	in Feet To	Hole Diameter	Sacl of M	-	ubic Feet f Cement	Meth	od of Placem	ent 💂
		Diameter	0.1.		3	hand		<u>-</u>
0	12 #		 					<u> </u>
			<u> </u>					
			-	• • • • • • • • • • • • • • • • • • • •				·····
				on 5. PLUGGII	NG RECORD			
lugging Contr.	actor					Depth in	Feet	Cubic East
lugging Metho	od				No.	Top	Bottom	Cubic Feet of Cement
Date Well Plugs lugging approv	-			,	1 2			
10 0-11		Ctota E	inaar Da	entative	3			
		State Eng	ineer Repres	entative .	4_	<u> </u>		
_		1000	FOR USE	OF STATE E	NGINEER ON	LY		
ate Received	June 22,	1982		Ouad	I	FWL .	<u>. </u>	FSL
•	RA-6969			05-	/Monitorin		17.26.9.1	
File No	KM-0303		···	Use		Location No.	.,.20.9.1	2111

		T T	Section 6. LOG OF HOLE
	in Feet	Thickness in Feet	Color and Type of Material Encountered
From	То	 	
	2	2	Red soil
2	8	6	gyp (weathered anhy) with red shale
8	14	6	gyp white and anhydritic sand
19	19	5	Fine red shale and anhyritic sand — water @ 16°
	•		
	<u> </u>		
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Section 7. REMARKS AND ADDITIONAL INFORMATION

observation/monitoring well

10, 131 60 G 7,5 W

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Nale Highes

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All ons, except Section 5, shall be answered as completely and accurate considering the property of the state Engineer. All ons, except Section 5, shall be answered as completely and accurate considering the property of the state Engineer. All ons, except Section 5, shall be answered as completely and accurate considering the property of the state Engineer.

EIELD ENGR. LOG

Section 1. GENERAL INFORMATION

WW.	June 22,	-	FOR USE	OF STATE EN	NGINEE	R ONL	Y				
	•	State Eng	gineer Represe	ntative		3 4			1		
lugging appro	_					2			1		
	od					No.	Тор	Bottom		Cement	
lugging Contr	actor		· · · · · · · · · · · · · · · · · · ·				Depth	in Feet	Τ	bic Feet	
			Sectio	n 5. PLUGGIN	NG REC	ORD	,				
	<u> </u>		1				·····				
	*					_					
0	12 =				3		hand		•		
From	То	Diameter	of Mu	ıd oi	f Cemen	it		01 11800			
Depth	in Feet	Hole	Sack		ubic Fee	et		hod of Place	ment *		
		F	ion A BECCE	D OF WILLS	INC AN	ID CEL	ENTING				
						-					
					1	-					
6	PVC	-		20000		20		•	15	19	
Diameter (inches)	Pounds per foot	Threads per in.	Depth Top	in Feet Bottom		igth et)	Type of S	hoe	Perfor rom	ations To	
			Section	a 3. RECORD	OF CAS	SING					
						·					
15	18	3	fin	e anhydri	tic s	and a	and shale	NA	NA		
Depth From	in Feet To	Thickness in Feet	E	Description of '	Water-Be	earing F	ormation		Estimated Yield (gallons per minute)		
	 			CIPAL WATE	R-BEAR	ING ST	RATA				
ompleted wel	lis ⊠X sh	allow 🔲 :	artesian.		Depth t	o water	upon completi	on of well	10		
evation of lai	nd surface or	casi	ng	at wel	11 is <u>33</u>	867	_ ft. Total dep	th of well	19		
illing Began	6/9/82	Com	pleted 6/	9/82	_ Type t	tools <u>Ai</u>	r Rotary	Size o	hole_	7/8	
ldress		Route	1, Box 1	99A, Arte	sia,	N M	88210				
_	Contractor							₩D 749			
		. icei, I =		reet, N.	.m. C001	uinate S	y stem		-	Zone	
	vision, recorded			•					_	•	
c. Lot N	0	of Block No		of the							
b. Tract	No	_ of Map No		of the	·		-				
a. NE	_3;SE_ 1/4	NE ¼	¼ of Sec	ction 8	Tow	nship 🔟	L7SF	tange <u>26 E</u>		N.M.I	
ell was drilled	d under Permit 1	NoB	A 6970		_ and is	located	in the: Obser	rvation/M	onito	or	
Street or City and	Post Office Ad-	dressAr		159 N M 88	3210						
) Owner of	f well	DLAVAN			-		Ow	ner's Well No	19	9 .	

Use Monitoring

File No. RA-6970

17.26.8.24234

			Section 6. LOG OF HOLE
Depth From	in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	3 1	3 1	gravel
	6	2 1	brown soil
	9	3	дур
	18	9	gray clay & gyp
	19	1	Red clay
	<u> </u>		
	-3	72.2.7.11	*
<u> </u>			
	<u> </u>		
			

Section 7. REMARKS AND ADDITIONAL INFORMATION

well

3 os fil '82	observation/monitor
Jun 22	

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Daller

STATE ENGINEER OFFICE

WELL RECORD

FIELD ENGR. LOG

ection	١.	GENERAL	INFORMATION

A) Owner of	weil	NAVA		VING COMP	ANY	Owne	r's Well No	2	20	
Street or	Post Office Ad-	dress	Box 1	. New Mexi						
City and	State		Artesia	New Mex.	100 8821	J				
		NoP	IA 6972		and is located	in the: obser	vation/m	oni to	r	
aAut		<u>NU %</u>	¼ of Sec	tion9	Township	17 S Rar	nge <u>26 E</u>		_N.M.P	
b. Tract	No	_ of Map No.		of the						
	oo. vision, recorded							Ē		
					M. Coordinate	System		<u>.</u>	_ Zone _ Gra	
B) Drilling (Contractor	<u> Hughes</u>	Drillin	o Company	<u></u>	License No	<u>WD 7</u>	49		
ddress		Route 1,	Box 199	A. Artesi	ia, N M	88210				
rilling Began	6/9/82	Comp	leted6/	/9/82	. Type tools 🔟	Air rotory	Size of 1	10le_ 7 _	7/8	
levation of la	nd surface or	casing		at well	is3366	ft. Total depth	of well	20		
ompleted wel	lis 🗓 sh	iallow 🗆 ar	rtesian.	1	Depth to water	upon completion	of well	.11		
		Sect	ion 2. PRINC	CIPAL WATER	-BEARING ST	RATA_			_	
Depth From	in Feet To	Thickness in Feet	D	escription of V	Vater-Bearing F	ormation		ated Yi		
15	18	3	fine	red & gr	ray anhydi	ritic sand				
			 							
			+				 			
			<u> </u>							
	<u></u>	<u> </u>	Section	3. RECORD	OF CASING		<u> </u>			
Diameter	Pounds	Threads	Depth i		Length	Type of Sho		Perforat	ions	
(inches)	per foot	per in.	Тор	Bottom	(feet)	Type of sile	Fre	om	То	
6	PVC				20		-	16	20	
			on 4. RECOR	D OF MUDDI	NG AND CEM					
Death	in Feet	Hole				Mask	od of Placem	ent 🚆		
Depth From	in Feet To	Hole Diameter	of Mu	id of	Cement	Metho			÷	
			of Mu	id of		hand		•		
From	То		of Mu	id of	Cement			•		
From	To 12 #		of Mu	id of	Cement			*		
From O	12 *	Diameter	Section	n 5. PLUGGIN	Cement 3			*		
From O	To 12 #	Diameter	Section		G RECORD	hand	Feet	Cubi	c Feet	
From O lugging Contraddress lugging Metho	To 12 a	Diameter	Section		Cement 3		Feet Bottom		c Feet	
From O lugging Control ddress lugging Metho atc Well Plug	To 12 a	Diameter	Section		G RECORD No. 1	hand Depth in				
From O lugging Control ddress lugging Metholate Well Plug	To 12 a	Diameter	Section		Cement	hand Depth in				
From O Clugging Contraddress	To 12 a	Diameter	Section	n 5. PLUGGIN	G RECORD No. 1	hand Depth in			c Feet ement	

Monitoring

RA-6972

17.26.9.13313

Depth in Feet To Thickness in Feet Color and Type of Material Encountered 0 3 3 5 501 5 2 tan gyp - oil soaked 10 5 gray anhydritic sand and shale 15 5 50/50 gray & red anhydritic sand 20 5 fine red shaley anhydritic sand				Section 6. LOG OF HOLE
0 3 3 soil 5 2 tan gyp - oil soaked 10 5 gray anhydritic sand and shale 15 5 50/50 gray & red anhydritic sand 20 5 fine red shaley anhydritic sand				Color and Type of Material Encountered
10 5 gray anhydritic sand and shale 15 5 50/50 gray & red anhydritic sand 20 5 fine red shaley anhydritic sand			 	soil
15 5 50/50 gray & red anhydritic sand 20 5 fine red shaley anhydritic sand		5	2	tan gyp – oil soaked
20 5 fine red shaley anhydritic sand	****	10	5	gray anhydritic sand and shale
		15	5	50/50 gray & red anhydritic sand
		20	5	fine red shaley anhydritic sand
		7		•
				·
				,
		-		
		-		

Section 7. REMARKS AND ADDITIONAL INFORMATION

observation/monitor well

in the object of the state of t

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Mak Hunkes Deller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All existing, except Section 5, shall be answered as completely and accurated to the appropriate district office of the State Engineer. All existing section 5, shall be answered as completely and accurated to the appropriate district office of the State Engineer. All existing section 5, shall be answered as completely and accurated to the appropriate district office of the State Engineer. All existing section 5, shall be answered as completely and accurated to the appropriate district office of the State Engineer. All existing section 5, shall be answered as completely and accurated to the appropriate district office of the State Engineer. All existing section 5, shall be answered as completely and accurated to the appropriate district office of the State Engineer. All existing section 5, shall be answered as completely and accurated to the appropriate district office of the State Engineer. All exists a section 5, shall be answered as completely and accurated to the appropriate district office of the State Engineer. All exists a section 5, shall be answered as completely and accurated to the appropriate district office of the State Engineer. All exists a section 5, shall be answered as completely and accurate to the appropriate district office of the section 5.

			Section 1. G	ENERAL IN	FORMATION		FIFFN	ENG	R. LO		
A) Owner o	f well	CAVAN	, 	Owner	's Well No	21					
Street or	Post Office Ad	dressA	Eox rtesia, N	159 M 882		·					
-							/	• • •			
		c(v)				in the: Observ	•				
aNE_	_ ¼ <u>Nid ¼</u>	_SE_ ¼	¼ of Section	on <u>9</u>	_ Township	17 S Ran	ge2 <u>5</u>	Ε	_N.M.P.M		
b. Tract	No	_ of Map No:		of the	 						
c. Lot N	10	of Block No		of the_							
								~			
d. X= _	,	_ feet, Y=		feet, N.M	I. Coordinate S	ystem			_ Zone is		
the									Grant		
B) Drilling (Contractor	Hug	hes Drilli	ng Compa	пу	_ License No	MD ,	749			
ddress		Route	1. Box 199	A. Arte	sia, N M	88210			<u> </u>		
).'''' D	6/11/8	3.7 Com	alated 6/1	1/82	Tura toola Di	r rotary	Sine of b	-1- 7	7./0:-		
					-	-			·		
levation of la	nd surface or _	casing		at well	is 3362	_ ft. Total depth	of well	33	ft		
ompleted wel	llis 🛛 st	iallow 🗆 a	irtesian.	Г	epth to water	upon completion	of well	7	ft		
		Sec	tion 2. PRINCII	PAL WATER	BEARING ST	RATA					
	in Feet	Thickness in Feet	Des	scription of W	ater-Bearing F	ormation	Estima (gallons	ated Yi			
From	To										
16	20	4	fine	gray an	hydritic	sand & shal	.e	NA			
						<u>-</u>		•			
•											
	L	L		DECORD (T C A SINC	<u>-</u>					
Diameter	Pounds	Threads	Depth in	Feet Feet	Length		P	erforat	ions		
(inches)	per foot	per in.	Тор	Bottom	(feet)	Type of Show	Fro	From			
6	PVC				33		29	∍	33		
								}			
		LL		1	1						
											
Denth	in Feet		on 4. RECORD						od of Placement		
Depth From	in Feet To	Secti Hole Diameter	on 4. RECORD Sacks of Mud	Cul	NG AND CEMI Dic Feet Cement		d of Placeme	ent 🚅			
		Hole	Sacks	Cul	oic Feet		d of Placeme	ent =			
From 0	12	Hole	Sacks	Cul	oic Feet Cement	Metho		ent #			
From	То	Hole	Sacks	Cul	oic Feet Cement	Metho		ent			
From	12	Hole	Sacks	Cul	oic Feet Cement	Metho		ent			
From	12	Hole	Sacks of Mud	Cul	oic Feet Cement 3	Metho		ent .			
From 10 12 Plugging Conti	33 = 33 = 33 = 33 = 33 = 33 = 33 = 33	Hole Diameter	Sacks of Mud	Cul	oic Feet Cement 3	Metho		ent #			
From 1 12 Plugging Contraddress	33 = 33 = 33 = 33 = 33 = 33 = 33 = 33	Hole Diameter	Sacks of Mud	Cul	oic Feet Cement 3	Methodhand gravel pa	ck Feet	Cubi	c Feet		
Plugging Contraddress Plugging Methologie Well Plug	33 =	Hole Diameter	Sacks of Mud	Cul	oic Feet Cement 3 GRECORD , No. 1	Metho hand gravel pa	ck	Cubi			
From 1 12 Plugging Contraddress	33 =	Hole Diameter	Sacks of Mud	Cul of	oic Feet Cement 3	Methodhand gravel pa	ck Feet	Cubi			

Quad_

______Monitoring

RA-6971

File No ._

_ FWL __

_ Location No. _____17.26.9.31222

Depth	in Feet	Thickness	Color and Type of Material Empoyetared
From	То	in Feet	Color and Type of Material Encountered
0	5	5	oil soaked sand
	10	5	fine anhydritic sand & clay
	15	5	fine anhydritic sand & clay
	20	5	fine gray anhy sd, clay, & gravel
	25	5	coarse gravel and gray clay cement
	30	5	gyp & red clay or shale
	33	3	very shaley gyp.
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			,
 -			
			
- * 2-			
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.f.	 		
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Section 7. REMARKS AND ADDITIONAL INFORMATION

observation/monitor well

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

e Hugher

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All fions, except Section 5, shall be answered as completely and accurate cossible when any well is defined repaired or deepen.

FIELD ENGR. LUG

Section 1. GENERAL INFORMATION

		NIA VIA 30 00		.GENEKAL						2	
	well Post Office Ad	NAVAJO RE	Drawe:	159			Ow	ner's Well N	lo4		
City and	State				88210)					
ell was drilled	under Permit	NoRA_	6975		and i	is located i	n the:				
a. <u>NE</u>	_ ¼ _NE_ ¼	_ММ ¾ _5	Ш_ ¼ of Se	ection9	To	wnship	175 F	Range21	5E	N.M.P	
b. Tract	No	_ of Map No.		of t	he	~ ~~~					
		of Block No									
•		_ feet, Y=			-		ystem			Zone	
		S. Dale				,		IID 21		Gra	
,		e 1. Box									
		4. 182comp									
mpleted well		nallow 🗆 a					pon completi				
inpicted wen	ىد. سى س			ICIPAL WAT	-			"			
Depth	in Feet	Thickness		Description of					stimated		
From	To	in Feet		n water-	Dearing 1 C		(gal)	(gallons per minute)			
16 	18	2	gyr	sand					па		
				•							
		1	Contic	n 2 DECOD	D OF C	ASINC	•				
Diameter	Pounds	Threads		Section 3. RECORD OF CASING Depth in Feet Length Turn of Change				Perfo	Perforations		
(inches)	per foot	per in.	Тор	Bottom		feet)	Type of S	noe	From To		
6						20			16	20	
					-						
				<u></u>							
Depth	in Feet	Secti Hole		RD OF MUD	Cubic F						
From						Cement Met		hod of Placement			
0	4 =	8			3		hand		÷		
	4										
									·		
		,	Section	on 5. PLUGG	ING RE	CORD					
ugging Contr							Denth	in Feet	1 0	bic Feet	
ugging Metho	od b					No.	Тор	Bottom		Cement	
ate Well Plugs	_					2					
ugging appro						3					
ugging appro		State Eng	ineer Repres	entative		4					

	in Feet	Thickness	Color and Type of Material Encountered
From	То	in Feet	
0	4	4	fill
	5	1	oil soaked sand
	10	5	gyp and clay
	16	6	gyp and clay
	18	2	anhydritic sand, gravel
	19	1	gyp and clay
			•
·····			
	47. <u></u>	<u> </u>	
	 		
			
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· <u></u>			
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<u> </u>			
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Section 7. REMARKS AND ADDITIONAL INFORMATION

Aug is to 20 AH 102

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Nale Hughes

INSTRUCTIONS: This for "hould be executed in triplicate, preferably typewritten, and submitted troof the State Engineer. Al drilled, repaired or deepened when this form is used as a plugging record, only Section 1(a) and Section 2: need be completed.

EIELD ENGR. LOG

Section 1. GENERAL INFORMATION

\	C	NAVAJO B	Section 1	COMPANY		Owner	'a Wall No	23	
Street or	Post Office Ad	dress	Draw	er 159		- Owner	5 WEII NO		
City and	State	Aı	<u>tesia. N</u>	M 8821]				
ell was drilled	i under Permit l	No. RA	6975 X		and is located i	n the:			
a. <u>NE</u>	_ ¼ _ <u>Nhl</u> ¼	<u>Niii</u> ¼ <u>.</u> 5	3111 ¼ of Sec	ction 9	_ Township	17 S Ran	ge <u>26 E</u>	N.M.P	
b. Tract	No	_ of Map No.		of the			· · · · · · · · · · · · · · · · · · ·		
c. Lot N Subdi	ovision, recorded	of Block No		of the Co	ounty.			ž	
	•			•				- -	
					1. Coordinate S	ystem		Zone	
B) Drilling (Contractor	S. Dale	. Hughes			_ License No	』D 749		
ddress	Rou	te 1. Box	199 A.	Artesia,	N M 8821	0			
rilling Began	6/28/82	Com	pleted <u>6/</u>	28/82	Type toolsA	ir Rotary	Size of ho	ole <u>7_7/</u> 5	
levation of la	nd surface or —			at well	is3363	ft. Total depth	of well	_20	
ompleted wel	llis L¥at sh	allow 🗀 :	artesian. Mo	nitor I	Depth to water i	ipon completion	of well	9	
		Sec	tion 2. PRIN	CIPAL WATER	BEARING STI	RATA			
	in Feet	Thickness in Feet	· 1	Description of W	ater-Bearing Fo	rmation		ted Yield per minute)	
From 15	17	2	Anh	yritic sar			na		
				•					
			Section	n 3. RECORD (OF CASING				
Diameter	Pounds	Threads		in Feet	Length	Tues of Cha	P	erforations	
(inches)	per foot	per in.	Тор	Bottom	(feet)	Type of Sho	Fror	n To	
6	PVC				20		15	20	
			<u>-</u>						
			ion 4. RECO	RD OF MUDDI		NTING			
Donth	in Feet To	Hole Diameter	Sack of M		bic Feet Cement	Metho	d of Placeme	nt 🚅	
		8			3	Hand		-	
From	7 -				-				
		-							
From	<u> </u>								
From									
From				n 5. PLUGGIN	G RECORD	.,			
From				n 5. PLUGGIN		Depth in I	Feet	Cubic Feet	
From	ractor			n 5. PLUGGIN	No.	Depth in I	Feet Bottom		
From	ractor			n S. PLUGGIN					
From D lugging Contr	ractor				.No.			Cubic Feet of Cement	

Use Observation Location No. 17.26.9.31122

Section 6. LOG OF HOLE Depth in Feet Thickness Color and Type of Material Encountered From То in Feet 5 5 gyp with anhydrite crystals 0 10 5 12 2 gyp and granular anhydrite 15 anhydritic sand and clay 2 17 20 3 anhy sand with limestone gravel

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Dale Hughes

INSTRUCTIONS: This for should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. A drilled, repaired or deepene. When this form is used as a plugging record, only Section 1(a) and Section need be completed.

EIELD ENGR. LOG

Section 1. GENERAL INFORMATION

Street or City and	Post Office Ad	dress	Draw	er 159		Owner				
'ell was drilled	d under Permit	No	RA_6	5975 X 2	and is locate	ed in the:				
aE	_ ¼ _511_ ¼	_511_ ½ 1	Will % of Se	ction9_	Township	17_5 Ran	ge <u> 26 F</u>	N.M.P.		
b. Tract	No	_ of Map N	o	of th	ne					
	vision, recorded				•			-		
					N.M. Coordinate	e System		Zone Gran		
3) Drilling (Contractor	S. Dal	Le Hughes			License No	WD 749			
ddress	R	oute 1,	Box 199A	Artesi	ia, N M	88210		······································		
rilling Began	7/5/82	Соп	npleted 7/5	5/82	Type tools	ir rotary	Size of h	ole <u>8</u> i		
levation of la	nd surface 😽 🗕			at w	ell is 3362	ft. Total depth	of well	19		
ompleted wel	_					er upon completion		_		
					ER-BEARING S	•	•			
Depth	in Feet	Thickne	ss		Water-Bearing			ated Yield		
From	To	in Feet	<u> </u>			1 Officiation		(gallons per minute)		
16	18	2	Ant	ny sand		па				
			Sectio	n 3. RECORI	OF CASING					
Diameter (inches)	Pounds per foot	Threads per in.	Depth Top	in Feet Bottom	Length (feet)	Type of Sho	e Fro	Perforations To		
	1					Type of Sho	e Fro			
(inches)	per foot				(feet)	Type of Sho	e Fro	т То		
(inches)	per foot				(feet)	Type of Sho	e Fro	т То		
(inches)	per foot	per in.	Тор	Bottom	(feet)		e Fro	т То		
6 Depth	per foot PVC	per in.	Top tion 4. RECO	Bottom RD OF MUD	(feet) 20	MENTING	e Fro	m To 5 20		
(inches)	per foot PVC in Feet To	per in.	Top tion 4. RECO	Bottom RD OF MUD	(feet) 20 DING AND CE	MENTING	e Fro	m To 5 20		
(inches) 6 Depth	per foot PVC in Feet To 7	Sec Hole Diameter	Top tion 4. RECO	Bottom RD OF MUD	(feet) 20 DING AND CE Cubic Feet of Cement	MENTING Metho	e Fro	m To 5 20		
(inches) 6 Depth	per foot PVC in Feet To 7	Sec Hole Diameter	Top tion 4. RECO	Bottom RD OF MUD	(feet) 20 DING AND CE Cubic Feet of Cement	MENTING Metho	e Fro	m To 5 20		
(inches) 6 Depth	per foot PVC in Feet To 7	Sec Hole Diameter	Top tion 4. RECO	Bottom RD OF MUD	(feet) 20 DING AND CE Cubic Feet of Cement	MENTING Metho	e Fro	m To 5 20		
(inches) 6 Depth From	per foot PVC in Feet To 7	Sec Hole Diameter	Top tion 4. RECO Sack of M	RD OF MUD	(feet) 20 DING AND CE Cubic Feet of Cement	MENTING Metho	e Fro	m To 5 20		
O Depth From O Contraddress	per foot PVC in Feet To 7 2 2 2 actor	Sec Hole Diameter	Top tion 4. RECO Sack of M	RD OF MUD	Oling AND CE Cubic Feet of Cement 3	MENTING Metho	Fro	To To To Cubic Feet		
Openth From Ougging Contraddress Lugging Method	in Feet To 7 actor	Sec Hole Diameter	Top tion 4. RECO Sack of M	RD OF MUD	(feet) 20 DING AND CE Cubic Feet of Cement 3	MENTING Metho	Fro	m To 5 20		
O Depth From O Contraddress	in Feet To 7 actor od ged	Sec Hole Diameter	Top tion 4. RECO Sack of M	RD OF MUD	Oling AND CE Cubic Feet of Cement 3	MENTING Metho hand	Feet Fro	To To To Cubic Feet		
Openth From Olugging Contraddress Jugging Metholate Well Plug	in Feet To 7 actor od ged	Sec Hole Diameter 8	Top tion 4. RECO Sack of M	RD OF MUD	Office (feet) 20 DING AND CE Cubic Feet of Cement 3 ING RECORD No. 1	MENTING Metho hand	Feet Fro	To To To Cubic Feet		

_Use___Observation ocation No._

			Section 6. LOG OF HOLE
Depth From	in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	5	5	gyp & gran. anhydrite
	10	5	u 11 11 11 .
	16	6	gyp & clay
	18	2	anhydritic sand and gravel
·	19	1	gyp and gravel
	ļ		
		_	
<u> </u>			•

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Nale Hughio

EIELD ENGR. LOG

Street or	Post Office Ad	dress	Dr:	<u>awer 159</u>		Owner		25
			_		_ and is located			
						17_S Ran	ge26	<u>EN.M.P.</u>
					-			_
		_						
Subdiv	vision, recorde	d in			ounty.			*
					M. Coordinate	System		Zone Gran
B) Drilling C	ontractor	S. Dal	Le Hughes	ā		License No	WD 749	
Address	f	Route 1,	Box 199	A , Arte	sia, N M	88210		
Orilling Began .	7/13/8	32 Com	oleted7,	/13/ 82	_ Type tools _£	ir rotary	Size of h	10le <u> </u>
			·			ft. Total depth		
		_			•	•		
Completed well	lis LXS s	hallow 🗀 a	rtesian.		Depth to water	upon completion	of well	8
Depth	in Feet	Sec Thickness			R-BEARING ST		Fetim	ated Yield
From	То	in Feet	I		Water-Bearing F	ormation		per minute)
15	17	2	ar	hydritic	sand		na	
				•				
		J	Santia	n 3. RECORD	OF CASING			
Diameter	Pounds	Threads		in Feet	Length	Type of Shoo		Perforations
(inches)	per foot	per in.	Тор	Bottom	(feet)	1,7,6	Fro	
-	700				20			.6 20
		Secti	on 4. RECOI	RD OF MUDD	ING AND CEM	ENTING		
Depth From	in Feet To	Hole Diameter	Sack of M		ubic Feet Cement	Metho	d of Placem	ent "
0	8	8			4	hand	-	÷
								-
	,							
		<u> </u>	1					
Plugging Contra	actor			n 5. PLUGGIN	IG RECORD			
Address Plugging Metho				· · · · · · · · · · · · · · · · · · ·	No.	Depth in I	Feet Bottom	Cubic Feet of Cement
Date Well Plugg	ged							
ingRiuR sbbto.		State E	ineer Represe	entative				
		State Eng	meer Kepres	entative	4	1		
Date Received	August 19.	1982			NGINEER ONL	Y		
1,000,700				Quad		FWL		FSL
File No. RA	-6975 x 3			Use Obse	ervation	Location No	17.26.8.2	4241

Depth i		Thickness	Color and Type of Material Encountered
From	То	in Feet	Color and Type of Material Encountered
0	5	5	oil spaked spil
	12	7	дур
	15	3	gyp & clay
	17	2	anhydritic sand
	20	3	red gyp clay
	· · · · · · · · · · · · · · · · · · ·		
	_==		
			_
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Section 7. REMARKS AND ADDITIONAL INFORMATION

29 M 19

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

ale Hunfur Driller

EIELD ENGR. LOG

Section 1. GENERAL INFORMATION

Street or	Post Office Ad	ddress	Drawer	159		Own			
City and	State		Artesi	a. N M			· · · · · · · · · · · · · · · · · · ·		
Well was drilled	d under Permit	No. RA 65	175 X 4		and is located	in the:			
						17 S Ra			
b. Tract	No	of Map No.		of the					
	0							-	
				Co		•		€,	
				feet, N.M		ystem		- -	Zone in Grant.
(B) Drilling (Contractor	S. Dal	e Hughes	l .		_ License No	WD 749		
Address	Ro	oute 1, Bo	x 199 A.	Artesia,	N M 882	מני			<u></u> .
Drilling Began	7/15/82	Comp	pleted 7 _/	15/82	Type tools Ai	r Rotary	Size of	hole	in.
Elevation of la	nd surface or _			at well	is 3364	_ ft. Total depti	n of well	20	ft.
	_					_			
Completed wel	11S LÆ S	shallow 🗆 a			•	upon completion	n oi weli		I t.
Denth	in Feet	Sec Thickness	- ·	CIPAL WATER	-BEARING ST	RATA	- Ectim	anted N	/ield
From	To	in Feet	I	Description of W	ater-Bearing F	ormation	Estimated Yield (gallons per minute)		
16	18	. 2	a	nhydritic	sand		na	na	
									,
	<u> </u>			- 2 PECORD (DE CASING				
Diameter	Pounds	Threads		n 3. RECORD C	Length	T 6.61		Perfor	ations
(inches)	per foot	per in.	Тор	Bottom	(feet)	Type of Shoe Fro		om	То
6	PVC		:		20		1	.6	20
	ļ		i						
1		1 1							
	<u> </u>				<u>-</u>				
		Secti	on 4. RECOI	RD OF MUDDI	NG AND CEMI	ENTING]	
	in Feet	Secti Hole Diameter	Sack	s Cu	bic Feet		od of Placerr	nent	
Depth From	in Feet To	Hole	Τ	s Cu			od of Placerr	nent	
From	То	Hole Diameter	Sack	s Cu	bic Feet Cement	Meth	od of Placen	nent	
From	То	Hole Diameter	Sack	s Cu	bic Feet Cement	Meth	od of Placem	nent -	
From	To 9	Hole Diameter	Sack	s Cu	bic Feet Cement	Meth	od of Placem	nent	
From	To 9	Hole Diameter	Sack of Mu	s Cu	bic Feet Cement	Meth	od of Placerr	nent	
From O Plugging Contr	To 9 in a sector	Hole Diameter 8	Sack of Mu	n 5. PLUGGING	bic Feet Cement	Meth		-	
From D Plugging Contraddress Plugging Metho	To 9 interpretation and a second a second and a second	Hole Diameter 8	Sack of Mi	n 5. PLUGGING	bic Feet Cement	Meth		Cu	bic Feet Cement
Plugging Contraddress Plugging Methodate Well Plug	To 9 ractor od ged	Hole Diameter 8	Sack of Mi	n 5. PLUGGING	bic Feet Cement 5 G RECORD No.	Meth hand Depth in	Feet	Cu	
From D Plugging Contraddress Plugging Metho	To 9 ractor od ged	Hole Diameter 8	Sack of Mi	n 5. PLUGGING	bic Feet Cement 5 G RECORD No.	Meth hand Depth in	Feet	Cu	

Use Observation Location No. 17.26.8.24243

	Section 6. LOG OF HOLE					
Depth	in Feet	Thickness	Color and Type of Material Encountered			
From	То	in Feet				
0	6	6	oil soaked gyp			
	10	4	дур			
	12	2 .	gyp & clay			
	16	4	gyp & clay			
	18	2	anhydritic sand			
	20	2	gyp & gravel			
	£					
			-			
						
			10-300			
	-					
	-					
		1				

Section 7. REMARKS AND ADDITIONAL INFORMATION

FE 182

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller

FIELD ENGR. LOG

STATE ENGINEER OFFICE WELL RECORD

Section 1. GENERAL INFORMATION

dd: lugi	ress	od ged			resentative	e 1	1 2 3					
Addi Yugi Date	ress ging Metho Well Plugg	od ged										
lddi	ress	od			-							
							No.	Depth in	Bottom		oic Feet Cement	
		actor					-	D. 45.1	Fact	-		
				Se	ction 5. PL	UGGING	RECORD					
		-		1								
		ļ										
		•				 			·			
_	0	8	8				4	hand		-		
	From	То	Diameter		Mud		Cement	Meth	od of Placem	nent ,		
	Depth	in Feet	Sec Hole		CORD OF I		IG AND CEM					
				sian & DE	CORD OF	MUDDE	C AND CEL	ENTING	·			
	l				1	-			1	1		
								·				
	6	PVC					20			16	20	
	inches)	per foot	per in.	Тор		tom	(feet)	Type of Sh	oe Fr	om	To	
	iameter	Pounds	Threads		tion 3. RE		F CASING Length			Perfora	tions	
_		· · · · · · · · · · · · · · · · · · ·			diam 2 BF	CORD	E CACINIC					
_		•										
									 	,		
	17	72			anhydri	rtic S				na ————————		
	From	To	2						(gallons per minute		niu(e)	
	Depth i		Thicknes		Descript	ion of W	ater-Bearing F	ormation		Estimated Yield		
_					RINCIPAL V	WATER-	BEARING ST	RATA				
om	pleted well	lis L∏X sh	allow 🔲	artesian.		D	epth to water	upon completio	n of well	9_		
leva	ition of lan							_ ft. Total dept				
								•				
					-			ir Rotary				
.ddr	ess		Route 1	, Box_1	99 A. A	Artesi	a, N M	38210				
B)	Drilling C	ontractor	S. C	ale Hug	hes			_ License No	<u>ШО 7</u>	49		
			feet, Y=		1	feet, N.M	. Coordinate S	System		_		
		vision, recorded					-					
		* 0										
	b. Tract !	No	_ of Map N	o		of the _						
	aSE	4 <u>NE</u> 4	_SE ¼ 1	LE ¼ of	Section	8	_ Township	17_ S Ra	inge 2 6	Ε	_N.M.P	
ell ·	was drilled	under Permit N	No. RE	6975	(5	:	and is located	in the:				
	City and	State	riess	rtesia	NM							
()		wellPost Office Add				COMPA er 15		Own	er's Well No.	2*	7	

File No. RA-6975 X 5

Use Observation Location No. 17.26.8.24244

	Section 6. LOG OF HOLE					
	in Feet To	Thickness in Feet	Color and Type of Material Encountered			
From D	8	- B	oil soaked gyp			
	13	5	дур			
	17	4	gyp & clay			
	19	2	anhydritic sand			
	20	1	anhydritic sand & gravel			
			-			
-	ļ. <u></u>		-			
	İ					
	<u> </u>					
	 					
			λ			

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Drille

EJELD ENGR. LOG

A) Owner of well NAVAJO REFINING COMPANY Owner's Well No. 20 Street or Post Office Address Drawer 159	3
5(700) 01.000 01.000	
City and State Artesia, N M 88210	
/ell was drilled under Permit No. RA 6975 X 6 and is located in the:	
a. NE 1/4 SE 1/4 Slul 1/4 of Section 9 Township 1.7 S Range 98 26 f	N.M.P
b. Tract No of Map No of the	
c. Lot No of Block No of the	
Subdivision, recorded in County.	
d. X= feet, Y= feet, N.M. Coordinate System sthe	Zone
B) Drilling Contractor S. Dale Hughes License No. 110.749	
ddress Route 1, Box 199 A, Artesia, N M. 88210	
rilling Began	8
levation of land surface or at well is361 ft. Total depth of well30	
ompleted well is X shallow artesian. Depth to water upon completion of well 10	
Section 2. PRINCIPAL WATER-BEARING STRATA	
Depth in Feet Thickness Estimated From To in Feet Description of Water-Bearing Formation (gallons per	
From To Mirect (gamons per	uic)
10 12 2 anhydritic sand na	
	· · · ·
·	
Section 3. RECORD OF CASING Diameter Pounds Threads Depth in Feet Length T (2) Perfo	rations
Diameter Pounds Threads Depth in Feet Length Type of Shoe From Top Bottom (feet) Type of Shoe From	To
6 PVC 30 25	30
	<u> </u>
Section 4. RECORD OF MUDDING AND CEMENTING	
Depth in Feet Hole Sacks Cubic Feet of Mud of Cement Method of Placement	
0 10 8 4 hand	
Section 5. PLUGGING RECORD	
lugging Contractor Depth in Feet C	ubic Feet
lugging Method No. Top Bottom o	Cement
lugging approved by:	
State Engineer Representative 3 4	
FOR USE OF STATE ENGINEER ONLY	
Date Received August 19, 1982	
Quad FWL FSI	
File No. RA-6975 X 6 Use Location No. 17.26.9.34223	

			Section 6. LOG OF HOLE
	in Feet	Thickness	Color and Type of Material Encountered
From	То	in Feet	
0	5	5	gyp & red clay
	10	5	и и
	12	2	anhydritic sand & gravel
	25	13	gyp & gravel
	30	5	дур
	•		,
	-		
	<u> </u>		
<u> </u>			
	-		
			
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Section 7. REMARKS AND ADDITIONAL INFORMATION

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The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Nale Augher Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. tions, except Section 5, shall be answered as completely and accurate to possible when any well is drilled, repaired or deepers. When this form is used as a plugging record, only Section 1(a) and Section need be completed.

EIELD ENGR. LOG

Section 1. GENERAL INFORMATION

Street or	Post Office Ad	ldress	Draw	er 159		Own				
										
	4 2	No. RA 65						_		
						<u>17 S</u> R				
b. Tract	No	of Map No =		of the _						
		of Block No in								
					-	e System		_		
					Coordinate	s system				
3) Drilling (Contractor	S. Dale	Hughes			License No	₩D 74	9		
ddress		Route 1. E	Box 199 A	. Artesia	N M	88210				
rilling Began	7/20/82	Compl	eted7/2	1/821	vpe tools	Air rotary	Size of	f hole	 8i	
						ft. Total dep				
	_									
ompleted we	llis K∟ si	hallow 🗆 ar			•	er upon completio	on of well		f	
Depth	in Feet	Secti Thickness	on 2. PRINCII	PAL WATER-E	BEARING S	STRATA	Esti	mated Y	'ield	
From	То	in Feet	Des	scription of Wa	ter-Bearing	Formation	(gallons per minute)			
20	21.5	1.5	Anhyo	dritic sar	nd		П	8		
							ļ			
		,	Section 3	RECORD OF	CASING				·	
Diameter (inches)	Pounds per foot	Threads per in.	Depth in Top	Feet Bottom	Length (feet)	Type of Si	hoe F	e Perforations From To		
6	PVC		·		22			19	22	
Depth	in Feet	Sectio Hole	n 4. RECORD Sacks	OF MUDDIN	G AND CEI					
From	То	Diameter	of Mud		ement	Meti	hod of Placer	ment =	<u>, </u>	
0	8	8			i	hand				
	-									
			Santian I	5. PLUGGING	DECORD					
lugging Cont	ractor		Section .		- KECOKD					
ddress	od	•			No.	Depth i			bic Feet	
ate Well Plug	ged					Тор	Bottom	OI	Cement	
lugging appro	oved by:			· ·	_ 3					
		State Engir	neer Represent	ative	4			<u> </u>		
ate Received	August 1			F STATE ENG		LY				

	Section 6. LOG OF HOLE									
Depth From	in Feet To	Thickness in Feet	Color and Type of Material Encountered							
0	5	5	miscellaneous fill							
	10	5	oil stained gyp							
	15	5	дур							
	20	5	дур							
	21.5	1.5	anhydritic sand & gravel							
	=									
	•		*							
	72.									
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	ļ									
· ·	İ		,							
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Section 7. REMARKS AND ADDITIONAL INFORMATION

MIN OF CHE

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Dale Hunkes

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. :tions, except Section 5, shall be answered as completely and accure s possible when any well is drilled, repaired or deepens. When this form is used as a plugging record, only Section 1(a) and Sectio. need be completed.

EIELD ENGR. LOG

Section 1. GENERAL INFORMATION

levation of la	nd surface or			at well	is3358	_ ft. Total depth o	f well	21.5		
ompleted wel	lis 🗓 st	iallow 🗆 a			•	apon completion o	f well8			
Depth	in Feet	Sec Thickness		PAL WATER	R-BEARING ST	RATA	Estimated	Vield		
From	in East			scription of V	Vater-Bearing Fo	ormation	(gallons per minute)			
18	20	2	anh	ydritic	avel	na ———				
							··			
	<u> </u>									
	T D- 4-	1		3. RECORD			Pf-			
Diameter (inches)	Pounds per foot	Threads per in.	Depth in Top	Bottom	Length (feet)	Type of Shoe	Perforation From			
6	PVC				22		17	22		
								ļ		
								<u></u>		
		Secti	on 4. RECORI	OF MUDDI	NG AND CEMI	NTING				
	in Feet To	Hole Diameter	Sacks of Mud		bic Feet Cement	Method	of Placement.			
										
From	4 =	8			2	hand	÷			
	4 :	8			2	hand	÷			

Use Observation Location No. 17.26.9.13222

File N-RA-6975 X 8

Denth	Depth in Feet Thic		Section 6. LOG OF HOLE
From	То	in Feet	Color and Type of Material Encountered
0	5	5	oil soaked gravel, sand & gyp (fill)
	10	5	gyp
	15	5	дур
	18	3	gyp & gravel
	20	2	anhydritic sand & gravel
	21.5	1.5	gyp & gravel
	-		
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÷			
	,		·
			· · · · · · · · · · · · · · · · · · ·
			
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Section 7. REMARKS AND ADDITIONAL INFORMATION

STEELLLA LET

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Note Hugher Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. :tions, except Section 5, shall be answered as completely and accur: s possible when any well is drilled repaired or deepen. When this form is used as a plugging record, only Section 1(a) and Section of the section of the State Engineer. It is a possible when any well is drilled repaired or deepen. When this form is used as a plugging record, only Section 1(a) and Section of the section of the state Engineer.

EIELD ENGR. LOG

A) Owner of	f well <u>N</u>	AVAJO REF	INING CO	MPANY		Owne	r's Well No.	31		
	Post Office Ad State	U.C.33	rawer 1 A, N M		· · · · · · · · · · · · · · · · · · ·					
•		No. RA-69	75-X-9		and is loca	ited in the:				
a. —Stá	_ ¼ -NE ¾	-SE 14 -NI	¼ of Sec	ction 8	Townshi	p <u>175</u> Rai	nge <u>26 E</u>	N.M.P		
b. Tract	No	of Map No.		of th	ie	*	<u>-</u>			
c. Lot N	ō _	of Block No		of th	ıe					
	•	d in						*		
d. X≈ the		_ feet, Y=			N.M. Coordin	ate System		Zone Gra		
B) Drilling (Contractor _S_	Dale Hug	199	·		License No	<u>ЫD 749</u>			
Address	Rt.	1, Box 1	99 A, Ar	tesia, N	M. 882	יום				
Orilling Began	10/19/8	2 Comp	leted <u>10</u>	/19/82	Type tool	s Auger	Size of	hole 8		
Elevation of la	nd surface or _			at w	ell is <u>3365</u>	ft. Total depth	of well	22		
Completed wel	lis 🔀 s	hallow 🔲 ai	rtesian.		Depth to w	ater upon completior	of well	10		
·		Sect	ion 2. PRIN	CIPAL WATI						
<u>-</u>	in Feet	Thickness				ng Formation		nated Yield s per minute)		
From To in Feet 14 16 2						y-brown silty	 	NA NA		
		,								
				· ····	`					
	l		Section	n 3. RECORI	OF CASIN	G.	<u> </u>			
Diameter	Pounds	Threads	Depth	in Feet	Length	Type of Shi	oe	Perforations		
(inches)	per foot	PVC	Тор	Bottom	(feet)		Fr	13 18		
		100			10			15 10		
	L	Section	on 4. RECO	RD OF MUD	DING AND C	EMENTING	I			
Depth From	in Feet	Hole Diameter	Sack of M	cs (Cubic Feet of Cement	1	od of Placen	nent ,		
0	12	8			4 sx	hand placeme	ent	<u> </u>		
	:							-		
			1							
	<u> </u>	<u> </u>	L	1		<u>L</u>				
n				n 5. PLUGGI	NG RECORI	D				
Address						Depth in	Feet	Cubic Feet		
Plugging Metho					N	Top	Bottom	of Cement		
Date Well Plug Plugging appro	_		,		<u>1</u>			 		
* ct.,	·	Paras P. 1	D- : :							
		State Engi	neer Repres	entative	4			<u> </u>		
			FOR USE	OF STATE I	ENGINEER C	ONLY				
Date Received	Novembe	er 9, 1982		Qua	d	FWL .		FSL		
	··· na cosc			•						
File No	RA-6975	ーメーソ		Use Obse	rvation	Location No	1, 26,0	<u> </u>		

			Section 6. LOG OF HOLE
	in Feet	Thickness	Color and Type of Material Encountered
From	То	in Feet	1
0	2	2	brown topsoil with gravel & concrete
2	3	1	brown silty clay w white pebbles
3	7	4	IXER silty clay dense
7	81/2	1 1 2	tan silty clay
81/2	14	51/2	gray silty clay with gyp & unweathered anhydrite
14	16	2	dolo gravel water bearing seams w gry-brn silty clay
16	20 =	4	brown sandy silty clay
20	22 ₹	2	red clay well sorted
			*
			-
		ļ. <u> </u>	
		_	
 '			
			1

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

- Maghis-Drille

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. F tions, except Section 5, shall be answered as completely and accurate possible when any well is drilled, repaired or deepen. When this form is used as a plugging record, only Section 1(a) and Section leed be completed.

EIELD ENGR. LOG

A) Owner of Street or	wellPost Office Ad	MAVAJO RE	FINING C	OMPANY 159 88210			Owne	r's Well No	32	
	State					locat	ed in the			
								26 E		
						•	<u>17 S</u> Rar	Ŭ		
	*									
	o vision, recorded									
d X=	•	feet. Y=		feet. Ì	N.M. Coor	dina	te System			_ Zone
B) Drilling C	ContractorS.	Dale Hu	ighes	· · · · · · · · · · · · · · · · · · ·			License No	WD 749		
Address	Rt. 1	, Box 199	A, Arte	esia, N M	882	חני				
Orilling Began .	10/20/0	32 Com	pleted	10/20/82	Type t	ools	Auger	Size of I	hole	3
Elevation of lar	nd surface or			at w	ell is 33	63	ft. Total depth	of well	24	
Completed well	lis Dd sh	allow 🔲	artesian.		Depth to	o wai	ter upon completion	of well	10	
		Sec	ction 2. PRIN	CIPAL WATI						
	in Feet	Thickness in Feet		Description of					ated Y	
From 16	To	6	Anhyo	dritic sa	nd & p	ebt	oles with	(gallons per minute)		
· · · <u> · </u>			brown	nish red	sandy	sil	ty clay			
										
								<u> </u>		
Diameter	Pounds	Threads		in Feet	D OF CAS			Perfora	tions	
(inches)	per foot	per in.	Тор			et)	Type of Sho)e 	om_	То
2	PVC				2	22		17	7	22
				<u> </u>						
				RD OF MUD			EMENTING	-		
From	in Feet To	Hole Diameter	Saci of M		Cubic Fee of Cemen		Metho	od of Placement		
0	16	8			5 sx		Rose Gravel	truck		
	:									-
			Section	on 5. PLUGGI	ING RECO	ORD				
Plugging Contr. Address	actor				г		Depth in	Feet		- Feet
	od					No.	Тор	Bottom		ement
Plugging appro						2				
	<u></u>	State En	gineer Repres	entative		<u>3</u>				
			FOR USE	OF STATE E	ENGINEE	R O	NLY			
Date Received	November	r 9, 1982		Qua	ıd		FWL _		FSL_	
File No	RA-7098-	-X-6		rice Obse	rvation	2	_ Location No	7. 26.8.	24	22

			Section 6, LOG OF HOLE
	in Feet To	Thickness in Feet	Color and Type of Material Encountered
From	2 1 /2	2 1 /2	Dark brown topsoil
21/2	4	11/2	lt. brown silty clay with unweathered anhydrite
4	6	2	tan silty clay
6	6 1	1/2	red silty clay
6 1	10 1	4	lt brown silty clay with pebble seam at bottom
101	13	2 1	tan silty clay
13	16	3	Brey Pritry Clerk Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
16	22	6	anhydritic sand & pebbles with brn-red sdy, silty clay
22	24	2	red clay hard

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

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EIELD ENGR. LOG

Section 1. GENERAL INFORMATION

Owner of well NAVAJO REFINING COMPANY Owner's Well No. 33 Street or Post Office Address Drawer 159 City and State ARTESIA, N M 88210											
•	d under Permit					ed in the:		···-			
						17 S Ra	nge 26	Ε	NMDI		
	*										
	o vision, recorded										
	,				•	te System	•				
						te System			Gran		
3) Drilling (Contractor	S, Dale	Hughes			License No	WD 749				
ddress	R	t. Box 1	99 A. Ar	tesia. N	M 882.	10					
						Auger					
levation of la	nd surface or —					3 ft. Total depth					
ompleted wel	llis □X sh	iallow 🗆	artesian.		Depth to wa	ter upon completion	n of well	10	f		
		Se	ction 2. PRINC	CIPAL WATE	R-BEARING	STRATA					
Depth From	in Feet To	Thicknes in Feet	1 T	Description of	Water-Bearin	g Formation	tion Estimated Yield (gallons per minute)				
	17	2 1	Onby	cand with	th white	oray cilty	ty clay NA				
141/2	17	2-2	Aility.	Salid mi	CII WIII CE	gray silty	Jay	1011			
								·			
						····					
			Section	n 3. RECORD	OF CASING						
Diameter (inches)	Pounds	Threads	Depth i		Length	Type of She	oe		ations		
2	per foot	per in.	Тор	Bottom	(feet) 18			om 3	18		
		 									
,,,,, <u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>											
		Sec	tion 4. RECOR	RD OF MUDD	ING AND CI	EMENTING					
Depth From	in Feet To	Hole Diameter	Sack of Mu	1	bic Feet Cement	Meth	od of Placen	nent .			
		В			4 sx	Rose Grave	1 truck				
0 12			-		7 37						
			-								
				1							
	-		Section	n 5. PLUGGIN	G RECORD						
	actor			n S. PLUGGIN	G RECORD	<u> </u>					
lugging Conti				n 5. PLUGGIN	IG RECORD	Depth in			bic Feet		
lugging Contr ddress lugging Metho ate Well Plug	od			n S. PLUGGIN	No.	Depth in	Feet Bottom		bic Feet Cement		
lugging Contr ddress lugging Metho	od			n S. PLUGGIN	No.	Depth in					

Use Observation Location No. 17. 26 8.2422

RA-7098

Depth i	in Feet	Thickness	Section 6. LOG OF HOLE
From	То	in Feet	Color and Type of Material Encountered
٥	4	4	Brown topsoil
4	13	9	1t brown silty clay w anhy.
13	141/2	1 1 2	gray silty clay
141/2	17	2 1	anHyd. send in white gray silty clay & red-tan clay
17	19½	2 1 /2	red clay
			_
	*		·
			
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Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

HI-Mis Ofiller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. A tions, except Section 5, shall be answered as completely and accurat possible when any well is drilled, repaired or deepen. When this form is used as a plugging record, only Section 1(a) and Section leed be completed.

FIELD EHGR. LUG

A) Owner of well NAVAJO REFINING COMPAN Street or Post Office Address Drawer 159 City and State ARTESIA, N M 88210										. Ow	ner's We	li No	31	<u> </u>		
				io. RA-70		•				is locat	ed in the:					
	a. SE	% N	E_ ¼.	_SE_ %	NE_	¼ of Se	ction	В	_ To	wnship	17_S_	F	Range	26 E		N.M.P.M
										_			_			
			_													
				in											_	
				feet, Y=							e System					_Zone ir Grant
B)	Drilling Co	ontractor		5	Dale	Hugh	es				License	No	<u> </u>	749		
ddre	ess		Rt.	Box 19	9A.	Arte	sia.	NM		88210						
)rillin	ng Be gan _	_10/	20/8	12 Com	pleted	10/	′2D/82		Туре	e tools .	Auge	r	s	ize of ho	leE]in
Elevat	tion of lan	d surface	or			-14		at well	is	3363	ft. Tota	ıl dep	th of we	112	2	ft
	leted well	-	_	allow 🗆							er upon com					
Jinp	icica well										STRATA		o			
	Depth is	n Feet		Thicknes	s									Estimat		
F	From To in Feet				Description of Water-Bearing Formation						(ganons per minute)					
	16	20		4	<u> </u>	nhyd.	sand	in	ļray	sil	ty clay & gyb NA					
													_			
						Sectio	n 3. REC	ORD (OF CA	ASING	——————————————————————————————————————					
	ameter	Pound per fo		Threads per in.			in Feet			ength	Туре	of S	hoe		rforat	
	2	per ro	PVC			ор	Botto	om		feet) 21				From 16	-	<u>To</u> 21
	-									- <u>-</u>						
											-			-		
							<u> </u>	1					··	<u> </u>		
	Depth i		\Box	Hole	ion 4.	Saci	cs	Cu	bic F	eet	MENTING	Met	thod of l	Placemen		
	tow	To		Diameter	+	of M		 	Ceme	ent	C C				- 3	
	0	15	ž	8	+			2	SX		Rose Gi	rave			-	
			*		-	 -										
								<u> </u>						·		
						Sectio	n 5. PLU	GGING	S REG	CORD						
'luggi	ing Contra	ctor														
	ess									No.			in Feet			Feet
	well Plugg						•			1	Тор		Botte	om	- OI C	ement
luggi	ng approv	ed by:								2						
		_		State En	gìneer	Repres	ntative			4						
			·			R USE	OF STA	TE EN	GINE	ER ON	ILY			-		·····
	Danian d	Nove	mber	9, 1982	•											
ate F	Keceiven			•,				Oned	٠.			E.M.			ei.	

Depth	in Feet	Thickness	Section 6. LOG OF HOLE
From	То	in Feet	Color and Type of Material Encountered
0	6	6	Brown topsoil & fill
6	10	4	Gray-brown silty clay with unweathered anhydrite
10	16	6	gyp in silty clay & unweathered anhydrite
16	20	4	anhydritic sand in gray silty clay & gyp
20	22	2	gray clay.
	=		
			*
	_		
			-
1.5			

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. I tions, except Section 5, shall be answered as completely and accurate possible when any well is drilled, repaired or deepens. When this form is used as a plugging record, only Section 1(a) and Section and Section and Section and Section are deepens.

EFELD ENGR. LUG

Street or	well Post Office Ac	dress	REFININO Drawe tesia, N	r 159	210		Own	er's Well No.	35		
•		No. RA 709				s located	d in the:				
							<u> 17 S</u> R	nge 26	Ε	NMPM	
						•		_			
	#										
		of Block No							=		
	•	_ feet, Y=		feet, N.1	M. Cod	ordinate	System			Zone in Grant.	
(B) Drilling C	Contractor	S. Dale H	ughes				License No	WD 749			
Address		Rt. 1, 80	x 199 A,	Artesia,	יו או	1 88:	210				
Drilling Began	10/20/	/82 Compl	eted	.0/20/82	_ Туре	tools_	Auger	Size of	hole_	8in.	
Elevation of lai	nd surface or _			at well	l is	3362	ft. Total dept	h of well	21	1 ft.	
Completed wel	lis ⊡XIs	hallow 🗆 ar Secti		I CIPAL WATER	•		r upon completio	n of well	7_	ft.	
Depth	in Feet	Thickness		Description of V	-				nated Y		
From	To	in Feet				igallons per minute) Light gray sdy silty NA					
					ay						
							•				
		1	Section	a 3. RECORD	OF CA	SING					
Diameter	Pounds	Threads	Depth		Le	ngth	Type of Sh	oe	Perforations		
(inches)	per foot	per in.	Тор	Bottom	-	eet) 20	1,7,7	F	om 5	то 20	
							-				
					-		 				
	<u> </u>	Section	n 4 RECOE	RD OF MUDDI	NG A	ND CEN	AENTING				
Depth From	in Feet To	Hole Diameter	Sack of Mu	s Cu	bic Fe	eet		od of Placen	nen t		
0	14	8	Of Mil		of Cement 4 1/2 sx Rose Grave		el Truck ÷				
	:								-		
Pl Canta			Sectio	n 5. PLUGGIN	G REC	CORD		_			
Plugging Contr Address						No.	Depth is	n Feet		bic Feet	
Plugging Metho Date Well Plug			•		_	. 1	Тор	Bottom	of	Cement	
Plugging appro	-					2					
		State Engir	neer Represe	entative		4					
Date Received	November	9, 1982	FOR USE	OF STATE EN	GINE						
• •				Quad			FWL				
File No	RA-7098-	X-2		_ Use Observ	vatio	n	Location No.	1.26.9	132	_3	

			Section 6. LOG OF HOLE							
	in Feet	Thickness	Color and Type of Material Encountered							
From 0	To 2	in Feet 2	Brown-ehite topfill							
2	5	3	brn-gry silty clay with gravel & gyp							
5	10	5	lt. brn silty clay with gravel							
10	1112	1 1/2	lt. brn silty clay with gravel							
$11\frac{1}{2}$	15	31/2	white silty clay w anhydrite							
15	20	5	dolomite seams in tight gray sand-silty clay							
20	21 1	11/2	dry tight white silty clay with anhydrite							
	-									
 ;										
			,							

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

- Aleghur Driller

STATE ENGINEER OFFICE

	WELL RECORD							ELELI) Fi	
			Section 1.	GENERA	L INFOR	MATIO	N		2 ,2/10	n. LU
A) Owner of	well	NAV	AJO REFIN	ING COI	MPANY		Ow	ner's Well No.	36	
Street or	Post Office Ad State	dress		er 15	9					
-								···		
Vell was drilled	l under Permit 1	No. RA	7098 X 3		and	is locate	d in the:			
						-	<u> 175</u> F	J		
b. Tract	No	of Map No	o	01	f the					
c. Lot N	o	of Block No.		o	f the					
	vision, recorded								=	
					t, N.M. Co	ordinat	e System		- 2	_Zone i _Gran
3) Drilling C	Contractor	S. Da	le Hughes				License No	MD 749	2	
ddress		Rt. 1.	Box 199	A. Ar	tesia.	N M	88210			
		-					Auger			-
levation of las	nd surface or —		·····	at	well is	3360	ft. Total dep	th of well	25	f
ompleted wel	lis 🗓 sh	allow 🗆	artesian.		Depth	to wat	er upon completi	on of well	_ 7	f
		Se	ction 2. PRING	CIPAL WA	TER-BEA	ARING S	STRATA			
Depth	in Feet	Thicknes	· •	Description	of Water	Bearing	Formation		nated Yie	
From 14	To 15½	in Feet					igh t gype (s per mir VA	nute)
14	1,72	12	Ailiyu	• Clay	cy and		Tgitt gype (·		
										
		-								-
	I			n 3. RECC	1					
Diameter (inches)	Pounds per foot	Threads per in.	Тор	in Feet Bottor		ength (feet)	Type of S	hoe Fr	Perforati om	To
2	PVC		-			17		1	2	17
			• "		_					
									l_	
		Sec	tion 4. RECOR	RD OF MU	JDDING A	ND CE	MENTING			
Depth From	in Feet To	Hole Diameter	Sack of Mu		Cubic F of Cem		Me	thod of Placen	nent	
0	11	8			4 sx		Rose Grav	vel Truck	7	
	*				7 5		11036 010		-	
	:									
	7					1				
	•					4.				
–			Sectio	n 5. PLUC	GING RE	CORD				
lugging Contr ddress	actor					<u> </u>	Denth	in Feet	Oubi	c Feet
lugging Metho						No.	Тор	Bottom		ement
			···			1 2	 		 	
ate Well Plug	ved by:				_					
Date Well Plug lugging appro	ved by:	State Fr	gineer Repress	ntative		3				

RA-7098-X-3

File No.___

Use Observation Location No. 17.26,9.1342

Thickness in Feet	Color and Type of Material Encountered
41/2	Brown soil & fill
3 1	lt brn silty clay with gravel
6	gray silty clay
11/2	anhydritic clayey sand in tight gyp clay
31/2	white clay with anhydritic nodules, gyp
5	red-gray clay
₹	
	: <u>.</u>
	,
	in Feet 4\frac{1}{2} 3\frac{1}{2} 6 1\frac{1}{2} 3\frac{1}{2}

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Wale Hugher Driller

INSTRUCTIONS: This form of the State Engineer. All drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section 5 seed be completed.

FIELD FINGR. LOG

Street or	well Post Office Ad State	dress	Drawer 1	88210		Own	ner's Well No	o	
•			198 X 4		and is loca	ted in the			
							20		
					`	<u>17 5</u> R	•		
	-								
								=	
					A. Coordina	ate System			
) Drilling C	ontractor	S. Dale	Hughes			License No	WD 749		
idress		Rt. Box	199 A. Art	tesia,	<u>n m b</u> e	3210			
rilling Began .	10/21/8	Compl	eted <u>10/21</u> /	/82	Type tools	Huger	Size o	f hole	8in.
evation of lan	d surface or _			at well	is3361	ft. Total dept	h of well	201	<u></u> ft.
ompleted well	is 🗓 si	nallow 🗆 ar	tesian.	1	Depth to wa	ater upon completio	on of well	8	ft.
Danih :	- Foot		on 2. PRINCIPA	L WATER	-BEARING	STRATA	T		,,,,
Depth i From	To	Thickness in Feet	Descri	iption of W	ater-Bearin	g Formation		imated Y	
14	18	4 -	Anhydriti	ic sand	in lt.	gray silty	clay w	дур	NA
				····			_		
			-						
			Section 3. F	RECORD (OF CASING)			
Diameter (inches)	Pounds per foot	Threads per in.	Depth in Fe	ottom	Length (feet)	Type of Sh	ioe F	Perfor	ations To
2	PVC				17			12	17
	· · · · · · · · · · · · · · · · · · ·	Section	n 4. RECORD O	E MIIDDII	NG AND C	EMENTING			
Depth i		Hole	Sacks of Mud	Cu	bic Feet		od of Place	ment	
From	11	Diameter 8	OI Mud		Cement	Rose gravel truck			
	:								
l		<u> </u>							
ugging Contra	ector		Section 5. I	PLUGGING	G RECORD)			
ddress					No	Depth is			bic Feet
ugging Metho ate Well Plugg			1.11		$=$ \vdash \vdash	Тор	Bottom	of	Cement
ugging approv					-				
		State Engir	neer Representati	ve	- 3 4				
			FOR USE OF S	TATE EN	GINEER O	NLY			
te Received	Novembe	r 9, 1982		Quad _		FWL		FSL.	
		_¥4		-					
File No	RA-7098	-A-4	Us	euserv	at TOU	Location No. 1	1.46.	11127	

			Section 6. LOG OF HOLE
Depth From	in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	2 1	2 1	Brown topsoil & fill
2 1 /2	5	2 1	Dark brown silty clay
5	14	9	Lt. brn silty clay
14	18	4	Anhydritic sand in light gray silty clay with gyp
18	20 1	21/2	Tight gray clay
	-4		
	₹		
			• -
<u>-</u>			
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·-			

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller

INSTRUCTIONS: This for of the State Engineer. AL drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section 5 are described.

EIELD ENGR. LUG.

A) Owner of	well Post Office Ad	dress	Drawer	<u> 159</u>	PANY		Owner	s Well No	38
City and	State	AR	TESIA.	NM	88210				
Vell was drilled	under Permit	No. <u>RA 70</u>	98 X 5		and	is loca	ted in the:		
						_	<u>17_S</u> Rang		
b. Tract	No	_ of Map No.		0	of the				
		of Block No							
_		in <u> </u>							-
							te System		
B) Drilling C	Contractor	S. Dale	Hughes				License No	WD 749	
ddress		Rt. 1, Bo	× 199 A,	Artes	ia, N	<u>m</u>	38210		
rilling Began .	10/21/	B2 Comp	leted <u>10</u>	/21/82	Typ	e tools	Auger	Size of I	nole <u>8</u>
levation of lar	nd surface or _			a	t well is_	336:	ft. Total depth o	of well	231/2
	tia [177] at	nallow 🗀 a	rtesian		Denti	h to wa	ter upon completion of	of wall	6
ompleted well	lis LAD SI	ialiow 🗀 a	riesian.		Dept	n to wa	ter upon completion of	or well	
			tion 2. PRIN	CIPAL W	ATER-BE	ARING	STRATA		
Depth From	in Feet To	Thickness in Feet	1	Description	n of Water	-Bear in	g Formation		ated Yield per minute)
16	21	5	Anhyd	nitio	cand &	dole	pebbles with	. N	IA
10				silty		0010	J PEDDIES WIG		
	<u> </u>								
	<u> </u>								
	<u> </u>	<u> </u>	Saction		ORD OF C	ASING			· · · · · · · · · · · · · · · · · · ·
Diameter	Pounds	Threads		in Feet		ength			Perforations
(inches)	per foot	per in.	Тор	Botto	m	(feet)	Type of Shoe	Fre	om To
2	PVC			-		21		1	.6 21
				-					
				<u> </u>					
Donth	in Feet	Section Hole	on 4. RECO				EMENTING		
From	To	Diameter	of M		Cubic I of Cem		Method	of Placem	ent -
0	15	8			5	sx	Rose Gravel Truck		<u>.</u>
	:								
	F								
<u> </u>		·	Section	on S. PLUC	GGING RE	CORD			· .
									
	od					No	Depth in F	eet Bottom	Cubic Feet of Cement
Date Well Plug	ged					1			
lugging appro	ved by:					3			
		State Eng	ineer Repres	entative		4			
	***************************************	**************************************	FOR USE	OF STAT	FENCIN	FFPO	NI Y		
Date Received	November	9, 1982	I OR USE	OI SIAI	L ENGIN	LLK U	14. I		
,					Quad		FWL _		FSL
File No	RA-7098-	·x-5		lice Ob	servati	on	Location No. 17.	26.9.1	344
FIIE NO	V4-1030-	<u></u>		ose			Location No		-

		Thickness	Section 6. LOG OF HOLE							
	Depth in Feet		Color and Type of Material Encountered							
From	То	in Feet								
O	4	4	Brown topsoil							
4	6 1	2 1	Brn silty clay							
6 1	10	31/2	Lt. brn silty clay - soft							
10	11	1	Very hard Anhydrite							
11	. 16	5	gray soft silty clay							
16	21	5	Anhydritic sand & dolomite pebbles with dense gray silty							
21	23 1	2 1 /2	Very tight gray clay marbled with anhydrite							
	-									
	, र									
			·							
			-							
	l									
			·							

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

INSTRUCTIONS: This for ould be executed in triplicate, preferably typewritten, and submitted to ons, except Section 5, shall be answered as completely and accurate.

drilled, repaired or deepened. when this form is used as a plugging record, only Section 1(a) and Section 5 need be completed.

Tiller

Wells 31-38 also logged by Geraghty and Miller, Inc.

Geraghty & Miller, Inc.

Well	32	Sample Log	Page <u>2</u> of
Project 1	Vavajo Refin	nery Location SE corner of	Telephone Storage
Drilling (Contractor_D	.Anderson Driller Richard He	elper Eddic
Rig Type	Iollow Stem	Hole Diameter 8" inches Dril Date and Time 10/20/82	lling Fluid N/A Date and Time
		on Shelly Drilling Began 7:202M	4
Geraghty a	and Miller R	epresentative J. Dauchy T.	Bouvete
Blows per 6 inches	Recovery	Sample Description	Depth Feet to Feet
		Dark brown topsoil	0 - 2/2
		light brown silty day of unweather poo	fey 2/2 - 4
3-4-5	Split Spoon 5-6/2	tan silty clay, brittle, poorly sorted	4 - 6
		red silty clay	6 - 64z
5-6-10	Split Spoon 10-111/2	light brown sitty day, mottled, poorly sort	red 642-1042
	organic smell	Pebble seam wet, dolmite gravel, a	2" /0Yz
	Split Spoon	tan sitty clay, same as above	10/2-13
5-8-12	15-16/2 organic smell	gray silty day, well sorted, less dens anhydritic sand pebble seams interbed	se 13-16
9-16-17	17/2-19	brownish red sandy silty day	16-22
6-7-9	Split Spoon 20 - 21/2		-
7-8-9	Split Spoon 221/2-24	red clay, well sorted, dry & hard	22/2-24
			<u> </u>

Well	* 33	Sample Log	Page 3 of
Project_h	Vavajo Refin	rery Location NE of Colony	C Entrance Gate
Drilling	Contractor D	.Anderson Driller Richard I	ielper Eddic
Rig Type	tollow Stem	Hole Diameter <u>6"</u> inches Dri Date and Time 10/20/82 bn ShellyDrilling Began 10 004m	lling Fluid N/A
Type of S	ample <u>SplitSpo</u>	shelly Drilling Began 10:00Am	_Drilling End_12:30 pm
Geraghty	and Miller R	epresentative J. Dauchy T.	Bouvete
Blows per 6 inches		Sample Description	Depth Fee t to Feet
		Brown topsoil	0 - 4
,	1 4 1 T h .	light brown silly clay w/ unweathered po	
	organic smell	gray brittle silty cby white ired cors Analydritic sand interbedded in white	
3-7-8	15-16/z	Analydritic sand interbedded in white sity clay and reditan sity clay	14/2 - 17
5-5-7	Split Spen 17-18/2	red day	17 - 19/2
	·		
	.•		
	·		
		• •	

Well	34	Sample Log	Page 4 of			
Project_	Vavajo Refin	nery Location East Fence	e of Colony			
Drilling (Drilling Contractor D. Anderson Driller Richard Helper Eddie					
Rig Type	lollow Stem	Hole Diameter 8" inches Date and Time 10-20	Drilling Fluid N/A			
Type of Sa	ample SplitSpo	on Shelly Drilling Began 2:0	Drilling End 3:30pm			
Geraghty a	and Miller R	epresentative J. Dauchy	T. Bouvete			
Blows per 6 inches	e Recovery	Sample Description	Depth Feet to Feet			
		Brown Topsoil & Fill	0-6			
	organic smell	Gray brown mottled silty day w/ 2"	nweather poorly			
7-12-16	I SOUTH STORM					
	Shelby tube 15-17	very brittle gyp in silty day w/ w water bearing analydritic sand in silty day sayp.	nter lain in gray 16-20			
		gray clay, well sorted	20-22			
		1 7 9 9 7 1 Wall 2011ed				
·						
	·					
L	<u></u>	<u> </u>	·			

Well	35	Sample Log	Page_5_of
Project_h	Vavajo Refi	nery Location 5W corner @	L TEL weathering
Drilling (Contractor_D	Anderson Driller Richard H	elper Eddie
Rig Type	Iollow Stem	Hole Diameter 8" inches Dri Date and Time /0-20-82	lling Fluid NA
Type of Sa	ample <u>SplitSpo</u>	on Shelly Drilling Begain 4:25pm	Drilling End 5:4:
Geraghty a	and Miller R	epresentative J. Dauchy T.	Bouvete
Blows per 6 inches	% Recovery	Sample Description	Depth Feet to Feet
		Brown white topsill	0-2
		brown gray sitty clay w/ gravel (1) & gyp	-
		light brown siltyclay w/ gravel (38) mixed	
3-4-6	Don't Stook	light brown silty day wout gravel mois	\
		white silty clay w/ anhydrite, very wet	
	Splitspoon 15-16/2	water bearing domite gravel seams in tight grave same dry tight white silty clay w/ anh	lysiltyday 15-20
5-5-10	Split Spoon 20-21/2	dry tight white silty clay w/ anh	ydrite 20-21/2
·	•	·	
	·		
·			
		·	

Well	*36	Sample Log	Page 6 of
Project_	Vavajo Refir	nery Location North of	TEL in Non Hazardous Landfarm
Drilling (Contractor D	.Anderson Driller Richard	Helper Eddie
Rig Type	Iollow Stem	Hole Diameter 8" inches Date and Time 10/21/	Drilling Fluid N/A
Type of Sa	ample <u>SpitSpo</u>	on Shelly Drilling Began 7:20	Drilling End 8:35am
Geraghty a	and Miller Ro	epresentative J. Dauchy	T. Bouvete
Blows per 6 inches	% Recovery	Sample Description	Depth Feet to Feet
		Brown topsoil : fill	0-41/2
	organic smell	light brown silty clay w/ gravel (3	
	organicsmel	gray silty day of black, red, white water bearing, anhydritic dayer in tight are alay	coarse grains 8-14
18-33-50	15-16/z	in tight gyp alay	14-15/z
10-8-7	5plit Spoon 17/2-19	whitegray clay w/ anhydritic nodules	5, 94psum 15/2-19
		red gray day	19-25
		J , ,	
	·		
·			
			-
	·		
			· · · · · · · · · · · · · · · · · · ·

Well	*37	Sample Log	Page 7 of
Project_N	Vavajo Refin	nery Location NE Corner	of TEL
Drilling (Contractor D	.Anderson Driller Richard 1	Helper Eddie
Rig Type	Iollow Stem	Hole Diameter 8" inches Dr: Date and Time 10/21/62	illing Fluid N/A Date and Time
	•	on Shelby Drilling Began 1:05	
	and Miller K	epresentative J. Dauchy T.	
Blows per 6 inches	Recovery	Sample Description	Depth Feet to Feet
		brown topsoil- fill	0-Z ^y z
	organic stell	dork brown silty clay mottled	· 2 ¹ / ₂ - 5
		light brown silty day white ! black pebbles anhydritic sand in light gray	poorly 5-14
13-62-25	1 14-15/2	1 m/ all 0.	14-18
12-13-16	Split Speen 19-20/2	tight gray day well sorted	18-20 ^y 2
·			
	÷		
		·	
		·	

Well	考8	Sample Log	Page 8 of
Project_N	Vavajo Refin	nery Location East Fence	of TEL
Drilling (Contractor D	.Anderson Driller Richard B	elper <u>Eddie</u>
Rig Type	Iollow Stem	Hole Diameter 8" inches Dri Date and Time 10-21-82	lling Fluid N/A
Type of Sa	ample <u>SplitSpo</u>	on Shelby Drilling Began	_Drilling End
Geraghty a	and Miller Ro	epresentative J. Dauchy T.	Bouvete
Blows per 6 inches	% Recovery	Sample Description	Depth Feet to Feet
		Brown topsoil	0-4
:	organic smell	poorly sorted brown silty clay marbled w/ gray soft	
		light brown silty clay soft, poorly sor	·
	15/20/10/10/20	very hand anhydrite (cement/crystals) w/	•••
9-17-19	Split Speen 15-16/z		
4-8-9	Split Spoon 20-21/2	aray soft sity clay reddish tint, po anhydritic large grain sand : domite per bearing zones (1-2") interbed w/ dense gray	silly clay 16-21
8-13-13	5plit 5poon 22-23/2		
	•		

0-6-	Lt-Red Clay 50il	
	gyp anhy pebbles, clay	
14	gry gyp- oder gas	
174	gragyp, anhy Oil abor and stain	
18 1/2	anky, gyp, clay	
20	Red tgry shale, anny + anny xls, Red shale we	x+
21%	Red clay + anhy mixed with pebbles water	
21	mixed red 4 white anhy + clay- some pebbles	
	fine red & wht anhy with clay - dry.	
	:	

Well #40 Navajo Refining Company - Monitor wells

Drilling Contractor - D. Anderson, El Paso

Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"

Date 6-14-84 7asio 4 Chancy

Depth

Sample description

336136

0-4 50.1
82 gyp, anhy, gry shale dry
13 gyp, anhy, gry shale water
16 anhy, shale, gyp- Bleeding Oil
16 anhy, shale, gyp- Bleeding Oil 18th L+ gry fine anhy - no oil
19 14 L+ gry, tau, granular anhy - 0:1
20 14 gyp - water
23 yyp, anhy - water
23 th gyp, anhy - water 25 th Tan, fine, xIn anhy
28/4 Tan fxln onky - sand - gravel at 25.55
31'h Red sandy silt
,

⊍ell # <u>4</u> / Navajo F	Refining Compan	y – Monitor ι	uells	•
Orilling Contractor - D.	Anderson, El P	aso		
Rig – Hollow stem auger	,	Split spoon		18"
Date <u>6-15-84</u>	76510	4 Chan	104	

Depth Sample description

30:

0-15 Soil - Wet at 135 feet
16/2 wh++ Tau only + gyp-water
21 wht gyp with anhypieces (gravelly)
21 wht gyp with anhypieces (gravelly) 252 what gry gyp + anhy - deuse
272 gry sandy clay tight
29 Red 4 gry sandy clay
31 Red sandy shale (clay)

Well # $\frac{42}{}$ Navajo Refining Company - Monitor wells

Drilling Contractor - D. Anderson, El Paso

Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"

Date $\frac{6-18-84}{6-19-84}$. $\frac{7}{6}$. $\frac{7}{6}$. $\frac{7}{6}$. $\frac{1}{6}$. Sample description

0-10 Soil damp at 9'

14 1/2 wht gyp, anhy & clay - Light 19'2 wht gyp, anhy pebbles clay water 221/2 gyp + gry, red sanky silt 24 by fine gry shaloy silt with pobbles 29 gry Shaley, Sandy, Silt. 29 Red Shaley, Saudy, Silt

Well #43 Navajo Refining Company - Monitor wells
Drilling Contractor - D. Anderson, El Paso
Rig - Hollow stem auger 8" diameter Split spoon core barrel 18" Date 7-17-84 Chancy - 5trock
Date 7-17-84 Chancy - Stroat
7:15 aux - 12:10 pm Depth Sample description
Depth Sample desdription

	_	,
0-42 Soil		
, , , , , , , , , , , , , , , , , , ,		•
7 = mixed Red shale + gyp - vy red shale at botto	THE THE	_
9 67 mixed so; 14 gyp 88 gyp w HCR. odo	پال	gas
	1 1	/
10 = gyp with anky pebbles HCR-odor-no blag 12 .75 gyp wolanly belbles HCR- ,75 wht gyp 13 = 1-gyp w pebbles - gas stutodor-0=gyp-51.gi		
13= 1- gypw pebbles - gas stutdor-0=gyp-51.gi	1/1	y wet
15 0 gub+gravel-oil +wfr 12 gub argrel - wet-t	See	20H
16 D-gyptgravel-wt1-12 gry gyp-tight-i	de	/
18 0=gub+grave/wty-1=gubw+ddo ses-025 Red-] \$/*	-sul
16 0-gyptgravel-wtv-12 gry gyp-tight-v 18 02-gyptgravelwtv-12 gypwtdopes-02 Rol- 195 0-Rdsilty Saudyt places-02 Rel-fine Silty 225 Or 1 Rd 5.1ty Saud-TD.	13	au Les
225 Or 1 Rl 5.14 Sand - TD.		

Navajo Refining Company – Monitor wells

Well # 4 #

Orilling Contractor - D. Anderson, El Pa	150
KIN - HOTIOM 20011 40001	Split spoon core barrel 18"
Date 7-17-84 Chaney 2-pm 5:25pm	- stroud
Depth Sample description	336- 23
0-16 Red silty-saudy soil	
17 wht gyp- water	
185 wht-gyp-deuse	
20 o'whtgypans - 13	- Red silty sauly clas
225 Red Clay - T.D.	, , , , , , , , , , , , , , , , , , ,
	· ·
	•
	,

Well #<u>45</u>

Navajo Refining Company - Monitor wells

Orilling Contractor - D. Anderson, El Paso	
Rig - Hollow stem auger 8" diameter Split spoon core barrel 18" Date 8727/84 Stroud - Ledosma	
Depth Sample description By Effluent ditch at NW Corner farm 11' So. & ditch	
0-45 Red Soil dry 5 gyp- dry 65 63 wht gyp dry - 65 gry shale dry 8 gry sky shalo w very 1ge anhy pes- dry 95 18 gry shalo v gyp. I anhy gravel-95 gry shalo + anhy 10 2'cote 115 108 gry shalo w early pes- 113 anhy gravel-115 gry shi 49 dow 13 gry shalo w gyp-only pos- doup. 314 whom they shall 145 gravel at top: 14' and at 145 - gry shi w gravel strocks 27 bor 16 14 is gry shi + gravel - 15.16 gry shi to - why TD 16 casing gravel 16-10 Rellets 10-8 Cmy+ 85-0	de si si si si si si si si si si si si si

Well # 46 Navajo Refining Company - Monitor wells
Orilling Contractor - D. Anderson, El Paso
Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"
Date 8/20/84 Stroud-Ledesman
11:552
Depth Sample description Center north sede
Novago-Collier Farm
3334/11
0-65 Dark red 50.1
8 Lite Red soil 494 p dry
8 C/12 / 30/ 30/ 1 + 1 / 1 / 1
11 gry clay w gyp damp
125 gry clay, gyp, anhy pc tight-dry
14 gryclay-gyp. auky gravel - wtr
155 14-153- gry sly-shale 153-5 Red shale
17 Fine Red Shale.
7)
•
C.sq-17'
gravel + Rerts 17-12 Rellets 12-10
Rellets 12-10
Cunt 10-0

47 SAMPLE LOG
Well ### Navajo Refining Company - Monitor wells
Orilling Contractor – D. Anderson, El Paso
Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"
Date 8/27/84 Stroud-Ledesma
Date 8727/84 Stroud-Ledesma Bepth Sample description SE Connel Navago Collier 74
0-5 derk Red soil deup
10 lite Red soil dauge
115 Red Shale
13 Ovarge Red Shel Sauf
124 11 15 11
TD
Casing 14
Casing 14 gravel + Resp - 14-9
Rellets 9-8
Cunt 8-0

Well # AA Mavajo Refining Company - Monitor wells

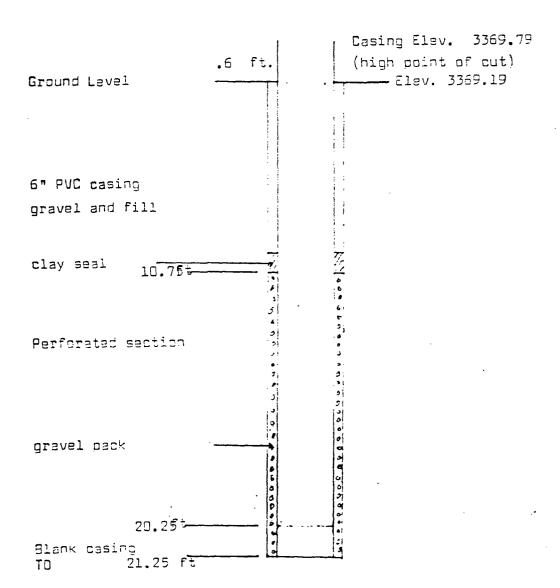
Orilling Contractor - D. Anderson, El Paso

Rig - Hollow stem auger 9" diameter Split spoon core barrel 18"

Date 6/8/83 11:15 am

		-
0 - 5	Fill - clay & gravel	_
5 - 6½	Red clay - fill?	_ :
6 1/2 - 8	Blk oil stained soil or fill Rec. 1' lost $\frac{1}{2}$ '	- h
8 - 9½	Heavy HCR (hydrocarbon residue) in gypsum – oil odor Rec. 1' lst $\frac{1}{2}$ '	Red Clay
9½ - 10	Orill gyp	BIK Oul
$10 - 11\frac{1}{2}$	1.1' gyp oil odor .4' gyp & red clay oil odor	Heavy HCT
11- 13	.5' porous gyp heavy gasoline odor. I' gyo with gasoline odor	12 941
$13 - 14\frac{1}{2}$.5' porous gyp gasoline dripping. l' gyp	Gashne
$14\frac{1}{2} - 16$.3' porous gyp with free gasoline. 1.2' gyp sli por gasoline odor. Tr gray clay	
$16 - 17\frac{1}{2}$	l' gyp & lst gravel with gasoline5' gyp no odor	15
$17\frac{1}{2} - 19$	gyp & lst gravel - water	and gyp + orace
19 - 19 ¹ / ₂	Orill gyp	Water gup 16 mi
$19\frac{1}{2} - 21$	1.2" gravel & gyp; water3' dry gravel - solid	20 6
21+	No go core. Rec. + .25' very crs gravel & gyp	TD 945
**************************************		•
OIL CONSE	-19 WH -19 WH -10 9 24 24 (7/27) RVATION DIVISION -3 96	·

Data _	6/8/93	•	Well	-;	
Compan	ny <u>Navajo Refining</u>				



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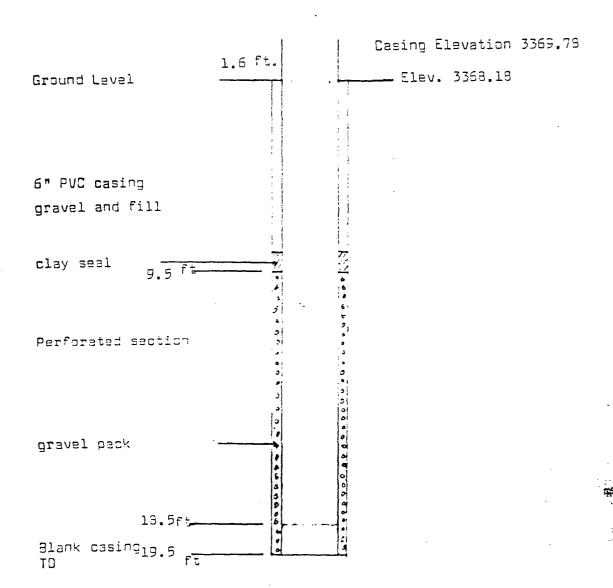
Well #	BA	Navajo P	lef:	Lning Compan	y – Mor	nitor u	Jells		
Orilli	ng Contracto	r - 0.	Апо	derson, El P	aso .				
Rig -	Hollow stem	auger	3"	diameter	Split	spoon	core	barrel	18"
Dato	6/0/93	7.15 20		•				÷	,

0 - 9 Sail - Fill - Red 9 - 10½ dk. gry gyp & clay with 1st pebbles and blk HCR seams. sli gas odor 10½ - 12 gravel (crs 1st pebbles in gyp) free gasoline 12 - 13½ crs. 1st pebbles in gyp free gasoline 13½ - 15 crs 1st pebbles in gyp free gasoline 15 - 16½ gyp & med gravel - gasoline & water 16½ - 19½ Drill gyp & gravel 74 Crss/re 15 Gasoline 15 - 16½ crs 1st pebbles in gyp free gasoline 16½ - 19½ Drill gyp & gravel 74 Crss/re 75 Gasoline 76 Gasoline 77 Crss/re 77 Gasoline 77 Crss/re 77 Gasoline 77 Crss/re 78 Gasoline				
sli gas odor 10½ - 12 gravel (crs 1st pebbles in gyp) free gasoline 12 - 13½ crs. 1st pebbles in gyp free gasoline 13½ - 15 crs 1st pebbles in gyp free gasoline 15 - 16½ gyp & med gravel - gasoline & water 16½ - 19½ Orill gyp & gravel Top Casoline Top Casoline The Casoline	0 - 9	Sail - Fill - Red		
10½ - 12 gravel (crs 1st pebbles in gyp) free gasoline 12 - 13½ crs. 1st pebbles in gyp free gasoline 13½ - 15 crs 1st pebbles in gyp free gasoline 15 - 16½ gyp & med gravel - gasoline & water 16½ - 19½ Orill gyp & gravel Top Gasoline	9 - 101/2		1	
13½ - 15 crs 1st pebbles in gyp free gasoline 15 - 16½ gyp & med gravel - gasoline & water 16½ - 19½ Orill gyp & gravel Tap Susoline	$10\frac{1}{2} - 12$		1	
15 - 16½ gyp & med gravel - gasoline & water 16½ - 19½ Orill gyp & gravel Typ Gasoline Typ Gasoli	$12 - 13\frac{1}{2}$	crs. 1st pebbles in gyp free gasoline .	54	
16½ - 19½ Orill gyp & gravel Tap Gesoline Tap Gesoline The gravel 15 15 15 15 15 15 15 17 17 18 19 19 19 19 19 19 19 19 19	13½ - 15	crs lst pebbles in gyp ffee gasoline		
Tap Gasoline Tap Gasoline Tap Gasoline Gasoline Gasoline Gasoline Gasoline Gasoline Gasoline Gasoline Gasoline Gasoline Gasoline Gasoline Tap Gasoline Gasoline Tap Gasoline Gasoline Tap Gasoline	$15 - 16\frac{1}{2}$	gyp & med gravel - gasoline & water	15	
Top Gusoline The Franch Top Gusoline Gliptill Grand Top Fli 7/2 5 Top Fli 7/2 5	$16\frac{1}{2} - 19\frac{1}{2}$	Orill gyp & gravel	<u> </u>	947.0000
-16.5 201 -11.34 Top fl. 7-3 TD	1		ere tre tre	Gasoline
5.13 Top fli 7/23	:	Top Susoline .	360	Algravel
5.13 Top fli 7/23			606 606	·
5.15 TP		ti de la companya de la companya de la companya de la companya de la companya de la companya de la companya de	5	gape ma
5.13 TP		-16.5 26 m		gust water
\vdash	1	-11,34 Top fld 7/23		<u> </u>
				TD -
			,	
MAR 06 1985				
OIL CONSERVATION DIVISION SANTA FE	C			

	•
Date	6/9/93

Well # _A3___

Company <u>Navajo Refining</u>



SAMPLE LOS

Well # AC Navajo Rafining Company - Monitor wells

Orilling Contractor - O. Anderson, El Paso

Rig - Hollow stem auger 9" diameter Split spoon core barrel 18"

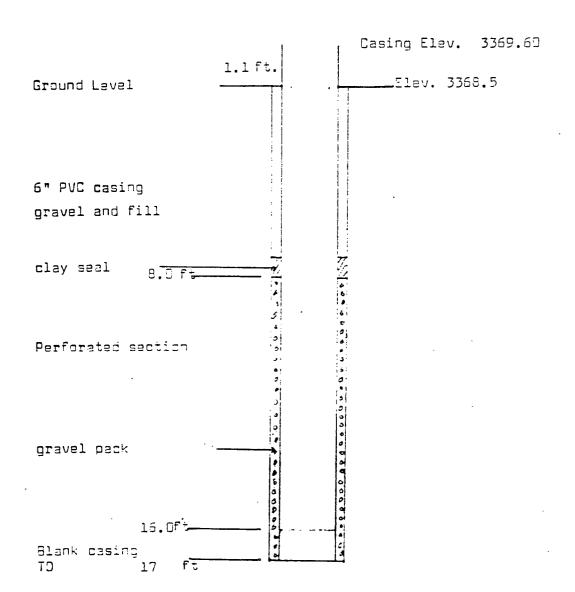
Date 6/9/83 10 am

Depth Sample description

SANTA FE

0 - 5 Fill dirt. Top lt red soil @ 5'	
5 - 8 Lt red soil. Top gravel 3 8'	
8 - 10 gravel & red soil	
$10 - 12\frac{1}{2}$ gravel & red soil or clay - top gyp gas odor	2
$12\frac{1}{2}$ - 13 Orill gyp	
13 - $14\frac{1}{2}$.5' gyp w gas & water some gry clay 1' gyp	grave! soil
$14\frac{1}{2}-15\frac{1}{2}$ gyp & gry clay. Sli gravel $14\frac{1}{2}-\frac{2}{4}$ water	10-600
$15\frac{1}{2} - 17$ 1.4' gyp wet .1' dry gyp	
	94P-19181 gas 4 water
	15 Water
	TD
-14.75 wti	
- 10.47 41/ 1/23	20-
- CL.77	
- BEGRIWIETT	_ .
MAR 06 1985	-
OIL CONSERVATION DIVISION	•

Date	6/9/83	Well	#	20
Company	lavajo Refining			



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SAMPLE 1100

Well # AD Navajo	Refining Company	y – Monitor wa	lls
Orilling Contractor - 0.	Anderson, El Pa	aso	
Rig – Hollow stem auger	9° diameter	Split spoon o	ore barrel 18°
Date <u>6/9/83</u> 1:55	DM		

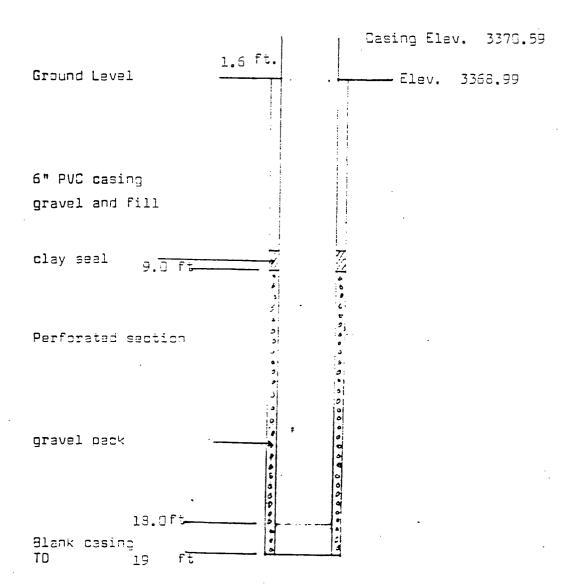
$0 - 7\frac{1}{2} $ Fill	
$7\frac{1}{2}$ - $11\frac{1}{2}$ Sandy gravel	
$11\frac{1}{2}$ – 12 Orill gyp odor gas	
12 – 13 $\frac{1}{2}$ gyp w 1st peobles (gravel) gasoline – fair porosity	
$13\frac{1}{2}-15$ gyp w anhydrite pcs - no gravel. Fair to poor poro Odor gasoline l' - No odor bottom .5'	sity
15 - $16\frac{1}{2}$ gyp w anhydrite pcs - water	Sandy g ravel
$16\frac{1}{2} - 17\frac{1}{2}$ gyp w ahhydrite pcs – water	10
$17\frac{1}{2} - 19$ gyp TD	der gas
	anhya rile
	15
	Water
	- TD
THE GROWING TO THE PROPERTY OF	
MAR 06 1985	
OIL CONSERVATION DIVISION	A management of the
SANTA FE	

Date	6/9/83
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Well # __40

Company <u>Navajo Refining</u>



Well # AE Navajo Refining Company → Monitor wells

Orilling Contractor - D. Anderson, El Paso

Rig - Hollow stem auger 3" diameter Split spoon core barrel 19"

Date 6/10/83 7:15 am

O - 5 Fill & soil		
5 - 7 Gry clay & gyp	**	
7 - 9 Gry clay & gyp - change at bottom	- 1); 1	4
9 - 10 Drill	5	clau
10 - 11 ¹ granular gyp & anhy .8'. porous gyp .45' gasoline in whole core	•	941
$11\frac{1}{4}$ - 12.7 med gravel & gyp - porous gasoline	-	
12 ⁷ - 14 ² 1' med gravel & gyp5' gran gyp. gasoline	10-	gran gup
14 ² - 15 gravel & gyp gasoline		Gasoline
15 - $16\frac{1}{2}$ l' grav seams in gyp9' gyp w water	-	
$16\frac{1}{2}$ – 18 $\frac{3}{4}$ ' gravel & gyp w water. $\frac{3}{4}$ ' tight gyp	15	463:0
18 – 18 ⁸ hard gyp	•	Water
18 ⁸ - 20 ³ Orill hard gyp	-	riggp
e e e e e e e e e e e e e e e e e e e	20-	TO -
	-	
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MAR 06 1985 OIL CONSERVATION DIVISION SANTA FE	1.	•

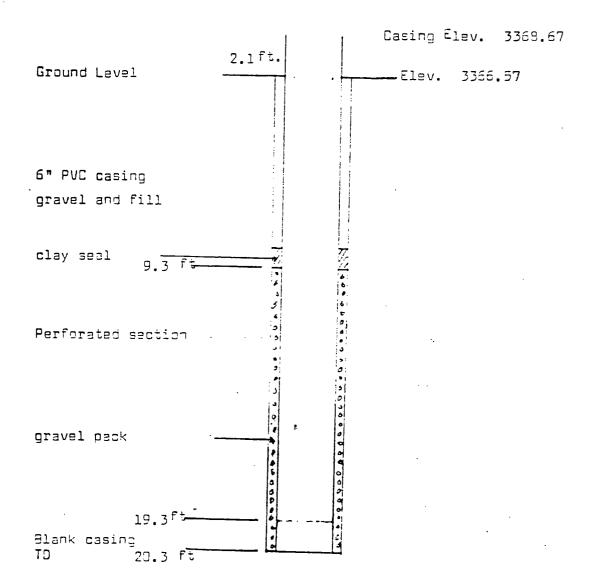
Date	6/10/83	

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Well # AE

Company <u>Davajo Refinino</u>



Well # AF Navajo Refining Company - Monitor wells

Orilling Contractor - O. Anderson, El Paso

Rig - Hollow stem auger 9" diameter Split spoon core barrel 18"

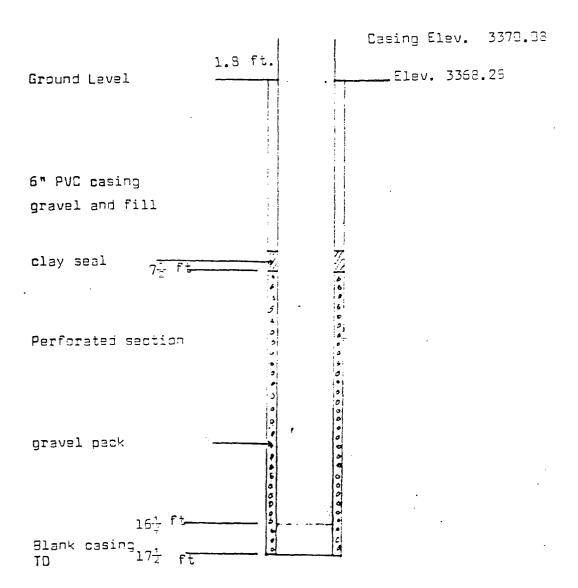
Date 6/10/83 10:30 am

Depth Sample description

$0 - 7\frac{1}{2}$	Fill - 27½' top gry clay (gyp) & pebbles	_	
$7\frac{1}{2} - 11$	HCR stained gyp w crs pebbles Top gasoline section	-	
$11 - 12\frac{1}{2}$	gry gyp w med gravel - gasoline saturated	-	
$12\frac{1}{2} - 13$	gry gyp w med gravel – gasoline saturated	— ⁱ 2 •	
$13 - 13\frac{1}{2}$	Orill gyp & gravel	-	
$13\frac{1}{2} - 14$	Orill gyp	- 94	ip & 15 gave 16 R
14 - 15½	gry gyp w med gravel 1.2' water. Hard gyp .3'	10-11	1-10
$15\frac{1}{2} - 17\frac{1}{2}$	Drill gyp	- 6. 6a	soline Aines Gravel
	, , , , , , , , , , , , , , , , , , ,		graver.
		150 3	ater
		- Has	1 940
		- 	Ò
:		29-	1. 1.5 2. 2
		-	
		-	
	PROPERTY	-	
	MAR 06 1985	- -	
	OIL CONSERVATION DIVISION SANTA FE		

SANTA FE

Date	6/13/93	Mell	#	<u>e</u> F
Company	Navajo Refining			



Well # AG Navajo Refining Company - Monitor wells

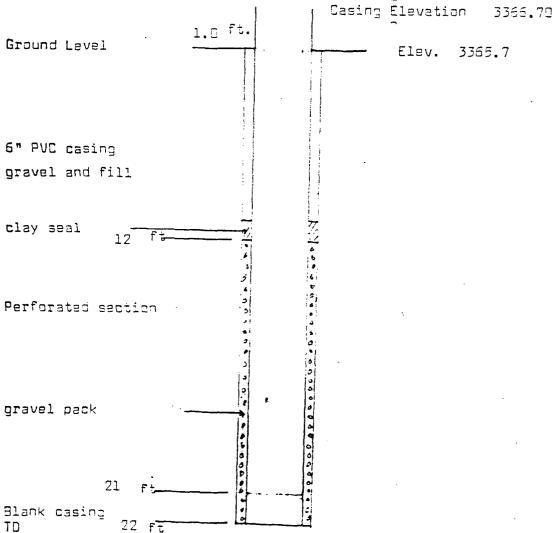
Orilling Contractor - D. Anderson, El Paso

Rig - Hollow stem auger 8" diameter Sòlit socon core barrel 18"

Date 6/10/83 3:00 pm

$0 - 7\frac{1}{2}$ gravel & clay	
$7\frac{1}{2}$ - 9 gyp & clay - tight	
9 - 10½ gyp & clay - slight odor. Tight clay last 🐇	
$10\frac{1}{2}$ – 12 gyp and gry clay no fluid	- ₅ .
12 - 13½ gyp & gry clay " "	- 1.5 Calk
13½ - 15 gyp & gry clay " "	- gyp8cky
15 - 16½ gry clay & gyp " "	di des que
$16\frac{1}{2}-18$ gry clay & gyp .5'. gry sand l' sli wet at bottom	-
18 - $19\frac{1}{2}$ gry sand l.4' gyp & gry clay .1' fluid in ss water	
$19\frac{1}{2}$ - 20 drill gyp	15-
20 - $21\frac{1}{2}$.6' sand wet .9' gyp & clay water	- 12 1
21½ - 22 Orill to TO	- Same Water
	20-
	SSWALAN
- nc 1005	-
MAR 08 1985	- MARKET THE
OIL CONSERVATION DITTOR	

Data <u>6/10/33</u>		Well #
Company <u>Mavajo Refinino</u>		
	1	Casing Elevation 33.



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SAMPLE LOS

Well # AH Navajo Refining Company - Monitor wells

Orilling Contractor - O. Anderson, El Paso

Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"

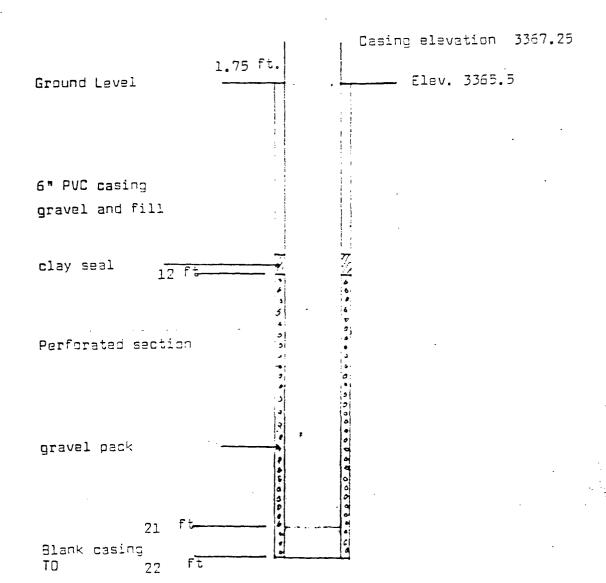
Date 6/11/83 7:30 am

0 - $4\frac{1}{2}$ Crs gravel fill & valley fill	
4½ - 5 gry clay & gyp	
5 – 6½ Pnk sdy clay & gravel	- (3)
6½ - 8 Crs gravel & gyp	gup & gavel
8 - 9½ gyp - dry - no gravel -	
$9\frac{1}{2}$ – ll gyp & gry shale – no gravel	No gravel
ll – $12\frac{1}{2}$ gravel & gran. gyp & gry shale. Tr fluid odor gas	10- No gravel
$12\frac{1}{2}$ - 14 .2' gravel, gyp & gry shale. 1.3' med gravel & gyp no free fluid	
14 – $15\frac{1}{2}$ gyp, gry shale & gravel zones .1' thick. sli odor no fluid	
$15\frac{1}{2}$ – 17 gyp, gry shale – dry. Tr sand on bottom	15
17 - 18.5 clay & gyp sli wet	- dry
18½ - 20 lt red clay & gyp - water	
$20 - 20\frac{1}{2}$ Orill	25- Watel
$20\frac{1}{2}$ - 22 clay & gyp - tight - no fluid. Red shale on bottom	
	TO PLAN
The state of the s	
	-
MAR OG 1385	-
OIL CURSUATION DIVISION SANTA FE	

Date	6/11/83

Well # AH

Company <u>Mavajo Refining</u>



Well # AI Navajo	Refining Company – Monitor wells
Orilling Contractor - D.	Anderson, El Paso
Rig – Hollow stem auger	9" diameter Split spoon core barrel 18
Date <u>6/11/83 10:35</u>	am

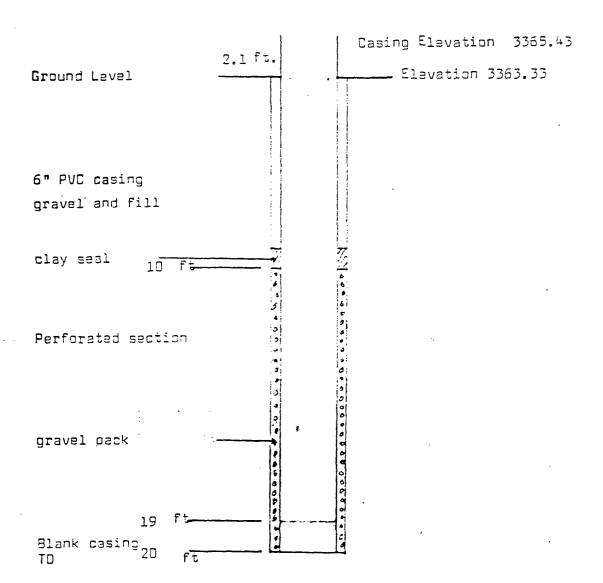
0 - 9	Valley fill	
$9 - 10\frac{1}{2}$	clay & gyp - no fluid; no gravel	
$10\frac{1}{2} - 12$	l' clay & gyp5' gyp & gravel odor gas	
$12 - 13\frac{1}{2}$	l' gyp & gravel – sli odor- damp5' hard dry gyp 5	
$13\frac{1}{2} - 15$.5' gyp & gravel - water ; 1' red clay & gyp dry	
15 - 15½	Drill	AL AGUA
$15\frac{1}{2} - 17$	रै। gyp & red clay w gravel – wtr. ई। dk gry clay & gyp w gravel	94 P 10 Gravel
17 - 18	gyp w little gravel at top. Balance tight	SI: odor
18 - 20	Orill *	rater
	15	
<u> </u>		997 Tight
	2.0	
·		
	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	

Date	5/11/83	
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Usll # _4I

Company <u>Navajo Refining</u>



Sample LOG

Well #	R As	avajo R	efir	ning Company	<u> </u>	itor w	ells		
Orilling	Contractor	- D.	Ands	erson, El Pa	so				
Rig - Ho	ollow stem a	nāez	9" c	diameter	Split	spoon	core	barrel	18"
Date	6/7//83	10:15	am .	•				•	

Depth Sample description

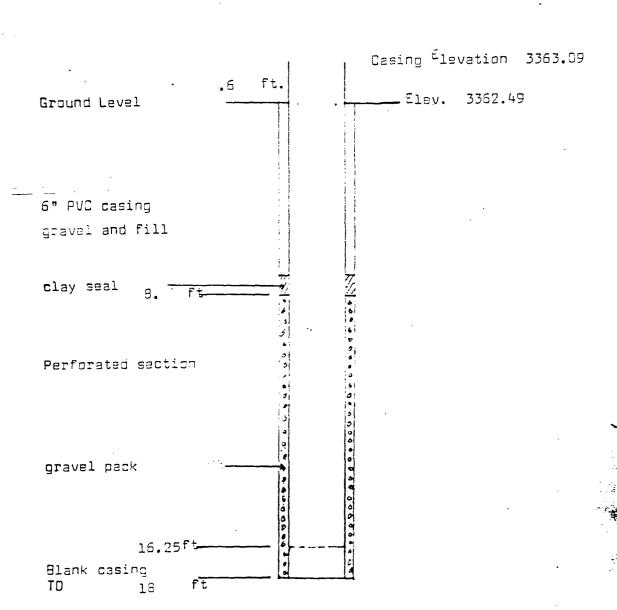
$0 - 4\frac{1}{2}$	Red sail		
41/2 - 6	Red clay & gyp no porous zone	7:0	
6 - 7½	gyp & anhydrite — l¼': gyp ¼' ω oil odor		- (aku
$7\frac{1}{2} - 8\frac{3}{4}$	gyp & anhy – oil stained – sli porosity	5-	Redcky
8 - 9	drill		9470:1
$9 - 10\frac{1}{2}$	l' ail wet gyp – porous5' tight gyp oil odor		
$10\frac{1}{2} - 12$.7' dk gry gyp & gravel wet - oil5' dk gry gyp & , gravel sli wet: .3' gry & rd shly gyp	0	
$12 - 13\frac{1}{2}$	1 red gravelly shale - water: .5' gry gyp water: .3' red anhy, gravel dry odor: .4' rd hard limey s	h1	-water
$13\frac{1}{2} - 15$.4' rd-gry shly gyp: .9' gravel w water: .2' red shal	k	
15 - $16\frac{1}{2}$.7' red shale	5	
$16\frac{1}{2} - 18$	Red shale TD		Red shale
		1	TO
		٥٩	o
	A CONTRACTOR AND A CONT	1	ाम्हराज्य े 🎉

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Date	6/7/93

Well # R

Company <u>Navaio Refining</u>



Sample description

Depth

Well #S Navajo 9	Refining Company - Monitor wells
Orilling Contractor - 0.	Anderson, El Paso
Rig – Hollow stem auger	9" diameter Split spoon core barrel 18
Date <u>6/7/83 3:05</u>	pm .

$0 - 4\frac{1}{2}$	Soil	•	
4 - 6	Lt rd sdy gyp dry .7' : dk gry clay .8'	1.0	
$6 - 7\frac{1}{2}$	gy shl & gyp – oil stain & odor	.50	المحددات
7½ - 9	dk gy shly gyp $\frac{1}{4}$ ' oil stn & odor : $1\frac{1}{4}$ ' lt gy shly gyp oil odor	5	J#170 / 1
$9 - 10\frac{1}{2}$	lt & dk gy shly anhy & gyp – granular – bldg ail		941-0:1
$10\frac{1}{2} - 12$	drill		
$12 - 13\frac{1}{2}$	lt & dk gy shly gyp, sli porous - oil & wtr	10	;
13½ - 15	lt gy gravel l' w wtr : lt gy gyp w oil & wtr .5': at bottom tight.		0:1 & Water
15 - 16½	gravel, clay & gyp - water	83	water
$16\frac{1}{2} - 19$	Orill to TD	5-120	gub-tight
·			11.a-er
			~~
		20-	TD
 -			
		-	ANTON COM

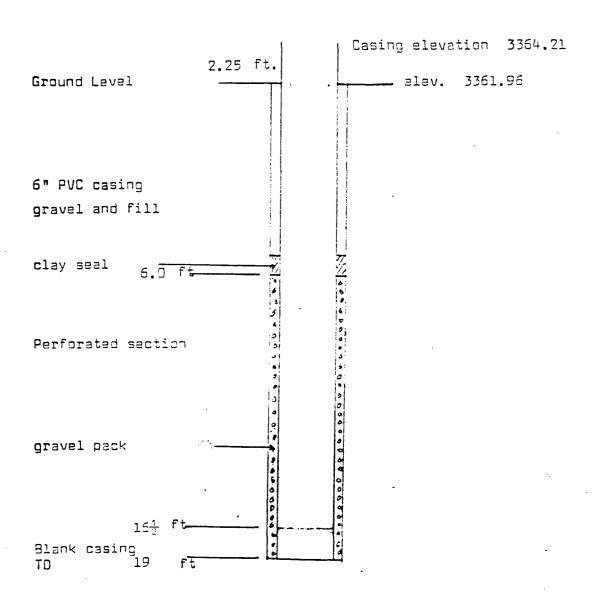
DETAILS OF WELL CONSTRUCTION

Date	5/7/93	

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Well # _ S___

Company Navajo Refining



SAMPLE LOG

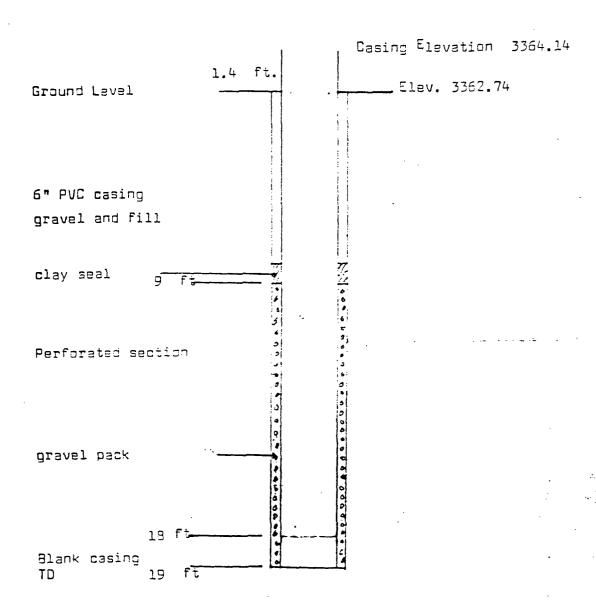
Well	# <u> </u>	Navajo F	Refini	uō Cowbsi	пу – Мог	nitor (uells		
Drill	ing Contracto	or - 0.	Ander	son, El i	Paso				
Rig -	Hollow stem	auger	9" di	ameter	Split	spoon	core	barrel	18"
Date	6/8/83	8:45 ar	n .						

Depth Sample description

0 - 8	Red soil - clay	
8 - 10	Pok clay w gravel - valley fill l' : .5' gyp	
10 - 11	gyr - ,15': gry clay & gravel + 1. : .15' dk gy gyp	
$11\frac{1}{2} - 13$	$\frac{1}{4}$ ' dk gry gyp, oil odor, core bbl wet w oil : $1\frac{1}{4}$ ' gy gyp sli odor tight	5
13 - 13号	lt gy gyp & gravel – water – core blocked	2.
$13\frac{3}{4} - 18$	dk gy clay & gyp	elay, grand
18 - 19	Red clay	10- 711-011
		gyp-tight
	·	weder
		15
		- =
:		- Rei clay
;		20-
#1. #1.	· · · · · · · · · · · · · · · · · · ·	-
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		-
		1 1

DETAILS OF WELL CONSTRUCTION

Date	6/3/83		Well	#	T
Company	ilavajo	Refining			



The state of the s

WELL LOGS USED ON THE EAST - WEST CROSS SECTION

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section	1			(A) Owne	or of mell	City	of Artesia			
				Street and						
			7	City			Artesia	State _	N.M.	
	-							an		ed in the
	-	ŀ						Twp. 17		
	++							cumb Lice	_	
1					-				1136 110	
				-				State _		
1	1	•						June		10 09
į		- 1						Aug.		
(1	Plat of 640	acres)		Diming w	as comple					19
Elevatio	n at top	of casing	in fee	t above se	a level	<u> </u>	Total de	pth of well	968	
								ter upon comple		
Section :	2			PRIN	CIPAL WA	TER-BEAR	ING STRATA	•		
No.	Depth	in Feet	_ Thi	ckness in Feet		De	scription of Wate	r-Bearing Formation	a	••
1										
-						ow 890'				·
		ļ			2nd fl	ow grad	ual increase	890-920		
3										
4										
5		<u> </u>								
Section	3				RECOR	D OF CA	SING			•
Dia	Pounds		reads	Dep		Feet	Type Shoe	1	orations	
in.	ft.		in	Top	Bottom			From	1 2	Co
_ 11 5,	/B			ļ		121	 		↓	· · · · · · · · · · · · · · · · · · ·
8	<u> </u>					727			<u> </u>	
6	<u> </u>					211	<u> </u>			
	1, ,	Packe	r betw	een 6" x	8"		<u> </u>	1	_!	
Section	4			RECOR	D OF MUD	DING A	ND CEMENTING			
Dept	h in Feet		meter in in.	Tons	No. Sa			Methods Used		
	+			 				······································		
	1								•	
	_				~	ILIC BEC			-	• .
Section		Í				ing rec			-	
	f Pluggin	•	actor_					License No		
	nd Numb		 .					State		
	Clay use			Tons of R	oughage u		_	pe of roughage_		
	g method		i					ıgged		
Pluggin	g approve	d by:	-	•		_	Cement Plu	gs were placed a	s follows:	
_			-	Basin Sup	ervisor	N	Depth of F	To No. o	of Sacks Us	med.
	FOR U	SE OF ST	ATE E	GINEER O		7 🗀				
Date	Received					- _				
	from	dr111	er's 1	og 12-6-	62				<u> </u>	
					_	ļ				

Use

Location No. 17.26.17,210

Depth		Thickness	Color	Type of Material Encountered			
From	To	in Feet		ayye or marcial amounted			
	13		E 2 1 1	soil			
13	30			rock			
30	40			sand			
40	100			gyp			
100	121	·	P. C. S.	sand			
121	141		5/25	rock			
141	205		, -	shale			
205	228			rock			
228	698	±	25-5	shale			
698	768	I .		rock			
768	830	-	•	shale _			
830	856			rock			
856	877			shale			
877	890			rock			
890	920			water rock, hard			
920	968			Rock-bard			
	-:						
	+						
			 				
	 	 	 				
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	<u></u>	<u> </u>					
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The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Well	Driller

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1	1			(A) Owne	er of well	<u> </u>	Albert P	f. Wood	is,	
[
'				•						
				Well was	drilled un	ıder Perr	ait No		and i	is located in the
] _'										Rge. 268
			- 1		_					se No
1	1	_								
			1	-						
	1	ļ	•	_				_		1930
(F	Plat of 640	acres)	,	Drilling w	as comple	:ted		June ,	-	1930
		-	in fee	t above se	a level	<u> </u>	Total de	pth of v	well 123?	3'
	_	=					Depth to wa			
Section 2							RING STRATA			
		in Feet	_	ickness in		. , De	escription of Water	- Rearin	- Formation	
No.	From	То		Feet		3 7	Stripuon to	1-20	FULL	
1			$T_{_}$							
2										
3			1							
4		 	+			• • • • • • • • • • • • • • • • • • • •				
5			1				,			
Section 3	3 -	!			RFCOF	D OF CA	CING			
	Pounds	Thr	eads	De.	pth	{	1		Perfora	tions
Dia in.	Pounds ft.		eads n	Top	Bottom	Feet	Type Shoe	F	rom	To
123	50	1		0	1233	1233		<u> </u>		
	T	1				<u> </u>		<u> </u>		
Section 4	4			RECOR	D OF MUI	DDING AI	ND CEMENTING		W-1	
Depth	h in Feet		neter in in.	Tons Clay	No. Sa Cem			Metho	ods Used	
From	10	-			-	-				
	+	+-		 	+	-				
	+	+		 	+	-				
		+-		 		-+				
				<u>!</u>		•				
Section 5	5				PLUGG	SING REC	-			
	f Pluggin	-								
	dmuN ba					_				
					loughage v	rseq	Ту	-		
-	g method				<u> </u>					19
Plugging	g approve	d by:	• -	-			Cement Plu		placed as 1	iollows:
				Basin Sup		No	o. Depth of P	Plug To	No. of !	Sacks Used
						-	+	+		
	- FOR Us	SE OF STA		ygineer o	NLY		1			
Date	Received						+			
	100000					1 -	+	-+		
Yim	9, fa T est		1.			· '-				
Der	l. fa Fest	J .;**	เครายก							
File No	RA-	1090		<u> </u>	Use		Location	on No.	17 26 16	.110

LOG OF WELL

Depth in Feet		Thickness	Color	Type of Material Encountered
From	To	in Feet	Color	Type or minima incommend
0	15	22.2.5		soil
15	30	3340		87P
15	30			вур
30	35	33 9 5	• •	sand .
35	450	2 * 2 > 1	<u> </u>	gyp and clay
450	460			gyp rock
460	490			sandy shale and gyp stratas
490	690			sandy sable and gyp strates
690	710			rock
710	740			red sand
740	770			rock "
770	820		-	red sand
820	840			rock lime
840	876			shale
876	912			lime rock
912	913	-		water rock
913	958			lime rock
958	960			water rock
960	<u>~</u> 996			lime rock
996	1000			water rock
1000	1027			lime rock
1027	1032			water rock
1032	1058			lime rock
1058	1060			water rock
1060	1118			lime rock
1118	1132			water rock
	1218			lime rock
	1220			water rock
1132 1218 1220	1218 1220 1232			

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well

Wall Dellar	

المناكات المسادات

STAND ENGINEER OFFICE

والمعاصل أيادية الأيالية المساهدة

STATE ENGINEER OFFICE

			Section 1	. GENER	AL INFOR	MATION	i			
(A) Owner of	well Irea	! Jones					Ow	ner's Wel	l No	R.1-66 L
Street or City and	Post Office Ac State された	Idress <u>P.C</u> via, Nº) μυ <u>, μο</u> 88210	23						
		No. 24							_	
a. <u>5 -</u>	_ ¼ <u>_5:/</u> ¾	<u>''')</u>	Y of Se	ction 9	Tov	vnship	<i>175</i> 1	lange	<u>25</u> 5	N.M.F
h Tract	No	of Map No.		· c	of the Hi	Icres:	t acre subc	livisio	n	
c. Lot N Subdit	o vision, recorde	of Block No		°	of the County.	ui.ea	east cente	or of a	.02	
										_
		_ feet, Y=		fe	et, N.M. Co	ordinate				
		и <i>и</i> и С и.							_	
		4 1 Ente								
Address		0. Blix 437	•	ilnt	esia, M	882	10			
Drilling Regan	4_7℃	Comp	leted <u>4-2</u>	(=80	Туре	tools	Cable	Si:	ze of hole	7"
•	•						_			
Elevation of las	nd surface or _			8					225	
Completed wel	lis 🖾 s	hallow 🗆 at	tesian.		Depth	to water	upon complet	ion of wel	il l	
		Sect	ion 2. PRIN	CIPAL W.	ATER-BEA	RING ST	TRATA			
Depth	in Feet	Thickness	· · · · · ·	Descriptio	n of Water-J	Passina I	Commetion		Estimated '	
From	То	in Feet					Offination	(g	allons per n	ninute)
273	303	30	₹.	ire sna	d and Go	ravel			<i>8</i> ;	
					•		•	\vdash		
		-						-		
		_	1							
•			Sectio	n 3. REC	ORD OF CA	SING				
Diameter	Pounds	Threads	Depth	in Feet		ngth	Type of S	hoe	Perfor	rations
(inches)	per foot	per in.	Тор	Botto	m (1	feet)	ļ		From	To
?"	26	PE _		302	30	73	75		273	303
							1			
	L	<u> </u>		L			<u> </u>		L	<u> </u>
	i- East	7	n 4. RECO				IENTING			
From	in Feet To	Hole Diameter	Sact of M	-	Cubic Fe of Ceme		Me	thod of P	Placement	
			_							
_				on 5. PLU	GGING RE	CORD				
Plugging Contr Address						ſ <u>.</u> .	Depth	in Feet		bic Fee
		-				No.	Тор	Botto		Cement
Date Well Plug Plugging appro						2				
		State Engi	neer Repres	entative		3				
		J.u 21181				4		<u> </u>		
Date Received	April 30	1980			TE ENGINE	ER ONI	.Y			
Pare Merciaen	ANTALON ST			(Quad		FW	٠	FSL	,
Eile Me	RA-6612	•					Location No		.9.34430) 、 ,;
FIIE NO.	101 0014			Use			Temp. on	SW Cor	ner	

Section 6. LOG OF HOLE

Dept	h in Feet	Thickness	Section 6. LOG OF HOLE		
From	То	in Feet	ファビュー Color and Type of	Material Encountere	d
	10	10	Jop Soil	35 45	i
10	70	60		327 <u>5</u>	
70	190	120	bypsiim and clay mand	•	
190	240	50	(lay		
240	270	30	(lay and Sand	2015	373-293
270	290	20	fine Gravel and Sand	<u> </u>	10 m 6 - 3 - 3 - 7 3
290	325	35	tine Gnavel clay Red B		
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	 			STATS	7 80
	<u> </u>			TE ENGINEER OF ROSWELL, N. M.	7 9
		Section 7	. REMARKS AND ADDITIONAL INFOR	NGINEER OPFIC SWELL N.M.	30
				. ≈ æ	AH
			•	OPFI M.	
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The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller

INSTRUCTIONS: This for should be executed in triplicate, preferably typewritten, and submitted to submitted to should be executed in triplicate, preferably typewritten, and submitted to s in used as a plunning record, only Section 1(a) and Section

2.5.

WELL RECORD

-		** .	-
FU	8	No	

INSTRUCTIONS: This form should be typewritten, and filed in the office of the State Engineer, P. O. Box 1079, Santa Fe, New Mexico, or in the office of the Artasian Well Supervisor, Roswell, New Mexico. Section 5 should be answered only if an old artesian well has been plugged. All other sections should be answered in full in every case, regardless of whether the well drilled is shallow or artesian in character. This report must be subscribed and sworn to before a Notary Public.

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1	: 1		-			-			
}			Stree	et and N	umber.R.t.	l Box	30		
NW		NE				tesia Ne			
			· Wall	wa Ari	lled under i	Permit No F	RA-2723	5	
			4						
			-1			• •			of Section9.
SW		S.E	Tow.	nship	17 S out	t.h	, Range	26_	EAS _t
i	-45-4		Drill	ling Cont	tractor	Blount	& Coll	L	
	460	х	_ Stre	et and N					
	iat of 640 . te Well Ac		: Post	Office		Artesia	New 1	Mexico)
ling was	commenced	J	uly 9		1951. Dri				3 1951 , 19
ation at t	op of casin	g in feet abo	ve sea le	vel3	> - 5				
e whether	well is shi	allow or arte	sian	S	hallow				
_	of well	318			•				feet below land surf
. Z	240	ب ع		-		ARING STR		mation S	and_rock
						L			
3			į		ORD OF C				
		T	N		·		Y)	.4.3	<u> </u>
iameter Inches	Pounds per Foot	·Threads per Inch		me of facturer	Feet of Casing	Type of Shoe	From	io	Purpose
7"00			,		240				Timon
	. Pe	morate		. !				1	Liner
5"OD					85			1	
5 00					- 65				
				D OF M		AND CEME	NTING		
. 4			RECOR	D OF M		AND CEME			
	er of	Number of of Ceme	RECOR	D OF M			Specific	Gravity Mud	Tons of Clay Used
4 Diamete	er of	Number of	RECOR	D OF M	AUDDING A		Specific	-	1
4 Diamete	er of	Number of	RECOR	D OF M	AUDDING A		Specific	-	1
4 Diamete	er of	Number of	RECOR	D OF M	AUDDING A		Specific	-	1
4 Diameter	er of	Number of	RECOR	D OF M	AUDDING A		Specific	-	1
Diamete Hole in 1	er of	Number of	RECOR Sacks ent		Methods U	sed	Specific of	-	1
Dlamete Hole in 1	er of Inches	Number of of Ceme	RECOR Sacks ent	UGGING	Methods U		Specific of	Mud	Clay Used
Diameter Hole in 1	er of Inches	Number of of Ceme	RECOR Sacks ent	UGGING	Methods U	of OLD W	Specific of	Mud	Clay Used
Diameter Hole in 1	er of Inches	Number of of Ceme	RECOR Sacks ent	UGGING	Methods U	of OLD W	Specific of	Mud	Clay Used
Diameter Hole in 1	er of Inches	Number of of Ceme	RECOR Sacks ant	UGGING	Methods U	OF OLD Wi	Specific of	Mud	Clay Used
Dlamete Hole in 1	er of Inches	Number of of Ceme	RECOR Sacks ent PLI plugging Tons of	UGGING	Methods U	OF OLD Wi	Specific of	Mud Tow	Clay Used
Dlamete Hole in 1	er of Inches	Number of of Ceme	RECOR Sacks ent PLI plugging Tons of	UGGING	Methods U	OF OLD Wi	Specific of	Mud Tow	Clay Used
Diameter Hole in 1	er of Inches Led in the Lumber Lused Led were place	Number of of Ceme	RECOR Sacks ent PLI plugging Tons of	UGGING	Methods U	OF OLD Wi	Specific of	Mud Tow of rough	Clay Used Inship Inship Well Supervisor?
Diameter Hole in land to the second of the second New York and New Yor	er of Inches Inches Led in the Inches Led in the Inches Led in the Inches	Number of of Ceme	RECOR Sacks ent PLI plugging Tons of	UGGING	Methods United States of the S	OF OLD Wi Section	Specific of Specific of Cement of Cement	Tow of rough	Clay Used nship uage Well Supervisor?
Diamete Hole in l S is locat ge et and N s of ciay tent plugs I was pla 2 was pla 3 was pla	er of Inches Inc	Number of of Ceme	PLU Plugging Tons of	UGGING	Methods United States of S	OF OLD Wi Section	ELL Type pproved by of cement of cement	Tow of rough Artesian used	Clay Used nship nage Well Supervisor?
Diamete Hole in l Solution Solutio	er of Inches Inc	Number of of Ceme	PLU Plugging Tons of	UGGING	Methods United States of S	OF OLD Wi Section	ELL Type pproved by of cement of cement	Tow of rough Artesian used	Clay Used nship uage Well Supervisor?
Diamete Hole in l 5 1 is locatinge set and N s of ciay nent plugs 1 was pla 2 was pla 3 was pla	er of Inches Inc	Number of of Ceme	RECOR Sacks ent PLI plugging Tons of	UGGING	Methods United Number N	OF OLD Wi Section at Office at Offic	ELL Type pproved by of cement of cement of cement of cement	Tow of rough Artesian used used used used used used	Clay Used nship nage Well Supervisor?
Diameter Hole in land to land the land N is of clay lent plugs 1 was pla 2 was pla 3 was pla 4 was pla	ted in the	Number of of Ceme	PLU Plugging	UGGING	Methods United Number N	OF OLD Williams of Sacks aber of sacks aber of sacks aber of sacks aber of sacks	ELL Type pproved by of cement of cement of cement of cement	Tow of rough Artesian used used used used used used	Clay Used nship nage Well Supervisor?
Diameter Hole in land Hole in land No. 5 is locating et and No. 5 of ciay ent plugs 1 was pla 2 was pla 3 was pla 4 was pla	ted in the	Number of of Ceme	PLU Plugging	UGGING Contract frougha	Methods United States of the S	OF OLD William Section at Office at	ELL Type pproved by of cement of cement of cement	Tow of rough Artesian used used used used used used	Clay Used nship nage Well Supervisor?
Dlamete Hole in l 5 is locat ge et and N of ciay ent plugs 2 was pla 3 was pla 4 was pla	ted in the	Number of of Ceme	PLU Plugging	UGGING Contract frougha	Methods United States of the S	OF OLD Wi Section at Office at Offic	ELL Type pproved by of cement of cement of cement	Tow of rough Artesian used used used used used used	Clay Used nship nage Well Supervisor?

- From (Depth in Feet)	To (Dopin th Foot)	Thickness in Foot	Classification of Formation
	im filegi <u>i si imbiğ</u> ir iml <u>iğ</u> irile f	et polg zwa "desandmonok	
ju jao komenas seluju od se na komenas	3.3.55	وبالأراء ويصفنان والإصابات الرا	and out to resite the second colors.
Matema 11 car bakar 0 = 30	ాయం అకు తూరుత 33శివ	ingulier. The report :	on milestro to with the difference & clay
30 - 40	3 315		gravel & gyp
40 - 164	\$19) mas.	12 _ (8-# 15 tam#O	clay & gyo
164 - 200	3/55	The street transfering	sand rock
200 - 225	3/30	er From July month opens	loose sand
225 - 260	2°75	selesta congres con con con-	shells & clay
260 - 274	3081		clay
274 - 318	3037		sandrock & clay
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out the second of the second		-	

I, _______, do solemnly swear that, to the test of my knowledge and belief, the foregoing information is a true and correct record of the well for which report is hereby made, insofar as can be determined from all available records. SUBSCRIBED AND SWORN TO BEFORE ME this

Notary Public My Commission Expires / P. Aug. 1952

Post Office Stein , new Maxiel

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

				(A) Owne	er of well_		ce Harris		
1	1			Street and	l Number_		£42		
1				CityA	rtesia			State	New Mexico
 	 		,	Well was	drilled un	ider Pern	nit No. RA-41	96 a	nd is located in the
			1.	SVI 1/4	SW 3/4	SW	of Section 1	0 _{Twp.} 17-	S Rge 26E
-									ense No.WD-62
			•	• •	l Number	330	2 Merchant		
<u> </u>	 !-		- 1				esia	State	New Mexico
									19 60
	<u> </u>				vas comple		ay 12		19.60
(1	Plat of 640	acres)			do comp.	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
Elevatio	n at top c	of casing i	n feet	above se	a level		Total de	pth of well	294
State wl	nether we	ell is shall	ow or	artesian.	Shallow	<u> </u>	Depth to wa	ter upon comp	letion_80
							ING STRATA		
Section :					CIPAL WA	(IEK-DEAN	ING SIKOIO		
No.	Depth i	To To	1	kness in Feet		De	scription of Water	r-Bearing Format	tion
							-		
1	280	292		L2	Sand &	Grave	1		
2									
3									
4									
5									
	<u>'</u>	·	<u>' </u>		<u>'</u>				
Section	3				RECOR	RD OF CA	SING		
Dia	Pounds	1	ds		pth	Feet	Type Shoe		forations
in.	ft.	in		Тор	Bottom		,	From	То
OD	20	& Ro	und		294	294	Steel.	275	294
						<u> </u>			
						<u> </u>			
						-	in on think		
Section					- 		1D CEMENTING		
	h in Feet	Diame Hole is		Tons Clay	1 2.2	acks of		Methods Used	
From	To		1 111.	Ciay		- I -			
	 	gn							
									
	i	1		<u> </u>	<u> </u>	1			
·	-				DI LIGA	SING REC	OBD		
Section		- .	-		•				_
									Vo
	•						_		e
	-								19
Pluggin	g approve	d by:					Cement Plu	gs were placed	as follows:
						N	Depth of P	lug N	A Caralan Mana
				Basin Sur	pervisor		From :	ro No.	of Sacks Used
	FOR US	E OF STA	re en	GINENA O	NLY	7 _			
1	EUM		19181 1810)		1121				
Date	Received.	131710. R TT				_	1 1		
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l		e i :8 ma	8-	NUL DEC	, ·	-			
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TOUR NO	RA-A	1196			Tise (lan.	Locatio	n No. 12.5	610.833

LOG OF WELL

From To in Feet Color Type of Material Encountered 3355 14	Depth	in Feet	Thickness		
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The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well

WELL RECORD

casing above sea level,	167'8"
casing above sea level,	Percentage 26k ; Elevation of the control of the co
casing above sea level, feet; diameter depth to water upon completion, feet and completed Jan. 8 19.53 cm.; Address, Art. 6 2. Principal Water-bearing Strata: Depth in Feet To Thickness	et; drilling was commenced
depth to water upon completion, fee and completed Jan. 8 19.52 ; Address, Arte ; Address, Arte 2. Principal Water-bearing Strata: Depth in Feet To Thickness	passes are properties of the Casing Type of Shoe Prom Perforation 167'8*
and completed Jan. 8	Description of Water-bearing Formation Sund & Clay Streaks or Liner Feet of Casing Type of Shoe Prom 16718**
2. Principal Water-bearing Strata: Depth in Feet To Thickness	Description of Water-bearing Formation Sand & Clay Streeks or Liner Feet of Casing Type of Shoe Fram 167'8*
2. Principal Water-bearing Strata: Depth in Feet To Thickness	Description of Water-bearing Formation Sund & Clay Streeks or Liner Feet of Casing Type of Shoe Fram 167'8*
Depth in Feet From To Thickness No. 1 260 295 35 No. 2 No. 3 No. 4 No. 5 3. Casing Record: Diameter Pounds per fit. per feeh Top Be get fit. 3. GRICK 7*0D 5*ID	er Liner Feet of Type of Shoe Prom
No. 1 260 295 35 No. 2 No. 3 No. 4 No. 5 3. Casing Record: Diameter Pounds Threads Depth of Casing of in bother per ft. per inch Top B. 1631-2** 7*OD 5*ID	er Liner Feet of Type of Shoe Prom
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No. 4 No. 5 3. Casing Record: Diameter Pounds Threads Depth of Casing of the per factor of the per	167 8 Type of Shoe Pram
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Diameter Pounds Threads Depth of Casing of Bending the Bending	167 8 Type of Shoe Pram
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4. If above construction replaces old well to be aban	
4. If above construction replaces old well to be aban	
4. If above construction replaces old well to be aban	·
	ndoned, give location:
of Section, Township, 1	Range; name and address of plugging cont
and the state which we have a first term of the	and a figured from a common filter to grown margin reader as a filter from the properties of the properties as a filter from t
date of plugging	describe how well was plugged:
March 2 and 2 men	
series	ED
rightage and filed will the State Anguner's Office at	Instruction

PD-2253

17.26.15,121

WELL RECORD

Date of Receipt

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The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Dh Inay

Instructions

This form shall be executed, preferably typewritten, in triplicate and filed with the State Engineer's Office at Roswell, New Mexico, within 10 days after drilling has been completed. Data on water-bearing strata and on all formations encountered should be as complete and accurate as possible.

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section :	L 		(A) Owne	er of well	DD. 1	Bullivan Den		
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<u></u>			— (B) Drilli	ing Contra	actor	Gesler &	Slacumb Licer	ise No
ļ		ŀ	Str	eet and	Number_				
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Section	4			RECOR	D OF MUI	DDING A	AND CEMENTING		
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From	To	Hole i	n in.	Clay	Cen	nent		Methods Used	
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Section	5				PLUG	SING RE	CORD		
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Depth :		Thickness	Color	Type of Material Encountered
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22	34		3306	sand
34	44	<u> </u>	3276	boulders
44	78		3262	rock
78	120		3220	sand
120	302		3038	abale
302	320		3020	gumbo
320	340		3000	clay
340	420			shale
420	480			_ rock
480	757			Shale
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764	789			rock
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837	856			shale
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956	968			rock
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The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Well Driller	

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WELL RECORD

Fi	le	No.
111	Œ	140

INSTRUCTIONS: This form should be typewritten, and filed in the office of the State Engineer, (P.O. Box 1079) Santa Fe, New Mexico, unless the well is situated in the Roswell Artesian Basin, in which case it should be filed in the office of the Artesian Well Supervisor, Roswell, New Mexico. Section 5 should be answered only if an old artesian well has been plugged. All other sections should be answered in full in every case, regardless of whether the well drilled is shallow or artesian in character. This report must be subscribed and sworn to before a Notary Public.

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Sec. 2	213	. 24			TER-BEAR			S	and
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Sec. 3	•			RECO	RD OF CA	SING			
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	do solemnly swear that, to the best of my knowledge and
and determined description of the contract of	cord of the well for which report is hereby made, insofar as can
SUBSCRIBED AND SWORN TO BEFORE ME this	Signed & D. M. Gray Position Contractor
day of, A. D., 19	Position Contractor
Notary Public	Street and Number 10.0.7 Man St Post Office Artesia, N. M.
My Commission Expires	Post Office

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WELL RECORD

File No RA-2649

INSTRUCTIONS: This form should be typewritten, and filed in the office of the State Engineer, P. O. Box 1079, Santa Fe, New Mexico, or in the office of the Artesian Well Supervisor, Roswell, New Mexico. Section 5 should be answered only if an old artesian well has been plugged. All other sections should be answered in full in every case, regardless of whether the well drilled is shallow or artesian in character. This report must be subscribed and sworn to before a Notary Public.

W. L. Webb

		Street and	Number	TONT V	TY DOLG	·×··×	·
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to hefore a Notam: Public	t be subscribed and sworr	wester. This report mus	Red Clay
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I Willard Beaty do solemnly swear that, to the best of my knowledge and belief, the foregoing information is a true and correct record of the well for which report is hereby made, insofar as can be determined from all available records.

SUBSCRIBED AND SWORN TO BEFORE ME this Signed Drilling Contractor

14thay of August AD, 19 50 Position Drilling Contractor

Mrs. Johnnie Aeith Notary Public Street and Number 1102 W. Merchant St.

My Commission Expirea March 2, 1953 Post Office Artesia, New Mexico

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

ection 1			(A) Own	er of well.	·. ·	· • ·	.,-	<u> </u>		
		l	. la			- .				
			City	· - · · · · · · · · · · · · · · · · · ·			s	tate	· · · · · · · · · · · · · · · · · · ·	
			Well was	drilled un	der Perm	it No	· · · · · · · · · · · · · · · · · · ·	and i	s located in th	
			%		¥	of Section	Twp)	_Rge	
		ĺ	(B) Drill	ing Contra	ctor			License	No. WD-342	
1	1		Street and			•			-	
	<u>`</u>		City	····			S	tate	· · · · · · · · · · · · · · · · · · ·	
ļ			Drilling v	vas comme	enced		· .	<u> </u>	19	
/P	lat of 640 a	cres)	Drilling w	as comple	ted			<u> </u>	19	
			n feet shove se	a laval .	230 t	Total de	nth of we	.m 💆		
esta mh	ether wel	l ic chall	nw or artesian	a sever	3.77	Total depoint to wa	ter unon	completio	n 130	
		13 3/14/1				ING STRATA	oci upon	compicero	<u> </u>	
ection 2		- 1		I I I	TIEK-DEAK	ING SIRAIA	·			
No.	Depth in	To	Thickness in Feet			scription of Water	r-Bearing l	Formation		
1		•			-	(4 . T T				
2								· · · · · · · · · · · · · · · · · · ·		
3	+									
4										
5										
1.	1		1						· · · · · · · · · · · · · · · · · · ·	
ection 3			 	RECOR	D OF CAS	SING				
Dia	Pounds	Threa		pth	Feet	Type Shoe		Perforations From To		
in.	ft.	in	Top	Top Bottom		- %	FTO	m	10	
`				-	•••					
		_								
		+				<u> </u>	ļ			
	<u> </u>	1	1	1	<u> </u>	1	<u> </u>	1		
ection 4	:		RECOR	D OF MUD	DING AN	ID CEMENTING				
Depth	in Feet	Diame		No. Sa	cks of		Mathad	. 773		
From	То	Hole in	n in. Clay	Cem	ent		Methods	Used		
	<u>i</u>			<u> </u>	1_					
				BILICO	SING REC	OPD				
ection 5										
			tor							
	•			tougnage v		Ту	_			
	method u					Date Plu				
lugging	approved	by:			_	Cement Plu		IRCEG RS I		
			Basin Su	pervisor	No.	Prom :	Tug To	No. of S	acks Used	
	FOR HE	· VIIII	TE PHONEER C	NLY	7					
	FOR USI	ار آآ ا آآ	ייטועונין אינדיז ביי מיטועונין				- 1-			
Date 1	Receive	בוצ סדרו	MUN3 21 Mat910		┛┞			· · · · · · · · · · · · · · · · · · ·		
			STATE ENGINE	0	l i	1				
	70	D IIP		. 1/\	2 1	1 1				
	35	:8 MA	11 JUL 1961	ant h	-					

Section 6

LOG OF WELL

Depth	in Feet	Thickness	Calan	The of Material Processed
From	To	in Feet	Color	Type of Material Encountered
0	10 32,90	10	white	Calechie and Gravel
10	7831.22	68	white	White Clay and Gravel
78	90-11	12	viite	Sand and Gravel
-50_	125	35	· · · · · · · · · · · · · · · · · · ·	Clay and Gravel
125	7110	15	From	Sand and Gravel
140	3,45 155	15	Grey	Conglomerate
155	160		<u>הטוחו</u>	Sand and Gravel (water)
160	175	15	Red	Clay
		_	,	
			-	
	†			
	 			
	Į.		ì	

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Well Driller

WATER WELL LOGS USED ON NORTH-SOUTH CROSS SECTION

File No..

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1			_ (A) Owner	of well_		Howard R. Bt	roup	
		}	Street and	Number_				
							State _Ne	
			•				-1380 and i	
)							4Twp17	_
		1	1 ' '	•			License	
}	1		f				·	
	<u>_</u>		City				State	
	• 1		Drilling wa	as comme	enced	Α)	pril 20,	19 36
(B)	at of 640 ac		Drilling wa	s comple	ted		ay 20,	19 36
(F1 4	_+ + of	essing in f	oet ahove sea	level _	3.3.3	Total de	pth of well	212 _
							ter upon completion	
tate whe	emer wen	15 SHAHOW					ver upon compress	**
ection 2			PRINC	CIPAL WA	TER-BEAR	NG STRATA		-
No.	Depth in		Thickness in Feet		Des	cription of Water	-Bearing Formation	
	From	To						
1						·		
2						·		
3								
4					•			
5								
4: 0				PECOP	D OF CAS	ING		
ection 3		T	Dep		1	1	Perfora	tions
Dia in.	Pounds ft.	Threads in	Top	Bottom	Feet '	Type Shoe	From	To
121		 			196			
10		 			30			
								,
ection 4		,			 	D CEMENTING		
Depth From	in Feet	Diameter Hole in it			cks of ent		Methods Used	
From	10-	ļ		+				
	 	<u> </u>		+				
	 	ļ		+				
	 	ļ		 -				
	<u> </u>	'	!					
ection 5				PLUG	SING REC	ORD		
lame of	Plugging	Contractor	Γ				License No.	
							State	
ons of C	Clay used		Tons of Ro	oughage ı	ısed	Ту	pe of roughage	
lugging	method us	sed				Date Plu	ıgged	19
	approved						gs were placed as i	
					J.,.	Depth of P	lug	
			Basin Sup	ervisor	No		ro No. of S	Sacks Used
	FOR USE	OF STATE	ENGINEER OF	VLY	1 1_			
		= 						
Date I	Received _))	1 1		
Date I	Received _					 		
Date I	Received _							

LOG OF WELL

,				100 0	/ WELL
	15.00	There was had a final fi	(Type of Material Encountered
•	1 75	ユニーフ ユニーフ	1		Soil
		1 2342			Gravel - water
,		د او			Red clay
5	2.5	2,42			Sand
• • •	1	3/6-1		1	Rock
	, 2	! 3.553 		- 1	Red clay
3,9	្រែវ	3/47			Red clay
ر ا					Red sand
243		3747			White gyp
4,10	İ	, ~ . * / -			-
	! - !	* !	; - 		
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		1	:		
			<u> </u>		
		<u> </u>	i		

We can the light of ynearlifier $-t_i$ to t_i best of his knowledge and belief, the foregoing is a true and corect record of the above described as t_i

Buck	Bros.		
	Well	Treiller	

r Et a 180

WELL RECORD

Date of Receipt.

of Receipt				Permi	t No. RA-3262	
ame of permitte	e,	B. Stepher	18	* * * !		
or P. O		_		Artesia,	New Mexico	<u> </u>
ell location and	description: The	hallow well in	s located in	SE	4, <u>SE</u>	
% of	Section5	Township	_17S_, Rar	1ge 26E	; Elevation of	top
sing above sea	level,	feet; diameter o	hole, 8m	inches; tota	1 depth,100	_ fe
pth to water upo	on completion,40	feet; drill	ng was comme	enced Septe	mber 12	19.5
d completedS.	eptember 14	, 19.54; name	of drilling co	ontractor W11	lard Peaty	
102 M rch	nt ; Address, .	Artesia, 1	I. K.	; Driller's Lice	nse No. 11D-62	
incipal Water-be	earing Strata:	•				
Depth Prom	in Feet	Thickness	Descri	ption of Water-bear	ing Formation	
1	80	10		0078		
		10		sand	<u>·</u>	-
87 3	96	9		send		
4						
5	-					
sing Record:		•				
ches Pounds		of Casing or Liner Bottom	Feet of Casing	Type of Shoe	Perforation From To	,
14_	welded 0	100	100	none	709	6
					······································	
		<u> </u>	:			
above construct	ion replaces old wel	l to be abandoned	, give location	ı:¥,	¥,	
Section	, Township	, Range	; n	ame and addres	s of plugging cont	ract
500000						
			· · · · · ·			
	minima e e e e e e e e e e e e e e e e e e e	, 19		well was plugged		
	managa e an a		; describe how	well was plugged	1:	
	managa e an a		; describe how	well was plugged	1:	

FILED

OCT 26 1954

OFFICE GROUND WATER SUPERVISOR
ROSWELL, NEW MEXICO

17.76 5. 404

5. Log of Well:

Depth Frank	in Post	Thickness in fact	Description of Formation
		1	top soil 3234
1_	12		oleachie 3253
12	22	10	red clay 3543
22	48	26	yollow clay 33/7
	70	22	JOILOW GLZJ
·	1		
70	80	10	water sand 3234
80	87	7	red clay 3273
87	96	9	water sand 5 76 %
96	100	4	clay 2003
			*
•			
·		· .	
			- · · · · · · · · · · · · · · · · · · ·
	 	 	
1			

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Instructions

, mail

This form shall be executed, preferably typewritten, in triplicate and filed with the State Engineer's Office at Roswell, New Mexico, within 10 days after drilling has been completed. Data on water-bearing strata and on all formations encountered should be as complete and accurate as possible.

26

(This form to be executed in triplicate)

WELL RECORD

			nit NoRA	
Coleman				i
307	City and State	erresis,	New V	ezico
The Shallow well	is located in	NE	_%,N	<u> </u>
(shallow or artesian)				
-		. 20E	; Elevi	ation of top
feet; diameter	of hole,	inches; to	al depth,	100 fe
a	illing was commen	ced May 1	7	19 4
-	• :			
	•			•
Idress, ATTESIA N	lev Mexico	; Driller's Lic	ense NoV	D 62
. :		· ·		•
Thickness	Descript	on of Water-be	aring Formatic	049
-				
	Sen			·
14	San	l		
		· · · · · · · · · · · · · · · · · · ·		
Depth of Casing or Liner Top Bottom	Casing T		Pe Proin	rforation To
		10mm		~ .
· · · · · · · · · · · · · · · · · · ·		to:18	65	-94
			65	-94
		:		
		:		
		:		
		:		
old well to be abandon				4.
old well to be abandon	ed, give location:			4.
	ed, give location:			4.
	ed, give location:			4.
Range	ed, give location:	ne and addre	ess of plugg	4.
Range	ed, give location:	ne and addre	ess of plugg	4.
Range	ed, give location:; bal	ne and addre	ess of plugg	4.
, Range	ed, give location:; bal	ne and addre	ess of plugg	4.
Range	ed, give location:; bal	ne and addre	ed:	4.
	The Shallow well (shallow or artesian) 9	The Shallow well is located in	Caleman 307 City and State FILERIA, The Shallow well is located in NE (shallow or artesian) Q Township 17S, Range 20E feet; diameter of hole, B inches; total, 25 feet; drilling was commenced May 1 1954; name of drilling contractor E11 ddress, Arlesia, Net Maxico,; Driller's Lice Thickness Description of Water-be 5 Sand Depth of Casing or Liner Feet of Top Bottom Casing Type of Shoe	Coleman 307 City and State Preside, New V. The Shallow well is located in NE 14, Ni (ahallow or artesian) 9 Township 17S Range 20E; Eleving feet; diameter of hole, B inches; total depth, 15, 25 feet; drilling was commenced May 17 1954; name of drilling contractor Willer's License No. Weldress, Arlesia, Ney Mayico, priller's License No. Weldress, Arlesia, Ney Mayico, Sand 14 Sand Depth of Casing or Liner Feet of Top Bottom Casing Type of Shoe From

- Ay

OFFICE
GROUND WATER SUPERVISOR
ROSWELL NEW MEXICO

11 2225

5. Log of Well:

Depth Frem	In Foot To	Thickness in feet	Description of Formation
	. 2	3	Top Soil 3557
_ <u>0</u>	10	7	Cleachie 3340
10	26	16	Red Clay 3224
26	A2	16	Yellow Clay 32/5
<u> </u>	50	8	Red Clay 33/5
50	65	15	Red Bed 3275
	70	5	Water Sand 3200
65 80			Red Clay 3242
8 0	80	10	
80	94	14	
94	100	6	Red Clay 25%
	-		
		_	
		•	,
	-	_	
	_	_	
	<u> </u>	,.	

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

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				(A) Our	ar of moli	Canti	C C+		
1 Ī								'd	
		- 1						D. J. Nov.	
-	x							State New	
								182 and i	
								Twp. 179	
			_ ((B) Drilli	ing Contra	actor_ki1	lierd Besty	License	≥ No
								2 Nerchant	
	 -			City Ar	tesia			State No	v l'exico
	İ	İ	1	Orilling w	as comm	enced	August 28		19
			╜┚	Orilling w	as comple	ted Se	tember 2	······································	19
_	lat of 640	-							
								oth of well 125	
tate wh	ether we	ll is shall	ow or	artesian_	<u>Shelle</u>	· •	Depth to wat	er upon completio	on 60
ection 2				PRIN	CIPAL WA	TER-BEAR	ING STRATA		~.
	Depth i	n Feet	Thic	kness in		'De	scription of Water	-Bearing Formation	
No.	From	То	:	Feet				Eormanon	
1		·	l			-			· · · · · · · · · · · · · · · · · · ·
2	€9	- 92		- S		ne San	_		
	105	1 :3	-	73	We	ter Su	n d & Grave l	,	
3								 	
4									
5									
ection 3					RECOR	D OF CAS	SING		
		1	. 1	De		1	1 1	Perfora	tion o
Dia in.	Pounds ft.	Threa		Top	Bottom	Feet	Type Shoe	From	To
					<u> </u>	ļ	 		
-7:53	17	 1	1		125	125	collar	105	125
						 			
									
					<u> </u>	<u> </u>	1		
						DING AN			
ection 4	Į			RECOR	D OF MUL	יות שאווענ	ID CEMENTING		
		Diame	eter	Tons	No. Sa		ID CEMENTING		·
	in Feet	Diame Hole in				cks of	ID CEMENTING	Methods Used	·
Depth	in Feet	1		Tons	No. Sa	cks of	ID CEMENTING	Methods Used	
Depth	in Feet	1		Tons	No. Sa	cks of	ID CEMENTING	Methods Used	
Depth	in Feet	1		Tons	No. Sa	cks of	ID CEMENTING	Methods Used	·
Depth From	in Feet To	1		Tons	No. Sa	cks of	ID CEMENTING	Methods Used	
Depth From	in Feet	1		Tons	No. Sa	cks of	ID CEMENTING	Methods Used	
Depth	in Feet To	1		Tons	No. Sa Cerr	cks of		Methods Used	
Depth From	in Feet To	Hole in	a in.	Tons Clay	No. Sa Cerr	cks of hent	ORD		
Depth From	in Feet To	Hole in	tor	Tons	No. Sa Cerr	cks of nent	ORD	License No.	
Depth From	To To Pluggin, ad Numb	g Contrac	tor	Tons	No. Sa Cem	cks of hent	ORD	License NoState	
Depth From Section 5 Vame of Street an	Pluggin	g Contrac	tor	Tons Clay	No. Sa Cem	cks of hent	ORD Tyj	License NoStatepe of roughage	
Depth From Section 5 Name of Street and Cons of Colugging	Plugging Numb	g Contrac	tor	Tons Clay	No. Sa Cem	cks of hent	ORD Tyl	License No	19
Depth From Section 5 Iame of Street and Cons of Colugging	Pluggin	g Contrac	tor	Tons Clay	No. Sa Cem	cks of hent	ORD Tyl	License NoStatepe of roughage	19
Depth From ection 5 fame of treet and treet an	Plugging Numb	g Contrac	tor	Tons Clay	PLUGG	cks of hent	ORD Typ Date Plu Cement Plug Depth of P	License No	19
Depth From Section 5 Name of Street and Cons of Colugging	Pluggin ad Numb	g Contracer used d by:	tor	Tons Clay Tons of R	PLUGG	cks of hent	ORD Typ Date Plu Cement Plug Depth of P	License No	19 ollows:
From Section 5 Name of Street an Fons of C	Pluggin ad Numb	g Contrac	tor	Tons Clay Tons of R Bapin Sur	PLUGG	cks of hent	ORD Typ Date Plu Cement Plug Depth of P	License No	19 ollows:
Depth From Section 5 Name of Street an Cons of C Plugging	Pluggin ad Numb	g Contracer used d by:	tor	Tons Clay Tons of R	PLUGG	cks of hent	ORD Tyl Date Plu Cement Plug Depth of Plus From T	License No	19 ollows:
Depth From Section 5 Name of Street an Cons of C Plugging	Pluggin ad Numb	g Contracer used d by:	tor	Tons Clay Fons of R Bapin Spr GINEER O G 31 19	PLUGG	cks of hent	ORD Typ Date Plu Cement Plug Depth of P	License No	19
Depth From Section 5 Name of Street an Cons of C Plugging	Pluggin ad Numb	g Contracer used d by:	tor	Tons Clay Tons of R Basin Sur GINEER O G 31 19 Office Water Su	PLUGG	cks of hent	ORD Tyl Date Plu Cement Plug Depth of Plus From T	License No	19 ollows:
Depth From Section 5 Jame of Street an Cons of Chagging	Pluggin ad Numb	g Contracer i used d by:	tor	Tons Clay Tons of R Baptin Spir GINEER O G 31 19 Office	PLUGG	cks of hent	ORD Tyl Date Plu Cement Plug Depth of Plus From T	License No	19 ollows:

Depth in Feet		Thickness	Color	Type of Material Encountered			
From	To	in Feet	Color	Type of Material Encountered	,		
0	2	2	Brown	Top Soil	3255		
2	12	10		Cleachie	3 <i>348</i>		
	50	- 38	Red	Clay	3 2/0		
50	60	10	Brown "	Sand, Showing of Water	_ ನೆತೆ⊍೧		
60	£3_	20	Red	Clay	3290		
	- 92	12	Brown	Water Sand	3268		
92	105	13	Red	Clay	3 <i>೩೩</i> ೯		
_105	1:3	18	Brown	Vater, Sand & Gravel	3237		
123	125	2	Red	Clay	3235		
				-			
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 :	 			<u> </u>			
	 						
	 						
	 						
	 						
	1	1		1			

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well

Well Driller

•

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

ection 1	l			'A) Owne	er of well	N.	E. Garrett			
			- 1							
·			lo	City			Las Vega	ss	tate New Me:	xico
	 		_V	Vell was	drilled un	der Perr	nit No		and is lo	cated in th
			_	NW 1/4	NW 3/4		of Section9	Twp.	17Rg	e 2 6
							G. R. Dubli	-	_	
			s	treet and	Number_					
			—	City				S	tate	
			I	Orilling w	as comm	enced		October	.10	19_09_
levation		casing i					Origina Total dep Depth to wa			
ection 2	2			PRIN	CIPAL WA	TER-BEAF	ING STRATA			
No.	Depth in	Feet	1	kness in Feet		De	scription of Water	-Bearing F	ormation	V
1	From	10	-						•	
2			-				880 ft.			
3			 		2nd	Ilow at	940 ft.			
										
4										
5			<u> </u>	!						<u> </u>
ection 3	3				RECOR	D OF CA	SING			
Dia in.	Pounds ft.	Threa	-	Der Top	Bottom	Feet	Type Shoe	From	Perforations n	То
111	1	1		0	528					
<u>u</u>		 			223		 		<u> </u>	***
		1								
		<u> </u>								
ection 4	4			RECOR	D OF MU	DING A	ND CEMENTING			
Depti	h in Feet	Diame		Tons	No. Sa			Methods	Trend	
From	To	Hole in	n in.	Clay	Cen	nent		- Memous	0360	
	i									
					BI LICC	TINC BEC	000			•
ection 5						SING REC				
	•						Ту	-		
lugging	g method u	ised					Date Plu			
lugging	g approved	by:					Cement Plu	gs were pl	aced as follow	ws:
				Basin Sup		N	Depth of P	lug	No. of Sacks	Used
						┑ ├		-		
	FOR USE	OF STA	TE EN	GINEER O	NLY		-			1
Dete	Received _					-	 			
Date	700011460 T				-,,	- _	 			
						1 -				
						-				
•	(8-31	:	€ x = '			-				:= ; == :

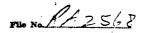
Depth i		Thickness in Feet	Color	Type of Material Encountered
om	То	in reet		•
0	5		····	Sandy loam 3355
5	8			Clay 3352
_8	15			Gyp rock 3 345
15	21			Gyp rock 3339
21	29			Clay 333/
29	43			Clay 33/7
43	51			Chumbo 33c9
51	59			Sand 330/
59	89			Gumbo 327/
89	91			Gyp rock 3269
91	109			Gumbo 3 2 5]
109	120		·	Sand 3240
120	156			Gumbo 3 2 0 4
156	241			Gyp rock 3// 9
241	246			Sand 3//4
246	391			Gumbo 2969
391	408			Hard shell rock
408	471			Soft shale
471	498			Sand
498	589			Sand
582	602			Shale
602	648			Sand
648	661			Hard lime stone
661	791			Soft rock
791	810			Shale
810	828			Gray lime rock
828	633			Gray lime rock
€.33	852		··········	Soft shale rock
85 2	875			Hard lime rock
875	1005		······································	Hard lime rock

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

G. R. Dublin Well Driller

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WELL RECORD



INSTRUCTIONS: This form should be typewritten, and filed in the office of the State Engineer, P. O. Box 1079, Santa Fe, New Mexico, or in the office of the Artesian Well Supervisor, Roswell, New Mexico. Section 5 should be answered only if an old artesian well has been plugged. All other sections should be answered in full in every case, regardless of whether the well drilled is shallow or artesian in character. This report must be subscribed and sworn to before a Notary Public.

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Breet and Number P. O. Box 673, Roswell, New Mexico Post Office Roswell, New Mexico Well was drilled under Permit No. RA. 2565 and Drilling was commenced. January 21, 157 Drilling was commenced. January 21, 150. Drilling was completed. January 26, 1650 Elevation at top of casing in feet above sea level. Biate whether well is shallow or artesian Shallow Total depth of well. 232 feet. Water level upon completion of well. A2 feet below land surface. Sec. 2 RENCIPAL WATER BEARING STRATA No. 2, from. to Thickness in feet. Formation. No. 3, from. to Thickness in feet. Formation. No. 5, from. to Thickness in feet. Formation. No. 6, from. to Thickness in feet. Formation. No. 6, from. to Thickness in feet. Formation. No. 7, from. to Thickness in feet. Formation. No. 5, from. Thickness in feet. Formation. No. 6, from. to Thickness in feet. Formation. No. 6, from. to Thickness in feet. Formation. No. 7, from. to Thickness in feet. Formation. No. 8, from. Thickness in feet. Formation. No. 8, from. Thickness in feet. Formation. No. 8, from. Thickness in feet. Formation. No. 8, from. Thickness in feet. Formation. No. 8, from. Thickness in feet. Formation. No. 8, from. Thickness in feet. Formation. No. 8, from. Thickness in feet. Formation. No. 8, from. Thickness in feet. Formation. No. 8, from. Thickness in feet. Formation. No. 8, from. Thickness in feet. Formation. No. 8, from. Thickness in feet. Formation. No. 8, from. Thickness in feet. Formation. No. 9, from 70 Purpose Diameter of Pund Pund Pund Pund Pund Pund Pund Pund				Owner of v			rong & S	
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Tons of clay used. Tons of roughage used. Type of roughage. Was plugging approved by Artesian Well Supervisor? Cement plugs were placed as follows: No. 1 was placed at feet. Number of sacks of cement used. No. 2 was placed at feet. Number of sacks of cement used. No. 3 was placed at feet. Number of sacks of cement used. No. 4 was placed at feet. Number of sacks of cement used. No. 5 was placed at feet. Number of sacks of cement used. No. 5 was placed at feet. Number of sacks of cement used. (over)	Well is loca			PLUGGING	G RECORD (OF OLD WE	LL	Clay Used
Cement plugs were placed as follows: No. 1 was placed at feet. Number of sacks of cement used. No. 2 was placed at feet. Number of sacks of cement used. No. 3 was placed at feet. Number of sacks of cement used. No. 4 was placed at feet. Number of sacks of cement used. No. 5 was placed at feet. Number of sacks of cement used. No. 5 was placed at feet. Number of sacks of cement used. (over)	Well is loca Range			PLUGGING	G RECORD (DF OLD WE	LL	Clay Used
Cement plugs were placed as follows: No. 1 was placed at	Well is loca Range Street and I	iumber		PLUGGING	G RECORD (OF OLD WE	LL	Clay Used
No. 1 was placed at feet. Number of sacks of cement used No. 2 was placed at feet. Number of sacks of cement used No. 3 was placed at feet. Number of sacks of cement used No. 4 was placed at feet. Number of sacks of cement used No. 5 was placed at feet. Number of sacks of cement used (over)	Well is loca Range Street and I	iumber		PLUGGING L Plugging contract Tons of rough	G RECORD (OF OLD WE	LL Type of 2	Clay Used Township
No. 2 was placed at feet. Number of sacks of cement used. No. 3 was placed at feet. Number of sacks of cement used. No. 4 was placed at feet. Number of sacks of cament used. No. 5 was placed at feet. Number of sacks of cement used. (over)	Well is loca Range Street and ? Tons of clay	Number		PLUGGING	G RECORD (OF OLD WE	LL Type of 2	Clay Used Township
No. 3 was placed at	Well is loca Range Street and I Tons of clay Coment plug	fumber		PLUGGING	G RECORD (DF OLD WE	LL Type of z proved by Arte	Township oughage sian Well Supervisor?
No. 4 was placed at	Well is loca Range Street and I Tons of clay Cement plug: No. 1 was plu	useds were place		PLUGGING	G RECORD (DF OLD WE Section	LL Type of a proved by Arte of cement used	Township
No. 5 was placed at feet. Number of sacks of cement used	Well is loca Range Street and I Tons of clay Cament plug No. 1 was plu No. 2 was plu	used	Name of p	PLUGGING We plugging contract Tons of rough	G RECORD (OF OLD WE Section	Type of z proved by Arte of cement used of cement used at the control of cement used at the cont	Township oughage sian Well Supervisor?
(over)	Well is loca Range Street and I Tons of clay Cament plug No. 1 was plu No. 2 was plu No. 3 was plu	number used swere place aced at aced a	Name of 1	PLUGGING L Dlugging contrac Tons of rough	G RECORD (OF OLD WE Section	Type of z proved by Arte of cement used	Township oughage sian Well Supervisor?
	Well is loca Range Street and I Tons of clay Cement plug: No. 1 was pli No. 2 was pli No. 3 was pli No. 4 was pli	were place aced at ace	Name of 1	PLUGGING L Dlugging contrac Tons of rough	G RECORD (''' of i tor	DF OLD WE Section	Type of temperatused of cement used	Township oughage sian Well Supervisor?
னைது, நகுது நடிகள் பது குண்டுகள் அன்றுக்கு இறைப்புள்ளேன். இருக்கும் சி	Well is loca Range Street and I Tons of clay Cement plug: No. 1 was pli No. 2 was pli No. 3 was pli No. 4 was pli	were place aced at ace	Name of j	PLUGGING L Plugging contrac Tone of rough	G RECORD (''4 of 1 tor Pos age used War feet. Num feet. Num feet. Num	DF OLD WE Section	Type of a proved by Arte of cement used of cement u	Township oughage sian Well Supervisor?

x 6 7 1		حو د	Jan 1997 Francisco State Control
		OF WELL	
FROM (Depth in Feet)	TO (Depth in Feet)	THICKNESS IN FEET	CLASSIFICATION OF FORMATION
0	<u>\$ 3276</u>		Top Soil
<u> </u>	18 3362	14	Sandstone
18	40 3540	22	Sandy clay
40	56 5324	16	Send and clay
5 6	60 3220	4	Gravel .
60	118 3262	58	Send ·
118	140 3,240	22 ·	Sandy clay
140	148 3232	8	Red clay
148	170 32/0	22	Sand and Oravel
170	172 3 203	2	Red clay
172	190 3/90	18	Conglomerate
190 .	. 200 . 2/50	10	Sand and clay
200	216 3/64	16	Sandstone
216	220 3/60	4	Water sand
220	232 3143	12	Conglomerate
·			
			44 3 7
			
			<u> </u>
		· ·	

L Conrad G. Keyes belief, the foregoing information is a true and correct record be determined from all available records.	., do solemnly swear that, to the best of my knowledge and of the well for which report is hereby made, insofar as can
De determined from all available records.	,
SUBSCRIBED AND SWORN TO BEFORE ME this	Signed / //
day of, A.D., 19	Position Driller
	Street and Number 1012 So. Penn. Ave.
Notary Public	Street and Number 4012 500 Forms AVV.
•	
My Commission Expires	Post Office .

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

							f Artesia		
		- 1							
		1	•						-
			-						
								r Lic	ense No
			•						
			_						
lat of 640 a	acres)	I	Orilling w	as comp	oleted	UC	tober 22		19_4
at top of	f casing i	n feet	above sea	level	7.	. : :	Total dep	oth of well	1071
ether wel	l is shalle	ow or	artesian	artes	ian		_Depth to wat	er upon comp	letion
:			PRIN	CIPAL V	VATER-B	EARI	NG STRATA		
Depth in	Feet	_				Des	cription of Water	-Bearing Format	ion .
From	То		Feet				•		
933	939		6	lime					
943	948	<u></u>	5	lime	. <u> </u>	_			
981	1002		21	lime	incres	se_:	at 995		
1 035	1040		5	lime					
1040	1055		15						
	1068								
	Three	de	Der		ı		ı	Per	forations
ft.	in		Top		_ Fe	et '	Type Shoe	From	То
40.5	8				66	8	Larkin float	none	
48.0	8								
					91	12			
<u> </u>							1 1		
L			RECORI	OF M	UDDING	AN	D CEMENTING		
in Feet To	1		Tons Clay					Methods Used	
1	16				100		Halliburto	ac	
				Purpos	e to c	ene	nt casing		
1	1	- 1							
. 	-↓			_		1			
1	<u> </u>					_			77
1	1			PLU	SGING	REC	ORD .		
Plugging	Contrac	tor			SGING			License N	No.
Plugging	•			 					No
Plugging	Pr				Cit	y		State	
Plugging	er		Tons of R	oughage	Cit;	y	Туј	State pe of roughage	<u> </u>
Plugging ad Numbe Clay used	used		Tons of R	oughage	Cit;	y	Tyj	State pe of roughage	19
Plugging ad Numbe Clay used method t	used		Tons of R	oughage	Cit;	y	Date Plu Cement Plug	State pe of roughage gged gs were placed	19_as follows:
Plugging ad Numbe Clay used method t	used		Tons of R	oughage	Cit;	y	Tyl Date Plu Cement Plug Depth of P	State pe of roughage gged gs were placed	19
Plugging nd Number Clay used method used approved	erused		Tons of R	oughage	Cit;	y	TyjDate Plu Cement Plug	State pe of roughage gged gs were placed	19_as follows:
Plugging nd Number Clay used method used approved	erused		Tons of R	oughage	Cit;	y	TyjDate Plu Cement Plug	State pe of roughage gged gs were placed	19_as follows:
Plugging nd Number Clay used method used approved	usedl by:	TE EN	Tons of R	oughage	Cit;	y	TyjDate Plu Cement Plug	State pe of roughage gged gs were placed	19_as follows:
Plugging and Number Clay used a method to approved FOR USI	usedl by:	TE EN	Tons of R	oughage	Cit;	y	TyjDate Plu Cement Plug	State pe of roughage gged gs were placed lugNo.	19_as follows:
	Depth in From 933 943 981 1035 1040 1055 40.5 48.0 in Feet	Depth in Feet From To To 933 939 943 948 981 1002 1035 1040 1055 1055 1068 St. A0.5 8 48.0 8 St. In Feet Diame To Hole in To Hole in To To To To To To To T	Depth in Feet	Well was SW 1/4	Well was drilled SW 14 SW (B) Drilling Con Street and Number City Has Drilling was computed to 640 acres) at top of casing in feet above sea level—tether well is shallow or artesian—artes PRINCIPAL VIOLENTE PRINCIPAL VIO	Well was drilled under F SW 1/4 SW 1/4 ME (B) Drilling Contractor Street and Number	Well was drilled under Perm SW 1/4 SW 1/4 NE 1/4 (B) Drilling Contractor Very Street and Number Box: City Hagerman, Drilling was commenced Oc. Drilling was completed Oc. In at top of casing in feet above sea level Street and Number Box: City Hagerman, Drilling was completed Oc. Drilling was completed Oc. In at top of casing in feet above sea level Street and Number Box: City Hagerman, Drilling was commenced Oc. Drilling was completed Oc. In at top of casing in feet above sea level Street and Number Box: City Hagerman, Drilling was commenced Oc. Drilling was completed Oc. In at top of casing in feet above sea level Street and Number Box: City Hagerman, Drilling was commenced Oc. In at top of casing in feet above sea level Street and Number Box: City Hagerman, Drilling was completed Oc. In at top of casing in feet above sea level Street and Number Box: City Hagerman, Drilling was completed Oc. In at top of 640 acres PRINCIPAL WATER-BEARI Des Feet 1040 1055 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Well was drilled under Permit NoRA-2155 SW 14 SW 14 NE 14 of Section 17 (B) Drilling Contractor Vernon Wintheless Street and Number Box 38 City Hagerman, Drilling was commenced October 5 Drilling was completed October 22 Intervel is shallow or artesian artesian Depth to was set of the shallow or artesian artesian Depth to was set of the shallow or artesian artesian Depth to was set of the shallow or artesian artesian Depth to was set of the shallow or artesian artesian Depth to was set of the shallow or artesian artesian Depth to was set of the shallow or artesian artesian Depth to was set of the shallow or artesian artesian Depth to was set of the shallow or artesian artesian Depth to was set of the shallow or artesian artesian Depth to was set of the shallow or artesian artesian Depth to was set of the shallow or artesian artesian Depth of Water Principles in Feet Diameter Top Bottom Feet Type Shoe for the shallow of the shallow	Well was drilled under Permit No. RA-2155. au SW 14 SW 14 NE 14 of Section 17 Twp 17 (B) Drilling Contractor Yernon Wintheiser Lic Street and Number Box 38 City Hagerman, State Drilling was commenced October 5 Drilling was completed October 22 Lat of 640 acres) Poulling was completed October 5 Drilling was completed October 22 PRINCIPAL WATER-BEARING STRATA Depth in Feet Thickness in Feet Description of Water-Bearing Format From To Peet 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

LOG OF WELL

Depth From	in Feet	Thickness in Feet	Color	Type of Material Encountered
0	36	36	3344	soil & caliche
36	50	14	3 3 3 0	caliche
50	65	15	3.3/5	sand
65	94	34	3296	sand & gyp
94	98	4	3282	hard shell
98	175	85	3205	gyp & sand
175	200	25	3/80	sand & gravel
200	205	5	3175	shell
205	234	29	3146	sand & gravel
234	260	26	3/20	•
260	300	40	305	sand gyp gyp & red rock
300	323	23	3033	hard ford rock
323	350	27	3030	
350	400	50		shalo & gyp
400	580	180	2 980	shale & gyp
		5		clay
580	585	24		hard shell red sand
585 609	609	76		
	 			red rock & shale
685	695	10		hard gyp shell
695	700	5		red shale
700	704	4		lime shell
704	715	11 5		gyp shell
715 720	720 758	38		shale
792	810	18		red sand & rock
				hard shale
810	830	20		red sand
830	832	2		hard sand & shale
832	837	5		lime shell
837	862	25		hard gray lime
862	875	13		hard gray lime water rock (lime)
875	880	5.		
880	882	3		soft sand
882 885	885 895	10		hard gray lime
	 			hard lime
895	925	30		
925	933	<u>8</u> 6		lime lime (water rock)
933	939	4		lime (water rock)
939	943			increase in water (lime)
943 948	948 955	7		lime
955	981	26		lime with shale streaks
081	. 1002	21		white lime (increase in water)
981	 			
1002	1010	8		hard white lime
1010	1035	25		white lime
035	1040	5		lime (water rock)
1040	1055	15		lime (increase in water at 1052)
L 055	1068	13		lime (increase in water at 1068)
1 068	1071	3		brown lime

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section .				(A) Owner	r of well.			J, E	3. Wall	ace		
				Street and	Number_				Box 35	6		
				•				Artesia	•			
				Well was	irilled un	der Pe	rmi	t NoR	A-1749	and	is loca	ted in the
								of Section				
			١		_			Roe L. New			se No	
Ĺ			- 1		-						•	
				•								
		Ľ										
(1	Plat of 640	acres)		Dimmig wa	as comple	:teu	******			<u></u>		19
Elevatio	n at top	of casing i	n fee	t above sea	level	<u> </u>		Total de	epth of	well	105	
State w	hether w	ell is shall	low o	r artesian_				Depth to w	ater up	on complet	ion	
Section	2			PRINC	CIPAL WA	TER-BE	ARII	NG STRATA				•••
		in Feet	Thi	ckness in			Doca	ription of Wate	or Boorie			• • •
No.	From	To		Feet			Desc	ription of was	er-Dearm	ig Formation	1	
1					-							
2												
3			 			••			·			
4		-	+									
5			┼									
!		1	<u></u>	<u>'</u>	,							
Section	3				RECOR	D OF C	CASI	NG				
Dia	Pounds	Thre in		Top	Bottom	Feet		Type Shoe	ļ	Perfor From		To
in.	1			Тор		105			ļ			
	 					105	\dashv	·	 		<u></u>	
	-								- 			
	 								 			
				<u>' </u>		<u>'</u>	·····		'		'	
Section	4			RECORE	OF MUE	DING	ANI	CEMENTING				
Dept	h in Feet	Diam Hole i		Tons Clay	No. Sa Cem		[Meth	ods Used		
From	16				-		-					
	+				-							
					+		 					
	 	+					\vdash					
				[<u>'</u> -					
Section	5				PLUGG	SING R	ECC	RD				
		_						···				
	-							Т	_			
Pluggin	g method	used				··· ··· ··· ·		Date Pl				
Pluggin	g approve	d by:				_		Cement Plu	ıgs wer	e placed as	follows	:
_				D!- ^			No.	Depth of		No. of	Sacks U	sed
				Basin Sup	T VISOF	┰┞	<u>.</u>	From	То			
	FOR U	SE OF STA	TE EL	igineer of	VLY	1					 .	
	Danier 3							 		 -		
Date	received					- 			•			
1						L		<u> </u>				i
l						-						
File N	RA-17	49		4	_Use			Locati	ion No.	17.26.	17,400	

Section 6

LOG OF WELL

Depth i		Thickness	Color	Type of Material Encountered
From	То	in Feet	Color	Type of Material Encountered
0	1			8011
1	17		•	Sand
17	23			Gravel
23	37			Pink clay
37	53			Gravel
53	105			Water, sand and gravel
	100	† <u>†</u>		water, sand and graves
		 		
		 		
		+		
		 		
		 -		<u> </u>
		11		
		 		
- 37		 		
		+		
		 		
		 		
		 		
		 		
		 		
			<u> </u>	

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

 Roe	Newberrry	
	Well Driller	

1. 9 - 200

ADDITIONAL WELL LOGS

phony 259

STATE ENGINEER OFFICE WELL RECORD

FIELD EROR. LOS

Section 1. GENERAL INFORMATION

City and	Post Office Ad	e Dilbeck Idress <u>210</u> Ant	Centre esia. Neu	Mexico 80	\$210	Owner	s well No	RA 6550
		No. RA-65				in the:		
. W	u NE u	ALCO V	% of Se	ction 10	Township		ne 268	NMP
				Co				
the								Gra
) Drilling (Contractor	H&WEn	terprises			_ License No	WD675	***
ldress	P.O. Box 4	137 Arte	sia NM	88210 E.	of Arte	116 79	c - 4516	
						Cable		
						_ ft. Total depth		
mpleted wel		hallow 🗀 a				upon completion		
mpieteu we	1115 42 51						01 w cn	
Depth	in Feet	Thickness		CIPAL WATER- Description of W				ated Yield
From	To	in Feet			atter bearing i	Annucion		per minute)
95	120	25	Wat	er Sard				
		-						
		ļ <u>.</u>						
<u>-</u>		<u></u>						<u> </u>
		T T		n 3. RECORD C				D (
Diameter (inches)	Pounds per foot	Threads per in.	Top	in Feet Bottom	Length (feet)	Type of Shoo	Fro	Perforations om To
7"	29 Lb	P/E		125	126	3/9	90	0 120
	1	1						
		Secti	on 4. RECO	RD OF MUDDI	NG AND CEMI	ENTING		
	in Feet To	Secti Hole Diameter	on 4. RECO	ks Cul	NG AND CEME		d of Placem	ent
Depth From	in Feet To	Hole	Sacl	ks Cul	bic Feet		d of Placem	ent
		Hole	Sacl	ks Cul	bic Feet		d of Placem	ent
		Hole	Sacl	ks Cul	bic Feet		d of Placem	ent
		Hole	Sacl	ks Cul	bic Feet		d of Placem	ent
From	То	Hole Diameter	Saclof M	ks Cul	bic Feet Cement		d of Placem	ent
From ugging Cont	To	Hole Diameter	Saclof M	ks Culud of	bic Feet Cement	Metho Depth in I	Feet	Cubic Feet
From ugging Contiddress ugging Meth	To To	Hole Diameter	Saclof M	ks Culud of	bic Feet Cement	Metho		
From ugging Contiddress ugging Meth	ractor	Hole Diameter	Saclof M	ks Culud of	Dic Feet Cement G RECORD No.	Metho Depth in I	Feet	Cubic Feet

Section 6. LOG OF HOLE

			Section 6. LOG OF HOLE
	ın Feet	Thickness	Color and Type of Material Encountered
From	То	in Feet	
	20	20	Jop Soil
20	60	40	Calicher-Clay
60	85	25	Fine Brown Sand
<u>85</u>	95	10	Coarse Sard
95	120	25	Water & Sand
	125	5	Red Bed JD
			·
			·
			51 79
		Section	7. REMARKS AND ADDITIONAL INFORMATION TO THE TOTAL PROPERTY OF THE
	•		
			<u>ग</u> ना

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

5

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to proportiate district office of the State Engineer. AI ons, except Section 5, shall be answered as completely and accurately drilled, repaired or deepened. In this form is used as a plugging record, only Section 1(a) and Section 5 n ed be completed.

Section 1

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

		1	- 1				. Bouthworth	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	· · · · · · · · · · · · · · · · · · ·
	1	ŀ							Non Monday
				•				State	
									l is located in the
								-	Rge26
			ł	• •	_			Licer	nse No
1 1		l			Number_				
	i			-				State <u>Ne</u>	
'				_					19 43
<u></u>	1 1		ر لــــ	Orilling w	as comple	ted	November 5	***************************************	19. <u>43</u>
•	lat of 640 a								714
Elevation	at top of	casing ii	n teet	above se	a level	on.	Total de	pth of well	214
State wh	ether well	l is shall	ow or	artesian_	711 0001		Deptn to wa	ter upon comple	tion
Section 2	:			PRIN	ICIPAL WA	TER-BEAR	ING STRATA		
	Depth in	Feet	Thic	kness in		Des	scription of Water	r-Bearing Formatio	n
No.	From	To		Feet		20.	cripiton of water	-Dem mg Pormatio	
1							,		
2									
3								··· 	
			<u> </u>						<u> </u>
4			ļ						
5			<u> </u>		<u> </u>				<u> </u>
Section 3	3				RECOR	D OF CAS	ING		
Dia	Pounds	Threa	ds	Dej	pth	l	I	Perfo	rations
in.	ft.	in	<u> </u>	Тор	Bottom	Feet	Type Shoe	From	То
13" O.I	50	8				80)	set in one st	ring joined
	O.D 40	8				795	Drive	1	ipple.
10 3/4	0.0 40	1				1,2,1	7	total length	
		1					—	JOLAT Tengun	075
	<u> </u>		 :		·			·	<u> </u>
Section 4	ł			RECOR	D OF MUE	DING AN	D CEMENTING		
Depth	in Feet	Diame		Tons	No. Sa		•	Methods Used	
From	То	Hole in	in.	Clay	Cem	ent	· · · · · · · · · · · · · · · · · · ·		
		13 3/4		540			pumped in by	plug	
							· · · · · · · · · · · · · · · · · · ·		
	<u> </u>								
	i	İ							
					NUCC	SINIO REO	000		
Section 5						SING REC			
									·
	-								
Plugging	method u	sed							19
Plugging	approved	by:					Cement Plu	gs were placed as	s follows:
						No	Depth of P	lug No. 2	f Sacks Used
				Basin Sup	ervisor		From !	ro No. 6	1 Sacks Used
	FOR USE	OF STAT	TE EN	GINEER O	NLY	_			
Date 1	Received _					_[
							 		
						1 -			
					::-				
File No.	RA-7	68			Use		Locatio	n No. 17.26.9.	323

LOG OF WELL

Depth in Feet				Type of Material Encountered
From	То	in Feet		Type of Makerial Encountered
0	5	3360		soil
5	30	£335		sandy gyp & clay
30	80	3 <i>29 2</i>		sand & gyp
80	290	3075		gyp & sandy clay
290	385	2230		gyp & sandy clay
385	720			red sand & gyp stratas
720	755			crock
775	870			red bed & rock stratas
870	875			lime rock
	casing	set		•
875	880			Water rock
880	1214			limerock several streaks of water rock
		vell is 12	4 feet	
total		(1 1000.	
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The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well

S	<u></u>	Myron	Bruning	
		Well Dri	ller	

L.B.

WELL RECORD ---

FILE No. RA-1440

INSTRUCTIONS: This form should be typewritten, and filed in the office of the State Engineer, (P.O. Box 1079) Santa Fe, New Mexico, unless the well is situated in the Roswell Artesian Basin, in which case it should be filed in the office of the Artesian Well Supervisor, Roswell, New Mexico. Section 5 should be answered only if an old artesian well has been plugged. All other sections should be answered in full in every case, regardless of whether the well drilled is shallow or artesian in character. This report must be subscribed and sworn to before a Notary Public.

SEC. 1					• •				
		x						-i	
			Owne	er of well _	T.	J. Jacks	ZOE.	;	····
N.W		N.E	Stree	t and Numb	oer		· · · · · · · · · · · · · · · · · · ·	<u> </u>	
} } }			Post	Off.ce	Art	esia, No	w Mexic	•	`·
			Weli	was drilled	under Permi	t No. B	L-1440		and
	-		is loc	ated in the		<u> </u>	×	10	K of Section 9
SW	ļļ	-S.E	Town	ship 1	78/ -	, Range	<u> 261. </u>	- :	
	11		Drilli	ing Contract	tor Ros I	. Newber	rry and	T. P.	Black
			Stree	t and Numb	per		_::		
,	at of 640 acre e Well Accu								
Drilling was c	ommenced _	Februar	7 10	19 <u></u>	1 Drillin	g was compl	eted Febr	nary 2	6th 19 41
		in feet above a							•
State whether	well is shal	low or artesia	n	Shall	ow 320°		<u> </u>		
SEC. 2					ATER-BEARI				
No. 1, from		to		, Thickness	s in feet		Formation		
		to					* .	•	
		to							
No. 4, from		to		, Thickness	s in feet		Formation		
No. 5, from		to		, Thickness	s in feet	<u> </u>	Formation		
SEC. 3	•			RECO	ORD OF CASE	NG		٠.	
DIAMETER .	POUNDS PER FOOT	THREADS PER INCH		ME OF	FEET OF CASING	TYPE OF SHOE	FROM	TO	PURPOSE
12 <u>}</u>					202				
10					106	•		· _	
	Pipe	slit with	tord	h.6 sli	ts per ci	rcle.			
		1							
			. pc	CORD OF M	UDDING AND	CEMENTIN	<u>-</u>	<u> </u>	
SEC .4				CORD OF M	DING AND	CEMENTIN			
MULE IN I		NUMBER OF S OF CEMEN			METHODS USED	'	SPECIFIC OF		CLAY USED
-				†					†
-									
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			···-	 					
<u> </u>				<u> </u>					<u>'</u>
SEC. 5		,	••	PLUGGING	RECORD OF	OLD WELL	a Vizigar jarg		and the second s
Well is locate	d in the	x_		×		of Section		, Town	ship
Range	<u> </u>	Name of 1	bluceins	contractor	شهران وجواند	والمنتقب المستد		êlor.	
5 / 12 x			1	پېښېنې	Bright Breeze	Office -	4. A. A. A.	4 1 2 2	200 1 - 1 6 B - 1500
Street and I	Same and the same	4							
Tons of clay	used	اليوساء الراغيان كبيجيته	منتحد کانی ۱	· • • • • • • • • • • • • • • • • • • •	age used	Sec. 30.	يو سون تيهيت	200 S	المعاد الاولاد والمستنف المرابيين المتعادية
1 . 1 . 1 . 1 . 1 . 1 . 1 . 1 . 1 . 1 .	- J	Party Control	1.7		Was	plugging ar	proved by	Artesian V	Vell Supervisor
				T-1	لوعوا السراعية بياور: لما عليان الارتاب			2 40	
					Numb	er of eacks c	i cement us	ACI	Commercial for the first of the second secon
No. 2 was pla	ced at	A STATE OF THE STATE OF	C. C.	feet					THE PROPERTY.
No. 3 was pla		194 4		feet	The Control				
NO. 4 WAS DIS	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	500 8 16 N 18	No. 1			- 1 - C		· Dec	FA-1502-112
No. 4 was pla	ced at			feet	Numb	er of sacks (o cement m	ed <u>Wals</u> i	
No. 5 was pla	ced at	#Z. PEZZ F		feet	Numb	er of sector of	oment us		
					(OVER)		te un 😁		

FROM (DEP			IN PERT DESIGNATION	OG OF W.	S IN FEET	CLASUR A OF FORMATION
美国		-		The State La		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Comments of the Comments of th	30 32	1		STORY OF		Tartie Galay May
74 80°	To the same	7 4 4	To all to have the	Feet 50		Pink Clay
110		13	o de la face de O	20		Red Sand Water
		公司	j	20		Red Sandy Cla-
150		5 × 17		20		Tellow, pandy clay
泽 170		19	6	26		Red sand olay, some
196	-	a rai		14	. ,	Pink Vater Sand
210	-		5			White water Sand
225	5-6		5 I.			Red Sandy Clay
245	- 2 to A	32 26	and the second	15		
	Tem you T. B. Codery			1		Vator Sand
260		28		25		Red Clay
285	, - '	32	0	35		Water Sand, bottomed at red clay.
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				<u> </u>		and the second region, who deposits a region of the second second in the second
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	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			· · · · · · · · · · · · · · · · · · ·	
e foregoing informatio	n is a true and correct record	d of the well (or w).		o the best of my ade, insofar as ca	knowledge a1 be an be determined f
e foregoing informatio I available records.	n is a true and correct record	d of the well for wh	ep rt is hereby m	ade, insofar as ea	an be determined fo
ne foregoing information in available records. SUBSCRIBED AN	n is a true and correct record D SWORN TO BEFORE 1	d of the well (or w).	ep rt is hereby m	ade, insofar as ea	an be determined fr
he foregoing informatio Il available records.	n is a true and correct record	ME this, A. D., 19	Signed Court	ade, insofar as ea	an be determined fr

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L',	W,

WELL RECORD

File !	No
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INSTRUCTIONS: This form should be typewritten, and filed in the office of the State Engineer, P. O. Box 1079, Santa Fe, New Mexico, or in the office of the Artesian Well Supervisor, Roswell, New Mexico. Section 5 should be answered only if an old artesian well has been plugged. All other sections should be answered in full in every case, regardless of whether the well drilled is shallow or artesian in character. This report must be subscribed and sworn to Refore a Notary Public.

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			Own	er of we	11Br1	ton Go	1-1			
 }			1					•		
NA	/	NE	-							
1-+		· -	Post Office Artesis New McXico Well was drilled under Permit No. RA 2698 and							
			1					-	4 of Section	
		SE	1						<u></u>	
31			1		•	-Blount		.,		
			1							
	Plat of 640 ate Well A							-		
Drilling was		d Jul	v-28-		19 5] Dr	illing was co	mpleted		-31 ¹ 51	
Elevation at	top of casi	ng in feet abo	ve sea le	vel.	<u>: 17</u>					
State whethe	r well is sh	allow or arter	iana	s	hellow,	Stock	well-		feet below land surface.	
Total depth	of well	140							feet below land surface.	
Sec. 2						ARING ST				
No. 1, from	18	to	50	, Thick	ness in fee	12	Form	ation	3 y p	
No. 2, from	50	to(30	, Thick	ness in fee	-30	, Form	ation C	lsy & Gravel	
No. 8, from	-30	tg	40	, Thick	ness in fee	ـــــارا	, Form	ation.	news.1	
No. 4, from		to		, Thick	ness in fee	L		ation	ratet	
		to								
Sec. 3					ORD OF C					
Diameter	Pounds	Threads	Nai	me of	Feet of	Type of	Perfora	ted		,
in Inches	per Foot	t per Inch	Manu	facturer	Casing	Shoe	From	TO	Purpose	
8					40				Shut off	
·	ļ	1	<u> </u>						surface water	
-7	<u> </u>	-			23				Meet domestic	
	<u> </u>	!		\	L				well requires	nts.
Sec. 4			RECOR	D OF M	UDDING A	AND CEME	NTING		-	
Diamet Hole in		Number of of Ceme			Methods U	ed	-	Gravity Mad	Tons of Clay Used	
- 										
- 				 -						
				ļ — —					 	
L				L						
Sec. 5			PLI	UGGING	RECORD (OF OLD W	ELL		***	
Well is loca	ted in the	·			% of	Bection		, Town	nship	. •
Range		Name of p	lugging	contracto	r					
Street and P	Yumber				Por	rt Office				
Tone of clay	nsed		. Tons o	of rougha	-		Туре			
						s plugging a	pproved by .	Artesian	Well Supervisor?	•
Cement plug	s were plac	ced as follows	•			,	:	i	2 2 2	
No. 1 was ph	sced st					ber of sacks				
No, 2 was pl	aced at	. 1 -				ber of sacks		4		-
No. 8 was pl	aced at	<u> </u>			feet. Nun	ber of sacks	of cement	um4	DEC 12 1951	.
No. 4 was pl	aced at				feet_Num	ber of sacks	of coment	used	OFFICE	1
No. 5 was pli	aced at					ber of sacks	of cement		THIAN WELL BUPERVISO	BC
	-				(over)			'ا	OSWELL, NEW MEXICO	
				ميونية مشت	u' •	tion the state		·	in the second second second second second second second second second second second second second second second	ہ بر ٹین

BA-2698-

17.26. 9.244

FROM (Dopth in Feet)	and the second	THICKNESS IN FEET	CLASSIFICATION OF FOI
		*u.	an divinita gass} is
			The second of th
		. Crea	the of faction to will be
	18	18	Topsoil & Cle
18	30	12	Gyp
	50	20	Clay
50		30	Gravel & Clay
80	130	50	Sand rock
	140	10	Sanl & Gravel
<u> </u>			
		<u> </u>	
		 	
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I, belief, the foregoing information is a true and correct record to determined from all available records.	. do solemnly swear that, to the best of my knowledge and of the well for which report is hereby made, insofar as can
SUBSCRIBED AND SWORN TO BEFORE ME this	Signed
	Position
Notary Public	Street and Number
dy Commission Expires	Post Office

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

			(A	A) Owne	er of well	7.	I. Zlea	pal-	
			1 ,		Number.	·// /	-416		
l					400	This	001	Stat	te nimi
	<u> </u> -		1	-		der Perm	it No RA -	_	Quand is located in
									171 Rge 261
	 				ing Contra				License No. Lud
				-	_	2)	04/20		License No. 12 1
					Number MLs		,		
				-			_		te <u>71, 711.</u>
			1	_	as comm		die i		19_6
	Plat of 640		— Dr	illing w	as comple	eted	ale.		19.6.
			•4 -		. 11	7:-0	. Total da	-4h -411	918'
levation	n at top o	of casing in	n ieet a	pove se	a level	0-111	Total de	tor upon ea	mpletion 25
tate wh	netner we	il is snail	ow or a	irtesian 4			z_Depin to wa	ter upon co	mpletion
ection 2	2			PRIN	CIPAL WA	ATER-BEAR	ING STRATA		
	Depth :	in Feet	Thickr	ness in		De	scription of Water	-Rearing For	mation
No.	From	То	Fe	eet		20.	arphon or water	-Dearing For	ination
1 /	25	35		10		7/2	0		
2	01		/_/_	$\boldsymbol{\omega}$		ncia	0		
	76	139	14-	≾		euu-	<u> </u>		
3			1					***	
4									
5									
					DECOR	D OF CAS	TNC		
ection 3	3					U OF CAS	SING		
Dia	Pounds		L	Dep	oth Bottom	Feet	Type Shoe	Perforations To	
in.	ft.	in		Тор	Bottom	120	4 -	From	To
7//	 					139	More	118	139
	ļ					 	1,00	·	
				<u> </u>	·	<u> </u>			
			<u> </u>	•		1 .			
					•₹ NOEMU	CONOCAN	D CEMENTING		
ection 4							D CEMENTING		
	in Feet	Diame Hole in		Tons · Clay	1 .	ecks of .		Methods Us	sed
From	10								
	<u> </u>								
					<u> </u>		· · · · · · · · · · · · · · · · · · ·		
			1						
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					BULGO	SING PEG	000		
	5				PLUGG	SING REC			
ame of	o Pluggin	g -Contrac				<u> </u>			₽ No
ame of	i Pluggin nd Numb	er				_ City		State	
ame of	i Pluggin nd Numb	er				_ City		State	
ame of reet ar	i Pluggin nd Numb	er				City	Ty]	State pe of rough:	
ame of reet ar ons of t	5 Plugging nd Numb Clay used	er i used				City	Tyl	State pe of rough: gged	age
ame of reet ar ons of t	Plugging nd Numb Clay used g method	er i used				_ City	Date Plu Cement Plug	State pe of roughs gged	age19 ed as follows:
ame of reet ar ons of t	Plugging Numb Clay used method gapproved	er i used d by:	Tc	ons of R	oughage u	City	Typ Date Plu Cement Plug	State pe of roughs gged	age19
ame of reet ar ons of t	Plugging Numb Clay used method gapproved	er i used d by:	Tc	ons of R	oughage u	_ City	Typ Date Plu Cement Plug	State	age19 ed as follows:
ame of treet ar ons of (lugging	Plugging Numb Clay used method approved	er lused d by: E OF STAT	To	Basin Sup	oughage u ervisor	_ City	Typ Date Plu Cement Plug	State	age19 ed as follows:
treet arons of dugging	Plugging Numb Clay used method approved	used d by:	To	Basin Sup	oughage u ervisor	_ City	Typ Date Plu Cement Plug	State	age19 ed as follows:
ame of reet ar ons of d dugging	Plugging nd Numb Clay used method gapproved FOR US	erusedd by: E of \$\frac{1}{2} \frac{1}{2} ge	Basin Sup	oughage u	_ City	Typ Date Plu Cement Plug	State	age19 ed as follows:	
ame of reet ar ons of ugging ugging	Plugging nd Numb Clay used method gapproved FOR US	er lused d by: E OF STAT	To Page	Basin Sup	oughage u	_ City	Typ Date Plu Cement Plug	State	age19 ed as follows:
ame of reet ar ons of ugging ugging	Plugging nd Numb Clay used method gapproved FOR US	erusedd by: E of \$\frac{1}{2} \frac{1}{2} ge	Basin Sup	oughage u	_ City	Typ Date Plu Cement Plug	State	age19 ed as follows:	

Use 12 on. Location No. 17.2610.110

LOG OF WELL

Depth	in Feet	Thickness in Feet		
From	To	in Feet	Color	Type of Material Encountered
.0	25	25		red Clay
25	35	10		Dank
35	96	61		red Clay
96	139	43		sand
139	2/8	79		hod Class
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The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well?

Well Driller

Es .

File No.

Form WR-23

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging

		- 1									
		- 1	- 1	Street and	Number						
				•					New Mexico		
1									and is located in		
! .								-	17S Rge. 26B		
			- 1		=				cense No		
<u>}</u>								<u></u>			
	i i		- 1	-							
ĺ	1 1	ľ		-					19		
	Plat of 640	acres)		Drilling w	as comple	ted	5-28-26		19		
•		-	n fee	t above se	a level	2220	Total de	onth of well 1	263		
	-	_						-	pletion		
		11 13 Billion	OW 0.					iter upon com	рленоп		
Section	2			PRIN	CIPAL WA	TER-BEAR	NG STRATA		<u> </u>		
No	Depth i		Thi	ckness in Feet		Des	cription of Wate	r-Bearing Forms	ation		
	From	То	 				-		· · · · · · · · · · · · · · · · · · ·		
1											
2											
3			1								
4											
5											
					DECOR	D OF C45	INC				
Section :	3			1 -		D OF CAS	ING	1			
Dia in.	Pounds ft.	Thre		Top	Bottom	Feet	Type Shoe	From	erforations To		
	-				200000	4	<u> </u>	210111	10		
123	 			 	 	452	 	 . 	_		
10		t-	~	15 fost :	n 101	930	g no seal.	<u> </u>			
10 1	пси соше	s up ab	Jul .	3 Teet	11 125 11	cu cası	g no seal.	 			
	<u> </u>			 	<u>'</u>		·	1			
Section 4	4			RECOR	D OF MUE	DING AN	D CEMENTING				
	h in Feet	Diam		Tons	No. Sa	1	Methods Used				
From	То	Hole i	n in.	Clay	Cem	ent	memons osen				
				ļ							
	J						~ ~~~~~~				
	<u>i </u>			[1	1					
					BLUCG	ING RECO	200	· -			
Section 5									••		
									No		
						_			 		
	-								e		
									19		
'lugging	g approved	ı by:					·	gs were placed	as follows:		
				Besin Sup		No.	Depth of F	No	. of Sacks Used		
				Basin Sup	ervisor	-	From	To			
	FOR US	E OF STA	re en	GINEER O	NLY		 				
Date :	Received .					- _	 				

LOG OF WELL

Dep	th in Feet	Thickness in Feet	Color	Type of Material Encountered
			 	
0 20	45			soil and gyp
45	56	 		gravel clay
55	60			rock
60	75			white gumbo
75	94			white gumbo
94	118			white gumbo
118	139			white gumbo
139	159			gumbo
159	177			gumbo
177	197			sand
197	217_			sand rock
217	239			sand
239	276			sand
276	295			sand shale
295	314			sandy shale
314	334			sand
334	353			rock
353	373			rock
373	393			gumbo and rock caving
393	411			gumbo
411	432			sand
432	452			rock and sand
452	471			rock and sand
471	491			red clay
491	512			sand
512	531			sand
531	552			gumbo
552 572	572 586			guabo clay and typ rock
586	645			sand
645	664			clay
664	685			clay
685	705			sand
705	720			sand
720	740			sand rock
740	759			sand rock
759	779			sand rock
779	799			rock
799	818			sand rock
818	837	1		hard rock
837	852			rock and clay
852	871			rock
871	891			rock and sand
891	908			clay and sand
908	928			hard rock
928	947			hard rock sand 4 or rock 17
947	969	,		
969	990			hard rock
990	1010	·		hard rock
1010	1067			hard rock rough rock
				first flow
1086	1106			rock
1124	1124			limerock
1143	1160			limerock
1160	1184			limerock
				
1184	1202	1	1	limerock rough streaks
1184 1202	1202			limerock rough streaks

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and cor-

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section				(A) Owne	er of well.		D. D. Su	lliven	
	1 1			Street and	l Number			····	
									New Mexico
									d is located in the
			_					_	Rge26
					-				nse No
			- 1						
				_					10 27
	1 [19 37 19 37
	(Plat of 640	acres)		Drining w	as combre	:tea		m. r. = 1	19
Elevatic	on at top	of casing i	n fee	et above se	a level	337,	Total de	pth of well 21	0 ft.
	_							ater upon comple	
Section	. 2			PRIN	ICIPAL W/	ATER-BEAT	RING STRATA	•	
		in Feet	l Th	ickness in	<u> </u>			Farmatic	
No.	From	To	1	Feet	1	100	scription of water	r-Bearing Formatio	מנ
1	<u> </u>	18'	181	t flow					
2		36 to 4	┼	2nd flow					
3	-	1	f-	1	 				
4	 	1	 						
5	 	+	-		 				
	<u> </u>	<u> </u>	<u> </u>						
Section	3	•				RD OF CA	SING		
Dia	Pounds	s Threa		Top	pth Bottom	Feet	Type Shoe	Perfo From	orations
in.	ft.			Тор	Bottom	 	 	From	То
	+				 	 	+	 	+
	+				 	 			-
	+			+'	 			 	
				<u>'</u>	<u> </u>	<u></u>	.'	1	_1
Section	. 4			RECOR	D OF MU	DDING A	ND CEMENTING		
	th in Feet	Diame Hole in		Tons	1	acks of		Methods Used	
From	То	Hore -	<u> </u>	Clay		nent			
				+					
				 					
				 		-			
	1			!	<u>. ! </u>				
Section	. 5				PLUGE	GING REC	CORD		
Name (of Pluggir	ng Contrac	:tor_					License No)
		ber				_ City		State	
	-				toughage 1	used	Ту	pe of roughage_	
Pluggir	ng method	l used					Date Pl	ugged	19
Pluggin	ig approve	ed by:	- -	-	•	· • • <u>· · ·</u>	Cement Plu	igs were placed a	s follows:
	- -					N	Depth of P	No. 6	of Sacks Used
	-			Basin Sup	pervisor	<u> </u>	From :	To No. o	R SECES USOL
	FOR U	SE OF STA	TE E	NGINEER O	NLY				
			-			1			
Date	Received	l ———				- <u>.</u>			
l	15.4								
Det	tigs pr Lee;	12 12 Aic	~لانه ۱۵۰۸	(
		RA-1300	<u> </u>		Use		Tocati	No 17.90	5.10.430
и эки	To				U8E	- , 		UII 410	, FWXT-5AN

Depth :		Thickness in Feet	, Color	Type of Material Encountered	
From	To	In Feet	2240 = 1		
0	23		3217	Gypsum rock	
23	25		33/5	Water sand	
25	36	11	2334	Sand and gravel	
36	- 40			Gravel (water)	
40	43	<u> </u>	3 29 j.	Water sand	
43 .	48 .		3292	White clay	
48	55		3234	White clay	
55	70		3270	Water sand	
70	76		3234	White clay	
76	80		3210	Sand	
80	90		3250	White clay	
90	125		2215	White clay	
125	132		3208	Sand rock	
132	145		3195	White clay	
145	150		3/95	Sand	
150	157		3/83	Sand rock	
157	175		3165	Water sand	
175	195		3145	White clay	
195	206		3/32/	Sand rock	
206	210		3/30	Water sand	
		 			
		†		 	
		+	 	 	
		 	<u></u>		
		 			
		 			
······································		-			
	<u> </u>	 			

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

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R & R Drilling Co.
Well Driller

WELL RECORD.

A COUNTY OF THE

APPENDIX B
WATER QUALITY ANALYSES

WATER QUALITY OF MONITOR WELLS NEAR EVAPORATION PONDS

ASSAIGAI

ANALYTICAL LABORATORIES, INC.

TO: Geo Science

500 Copper Ave. N.W.

Albuquerque, NM

DATE: 8 November 1984

1080, 1040

ANALYTE

SAMPLE ID/ANALYTICAL RESULTS

	JAMES I	D/ MANDITIONE RESC	, 113
	11184 1330 Well 28	103184 1432 Well 45	103184 1240 Well 46
Benzene Toluene Ethylbenzene Xylenes	<0.005 mg/l <0.005 mg/l <0.005 mg/l <0.005 mg/l	<0.005 mg/l <0.005 mg/l <0.005 mg/l <0.005 mg/l	<0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1
	103184 1520 Well 47	103184 1550 Fire Pond	
Benzene Toluene Ethylbenzene Xylenes	<0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1	<0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1	
	Well 3	Well 5	Well 12
NO 3 as N NH 4 CN Benzene Toluene Xylenes Ethylbenzene	<0.01 mg/l 1.16 mg/l <0.01 mg/l <0.005 mg/l <0.005 mg/l <0.005 mg/l <0.005 mg/l	<pre><0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>
	Well 13	Pond 1	Pond 3
NO 3 as N NH 4 CN Benzene Toluene Xylenes Ethylbenzene	<pre><0.01 mg/1 5.6 mg/1 0.09 mg/1 0.254 mg/1 0.345 mg/1 0.389 mg/1 <0.100 mg/1</pre>	<pre><0.01 mg/1 10.6 mg/1 0.4 mg/1 0.711 mg/1 0.588 mg/1 0.591 mg/1 0.240 mg/1</pre>	<pre><0.01 mg/1 13.87 mg/1 0.2 mg/1 0.027 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>

& CUSTOMER Navajo Refining Co ny ADDRESS Box 526 CITY Artesia, NM 88210 CATTENTION Ed Kinney

INVOICE NO. 104223

KINNEY

ANALYSIS

SAMPLES RECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.O. #20030) 	
TYPE OF ANALYSIS Water			
Sample <u>Identification</u>	Type of Analysis	mg/liter	11/21/80 10
Navajo Well #1	Acidity Alkalinity, "P" (As CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium Chromium Chromium 6+ Copper Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium Nickel pH Units Phenols Alkalinity , "M" Solids, Total Dissolved Sulfate	179 < 1 0.1 44 0.05 145 8313 0.002 < 0.01 0.001 0.9 5760 0.05 0.006 850 0.02 7.8 0.015 700 19700 4920	5800 0.9
	Sulfide Zinc	0.21 < 0.1	

Sample Analysis by: B.P. Date and Time of Analysis: BOD₅ - 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD₅ - 5 day incubation pH: electrode



4/30/81

Elmer D. Martinez, Director of Quality PAGE 5 OF 13 PAGE

CUSTOMER
ADDRESS
CITY
ATTENTION

VOICE NO

Navajo Refining Con of Drawer 159 Artesia, NM 88210 Ed Kinney



SAMPLES RECEIVED 4/24/81 CUSTOMER ORDER NUMBER P.O. # 20030

TYPE OF ANALYSIS

104223

Water

Sample Identification	Type of Analysis	mg/liter	11/21/80	14/317
Navajo Well # 3		32 < 1.0 < 0.1 40 0.009 73		
	Chloride Chromium Chromium 6+	2652 < 0.001 < 0.01 < 0.001	Z 200	1180
,98	Fluoride Hardness (as CaCO ₃) Iron	1.6 2760 0.01	5. O	3.2/
	Magnesium	<pre> 0.001 250 0.01 7.4</pre>		
	•	 0.001 356 7730 2720 	7640	6777
	Sulfide	< 0.10 < 0.1	•	

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



Elmer D. Martinez, Director of Quality Assurance
PAGE 6 OF 13 PAGE
4/30/81

ADDRESS

CITY

Navajo Refining Cor.

Drawer 159

Artesia, NM 88210

ATTENTION NVOICE NO.

Ed Kinney 104223



SAMPLES RECEIVED 4/24/81 CUSTOMER ORDER NUMBER P.O. # 20030

TYPE OF ANALYSIS

Water

Sample Identification	Type of Analysis	mg/liter	11/21/50	10/3/7
Navajo Well # 5	Acidity	36		
•	Alkalinity, "P" (as CaCO ₃)	< 1.0		
	Barium	0.1		
	Biochemical Oxygen Demand	24		
	Cadmium	0.05		
	Chemical Oxygen Demand	176	_	
	Chloride	70 89	8600	4127
/	Chromium	0.002		
163	Chromium 6+	< 0.01		
/**	Copper	0.001	_	
	Fluoride	0.44	0.96	p.43
	Hardness (as CaCO ₃)	4660		
	Iron	0.04		
	Lead	0.007		
• .	Magnesium .	650		
	Nickel	< 0.01		
	pH Units	7.7		1
	Phenols	< 0.001		
	Alkalinity, "M"	506		
•	Solids, Total Dissolved	16,800	21.100	7367
	Sulfate	4290		
	Sulfide	0.13	•	
	Zinc	< 0.1		1 .

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 7 OF 13 PAGE *CUSTOMER ADDRESS CITY

Navajo Refining Co. Drawer 159

Artesia, NM 88210 Ed Kinney

ATTENTION NVOICE NO

104223

SAMPLES RECEIVED

4/24/81

CUSTOMER ORDER NUMBER

P.O. # 20030

TYPE OF ANALYSIS

Water

Sample Identification	Type of Analysis	mg/liter	11/21/80	10/3/
Navajo Well # 7	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium Chromium	36 < 1.0 < 0.1 38 0.04 136 3570 0.002 < 0.01	3400	\\ \{\sigma} = \(\frac{1}{2} \)
,6+	Copper Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium Nickel pH Units Phenols	0.004 0.3 3160 0.05 0.001 370 < 0.01 8.0 < 0.001	0.92	0.40
· .	Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	596 14,200 5600 0.05 < 0.1	21,500	28.05

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



CUSTOMER ADDRESS CITY

Navajo Refining Co

Drawer 159

Artesia, NM 88210

ATTENTION NVOICE NO

Ed Kinney 104223

SAMPLES RECEIVED

4/24/81

CUSTOMER ORDER NUMBER

P.O. # 20030

TYPE OF ANALYSIS

Water

Sample Identification		Type of Analysis		mg/liter	11/21/80
Navajo Well # 9		Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand	v	36 1.0 0.1 36 0.01 88	
		Chloride Chromium Chromium 6+	<	2703 0.002 0.01	2200
	.65	Copper Fluoride Hardness (as CaCO ₃) Iron		0.006 0.7 3120 0.01	1.8
	·	Lead Magnesium Nickel	<	0.001 370 0.01	
		pH Units Phenols Alkalinity, "M"	<	322	A77.0
-	·	Solids, Total Dissolved Sulfate Sulfide		10,400 4160 0.03	9820

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

Zinc

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



< 0.1

CUSTOMER

Navajo Refining Con

Drawer 159 ADDRESS

Artesia, NM 88210 CITY

ATTENTION NVOICE NO

Ed Kinney 104223



29.000 2884

SAMPLES RECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.O. # 200	30
TYPE OF ANALYSIS Water		
Sample Identification	Type of Analysis	mg/liter 11/21/80 10/
Navajo Well # 12	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium Chromium Chromium 6+	55 < 1.0 < 0.1 38 0.07 256 8058 0.002 < 0.01 0.002
	Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium	0.9
	Nickel pH Units Phenols	0.02 7.6 *<0.001

Alkalinity, "M"

Sul fate

Sulfide

Zinc

Solids, Total Dissolved

* Data will follow on 5/6/81.

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



545

28,900

11,500

0.05

< 0.1

ADDRESS
CITY
ATTENTION

VOICE NO

Navajo Refining Cor ny Drawer 159 Artesia, NM 88210 Ed Kinney

104223

l l	SAMPLES RECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.O. # 200	030
	TYPE OF ANALYSIS Water		
}	Sample Identification	Type of Analysis	mg/liter /1/2//8c /c/2/7;
	Navajo Well # 13	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium	11 < 1.0 0.1 22 0.002 48 357 0.002
		Chromium 6+ Copper Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium Nickel pH Units	<pre> < 0.01 0.001 1.2 3.5 /.47 1570 0.02 0.003 79 < 0.01 7.4 </pre>

Pheno1s

Sulfate

Sulfide

Zinc

Alkalinity, "M"

Solids, Total Dissolved

Sample Analysis by: BP

Date and Time of Analysis: BOD₅: 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



< 0.001

146

3200

1810

0.04

< 0.1

3060

CUSTOMER ADDRESS Navajo Refining Cor

Drawer 159

104223

Artesia, NM 88210

ATTENTION VOIÇE NO

Ed Kinney

SAMPLES RECEIVED

CITY

4/24/81

CUSTOMER ORDER NUMBER

P.O. # 20030

TYPE OF ANALYSIS

Water

Sample Identification	Type of Analysis		mg/liter
Navajo Well # 16	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium Chromium Chromium Chroper		13 1.0 0.1 44 0.002 152 1173 0.001 0.01
.62	Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium Nickel pH Units Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	<	0.44 1610 0.01 0.002 140 0.01 7.7 0.016 425 4,770 1,890 0.10

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 12 OF 13 PAGE

- CUSTOMER ADDRESS

Navajo Refining Cor

Drawer 159

city Artesia, NM 88210

ATTENTION NVOICE NO. Ed Kinney 104223

SAMPLES RECEIVED

4/24/81

CUSTOMER ORDER NUMBER

P.O. # 20030

TYPE OF ANALYSIS

Water

Sample Identification	Type of Analysis		mg/liter
Navajo Well # 17	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium	<	17 1.0 0.1 42 0.03 88 4692 0.002
16	Chromium 6+ Copper Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium	< <	0.002 0.01 0.001 0.3 4470 0.03 0.005 470
	Nickel pH Units Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	<	0.01 7.6 0.001 198 11,200 2,930 0.03 0.1

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



40687 MEF ADDREES CITY

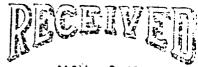
ATTENTION

VOICE NO

wavajo Refining Cor Drawer 159

Artesia, NM 88210

Ed Kinney 104223



10/3/7

11/30

132

6/62

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1/	17	ł	P	IJ	U	h	E	FI	1/	\prod_{i}	i G	C(J.

SAMPLES RECEIVED CUSTOMER ORDER NUMBER 4/24/81

Windmill (Fig 4-9 Rerries Water TYPE OF ANALYSIS

> Sample Type of Identification Analysis mg/liter Well Water Acidity 13 Alkalinity, "P" (as CaCO₃) < 1 Barium 0.1 Biochemical Oxygen Demand 38 Cadmium 0.002 Chemical Oxygen Demand 88 Chloride . 1632 Chromium 0.002 Chromium 6+ 0.01 Copper 0.004 Fluoride 0.25 Hardness (as CaCO₂) 2400 Iron 0.06 Lead 0.005 Magnesium 310 Nickel 0.01 pH Units 7.8 Pheno1s 0.022 Alkalinity, "M" 205 Solids, Total Dissolved 6860 Sulfate 2830

> > Sulfide |

Zinc

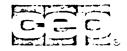
Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: $BOD_5 - 5$ day incubation

pH:electrode



0.03

0.2

customer Navajo Refining Co. any Drawer 159
CITY Artesia, NM 38210
Attention Ed Kinney
INVOICE NO. 104223

SAMPLES RECEIVED 4/24/81

CUSTOMER ORDER NUMBER P.O. #20030

4/30/81

TYPE OF ANALYSIS W

Water

Sample Identification

Type of Analysis

mg/liter

Navajo Well #12

Phenols

< 0.001



APPENMED BY Hartinez, Director of Quality
Assurance

WATER QUALITY OF MONITOR WELLS IN REFINERY AREA

ASSAIGAI

ANALYTICAL LABORATORIES, INC.

TO: Geo Science 500 Copper Ave. N.W. Albuquerque, NM DATE: 8 November 1984 1080, 1040

ANALYTE

SAMPLE ID/ANALYTICAL RESULTS

P	11184 1330 Well 28	103184 1432 Well 45	103184 1240 Well 46
Benzene Toluene Ethylbenzene	<0.005 mg/l <0.005 mg/l <0.005 mg/l	<0.005 mg/1 <0.005 mg/1 <0.005 mg/1	<0.005 mg/1 <0.005 mg/1 <0.005 mg/1
Xylenes	<0.005 mg/l	<0.005 mg/1	<0.005 mg/l
	103184 1520 Well 47	103184 1550 Fire Pond	
Benzene	<0.005 mg/l	<0.005 mg/l	
Toluene Ethylbenzene	<0.005 mg/l <0.005 mg/l	<0.005 mg/l <0.005 mg/l	
Xylenes	(0.005 mg/l)	<0.005 mg/1	
	Well 3	Well 5	Well 12
NO 3 as N	<0.01 mg/l	<0.01 mg/1	<0.01 mg/1
NH 4	1.16 mg/1	2.5 mg/1	0.25 mg/l
CN Pangana	<0.01 mg/1 <0.005 mg/1	<0.01 mg/1 <0.005 mg/1	<0.01 mg/l <0.005 mg/l
Benzene Toluene	(0.005 mg/l)	<0.005 mg/1	<0.005 mg/1
Xylenes	<0.005 mg/1	(0.005 mg/l)	<0.005 mg/1
Ethylbenzene	<0.005 mg/1	<0.005 mg/1	<0.005 mg/1
	Well 13	Pond 1	Pond 3
NO 3 as N	<0.01 mg/1	<0.01 mg/l	<0.01 mg/1
NH 4	5.6 mg/l	10.6 mg/l	13.87 mg/l
CN	0.09 mg/l	0.4 mg/l	0.2 mg/1 0.027 mg/1
Benzene Toluene	0.254 mg/l 0.345 mg/l	0.711 mg/l 0.588 mg/l	<0.02/ mg/1 <0.005 mg/1
Xylenes	0.389 mg/1	0.591 mg/1	<0.005 mg/1
Ethylbenzene	<0.100 mg/1	0.240 mg/l	<0.005 mg/1

ASSAIGAI

ANALYTICAL LABORATORIES, INC.

TO: Geo Science

Attn: Randy Hicks 500 Copper N.W.

Albuquerque, NM 87105

DATE: 3 December 1984

1111

ANALYTE	SAMPLE IDENT	IFICATION/ANAL	YTICAL RESULTS
	Fire Pond	Well 47	Well 28
	10/31/83	10/31/84	11/1/84
	1550	1520	1330
Phenols	20.0 ug/1	33.0 ug/1	20.0 ug/1
Cl	134.0 mg/1	122.0 mg/1	101.0 mg/1
SO	1800.0 mg/1	1400.0 mg/1	2150.0 mg/1
TDS	3664.0 mg/1	2728.0 mg/1	5192.0 mg/1
TSS	96.0 mg/1	13588.0 mg/1	720.0 mg/1
NO	$2 \cdot 18 \text{ mg}/1$	1.79 mg/1	1.63 mg/1
NH	1.0 mg/1	0.3 mg/1	0.3 mg/1
Cr	<0.01 mg/1		<0.01 mg/1
CN	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
	Well 45	Well 46	
	10/31/84	10/31/84	NOMINAL DETECTION
	1432	1240	LIMIT
Phenols	16.0 ug/1	13.0 ug/1	0.01/1
C1	495.0 mg/1	446.0 mg/1	0.01 ug/1
SO	1650.0 mg/1	2100.0 mg/1	1.0 mg/1
TDS	3836.0 mg/1	3988.0 mg/1	1.0 mg/1
TSS	2004.0 mg/1	4084.0 mg/1	1.0 mg/1
NO	0.10 mg/1	0.80 mg/1	1.0 mg/1
NH	11.6 mg/1	1.0 mg/1	0.1 mg/1
Cr	<0.01 mg/1	<0.01 mg/1	0.1 mg/1
CN	<0.01 mg/1	<0.01 mg/1	0.01 mg/1 0.01 mg/1

REFERENCE: "Standard Methods for the Examination of Water and Wastewater", 15th Edition, APHA, N.Y., 1980.

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

Sincerely,

Jennifer V. Smith, Ph.D.

Laboratory Director

TEL Weathering Area

Geraghty 8	k Miller	pgradient		Downgradient	
		Well 35	36	Wells 37	38
рН		7.28	7.27	7.57	7.37
Spec Cond		3942	9462	9462	7899
TOC	(*)				
TOX Ug/1		318	125	223	170
Chloride	(*)				
Iron		4.6	0.89	0.14	0.73
Manganese		1.34	1.34	1.26	0.789
Phenols		0.001	0.001	0.001	0.001
Sodium	(*)				
Sulfate	(*)				
Arsenic		0.07	0.03	0.02	0.02
Barium		0.1	0.1	0.1	0.1
Cadmium		0.001	0.001	0.001	0.001
Chromium		0.003	0.002	0.001	0.001
Fluoride		1.45	1.34	2.05	1.60
Lead		0.001	0.001	0.001	0.001
Mercury		0.0004	0.0004	0.0004	0.0004
Nitrate		0.1	0.1	0.1	0.1
Selenium		0.01	0.01	0.01	0.01
Silver		0.01	0.01	0.01	0.01
Pest & Her	,p	-	-	-	-
Radio	(**)	-	-	-	-
Coliform		1	1	2700	1

Chemical data from TEL Weathering area monitoring wells taken 12-1-82.

^{*} Results pending, re-analysis by laboratory.
** Radioactivity activity results were omitted due to high TDS.

Geraghty & Miller, Inc. Upgradient			Downgradient Wells				
		Well 31	32	33	34		
рН		7.31	7.41	7.41	7.30		
Spec Cond.		25544.5 - 2489	2693	3590	2563		
TOC mg/1	(*)	2707					
TOX ug/1		41.5	102.3	64.5	26		
Chloride	(*)						
Iron		0.06	0.01	0.01	1.81		
Manganese		1.08	0.311	0.521	0.567		
Phenols		0.001	0.001	0.001	0.001		
Sodiu		100	35.4	44.4	88.5		
Sulfate	(*)						
Arsenic		0.01	0.01	0.01	0.01		
Barium		0.1	0.1	0.1	0.1		
Cadmium		0.001	0.001	0.001	0.001		
Chromium		0.001	0.001	0.001	0.004		
Fluoride		1.15	1.28	2.70	1.28		
Lead		0.002	0.001	0.001	0.005		
Mercury		0.0004	0.0004	0.0004	0.0004		
Nitrate		0.1	0.1	0.1	0.1		
Selenium		0.01	0.01	0.01	0.01		
Silver		0.01	0.01	0.01	0.01		
Pest & Herb		ND	ND	ND	ND		
Radio	(**)	-	-	-	-		
Coliform	(*)						

Chemical data from the Colony Landfarm monitoring wells taken 12-2-82. Table 4.

^{*} Results pending, re-analysis by laboratory. ** Radioactivity results were omitted due to high TDS.

QUALITY OF WATER IN EVAPORATION PONDS

ASSAIGAI

ANALYTICAL LABORATORIES, INC.

TO: Geo Science 500 Copper Ave. N.W. Albuquerque, NM DATE: 8 November 1984 1080, 1040

ANALYTE

SAMPLE ID/ANALYTICAL RESULTS

	11184 1330 Well 28	103184 1432 Well 45	103184 1240 Well 46
Benzene Toluene Ethylbenzene Xylenes	<0.005 mg/l <0.005 mg/l <0.005 mg/l <0.005 mg/l	<0.005 mg/l <0.005 mg/l <0.005 mg/l <0.005 mg/l	<0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1
	103184 1520 Well 47	103184 1550 Fire Pond	
Benzene Toluene Ethylbenzene Xylenes	<0.005 mg/l <0.005 mg/l <0.005 mg/l <0.005 mg/l	<0.005 mg/l <0.005 mg/l <0.005 mg/l <0.005 mg/l	
	Well 3	Well 5	Well 12
NO 3 as N NH 4 CN Benzene Toluene Xylenes Ethylbenzene	<pre><0.01 mg/1 1.16 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<pre><0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>
J	Well 13	Pond 1	Pond 3
NO 3 as N NH 4 CN Benzene Toluene Xylenes Ethylbenzene	<pre><0.01 mg/1 5.6 mg/1 0.09 mg/1 0.254 mg/1 0.345 mg/1 0.389 mg/1 <0.100 mg/1</pre>	<pre><0.01 mg/1 10.6 mg/1 0.4 mg/1 0.711 mg/1 0.588 mg/1 0.591 mg/1 0.240 mg/1</pre>	<pre><0.01 mg/1 13.87 mg/1 0.2 mg/1 0.027 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>

TO: Geo Science 500 Copper Ave. N.W. Albuquerque, NM DATE: 8 November 1984 1080, 1040 Page 2 of 2

ANALYTE

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SAMPLE ID/ANALYTICAL RESULTS

NOMINAL DETECTION LIMIT

	floating film	
NO 3 as N NH 4 CN Benzene Toluene Xylenes Ethylbenzene	0.617 mg/1 0.467 mg/1 0.463 mg/1 0.201 mg/1	0.01 mg/1 0.1 mg/1 0.01 mg/1 0.005 mg/1 0.005 mg/1 0.005 mg/1 0.005 mg/1

Pond #1

REFERENCE: "Standard Methods for the Examination of Water and Wastewater", 15th Edition, APHA, N.Y., 1980.

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

Sincerely,

Jennifer V. Smith, Ph.D.

Laboratory Director

•CUSTOMER ADDRESS Navajo Refining Co.

Drawer 159

Artesia, NM 88210

ATTENTION NOICE NO

Ed Kinney 104223



SAMPLES RECEIVED

CITY

4/24/81

CUSTOMER ORDER NUMBER

лy

P.O. #_20030_

TYPE OF ANALYSIS

Water

Sample Identification	Type of Analysis		mg/liter
Navajo West Pond	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium Chromium 6+ Copper Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium Nickel pH Units Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	<	13 1 0.2 116 0.003 102 918 0.04 0.01 0.001 6.6 760 0.06 0.06 0.002 60 0.01 7.7 0.04 173 2930 885 25.1 0.1

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 4 OF 13 PAGE

-CUSTUMER

Navajo Refining Com

ADDRESS

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CITY Art

Artesia, NM 88210

ATTENTION INVOICE NO

Ed Kinney 104223



SAMPLES RECEIVED	4/24/81	CUSTOMER ORDER NUMBER	P.O. # 20030	
TYPE OF ANALYSIS	Water			

Sample Identification	Type of Analysis		mg/liter
Navajo Middle Pond	Acidity		29
	Alkalinity, "P" (as CaCO ₃)	<	1
	Barium	<	0.1
	Biochemical Oxygen Demand		116
	Cadmium		0.002
	Chemical Oxygen Demand		363
	Chloride		1468
	Chromium		0.1
	Chromium 6+	<	0.01
	Copper	<	0.001
	Fluoride		7.4
	Hardness (as CaCO ₃)		1060
	Iron		0. 06
140	Lead	<	0.001
	Magnesium		96
	Nickel	<	0.01
	pH Units		7.4
	Pheno1s		0.027
	Alkalinity, "M"		349
·	Solids, Total Dissolved		4020
	Sulfate		1050
·	Sul fide		13.4
	Zinc	<	0.1

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



ADDRESS

CUSTOMER Navajo Refining Con-

Drawer 159

Artesia, NM 88210

ATTENTION VOICE NO

Ed Kinney 104223

SAMPLES RECEIVED

CITY

4/24/81

CUSTOMER ORDER NUMBER

P.O. # 20030

TYPE OF ANALYSIS

Water

Sample Identification		Type of Analysis		mg/liter
Navajo East Pond		Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium Chromium Chromium	<	10 1 0.1 72 0.002 225 1632 0.1 0.01
	ر م	Copper Fluoride Hardness (as CaCO ₃) Iron	٠	0.002 5.8 1160 0.1
	1-	Lead	<	0.001
		Magnesium Nickel pH Units	<	110 0.01 7.2
	·	Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide	<	0.001 214 4920 1520 0.36

Sample Analysis by: BP

Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

Zinc

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



APPROVED BY Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 2 OF 13 PAGÉ

< 0.1