GW -

GENERAL CORRESPONDENCE

YEAR(S):



Discharge Plan Navajo Refinery (Public Review Copy)

STATE OF NEW MEXICO



OIL CONSERVATION

DAVID G. BOYER Hydrogeologist

P.O. BOX 2088 LAND OFFICE BUILDING SANTA FE, NEW MEXICO 87501 7505-827-5812



STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION



1935 - 1985

December 17, 1985

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

CERTIFIED MAIL RETURN RECEIPT REQUESTED

Mr. David G. Griffin, Environmental Affairs Superintendent NAVAJO REFINING COMPANY P.O. Drawer 159 Artesia, NM 88210

> Re: Navajo Refining Company Discharge Plan, Artesia Refinery

Dear Mr. Griffin:

This office has received your letter of December 13, 1985, which requested an extension of time to April, 1986, for the Navajo Refinery to discharge without an approved discharge plan. The current approval expires December 19, 1985. The request states that during this time and beginning December 8, 1985, an extensive, six-week sampling program will commence to provide effluent for treatability and toxicity studies. The reason for this work is the requirement that Navajo comply with various harzardous waste regulations under the State's RCRA program. At the completion of the analysis period in March, Navajo states that decisions will be made regarding the type of treatment and mode of discharge to be used for effluent disposal. At that time you plan to provide more information and a schedule concerning implementation of new treatment and discharge systems.

Pursuant to Section 3-106.A. of the New Mexico Quality Control Commission Regulations and for good cause shown, Navajo Refining Company's Artesia Refinery is hereby granted approval to discharge without an approved discharge plan for 120 days commencing December 20, 1985, and expiring April 18, 1986. To receive a further extension beyond that date, Navajo will need to provide the scheduling and implementation information referred to in the December 13, 1985 letter. Prior to April 18, 1986, Navajo should communicate and discuss with OCD Environmental Bureau staff the progress of the RCRA permitting as it affects discharge plan decisions. This will allow a new discharge plan

submittal and compliance schedule to be drawn up and approved prior to

If you have any questions regarding this matter, please contact David Boyer of the Environmental Bureau at 827-5812.

R. L. STAMETS Director

RLS/DB/dp

cc: OCD - Artesia District Office EID - Hazardous Waste Section Joel M. Carson, Lossee & Carson, P.A. Randy Hicks, GeoScience Consultants, Ltd.

SENDER: Complete items 1, 2, 3 and 4. Put your address in the "RETURN TO" space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for service(s) requested.			
1. DX Show to whom, date and address of delivery.			
2. Aestricted Delivery.			
3. Article Addressed to: David G. Griffin Environmental Affairs Navajo Refining Company P.O. Drawer 159 Artesia, NM 88210			
4. Type of Service:	Article Number		
Registered Insured COD Express Mail	P505906041		
Always obtain signature of addressee or agent and DATE DELIVERED.			
5. Signature – Addressee			
6. Signature - Agent " 1. Date of Delivery 12 - 20-85 8. Addressee's Address (ONLY if requested and fee paid) 201 N. 4 th ANTSSIA, M.M. 88210			
201 N. 4th ARTSSIA, N.M. 88210			
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REFINING COMPANY

501 EAST MAIN STREET ● P. O. DRAWER 159

ARTESIA, NEW MEXICO 88210

December 13, 1985

Mr. Richard L. Staments, Director N.M. Oil Conservation Division P. O. Box 2088
Santa Fe, NM 87501

Re: Navajo Refining Discharge Plan

Dear Mr. Staments:

Due to events beyond the control of either Navajo Refining or the Oil Conservation Division, we find it necessary to request an extension to discharge without an approved discharge plan. In your letter of September 19, 1984, Navajo was granted the right to discharge without an approved discharge plan until December 19, 1985. During this period of time Navajo was required to submit various elements of a discharge plan for OCD review per an agreed to schedule. I believe you will find the record to show that both Navajo and OCD have done well in living up to that schedule. There is every reason to believe that we would have completed the discharge permitting by now if a conflict had not arisen with NMEID - Hazardous Waste.

Navajo was formally notified by an August 2, 1985 notice from NMEID - Hazardous Waste Department that the effluent ditch and the No. 1 Evaporation Pond has fallen under New Mexico Hazardous Waste Management Regulations due to trace amounts of Chromium in the sediment. In response to this notice Navajo has had a number of conversations and meetings with Mr. Boyer of your staff and Ms. Alice Barr of NMEID - Hazardous Waste, in an effort to define the impact of this notice and develop a plan to address the impact. Attached you will find a copy of a letter to Ms. Barr outlining the schedule Navajo is currently following in an effort to determine the optimum effluent treatment process that Navajo can install to address both NMOCD discharge requirements and NMEID - Hazardous Waste concerns.

The program, as outlined in the schedule, should put Navajo into a position by April of 1986 to know what treatment and discharge option will most cost effectively meet the requirements of the regulatory divisions involved. Therefore Navajo requests that you extend our right to discharge until April, 1986 at which time Navajo will supply your division with the results of the study currently underway, and will then be in a

position to give you a more detailed schedule concerning implementation of new treatment and discharge systems. I will be happy to answer any questions you may have concerning this request.

Sincerely,

David G. Griffin
Supt. of Environmental
Affairs & Quality Control

DGG/pb

attachments



REFINING COMPANY

501 EAST MAIN STREET . P. O. DRAWER 159

(910) 986-0990

TELETYPE

D66r

ARTESIA, NEW MEXICO 88210

December 5, 1985

Ms. Alice Barr Environmental Improvement Division P. O. Box 968 Santa Fe, NM 87501

Re: Evaporation Pond Schedule

Dear Alice:

The following is the best schedule I can put together at this time covering all of the interrelated steps necessary to address the effluent ditch and first evaporation pond under applicable HWMR-2 regulations.

September 1985 - Navajo hired PSC in conjunction with CH2M-Hill to evaluate waste water treatment processes necessary to remove the affected ditch and pond from service.

October, 17 & 18, 1985 - Meeting at CH2M-Hill's Seattle office uncovered a big problem with treatment processes meeting WQCC stream standards for discharge to the Pecos River.

November 12, 1985 - Meeting with NMEID Surface Water Quality group to discuss discharge limits applicable to Navajo and the Pecos River. Discussed a plan for studying Navajo's effluent to determine treatability of meeting River Standards and toxicity testing to evaluate impact of discharge on River.

December 8, 1985 - Commencing with Evening Shift on this day, Navajo will begin a six (6) week intensive sampling program to provide effluent for analysis and treatability study to CH2M-Hill's Montgomery, Alabama laboratory. Toxicity studies will be conducted at CH2M-Hill's Gainesville, Florida lab.

February 1986 - The treatability and toxicity studies will be complete after which attention will refocus on determining the best treatment process.

March 1986 - If all goes well, we should be in a position to initiate permitting procedures to cover the new treatment system. The schedule beyond this point becomes very difficult to pin down at this time.

Sometime during the early Summer of 1986, I should be able to supply you with a detailed schedule covering engineering, procurement, construction, and commissioning of the new treatment system. Hopefully all of this can be completed by the Summer of 1987. After commissioning, we will be in a position to physically address the ditch and pond.

As in the past I will keep you informed of any changes and updates to this schedule as they evolve. Please feel free to call me anytime concerning questions on this or any other matter.

Sincerely yours,

David G. Griffin

DGGr/pb



STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION

POST OFFICE BOX 2088

STATE LAND OFFICE BUILDING SANTA FE. NEW MEXICO 87501

(505) 827-5800

October 1, 1985

CERTIFIED MAIL RETURN RECEIPT REQUESTED

HICKS

Mr. Randall T. Hicks, Vice-President Geoscience Consultants, LTD. 500 Copper Avenue, NW, Suite 325 Albuquerque, New Mexico 87102

Ground Water Discharge Plan (GW-28) Application for Navajo Refining Company Artesia, New Mexico

Dear Mr. Hicks:

The NMOCD Environmental Bureau received on August 8, 1985, your revised discharge plan dated July 31, 1985, and has completed review of the document. In addition to this review we have compared the material with information previously requested by OCD letter dated February 7, 1985, and partially submitted on March 5, 1985. The July 31, document also did not include all the previously requested information.

The comments made herein address the material that has been submitted. The proposed facility changes as a result of EID classification of evaporation pond #1 as a hazardous waste surface impoundment will make submittal of some of the requested additional technical data to OCD unnecessary. is because closure of the ditch and evaporation ponds is planned as a result of EID's action; however, OCD will provide technical comments on that information submitted to aid the company, their consultants, and regulatory agencies in developing pond closure plans or in permitting the non-RCRA regulated components of the evaporation pond system if a later decision is made to retain them.

General Comments

The planned closure of the ditch and evaporation ponds greatly alters the original discharge plan proposal. Navajo now proposes to treat biologically the effluent prior to discharge to either or several of the following:

City of Artesia sewage treatment plant;

- 2. Discharge to the Pecos River;
- 3. Evaporation ponds; or
- 4. Land application.

The options are only mentioned and not discussed, and no specific dates are presented for implementation except that changes made will be implemented on or before 1988. The OCD cannot approve a discharge plan when the methodology for treatment and discharge to ground water are not known. September, 1984, schedule of compliance required that final design of the wastewater management plan be submitted for review this summer. Until decisions regarding scheduling are made by, and between the interested parties, OCD can not proceed with review except for comments regarding the material already submitted. I suggest that a meeting or conference call between the OCD, EID, Navajo Refinery and their consultants be scheduled for late October or early November to determine a schedule for decisions on the type of treatment to be employed.

The decision by Navajo to use pipelines to transport effluent between generation and treatment points (p. 7-1) will simplify plan review and eliminate a major point of contention that was present in the previous proposal. A similar commitment for lining or tankage of all existing or proposed transfer, storage, and treatment units at the North and South Division sites will greatly simplify review of the design from the standpoint of ground water protection. This includes the proposed biological treatment process units (eg. aerated lagoons, oxidation ditch, etc), existing unlined fire pond (discussed later), and any pits, impoundments, or catchment units used to contain fluids during process upsets or spillage.

The complexity of permitting, for final effluent disposal, any unlined evaporation ponds, conveyance ditches, or land application areas depends on their location and on the organic and inorganic characteristics of the biologically treated effluent. None of the information needed for this evaluation by OCD is yet available.

Comments on Hydrogeology

The hydrology of the Pecos Valley alluvium near the evaporation ponds continues to be ill-defined in the report. Flow in Figure 4-8 is shown to be slightly east of south for the mid-April 1985 sampling. April is also a time of low discharge of the Pecos River as shown in Figure 4-10. There is no evidence presented that the ground water flow reversal mentioned in the discharge plan actually takes place at low flows. The only way to document the relationship is to compare changes in monitoring well water levels with river stage and discharge. These points and others were covered in

my comments of February 7, 1985. If further use of the unlined ponds in any form is proposed beyond 1988, this issue and others in my February letter (specifically hydrogeology E16, 18, 20, 21, 23) must be satisfactorily addressed. This could be done concurrently with any further hydrogeologic work necessary for pond closure.

Comments on Ground Water Quality

One purpose of the April, 1985, Geoscience investigation was to demonstrate that background total dissolved solids (TDS) concentrations exceed 10,000 mg/l in shallow ground water in the alluvium near the river. This has not been demonstrated. The Geoscience sampling in April combined with earlier sampling by the company does show lower TDS water directly down the presumed gradient from the ponds; however, examination of the limited organic analysis data shows that all four down-gradient wells that have lower TDS also have organic contamination. Monitor well #13 close to pond #1 has benzene exceeding the ground water standard of 0.01 mg/l. The other three wells have either phenols or unnamed aliphatic hydrocarbons present. The extent, rate, direction of movement, and expected attenuation of hydrocarbon contamination will need to be determined if approval for use of the unlined evaporation ponds past 1988 is requested.

Geoscience contends that the xylenes and aliphatic hydrocarbon compounds found in April 1985 by OCD and Geoscience sampling of groundwater in the vicinity of the ditch and ponds, is a "background condition" and that the water quality data demonstrate that "no degradation of ground water has occurred" in this area. I doubt very much that the presence of these hydrocarbons is common to the Pecos Valley alluvium. proximity of the monitor wells to the ditch and ponds, which are both documented to contain suspended and dissolved hydrocarbons, makes it very probable that they are the source of the hydrocarbon contamination. Further support of this comes from analyses of the higher TDS monitor wells which show hydrocarbon contamination. That the groundwater degradation is organic rather than inorganic does not change the fact that there is degradation. Though a balance between TDS improvement and hydrocarbon degradation in the river alluvium might be examined as part of the discharge plan (especially if attenuation can be demonstrated), degradation of some water quality parameters has occurred and the Geoscience statement is incorrect.

Background water quality in the terrace water-bearing unit in the area of the refinery has been demonstrated to be much better than that of the Pecos Valley alluvium. The best water quality is in the monitor wells to the north of Eagle Draw. On the south side both the upgradient TEL well #35, and recovery well #4 both show TDS of less than 3000 mg/l

indicating water to be protected from future discharges. unlined fire pond had a TDS of 3554 mg/l in October , 1984 (Geoscience Sampling), and 4628 mg/l in April, 1985 (OCD In addition to high TDS, the pond has sulfate concentrations that exceed by 3 to 8 times the groundwater standard of 600 mg/l. Sulfates in well #35 are not reported, and recovery well #4 has sulfates of 553 mg/l. Sulfates in well #31 to the north of Eagle Draw average about 540 mg/l. The contentions by geoscience that leakage from the fire pond would improve the quality of soil water, and would be captured by recovery well/trench #4 are either incorrect or not demonstrated. The statement that such leakage could not affect artesian ground water in the area is correct for the deep water in the San Andres and Upper Queen Formation. The effect of such leakage on the shallow water present at about. 15 feet beneath the refinery remains to be determined.

To continue use of the unlined pond with such high concentrations of TDS and sulfate will require demonstration of the extent (thickness and composition) and rate of leakage of the "natural liner." The information on size, depth, liner composition, pond discharge, TDS variation, etc., requested in Plant Processes in question #2 (P.7) of my February 7, 1985, letter is still needed for this evaluation and must be submitted for review with other discharge plan elements prior to plan approval.

In summary, if further use of the evaporation ponds in any capacity beyond 1988 is proposed, additional work, as described above, will be needed to answer Water Quality question #2 in my February letter. Although hydrocarbon product contamination and recovery is being addressed separately from the discharge plan, approval for continued use of the unlined fire pond will require you to address Water Quality question #6, and provide the information required in Plant Process question #2 prior to discharge plan approval.

Plant Process

In addition to question #2, the material requested in question #5 was not provided. This information is necessary for our review prior to discharge plan approval.

In addition to pipelines replacing unlined ditches for transfer of effluents, a committment and schedule for lining of the fire pond and any other pits, impoundments, or containment units in the North and South Divisions that regularly receive process or upset fluids or effluents prior to transfer or disposal, or that contain leakage or spills from routine operations (eg. truck or rail loading) will simplify final permitting. With the exception of the fire pond, these activities were not addressed in the discharge plan.

Summary

The discharge plan cannot be approved at this stage due to the lack of information regarding what refinery modifications are planned, what type of discharge will result from the modifications, their quality, etc. It is suggested that Navajo be prepared after thirty days from receipt of this letter to meet with OCD and any other interested parties regarding the letter, and to present and discuss a schedule for when decisions will be made on process selection for design completion, and expected implementation.

The current extension for Navajo to operate without an approved discharge plan expires December 19, 1985, and OCD cannot extend that without additional specific dates and commitments as to when this information will be provided. The result of the suggested meeting will be the revising of the schedule of compliance that will take into consideration the new developments.

An extension to operate will also require a commitment by Navajo to provide at least 1.5 feet of freeboard in the ponds and 5 inches in the ditch at all times during the period of the extension, to prevent pond breaching.

We look forward to meeting to discuss the rescheduling, and the information requested in this letter. If you have any questions, please contact me at the above address or by phone at 827-5812.

Sincerely,

David G. Boyer PLB

DAVID G. BOYER Hydrogeologist Environmental Bureau Chief

DGB/et

xc: R. L. Stamets
OCD, Artesia Field Office
NMEID, GroundWater/Hazardous Waste Bureau
David Griffin, Navajo Refining Co.
Joel Carson

Geoscience Consultants, Ltd.



July 31, 1985

RECEIVED

AUG 8 1985

OIL CONSERVATION DIVISION

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

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 7. Hicks Vice President

RTH/pe/STAME001.LTR

Enclosures

cc: Mr. David Griffin, Navajo Refining Company

Peter Pache, NMEID



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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

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ASSESSION.

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WQCC REGULATION REQUIRED IN DISCHARGE PLAN	SECTION IN DISCHARGE PLAN
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1–202	To be submitted
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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
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3-106.C.7	9.0
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3–107	8.0
3.108.B	1.0
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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 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. Biological treatment of wastewater will substantially improve the quality of wastewater at the facility.

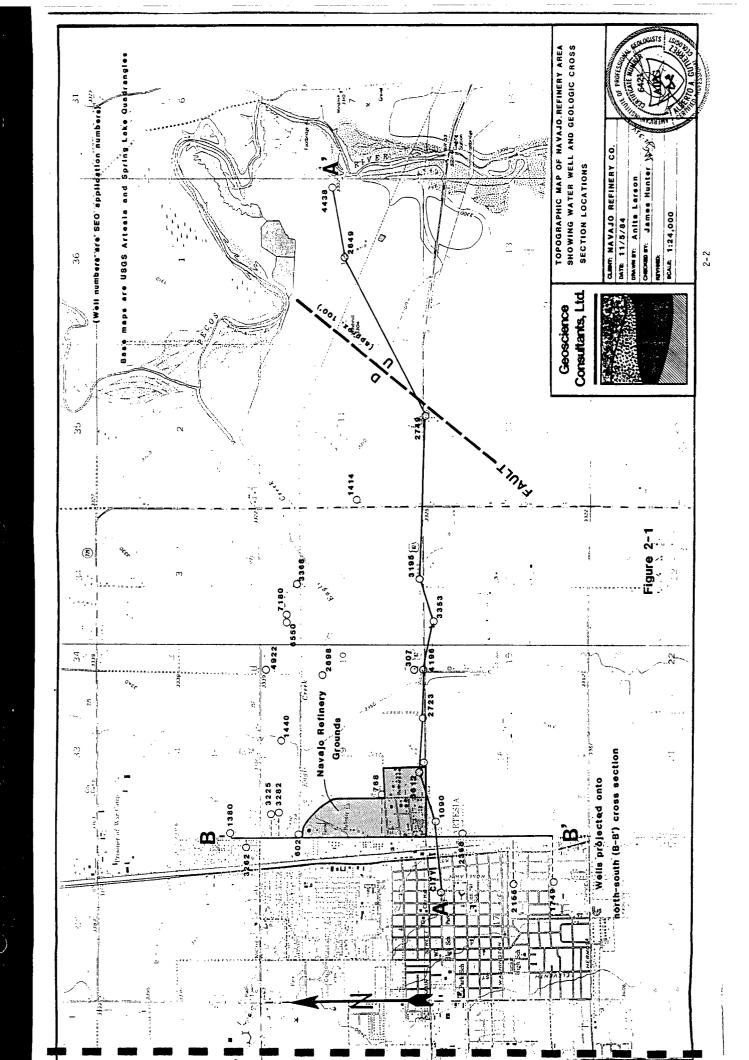
2.0 LOCATION AND PHYSIOGRAPHY

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 aguifers of the Artesia area (Welder, 1983). The San Andres, locally called the deep or artesian aguifer, 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

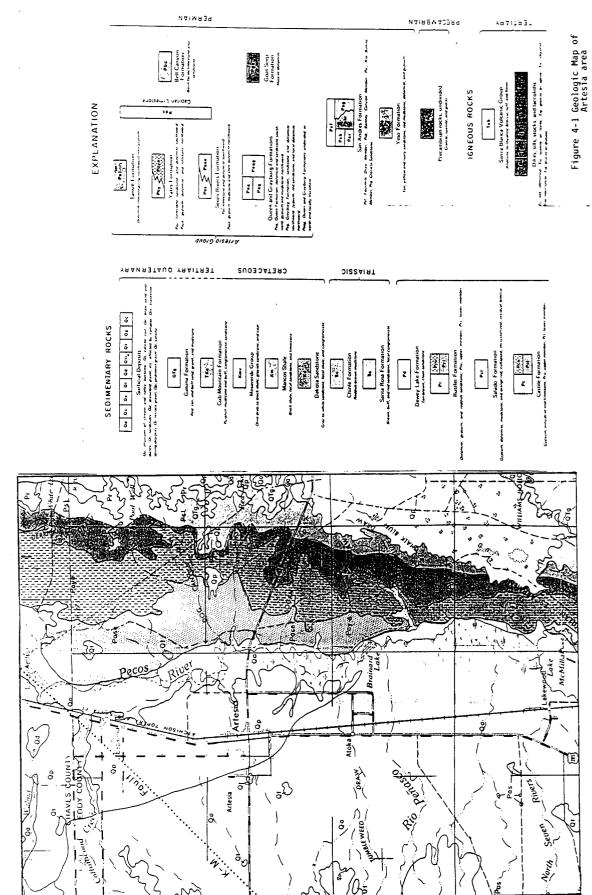
The town of Artesia and the Navajo site are underlain by thin (20 feet or less) layer of soils, alluvium and weathered bedrock, which generally conceals subcrops of the Artesia Group (Permian). As seen in the explanation of Figure 4-1, the Artesia Group consists of carbonates, evaporites and shales deposited 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



4-3

4-3

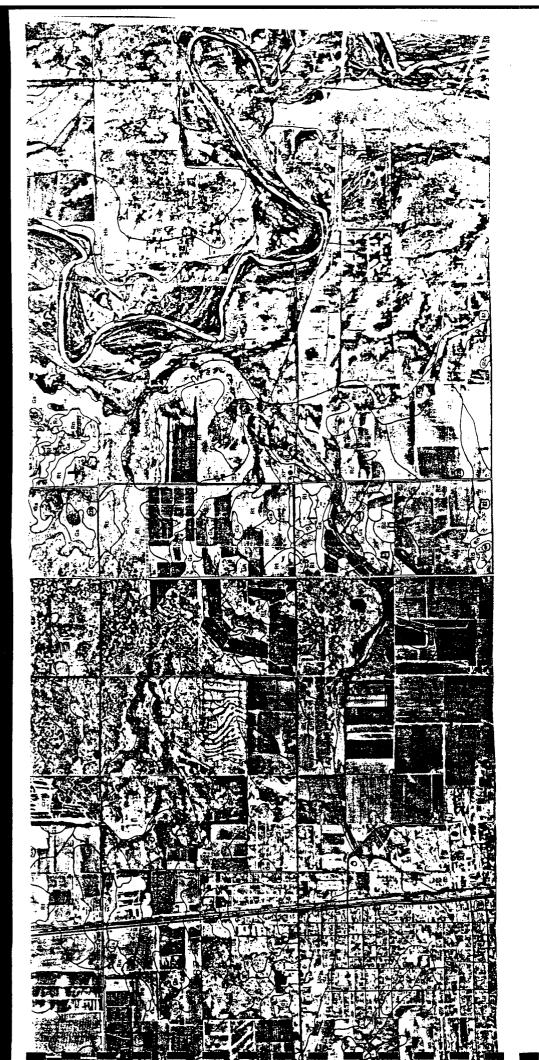


Figure 4-2 Characteristics and distribution of soils in Artesia area.

Interest of the second A control of the cont Migh Migh High Migh Migh Migh Migh 4.0 10.0 6.0-15.0 0-4-0 2.9-6.4 7.9-6.4 7.4-7 8 7.9-8.4 Available water capacity 0.18-0.20 0.11-0.19 0.16 0 18 0.18-0.70 0.16-0.20 0.05-0.70 0 05-0.20 0 08-2.5 0.8-2.5 0.8-2.5 0.2-0.8 Permen. Billity 6-114
6-114
14-60
6-12
0-20
74-60
6-60 More than 60. Arno AM, Kh. Am (Jeer Heatery part of Am and Am nathery series) nathery 'Na. Me Level 14, 41, 61, 14, Flat. PR. Pt. Ps. Ps.

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 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 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.

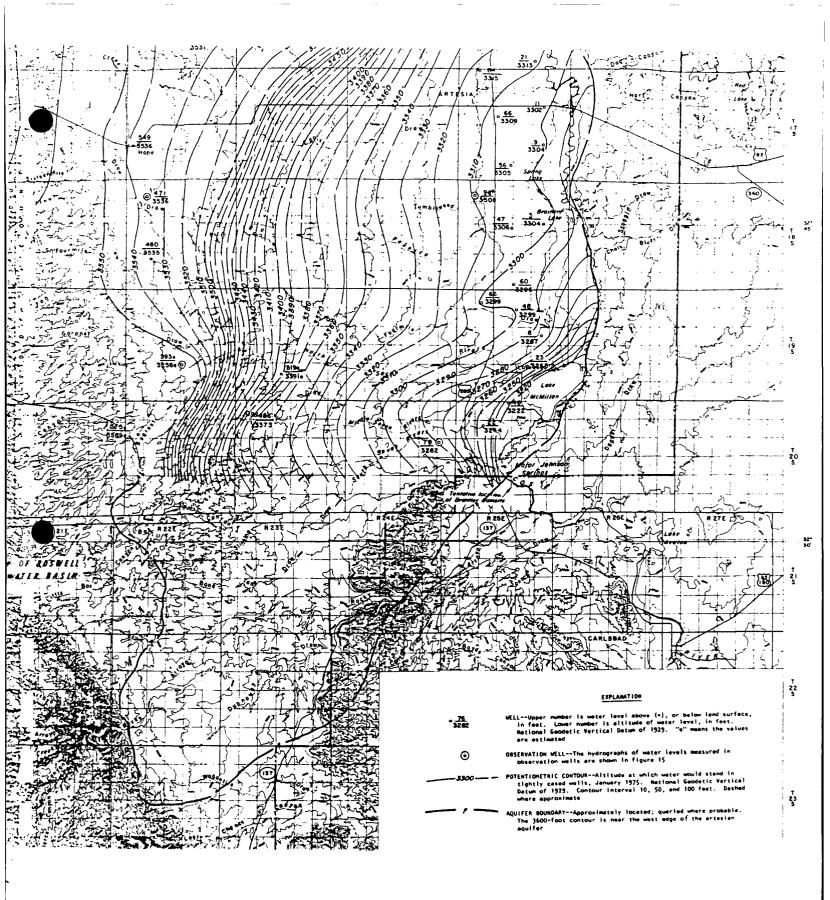


Figure 4-4 Potentiometric surface of deep aquifer (Welder, 1983)

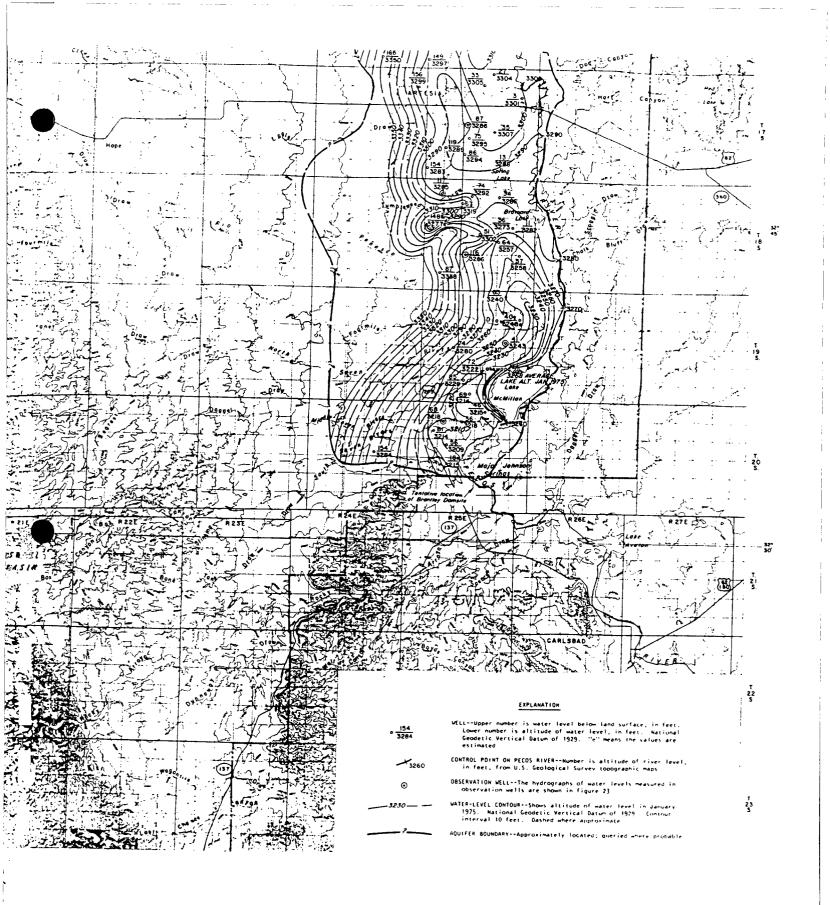


Figure 4-5 Potentiometric surface of shallow aquifer (Welder, 1983)

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.

11.

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

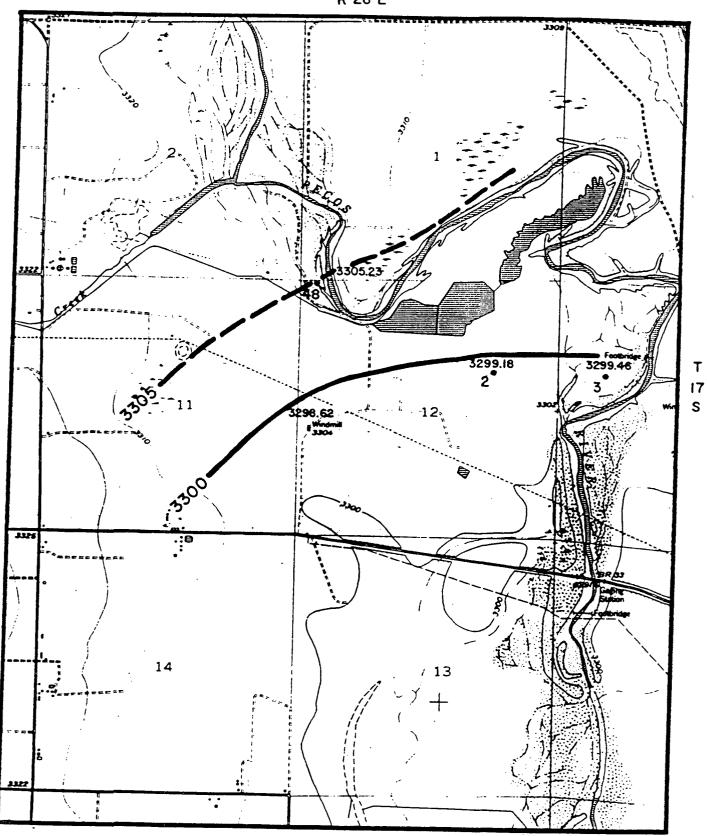
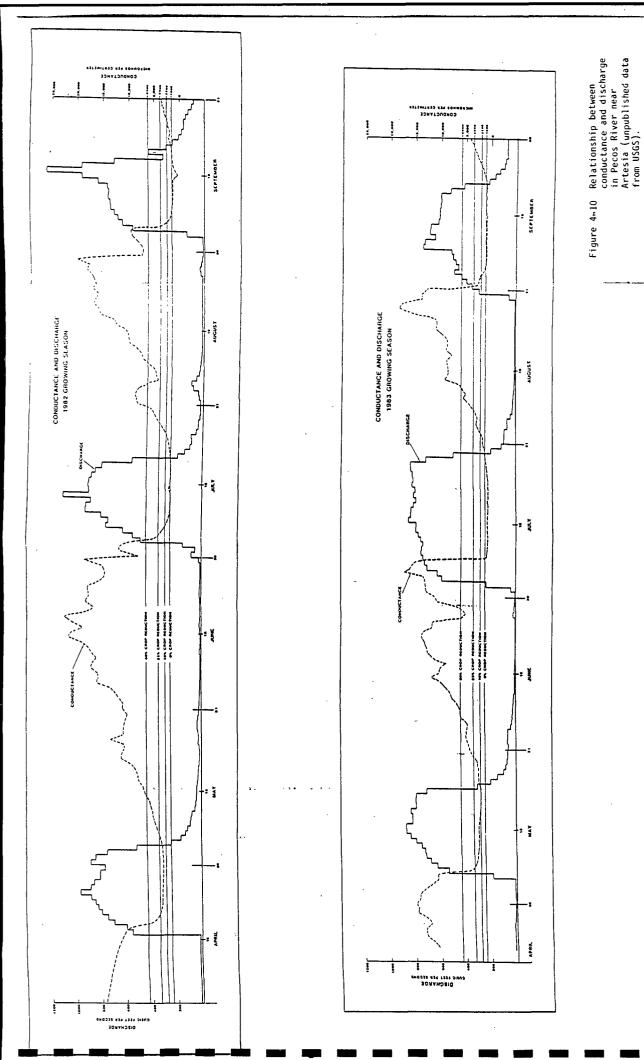


Figure 4-8 Potentiometric Surface Map of Valley Fill Aquifer

NORTH 2000



1-15

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	WASTE STREAM SOURCE NUMBER	DISPOSAL/ TREATMENT SYSTEM
South Division	Cooling Tower		South division Separator
South Division	Boilers	sys sto ove	fire control tem water rage ponds rflow directly o conveyance ch
South Division	Crude Unit Desalter (D-130)		South division separator
South Division	Crude Unit Overhead Accumulator (D-140)		South division separator
South Division	Crude Unit Stabilizer (D-202)		South division separator
South Division	Alkylation Unit Regenerator	zat Sou	alky neutrali- ion then to th division API arator
South Division TCC Unit	Cooling Tower and Vacuum Unit		South division separator
South Division	Crude Unit Straig Run Gasoline stabilizer (W-5	API	South Division separator
North Division	Crude Unit Desalters (D-1, D-2) oil	North division /water arator

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

4) 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)

MDEC 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 5					
£a Cd					
Cq					
Cr	<0.1	<0.1	<0.1	7.8	
CN	<0.1	<0.1	<0.1	<0.1	41.6
<i>r</i>				· · · ·	<1.0
F	1.3	0.5	0.4	10.8	
fb ''-					
Hg					
NO3		•			
Se					
Ag					
U					
C1					
Cu					
Fe	<0.1	3.9	17.0	7.8	
Ħn SO⁴					
TDS	805	2160	560	2872	2524
Zn	<0.1	<0.1	0.12	18.8	2324
рH	6.3	9.0	9.5	3.6	
Al T					
F.					
Co					
Mo Ni					
	_				
Phenols TSS	9.9	710	250	0.26	
Cond.					
NH ₄	1202	B379	1702	8870	6 00
S S	78	2320	256	(1	5.0
J	64	180	7.7	1.4	<1.0

Table 5-2 (continued)

BOILERS

MBCC 3-103	S.D.	N.D.	N.D.
PARAMETERS	BOILER	HIGH	FOK
	BLOWDOWN	PRESSURE	PRESSURE
-		BOILER	BOILER
	(#2)	(#18)	(#12)
As	. 004	.005	.003
Ba	<.1	<.1	<.1
Cd	<.01	<.01	⟨.01
<u>Cr</u>	<.05	<.05	<.05
CN	•		(100
F	3.1	2.2	1.5
Pb	.18	.14	.05
Hg			
MO2	.2	.1	.05
Se			*05
Ag	<.05	<.05	<.05
U	<.05	<.05	<.05
Cl	127	73	44
Cu	<.03	<.03	<.03
Fe	1.9	0.65	0.25
Ma 	.07	<.03	⟨.03
SO .	1549	1242	693
TDS	4220	2873	1807
Zn	.06	<.01	<.01
pH	11.6	11.6	11.2
Al .	<1.0	<1.0	<1.0
B			
Co ~-	<.01	.02	.01
Mo 	<.5	<.5	<.5
Ni Dhaaa	<.05	<.05	<.05
Phenols			
TSS Cood	20	0	0
Cond. COD	6000	5000	2800
UU lH4	116	0	0
1114			

Table 5-2 (continued)

COOLING TOWERS

MOCC 3-103 STANDARDS	N.D. COOLING TOWER BLOWDOWN (#10)	S.D. ALKY COOLING TOMER BLOWDOWN	S.D. TCC COOLING TOKER BLOWDOWN	N.D. FCC CDOLING TONER BLOWDOWN
	- 11107	(#1)		(#16)
As	644			
Ba	.004	<.001	.011	.001
Cd	<.1	<.1	<.1	<.1
Cr	₹.01	<.01	<.01	<.01
	.06	1.05	<.05	0.22
CN F				
	1.6	4.4	2.2	1.6
Pb u-	.05	.05	<. 0 5	.05
Hg	_	•		
N O ₃	.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
S0	1077	1461	1236	1067
TDS4	1906	2732	1694	
Zn	.48	28	<.01	1973
pH	7.6	6.9	7.7	.17
Al	<1.0	<1.0	1.0	8.0
F			1.0	<1.0
Со	<.01	.01	.02	Δ4
ño	<.5	<.5	.02 <.5	.01
Ni	<.05	<.07		<.5
Phenols		(***/	<.05	<.05
TSS	13	0	17	
Cond.	0 .	()	67	0
COD	1850	v	10B	1800
NH.				15

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.

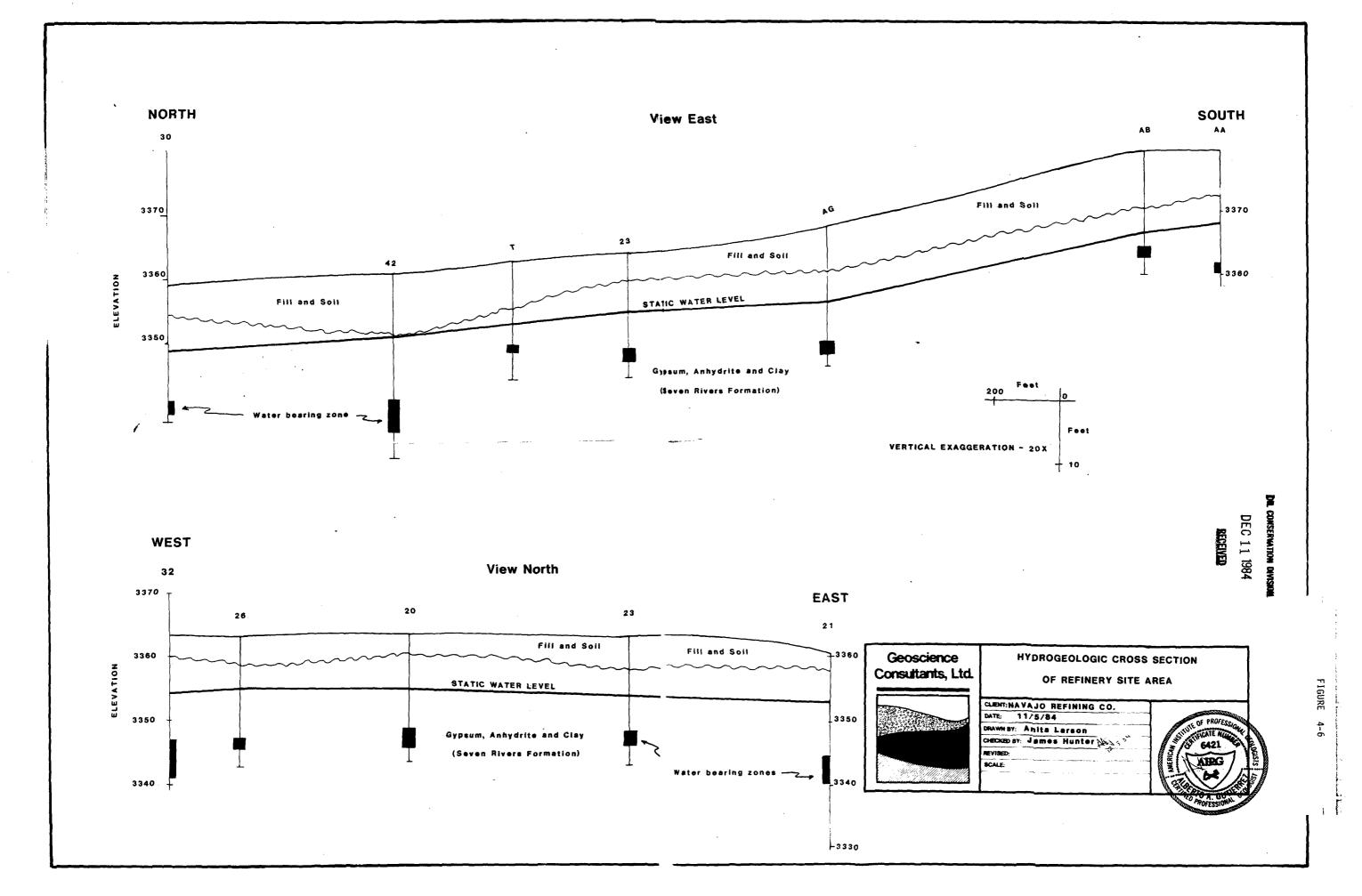
9.0 BASIS FOR DISCHARGE PLAN APPROVAL

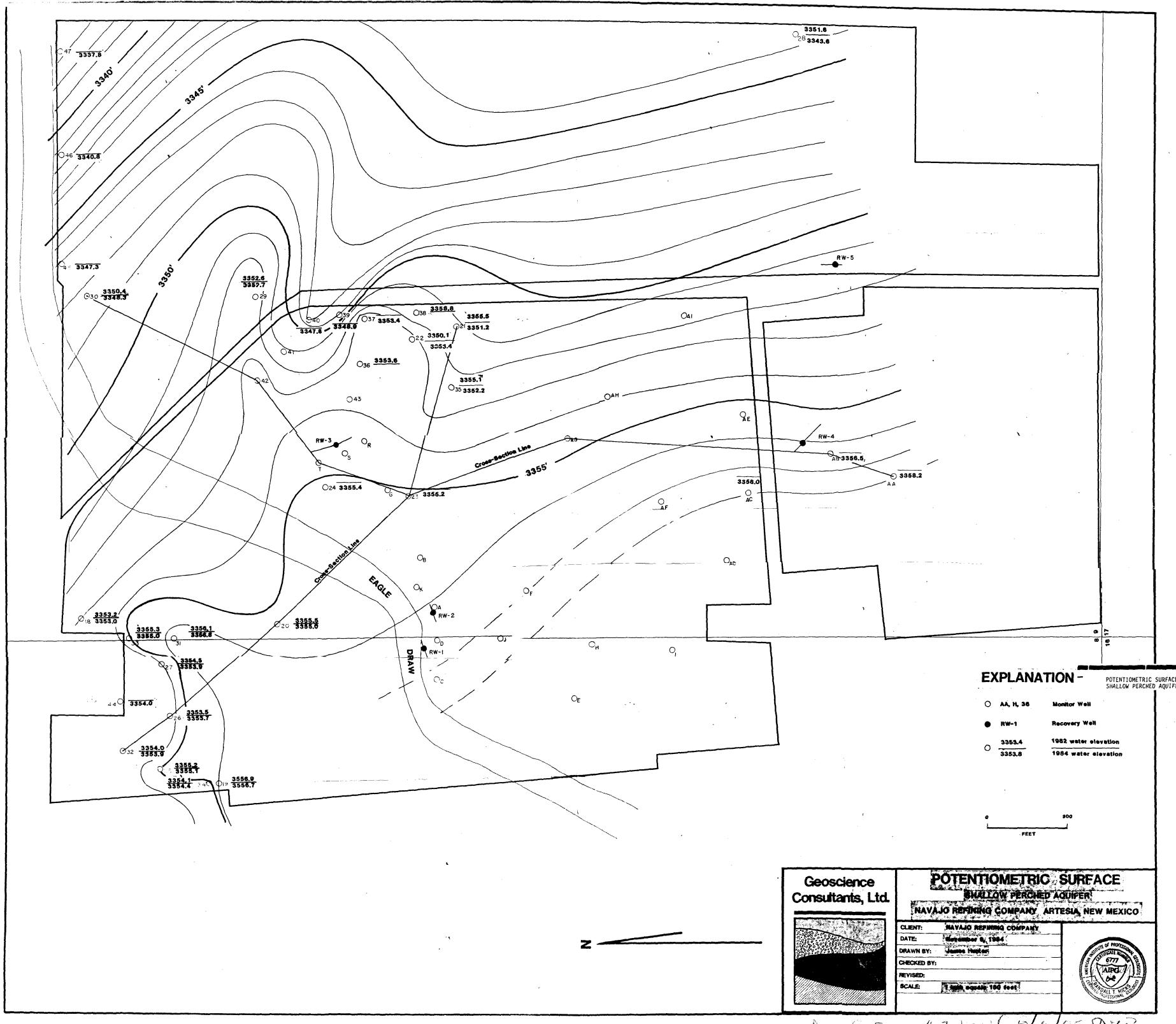
- o Ground water sampling and analyses performed to date show that ground water quality in the area of the conveyance ditch and evaporation ponds has not been significantly affected by over 20 years of discharges.
- O Discharges into the present wastewater management system for the next three years will 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.

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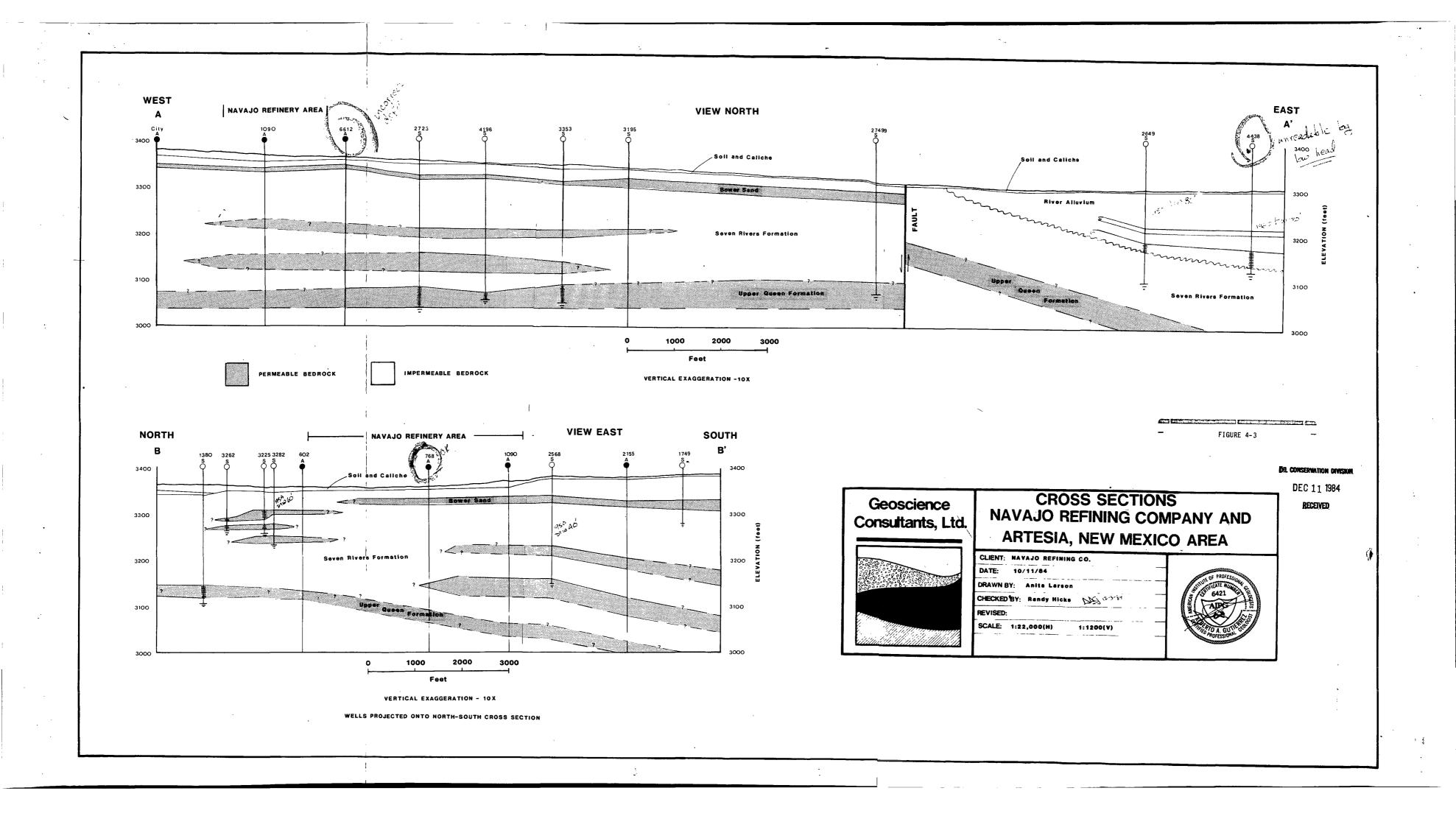
10.0 REFERENCES CITED

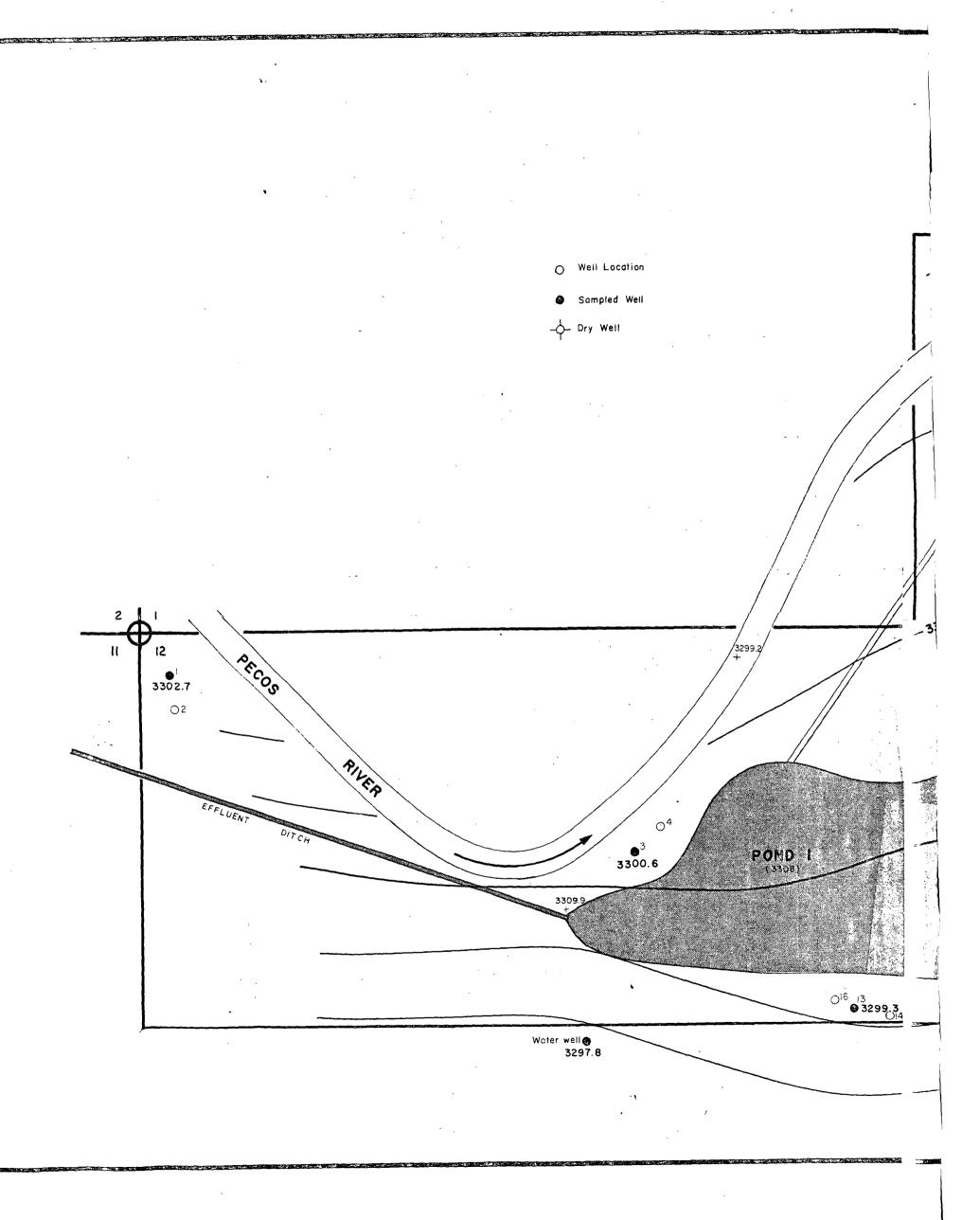
- 1. Kelley, V.C., 1971 Geology of the Pecos Country, Southeastern New Mexico: New Mexico Bureau of Mines and Mineral Resources, Memoir 24, Socorro, New Mexico, 77p. 7 maps.
- 2. New Mexico Environmental Improvement Division, 1980, Chemical Quality of New Mexico Community Water Supplies, 256 p.
- 3. Patterson, J.L., 1965, Magnitude and Frequency of Floods in the United States, part 8: United States Geological Survey Water Supply Paper 1682, Washington, D.C., 506 p., 1 map.
- 4. United States Soil Conversation Service, 1971, Soil Survey of Eddy Area, New Mexico: United States Department of Agriculture, Washington, D.C. 82 p., 152 maps.
- 5. Welder, E.G., 1983, Geohydrologic Framework of the Roswell Ground-Water Basin, Chaves and Eddy Countries, New Mexico: New Mexico State Engineer's Technical Report 42, Santa Fe, New Mexico, 28 p, 28 maps.

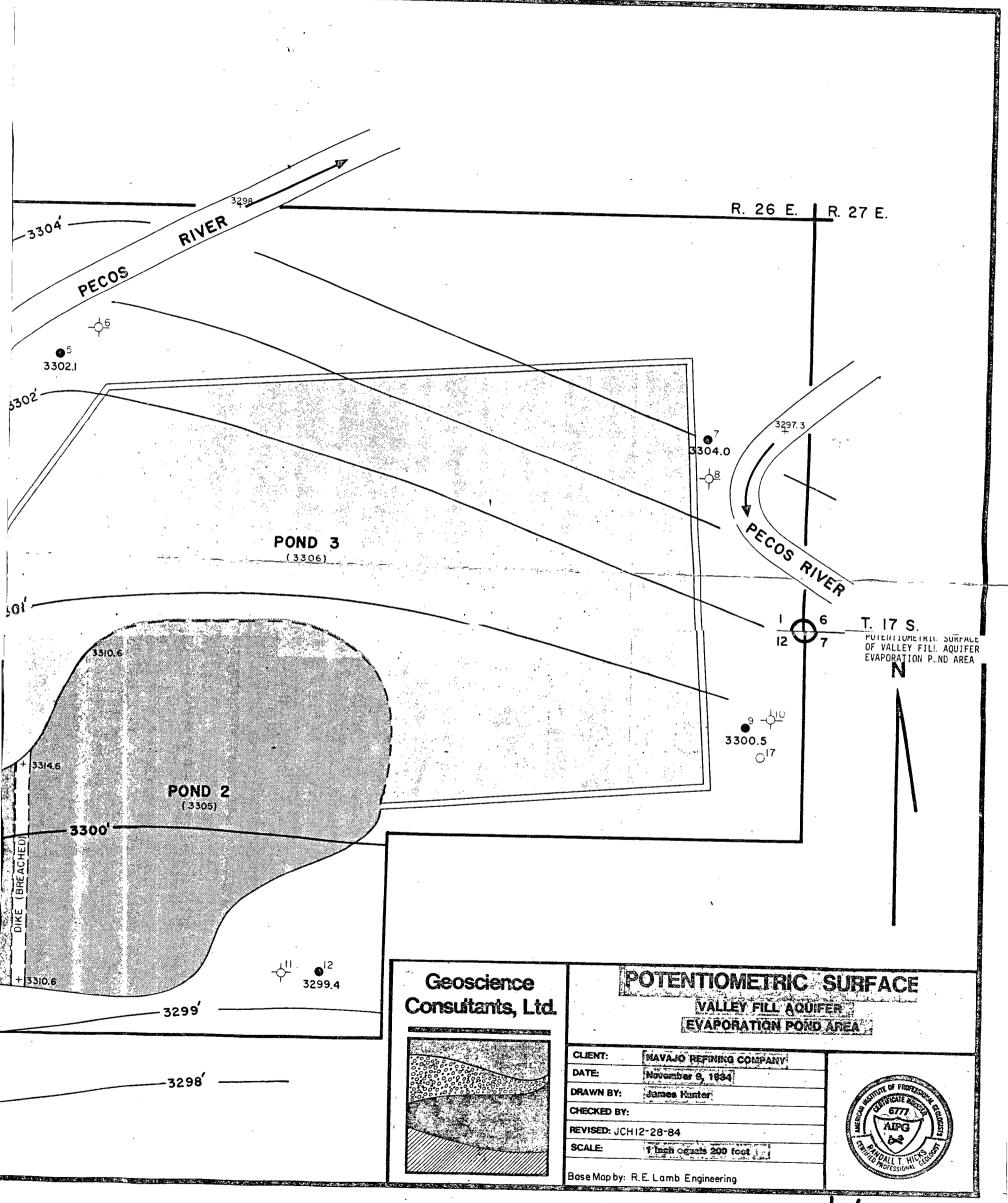




Provide Figure 4-7 Ke U & 8/5/85 WB







Revised Figure 49 RCVR 8/8/85 ANR (Public Periew Copy)

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



TO: Geo Science 500 Copper Ave. N.W. Albuquerque, NM DATE: 8 November 1984

1080, 1040

ANALYTE

SAMPLE ID/ANALYTICAL RESULTS

	11184 1330	103184	103184 1240
	Well 28	Well 45	Well 46
Benzene	<0.005 mg/1	<0.005 mg/l	<0.005 mg/l
Toluene	<0.005 mg/1	<0.005 mg/l	<0.005 mg/l
Ethylbenzene	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l
Xylenes	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l
	103184	103184	
	1520	1550	
	Well 47		
	well 47	Fire Pond	
Benzene	<0.005 mg/l	<0.005 mg/l	
Toluene	<0.005 mg/l	<0.005 mg/l	
Echylbenzene	<0.005 mg/l	<0.005 mg/1	
Xylenes	<0.005 mg/1	<0.005 mg/l	
	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/l	0.25 mg/l
CN	<0.01 mg/1	< 0.01 mg/1	<0.01 mg/1
Benzene	<0.005 mg/1	<0.005 mg/1	<0.005 mg/l
Toluene	<0.005 mg/1	<0.005 mg/l	$\langle 0.005 \text{ mg/l} \rangle$
Xylenes	<0.005 mg/l	<0.005 mg/l	$\langle 0.005 \text{ mg/l} \rangle$
Echylbenzene	<0.005 mg/1	<0.005 mg/l	<0.005 mg/l
	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/1	10.6 mg/l	13.87 mg/l
CN 4	0.09 mg/l	0.4 mg/l	0.2 mg/l
Benzene	0.254 mg/l	0.711 mg/l	0.027 mg/1
Toluene	0.345 mg/1	0.588 mg/l	<0.005 mg/l
Xylenes	0.389 mg/l	0.591 mg/1	<0.005 mg/1
Ethylbenzene	<0.100 mg/l	0.240 mg/l	<0.005 mg/1
2011, 200110110	.0.200 -0, -	- · · - · · · · · · · · · · · · · · · ·	.

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

K. NALY-

REPORT OF ANALYSIS

	SAMPLES RECEIVED 4/24/81 CUS	STOMER ORDER NUMBER P.O. #20030
		TOWNER ORDER NOWBER
	TYPE OF ANALYSIS Water	
	Sample	Type of
	<u> Identification</u>	Analysis mg/liter 11/21/80 19
	Navajo Well #1	Acidity 179
		Alkalinity, "P" (As CaCO ₃) < 1 Barium 0.1
		Biochemical Oxygen Demand 44
		Cadmi um 0.05
1	(D)	Chemical Oxygen Demand 145
		Chloride 8313 5800
		Chromium 0.002
	Proceedings of the American Conference of the Co	Chromium 6+ < 0.01
-		Copper 0.001 Fluoride 0.9
		Fluoride 0.9 Hardness (as CaCO ₃) 5760
	19	Iron -0.05
		Lead 0.006
		Magnesium 850
ı		Nickel 0.02
		pH Units 7.8
		Phenols 0.015
		Alkalinity , "M" 700 Solids, Total Dissolved 19700 15800
I	erroritation (Company)	Sulfate 4920
١		Sulfide 0.21
		Zinc < 0.1
ı	· 有种的基础的对象。不同种人,在	사용하다 그 사람들은 사람들은 사람들은 사람들은 사람들이 되었다. 그 사람들은 사람들은 사람들은 사람들은 사람들은 사람들은 사람들은 사람들은

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



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

ADDRESS
CITY
TTENTION
MVOICE NO

Navajo Refining County Drawer 159 Artesia, NM 88210 Ed Kinney

104223



				٦ .
CAMBLES DECEIVED A/2A/01	CUSTOMER ORDER NUMBER P.O. # 2003	20		
SAMPLES RECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.O. # 2003	30		\dashv
TYPE OF ANALYSIS Water			•	
TIPE OF ANALYSIS NA CET				\dashv
Sample	Type of			
Identification	Analysis	mg/liter	11/21/80	14/3
	· · · · · · · · · · · · · · · · · · ·	g/ 110C1	11. 10.	1
Navajo Well # 3	Acidity	32		
1	Alkalinity, "P" (as CaCO ₃)	< 1.0		
A seed of	Barium	< 0.1		-
	Biochemical Oxygen Demand	40		
1	Ca dmi um	0.009		
	Chemical Oxygen Demand	73		Ì
	Chloride	2652	Z200	118
	Chromium	< 0.001	•	
	Chromium 6+	< 0.01		
Ty.,	Copper	< 0.001	<i>-</i> .	
	Fluoride	1.6	5. O	3.2
,98	Hardness (as CaCO ₃)	2760		
	Iron	0.01		
	Lead	< 0.001		
T2.	Magnesium	250		
	Nickel	< 0.01		İ
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	pH Units	7.4		
1	Phenols	< 0.001		
	Alkalinity, "M" Solids, Total Dissolved	356 7730	7640	677
(17) (A) (12) (A) (A) (A) (A) (A) (A) (A) (A) (A) (A	Sulfate	2720	, = , .	Γ"
1 2000 122	Sulfide	0.10	· •	1
	Zinc	< 0.1		
	£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 Navajo Refining Cor. 19

ADDRESS Drawer 159

CITY Artesia, NM 88210

VOICE NO.

TTENTION 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 14/0/
Navajo Well # 5	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand	36 < 1.0 0.1 24 0.05 176	
165	Chloride Chromium Chromium 6+ Copper	7089 0.002 < 0.01 0.001	8600 4121
·	Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium Nickel pH Units	0.44 4660 0.04 0.007 650 < 0.01 7.7	0,96 0.43
	Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	< 0.001 506 16,800 4290 0.13 < 0.1	21.100 7367

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



*CUSTOMER ADDRESS

Navajo Refining Co.

Drawer 159

Artesia, NM 88210

CITY TTENTION VOICE NO.

Ed Kinney 104223

AMALISIS

SAMPLES REC	EIVED 4/24/81	CUSTOMER ORDER NUMBER P.O. # 200	30		
TYPE OF ANA	LYSIS 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	36 < 1.0 < 0.1 38 0.04 136	,	
		Chloride Chromium Chromium 6+ Copper	3570 0.002 < 0.01 0.004	3400	80
D	,6	, Fluoride	0.3 3160 0.05 0.001 370	0.92	0.9
		pH Units Phenols Alkalinity, "M" Solids, Total Dissolved	< 0.01 8.0 < 0.001 596 14,200	21,500 2	28.0
		Sulfate Sulfide Zinc	5600 0.05 < 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



CUSTOMER ADDRESS

CUSTOMER Navajo Refining Co

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	11/21/80
Navajo Well # 9	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand	«	36 1.0 0.1 36 0.01 88	
	Chloride Chromium Chromium 6+ Copper	<	2703 0.002 0.01 0.006	2200
.65	Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium	٠	0.7 3120 0.01 0.001 370	7 - 3
	Nickel pH Units Phenols Alkalinity, "M"		0.01 7.7 0.001 322	O(in ::
	Solids, Total Dissolved Sulfate Sulfide Zinc	<	10,400 4160 0.03 0.1	9820

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



ADDRESS Drawer 159

CITY Artesia, NM 88210

ATTENTION Ed Kinney NOICE NO 104223 REFORE OF ANALYSIS

er i			
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 14
Navajo Well # 12	Acidity	55	72772
	Alkalinity, "P" (as CaCO ₂)	< 1.0	
	Barium	< 0.1	
	 Biochemical Oxygen Demand Cadmium 	38 0.07	
	Chemical Oxygen Demand	256	
	Chloride	8058	6700 7
· · · · · · · · · · · · · · · · · · ·	Chromium	0.002	-
	Chromium 6+	< 0.01	
	Copper Fluoride	0.002	2.5 1:
00	Hardness (as CaCO ₃)	0.9 8920	2,3
11	Iron	0.04	
,	Lead	0.007	
	Magnesium	1330	
	Nickel	0.02	
	pH Units Phenols	7.6 *<0.001	
	Alkalinity, "M"	545	
	Solids, Total Dissolved	28,900	29.000 2
	Sul fate	11,500	
	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



ATTENTION VOICE NO.

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



SAMPLES RECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.O. # 200	30		
TYPE OF ANALYSIS Water				
Sample Identification	Type of	/liton	. ,	
Identification	<u>Analysis</u>	mg/liter	11/21/80	10/3/
Navajo Well # 13	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand	11 < 1.0 0.1 22 0.002 48	·	
-	Chloride Chromium Chromium 6+ Copper	357 0.002 < 0.01 0.001	380	12
.20	Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium	1.2 1570 0.02 0.003 79	3.5	1.4
Alexander Salah (1945)	Nickel pH Units Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate	< 0.01 7.4 < 0.001 146 3200 1810	3060	25.

Sample Analysis by: BP

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

Sulfide

Zinc

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



0.04

< 0.1

-CUSTOMER Navajo Refining Cor

Drawer 159

ADDRESS CITY

Artesia, NM 88210

NVOIÇE NO.

TTENTION Ed Kinney 104223

AWALYSIS

	,				
SAMPLES RECEIVED 4	/24/81	CUSTOM	ER ORDER NUMBER P.O. # 2003	30	
TYPE OF ANALYSIS W	ater				
Sample Identifi	cation_	5 , 1	Type of Analysis		mg/liter
Navajo W	ell # 16		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	< < <	13 1.0 0.1 44 0.002 152 1173 0.001 0.001 0.001 0.44 1610 0.01 0.002 140
			Nickel pH Units Phenols Alkalinity, "M" Solids, Total Dissolved	<	0.01 7.7 0.016 425 4,770
			Sul fate		1,890

Sul fide

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



0.10

0.1

ADDRESS

-CUSTOMER Navajo Refining Cor

Drawer 159

CITY Artesia, NM 88210

VOICE NO.

TTENTION Ed Kinney 104223

REPORT OF MALYSIS

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	< <	0.01
	Lead Magnesium Nickel	<	0.005 470 0.01 7.6 0.001 198
	Sulfate Sulfide		11,200 2,930 0.03

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



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

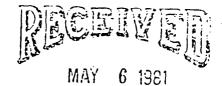
0.1

HOUSTONER ADDRESS CITY

TTENTION

VOICE 110

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



10/3/

1430

6/62

NAVAJO REFINING CO.

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

Water TYPE OF ANALYSIS

Sample Identification		Type of Analysis		mg/liter
Well Water		Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride	< <	13 1 0.1 38 0.002 88 1632
	Es,	Chromium Chromium 6+ Copper Fluoride Hardness (as CaCO ₃) Iron Lead	<	0.002 0.01 0.004 0.25 2400 0.06 0.005
		Magnesium Nickel pH Units Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	<	310 0.01 7.8 0.022 205 6860 2830 0.03 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



CUSTOMER Navajo Refining Co. any

ADDRESS

INVOICE NO.

Drawer 159

CITY Artesia, NM 88210

ATTENTION Ed Kinney 104223

ANALYSIS

4/24/81 SAMPLES RECEIVED

CUSTOMER ORDER NUMBER P.O. #20030

TYPE OF ANALYSIS

Water

Sample Identification

Type of Analysis

mg/liter

Navajo Well #12

Phenols

< 0.001



4/30/81

APERMED D. Martinez, Director of Quality Assurance

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

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 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/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
	103184 1520 Well 47	103184 1550 Fire Pond	
Benzene	<0.005 mg/1	<0.005 mg/1	
Luene	<0.005 mg/1	<0.005 mg/l	
Ethylbenzene Xylenes	<0.005 mg/1	<0.005 mg/1	
Aylenes	<0.005 mg/1	<0.005 mg/1	
	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/l
CN	<0.01 mg/1	<0.01 mg/1	$\langle 0.01 \text{ mg/} 1$
Benzene	<0.005 mg/l	<0.005 mg/1	$\langle 0.005 \text{ mg/l} \rangle$
Toluene	<0.005 mg/1	<0.005 mg/1	<0.005 mg/1
Xylenes Ethylbenzene	<0.005 mg/1	<0.005 mg/l	<0.005 mg/l
Lenyibenzene	<0.005 mg/l	<0.005 mg/1	<0.005 mg/l
	Well 13	Pond 1	Pond 3
NO 3 as N	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
NH 4	5.6 mg/l	10.6 mg/l	13.87 mg/l
CN	0.09 mg/1	0.4 mg/l	0.2 mg/l
Benzene	0.254 mg/1	0.711 mg/1	0.027 mg/1
Toluene	0.345 mg/1	0.588 mg/1	<0.005 mg/l
Xylenes Ethylbenzene	0.389 mg/l	0.591 mg/1	<0.005 mg/1
deny i benzene	<0.100 mg/1	0.240 mg/1	<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	[FICATION/ANALY	TICAL RESULTS
	Fire Pond	Well 47	Well 28
	10/31/83	10/31/84	11/1/84
	1550	1520	1330
Phenols	20.0 ug/l	33.0 ug/1	20.0 ug/l
Cl		122.0 mg/1	101.0 mg/l
SO	1800.0 mg/1	1400.0 mg/1	2150.0 mg/l
TDS	3664.0 mg/1	2728.0 mg/l	5192.0 mg/l
TSS	96.0 mg/1	13588.0 mg/1	720.0 mg/l
NO	2.18 mg/l	1.79 mg/1	1.63 mg/1
NH		0.3 mg/1	0.3 mg/l
Cr		< 0.01 mg/l	<0.01 mg/1
CN	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
	Well 45	Well	
	10/31/84	10/31/84	NOMINAL DETECTION
	1432	1240	LIMIT
Phenols	16.0 ug/l	13.0 ug/1	0.01 ug/1
Cl	495.0 mg/1	446.0 mg/l	1.0 mg/1
SO	1650.0 mg/1	2100.0 mg/l	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/l	1.0 mg/1
NO	0.10 mg/1	0.80 mg/1	0.1 mg/l
NH	11.6 mg/1	1.0 mg/1	0.1 mg/l
Cr	<0.01 mg/1	< 0.01 mg/1	0.01 mg/l
CN	<0.01 mg/1	<0.01 mg/l	0.01 mg/l

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

Geraghty & Miller, Inc.		pyraurent	Downgradient Wells		
	_	35	36	37	38
рН		7.28	7.27	7.57	7.37
Spec Cond		3942	9462	9462	7899
TOC	(*)				
TOX Ug/l		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	ъ	-	-	-	-
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 &	& Mill	Upgradient			
		Well 31	32	Wells 33	34
рН		7.31	7.41	7.41	7.30
Spec Cond.		25544.5	2693	3590	2563
TOC mg/1	(*)	2489			
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	(*)				

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

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

QUALITY OF WATER IN 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

	11184 1330 Well 28	103184 1432 Well 45	103184 1240 Well 46
Benzene Toluene Echylbenzene Xylenes	<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	<0.005 mg/l <0.005 mg/l <0.005 mg/l <0.005 mg/l
	103184 1520 Well 47	103184 1550 Fire Pond	-
Benzene Luene Luene Kylenes	<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>
	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

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

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,

Jennifer V. Smith, Ph.D.

Laboratory Director

ADDRESS Drawer 159
CITY Artesia, NM 88210
ATTENTION Ed Kinney
INVOICE NO 104223

SAMPLES RECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.O. # 20030	
TYPE OF ANALYSIS Water		
- N. V.		
Sample <u>Identification</u>	Type of Analysis	mg/liter
Navajo East Pond	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	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 < 0.001 214 4920
	Sulfate Sulfide Zinc	1520 0.36 < 0.1

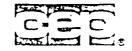
Sample Analysis by: BP

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



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

ontrols for Environmental Pollution, Inc.

P.O. Box 5351 • 1925 Rosina • Santa Fe, New Mexico 87502 Telephone 505/982-9841 -CUSTOMER
ADDRESS
CITY

Navajo Refining Con Drawer 159

Artesia, NM 88210

ATTENTION Ed Kinney INVOICE NO 104223

SAMPLES RECEIVED

4/24/81

CUSTOMER ORDER NUMBER

P.O. # 20030

TYPE OF ANALYSIS

Water

Sample Identification		Type of Analysis		mg/li te r
Navajo Middle Pond	i	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride	< <	29 1 0.1 116 0.002 363 1468
		Chromium Chromium 6+ Copper Fluoride	< <	0.1 0.01 0.001 7.4
·	140	Hardness (as CaCO ₃) Iron Lead Magnesium Nickel	<	1060 0.06 0.001 96 0.01
en en la		pH Units Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	<	7.4 0.027 349 4020 1050 13.4

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



-customer Navajo Refining Co. .
ADDRESS Drawer 159
CITY Artesia, NM 88210

ATTENTION Ed Kinney INVOICE NO 104223



		\		
SAMPLES RECEIVED	4/24/81	CUSTOMER ORDER NUMBER	P-0- #-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	V	13 1 0.2 116 0.003 102 918 0.04
100	Chromium 6+ Copper Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium Nickel pH Units Phenols Alkalinity, "M" Solids, Total Dissolved		0.01 0.001 6.6 760 0.06 0.002 60 0.01 7.7 0.04 173 2930
	Sulfate Sulfide Zinc	<	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: ${\rm BOD}_{\rm S}$ - 5 day incubation

pH:electrode



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

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



To: Geo Splence

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 27#324 854110701 , 444

Navajø 49 854110721

Pecos River 854100910

. 8300.0 umhos/4m 7620.0 mg/1

9000.0 umhos/om 7314.0 mg/1

14000.0 umhos/6m 8300.0 umhos 12564.0 mg/1 7620.0 mg/1 .<0.001 mg/1 <0.001 mg/1

Navajo Pt 4 #2 al 8504111037

Navajo Pepos River 854111120

<0.001 mg/1 Navajo Pedos

Benzene

4800.0 umbos/om

River 854111135

3852.0 mg/l % <0-001 mg/1

8220.0 mg/1 8782.0 mg/1 <0.001 mg/1 <0.001 mg/1

10000.0 umhos/am 10000.0 umhos/am

MOMINATE DETECTION LIMITS:

ECHA TDS A.

0.1 umhos/om

1 mg/1/

Benzene 0.001 mg/1

REPERENCE: Scandard Mechods for the Examination of Water and Wastewater

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

Sinderely,

Laboratory Director

GeoSolence Geo

Actn: Randy Hicks 500 Copper N.W. Suite 325 Albuquerque, NM 87102

DATE: 23 July 1985

Sample ID

Analysis of Chromacographs

Navajo Pr 2 854110701 No benzene or other hydrocarbons present

No benzene or other hydrodarbons present

854100910

No benzene or other hydrogarbons present

Navajo Pt 4 8504111037

No benzene, coluene or echyl benzene present; Xylenes masked by presence of apliphacie

Navajo Peços River 85411120

No benzene or orner hydrogarbons present

Navajo Pegos River 854111135

No benzene or other hydrogarbons present

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

Sinderely,

Laboratory Director

itants, Ltd.	500 Copper Avenue N	LAB
	Suite 220 Albuquerque, New Mexico 87102	DATE RECEIVED DATE ANALYZED
a Milli	Sample Location Pt # Date 4/11/85 Time	2 by Pecos Political By Character Collected By Charac
		SAMPLING CONDITIONS
	Samp. Type Well Wa Color Close Odor/Taste Nove/Sal Water Level 8'2/4" & Datum Casing Top	Cond Temp Flow Rate Elevation
		d preservation <u>Bailed Z VOA's</u>
	_ too small for 1	eg, bailer
	EC 140,000 pm/cm	
[] NC	mg/l [] CO3	mg/l
		[] Gr Almg/l [] Gr Betmg/l
Remar	cks on Analyses:	
		N OF CUSTODY
Shipp	ped or delivered to lab by	Time
I he	reby certify that to the b	est of my knowledge water samples (amt/size
(Owne deliv	er) sampling and analysis plan ery to the laboratory.	cordance with's and are safely containerized and labeled for
agna Addre		RECEIVING LABORATORY ASSAIGNI
Attn:	All Samples recei	
Date	List samples miss Received 4-/5-85 Time	ing or damaged
	Accepted by	1

Geoscience onsultants, Ltd.	500 Copper Avenue N	CLIENI (
	Albuquerque, New Mexico 87102	DATE RECEIVED DATE ANALYZED	
		R QUALITY ANALYSIS	
Min. Million			
3~	Date 4/11/85 Time	27 Collected By Literature	
	SAM	MPLING CONDITIONS	
1	Samp. Type Well water Color Turbid	pH Cond <u>6600</u>	
	Odor/Taste Faithe Water Level 6'7.1/2"	Temp /5-C Flow Rate	
	Datum <u>Pipe for</u>	Elevation	
15	Remarks on sampling and pro	reservation	
	· · · · · · · · · · · · · · · · · · ·	WATER CHEMISTRY	
	1 liter plastic cool to 40 C	500 ml plastic HNO3 to pH 2	
i. [] Ca	mg/1 [] HCO3 mg/1		
[] K [] Na	mg/! [] C!mg/! mg/1 [] Fmg/!	[] Crmg/l	
[] 21	$\frac{\text{mg/1}}{\text{s}_{4/22}\text{mg/1}} \begin{bmatrix} \text{s}_{04} & \text{mg/1} \\ \text{s}_{05} & \text{mg/1} \end{bmatrix}$		
13 300	500 ml plastic H ₂ SO ₄ to pH 2	Z VOA bottles Benz mg/1 [] Tol mg/1	
[] NO [] NH	mg/l TOCmg/l Mg/l TKNmg/l	UREA FORMA	DEHOE
(usa	250 ml glass TOX mg/l 6.25 mg N _a SO ₄ if free	250 ml glass H ₃ PO ₄ CuSO ₄ mg/_	e
/426	Cl is present)	_	
		[] Gr Almg/l [] Gr Betmg/l	
Remar	ks on Analyses:	·	
	CHAIN OF	OF CUSTODY	
Shipp	ed or delivered to lab by	Hente	
I her	reby certify that to the best	of my knowledge water samples (amt/size	
(Owner	r) sampling and analysis plan and	dance with 's are safely containerized and labeled for	
	ery to the laboratory.	RECEIVING LABORATORY ASSAIGAT	
Addres	SS	TOURT PASSION	
	All Samples received List samples missing	intact.	
Date F	Received 4-15-85 Time Accepted by		

eoscience Consultants, L	Suite 220 Albuquerque, New Mexico 87102 DATE RECEIVED DATE ANALYZED
	WATER QUALITY ANALYSIS
	Sample Location NAUAJO # 49 Date 4/11/85 Time 0721 Collected By 4 Heurt
	SAMPLING CONDITIONS
	Samp. Type Woll Water pH 7.2 Color Cond 8300 Odor/Taste Temp 15°C Water Level 11'10" Flow Rate Datum Guard Pipe Top Elevation
	Remarks on sampling and preservation Railed w/ cleaned
	PUC bailer
	WATER CHEMISTRY EC 83,000
	V 1 liter plastic cool to 4° C
[]	200 ml plastic H ₂ SO ₄ to pH 2 Benz NO mg/l [] Tol mg/l MO ₃ mg/l [] TOC mg/l [] Xyl mg/l [] SCAN UREA FORMALDEITYOU
(us	250 ml glass TOX mg/l [] Phenol mg/l
	[] Gr Almg/l [] Gr Betmg/l
Ren	chain on Analyses:
Shi	oped or delivered to lab by further
	Date
(Ow) were obtained to accordance with
	RECEIVING LABORATORY ASSAKAN

All Samples received intact.
List samples missing or damaged

Cor	eo rsu	scie tan	nce ts, L	td

Address Attn:

All Samples received intact. List samples missing or damaged

500 Copper Avenue N.) Suite 220 Albuquero

	CLIENI	<i>:</i>
	LAB	
DATE	RECEIVED	
DATE	ANALYZED	

Albuq	· ·	DATE ANALYZED
Announced.	WATER	QUALITY ANALYSIS
	Sample Location Peca Ro Date 4/11/85 Time 11.	is al of Pouds 35 Collected By Officiation
	SAMF	PLING CONDITIONS
	Samp. Type River Water	pH
	Odor/Taste	Cond Temp
	Water Level	Flow Rate
	Datum	Elevation
	Remarks on sampling and pre	eservation
		MATER CHEMISTRY
√ 11	EC 100,000 iter plastic cool to 40 C	500 ml plastic HNO ₃ to pH 2
[] Ca	mg/l [] HCO ₃ mg/l	[] As mg/l [] Ag mg/l
[] Mg ·	mg/1 [] C1mg/1	[] Bamg/l [] Semg/l [] Cdmg/l [] Femg/l
[] Na [] Si	mg/l [] Fmg/l mg/l [] SO ₄ mg/l	[] Crmg/l [] Mnmg/l [] Pbmg/l [] Hgmg/l
TDS 8782	mg/1 [] TSSmg/1	₹ VOA bottles
50	0 ml plastic H ₂ SO ₄ to pH 2	M Benz mg/l [] Tolmg/l
[] NO ₃	mg/l [] TOCmg/l mg/l [] TKNmg/l	[] Xy1mg/1 [] SCAN UREA FORMILDELTY OF
	l glass TOX mg/l	250 ml glass H ₃ PO ₄ CuSO ₄ mg/e
(use 6.25 m	g N _a SO ₄ if free	[] Thenoting/T
Clis	present)	
		[] Gr Almg/l [] Gr Betmg/l
Remarks on A	Analyses:	
	CHAIN OF	CUSTODY
Shipped or o	delivered to lab by	fenta
	ertify that to the best	of my knowledge water samples (amt/size
(Owner) samp) were obtained to accordance of the plan and a plan and a plan and a	ance with's are safely containerized and labeled for
delivery to	the laboratory.	4
Signature	75	RECEIVING LABORATORY ASSAIGHT

	The same of	
Geosci Consultar	ns Ind Sub Copper Avenue IV	
	Suite 220 Albuquerque, New Mexico 87102 DATE RECEIVED	1
	DATE ANALYZED	İ
	WATER QUALITY ANALYSIS	
	Sample Location Pegos River @ Pipline Consists	
	Date 4/0/85 Time 0910 Collected By Achinter	1
	SAMPLING CONDITIONS	ļ
ř	Samp. Type Prince water pH	
	Color <u>Slightly Finlid</u> Cond Odor/Taste Temp	•
,	Water Level Flow Rate	
	Datum Elevation	
•	Remarks on sampling and preservation Collected sample from	
	Peca Rine v 50 downsteam from pireline	
	WATER CHEMISTRY EC. 70,000 WATER CHEMISTRY	
	X 1 liter plastic cool to 40 C 500 ml plastic HNO3 to pH 2	
١.	[] Camg/l [] HCO3mg/l [] Asmg/l [] Agmg/l [] Mgmg/l [] CO3mg/l [] Bamg/l [] Semg/l	
	[] Kmg/* [] Clmg/l [] Cdmg/l [] Femg/l	
	[] Namg/1 [] Fmg/1 [] Crmg/1 [] Mnmg/1 [] Simg/1 [] SO ₄ mg/1 [] Pbmg/1 [] Hgmg/1	
1	TDS 7314 mg/1 [] TSSmg/1	
• 1	VOA bottles 500 ml plastic H ₂ SO ₄ to pH 2	
	$\begin{bmatrix} 1 & MO & ma \\ 1 & \end{bmatrix} & \begin{bmatrix} 1 & TOC & ma \\ 1 & \end{bmatrix} & \begin{bmatrix} 1 & TCC & ma \\ 1 &$	-
	[] NH4 mg/1 [] TKN mg/1 [] NH4 mg/1 [] TKN mg/1 250 ml alace Happy Cuspy	•
	250 ml glass H3P04 CuS04mg/l	
	(use 6.25 mg NaSO4 if free	
	Clas present)	-
	[] Gr Almg/l [] Gr Betmg/l	
*.	Remarks on Analyses:	
1		
	CHAIN OF CUSTODY	
,	Shipped or delivered to lab by funtur	
is	I hereby certify that to the best of my knowledge water samples (amt/size	
) were obtained to accordance with's (Owner) sampling and analysis plan and are safely containerized and labeled for	
	delivery to the laboratory.	
i	Signature RECEIVING LABORATORY ASSA16A1	
	Address	

All Samples received intact.
List samples missing or damaged

Attn:

eoscience Consultants, Ltd.	Sample Location Acas R Date 4/1/85 Time 112	QUALITY ANALYSIS QUALITY ANALYSIS QUALITY ANALYSIS QUALITY ANALYSIS QUALITY ANALYSIS
	SAMP	LING CONDITIONS
	Samp. Type Ruer Water Color Odor/Taste Water Level Datum	PH
	Remarks on sampling and pres	servation
[] M. K. N. S. T. T. N. C. U.S. C. N. C. U.S.	C 100,000 C 1 liter plastic cool to 4° C C C C C C C C C C	Soo ml plastic HNO3 to pH 2
		[] Gr Almg/l [] Gr Betmg/l
Remar	rks on Analyses:	
	CHAIN OF	CUSTODY
<u> </u>	ped or delivered to lab by Date	Time
(Owne		of my knowledge water samples (amt/size nce with's re safely containerized and labeled for

RECEIVING LABORATORY ASSAICAT

All Samples received intact.

List samples missing or damaged

APPENDIX C
PROPOSED CHANGES IN RCRA REGULATIONS

Dated: December 28, 1984
Valdas V. Adamkus,
Regional Administrator.
[FR Doc. 85-3330 Filed 2-8-85; 8:45 am]
BILLING COOE 8560-50-8

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 vastewater treatment processes, and ot to any wastes from secondary wastewater treatment such as sludges from biological oxidation.

DATES: 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 S-212A, U.S. Environmental Protection Agency, 401 M Street, SW., Washington. 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) 475-8725.

m May 19, 1980, as part of its final interim final regulations implementing Section 3001 of RCRA. EPA 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. 1 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

¹Envirex, 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.

List of Subjects in 40 CFR Part 261

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

Jack W. McGraw,

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.

^aThe background listing document and the Envirex rulemaking petition are available in the jubic 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) 496–4606.

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 64 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 secondary sludges from biological treatment of refinery 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
- 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.

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

		•
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

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)

HQCC 3-103 Standards	CRUDE UNIT PROCESS (#4, #11, #13)	CAT. CRACKER PROCESS SEFORE SOUR WATER STRIPPER	SOUR WATER STRIPPER EFFLUENT (\$17)	alky. Neutralizing Sewer (46)	ND 4 SD DESALTERS (#3, #9)
As			ř		
Ea					
Cq					
Cr	<0.1	<0.1			
CN	<0.1	<0.1	(0.1	7.8	•
_			1.0>	<0.1	(1.0
F	1.3	0.5			54.V
Fb		v. J	0.4	10.8	
Hg					
NO3				-	
Se					
Ag				•	
U				•	
CI -					
Cu					
Fe	<0.1	3.9			
Ko		3.7	17.0	7.8	
SO*					
TDS	805	2160	5.0		
In	(0.1	(0.1	560	2872	2524
pH	6.3	9.0	0.12	18.8	
A1			9.5	3.6	
8					
Ce					
fio 					
Ni					4 : 2**1
fhenols	9.9	710	250		
TSS		•••	230	0.26	
Cond.					
COD	1202	8379	702		
H₄	78	•	702 256	8870	600
	64		7.7	(1	5.0
			•••	1.4	(1.0

CO

NH. S

Table 5-2 (continued)

BOILERS

MGCC 2-103	S.D.	ĸ.D.	N. O.
PARAMETERS	BOILER	HIGH	
	RLONDOWN	PRESSURE	FOR
			FRESSURE
	(#2)	BOILER	BOILER
		(€18)	(#12)
As	.004		
Ba	(.1	.005	.003
Cd	<.01	⟨.1	(.1
Cr		<.01	<.01
CN CN	₹.05	<.05	<.05
F	7.4		
Pb	3.1	2.2	1.5
Hg	.18	.14	.05
KO²			
Se	.2	.1	.05
Ag			
n Ma	<.05	<.05	<.05
C1	<.05	<.05	<.05
Cu	127	73	44
Fe	<.03	<.03	<.03
Ka	1.9	0.65	0.25
SO	.07	<.03	<.03
TDS	1549	1242	693
In	4220	2873	1807
pH	.06	<.01	(.01
Al	11.6	11.6	11.2
B	<1.0	<1.0	<1.0
Co	/ 44		
fio	<.01 <.5	.02	.01
Ni		<.5	<.5
Fhenols	<.05	<.05	<.05
TSS	20		
Cond.	20 6000	0	0
COD	116	5000	2890
₹H₄	110	0	0
•			

Table 5-2 (continued)

COOLING TOWERS

MQCC 3-103 Standards	N.D. COOLING TOWER BLONDOWN (#10)	S.D. ALKY COOLING TOWER BLOWDOWN (#1)	S.D. TCC COOLING TOMER BLOWDOWN	N.D. FCC CDOLING TONER BLOWDOWN (#16)
As	.004			
Ba	.004 <.1	⟨.001	.011	.001
Cd	<.01	(.1	<.1	⟨.1
Cr	.06	⟨.01	<.01	<.01
CN	.00	1.05	<.05	0.22
F	1.6			****
Pb	.05	4.4	2.2	1.6
Hg	.03	.05	<.05	.05
N O ₃	.5			• • • •
Se	•3	.75	2	.3
Ag	/ ^6			40
υ	<.05	<.05	<.05	<.05
C1	(.05	<.05	<.05	₹.05
Cu	48	53	44	47
Fe	(.03	<.03	(.03	
Mn	.05	.5	⟨.05	(.03
SO	<.03	.07	⟨.03	<.05
TDS4	1077	1461	1236	(.03
Zn .	1906	2732	1694	1067
pH	.48	28	<.01	1973
AI	7.6	6.9	7.7	.17
8	(1.0	<1.0	1.0	8.0
Co			•••	<1.0
Ka	<.01	.01	.02	24
Ki	<.5	<.5	⟨.5	.01
	<.05	<.07	₹.05	<.5
Fhenols TSS			*****	⟨.05 🔎 🥍
	13	0	67	
Cond.	0	0	108	C
COD	1850		1.40	1800
NH.	0			15

j

RIO GRANDE BASIN

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

LOCATION.--Lat 32°50'25°, long 104°19'23°, in NWiNWi 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.

REMARRS.—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.

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.—Haximum 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 22,000 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), hased 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 ft³/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	MAT	JUN	JUL	AUG	SEP
1	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	129	56	60	94	48	21	131	17	617	45	9,6
6 7	12	114	58	59	86	46	20	103	16	641	39	12
7	13	103	59	60	80	45	21	83	11	655	50	11
8	14	93	59	60	71	42	22	83	8.9	718	71	8.9
9	17	87	57	59	72	41	21	71	8.2	740	52	38
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
									**	030		364
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
30	780	62	66	50	72	30	672	98	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	86	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	63	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	373	534	11	1/3
TOTAL	8186	2469	1919	1997	2108	1033	12612	2582	3984.4	21165	1668.6	6327.5
MEAN	264	82.3	61.9	64.4	72.7	33.3	420	93.3	133	683	53.8	211
MAX	905	165	74	87	106	51	808	417	595	750		
MIN	12	54	54.	50	51	14	18	24			217	1070
AC-FT	16240	4900	3810	3960	4180	2050	25020	5120	4.1 7900	534 41980	9.6 3310	8.9 12550
CAL VO	1070 708			445 "								

CAL TR 1979 TOTAL 53623.1 MEAN 147 1170 106400 66051.5 TOTAL MEAN 180 XAN 1070 **KIN 4.1** AC-FT 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 micrombos 7000

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.

MATER 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 PIELD (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)
12	0912	13	13800	8.1	24.5	15.5	12	9.0	59	3400
оу 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 Feb	1030	51.	8700	8.6	19.5	9.0	1.1	13.2	49	2100
26 MAR	1000	55	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	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 AUG	1000	730	1200	8.2	32.0	25.0	420	3.2	32	580
26 SEP	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
	HARD-		MAGNE-		SODIUM	POTAS-			CHLO-	PLUO-
,	HARD- NESS,	CALCIUM	Magne- Sium,	SODIUM,	SODIUM AD-	POTAS- SIUM,	ALKA-	SULFATE	CHLO- RIDE.	PLUO-
,		CALCIUM DIS-		SODIUM, DIS-		SIUM,			RIDE,	RIDE,
,	NESS, NONCAR-	DIS-	SIUM, DIS-	DIS-	AD- SORP-	SIUM, DIS-	LINITY	DIS-	RIDE, DIS-	RIDE, DIS-
,	NESS, NONCAR- BONATE	DIS- Solved	SIUM, DIS- SOLVED	DIS- SOLVED	AD- SORP- TION	SIUM, DIS- SOLVED	LINITY (MG/L	DIS- SOLVED	RIDE, DIS- SOLVED	RIDE, DIS- SOLVED
	NESS, NONCAR- BONATE (MG/L	DIS- SOLVED (MG/L	SIUM, DIS- SOLVED (MG/L	DIS- SOLVED (MG/L	AD- SORP-	SIUM, DIS+ SOLVED (MG/L	LINITY (MG/L AS	DIS- SOLVED (MG/L	RIDE, DIS- SOLVED (MG/L	RIDE, DIS- SOLVED (MG/L
DATE	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)
Date	NESS, NONCAR- BONATE (MG/L	DIS- SOLVED (MG/L	SIUM, DIS- SOLVED (MG/L	DIS- SOLVED (MG/L	AD- SORP- TION	SIUM, DIS+ SOLVED (MG/L	LINITY (MG/L AS	DIS- SOLVED (MG/L	RIDE, DIS- SOLVED (MG/L	RIDE, DIS- SOLVED (MG/L
DATE 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)
DATE 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)
DATE 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) 3700	RIDE, DIS- SOLVED (MG/L AS F) (00950)
DATE OCT 12 NOV 09 DEC 05 JAN 18	NESS, NONCAR- BONATE (MG/L CACO3) (00902) 3300	DIS- SOLVED (MG/L AS CA) (00915) 500	SIUM, DIS- SOLVED (MG/L AS MG) (00925) 520	DIS- SOLVED (MG/L AS NA) (00930) 2100	AD- SORP- TION RATIO (00931) 16	SIUM, DIS- SOLVED (MG/L AS K) (00935)	LINITY (MG/L AS CACO3) (00410) 130	DIS- SOLVED (MG/L AS SO4) (00945) 3200	RIDE, DIS- SOLVED (MG/L AS CL) (00940) 3700	RIDE, DIS- SOLVED (MG/L AS F) (00950)
DATE 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	SIUM, DIS- SOLVED (MG/L AS MG) (00925) 520 110	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 7.6	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	RIDE, DIS- SOLVED (MG/L AS F) (00950)
DATE OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR 25	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	RIDE, DIS- SOLVED (MG/L AS CL) (00940) 3700 770 860 2100	RIDE, DIS- SOLVED (MG/L AS F) (00950) .8
DATE 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	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) 130 130 170 150	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
DATE 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	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) 130 130 170 150 190	DIS- SOLVED (MG/L AS SO4) (00945) 3200 1100 2600 1800 1800	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
DATE OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR 25 APR 30 MAY 27 JUN	NESS, NONCAR- BONATE (MG/L CACO3) (00902) 3300 1400 2000 2300 3100 1000	DIS- SOLVED (MG/L AS CA) (00915) 500 420 430 480 560 750 370	SIUM, DIS, SOIVED (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 11 18	SIUM, DIS- SOLVED (MG/L AS K) (00935) 22 7.6 9.5 11 11 21	LINITY (MG/L AS CACO3) (00410) 130 130 170 150 100 190	DIS- SOLVED (MG/L AS SO4) (00945) 3200 1100 2600 1800 2600 970	RIDE, DIS- SOLVED (MG/L) AS CL) 3700 770 860 2100 2100 4200	RIDE, DIS- SOLVED (MG/L AS F) (00950) .8 .5 .8 .9 .6
DATE OCT 12 NOV 09 DEC 05 JAN 18 FEB 26 MAR 25 APR 30 MAY 27 JUN 24 JUL 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	\$1UM, 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 110	AD- SORP- TION RATIO (00931) 16 5.1 9.7 11 11 18 1.4	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 95	DIS- SOLVED (MG/L AS SO4) (00945) 3200 1100 2600 1800 2600 970	RIDE, DIS- SOLVED (MG/L) AS CL) 3700 770 860 2100 2100 4200 150	RIDE, DIS- SOLVED (MG/L AS F) (00950) .8 .5 .8 .9 .6
DATE OCT 12 NOV 09 DEC 05 JES FEB 26 MAR 25 APR 30 MAY 27 JUN 24 JUL	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- SOIVED (MG/L AS MG) (00925) 520 110 230 220 240 340 49 190	DIS- SOLVED (MG/L AS NA) (00930) 2100 450 1000 1200 1200 2400 110	AD- SORP- TION RATIO (00931) 16 5.1 9.7 11 .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) 130 130 170 150 100 190 95 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

	-								
		SOLIDS.	SOLIDS,	SOLIDS,		NITRO-		NITRO-	
				RESIDUE	NITRO-	GEN,	NITRO-	GEN,	NITRO-
	SILICA,	RESIDUE	SUM OF		GEN,	NO2+NO3	GEN,	AIMONIA	GEN,
	DIS-	AT 180	CONSTI-	AT 105			AMMONIA	DIS-	ORGANIC
	SOLVED	DEG. C	TUENTS,	DEG. C,	NO2+NO3	DIS-		SOLVED	TOTAL
	(MG/L	DIS-	DIS-	SUS-	TOTAL	SOLVED	TOTAL		(MG/L
	AS	SOLVED	SOLVED	PENDED	(MG/L	(MG/L	(MG/L	(MG/L	
DATE	SIO2)	(MG/L)	(MG/L)	(MG/L)	AS N)	AS N)	AS N)	AS N)	AS N)
	(00955)	(70300)	(70301)	(00530)	(00630)	(00631)	(00610)	(00608)	(00605)
OCT	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,	• •	•					
12	9.0	9990	10100	35	.71	.73	.270	.260	.54
NOV	3.0	~							
	15	3200	2960	154	.83	.84	.170	.090	.44
09	15	. 3200	2300	234			•		
DEC			5050	17	1.6	1.6	.340	.260	1.5
05	16	5770	5260	1,	1.0	2.0			
JAN						.83	.230	.260	1.8
18	11	6210	5920	12	.83	.03	230		
FEB				_			0.40	120	1.2
26	14	6070	5990	7	.02	.06	.940	.120	1.2
MAR									
25	7.8	10700	10400	15	.04	.04	.180	.170	1.1
APR									
30	8.4	1810	1720	1250	.09	.10	.140	.110	1.5
	0.4	1010	1,10						
MAY	••	5920	5410	81	.00	.00	.200	.220	1.3
27	12	5920	3410	01					
JUN		****	2050	1670	.32	.19	.380	.400	2.3
24	8.0	3090	2950	1670	.32	• 1.5	.500		
JUL							010	.000	2.6
22	7.1	945	879	224	.01	.05	.010	.000	2.0
AUG									~~
26	8.8	4730	4450	19	.00	.00	.350	.070	.75
SEP						•			
29	12	2430	2130	748	.63	.59	.120	.060	2.1
23		- "							
23		2 # 3 3							
23		233	PHOS-	, , ,		MANGA-		CARBON.	CARBON,
23			PHOS- PHORUS,			MANGA-	CARBON.	CARBON, ORGANIC	
23	NITRO-	PHOS-	PHOS- PHORUS, ORTHOPH	BORON,	IRON,	NESE,	CARBON,	ORGANIC	ORGANIC
23	NITRO- GEN,	PHOS- PHORUS,	PHOS- PHORUS, ORTHOPH OSPHATE	BORON, DIS-	IRON, DIS-	NESE, DIS-	ORGANIC	ORGANIC DIS-	ORGANIC SUS-
23	NITRO- GEN, TOTAL	PHOS- PHORUS, TOTAL	PHOS- PHORUS, ORTHOPH OSPHATE DISSOL.	BORON, DIS- SOLVED	IRON, DIS- SOLVED	NESE, DIS- SOLVED	ORGANIC TOTAL	ORGANIC DIS- SOLVED	ORGANIC SUS- PENDED
	NITRO- GEN,	PHOS- PHORUS, TOTAL (MG/L	PHOS- PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L	BORON, DIS- SOLVED (UG/L	IRON, DIS- SOLVED (UG/L	NESE, DIS- SOLVED (UG/L	ORGANIC TOTAL (MG/L	ORGANIC DIS- SOLVED (MG/L	ORGANIC SUS- PENDED (MG/L
DATE	NITRO- GEN, TOTAL	PHOS- PHORUS, TOTAL	PHOS- PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P)	BORON, DIS- SOLVED (UG/L AS B)	IRON, 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)
	NITRO- GEN, TOTAL (MG/L	PHOS- PHORUS, TOTAL (MG/L	PHOS- PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L	BORON, DIS- SOLVED (UG/L	IRON, DIS- SOLVED (UG/L	NESE, DIS- SOLVED (UG/L	ORGANIC TOTAL (MG/L	ORGANIC DIS- SOLVED (MG/L	ORGANIC SUS- PENDED (MG/L
DATE	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P)	BORON, DIS- SOLVED (UG/L AS B) (01020)	IRON, 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)
DATE	NITRO- GEN, TOTAL (MG/L AS N) (00600)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P)	BORON, DIS- SOLVED (UG/L AS B)	IRON, DIS- SOLVED (UG/L AS FE)	NESE, DIS- SOLVED (UG/L AS MN) (01056)	ORGANIC TOTAL (MG/L AS C)	ORGANIC DIS- SOLVED (MG/L AS C)	ORGANIC SUS- PENDED (MG/L AS C)
DATE OCT 12	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671)	BORON, DIS- SOLVED (UG/L AS B) (01020)	IRON, 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)
DATE OCT 12	NITROGEN, TOTAL (MG/L AS N) (00600)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671)	BORON, DIS- SOLVED (UG/L AS B) (01020)	IRON, 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)
DATE OCT 12 NOV 09	NITRO- GEN, TOTAL (MG/L AS N) (00600)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671)	BORON, DIS- SOLVED (UG/L AS B) (01020)	IRON, 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)
DATE OCT 12 NOV 09 DEC	NITROGEN, TOTAL (MG/L AS N) (00600)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671)	BORON, DIS- SOLVED (UG/L AS B) (01020) 990	IRON, 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)
DATE OCT 12 NOV 09 DEC 05	NITROGEN, TOTAL (MG/L AS N) (00600)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671)	BORON, DIS- SOLVED (UG/L AS B) (01020)	IRON, 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)
DATE OCT 12 NOV 09 DEC 05 JAN	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .070	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280	IRON, 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) 4.5 4.8	ORGANIC SUS- PENDED (MG/L AS C) (00689)
DATE OCT 12 NOV 09 DEC 05 JAN 18	NITROGEN, TOTAL (MG/L AS N) (00600)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671)	BORON, DIS- SOLVED (UG/L AS B) (01020) 990	IRON, 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)
DATE OCT 12 NOV 09 DEC 05 JAN 18 FEB	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 3.4	PHOS- PHORUS, TOTAL (MG/L AS P) (00665) .070 .070	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470	IRON, 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 5.6	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6
DATE OCT 12 NOV 09 DEC 05 JAN 18 FEB	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .070	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280	IRON, 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	ORGANIC SUS- PENDED (MG/L AS C) (00689)
DATE OCT 12 NOV 09 DEC 05 JAN 18	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 3.4	PHOS- PHORUS, TOTAL (MG/L AS P) (00665) .070 .070	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040 .000	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510	IRON, 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 5.2	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7
DATE OCT 12 NOV. 09 18 PEB 26 MAR	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1	PHOS- PHORUS, TOTAL (MG/L AS P) (00665) .070 .070	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470	IRON, 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
DATE OCT 12 NOV. 09 05 JAN 18 FEB 26 MAR	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .100 .090 .280	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040 .000	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510	IRON, 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 5.2 9.5	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7 22 1.9
DATE OCT 12 NOV 09 ESC JAN 18 FEB 26 MAR 25 APR	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .100 .090 .280 .110	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510	IRON, 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
DATE OCT 12 NOV 09 JAN 18 FEB 26 MAR 25 APR 30	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .100 .090 .280	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510	IRON, 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
DATE OCT 12 NOV. 09 05 JAN 18 FEB 26 MAR 30 MAY	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .090 .280 .110 .870	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040 .000 .040 .000	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510 870	IRON, DIS- SOLVED (UG/L AS FE) (01046) 50 20 60 30 70	NESE, DIS- SOLVED (UG/L AS MN) (01056) 20 440	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
DATE OCT 12 NOV 09 05 JAN 18 FEB 26 MAR ,25 APR 30 APR 30	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .100 .090 .280 .110	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510	IRON, DIS- SOLVED (UG/L AS FE) (01046) 50 20 60 30 70	NESE, DIS- SOLVED (UG/L AS MN) (01056) 20 440	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
DATE OCT 12 NOV. 09 PEB 26 MAR ,25 APR 30 MAY 27 JUN	NITROGEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1 1.3	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .100 .280 .110 .870 .090	PHOS- PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .020 .040 .000	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510 870	IRON, DIS- SOLVED (UG/L AS FE) (01046) 50 60 30 70 50	NESE, DIS- SOLVED (UG/L AS MN) (01056)	ORGANIC TOTAL (MG/L AS C) (00680) 8.5	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8 5.6 5.2 9.5 5.4 2.4	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7 22 1.9 .5
DATE OCT 12 NOV. 09 05 JAN 18 FEB 26 APR 30 MAY 27 JUN 24	NITROGEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1 1.3	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .090 .280 .110 .870	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040 .000 .040 .000	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510 870	IRON, DIS- SOLVED (UG/L AS FE) (01046) 50 60 30 70 50	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
DATE OCT 12 NOV 09 05 JAN 18 FEB 26 APR 30 APR 30 JUL	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1 1.3 1.7	PHOS-PHORUS, TOTAL (MG/L AS P) (90665) .070 .070 .100 .090 .280 .110 .870 .090 1.700	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040 .000 .040	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510 870 100 580	IRON, DIS- SOLVED (UG/L AS FE) (01046) 50 20 60 30 70 50 110	NESE, DIS- SOLVED (UG/L AS MN) (01056) 	ORGANIC TOTAL (MG/L AS C) (00680) 8.5	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8 5.6 5.2 9.5 5.4 2.4 6.6	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7 22 1.9 .5 1.6
DATE OCT 12 NOV. 09 05 JAN 18 FEB 26 APR 30 MAY 27 JUN 24	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1 1.3 1.7	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .100 .280 .110 .870 .090	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .010 .020 .040 .000 .040	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510 870	IRON, 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	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8 5.6 5.2 9.5 5.4 2.4	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7 22 1.9 .5
DATE OCT 12 NOV 09 05 JAN 18 FEB 26 APR 30 APR 30 JUL	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1 1.3 1.7	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .090 .280 .110 .870 .090 .670	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .020 .040 .000 .040 .000	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510 870 100 580 310	IRON, DIS- SOLVED (UG/L AS FE) (01046) 50 60 30 70 50 110 50 160	NESE, DIS- SOLVED (UG/L AS MN) (01056) 20 440 20	ORGANIC TOTAL (MG/L AS C) (00680) 8.5	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8 5.6 5.2 9.5 5.4 2.4 6.6	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7 22 1.9 .5 1.6 .6
DATE OCT 12 NOV. 09 05 JAN 18 FEB 26 APR 30 APR 3UL 24 JUL 22 AUG	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1 1.3 1.7 1.5	PHOS-PHORUS, TOTAL (MG/L AS P) (90665) .070 .070 .100 .090 .280 .110 .870 .090 1.700	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .020 .040 .000 .040 .000	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510 870 100 580 310	IRON, DIS- SOLVED (UG/L AS FE) (01046) 50 60 30 70 50 110 50 160	NESE, DIS- SOLVED (UG/L AS MN) (01056) 20 440 20	ORGANIC TOTAL (MG/L AS C) (00680) 8.5	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8 5.6 5.2 9.5 5.4 2.4 6.6	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7 22 1.9 .5 1.6
DATE OCT 12 NOV 09 05 JAN 18 FEB 26 APR 30 APR 30 JUL 22 AUG 24 AUG 26	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1 1.3 1.7 1.5	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .090 .280 .110 .870 .090 .670	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .020 .040 .000 .040 .000	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510 870 100 580 310	IRON, DIS- SOLVED (UG/L AS FE) (01046) 50 20 60 30 70 50 110 50 50	NESE, DIS- SOLVED (UG/L AS MN) (01056) 20 440 20 20	ORGANIC TOTAL (MG/L AS C) (00680) 8.5	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 .6 1.1
DATE OCT 12 NOV. 09 05 JAN 18 FEB 26 APR 30 APR 3UL 27 JUL 22 AUG	NITRO- GEN, TOTAL (MG/L AS N) (00600) 1.5 1.4 2.8 2.1 1.3 1.7 1.5 3.0 2.6	PHOS-PHORUS, TOTAL (MG/L AS P) (00665) .070 .070 .090 .280 .110 .870 .090 .670	PHOS-PHORUS, ORTHOPH OSPHATE DISSOL. (MG/L AS P) (00671) .010 .020 .040 .000 .040 .000 .000 .000 .00	BORON, DIS- SOLVED (UG/L AS B) (01020) 990 280 470 490 510 870 100 580 310 100	IRON, DIS- SOLVED (UG/L AS FE) (01046) 50 20 60 30 70 50 110 50 50	NESE, DIS- SOLVED (UG/L AS MN) (01056) 20 440 20 20	ORGANIC TOTAL (MG/L AS C) (00680) 8.5	ORGANIC DIS- SOLVED (MG/L AS C) (00681) 4.5 4.8 5.6 5.2 9.5 5.4 2.4 6.6	ORGANIC SUS- PENDED (MG/L AS C) (00689) .9 .6 1.7 22 1.9 .5 1.6 .6

TRACE ELEMENT ANALYSES, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

DATE DEC	7	:IME	(UC	ENIC FAL G/L AS) 002)	SO (U- AS	ENIC IS- LVED G/L AS) 000)	TO RI EI ()	RIUM. OTAL ECOV- RABLE UG/L S BA) 1007)	SOL (U AS	IUM, S- VED G/L BA) 005)	D SO (U AS	RON, IS- LVED G/L B) 020)	TC RE ER (U AS	MIUM TAL COV- ABLE G/L CD) 027)	SO (U AS	MIUM IS- LVED G/L CD) 025)	MI TO RE ER (U	RO- UM, VTAL COV- ABLE G/L CR) 034)	CHR MIU DIS SOL (UG AS	M. VED /L CR)
05		845		2		1.	:	400		300		470		0		0		0		10
MAR 25	. 0	945				1		, 		200		870		-		1				20
APR 30	. 0	930		3		1		800		400		100		1		0		30		10
JUN 24	,	030		10		1		1006		100		310		0		1		50		10
44000	•	.0.30		70		•		1000		100		310		v		•		20		70
D)ate	COBA TOT: REC ERA: (UG, AS (AL OV- BLE /L CO)	COBA DIS SOLV (UG AS	ED /L (CO)	COPPI TOTA RECI ERAI (UG, AS	AL OV- BLE /L CU)	(UG AS	VED /L (CU)	ERA (UG AS	AL OV- BLE /L FE)	IRO DI SOL (UG AS	S- VED /L FE)	LEA TOTA RECO ERAI (UG, AS	AL OV- BLE /L PB)	LEA DI SOL' (UG, AS	S- VED /L PB)	MANG NESI TOTA RECO ERAL (UG/ AS A	e. AL OV- BLE /L IN)	
DE	:c	(010	3/1	(010	35)	(010	44)	(010	40)	(010	43/	(010	40)	(010	21)	(010	49)	(010))	
	5		3		0		1	,	2		300		60		6		2		40	
MA 2	IR 15				٥				1				50				1			_
AP	R				٠				• .				50				-		_	
.3	0		11		0		27		3	19	000		110		55		2	9	30	
JU 2	4		18		0	:	150		44	33	000		160		57		•	-		
		MANG NES DI: SOL'	e, S- Ved	MERCI TOT. RECI ERA	al OV- Ble	MERCI DI: SOL	S- VED	SEL NIU TOT	M. AL	SOL	M, S- VED		AL OV- BLE-		S- VED	ZING TOT: RECO	AL DV- BLE	ZING DIS SOLV	ED	
D	ATE	AS		AS		(UG,		AS		(UG AS		(UG		(UG,		(UG,		(UG/		
		(010	56)	(719		(716		(011		(011		(010		(010		(010		(0109		
DE 0 MA	5		20		.1		.0		2		, 4		0		0		40		60	
	5		440				.1				2				٥				80	
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	c	HERIC	AL AI	NALYS	es o	P BOT	MOT	MATER	IAL,	WATE	R YE	AR OC	TOBE	R 197	TO	SEPTI	емве	R 1980)	
						ARSE	NIC	CADM	IUM	CHR	o-	COPP	ER.	LEA	٥.	MERCI	IRY.			
						TOT	AL.	REC	ov.	MIU	м,	REC	ov.	REC	v.	REC				
						IN B		PM B		REC		FM B		PM B		FM B				
						TOM I		TOM	MA- IAL	FM B		MOT		TOM !		TOM !				
				TI	ME	(UG)		(UG		TOM TER		TER (UG		TER:		TER				
		DA	TĒ			AS A		AS			/G)	AS		AS)		(UG,				
						(010		(010)		(010		(010		(010		(719				
		SEP 29	• • •	10:	30	,	0	,020	1	1220	1	(010	13, 2	(010:	0	•	.01			

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
DATE Sep	ENDO- SULFAN, TOTAL (UG/L) (39388)	ENDRIN, TOTAL (UG/L) (39390)	ETHION, TOTAL (UG/L) (39398)	HEPTA- CHLOR, TOTAL (UG/L) (39410)	HEPTA- CHLOR EPOXIDE TOTAL (UG/L) (39420)	LINDANE TOTAL (UG/L) (39340)	MALA- THION, TOTAL (UG/L) (39530)	METH- OXY- CHLOR, TOTAL (UG/L) (39480)	METHYL PARA- THION, TOTAL (UG/L) (39600)
29	.00	.00	.00	.00	.00	.00	.00	.00	.00
	METHYL TRI-	PARA-	TOX-	TOTAL	2,4,5-T	SILVEX.	PER - THANE	NAPH- THA- LENES, POLY- CHLOR.	MIREX,
	THION,	THION,	APHENE, TOTAL	TRI- THION	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
DATE	(UG/L) (39790)	(UG/L) (39540)	(UG/L) (39400)	(UG/L) (39786)	(UG/L) (39740)	(UG/L) (39760)	(UG/L) (39034)	(UG/L) (39250)	(UG/L) (39755)
SEP 29	.00	.00	0	.00	.00	.00	.00	.0	.00

MICROBIOLOGICAL ANALYSES, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

DATE	TIME	COLI- FORM, FECAL, 0.7 UM-MP (COLS./ 100 ML) (31625)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
OCT			
12	0912	53	460
NOV			
09	0945	20	85
DEC	0845	. 1	25
05	U843		25
JAN 18	1030	54	58
PEB	1030	34	36
26	1000	160	800
MAR	1000	200	-
25	0945	7	12
APR			
30	0930	230	1600
MAY			
27	1030	3	12
JUN			
24	1030	14	980
JUL			
22 AUG	1000	100	130
26	1030	28	28
SEP	1020	26	20
29	1030	2000	5200

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

DATE OCT	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	TEMPER- ATURE, WATER (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)	SED. SUSP. FALL DIAM. FINER THAN .008 MM (70339)	SED. SUSP. FALL DIAM. FINER THAN .016 MM (70340)
28 DEC	0810	877	14.0	2470	5850	37	43		61
05	0845	56	5.0	55	8.3	64	69	72	75
JAN 18	1030	51	9.0	26	3.6	·			
PEB 26	1000	- 55	11.0	29	4.3				
MAR 25	0945	17	15.0	34	1.6				
APR 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	1030	28	25.0	100	7.6				
JUN		410		4=00		38	49		73
26	1030 1112	419 524	25.5 26.0	4720 2470	5340 3500	35	45		65
JUL 02	1600	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 82		57 98
18 29	1535 1030	216 235	26.0 20.0	3900 94 5	2270 600	64 42	51		71
DATE	SED. SUSP. PALL DIAM. * FINER THAN .031 MM (70341)	SED. SUSP. FALL DIAM. * FINER THAN .062 MM (70342)	SED. SUSP. FALL DIAM. * PINER THAN .125 MM (70343)	SED. SUSP. FALL DIAM. FINER THAN .250 MM (70344)	SED. SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	SED. SUSP. SIEVE DIAM. * FINER THAN .125 MM (70332)	SED. SUSP. SIEVE DIAM. FINER THAN .250 MM (70333)	SED. SUSP. SIEVE DIAM. * FINER THAN .500 MM (70334)
OCT	SUSP. PALL 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 (70331)	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332)	SUSP. SIEVE DIAM. FINER THAN .250 MM	SUSP. SIEVE DIAM. FINER THAN .500 MM
OCT 28 DEC	SUSP. PALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM	SUSP. FALL DIAM. * PINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN .250 MM	SUSP. FALL DIAM. FINER THAN .500 MM	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	SUSP. PALL DIAM. FINER THAN .031 MM	SUSP. FALL DIAM. FINER THAN .062 MM	SUSP. FALL DIAM. * PINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN .250 MM	SUSP. FALL DIAM. FINER THAN .500 MM	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	SUSP. PALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM	SUSP. FALL DIAM. * PINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN .250 MM	SUSP. FALL DIAM. FINER THAN .500 MM	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 18 PEB 26	SUSP. PALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. * PINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN .250 MM	SUSP. FALL DIAM. FINER THAN .500 MM	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 (70334)
OCT 28 DEC 05 JAN 18 PEB 26 MAR 25	SUSP. PALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. PINER 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	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334)
OCT 28 DEC 05 JAN 18 FEB 26 MAR 25 APR	SUSP. PALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. PINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN (70344)	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 63	SUSP. SIEVE DIAM. FINER THAN (70333) 100 97 94	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334) 100
OCT 28 DEC 05 JAN 18 PEB 26 MAR 25 APR 14	SUSP. PALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. PINER 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 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 PEB 26 MAR 25 APR 14 27 30	SUSP. PALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. PINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN (70344)	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 63	SUSP. SIEVE DIAM. % FINER THAN .250 MM (70333) 100 97 94	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334) 100
OCT 28 DEC 05 JAN 18 PEB 26 MAR 25 APR 14 27 30 MAY	SUSP. PALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. PINER 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 PEB 26 MAR 25 APR 14 27 HAY 27 JUN	SUSP. PALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN (70342) 95 92 84	SUSP.FALL DIAM. PINER 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 (70332) 100 90 64 63 72	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333) 100 97 94	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334) 100
OCT 28 DEC 05 JAN 18 PEB 26 MAR 25 AP 14 27 JUN 24	SUSP. PALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. PINER 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 PEB 26 MAR 25 APR 14 27 JUN 24 JUN 24 JUL	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN (70342) 95 92 84	SUSP.FALL DIAM. PINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. 8 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 96	SUSP. SIEVE DIAM. FINER THAN .500 MM (70334) 100 100 100 100
OCT 28 DEC 05 JAN 18 PEB 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)	SUSP. FALL DIAM. PINER THAN .125 MM (70343)	SUSP. FALL DIAM. PINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. 8 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 PEB 26 MAR 25 APR 14 27 JUN 24 JUN 24 JUL 02 ADG	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. PINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN 500 MM (70345)	SUSP. SIEVE DIAM. 8 FINER THAN (70331) 95 85 35 41 39 76	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 PEB 26 MAR 25 APR 14 27 JUN 24 26 JUL 22 AUG 16	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. PINER THAN .125 MM (70343)	SUSP. FALL DIAM. PINER 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	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 PEB 26 MAR 25 APR 14 27 JUN 24 JUN 24 JUL 02 ADG	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. PINER THAN .125 MM (70343)	SUSP. FALL DIAM. PINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. 8 FINER THAN (70331) 95 85 35 41 39 76	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 PEB 26 MAR 25 APR 14 27 JUN 24 26 JUL 02 22 AUG 16 26 SEP 12	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN .062 MM (70342)	SUSP. FALL DIAM. PINER THAN .125 MM (70343)	SUSP. FALL DIAM. PINER 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	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 PEB 26 MAR 25 APR 14 27 JUN 24 JUN 24 JUL 02 ADG 16 ADG 16 SEP	SUSP. FALL DIAM. FINER THAN .031 MM (70341)	SUSP. FALL DIAM. FINER THAN (70342)	SUSP. FALL DIAM. PINER THAN .125 MM (70343)	SUSP. FALL DIAM. PINER THAN .250 MM (70344)	SUSP. FALL DIAM. FINER THAN .500 MM (70345)	SUSP. SIEVE DIAM. 8 FINER THAN (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

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980 ONCE-DAILY NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP DAY 11700 2850 7510 7960 8000 9450 15100 2200 10400 2330 1890 14900 11800 2830 7740 7790 7590 9450 12900 2470 11300 2310 2360 11700 11100 3000 7110 9720 13200 2700 12000 2280 2740 11600 10800 3160 7800 7840 6290 9900 14500 2720 11200 2290 3180 10100 7830 13600 3240 11700 2290 3300 3400 7960 6070 9810 5 10800 10900 3470 7920 8070 6250 10100 13100 3420 13700 2290 3490 10200 11700 3730 7870 7830 8010 13300 12600 3800 4170 13700 2290 3570 11300 13700 9900 3960 13400 2320 14800 3980 8070 7240 10300 7320 4020 14900 4030 8130 10400 13600 10 14100 4270 7790 8060 7500 10500 12100 5050 13600 2290 4980 7230 7770 13100 4400 8200 7820 10400 12300 5470 14200 2360 5340 3350 11 16700 5370 1460 12 13 10500 5530 2290 13500 4510 7890 8260 7770 12400 15000 4540 7930 8450 7980 10700 12800 4680 14800 2330 5340 1390 14 15 8450 18300 6080 1480 15100 4910 7670 8860 10700 3050 4940 2280 15000 5210 7690 8320 8230 11100 2470 5120 21500 2270 5870 1900 5770 16 17 18 14800 5300 7790 8320 7800 10900 2310 5220 13400 2170 2280 12700 11500 14900 5370 7760 8320 7210 11100 2230 5530 2020 2510 1920 1870 5960 8070 8520 7470 11700 2200 5830 2830 9080 1860 19 2140 6110 7730 8720 2170 6270 11200 1700 2040 20 1580 6340 7420 8780 7610 11700 2150 4520 12400 1530 4700 2640 7260 8790 7750 14500 1240 6520 3450 21 1690 6470 12100 2130 4640 1260 16200 3810 6720 7620 8070 12600 2100 4820 6600 22 1770 7210 1960 6740 7460 7840 7850 13500 2140 5050 18800 1180 5910 4270 4900 24 25 1910 6980 7720 7960 7830 13900 2140 5560 3560 1160 5840 1470 14800 7160 7210 7680 8100 1470 7190 7670 7730 8380 15300 2190 7620 2510 1160 6970 3330 26 7900 7790 7790 1470 1480 7510 7620 8570 8910 16400 26000 2200 2210 2330 2320 1280 1260 4540 1940 27 7320 8080 7650 7490 7530 8510 9620 28 7890 7970 9380 10300 1210 1350 1640 8880 15500 2110 2350 11000 3250 30 1930 7540 7660 14900 2110 2310 10900 3370 2250 8080 7790 14000 10500 1390 11200 MEAN 8230 5290 7730 8090 7680 12200 6940 5450 11300 1850 5430 5780 WTR YR 1980 MEAN 26000 MIN 1160 7160 MAX TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980 ONCE-DAILY DAY OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP 11.0 17.0 24.0 26.5 29.0 22.5 24.0 10.0 7.5 5.5 6.0 9.5 20.0 26.5 27.0 4.5 7.5 9.5 12.0 21.0 27.0 3.0 25.0 16.5 11.0 6.5 7.0 24.5 13.0 6.0 18.0 19.0 29.0 27.0 30.0 29.0 24.0 31.0 27.5 10.0 7.0 5.5 19.0 19.5 27.5 29.0 26.0 23.5 10.5 6.0 9.0 17.0 24.0 24.5 27.0 10.5 11.5 9:0 29.5 25.0 5.0 5.5 10.5 12.0 18.0 25.5 29.0 27.5 23.5 26.0 18.5 10.0 8.0 26.0 30.0 5.0 12.0 20.0 26.0 27.0 23.5 15.0 14.0 9.5 8.0 4.5 15.0 12.5 26.0 27.5 29.0 24.0 10 14.5 11.5 15.0 25.0 20.0 27.5 10.0 5.0 28.0 20.0 22.0 13.5 11.5 8.0 4.5 15.0 23.0 22.0 25.0 26.5 26.5 21.0 12 7.5 16.0 6.0 21.5 22.0 24.5 21.5 9.0 13.0 28.0 27.0 12.5 10.5 15.0 5.0 18.0 20.0 20.0 33.0 27.5 23.0 24.5 15 22.0 11.0 4.0 12.5 12.0 14.0 13.0 21.0 28.5 27.5 25.0 24.0 24.5 17.0 16 10.0 3.0 9.0 12.0 15.0 15.0 19.0 29.5 28.0 27.0 24.5 7.5 9.0 17.5 28.0 27.5 3.0 6.5 13.5 16.5 29.0 25.0 23.0 18 17.0 13.0 3.5 13.0 13.0 19.0 24.0 25.5 26.0 10.0 19 11.5 16.5 12.0 5.5 11.0 17.0 16.5 24.0 29.0 26.0 26.0 22.5 20 16.5 9.0 19.0 28.0 25.5 23.0 10.0 11.5 15.0 25.0 30.0 13.5 7.0 18.0 24.5 27.0 27.0 16.0 28.0 23.5 13.5 12.5 9.5 26.5° 27.0 22 13.0 16.0 18.0 23 5.0 20.5 17.5 5.0 11.5 10.0 26.0 33.0 28.5 20.5 24 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 4.0 5.0 20.0 18.0 27.5 25.0 27.0 25.0 25.5 23.0 15.0 8.0 10.5 15.0 26.0 18.0 27 15.5 11.0 8.0 11.0 13.0 26.0 18.0 14.0 7.5 23.5 28 7.0 12.0 17.0 19.0 26.5 26.5 30.5 4.0 5.0 13.0 12.0 18.0 27.0 28.0 27.0 18.5 30 16.0 27.5 27.5 26.0 29.5 31.5 21.5 31 12.0 5.0 5.0 12.0 29.5 28.0 MEAN 17.5 10.0 7.0 7.0 9.0 14.0 17.5 23.5 28.0 27.0 26.5 23.0 WTR YR 1980 MEAN MAX 33.0 MIN

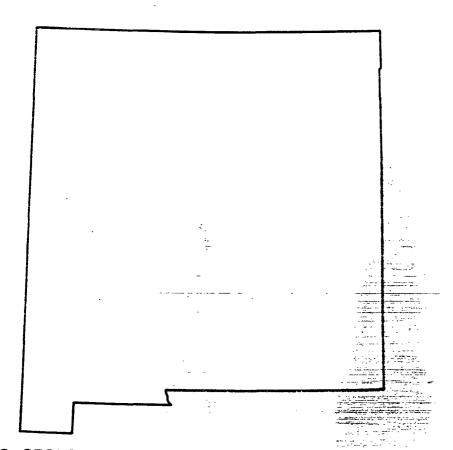
SUSPENDED-SEDIMENT DISCHARGE, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980 -

DAY		LOADS (T/DAY) CTOBER		LOADS (T/DAY) EMBER	(MG/L)	LOADS (T/DAY) CEMBER	MEAN CONCEN- TRATION (MG/L) JA	LOADS (T/DAY) ANUARY	MEAN CONCEN- TRATION (MG/L) FEB	LOADS (T/DAY) RUARY	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) MARCH
1 2 3 4 5	58 29 35 70 47	3.9 2.0 2.1 3.6 1.6	398 310 237 214 198	177 125 88 76 68	21 80 16 20 39	3.1 12 2.4 3.0 5.9	207 7 11 43 6	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 1.3
6 7 8 9 10	32 218 22 26 19	1.0 7.7 .83 1.2 .72	180 151 98 125 117	55 42 25 29 27	59 73	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 6.0	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	36 23 4360 4700 2650	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 11	9 10 9 8 8	.90 .97 .87 .73 .65
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	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	2780 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	15 27 9 10 11 30	1.7 1.8	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 25.66
DAY	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) APRIL	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) MAY	MEAN CONCEN- TRATION (MG/L)		MEAN CONCEN- TPATION (MG/L)	LOADS (T/DAY) JULY	MEAN CONCEN- TRATION (MG/L) AU			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	2.3 2.4 1.6 2.3	271 45 32 19 35	75 10 7.2 3.6 5.9	72 59 31 36 59	3.1 1.8 .74 .80 1.2	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	2.4 3.9 2010 4030 3360	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	1790 1800 1660 1800 1820 LOAD FOR	3570 3630	40 75 51 46 49 60 	3.1 5.7 3.7 3.0 3.2 4.4 2868.9 TONS.	1950 2050 1900	3480 2930 2880 3160 3050 23516.72	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





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



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

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.

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.

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	PFB	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	79	66	41	43	25	13	14	740	49	13	60
4	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
	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	33	21	19	20	26	19	272	76
20	47	65	, 48	51 .	33	19	26	14	23	14	265	73
21	48	64	48	52	34	18	29	14	24	15,	261	66
22	48	62	4 A	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		11	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
HASK	67.4	63.1	51.4	46.3	30.9	21,7	17.7	68.3	314	60.2	167	124
MAX	149	8.5	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
YC-L1	4150	3750	3160	2840	2160	1330	1050	4200	18710	3700	10240	7380
CAL YE	1900 TOTA	M. 50053		161	MAY 107			P# 117100				

CAL YR 1980 WYR YR 1981 TOTAL 31607.8 WATER-QUALITY RECORDS

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.

NAME OF THE PROPERTY OF

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

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.—

SEPTIME CONDUCTANCE. Maximum daily, 18,800 migrophos Max, 27, minimum daily, 600 migrophos July 28

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) Feb. 17.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981

			VIII. CI		,	I DIM OC	100011170	0 10 001	IMPIDENT IS	U 1		
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	SOLVE (MG/L	(HIG D LEVEL) (MG/L	D, - HARE - NESS - (MG/) AS) CACC	L BONA (MC (MC	SS, CAR- ATE S/L CO3)	HARD- NESS NONCAR- BONATE (MG/L AS CACO3) (95902)
NOV 19	1100	65	9400	8.0	8.0	7.	0 10.	۵	68 24	00 :	2200	
JAN	1100	03	7400	0.0	0.0		0 10.	,	00 24		2200	
30 MAR	1430	46	9500	8.5	14.0	8.	0 11.	8	66 24	00	2200	
19 MAY	1400	30	13600	8.7	26.0	12.	0 13.	1	99 35	00		3500
27 JUL	1225	19	15400	8.0	37.0	29.	0 9.	9 1	30 33	00		3200
23 SEP	1330	9.3	11200	8.3	40.0	33.	0 7.	6 1	80 25	00		2400
16	1400	86	6200	8.5	28.0	25.	0 -	- 2	30 17	00		1700
DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	ALKA- LINITY LAB (MG/L AS CACO3	SULFAT DIS- SOLVE (MG/L	DIS- D SOLV (MG/	, RIDE DIS ED SOLV L (MG/	DIS SOI SED (MC	S- LVED S/L	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)
NOV	(00915)	(00925)	(00930)	(00931)	(00935)	(90410						(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	15.	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
ח	0 2011 10 11)	TTRO- JEH, NO Z+NO3 DTAL SI JG/L (1	2+NO3 G DIS- AMM OLVED TO MG/L (M	EN, G ONIA ORG TAL TO	ANIC C TAL TO IG/L (N	en, p Tal 1G/L	PHOS- HORUS, TOTAL S (MG/L (PHOS- HORUS, ORTHO, DIS- OLVED MG/L S P)	BORON, DIS- SOLVED (UG/L AS B)	IRON, DIS- SOLVED (UG/L AS FE)	CARE ORGA TOT (MC	anic Pal S/L
NO	(00								(0102C)	(01046)	(00e	
	9	1.1	1.1	.690	1.1	2.9	.080	.070	440	50		5.1
3	0 R	•53	.54	.490	1.2	2.2	.230	.040	600	70	1	16
	9	.00	.00	.220	1.5	1.7	.130	.000	800	70	1	15
JU		.02	.00	.100	1.3	1.4	.150	.070	1100	70	1	11
SE	P	<.10	<.10	.190	1.5	1.7	.190	<.010	880	50		7.4
1	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)	ARSEI DI: SOL (UG, AS (S- D VED SC /L (U AS) AS	RON, IS- DLVED G/L B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD) (01027)	501 (U(AS	AIUM IS- LVED G/L CD) 125) (CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR) (01034)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR) (01030)	COPPE TOTA RECO ERAB (UG/ AS C	L COPPE N- DIS- LE SOLV L (UG/	E L
NOV 19	1100	1		1	440	3		, ``	20	0		2	
MAY 27	1225	2	!	2	1100	0		0	3	30	٠	5	
DATE	SOL' (UG, AS	N, TO S- RE VED ER /L (U FE) AS	ABLE G/L PB)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	ERAB (UG/) AS H	L MERC V- DI LE SOI L (UC G) AS	S- LVED S/L HG)	TOTAL (UG/I AS SE	DI SOL (UG E) AS	M, TOT S- REC VED ERA /L (UC SE) AS	PAL COV- ABLE S/L ZN)		
NOV 19		50 .	6	4		.0	.0		2	2	30	. 40	
MAY 27	DIS- RECOV- DIS- RECOV- DIS- NIUM, DIS- RECOV- DIS- SOLVED ERABLE SOLVED ERABLE SOLVED TOTAL SOLVED ERABLE SOLVED (UG/L												
	CHEM	ICAL ANA	LYSES (OF BOTTO	M MATE	RIAL, W	TER Y	EAR O	CTOBER 1	980 TO SE	PTEMBE	R 1981	
	DATE	Time	GEI NO2+I TOT. BOT I (MG,	N, GEN NO3 TO IN IN MAT M /KG (MG N) AS	I,NH4 (PTAL BOT. (IAT. (KG N)	IN BOT- TOM MA- TERIAL (MG/KG AS N)	PHOP TOT IN E MJ (MG/ AS	RUS, FAL 1 BOT. 1 AT. /KG P)	TOTAL IN BOT- TOM MA- TERIAL (UG/G AS AS)	CADMIUM RECOV. FM BOT- TOM MA- TERIAL (UG/G AS CD) (01028)	MIUM RECO FM BO TOM M TERI (UG/	i. V. T- AL G)	
1	MAY 27	(01046) (01051) (01049) (71900) (71890) (01147) (01145) (01092) (01090) 50 6 4 .0 .0 2 2 30 40 70 4 2 .2 .0 2 2 60 20 CHEMICAL ANALYSES OF BOTTOM MATERIAL, WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981 NITRO- NITRO- NITRO- PHOS- ARSENIC CADMIUM CHRO- GEN, GEN,NH4 GEN,TOT PHORUS, TOTAL RECOV. MIUM, NO2+NO3 TOTAL IN BOT- TOTAL IN BOT- FM BOT- TOT. IN IN BOT. TOM MA- IN BOT. TOM MA- TOM MA- BOT MAT MAT. TERIAL MAT. TERIAL TERIAL TOM MA- TIME (MG/KG (MG/KG (MG/KG (UG/G (UG/G TERIAL AS N) AS N) AS N) AS P) AS AS) AS CD) (UG/G) (00633) (00611) (00603) (00668) (01003) (01028) (01029)											
	DA.	re FM TOM TE (U	BOT- MA- RIAL G/G CO)	RECOV. FM BOT- TOM MA- TERIAL (UG/G AS CU)	RECOTEM BOTTOM METERIAL (UG/CAS FI	V. REC T- FM E A- TOM AL TEI G (UC E) AS	COV. BOT- MA- RIAL S/G PB)	NESE, RECOVER BOTTOM MATERIA TERIA (UG/O	RECOMENT TOMES TERM (UG. G) AS	OV. REC OT- FM B MA- TOM IAL TER /G (UG HG) AS	OV. OT- MA- HAL J/G ZN)		
			۰	,		20		21	: ^	02	1		
	. 21									,02 September			
DATE	TI,	GR AL SO (U ME A U-	ROSS JPHA, JIS- JLVED JG/L JS JNAT)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT)	GROS: BETA DIS- SOLV (PCI/) AS CS-13	S GRO - SUS ED TOT L (PC) AS 7) CS-1	OSS TA, SP. TAL I/L S	GROSS BETA, DIS- SOLVI (PCI, AS SI	G GRO BET SUS TOT (L (PC AS:	SS RAI A, 22 P. DI AL SOLV I/L RAI	PIUM 26, U S- N PED, DON PHOD	RANIUM DIS- SOLVED (UG/L AS U) 22703)	
YAM				,									
27	. 12			1.8			2.9	< 130		2.8 PTEMBER 1	.15	6.9	
		<i>.</i>		DATE	TIM	2,4, E TO:		SILVEX TOTAL (UG/I	(, L L)	. render 1	.701		
				MAY 27	122	5	.00	.0	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

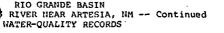
ISTANTANEOUS	SUSPE	NDED	SEDIM	ENT	AND	PART	PICLE	SIZE	, WAT	ER Y	EAR	OCTO	BER	1980	TO S	E
		STRI FLO					EDI-	SEI MEN DI CHAI	it,	. 1	SED. SUSP. FALL DIAM.	;	SED. SUSE FALI DIAM	·.	SED. SUSP FALL DIAM	
			ran-	TEM	PER-		JS-		JS-		INER		FINE		FINE	
	TIME		EOUS		URE		ENDED		NDED		CHAN		THAN		THAN	
DATE			FS)	(DE	G C)	()	4G/L)	(T/I	(YAC		2 MM		04 1		016 11	
Non		(000	061)	(00	010)	(80	154)	(801)	L55)	(70	337)	(7	0338	(70340)
NOV 19	1100		65		7.0		57		10				_	_		
MAR	1100		65		7.0		3,	•	10				-			
	1400		30		12.0		61		4.9				-		_	_
31	1410		10		23.0		99		2.7				-	-	_	-
MAY															_	
	1012		392		18.0		4990	528			48			9	9	
	1536 0812		430 576		23.0 22.0		3750 3800	435 593			35 33			0 19	8 8	
JUN	0012		370		22.0	•	3000	39.			33		7	,,	·	•
	1114		748		23.0		3400	681	70		41		9	55	8	5
06	1810		788		24.5		3130	666	50		25			35	5	
	1057		408		26.0		1550	17:			29			12	6	
	0930		169		25.0		889	4 (06		49		•	4	8	3
JUL 10	1130		301		23.5		4630	376	٥.		50			66	8	1
	1851		219		28.5		7400	438			57			,0 77	9	
	1639		136		30.0		9170	33			69			32	10	
AUG																
	1519		629		26.0		9400	1600			52			9	8	
	1510		369		26.5		6440	642	20		60)	7	18	9	3
SEP 07	1838		487		21.0		3520	463	20		45			51	8	,
	1419		317		24.0		1860	159			58 58			73	9	
20000			31,				1000	-5.	•					•	-	•
	SE		SEI			ED.		ED.		ED.		ED.		SED.		
		SP. LL	SUS FAI			USP. ALL		JSP. EVE	SI	JSP.		USP.		SUSP SIEVE		
		AM.	DIA			IAM.		IAM.		IAM.		IAM.	•	DIAM		
	% FI		% FIR			INER		INER	% F1			INER	8	FINE		
		AN	THA			HAN		IAN		IAN		HAN		THAN	i	
DATE	.062		.125			MM 0		2 MM		5 MM		MM O		500 M		
*****	(703	42)	(7034	43)	(70	344)	(70:	331)	(703	332)	(70	333)	(7	70334	.)	
NOV 19								73		82		96		10		
MAR								/3		02		70		10	U	
19								85						_	-	
31								70		75		96		10	0	
YAM																
07 30		100						98		100				-	_	
31								98		100					<u> </u>	
JUN								,,		100						
02								98		100				_	_	
06		89		100										-	_	
13								89		99		100		-	-	
14 JUL								95		100				-	-	
10		93		99		100								_	_	
10		100												-	_	
30														-	-	
AUG																
14		98		100						100				-	-	
15 SEP								98		100				-	-	
07								95		100				_	-	
10								99.		100				-	_	

MEAN

WTR YR 1981

MEAN

MAX



SPECÍFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. °C), WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981 ONCE-DAILY FEB APR JUN DAY OCT NOV DEC JAN MAR MAY JUL AUG SEP 16300 3300 6020 .8360 9530 8520 10300 · 16 11500 7210 7230 9710 15700 RRRO 15600 4670 6470

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

MIN

				•								
DAY	МАХ	. MIN JUNE	MEAN	MAX	MIN JULY	MEAN	MAX	MIN AUGUST	MEAN	. МАХ	min Septeme	MEAN BER
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
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
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
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			
21					8400		2700	2300	2520			
22							2300	2100	2210			
23							3100	2200	2670			
24							3700	3100	3430			
25				42.4540			4000	3500	3730		<u>`</u>	
26							5100 °	3800	4340			
27							6000	4800	5530			
28							6400	4800	6000	7		
29					600		7300	6300	6810			
30				4600	2700	3230	7600	3400	5970			
31				2900	2600	2740	8500	7400	7870			
MON'TH YEAR	9680	600	4160	9680	600	4780	8500	800	3510	9300	2840	4680
NOTE:				F RECORD EXC	EEDED 2	0% OF YEA	R					

			_	•								•
		TEM	PER W	ATER (DEG.	°C). WAT	ER YEAR OC	TOBER 1	1980 (kp	TEMBER	1981		
						CE-DAILY				-/		
"DAŶ	OCT	УО И	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	
, DAT	001	1101	DEC	Univ		TIMA	A II	11014	00.4	001	AUG	SEP
1	21.0	14.5	7.0	8.0	6.5	15.0	22.0	27.0	21.0	30.5	29.5	
												29.0
2	25.5	13.0	11.5	8.0	6.5	15.5	16.5	22.5	23.0	25.5	25.5	28.5
3	21.0	15.0	9.0	9.0	5.0	16.5	16.0	20.5	24.0	30.5	26.0	23.5
4	25.0	12.5	8.5	8.5	9.0	11.5	19.0	21.0	24.5	29.5	27.0	24.0
5	19.0	13.5	12.5	9.0	7.0	15.0	18.5	23.5	24.0	30.0	25.0	24.5
6	20.0	15.0	11.5	10.5	7.0	14.5	14.0	25.0	24.5	28.0	25.5	22.5
7	25.5	13.5	12.5	8.0	7.0	9.5	13.5	18.0	26.0	28.5	24.0	21.0
8	20.0	15.5	13.5	8.0	7.5	11.5	20.0	19.0	27.5	33.0	24.0	
												20.5
9	19.0	19.0	6.5	8.5	11.0	9.5	20.5	23.5	28.0	28.5	25.0	20.0
10	23.0	13.5	5.0	9.0	9.0	10.5	23.0	22.5	28.0	28.5	25.0	24.0
								•				
11	22.0	14.5	9.5	8.5	11.0	12.5	18.0	19.5	29.0	29.0	25.5	25.0
12	23.0	15.0	8.5	8.0	5.5	11.0	23.0	27.0	26.5	25.0	24.0	25.0
13	22.5	14.0	7.5	7.0	5.0	16.0	25.0	25.0	26.0	27.5	23.5	24.5
14	23.0	15.0	6.0	5.0	11.5	15.5	18.0	26.0	25.0	31.0	26.0	
												24.0
15	18:0	14.5	12.0	6.5	7.5	12.5	16.0	22.5	22.5	28.0	26.5	23.5
					- ·							
16	19.0	14.0	12.0	7.0	8.0	13.0	22.0	23.0	23.0	29.5	24.0	27.0
17	19.0	13.5	12.5	6.0	15.5	17.5	23.0	22.0	25.0	30.0	25.0	21.5
18	19.5	13.0	11.0	5.0	15.0	15.0	18.0	22.5	29.0	32.0	25.0	19.0
19	14.5	5.0	7.0	3.5	18.0	15.0	19.0	26.5	28.0	29.5	26.0	25.0
20	19.0	4.0	5.5	3.0	12.0	15.5	21.5	25.0	28.5	35.0	27.0	19.5
		•••	• • • • • • • • • • • • • • • • • • • •	•••						••••		13.3
21	19.0	9.0	5.0	4.5	7.5	15.0	21.5	25.5	33.0	29.0	27.0 -	20.0
22	15.0	4.0	3.0	6.5	9.0	11.0	22.0	27.0	34.0	27.0	25.5	21.5
					11.0	16.5		27.5				
23	18.5	4.0	5.0	5.0			22.5		28.0	33.5	23.5	21.0
24	16.5	5.5	6.0	8.5	10.5	18.0	23.0	26.5	28.5	31.0	28.5	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	13.0	4.5	12.0	6.5	17.5	22.0	27.5	24.5	29.0	30.5	23.5	23.0
27	16.5	6.0	7.0	6.0	15.0	22.0	25.5	25.0	28.0	29.0	25.0	24.5
28	11.0	8.0	10.0	11.0	11.0	21.0	24.0	24.5	29.0	25.0	24.0	25.0
29	7.0	6.0	12.5	9.0		15.0	24.5	25.5	25.0	22.0	30.0	26.0
30	14.5	7.0	12.0	10.0		16.0	26.5	23.0	25.0	30.0	23.0	21.0
31	13.0		7.0	8.0		23.0		22.0		25.5	23.5	
						•						
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	1981	MEAN	18.5	MAX	35.0	MIN		3.0				
	WATER T	EMPERATUR	RE (DEG. °C).	RECORDER	MAX IMUM	. AND MEAN.	WATER	YEAR OCTOR	ER 1980	TO SEPTEMBE	R 1981	•
			,			,						
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE		*****	JULY			AUGUST		11530	SEPTEM	
		OUNE			2011			AUGUST			PERIEN	ner.

.Ť.

DAY	MAX	MIN JUNE	MEAN	MAX	MIN JULY	MEAN	MAX	MIN AUGUST	MEAN	MAX	MIN SEPTEME	MEAN BER
1							33.0	25.0	28.5	25.5	21.5	23.5
2							35.5	24.0	29.5	29.0	21.0	24.5
2 3 4							31.0	26.5	28.5	30.0	22.5	26.0
4							32.0	25.0	28.5	24.5	21.5	23.0
5							34.0	24.5	29.0	22.5	21.5	22.0
6							34.0	24.5	. 29.0	23.5	20.5	22.0
7 8 9							26.5	23.0	25.0	23.0	21.5	22.5
8							30.0	21.5	25.5	21.5	20.5	21.0
				29.5	25.5	27.5	28.0	22.5	25.5	20.5	20.0	20.5
10				28.0	22.5	25.5	28.5	24.0	26.5	22.0	20.0	21.0
11				29.5	25.0	27.0	26.0	23.0	24.5	23.5	21.5	22.5
12				29.0	24.5	27.0	26.0	22.5	24.0	24.5	22.5	23.5
13				30.0	25.0	27.5	24.0	22.5	23.5	25.5	23.5	24.5
14				31.5	24.5	28.0	24.5	21.5	24.0	25.5	23.5	24.5
15				33.5	25.0	28.5	25.5	24.0	25.0	25.0	23.0	24.0
16				32.5	24.0	28.0	27.0	23.5	25.0	23.5	22.0	23.0
. 17				32.5	24.0	27.5	27.5	24.0	25.5			
18				34.5	24.0	29.0	27.0	24.5	25.5			
19	*.			35.5	24.5	29.5	27.5	24.0	26.0			
20				35.5	24.5	30.0	27.5	23.5	25.5			
21				35.5	24.5	29.5	27.5	23.5	25.5			
22				34.5	22.5	28.0	28.0	23.0	25.5			
23				34.5	23.0	27.5	29.0	22.5	26.0			
24				34.5	23.0	27.5	29.5	23.0	26.0			
25				34.0	21.5	27.0	31.0	22.5	26.5			
26				34.0	22.5	27.5	31.5	22.5	27.0			
27				33.0	23.0	27.0	31.5	23.5	27.0			
28				28.5	22.5	25.0	31.5	22.5	26.5			
29				27.5	21.0	24.5	32.0	22.5	26.5		*	
30				30.0	25.0	27.5	32.5	22.5	27.0		~	
31				32.0	25.0	28.0	32.0	22.5	26.5			
MONTH YEAR	35.5	20.0	26.0	35.5	21.0	27.5	35.5	21.5	26.5	30.0	20.0	23.0
NOTE:				OF RECORD EX	CEEDED 2	0% OF YE.	AR					

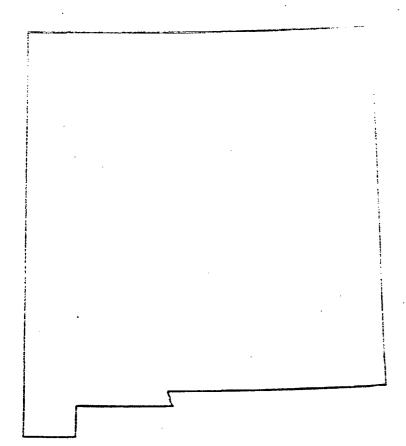
SUSPENDED-SEDIMENT DISCHARGE, WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981

DAY	MEAN CONCEN- TRATION (MG/L) OC 191	LOADS (T/DAY) CTOBER 77 68	MEAN CONCEN- TRATION (MG/L) NO 70 21	LOADS (T/DAY) VEMBER 15 4.6	18 15	LOADS (T/DAY) CEMBER 3.3 2.7	MEAN CONCEN- TRATION (MG/L) J 17 . 24	ANUARY 1.9 2.5	MEAN CONCENTRATION (MG/L) FEE 37 73	LOADS (T/DAY) BRUARY 4.5 8.5	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) MARCH .58 1.0
3 4 5	175 167 99	59 46 25	28 24 38	5.9 5.3 8.3	11 8 12	2.0 1.4 2.0	21 11 12	2.3 1.2 1.4	11 10 5	1.3 1.2 .61	10 10 14	.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	6 8 10 5 6	.76 .99 1.3 .63	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	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
	MEAN		MEAN		MEAN	•	MEAN		MEAN		MEAN	
DAY	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) APRIL	MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) MAY		LOADS (T/DAY)			MEAN CONCEN- TRATION (MG/L)	LOADS (T/DAY) JGUST	MEAN CONCEN- TRATION (MG/L) SEE	LOADS (T/DAY) PTEMBER
DAY 1 2 3 4 5	CONCEN- TRATION (MG/L)	(T/DAY)	CONCEN- TRATION		CONCEN- TRATION (MG/L)		CONCEN- TRATION	(T/DAY)	CONCEN- TRATION	(T/DAY)	CONCEN- TRATION (MG/L)	
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	(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	CONCEN- TRATION (MG/L) 144 187 1120 408	(T/DAY) JULY 14 38 148 124	CONCEN- TRATION (MG/L) AU 2220 200 128 127	(T/DAY) JGUST 288 9.7 4.5 4.5	CONCENTRATION (MG/L) SEE 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	CONCEN- TRATION (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) AV 2220 200 128 127 133 56 1360 2080 5760	(T/DAY) JGUST 288 9.7 4.5 4.5 7.2 2.7 77 146 2970	CONCEN- TRATION (MG/L) SEF 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 11 12 13 14	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 .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) IUNE 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 1250	CONCEN- TRATION (MG/L) AV 2220 200 128 127 133 56 1360 2080 5760 8490 7720 9630 13800 10400	(T/DAY) JGUST 288 9.7 4.5 4.5 7.2 2.7 77 146 2970 3850 2330 6050 29300 18200	CONCEN- TRATION (MG/L) SEE 77 74 29 290 450 450 4460 4140 2710 1920 1310 1050 960 525	(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	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 .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 58 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) IUNE 6730 5710 7030 5260 6660 5140 4630 3990 3370 2640 2130 1710 406 133 50 13 5.8 3.0	CONCENTRATION (MG/L) 144 187 1120 408 372 1820 1810 1280 155 4630 4850 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 1128 127 133 56 1360 2080 5760 8490 7720 9630 13800 10400 7180 5300 4180 4970 2000	(T/DAY) JGUST 288 9.7 4.5 4.5 7.2 2.7 77 146 2970 3850 2330 6050 29300 18200 8280 4090 3990 6010 61470	CONCEN- TRATION (MG/L) SEE 77 74 29 290 450 450 4000 4460 4140 2710 1920 1310 1050 960 525 347 88 36 47 44	(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 37 19 18 17 42 34 26 26 24 33 33 39	(T/DAY) APRIL 1.1 .71 .77 .57 .48 .39 .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 73 73	(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 4.0 3.9 4.3 4.1 4.8 5.4	CONCENTRATION (MG/L) 5750 3400 3510 2580 3130 2600 2390 2160 2090 1850 1790 1550 889 514 299 99 99 97 35 43 45	(T/DAY) IUNE 11100 6730 5710 7030 5260 6660 5140 4630 3990 3370 2640 2130 1710 406 133 50 13 5.8 3.0 2.8 11 18 2.5	CONCENTRATION (MG/L) 144 187 1120 408 372 1820 1810 1280 155 4630 5430 4850 6140 4950 2820 2860 143 210 186 97 96 80 100 83	(T/DAY) JULY 14 38 148 124 71 226 132 66 5.9 1980 3370 2210 2900 1250 388 263 8.9 14 9.0 3.7 3.9 1.9 2.7 1.5	CONCENTRATION (MG/L) AI 2220 200 200 128 127 133 56 1360 2080 5760 8490 7720 9630 13800 10400 7180 5300 4180 4970 2000 2300 1650 902 536 383	(T/DAY) JGUST 288 9.7 4.5 7.2 2.7 77 146 2970 3850 2330 6050 29300 18200 8280 4090 3990 6010 1470 1650 1160 451 197 111	CONCEN- TRATION (MG/L) SEE 77 74 29 290 450 460 4140 2710 1920 1310 1050 960 525 347 44 30 33 23 26 30 30 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 5.9 4.3 4.8 5.5 6.4





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 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.

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

DAY	CCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	ALG	SEP
1	56	96	59	53	58	49	23	885	24	7C	25	2.1
Z	53	95	62	. 53	57	49	24	845	19	55	30	1.3
3	87	8.8	62	53	56	48	24	754	16	154	37	4.9
4	57	83	é 2	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	1 C	620	56	654
7	109	104	62	51	56	39	23	143	11	76C	34	684
8	269	93	62	51	56	40	24	117	8.6	74C	32	713
9	182	83	61	51	55	41	24	166	7.3	80C	22	744
10	104	71	ėC .	50	56	40	22	9 8	7.7	930	18	750
11	168	67	é C	50	59	38	26	81	6.4	920	15	758
12	153	64	6 C	50	59	36	27	66	11	283	8.0	755
13	127	64	éC	50	59	39	25	58	7.5	1100	6.0	769
14	107	64	6 C	50	58	41	28	50	5.5	900	6.0	842
15	95	65	60	115	58	39	26	51	5.3	911	5.C	973
1 é	88	65	6C	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
1 8	73	60	5 έ	110	55	36	715	38	6.6	849	5.5	710
19	71	55	58	62	51	35	752	35	5.2	798	6.C	324
20	09	58	58	64	49	34	805	32	€.1	549	4.C	454
21	67	58	57	69	49	32	832	26	8.3	190	4.5	307
22	67	59	56	77	49	31	35C	22	8.1	146	3.5	256
23	72	56	55	£ 9	4.8	32	875	19	14	106	3.5	203
24	80	54	55	26	48	29	965	žó	11	87	4.C	181
25	ê 6	53	54	78	49	26	888	27	έ.6	92	4.0	166
20	-97	53	54	74	49	25	502	25	6.9	55	7.C	165
27	101	50	54	69	49	25	818	27	8.0	38	30	148
28	94	52	54	ć 5	49	26	812	32	6.9	39	35	128
29	102	54	53	61		24	815	36	7.8	31	20	99
3C	103	56	53	èò		21	77C	29	19	25	10	82
31	93		5,3	58		. 50		25		22	7.C	
TCTAL	3160	2053	1805	2095	1518	1036	12345	4685	305.5	14665	594.5	13772.3
#EAN	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	565	24	1100	£7	1240
HIN	53	5 C	53	50	4 É	20	22	19	5.3	22	3.5	1.3
AC-FT	6310	4070	358C	41 c C	3010	215C	24490	925C	60a	29090	1180	2732C
CAL YR	1981 TOTA	11 13C#Q	. S WEAN	90 6	MAY. 753	MIL	3.C AC+FT	45590	•			

AL YR 1981 TCTAL 33069.8 MEAN 90.6 MAX 788 MIN 3.0 AC-FT 65590 PTR YR 1932 TCTAL 58104.3 MEAN 159 MAX 1240 MIN 1.3 AC-FT 115230

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, 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, December, 1982.

EXTREMES FOR CURRENT YEAR .--

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.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE DEC	TIME	STREAM- PLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (STAND- ARD UNITS) (00400)	PH LAB (STAND- ARD UNITS) (00403)	TEMPER- ATURE, AIR (DEG C) (00020)	TEMPER- ATURE (DEG C) (00010)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM- ICAL (HIGH LEVEL) (MG/L) (00340)	HARD- NESS (MG/L AS CACO3) (00900)
02 APR	1300	60	10000	10300	8.2	7.7	13.0	8.5		<94	2653
01	1100	22 ·	14500	13400	8.0	7.1	21.0	14.0	8.3	250	3255
16	1600		10400						- -		
26	1600	866	2870	2870	8.0	7.5	33.0	16.0	8.2	53	1599
AUG											
31	1215	7.3	-	- 7500	8.2	8.3	28.0	28.0		32	1957
	HARD-		MAGNE-		SODIUM	POTAS-	BICAR-	CAR-		CHLO-	FLUO-
	NESS,	CALCIUM	SIUM,	SODIUM,	AD-	SIUM,	BONATE	BONATE	SULFATE	RIDE,	RIDE,
	NONCAR-	DIS-	DIS-	DIS-	SORP-	DIS-	ITFLD	ITFLD	DIS-	DIS-	DIS-
٠	NONCAR- BONATE	DIS- SOLVED	DIS- SOLVED	DIS- SOLVED	SORP- TION	DIS- SOLVED	ITFLD (MG/L	ITFLD (MG/L	DIS- SOLVED	DIS- SOLVED	DIS- SOLVED
	NONCAR- BONATE (MG/L	DIS- SOLVED (MG/L	DIS- SOLVED (MG/L	DIS- SOLVED (MG/L	SORP-	DIS- SOLVED (MG/L	ITFLD (MG/L AS	ITFLD (MG/L AS	DIS- SOLVED (MG/L	DIS- SOLVED (MG/L	DIS- SOLVED (MG/L
DATE	NONCAR- BONATE (MG/L CACO3)	DIS- SOLVED (MG/L AS CA)	DIS- SOLVED (MG/L AS MG)	DIS- SOLVED (MG/L AS NA)	SORP- TION RATIO	DIS- SOLVED (MG/L AS K)	ITFLD (MG/L AS HCO3)	ITFLD (MG/L AS CO3)	SOLVED (MG/L AS SO4)	SOLVED (MG/L AS CL)	DIS- SOLVED (MG/L AS F)
	NONCAR- BONATE (MG/L	DIS- SOLVED (MG/L	DIS- SOLVED (MG/L	DIS- SOLVED (MG/L	SORP- TION	DIS- SOLVED (MG/L	ITFLD (MG/L AS	ITFLD (MG/L AS	DIS- SOLVED (MG/L	DIS- SOLVED (MG/L	DIS- SOLVED (MG/L
DEC	NONCAR- BONATE (MG/L CACO3) (00902)	DIS- SOLVED (MG/L AS CA) (00915)	DIS- SOLVED (MG/L AS MG) (00925)	DIS- SOLVED (MG/L AS NA) (00930)	SORP- TION RATIO (00931)	DIS- SOLVED (MG/L AS K) (00935)	ITFLD (MG/L AS HCO3)	ITFLD (MG/L AS CO3) (99445)	SOLVED (MG/L AS SO4) (00945)	SOLVED (MG/L AS CL) (00940)	SOLVED (MG/L AS F) (00950)
DEC 02	NONCAR- BONATE (MG/L CACO3)	DIS- SOLVED (MG/L AS CA)	DIS- SOLVED (MG/L AS MG)	DIS- SOLVED (MG/L AS NA)	SORP- TION RATIO	DIS- SOLVED (MG/L AS K)	ITFLD (MG/L AS HCO3)	ITFLD (MG/L AS CO3)	SOLVED (MG/L AS SO4)	SOLVED (MG/L AS CL)	DIS- SOLVED (MG/L AS F)
DEC 02 APR	NONCAR- BONATE (MG/L CACO3) (00902)	DIS- SOLVED (MG/L AS CA) (00915)	DIS- SOLVED (MG/L AS MG) (00925)	DIS- SOLVED (MG/L AS NA) (00930)	SORP- TION RATIO (00931)	DIS- SOLVED (MG/L AS K) (00935)	TTFLD (MG/L AS HCO3) (99440)	ITFLD (MG/L AS CO3) (99445)	DIS- SOLVED (MG/L AS SO4) (00945)	DIS- SOLVED (MG/L AS CL) (00940) 2500	DIS- SOLVED (MG/L AS F) (00950)
DEC 02 APR 01	NONCAR- BONATE (MG/L CACO3) (00902) 2483 3105	DIS- SOLVED (MG/L AS CA) (00915)	DIS- SOLVED (MG/L AS MG) (00925)	DIS- SOLVED (MG/L AS NA) (00930)	SORP- TION RATIO (00931)	DIS- SOLVED (MG/L AS K) (00935)	ITFLD (MG/L AS HCO3)	ITFLD (MG/L AS CO3) (99445)	SOLVED (MG/L AS SO4) (00945)	SOLVED (MG/L AS CL) (00940)	DIS- SOLVED (MG/L AS F) (00950)
DEC 02 APR 01	NONCAR- BONATE (MG/L CACO3) (00902) 2483 3105	DIS- SOLVED (MG/L AS CA) (00915) 650	DIS- SOLVED (MG/L AS MG) (00925) 250	DIS- SOLVED (MG/L AS NA) (00930) 1300	SORP- TION RATIO (00931) 11	DIS- SOLVED (MG/L AS K) (00935) 10	ITFLD (MG/L AS HCO3) (99440)	(MG/L AS CO3) (99445)	DIS- SOLVED (MG/L AS SO4) (00945) 2100 2600	DIS- SOLVED (MG/L AS CL) (00940) 2500 4000	DIS- SOLVED (MG/L AS F) (00950)
DEC 02 APR 01 16	NONCAR- BONATE (MG/L CACO3) (00902) 2483 3105	DIS- SOLVED (MG/L AS CA) (00915)	DIS- SOLVED (MG/L AS MG) (00925)	DIS- SOLVED (MG/L AS NA) (00930)	SORP- TION RATIO (00931)	DIS- SOLVED (MG/L AS K) (00935)	TTFLD (MG/L AS HCO3) (99440)	ITFLD (MG/L AS CO3) (99445)	DIS- SOLVED (MG/L AS SO4) (00945)	DIS- SOLVED (MG/L AS CL) (00940) 2500	DIS- SOLVED (MG/L AS F) (00950)
DEC 02 APR 01	NONCAR- BONATE (MG/L CACO3) (00902) 2483 3105	DIS- SOLVED (MG/L AS CA) (00915) 650	DIS- SOLVED (MG/L AS MG) (00925) 250	DIS- SOLVED (MG/L AS NA) (00930) 1300	SORP- TION RATIO (00931) 11	DIS- SOLVED (MG/L AS K) (00935) 10	ITFLD (MG/L AS HCO3) (99440)	(MG/L AS CO3) (99445)	DIS- SOLVED (MG/L AS SO4) (00945) 2100 2600	DIS- SOLVED (MG/L AS CL) (00940) 2500 4000	DIS- SOLVED (MG/L AS F) (00950)

		,							11100	
	SILICA,	SUM OF	NITRO-	GEN,	NITRO-	NITRO-			PHORUS,	
	DIS-	CONSTI-	GEN,	NO2+NO3	GEN,	GEN,	NITRO-	PHOS-	ORTHO,	CARBON,
	SOLVED	TUENTS,	NO2+NO3	DIS-	AMMONIA	ORGANIC	GEN,	PHORUS,	DIS-	ORGANIC
	(MG/L	DIS-	TOTAL	SOLVED	TOTAL	TOTAL	TOTAL	TOTAL	SOLVED	TOTAL
	AS	SOLVED	(MG/L							
DATE	SIO2)	(MG/L)	AS N)	AS P)	AS P)	AS C)				
	(00955)	(70301)	(00630)	(00631)	(00610)	(00605)	(00600)	(00665)	(00671)	(00680)
DEC										
02	9.8	6930	1.1	1.1	.320	•98	2.4	.130	.060	3.9
APR										
01	8.0	9990	<.10	.15	.300	.21		.280	.090	8.8
16										
26	9.9	2510	.13	.16	.120	2.6	2.8		.030	13
AUG										
31	10	5460	.20	.12	.130	1.1	1.4	.090	.050	5.3

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)	CADMIUM DIS- SOLVED (UG/L AS CD) (01025)	RECOV-	CHRO- MIUM, DIS- SOLVED (UG/L AS CR) (01030)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU) (01042)	COPPER, DIS- SOLVED (UG/L AS CU) (01040)
DEC 02 APR	1300	2	1	560	. 1	<1	20	20.	5	3
01 26 AUG	1100 1600	8	2	830 120	<1	<u> </u>	40	10	40	3
31	1215			580						
DATE	IRON DIS SOLV (UG/ AS E	S- REC /ED ERA /L (UC FE) AS	CAL LEA COV- DI BBLE SOL I/L (UG PB) AS	S- REC VED ERA /L (UG PB) AS	CAL MERC COV- DI ABLE SOI G/L (UC HG) AS	IS- NI LVED TO G/L (U HG) AS	LE- NIU UM, D TAL SOI G/L (UC SE) AS	LE- ZIN UM, TOT IS- REC LVED ERA G/L (UG SE) AS 145) (010	AL ZING OV- DIS BLE SOLV /L (UG, ZN) AS	S- VED /L ZN)
DEC 02	1	130	3	2	.1	.2	3	2	30	20
APR 01 26		80 540	 19	10		.1	3		110	40
AUG 31	•	50								
		RADIOCH	IEMICAL AN	ALYSES, W	ATER YEAR	R OCTOBER	1981 TO	SEPTEMBER	1982	
DATE APR	11T	D) SOI (U) 4E AS UN/	PHA, ALF SS- SUS LVED TOT S/L (UG S AS	HA, BET P. DI PAL SOL /L (PCI AS	A, BET SUSTINE	TA, BE SP. D TAL SO I/L (P S AS 137) YT	TA, BE' OIS- SU OLVED TO OCI/L (PO OSR/ AS	SP. DI TAL SOLV CI/L RAD	6, URAN: S- NATU! ED, DI: ON SOL! HOD, (UG,	ral S- Ved /L
26	. 160	00 5	33 11	.0 <2	25	во <	24	77	.07	4.7
		PEST	CIDE ANAL	YSES, WAT	CER YEAR	OCTOBER 1	981 TO SE	PTEMBER 19	82	
	DATE	TIME	PCB, TOTAL (UG/L) (39516)	ALDRIN, TOTAL (UG/L) (39330)	CHLOR- DANE, TOTAL (UG/L) (39350)	DDD, TOTAL (UG/L) (39360)			DI- AZINON, TOTAL (UG/L) (39570)	
	AUG 31	1215	<.10	<.01	<.10	<.01	<.01	<.01	.01	
DATE AUG 31	DI- ELDI TOTA (UG,	- ENI RIN SULI AL TO /L) (UC 80) (39)	DO- PAN, ENDF PAL TOT 3/L) (UC 388) (393	RIN, ETHI PAL TOT (/L) (UC	HE ION, CH TAL TO G/L) (U 398) (39	HE PTA- CH LOR, EPO TAL TO G/L) (U 410) (39	PTA- ILOR EXIDE LIN PTAL TO IG/L) (U	DANE THI TAL TOT G/L) (UG 340) (395	MET. A- OX ON, CHL AL TOT. /L) (UG, 30) (394)	Y- OR, AL /L)
•	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)	(39034)	(39250)	MIREX, TOTAL (UG/L) (39755)	
	31	< .01	<.01	<.01	<1	<.01	<.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

					SEDI-	SED.	SED.
					MENT,	SUSP.	SUSP.
		STREAM-		SEDI-	DIS-	FALL	FALL
		FLOW,		MENT,	CHARGE,	DIAM.	DIAM.
		INSTAN-	TEMPER-	sus-	SUS-	% FINER	% FINER
	TIME	TANEOUS	ATURE	PENDED	PENDED	THAN	THAN
DATE		(CFS)	(DEG C)	(MG/L)	(T/DAY)	.002 MM	.004 MM
		(00061)	(00010)	(80154)	(80155)	(70337)	(70338)
OCT		(00001)	(00010)	(0023.)	(00233)	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(,,,,,,,,
10	1049	163	18.0	1120	493		
12	1007	157	19.5	1950	827	57	75
APR				2200			
01	1200	22	15.5	17	1.0		
16	1022	648	18.0	6690	11700	46	65
18	1720	728	17.0	3860	7590	48	60
22	0836	860	12.0	2720	6320	40	53
24	1105	980	12.5	2090	5530		
26	1600	866	16.0	2520	5890	31	39
30	1738	775	18.0	1880	3930		
YAM							
02	1543	830	17.0	2090	4680	30	38
04	1737	600	20.0	1170	1900	36	56
08	1737	117	24.5	245	77		
JUL							
04	0930	13	25.5	5370	188	44	58
13	1033	7.5	25.0	2220	45	. 38	51
18	1104	8.6	26.0	2520	59	22	32
AUG 08	0915	31	25.0	294	25		•
SEP	0313	27	25.0	294	45		
07	1045	695	24.0	2760	5180		
08	1700	735	25.0	2990	5930	29	38
22	1831	225	21.0	1730	1050		
25	0950	169	21.0	854	390		
						_	
	SED.	SED.	SED.	SED.	SED.	SED.	SED.
	SUSP.	SUSP.	SED. SUSP.	SUSP.	SED. SUSP.	SED. SUSP.	SED. SUSP.
•	SUSP. FALL	SUSP. FALL	SUSP. FALL	SUSP. FALL	SUSP. SIEVE	SUSP. SIEVE	SUSP. SIEVE
	SUSP. FALL DIAM.	SUSP. FALL DIAM.	SUSP. FALL DIAM.	SUSP. FALL 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. SIEVE DIAM. % FINER	SUSP. SIEVE DIAM. % FINER	SUSP. SIEVE DIAM. % FINER
	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
DATE	SUSP. FALL DIAM. * FINER THAN .016 MM	SUSP. FALL DIAM. % FINER THAN .062 MM	SUSP. FALL DIAM. FINER THAN .125 MM	SUSP. FALL DIAM. FINER THAN .250 MM	SUSP. SIEVE DIAM. FINER THAN .062 MM	SUSP. SIEVE DIAM. % FINER THAN .125 MM	SUSP. SIEVE DIAM. FINER THAN .250 MM
	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	SUSP. FALL DIAM. * FINER THAN .016 MM	SUSP. FALL DIAM. % FINER THAN .062 MM	SUSP. FALL DIAM. FINER THAN .125 MM	SUSP. FALL DIAM. FINER THAN .250 MM	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	SUSP. SIEVE DIAM. % FINER THAN .125 MM	SUSP. SIEVE DIAM. FINER THAN .250 MM
OCT 10	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	SUSP. FALL DIAM. % FINER THAN .062 MM	SUSP. FALL DIAM. FINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN .250 MM	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332)	SUSP. SIEVE DIAM. FINER THAN .250 MM
OCT 10 12	SUSP. FALL DIAM. * FINER THAN .016 MM	SUSP. FALL DIAM. % FINER THAN .062 MM	SUSP. FALL DIAM. FINER THAN .125 MM	SUSP. FALL DIAM. FINER THAN .250 MM	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	SUSP. SIEVE DIAM. % FINER THAN .125 MM	SUSP. SIEVE DIAM. FINER THAN .250 MM
OCT 10 12 APR	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	SUSP. FALL DIAM. % FINER THAN .062 MM	SUSP. FALL DIAM. FINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN .250 MM	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	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	SUSP. FALL DIAM. FINER THAN .125 MM (70343)	SUSP. FALL DIAM. FINER THAN .250 MM	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	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	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 16	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	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331) 99 99	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100 100 100	SUSP. SIEVE DIAM. FINER THAN .250 MM
OCT 10 12 APR 01 16 22	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	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 100 100 100	SUSP. SIEVE DIAM. FINER THAN .250 MM
OCT 10 12 APR 01 16 22 24 30	SUSP. FALL DIAM. FINER THAN. 016 MM (70340) 95 87 89 80	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 98	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 100 100 100	SUSP. SIEVE DIAM. FINER THAN .250 MM
OCT 10 12 APR 01 16 22 24 26 30	SUSP. FALL DIAM. & FINER THAN .016 MM (70340)	SUSP. FALL DIAM. & FIMER 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
OCT 10 12 APR 01 16 22 24 26 30 MAY 02	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	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	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 100 100	SUSP. SIEVE DIAM. FINER THAN .250 MM
OCT 10 12 APR 01 18 22 24 30 MAY 02 04	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) 100 100 100	SUSP. SIEVE DIAM. FINER THAN .250 MM
OCT 10 12 APR 01 18 22 24 30 MAY 02 04	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	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	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 100 100	SUSP. SIEVE DIAM. FINER THAN .250 MM
OCT 10 12 APR 01 16 18 22 26 30 MAY 02 04 08 JUL	SUSP. FALL DIAM. 8 FINER THAN .016 MM (70340) 95 87 89 80 62 60 77 62	SUSP. FALL DIAM. 8 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	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333)
OCT 10 12 APR 01 16 22 26 30 MAY 02 04 JUL 04	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	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	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 100 100 100 100 99	SUSP. SIEVE DIAM. FINER THAN .250 MM
OCT 10 12 APR 01 18 22 24 30 MAY 02 08 JUL 04 13	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	SUSP. FALL DIAM. 8 FINER THAN .062 MM (70342)	SUSP. FALL DIAM. % 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	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333)
OCT 10 12 APR 01 16 24 26 30 MAY 02 04 JUL 04 13	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	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 94	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 100 100 100 100 99	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333)
OCT 10 12 APR 01 18 22 24 30 MAY 02 08 JUL 04 13	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	SUSP. FALL DIAM. 8 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 96 98	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 100 100 100 100 99	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333)
OCT 10 12 APR 01 16 18 22 26 30 MAY 02 04 04 13 13 AUG	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	SUSP. FALL DIAM. 8 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 96 98	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 100 100 100 100 99	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333)
OCT 10 12 APR 01 18 22 24 30 MAY 02 04 08 JUL 13 13 18 AUG 08	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	SUSP. FALL DIAM. 8 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 96 98	SUSP. SIEVE DIAM. FINER THAN .125 MM (70332) 100 100 100 100 100 99	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333)
OCT 10 12 APR 01 16 22 24 26 30 MAY 02 04 04 13 18 AUG 08 SEP 07 08	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	SUSP. FALL DIAM. 8 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 98 96 98 96 94 94 96 98	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 16 18 22 26 30 MAY 02 04 04 13 13 AUG 08 SEP 07	SUSP. FALL DIAM. FINER THAN .016 MM (70340)	SUSP. FALL DIAM. 8 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 96 98 95 99 47	SUSP. SIEVE DIAM. % FINER THAN .125 MM (70332) 100 100 100 100 100 100 100 100 100	SUSP. SIEVE DIAM. FINER THAN .250 MM (70333)

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	SPECIFIC	CONDUCT	ANCE (MICE	OMHOS/CM		EG.° C),	WATER YEAR	OCTOBER	1981 TO	SEPTEMBER	1982	
DAY	OCT	NOV	DEC -	JAN	FEB	MAR		MAY	JUN	JUL	AUG	SEP
1	8650	6130	9810	9900	10200	11000	13700	2780	10600	11200	8220	7430
2	8580	6400	10100	10000	10300	11100	14200	2830	11200	11100	8510	8100
3	8890	6610	10100	9960	10200	11200	14300	2820	11900	9080	7980	9270
4	5750	6580	9350	10100	10300	11300	14000	3070	12800	3720	6550	9690
5	5780	7030	9270	10000	10200	11300		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	530 0	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		7950	1270
12	4070	8000	9890	10100	10600	11700		5190	17300		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	1120	12400	920
17	7090	8980	9620	11200	9690	12100		7760	20600	1100	12700	970
18	7080	8250	10000	11200	10000	12100		7630	22200	1100	15600	930
19	7720	9080	10000	9240	10100	11800		8140	17600	1110	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		16000	2000
23	8330	9510	-10200	9750	10800	12000		10200	17400		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		18200	2150
27	6430	9910	10400	9120	11000	12900		10300	14100		19300	2730
28	6440	9900	10400	9150	10900	13100	2820	10100	14800	4170	18700	2900
29	5820	9850	10300	9620		12900	2800	9930	18300	4480	25200	3120
30	5800	9670	10400	10000		13400	2830	9680	7430	5210	7460	3530
31	6090		10100	10200		13800		10700	~	7980	7180	
						*****		7070	16000	2020	11700	2660
MEAN	6840	8230		9880	10300			7030	16200	3070	11700	2660
WTR YR	1982	MEAN	8790	MAX	2520	U	MIN	350				

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

DAY.	XAM	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
_		FEBRUAR	Y		MARCH		1.000	APRII			MAY	
1							14800	13000	14000			
2 3 4							14800	12700	13400 13300			
3							14400 14400	12200 12500	13400			
4							14300	12200	13200			
5							14300	12200	13200			
6							13100	12100	12500			
7		•					13400	12100	12700	**		
. 8							14000	11800	12700		• :	
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 19							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	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST	-		SEPTEM	BER
1		00								7480	6880	7210
2										8530	7230	7930
3 ·	•									9630	7430	8920
4							*****					
5												
6						•						
7 .												
8												
.9												
10		•										
11								,				
12												
13								~				
14												
15												
16												
17												
18												
19 20												
20			•									
21												
22				•								
23									~			
24												
25												
26												
27							~~~					
28												
29 30												
30 31							7180	6980	7120			
MONTH							7180	6980	7120	9630	6880	8020
11011111							7200	0300	7120	7030	0000	0020
		TEMPE	RATURE WATE	R (DEG.º	C), WATE	R YEAR O	CTOBER 1981	1 TO SEPT	EMBER 198	2		
					ONC	E-DAILY						
DAY	OCT	NOV	DEC	JAN	ONC FEB	E-DAILY MAR	APR	MAY	JUN	JUL	AUG	SEP
•					FEB	MAR						
1	21.0	11.5	11.0	10.5	FEB 5.5	MAR 9.0	17.0	17.0	27.5	29.0	29.0	33.0
1 2	21.0 20.5	11.5 15.5	11.0 10.5	10.5 10.0	FEB 5.5 6.0	MAR 9.0 12.0	17.0 18.5	17.0 17.0	27.5 27.0	29.0 24.5	29.0 25.0	33.0 25.0
1 2 3	21.0 20.5 23.0	11.5 15.5 15.0	11.0 10.5 11.0	10.5 10.0 11.0	FEB 5.5 6.0 5.0	9.0 12.0 15.5	17.0 18.5 17.0	17.0 17.0 17.5	27.5 27.0 24.0	29.0 24.5 31.0	29.0 25.0 31.0	33.0 25.0 29.5
1 2 3 4	21.0 20.5 23.0 23.0	11.5 15.5 15.0 14.0	11.0 10.5 11.0 9.0	10.5 10.0 11.0 8.5	FEB 5.5 6.0 5.0 5.5	9.0 12.0 15.5 18.0	17.0 18.5 17.0 19.5	17.0 17.0 17.5 20.0	27.5 27.0 24.0 25.5	29.0 24.5 31.0 25.5	29.0 25.0 31.0 27.0	33.0 25.0 29.5 28.0
1 2 3	21.0 20.5 23.0	11.5 15.5 15.0	11.0 10.5 11.0	10.5 10.0 11.0	FEB 5.5 6.0 5.0	9.0 12.0 15.5	17.0 18.5 17.0	17.0 17.0 17.5	27.5 27.0 24.0	29.0 24.5 31.0	29.0 25.0 31.0	33.0 25.0 29.5
1 2 3 4 5	21.0 20.5 23.0 23.0 23.5	11.5 15.5 15.0 14.0 12.0	11.0 10.5 11.0 9.0 10.0	10.5 10.0 11.0 8.5 6.0	FEB 5.5 6.0 5.0 5.5 4.0	9.0 12.0 15.5 18.0 10.0	17.0 18.5 17.0 19.5 20.0	17.0 17.0 17.5 20.0 18.0	27.5 27.0 24.0 25.5 24.0	29.0 24.5 31.0 25.5 26.0	29.0 25.0 31.0 27.0 30.5	33.0 25.0 29.5 28.0 30.5
1 2 3 4 5	21.0 20.5 23.0 23.0	11.5 15.5 15.0 14.0	11.0 10.5 11.0 9.0	10.5 10.0 11.0 8.5	FEB 5.5 6.0 5.0 5.5	9.0 12.0 15.5 18.0 10.0	17.0 18.5 17.0 19.5	17.0 17.0 17.5 20.0 18.0	27.5 27.0 24.0 25.5 24.0	29.0 24.5 31.0 25.5 26.0	29.0 25.0 31.0 27.0 30.5	33.0 25.0 29.5 28.0 30.5
1 2 3 4 5 6 7	21.0 20.5 23.0 23.0 23.5	11.5 15.5 15.0 14.0 12.0	11.0 10.5 11.0 9.0 10.0	10.5 10.0 11.0 8.5 6.0	5.5 6.0 5.0 5.5 4.0	9.0 12.0 15.5 18.0 10.0	17.0 18.5 17.0 19.5 20.0	17.0 17.0 17.5 20.0 18.0	27.5 27.0 24.0 25.5 24.0	29.0 24.5 31.0 25.5 26.0	29.0 25.0 31.0 27.0 30.5	33.0 25.0 29.5 28.0 30.5
1 2 3 4 5 6 7 8	21.0 20.5 23.0 23.0 23.5 21.5	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0	9.0 12.0 15.5 18.0 10.0	17.0 18.5 17.0 19.5 20.0	17.0 17.0 17.5 20.0 18.0 22.0	27.5 27.0 24.0 25.5 24.0 25.0 28.0	29.0 24.5 31.0 25.5 26.0 25.0	29.0 25.0 31.0 27.0 30.5	33.0 25.0 29.5 28.0 30.5 25.0 24.0
1 2 3 4 5 6 7	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0	11.5 15.5 15.0 14.0 12.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0	17.0 18.5 17.0 19.5 20.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0	29.0 24.5 31.0 25.5 26.0 25.0 29.0 25.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 25.0
1 2 3 4 5 6 7 8 9	21.0 20.5 23.0 23.5 21.5 22.0 20.0 19.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 14.0	17.0 18.5 17.0 19.5 20.0	17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0	29.0 24.5 31.0 25.5 26.0 25.0 29.0 25.0 25.5 27.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0
1 2 3 4 5 6 7 8 9 10	21.0 20.5 23.0 23.5 21.5 22.0 20.0 19.0 19.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 14.0 15.0	17.0 18.5 17.0 19.5 20.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0 31.0	29.0 24.5 31.0 25.5 26.0 25.0 29.0 25.0 25.5 27.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 25.0 24.0 24.0
1 2 3 4 5 6 7 8 9 10	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.0 19.5	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.5 6.0 6.0 8.0	9.0 12.0 15.5 18.0 10.0 9.0 7.0 14.0 15.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0 31.0 24.0	29.0 24.5 31.0 25.5 26.0 25.0 29.0 25.5 27.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0	33.0 29.5 28.0 30.5 25.0 24.0 24.0 24.0 24.0 23.0
1 2 3 4 5 6 7 8 9 10	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.0 19.5 18.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 10.5 10.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0	5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 14.0 21.0 17.0	17.0 18.5 17.0 19.5 20.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0 31.0 24.0 22.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 24.0 23.5 23.0
1 2 3 4 5 6 7 8 9 10	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.0 19.5 18.0 24.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.5 6.0 8.0 8.0 10.0	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 15.0 21.0 17.0	17.0 18.5 17.0 19.5 20.0 13.0 	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0 31.0 24.0 22.0 29.0	29.0 24.5 31.0 25.5 26.0 25.0 25.0 25.5 27.0 27.5 26.0 25.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.0 23.5 23.5
1 2 3 4 5 6 7 8 9 10	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.0 19.5 18.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 10.5 10.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0	5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 14.0 21.0 17.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0 31.0 24.0 22.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 24.0 23.5 23.0
1 2 3 4 5 6 7 8 9 10	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.0 19.5 18.0 24.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.5 6.0 8.0 8.0 10.0	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 15.0 21.0 17.0	17.0 18.5 17.0 19.5 20.0 13.0 	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0 31.0 22.0 29.0 30.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0 27.5 26.0 25.0 26.5 26.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0 27.5	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 24.0 23.5 23.5 23.5 23.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.0 19.5 18.0 24.0 20.5	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 3.0 2.0	5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 8.0 10.0 11.0	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 15.0 21.0 17.0 18.0 17.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.5 22.5 24.5	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 24.0 24.0 29.0 31.0 22.0 29.0 30.0	29.0 24.5 31.0 25.5 26.0 25.0 25.0 25.5 27.0 27.5 26.0 25.0 25.0 26.5	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0 27.5	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.0 23.5 23.5 22.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.0 19.0 24.0 20.5	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5 10.5 10.0 12.5 12.0 12.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 3.0 2.0	5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 8.0 10.0 11.0	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 14.0 15.0 21.0 16.0 18.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0 31.0 24.0 22.0 29.0 30.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0 27.5 26.0 25.0 26.5 26.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0 27.5	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 24.0 23.5 23.5 23.5 22.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.0 19.5 18.0 24.0 20.5	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5 10.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 3.0 2.0	5.5 6.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 8.0 11.0 15.5	9.0 12.0 15.5 18.0 10.0 9.0 16.0 14.0 15.0 21.0 17.0 17.0 20.0 17.0 20.0	17.0 18.5 17.0 19.5 20.0 13.0 	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5 27.0 24.5	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 24.0 24.0 29.0 31.0 22.0 29.0 30.0	29.0 24.5 31.0 25.5 26.0 25.0 25.0 25.5 27.0 27.5 26.0 26.5 26.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0 27.5	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.0 23.5 23.5 22.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.5 18.0 20.5 25.0 24.0 23.5	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 10.5 10.0 12.5 12.0 12.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5 10.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 3.0 2.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.5 6.0 8.0 10.0 11.0 15.5	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 14.0 15.0 21.0 17.0 16.0 17.0 20.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 24.0 22.0 29.0 31.0 24.0 22.0 29.0 30.0	29.0 24.5 31.0 25.5 26.0 25.0 29.0 25.5 27.0 27.5 26.0 25.0 26.5 26.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0 27.5	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 24.0 23.5 23.5 22.5 22.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.5 18.0 24.0 20.5 25.0 24.0 23.5 16.0 20.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 10.5 10.0 12.5 12.0 12.0 14.5 15.0 14.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5 10.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 3.0 3.0 2.0	5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 8.0 10.0 11.0 15.5	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 14.0 15.0 21.0 17.0 16.0 17.0 17.5 21.0 17.5 21.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5 27.0 24.0 27.0	27.5 27.0 24.0 25.5 24.0 28.0 29.0 22.0 28.0 31.0 24.0 22.0 29.0 30.0 25.0 29.0 21.0 21.0 22.0 22.0 23.0 23.0 24.0 23.0 24.0 25.0 26.0 27.0 28.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0 27.5 26.0 25.0 26.5 26.0 27.5 26.0 28.0 30.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 27.5 31.5 29.0 23.5 26.5 28.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.5 23.5 22.5 22.5 21.5 21.5 21.0 23.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.0 19.5 18.0 24.0 20.5 25.0 24.0 23.5 16.0 20.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 10.5 10.0 12.5 12.0 12.0 15.0 14.5 15.0 11.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5 10.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 3.0 3.0 2.0 3.0 5.0 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 8.0 11.0 15.5 12.0 14.0 15.5 15.0 14.5	9.0 12.0 15.5 18.0 10.0 9.0 16.0 14.0 21.0 16.0 17.0 16.0 17.0 17.0 17.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5 27.0 24.5 27.0 27.5	27.5 27.0 24.0 25.5 24.0 28.0 29.0 22.0 28.0 31.0 22.0 29.0 30.0 25.0 26.0 27.0 26.0 27.0 28.0	29.0 24.5 31.0 25.5 26.0 25.0 29.0 25.5 27.0 27.5 26.0 26.5 26.0 27.5 26.0 28.0 30.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0 29.0 27.5 31.5 29.0 23.5 28.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.5 23.5 23.5 22.5 21.5 21.0 23.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	21.0 20.5 23.0 23.0 23.5 21.5 22.0 19.0 19.0 19.5 18.0 24.0 20.5 25.0 24.0 23.5 16.0 20.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5 10.5 12.0 12.0 12.0 14.5 15.0 14.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5 10.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 3.0 2.0 3.0 4.0 5.0 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 8.0 10.0 11.0 15.5 12.0 14.0 15.5 15.0 14.5	9.0 12.0 15.5 18.0 10.0 9.0 7.0 14.0 15.0 21.0 17.0 20.0 17.0 17.0 17.0 19.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5 27.0 24.0 27.5 26.5 25.0	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0 31.0 24.0 29.0 30.0 25.0 26.5 27.0 26.5 27.0 26.0 27.0 28.0 29.0 20.0	29.0 24.5 31.0 25.5 26.0 25.0 25.0 25.5 27.0 27.5 26.0 26.5 26.0 26.0 28.0 30.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 27.5 31.5 29.0 23.5 29.0 23.5 28.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.5 23.5 23.5 22.5 21.5 21.5 21.5 21.0 23.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	21.0 20.5 23.0 23.0 23.5 21.5 22.0 19.0 19.0 19.5 18.0 24.0 20.5 25.0 24.0 23.5 16.0 20.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5 10.5 12.0 12.0 12.0 14.5 15.0 14.5 15.0 14.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5 10.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 2.0 3.0 2.0 4.0 5.0 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.5 6.0 8.0 10.0 11.0 15.5 12.0 14.0 15.5 15.0 14.5	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 17.0 17.0 17.0 17.5 21.0 17.5 21.0 17.5 21.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5 27.0 24.0 27.0 27.5	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0 31.0 24.0 22.0 29.0 30.0 25.0 26.5 27.0 26.0 23.0 29.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0 27.5 26.0 26.5 26.0 28.0 30.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0 27.5 29.0 23.5 28.5 28.5 28.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.5 23.5 22.5 21.5 21.5 21.0 23.0 23.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.5 18.0 20.5 25.0 24.0 23.5 16.0 20.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 10.5 10.0 12.5 12.0 15.0 14.5 15.0 13.0 14.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5 10.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 3.0 3.0 2.0 3.0 5.0 7.0 7.0 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 8.0 11.0 15.5 12.0 14.0 15.5 11.5 11.5 11.0 14.5	9.0 12.0 15.5 18.0 10.0 9.0 16.0 14.0 15.0 21.0 16.0 17.0 16.0 17.0 18.0 17.0 19.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5 27.0 27.0 27.0 27.5 26.5 25.0 21.0	27.5 27.0 24.0 25.5 24.0 28.0 29.0 22.0 28.0 31.0 24.0 22.0 29.0 30.0 26.5 27.0 26.0 23.0 28.0	29.0 24.5 31.0 25.5 26.0 25.0 29.0 25.5 27.0 27.5 26.0 25.0 26.5 26.0 28.0 30.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0 27.5 31.5 29.0 23.5 26.5 28.0 30.0 28.5	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.5 23.5 23.5 22.5 21.5 21.5 21.0 23.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	21.0 20.5 23.0 23.0 23.5 21.5 22.0 19.0 19.0 19.5 18.0 24.0 20.5 25.0 24.0 23.5 16.0 20.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5 10.5 12.0 12.0 12.0 14.5 15.0 14.5 15.0 14.5	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5 10.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 2.0 3.0 2.0 4.0 5.0 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.5 6.0 8.0 10.0 11.0 15.5 12.0 14.0 15.5 15.0 14.5	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 17.0 17.0 17.0 17.5 21.0 17.5 21.0 17.5 21.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5 27.0 24.0 27.0 27.5	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0 31.0 24.0 22.0 29.0 30.0 25.0 26.5 27.0 26.0 23.0 29.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0 27.5 26.0 26.5 26.0 28.0 30.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0 27.5 29.0 23.5 28.5 28.5 28.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.5 23.5 22.5 21.5 21.5 21.0 23.0 23.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.5 18.0 20.5 25.0 24.0 20.5 16.0 20.0 17.0 14.5 16.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 10.5 10.0 12.5 12.0 12.0 13.0 14.5 15.0 11.0 11.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5 10.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.0 3.0 3.0 2.0 3.0 5.0 7.0 7.0 7.0 7.5 7.5	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 8.0 11.0 15.5 12.0 14.0 15.5 11.5 11.5 11.0 14.5	9.0 12.0 15.5 18.0 10.0 9.0 16.0 14.0 15.0 21.0 16.0 17.0 16.0 17.0 18.0 17.0 19.0 17.5 21.0 19.0 19.0 19.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5 27.0 27.0 27.0 27.5 26.5 25.0 21.0	27.5 27.0 24.0 25.5 24.0 28.0 29.0 22.0 28.0 31.0 24.0 22.0 29.0 30.0 26.5 27.0 26.0 23.0 28.0	29.0 24.5 31.0 25.5 26.0 25.0 29.0 25.5 27.0 27.5 26.0 25.0 26.5 26.0 28.0 30.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0 27.5 31.5 29.0 23.5 26.5 28.0 30.0 28.5	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.5 23.5 23.5 22.5 21.5 21.5 21.0 23.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27	21.0 20.5 23.0 23.0 23.5 21.5 22.0 19.0 19.0 19.5 24.0 20.5 24.0 20.5 24.0 20.0 17.0 18.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5 10.5 12.0 12.0 12.0 14.5 15.0 14.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 11.0 12.0 9.5 9.0 9.0 11.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 3.0 2.0 3.0 4.0 5.0 7.0 7.0 7.5 7.5	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 8.0 10.0 11.0 15.5 12.0 14.0 15.5 11.0 14.5	9.0 12.0 15.5 18.0 10.0 9.0 16.0 14.0 15.0 21.0 17.0 20.0 17.0 17.0 19.0 12.0 18.0 20.0 17.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5 27.0 24.0 27.0 27.0 26.5 25.0 26.5 27.0	27.5 27.0 24.0 25.5 24.0 28.0 29.0 22.0 28.0 31.0 24.0 29.0 30.0 25.0 26.5 27.0 26.0 23.0 28.0 27.0 27.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0 27.5 26.0 26.5 26.0 26.0 28.0 30.0 30.5 28.0 27.0 27.0 27.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 27.5 28.5 28.5 28.5 27.0 30.0 28.5 30.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.5 23.5 22.5 21.5 21.5 21.0 23.0 23.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	21.0 20.5 23.0 23.0 23.5 21.5 22.0 19.0 19.0 19.5 18.0 24.0 20.5 24.0 23.5 16.0 20.0 17.0 18.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5 10.5 12.0 12.0 12.0 14.5 15.0 14.5 15.0 11.0 11.0 11.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5 10.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 2.0 3.0 2.0 3.0 7.0 7.0 7.0 7.0 7.5 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.5 6.0 10.0 11.0 15.5 12.0 14.0 15.5 11.0 14.5 11.5 11.0 14.0 11.5 9.0	9.0 12.0 15.5 18.0 10.0 9.0 7.0 14.0 15.0 21.0 17.0 20.0 17.0 17.5 21.0 19.0 12.0 18.0 20.0 14.0	17.0 18.5 17.0 19.5 20.0 13.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5 27.0 24.0 27.0 24.0 27.0 24.0 27.0 24.0 27.0 24.0 27.0 28.0	27.5 27.0 24.0 25.5 24.0 28.0 29.0 22.0 28.0 31.0 24.0 22.0 29.0 30.0 26.5 27.0 26.0 23.0 28.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0 27.5 26.0 26.5 26.0 28.0 30.0 30.5 28.0 27.0 27.0 27.0 27.0 27.0 27.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 27.5 31.5 29.0 23.5 26.5 28.0 28.5 27.0 28.5 28.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.5 23.5 22.5 21.5 21.5 21.5 21.0 23.0 23.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29	21.0 20.5 23.0 23.0 23.5 21.5 22.0 20.0 19.0 19.5 18.0 24.0 20.5 25.0 24.0 20.5 16.0 17.0 14.5 16.0 17.0 17.0 18.5	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5 10.5 12.0 12.0 12.0 14.5 15.0 11.0 11.0 11.0 11.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 12.0 9.5 10.5	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.0 3.0 2.0 3.0 2.0 3.0 7.0 7.0 7.0 7.0 7.5 7.0 8.5 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 8.0 10.0 11.0 15.5 12.0 14.0 15.5 11.5 11.5 11.5 11.5 11.5 11.5 11	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 17.0 17.0 17.0 17.0 17.5 21.0 17.5 21.0 17.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 17.5 21.0 21.0 21.0 21.0 21.0 21.0 21.0 21.0	17.0 18.5 17.0 19.5 20.0 13.0 18.0 20.0 19.5	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.5 22.5 24.5 27.0 24.0 27.0 27.5 26.5 25.0 26.0 27.0	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0 31.0 22.0 29.0 30.0 25.0 26.5 27.0 26.5 27.0 26.0 27.0 28.0 29.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0 27.5 26.0 26.5 26.0 28.0 28.0 30.5 28.0 27.0 27.0 27.0 27.0 27.0 27.0 27.0 27.0 27.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 29.0 29.0 29.0 27.5 31.5 29.0 23.5 28.5 28.0 28.5 27.0 30.0 28.5 28.5 28.5 28.5 28.5 28.0 28.5 28.5 28.5 28.0 28.5 28.0 28.5 28.0 28.5 28.0 28.0 28.0 28.0 28.0 28.0 28.0 28.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.5 23.5 22.5 21.5 21.5 21.0 23.0 21.0 22.5 21.5 21.0 22.5 21.0 21.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	21.0 20.5 23.0 23.0 23.5 21.5 22.0 19.0 19.0 19.0 24.0 20.5 24.0 20.5 24.0 20.0 17.0 18.0 17.0 18.5 16.0	11.5 15.5 15.0 14.0 12.0 13.0 11.5 10.5 10.0 12.0 12.0 12.0 14.5 15.0 11.0 11.0 11.0 11.0 11.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.5 10.5 11.0 12.0 9.5 9.0 9.0 9.0 11.5 11.0	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 3.0 2.0 3.0 7.0 7.0 7.0 7.5 7.5 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 10.0 11.0 15.5 12.0 14.0 14.5 11.5 11.0 14.0 11.5 9.0 9.5	9.0 12.0 15.5 18.0 10.0 9.0 16.0 14.0 15.0 21.0 16.0 17.0 16.0 17.0 18.0 17.0 19.0 12.0 18.0 12.0 13.5 13.0 14.0	17.0 18.5 17.0 19.5 20.0 13.0 18.0 20.0 19.5 18.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.5 22.5 24.5 27.0 27.0 27.0 27.0 27.0 27.0 27.0 27.0 28.0 27.0	27.5 27.0 24.0 25.5 24.0 28.0 29.0 22.0 28.0 31.0 24.0 22.0 29.0 30.0 26.5 27.0 26.0 23.0 28.0 29.0 20.0 20.0 20.0 21.0 22.0 22.0 22.0 22.0 22.0 22.0 22.0 22.0 22.0 23.0 24.0 25.0 26.5 27.0 26.0 27.0 28.0 28.0 28.0 28.0 28.0 29.0 27.0 27.0 27.5 28.0 29.0 29.0 29.0 27.0 27.5 28.0 29.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0 27.5 26.0 26.5 26.0 28.0 30.0 30.5 28.0 27.0 27.0 28.0 29.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0 27.5 31.5 29.0 23.5 26.5 28.0 28.5 27.0 30.0 28.5 28.5 27.0 30.0 28.5 28.5 28.5 28.5 28.5 28.0 29.5 28.5	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.5 23.5 21.5 21.5 21.5 21.5 21.0 23.0 23.0 23.0 23.5 22.5
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 31	21.0 20.5 23.0 23.0 23.5 21.5 22.0 19.0 19.0 19.5 18.0 24.0 20.5 25.0 24.0 20.0 17.0 18.0 16.0 17.0 18.5 16.0 17.0 18.5 19.0	11.5 15.5 15.0 14.0 12.0 13.0 14.0 13.5 15.0 11.5 10.5 12.0 12.0 14.5 15.0 11.0 11.0 11.0 11.0 11.0 11.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.0 9.5 10.5 11.0 9.5 10.5 11.0 9.5 9.0 9.0 11.5 11.0	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.5 7.0 3.0 2.0 3.0 2.0 3.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 10.0 11.0 15.5 12.0 14.0 14.5 11.5 11.5 11.0 18.0 14.0 11.0	9.0 12.0 15.5 18.0 10.0 9.0 16.0 14.0 15.0 21.0 17.0 20.0 17.0 19.0 12.0 18.0 20.0 14.0 19.0	17.0 18.5 17.0 19.5 20.0 13.0 18.0 20.0 19.5 18.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.0 21.5 22.5 24.5 27.0 24.0 27.0 27.0 24.0 27.0 27.0 27.5 28.0 27.0 27.0 27.5 28.0 27.0 27.5 28.0	27.5 27.0 24.0 25.5 24.0 25.0 28.0 29.0 22.0 28.0 31.0 24.0 29.0 30.0 25.0 26.5 27.0 26.5 27.0 26.5 27.0 28.0 29.0 27.5 28.0 28.0 29.0 27.0 27.5 28.0 28.0 29.0 27.0 27.5 28.0 28.0 29.0 29.0 27.5 28.0 28.0 29.0 29.0 29.0 20.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0 27.5 26.0 26.5 26.0 26.0 28.0 30.0 30.5 28.0 27.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 27.5 29.0 29.0 27.5 29.0 23.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.0 29.0 20.0	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.0 23.5 23.5 21.5 21.5 21.5 21.5 21.0 23.0 23.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	21.0 20.5 23.0 23.0 23.5 21.5 22.0 19.0 19.0 19.5 18.0 24.0 20.5 24.0 23.5 16.0 17.0 14.5 16.0 17.0 18.5 18.0	11.5 15.5 15.0 14.0 12.0 13.0 11.5 10.5 10.0 12.0 12.0 12.0 14.5 15.0 11.0 11.0 11.0 11.0 11.0	11.0 10.5 11.0 9.0 10.0 8.0 7.5 8.0 11.5 9.5 10.5 11.0 12.0 9.5 9.0 9.0 9.0 11.5 11.0	10.5 10.0 11.0 8.5 6.0 11.0 7.5 5.0 5.5 7.0 3.0 3.0 2.0 3.0 7.0 7.0 7.0 7.5 7.5 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0	FEB 5.5 6.0 5.0 5.5 4.0 3.0 6.0 7.0 7.5 6.0 10.0 11.0 15.5 12.0 14.0 14.5 11.5 11.0 14.0 11.5 9.0 9.5	9.0 12.0 15.5 18.0 10.0 9.0 7.0 16.0 17.0 17.0 17.0 17.0 17.0 17.0 17.0 17	17.0 18.5 17.0 19.5 20.0 13.0 18.0 20.0 19.5 18.0	17.0 17.0 17.5 20.0 18.0 22.0 19.0 24.5 24.5 20.0 21.5 22.5 24.5 27.0 27.0 27.0 27.0 27.0 27.0 27.0 27.0 28.0 27.0	27.5 27.0 24.0 25.5 24.0 28.0 29.0 22.0 28.0 31.0 24.0 22.0 29.0 30.0 26.5 27.0 26.0 23.0 28.0 29.0 20.0 20.0 20.0 21.0 22.0 22.0 22.0 22.0 22.0 22.0 22.0 23.0 24.0 25.0 26.0 27.0 26.0 27.0 26.0 27.0 28.0 28.0 29.0 27.0 27.0 27.5 28.0 29.0 29.0 27.5 28.0 29.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	29.0 24.5 31.0 25.5 26.0 29.0 25.0 25.5 27.0 27.5 26.0 26.5 26.0 28.0 30.0 30.5 28.0 27.0 27.0 28.0 29.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	29.0 25.0 31.0 27.0 30.5 32.0 29.5 25.0 30.0 25.0 29.0 29.0 29.0 27.5 31.5 29.0 23.5 26.5 28.0 28.5 27.0 30.0 28.5 28.5 27.0 30.0 28.5 28.5 28.5 28.5 28.5 28.0 29.5 28.5	33.0 25.0 29.5 28.0 30.5 25.0 24.0 24.0 23.5 23.5 21.5 21.5 21.5 21.5 21.0 23.0 23.0 23.0 23.5 22.5

TEMPERATURE WATER (DEG.º 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
		FEBRUARY			MARCH			APRIL			MAY	
1 2							17.5 20.5	14.5 11.5	16.5 16.0			
3	•						17.5	10.0	14.0			
3 4							22.5	11.5	16.5			
5							22.0	11.0	16.5			
6							18.5	11.5	15.0			
7							18.5 21.5	12.5 11.5	15.5 16.5			
8 9							20.0	13.5	17.0			
10		•		•			22.0	13.5	18.0			
11							23.5	13.0	18.5			
12							24.5	16.0	20.5			
13							26.0	16.5	21.5			
14							22.5 24.0	17.0 13.5	20.0 18.5			
15								13.3	10.5			
16							20.0	15.5	18.0			
17							17.5 17.5	15.5 10.0	16.5 15.5			
18 19							16.5	15.0	16.0			
20							16.5	15.5	16.0			
21							15.5	14.0	14.5			
22			•				14.0	12.5	13.5			
23							12.5	11.5	12.0			
24							12.0	11.5	11.5			
25							14.0	12.0	12.5			
26							14.5	14.0	14.0			
27 28												
26 29		•										
30												
31							26.0	10.0	16.0			
MONTH	•		•									
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAY	MTN	MEAN	MAX	MIN	MEAN
						115764	MAX	MIN		*****		
		JUNE			JULY	110144	naa	AUGUST		•	SEPTEME	
		JUNE				1107114				35.5	SEPTEME 24.0	3ER 29.0
1 2		JUNE				11,525.4		AUGUST		35.5 32.0	SEPTEME 24.0 24.5	29.0 27.0
1 2 3		JUNE				11000		AUGUST		35.5	24.0 24.5 22.0	3ER 29.0
1 2		JUNE						AUGUST		35.5 32.0 31.5	SEPTEME 24.0 24.5	29.0 27.0 24.5
1 2 3 4 5		JUNE						AUGUST		35.5 32.0 31.5	24.0 24.5 22.0	29.0 27.0 24.5
1 2 3 4 5		JUNE				11344		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		JUNE		· 				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		JUNE		· • • • • • • • • • • • • • • • • • • •				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		JUNE						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						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		· · · · · · · · · · · · · · · · · · ·				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		JUNE		· · · · · · · · · · · · · · · · · · ·				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								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								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								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	·							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	·							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	·							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								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								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								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								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 24 25 26								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 27								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 27 28								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 27 28 29 29 20 20 20 20 20 20 20 20 20 20 20 20 20								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 27 28								AUGUST	31.0	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 27 28 29 29 29 20 20 20 20 20 20 20 20 20 20 20 20 20					JOLY		33.5	AUGUST		35.5 32.0 31.5	24.0 24.5 22.0 	29.0 27.0 24.5

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

	MEAN		MEAN		MEAN		MEAN		MEAN		MEAN	
	CONCEN-		CONCEN-		CONCEN-		CONCEN-		CONCEN-		CONCEN-	
	TRATION	LOADS	TRATION	LOADS	TRATION	LOADS	TRATION	LOADS	TRATION	LOADS	TRATION	LOADS
DAY	(MG/L)	(T/DAY)	(MG/L)	(T/DAY)	(MG/L)	(T/DAY)	(MG/L)	(T/DAY)	(MG/L)	(T/DAY)	(MG/L)	(T/DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1 .	22	3.3	31	8.0	6	.96	. 5	.72	4	.63	7	.93
2	22	3.1	27	6.9	21	3.5	7	1.0	3	.46	5	•66
3	39	9.2	43	10	12	2.0	9	1.3	3	.45	6	.78
4	58	8.9	42	9.4	7	1.2	6	-86	2	•30	13	1.5
5	63	16	38	7.9	3	.50	7	.98	2	. 30	4	.43
6	65	21	31	7.7	1	.17	4	•55	8	1.2	4	.42
7	68	20	30	8.4	1	.17	6	.83	5	.76	4	.42
8	470	341	32	8.0	Ō	.00	6	.83	4	.60	7	.76
وَ	417	205	23	5.2	ŏ	.00	š	1.2	ž	.30	6	.66
10	1050	465	27	5.2	ĭ	.16	7	.95	3	.45	ž	.76
					_				_		•	
11	1150	522	26	4.7	1	.16	9	1.2	5	.80	12	1.2
12	2020	834	30	5.2	3	.49	7	.95	6	.96	13	1.3
13	1560	535	18	3.1	2	.32	7	.95	4	. 64	19	2.0
14	453	131	15	2.6	0	-00	6	.81	5	.78	18	2.0
15	254	65	15	2.6	0	•00	8	2.5	5	₽78	22	2.3
16	176	42	26	4.6	0	-00	7	2.3	6	.96	32	3.0
17	76	16	20	3.5	1	.16	8	2.6	9	1.4	14	1.3
18	61	12	21	3.4	0	.00	9	2.7	5	.74	14	1.4
19	48	9.2.	24	3.6	1	.16	11	1.8	4	.55	21	2.0
20	53	9.9	27	4.2	0	.00	10	1.7	5	.66	18	1.7
21	53	9.6	14	2.2	2	.31	9	1.7	3	- 40	14	1.2
22	50	9.0	12	1.9	4	.60	12	2.5	4	.53	21	1.8
23	47	9.1	10	1.5	5	.74	13	3.1	8	1.0	24	2.1
24	49	11	13	1.9	5	.74	9	2.1	5	.65	13	1.0
25	66	15	9	1.3	9	1.3	8	1.7	5	.66	12	.84
26	92	24	10	1.4	7	1.0	8	1.6	4	.53	11	.74
27	75	. 20	. 9	1.2	3	.44	. 6	1.1	2	. 26	11	.74
28	75	19	10	1.4	7	1.0	ž	1.2	5	.66	13	.91
29	95	26	8	1.2	Ś	.72	ż	1.2			31	2.0
30	96	27	8	1.2	2	.29	1ó	1.6	-		28	1.6
31	38	9.5			ĩ	.14	7	1.1			16	.86
TOTAL		3447.8		129.4		17.23		45.63		18.41	10	39.31
		244110		20717		223		47.63		10.41		33.37
	MEAN		MEAN		MEAN		MEAN		MEAN		MEAN	
	CONCEN-		CONCEN-		CONCEN-		CONCEN-		CONCEN-		CONCEN-	

	MEAN CONCEN-		MEAN CONCEN-		MEAN CONCEN-		MEAN CONCEN-	•	MEAN CONCEN-		MEAN CONCEN-	
DAY	TRATION (MG/L)	LOADS (T/DAY)	TRATION (MG/L)	LOADS	TRATION	LOADS	TRATION	LOADS	TRATION	LOADS	TRATION	LOADS
DAI	(MG/L)	(T) DAY)	(WO\P)	(T/DAY)	(MG/L)	(YAD\T)	(MG/L)	(YAD\T)	(MG/L)	(Y/DAY)	(MG/L)	(YAC\T)
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	19	1.2	2320	5540	37		22		48	3.2	22	.12
2	25	1.6	2140	4880	36	1.8	39	5.8	70	5.7	17	.06
3	24	1.6	2060	4190	33	1.4	363	368	72	7.2	15	.20
4	40	2.7	1390	1940	58	2.0	5260	6860	59	9.1	664	693
5	26	1.8	800	531	53	1.6	4550	6600	79	19	4280	6520
6	26	1.7	550	263	46	1.2	3750	6280	54	8.2	3630	6410
7	60	3.7	454	175	31	.92	3220	6610	34	3.1	2910	5370
8	25	1.6	279	88	31	.72	2650	5290	142	12	3330	6410
9	44	. 2.9	234	67	22	-43	2150	4640.	38	2.3	4710	9460
10	28	1.7	155	41	39	.81	2110	5300	27	1.3	2820	5710
11	22	1.5	82	18	53	.92	2660	6610	36	1.5	2600	5320
12	18	1.3	48	8.6	38	1.1.	3770	8960	31	. 67	2580	5260
13	22	1.7	39	6.1	21	.43	2220	6590	44	.71	2650	5500
14	25	` 1.9	34	4.6	21	.31	3790	9210	54	.87	2790	6340
15	23	1.6	40	5.5	22	.31	3900	9590	35	.47	2400	6310
16	5800	9780	38	5.1	23	- 35	3310	8040	41	.66	2450	8200
17	6350	11300	35	4.5	27	.95	3090	7330	34	.60	2650	6910
18	4270	8240	37	3.8	38	.88	2500	5730	41	.61	2210	4240
19	3460	7030	29	2.7	26	.65	1650	3560	36	.58	1100	962
20	3240	7040	33	2.9	13	. 28	1350	2000	37	. 40	1220	1500
21	3080	6920	31	2.2	14	.31	838	430	43	.52	871	722
22	2700	6200	30	1.8	22	. 48	662	261	66	.62	1430	988
23	2410	5690	36	1.8	16	.60	480	137	63	.60	1640	899
24	2130	5550	37	2.0	17	• 50	460	108	53	.57	1020	498
25	2470	5920	44	3.2	92	2.1	197	49 -	56	-60	842	377
26	2410	5610	34	2.3	24	.45	104	15	44	.83	835	372
27	2300	5080	30	2.2	22	.48	61	6.3	46	3.7	501	200
28	2440	5350	42	3.6	$-\frac{20}{10}$.37	64	6.7	59	5.6	241	83
29	1800	3960	37	3.6		.21	38	3.2	55	3.0	140	37
30	1730	3600	31	2.4	13	.63	46	3.1	30	.81	66	15
31			34	2.3			44	2.6	34	.64		
TOTAL TOTAL	LOAD FOR	97298.5 YEAR: 32	4828.01	17804.2 TONS.		25.59	,	110599.9		95.66		95306.38

Geoscience Consultants, 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 MAR 06 1985

OIL CONSERVATION DIVISION SANTA FE

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 MQCC 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. In the second



- 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 <u>no</u> <u>wells</u> 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

- 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:

- 1) 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 demon-stration.



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/1 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.



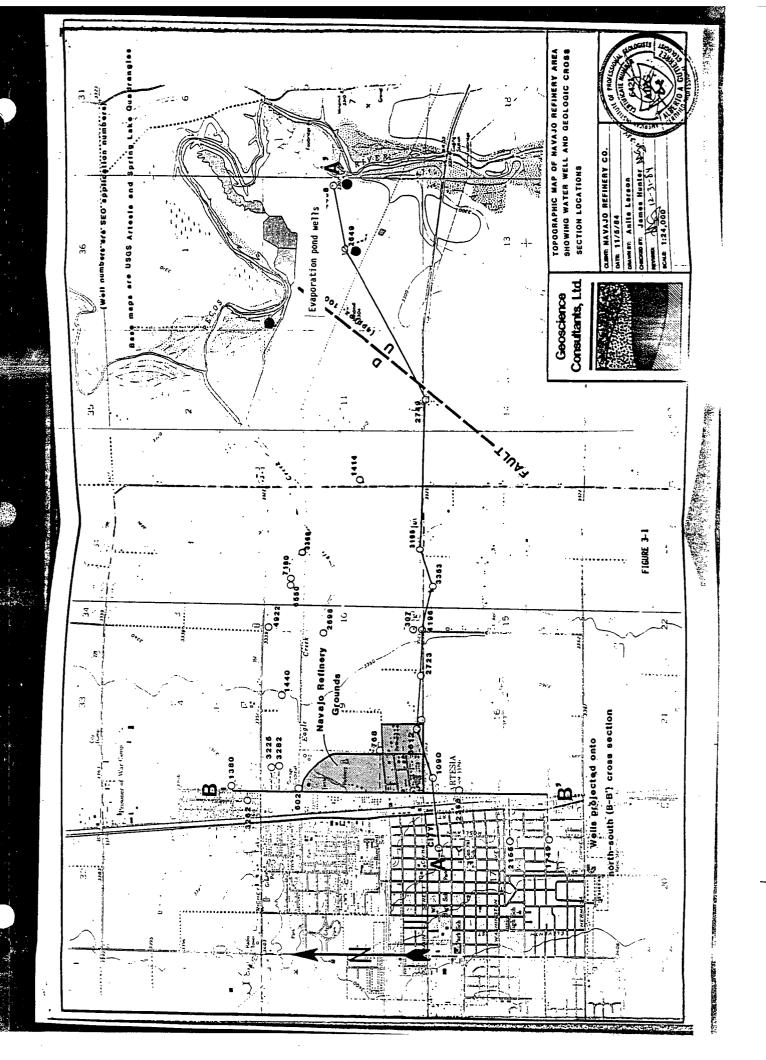


Table III-7 Sample Means for All Monitoring Parameters Through Fourth Quarter

Parameter Unit	•								
Forometer Unit		W	ell Number	Well Number					
	31 upgradient	32 downgradient	33 downgradient	34 downgradient					
Indicator	•								
pH Std Units	7 . 39	7.29	7.37	7.31					
Specific Conductance umho/cm	2535	2753	3600	2143					
Total Organic Carbon mg/l	53	57	140	42					
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/I	0.43	0.18	0.56	0.55					
Manganese mg/l	1.35	0.40	0.30	0.26					
Phenols mg/l	0.002	0.005	0.001	0.002					
Sodium ṁg/l	88	37	41	101					
Sulfate mg/l	- 539	1034	1414	415					
Primary Drinking Water									
Arsenic mg/l	0.005	0.005	0.005	0.009					
Barium mg/I	0.10	0.05	0.05	0.10					
Cadmium mg/l	0.0005	0.0005	0.0005	0.0005					
Chromium mg/l	0.0009	0.0014	0.0009	0.0015					
Fluoride mg/I	1.04	1.30	2.78	1.17					
Lead mg/l	0.0029	0.0030	0.0030	0.0036					
Mercury mg/I	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/1	0.05	0.05	0.05	0.05					
2,4,5-TP Silvex mg/l	0.005	0.005	0.005	0.005					
Turbidity Jackson U	nits 112	31	95	<i>9</i> 8					
Coliform col/100 m	i 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>	Well Number					
		31 upgradient	32 downgradient	33	34 downgradient		
Indianta.	•	opgradieni	downgradien	downgradiem	downgradiem		
Indicator	Cad II-ia-	7.31*	7.41	7.41	7.30		
pH	Std. Units						
Specific Conductance	umho/cm	2545*	2693	3590	2563*		
Total Organic Carbon	mg/l	63*(49)	240(8)	625(14)	25(64)		
Total Organic Halogen	mg/l	0.042*	0.102	0.065	0.026		
Total Dissolved Solids	mg/l	1434	2014	2812	1684		
Groundwater Quality							
Chloride	mg/l	89(105)	116(125)	163(170)	173(180)		
lron	mg/l	0.06	<0.01	<0.01	1.81		
Manganese	mg/l	1.08	0.311	0.521	0.567		
Phenois	mg/l	<0.001	<0.001	<0.001	<0.001		
Sodium	mg/1	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/I	<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	t analyzed due t	to high TDS			
Turbidity	Jackson Units	75	40	30	190		
Coliform	col/100 ml	1	200	1	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>	Well Number				
		31 upgradient	32 downgradient	<u>33</u>	<u>34</u> downgradient	
Indicator						
pН	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/l	0.038*	0.037	0.0!7	0.043	
Total Dissolved Solids	mg/l	1810	3290	2790	1510 —	
Groundwater Quality						
Chloride	mg/l	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	0.1	
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/l	<0.01	<0.01	<0.01	<0.01	
Silver	mg/I	<0.01	<0.01	<0.01	<0.01	
Pesticides & Herbicides		. ND	ŅD	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)

Parameter	<u>Unit</u>	Well Number					
- di dillerer		31 upgradient	32	33 downgradient	34 downgradient		
Indicator		opgradieni	downgradieni	downgradieni	downgradiem		
<u>Indicator</u> pH	Std Units	7.56*	7.59	7.46	7.47		
•	umho/cm	3040*	3900	5100	2400		
Specific Conductance		37*	14	21	25		
Total Organic Carbon	mg/l	<0.05 *	0.184	0.748	0.336		
Total Organic Halogen	mg/l		2730	3570	1680		
Total Dissolved Solids	mg/l	2130	2730	3370	1600		
Groundwater Quality							
Chloride	mg/l	130	200	200	140		
Iron	mg/l	<0.01	0.32	0.74	0.09		
Manganese	mg/l	0.814	0.335	0.165	0.085		
Phenois	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/I	<0.0004	~0.0004	<0.0004	<0.0004		
Nitrate (as N)	mg/l	<0.1	<0.1	0.1	0.3		
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			ot analyzed due	to high TDS			
Turbidity	Jackson Units	75	40	220	40		
Coliform	col/100 ml	1	1	1	1		
	•				-		

^{*} average of four replicates

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

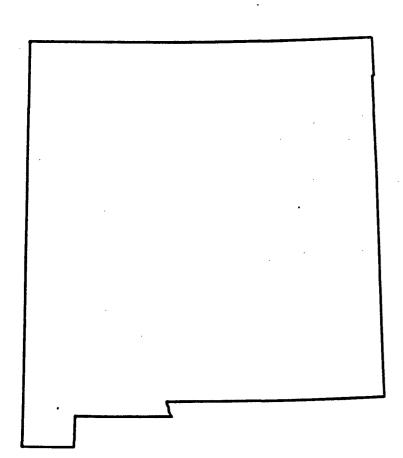
		(Sumpled 10-5-	03)				
Parameter	<u>Unit</u> .	. Well Number					
		31	32 downgradient	33 downgradient	<u>34</u> downgradient		
Indicator		opgi dalem	·	downgradiem	downgradiem		
pH	Std Units	7.40	7.44	7.82	7.36		
Specific Conductance	umho/cm	2076	2120	2680	1710		
Total Organic Carbon	mg/I	26*	12	20	75		
Total Organic Halogen	mg/l	0.063*	0.077	0.321	0.044		
Total Dissolved Solids	_	1730	2050	1670	1580		
lotal Dissolved Solids	mg/l	1730	2030	1670	1300		
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		
Phenois	mg/l	<0.001	<0.001	<0.001	<0.001		
Sodium	mg/I	85	43	44	62		
Sulfate	mg/l	520	1010	1400	260		
Primary Drinking Water		· .					
Arsenic	mg/l	<0.01	<0.01	<0.01	0.02		
Barium	mg/I	<0.1	<0.1	<0.1	<0.1		
Cadmium	mg/i	<0.001	<0.001	<0.001	<0.001		
Chromium	mg/l	<0.001	<0.001	<0.001	<0.001		
Fluoride	mg/l	0.9	1.1	2.4	1.0		
Lead	mg/l	0.006	0.006	0.007	0.006		
Mercury	mg/I	<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			t analyzed due				
Turbidity	Jackson Units	123	26	19	88		
Coliform	col/100 ml	1	1	t	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 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.

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 ft³/s (6.910 m³/s), 176,800 acre-ft/yr (218 hm³/yr).

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TCTAL 581C4.3

TCTAL

33069.8

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.

		DISC	HARGE, IN	CUBIC FEE		ONC, WAT	ER YEAR O	TOBER 19	81 TC SEP	TEMBER 19	82	
DAY	CCT	HOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	ALG	SEP
1	56	96	59	53	58	49	23	885	.24	70	25	2.1
ž	53	95	62	53	57	49	24	845	19	55	30	1.3
ž 3	87	8.8	62	53	56	48	24	754	16	154	37	4.9
4	57	63	62	53	56	42	25	517	• 13	483	57	129
5	95	77	62	52	56	40	25	246	11	537	87	564
6 7	117	92	62	51	56	39	24	177	1C	620	56	654
7	109	104	. 62	51	56	39	23	143	11	76C	34	684
8	269	93	62	51	56	40	24	117	6.6	740	32	713
9	182	83	61	51	55	41	24	166	7.3	80C	22	744
.10	104	71	23	50	56	40	22	98	7.7	936	18	750
11	168	67	60	50	59	38	26	21	6.4	920	15	758
. 12	153	64	6 C	50	59	36	27	é é	11	880	8.0	755
13	127	64	é Ç	5 C	59	39	25	58	7.5	1100	6.C	769
14	107	64	6 C	50	58	41	28	50	5.5	90C	6.C	842
15	95	65	éC	115	58	39	2 t	51	5.3	911	5.0	973
16	9.8	6.5	6C	120	59	35	55C	50	5.7	900	6.0	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	5.2	798	6.C	324
20	65	58	58	64	49	34	805	32	£.1	549	4.C	454
21	67	58	57	. 69	49	35	832	26	٤.3	190	4.5	307
22	67	59	56	77	49	31	95C	5.5	8.1	146	3.5	256
23	72	56	55	·£9	48	35	875	19	14	106	3.5	203
24	60	54	55	80	48	29	965	50	11	87	4.C	181
25	86	53	54	78	49	26	888	27	8.6	92	4.0	166
56	97	53	54	74	49	25	302 1	25	6.9	55	7.0	165
27	. 101	50	54	69	49	25	818	27	E.0	3.6	30 、	148
3.5	94	52	54	65	49	26	812	32	6.9	39	35	128
29	102	54	53	61		24	815	36	7.8	31	50	99
3C	103	56	53	€0		21	770	29	11	25	10	82
31	93		53	58		20		25		22	7.C	
TCTAL	3160	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	10.2	473	19.2	459 1240
XAM	269	104	65	120	59	49	965	885	. 24	1100	. 27	1240
MIN	53	5 C	53	50	46	20	22	19	5.3	5.5	3.5	1.3

MIN 3.C

925C

600

2909C

1120

2732G

3010

MAX

90.6

159

PEAN

MEAN

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

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. °C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982 ONCE-DAILY DAY OCT DEC JAN FEB SEP 14200 14300 8510 7980 10000 9270 10100 11200 10200 9170 **~**1090 5190 12 13 7630 11800 9240 1110 15900 22 10100 1570 5820 9680 5210 7460 MEAN WTR YR 1982 MEAN MAX MIN

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

DAY	XAM	MIN	MEAN	XAM	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		PEBRUAR	Y		MARCH			APRII			MAY	
1							14800	13000	14000			
1 2 3 4							14800	12700	13400			
3							14400	12200	· 13300			
4							14400	12500	13400			
5			•				14300	12200	13200			
6							13100	12100	12500			
6 7 8							13400	12100	12700			
é							14000	11800	12700			
ğ							13500	11700	12400			
10							12700	10800	11700			
10							12/00	10800	11700			
11							12100	10400	11200			
12					•		11400	10000	10800			
13							10700	2600	9710			
14							10100	2100	9400			
15							10700	2500	8920			
							20700	2300	0320			
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				
23							2/90	2570	2680			
26				ė			2700	2580	2620			
27									****			
28									~~~			
29									-			
30												
31										•		
MONTH							14800	2100	8230			



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08396500 PECOS RIVER NEAR ARTESIA, NM (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).

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WATER-DISCHARGE RECORDS

PERIOD OF RECORD. -- September 1905 to June 1909, August 1909 to current year. Monthly discharge only for some periods, published in WSF 1312 and 1712. Records for Aug. 22-31, 1904, and October 1936 to April 1937, published in WSF 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 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 downstream at same datum.

REMARKS.--Records fair. Flow regulated by Santa Rosa Lake (station 08382810) since April 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, 1959 determination, above station.

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

EXTREMES 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; 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 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 McMillan. The floods in August 1893 and October 1904 damaged McMillan Dam and washed out Avalon Dam.

EXTREMES FOR CURRENT YEAR.- Maximum 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 PEF SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983 MEAN VALUES

DAY	OCT	NOV	DEC	JAN	PEB	MAR	APR	HAY	JUN	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
3	645	62	69	59	59	47	24	21	75	. 24 2	92	440
4	429	59	66	65	58	46	29	24	68	591	90	492
5	231	51	62	64	60	42	32	23	45	630	76	458
				•						•••		420
6	193	58	58	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
9	113	55	56	68	66	35	53	685	28	760	26	746
10	97	49	61	68	65	34	64	721	26	750	19	727
				• •	• •		•					
11	88	49	62	69	62	34	69	729	22	742	13	656
12	74	51	73	69	61	34	68	750	16	760	10	690
13	69	53	73	69	60	34	58	798	13	780	ii	685
14	62	52	72	65	58	34	51	8 2 5	15	803	ii	622
15	62	51	74	62	57	34	50	872	18	792	10	614
					•		•	•••	77			017
16	78	46	74	61	56	31	58	873	17	860	12	614
17	77	44	68	60	51	27	36	822	15	843	8.0	607
18	77	46	67	59	48	28	39	816	14	837	5.8	59 5
19	78	47	64	58	46	27	31	839	12	819	5.7	600
20	81	47	62	58	46	27	23	794	ii	806	5.4	527
								,,,		000	2.4	321
21	81	47	60	61	45	27	20	802	11	818	4.7	4 24
22	78	47	58	' 64	45	29	19	796	15	802	5.3	219
23	74	45	58	65	45	25	21	715	ii	832	5.5	166
24	72	44	58	69	45	23	21	313	9.0	815	4.7	135
25	70	43	56	70	46	24	23	203	9.0	821	5.1	100
	. •		••		70	••		203	,,,	041	3.1	100
26	72	43	56	70	46	29	23	, 153	10	8 2 9	6.7	88
:7	75	50	59	70	44	32	15	109	20	839	8.1	76
28	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
١,	71		61	61		30		69		119	302	
_	. •		••	••				• •		112	302	
TAL	38 37	1592	1959	2000	1531	1039	1061	14400	767.0	20555.9	1124.0	12798
PIAN	1 24	53.1	63.2	64.5	54.7	33.5	35.4	465	25.6	663	36.3	4 27
*41	645	77	74	70	68	48	69	873	77	860	302	746
*:=	62	43	55	58	43	23	12	14	9.0	7.9	4.7	74
4:-FT	7610	3160	3890	3970	3040	2060	2100	28560	1520	40770	2230	25380
								20,00		40,,0	****	43300
A. TR	1982 TOTAL	58451.3	MEAN	160 MAX	1240	MIN 1.3	AC-FT	115900				
	1983 TOTAL	62663.9	MEAR		873	MIN 4.7	AC-FT	124300				

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RIO GRANDE BASIN

08396500 PECOS RIVER NEAR ARTESIA, NM -- Continued WATER-QUALITY RECORDS SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983 ONCE-DAILY AUG JUN JUL SEP DAY OCT HOV DEC JAN PER MAR APR MAT 10200 14500 4830 13200 1890 2940 5000 6070 7160 8520 12100 14400 8530 10100 12500 5190 13300 2180 2830 3990 6180 6900 8230 2720 1940 6230 6830 8660 8720 8700 9890 13200 5330 13400 2300 10300 10900 11900 5060 13700 1590 1530 6720 6900 8430 10700 17600 2900 5 8450 8700 10400 10900 4810 1520 6800 1680 6830 8580 10400 9950 11000 6070 16600 3180 1120 6 1860 7190 6890 8260 8550 4020 6470 15300 3940 1090 1980 7140 7200 8410 10800 10200 3670 2270 6760 7330 8290 8280 10900 9120 6470 1280 4680 1060 1250 5660 1100 2710 6880 7540 8580 8430 11200 9470 6960 9890 3040 7950 1170 5140 1160 10 2740 6890 8230 8110 8410 11300 7210 8050 11300 9710 2920 8160 1150 5970 1050 11 4060 7160 8360 7380 7460 8050 8580 8740 11400 9640 2920 8890 1150 6770 997 12 4630 2890 9500 1010 9920 8460 1130 13 5280 7310 7480 7950 11500 8440 8790 11700 11900 1100 8820 981 2850 14 5480 7560 7450 8080 15 7670 8800 8800 2940 10500 1060 8660 1050 5890 7330 7940 11600 2870 1070 7670 6970 1060 9000 7960 9000 11700 8660 10300 16 5590 9490 9770 7790 12100 8270 2690 1170 9020 1090 8550 9260 17 5380 6940 5280 7870 7080 8530 12400 8620 2630 11700 1010 8110 1090 2450 960 9160 1110 19 5220 7900 7300 8780 9840 12400 9310 12800 8870 9970 12400 2430 20 8320 7550 5210 970 21 4940 8360 7810 8740 9920 12700 10800 2420 13500 8860 1110 8370 9890 2400 9730 1300 11500 14200 960 22 5110 7990 8300 12100 12700 2430 11200 8280 8150 8430 9970 12100 13800 960 1430 23 5280 5530 8180 8320 10100 12700 13200 2740 11700 960 11000 1910 8430 25 5500 8050 8120 9820 13400 13100 2790 12200 1030 11100 2030 8460 15400 2780 8050 9950 12100 2850 6250 1010 26 5490 7800 8500 13200 7570 8140 12500 12800 2960 5640 1080 18500 3020 27 5280 10000 8360 5310 7540 8140 10900 14700 3080 6990 1470 18000 3410 28 8340 9950 29 5400 7620 8310 8240 10900 14600 3180 10900 1530 13800 3680 14200 4350 ---1650 30 5380 7120 8210 8330 10900 15100 4270 11400 4570 1730 12900 31 5670 8430 11300 8610 7410 10900 4870 9070 4220 8520 1740 4410 7600 8320 9160 11500 MEAN WTR YR 1983 MEAN 7300 MAX 18500 MIN 960 TEMPERATURE WATER (DEG." C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983 ONCE-DAILY DAY OCT NOV DEC JAN PEB MAR APR MAY JUN JUL ATIC SEP 30.0 29.0 17.5 10.0 18.0 12.0 17.0 19.0 9.0 18.0 18.5 14.0 19.5 25.0 25.0 28.0 30.5 30.0 30.5 26.0 26.0 22.0 14.0 9.5 3.0 20.5 13.0 5.0 15.0 19.0 .0 19.0 10.0 13.5 26.5 9.0 . 0 . 3.5 8.0 20.0 20.0 25.0 26.0 28.5 9.0 6.5 23.5 30.0 23.0 15.0 6.0 5.5 8.5 10.0 5.0 21.0 23.0 25.0 24.5 19.0 11.0 10.0 14.5 7.0 18.0 27.0 27.0 21.0 12.0 6.0 6.5 12.5 19.0 8.0 21.0 27.0 26.0 28.5 25.0 18.0 17.5 7.0 8.5 9.0 18.0 16.0 20.5 22.0 26.5 25.5 25.0 10 19.0 15.5 5.0 9.0 9.0 21.0 15.5 21.0 21.0 27.0 24.5 27.0 11 18.0 14.0 5.0 9.5 14.0 12.5 15.0 21.0 31.0 27.0 31.0 26.0 19.0 20.5 19.5 29.0 28.5 27.5 27.5 12 15.0 13.0 5.0 8.0 9.0 25.0 24.0 12.5 14.0 30.0 13 15.5 9.0 6.5 10.0 25.0 13.0 5.0 9.5 21.0 11.0 22.5 25.0 26.0 18.5 27.0 29.0 24.5 15 20.5 20.5 16.0 9.0 5.0 11.0 11.0 16.0 22.0 19.0 30.0 28.0 26.5 25.5 16 10.0 15.0 28.0 30.0 23.0 17 - 15.5 8.5 6.0 12.0 25.5 25.0 7.5 12.5 18 17.0 12.0 10.0 18.0 22.0 20.0 32.0 26.0 30.5 12.0 24.0 13.0 11.0 15.0 17.0 31.0 28.0 30.0 19 21.5 26.0 20 16.0 22.0 18.5 7.0 ₹9.0 27.0 27.0 14.5 13.0 11.0 15.5 18.0 29.0 21 15.0 27.5 20.0 12.5 7.5 17.0 14.5 18.5 20.5 26.5 13.0 7.5 7.0 10.0 28.0 22 23 18.0 7.0 9.0 13.0 24.0 26.0 25.0 22.0 8.5 16.0 10.5 5.5 13.0 12.0 23.5 24.0 23.0 26.5 25.0 20.0 7.0 6.5 18.0 11.0 12.0 21.0 21.5 31.0 25 15.5 25.0 27.0 26 15.0 5.0 9.0 9.0 10.5 16.0 18.0 24.5 25.5 27.0 25.0 27.0 29.0 30.5 4.5 26.0 25.0 20.5 23.0 27 17.0 4.0 7.5 13.0 11.0 15.0 4.0 12.0 11.5 15.0 25.0 21.0 28.0 28 23.0 29 18.0 9.0 3.0 10.0 20.0 23.0 23.0 31.0 29.5 25.0 22.5 29.0 30 17.0 16.5 11.0 3.0 8.0 21.5 18.5 25.0 19.5 29.0 29.5 23.0 27.5 27.0 11.0 31

11.5

MEAN

18.0

MEAN

WTR YR 1983

6.5

17.5

7.5

XAM

11.0

32.0

16.0

MIN

16.5

20.0

٠.

24.5

27.5

27.0

26.0

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.

Randal T. Hicks
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	PH
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

DATE	GPD	PH
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	PH
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

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)

WOCC 3-103 Standards	CRUDE UNIT PROCESS (#4, #11, #13)	CAT. CRACKER PROCESS SEFORE SOUR WATER STRIPPER	SOUR KATER STRIPPER EFFLUENT (#17)	ALKY. NEUTRALIZING SEWER (46)	ND & SD DESALTERS (#3, 49)
As					
Ea					
Cd					
Cr	<0.1	<0.1	/A /		
CN	<0.1	<0.1	(0.1	7.8	
			(0.1	<0.1	<1.0
F	1.3	0.5	0.4		
fb		v. 5	. 0.4	10.8	ı
Нд					:
K02					
Se A -					
Ag					
U C1					
Cu [*]			· •		
Fe .	. ,	•	•	•	
Ko.	<0.1	3.9	17.0	7.8	•
SO*					
TOS	245				
Zn	805	2160	560	2872	2524
pH	6.3	(0.1	0.12	18.8	2324
A1	0.3	9.0	9.5	3.6	
F					
Co					
flo					
Ni					
Phenols	9.9	710	250		
TSS		• • •	230	0.26	
Cond.					
COD	1202	8379	1702	8870	
NH.	78	2320	256	8670 (1	600
S	64	130	7.7	1.4	5.0
				•••	<1.0

Table 5-2 (continued)

BOILERS

MGCC 2-102	S.D.	K.D.	N.D.
Parameters	BOILER Blowdown	HIGH FRESSURE	LOW Pressure
,	(#2)	BOILER (#18)	90ILER (#12)
4-			
As	.004	.005	.003
Ba Cd	(.1	<.1	1.>
	(.01	<.01	<.01
Cr Cn	<.05	<.05	<.05
F			
r Fb	3.1	2.2	1.5
Hg	-18	.14	.05
KO2	.2	•	
Se	•4	.1	.05
Ag	<.05	₹.05	
บ	<.05	<.05	⟨.05
C1	127	73	<.05 ·
Cu	<.03	<.03	44
Fe	1.9	0.65	(.03
Kn	.07	<.03	0.25
S0	1549	1242	693
TDS	4220	2873	1807
Zn	.06	<.01	(-01
рH	11.6	11.6	11.2
Al	<1.0	(1.0	<1.0
B			11.0
Co	<.01	.02	.01
ño .	<.5	⟨.5	.01 <.5
Ni	<.05 _.	(.05	<.05
Fhenols			1.03
TSS	20	0	0 .
Cond.	6000	5000	2890
COD	116	0	0
NH4			v

Table 5-2 (continued)

COOLING TOWERS

WQCC 3-103 STANDARDS	n.d. Cooling Tower Rlondown	S.D. ALKY COOLING TOKER	S.D. FOD COOLING TOKER	N.D. FCC COOLING TONER
	(#10)	BLOWDOWN	BFORDORN	(416) Brondoku
As	.004	<.001	A11	
Ba	<.1	<.1	.011 <.1	100.
Cd	<.01	<.01	<.01	(.1
Cr	.06	1.05	<.05	<.01
CN	·	••••	1.03	0.22
F	1.6	4.4	2.2	
fb	.05	.05		1.6
Hg			(.05	.05
N 02	.5	.75	1	•
Se	•	.,,	.2	.3
Ag	<.05	<.05	/ AE	
U	(.05	(.05	<.05	<.05
CI	48	53	<.05	<.05
Cu	<.03	<.03	44	47
Fe	05	.5	(-03	<.03
Mn	<.03	.07	<.05	<.05
SO	1077	1461	<.03	<.03
TDS*	1906	2732	1236	1067
Zn	.48	28	1694	1973
pH	7.6	6.9	<.01	.17
A1	(1.0	<1.0	7.7	8.0
B		11.0	1.0	<1.0
Co	<.01	.01	42	
Ko	<.5	₹.5	.02	.01
Ki	<.05	<.07	(.5	<.5
Fhenols		1.01	₹.05	<.05
TSS	13	0	43	
Cond.	0	()	67	c
COD	1850	V	108	1800
NH.	0			!5

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 Echylbenzene Xylenes	<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	<0.005 mg/l <0.005 mg/l <0.005 mg/l <0.005 mg/l
	103184 1520 Well 47	103184 1550 Fire Pond	-
Benzene Toluene Echylbenzene Xylenes	<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	•
	Well 3	Well 5	Well 12
NO 3 88 N NH 4 CN Benzene Toluene Xylenes Echylbenzene	<pre><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>	<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>
	Well 13	Pond 1	Pond 3
NO 3 as N NH 4 CN Benzene Toluene Xylenes Echylbenzene	<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

SAMPLE ID/ANALYTICAL RESULTS

	Pond #1 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,

Jennifer V. Smith, Ph.D. Laboratory Director -cuaromen Navajo Refining Col ny

ADDRESS Drawer 159

city Artesia, NM 88210

ATTENTION Ed Kinney INVOICE 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 West Pond	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium Chromium Chromium Chromium 6+ Copper	13 < 1 0.2 116 0.003 102 918 0.04 < 0.01 < 0.001
100	Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium Nickel pH Units Phenols Alkalinity, "M"	6.6 760 0.06 0.002 60 0.01 7.7 0.04 173
	Solids, Total Dissolved Sulfate Sulfide Zinc	2930 885 25.1 < 0.1

Sample Analysis by: BP

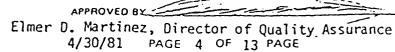
Date and Time of Analysis: BOD_5 : 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: $BOD_5 - 5$ day incubation

pH:electrode





-cognomer Navajo Refining Com

ADDRESS Drawer 159

City Artesia, NM 88210

ATTENTION: Ed Kinney INVOICE NO 104223



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

TYPE OF ANALYSIS Water

Sample Identification	Type of Analysis		mg/litær
Navajo Middle Pond	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand	< <	29 1 0.1 116 0.002 363 1468
	Chloride Chromium Chromium 6+ Copper Fluoride	v v	0.1 0.01 0.001 7.4 1060
- 140	Hardness (as CaCO ₃) Iron Lead Magnesium Nickel pH Units	< <	0.06 0.001 96 0.01 7.4
	Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	· · · · · · · · · · · · · · · · · · ·	0.027 349 4020 1050 13.4 0.1

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



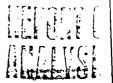
Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 3 OF 13 PAGE

-costomes Navajo Refining Com

ADDRESS Drawer 159

city Artesia, NM 88210

ATTENTION: Ed Kinney INVOICE NO 104223



Ì			
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	«	0.1 72 0.002 225 1632
104	Chromium Chromium 6+ Copper Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium	<	0.1 0.01 0.002 5.8 1160 0.1 0.001
	Nickel pH Units Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	<	0.01 7.2 0.001 214 4920 1520 0.36 0.1

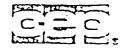
Sample Analysis by: BP

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





ONEY ANAYA

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.

- 2. The WQCC Regulations do not provide exemptions for 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 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?
- 5. On page 4-17, the statement is made that direct 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 ditch.
 - (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,

DAVID G. BOYER
Hydrogeologist

cc: OCD Artesia Field Office

NMEID Hazardous Waste Section

David Griffin, Navaio Refining Co.

Ltæ Authorized agen(ARTICLE NUMBER S of addressee P 505 905 848 RECEIPT FOR CERTIFIED MAIL NO INSURANCE COVERAGE PROVIDEDto whom and date signature NOT FOR INTERNATIONAL MAIL Randall RESTRICTED DE (The restricted delivery for the return receipt fee.) (See Reverse) ARTICLE ADDRESSED TO: to whom, Sent to Randall T. Hicks (Always obtain RÉGISTERED CERTIFIED Street and No. 500 Copper Ave N. W. SENDER: Show 1 P.O., State and ZIP Code ALDQ., N.M. 87102 PS Form 3811, Dec. 1980 RETURN RECEIPT, REGISTERED, INSURED AND CERTIFIED MAIE

Geoscience Consultants, Ltd.



DIL CONSERVATION DIVISION

DEC 11 1984

RECEIVED

December 7, 1984

Mr. Richard L. Stamets Oil Conservation Division, Room 206 310 Old Santa Fe Trail Santa Fe. New Mexico 87501

RE: Submission of Hydrogeology and Process Description Report

Dear Mr. Stamets:

Navajo Refining Company and Geoscience Consultants, Ltd. are pleased to submit Sections 1.0-6.0 of the ground water discharge plan for Navajo Refining Company's Artesia, New Mexico facility. This document contains the detailed report on site hydrogeology and process descriptions pursuant to the schedule contained in the permission to discharge without an approved plan dated September 19, 1984.

Pursuant to the schedule contained in your September 19, 1984 letter, OCD shall provide Navajo (and Geoscience Consultants, Ltd.) with comments on this submission on or before February 7, 1985. We do request, however, that your staff contact us as questions or comments arise so that we can address them in the most timely fashion.

If you have any questions please contact me at our Albuquerque office.

Sincerely, GEOSCIENCE CONSULTANTS. Ltd.

Randall T. Hicks Vice President

Enclosure

cc. Mr. David Griffin, Navajo

Mr. Joel Carson, Esq., Losee, Carson and Dickerson

Mr. David Boyer, NMOCD, w/o enclosure

OIL CONSERVATION DIVISION

DEC 11 1984

RECEIVED

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 waste-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 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.

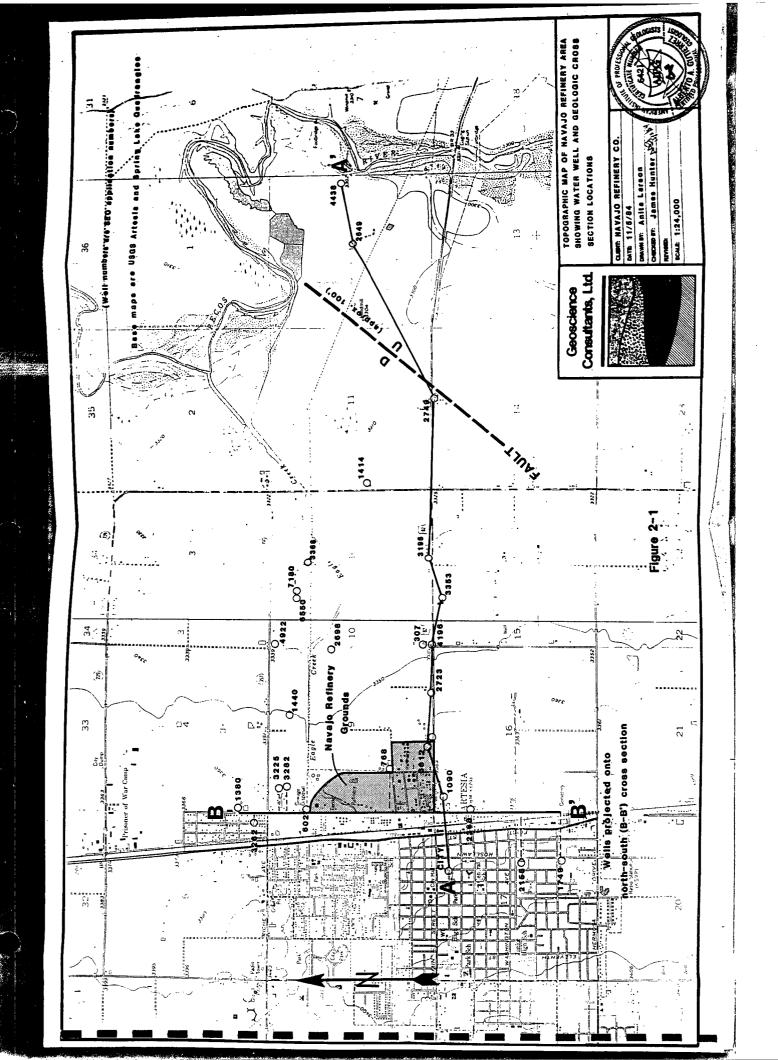
2.0 LOCATION AND PHYSIOGRAPHY

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

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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

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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.

Figure 4-1 Geologic Map of Artesia area

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.

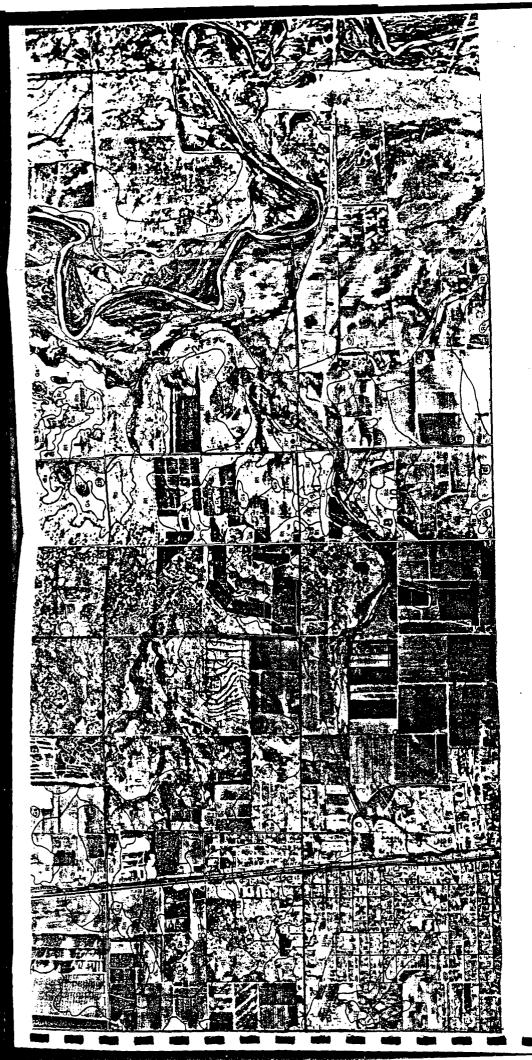


Figure 4-2 Characteristics and distribution of soils in Artesia area.

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	Pepth from surface	+ 09 + 10	79-0	0-72 24-50	9-0
	Depth to bedrock, hard callche, or grosum	Hore than 60.	Mare then 60.	Hare than 60.	Hore than 60.
	Soil series and map symbols	Arno: AM, Ak, An (for Nariey part of AM and Ak, see	Herbey: Ho. Hh	Kerro: 68, 61, 6r, 5u, 69	Pias: PH, Pe, Pn, Pv

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

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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

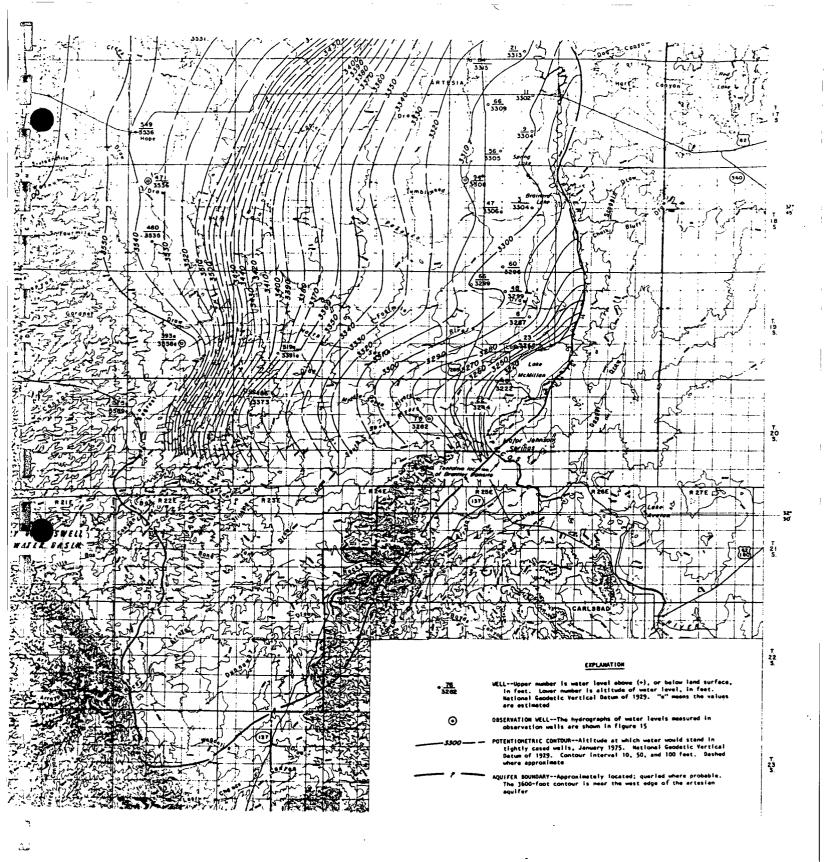


Figure 4-4 Potentiometric surface of deep aquifer (Welder, 1983)

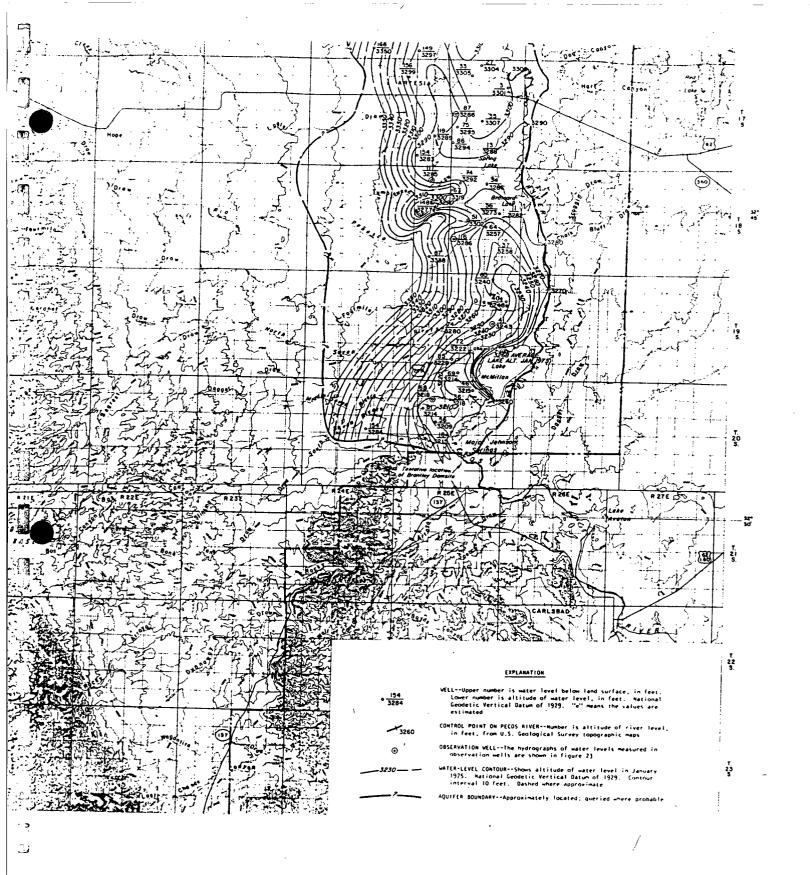


Figure 4-5 Potentiometric surface of shallow aquifer (Welder, 1983)

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.

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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).

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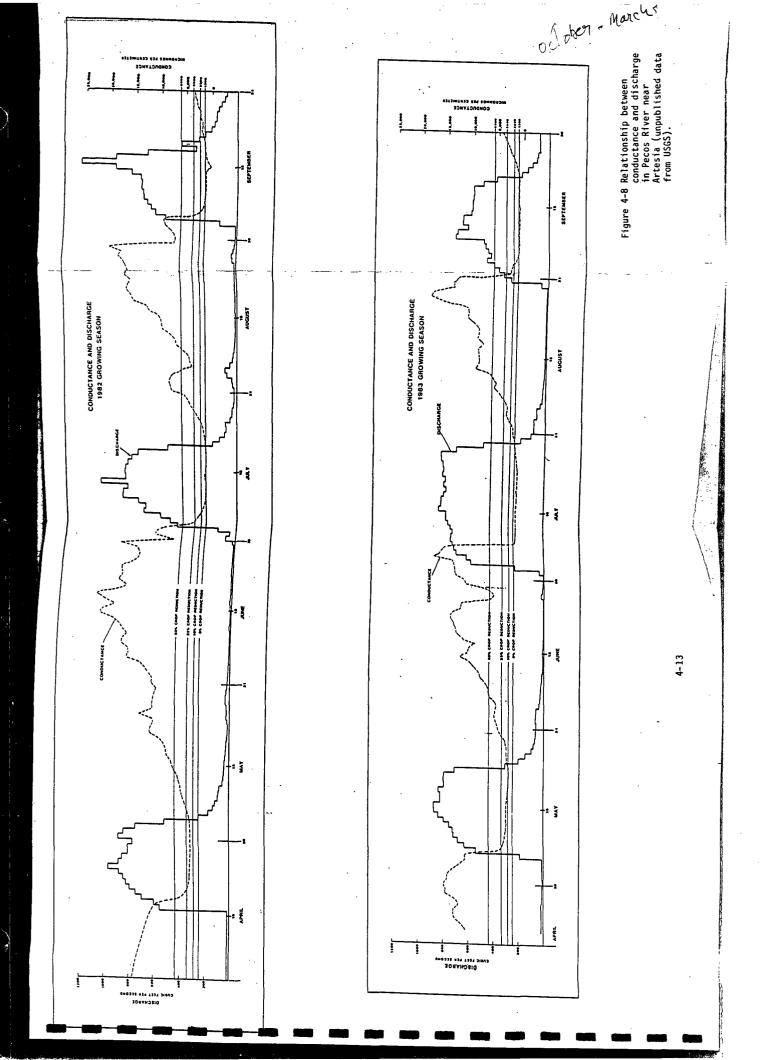
In some areas there is evidence for the existence of an isolated, discontinuous perched-water aquifer, which lies on top of clay or anhydrite lenses above the confined shallow aquifer. Very shallow (10-30 feet), low-production wells may have tapped this "gyp water" in the past and used the production 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. The 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.

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4.6 GROUND WATER QUALITY

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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. Direct 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
- Alkylation
- 4) Reforming

13

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	ION	PROCESS UNIT	WASTE STREAM SOURCE NUMBER	
South	Division	Cooling Tower		south division I Separator
South	Division	Boilers	sy st ov in	fire control stem water orage ponds erflow directly to colveyance tch
South	Division	Crude Unit Desalter (D-130)		south division I separator
South	Division	Crude Unit Overhead Accumulaton (D-140)		south division I separator
South	Division	Crude Unit Stabilizer (D-202)		south division I separator
South	Division	Alkylation Unit Regenerator	6 To	API separator
	Division Unit	Cooling Tower and Vacuum Unit		south division I separator
South	Division	Crude Unit Straig Run Gasoline stabilizer (W-58		API separator
North	Division	Crude Unit Desalters (D-1, D-2)	oi	north division 1/water Darator
North	Division	Cooling Tower	oi	north division 1/water parator

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

3) 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)

WBCC 3-103 STANDARDS	CRUDE UNIT PROCESS (#4, #11, #13)	CAT. CRACKER PROCESS SEFORE SOUR WATER STRIPPER	SOUR WATER STRIPPER EFFLUENT (#17)	ALKY. NEUTRALIZING SEWER (#6)	ND & SD DESALTERS (#3, #9)
As					
£a 0.4					
Cd					
Cr CN	<0.1 <0.1	<0.1	<0.1	7.8	
611	\0.1	<0.1	<0.1	<0.1	<1.0
F	1.3	0.5	0.4	10.8	
f'b	•				
Нд					
и0 ²					
Se An					
Ag V					
CI					
Cu .					
Fe	<0.1	3.9	17.0	7.8	
Ħn	.*		• • • • • • • • • • • • • • • • • • • •		•
SO*					
TDS	805	2160	560	2872	2524
Zn pH	(0.1	₹0.1	0.12	18.8	
Al	6.3	9.0	9.5	3.6	
B					
Ce					
Mo					
Ni					
Phenols	9. 9	710	250	0.26	
TSS					
Cond.	1202	0770	1700	0070	
NH4	78	8379 2320	1702 256	8870	600
5	6 4	180	7.7	<1 1.4	5.0 <1.0
	- -	•••	* 1 *	4.7	×1.0

Table 5-2 (continued)

BOILERS

MGCC 3-103	S.D.	N.D.	N.D.
PARAMETERS	BOILER Blowdown	HIGH FRESSURE BOILER	LOW PRESSURE 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 ₃	.2	.1	.05
Se			
Ag	<.05	<.05	₹.05
บ	(.05	<.05	<.05
C1	127	73	44
Cu	<.03	<.03	⟨.03
Fe	1.9	0.65	0.25
Ħn	.07	<.03	<.03
SD	1549	1242	693
TDS	4220	2873	1807
Zn	.06	<.01	<.01
На	11.6	11.6	11.2
A1	<1.0	<1.0	⟨1.0
В		42	.01
Co	<.01 <.5	.02 <.5	.01 <.5
No.	<.05	<.05	⟨.05
Ni	₹.05	/.03	1.03
Phenols	20	0	0
TSS Cond.	4000	5000	2800
COD	116	0	0
NH4	110	v	•
S			
•			

Table 5-2 (continued)

COOLING TOWERS

WQCC 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)
As	.004	<. 0 01	.011	001
₽a	<.1	₹.1	⟨.1	.001
Cd	<.01	₹.01	<.01	<.1
Cr	.06	1.05	⟨.05	<.01
CN		*****	1.00	0.22
F	1.6	4.4	2.2	1.6
Pb	.05	.05	<.05	.05
Hg			(176	.00
N O ₃	.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
SO SO	1077	1461	1236	1067
TDS*	1906	2732	1694	1973
In	.48	28	<.01	.17
рН	7.6	6.9	7.7	8.0
Al	<1.0	<1.0	1.0	<1.0
B				
Co	<.01	.01	.02	.01
ño	<.5	<.5	<.5	⟨.5
Ni	<.05	<.07	₹.05	<.05
Phenols				
TSS	13	Ō	67	0
Cond.	0	0	108	1800
COD	1850			15
NH.	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 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 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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DEC 11 1984

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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

STATE ENGINEER OFFICE

WELL RECORD F他D DUR. US Section 1. GENERAL INFORMATION (A) Owner of well Navajo Refining Co.

Street or Post Office Address P.O. Drawer 159

City and State Anteria, New Mexico Owner's Well No. _ Well was drilled under Permit No. R-6143-X-2 and is located in the: a NW % NW % NW % % of Section 12 Township 175 Range 268 _ of Map No. __ _____ of the ___ ____ of Block No. ____ c. Lot No. ___ _____ County. Subdivision, recorded in _ feet, N.M. Coordinate System_ Zone in . Grant. the. (B) Drilling Contractor H&W Entenprises License No. WD-675 Address P. O. Box 437 Antonia, New Mexico 6-16-77 Completed 6-16-77 Type tools cable ___ Size of hole _______in. Drilling Began ____ Elevation of land surface or _____ __ at well is___ ____ ft. Total depth of well___ Depth to water upon completion of well _______ Completed well is shallow artesian. Section 2. PRINCIPAL WATER-BEARING STRATA Estimated Yield ... Depth in Feet Thickness. Description of Water-Bearing Formation (gallons per minute) in Feet From To N/A Section 3. RECORD OF CASING Pounds Threads Depth in Feet Length Perforations Diameter Type of Shoe per foot (inches) per in. Top Bottom From To P18 P/e 850 22 19 20 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Cubic Feet Sacks Method of Placement Diameter of Mud of Cement N/A Section 5. PLUGGING RECORD Plugging Contractor . Address Depth in Feet Cubic Feet No. Plugging Method of Cement Date Well Plugged Plugging approved by: 2 State Engineer Representative

FOR USE OF STATE ENGINEER ONLY

Date Received

_ FWL ____

File No. RA-6/43-X-2

Use OBS. \$ EXPL. Location No. 17.26. 12

STATE ENGINEER OFFICE

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City and	State	eria, Nei	w Wexico							
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(inches) 891)	per foot	P/E	Depth Top 2 ction 4. RECO	Botto 23 RD OF M	m UDDING	Length (feet) 25 AND CEM	P/E	OG F	rom	То
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(inches) 89) Depth	per foot 4 in Feet To	per in. P/E Sec	Depth Top 2 ction 4. RECO	Botto 23 RD OF M	m UDDING Cubic	Length (feet) 25 AND CEMIFECT	P/E	OG F	rom	То
(inches) 89) Depth	in Feet To	per in. P/E Sec	Depth Top 2 ction 4. RECO	Botto 23 RD OF Miks	m UDDING Cubic	Length (feet) 25 AND CEMIFECT	P/E	OG F	rom	То
(inches) 89) Depth	in Feet To	per in. P/E Sec	Depth Top 2 ction 4. RECO	Botto 23 RD OF Miks	m UDDING Cubic	Length (feet) 25 AND CEMIFECT	P/E	OG F	rom	То
(inches) 89) Depth	in Feet To	per in. P/E Sec	Depth Top 2 ction 4. RECO	Botto 23 RD OF Miks	m UDDING Cubic	Length (feet) 25 AND CEMIFECT	P/E	OG F	rom	То
(inches) 851) Depth From	in Feet To	per in. P/F Sec. Hole Diameter	Depth Top 2 ction 4. RECO Sac of M	Botto 23 RD OF Miks	m UDDING Cubic of Ces	AND CEMI Feet ment	P/E	OG F	rom	То
Depth From	in Feet To	per in. P/F Sec. Hole Diameter	Depth Top 2 ction 4. RECO Sac of M	In Feet Botto 23 RD OF M ks ud N/A	m UDDING Cubic of Ces	AND CEMI Feet ment	P/E ENTING Meth	od of Place	ment	To 22
(inches) 851) Depth From	in Feet To	per in. P/F Sec. Hole Diameter	Depth Top 2 ction 4. RECO Sac of M	In Feet Botto 23 RD OF M ks ud N/A	m UDDING Cubic of Ces	AND CEMI Feet ment	P/E ENTING Meth	od of Place	ment	То
Depth From lugging Controlddress lugging Metholate Well Plug	per foot 4 in Feet To	per in. P/F Sec. Hole Diameter	Depth Top 2 ction 4. RECO Sac of M	In Feet Botto 23 RD OF M ks ud N/A	m UDDING Cubic of Ces	AND CEMI Feet ment ECORD No.	P/E ENTING Meth	od of Place	ment	To 22 bia Feet
Depth From	per foot 4 in Feet To	per in. P/F Sec. Hole Diameter	Depth Top 2 ction 4. RECO Sac of M	In Feet Botto 23 RD OF M ks ud N/A	m UDDING Cubic of Ces	AND CEMI Feet ment LECORD	P/E ENTING Meth	od of Place	ment	To 22 bia Feet

File No. RA-6/43

RELD ENCR. LOG

					L INFORMAT			#9		
) Owner of	well Nav	ajo Reli	ring (o.				Own	er's Well No.		
Caa	Post Office Ad	drage UNG	wer 179							
City and	State Ant	esia, Nev	n Mexico					· · · · · · · · · · · · · · · · · · ·		
il was drilled	t under Permit	No. <u>RA</u> -	6143-X-9		and is lo	cated in ti	ne:			
			% of Se						-	_N.M.P.I
			o							
c. Lot No Subdiv	vision, recor t e	of Block No		01	f the _ County.			· · · · · · · · · · · · · · · · · · ·		
		_ feet, Y=		fee	t, N.M. Coordi	nate Syst	·m			Zone i
	Н	& W Ente	erprises			ì	icense No	WD-675	_	
			tesia. New					•		
			mpleted6						hole	99D i
										•
vation of lat	nd surrace or _				, wen b		. Total ucpt	11 O1 WEB		
mpleted well	lis 🗆 si	hallow 🔲	artesian.		Depth to	water upo	n completic	n of well	2	1
		e	ection 2. PRIN	CIPAL WA	TER.REARIN	IC STRA	ra -			
Dinth	in Feet	Thickne		CIFALWA	TEN-BEARIN	O SI KA		Esti	nated Y	'ield
From	To	in Fee	1	Description	n of Water-Bear	ing Form	ation		nateu i is per m	
110										
					N/A_					
										
		\	Sectio	n 3. RECC	ORD OF CASI	NG				
Diameter	Pounds	Threads	Depth	in Feet	Lengt		Type of Sh	<u></u>	Perfora	tions
(inches)	per foot	per in.	Тор	Bottor	m (feet)	1700 01 31	F	om	То
890	4	P/E	2	21	23		P/E		3	20
•										
				ļ						·
			tion 4. RECO	· · · · · · · · · · · · · · · · · · ·		CEMENT	ING			
Dah	in Foot	Hole	Saci		Cubic Feet of Cement		Meth	od of Placen	nent	-
Depth From	in Feet To	Diameter	r of M	44						
			of M	40		<u> </u>	···			
	To		r ot M		N/A				•	
	То		r ot M		N/A				•	
From	To	Diamete	Section		<i>N/A</i>	RD			•	
From	To	Diamete	Section		GING RECOR		Death :	Feet	•	
From ugging Contriderss	To	Diameter	Section		GING RECOR	RD .	Depth it	r Feet Bottom	Cut	nic Feet Cement
From ugging Control ddress ugging Metho ste Well Plug	To	Diameter	Section		GGING RECOR	io.			Cut	nic Feet
From ugging Control ddress ugging Metho ate Well Plug	To	Diameter	Section		GGING RECOF	lo.			Cut	is Fest
From lugging Contr	To	Diameter	Section	on 5. PLUG	GGING RECOR	io.			Cut	nic Feet

Use OBS. 4 EXP2. Location No. 17.26, 12, 24243

דוצוש באטא נוספ

			Section	I. GENERAI	L INFORM	ATION		# 12		•
Owner of	well Navaj	o Refirir	a Co.	v			0w	ner's Well N	o	
C	Post Office Ad State	dress UNCH	ren 159							
•	under Permit					located	- the			
	under Permit							268		N M B
_										N.M.P.
	No							•		
	o vision, recoRtec						-			
		_ feet, Y=		feet,	N.M. Coo	rdinate S	ystem			Zone :
	Contractor	H & W Enti	PARAIARA	, , , , , , , , , , , , , , , , , , , ,			1 icense No	WD-675	_	
								•		
	Box 437	•								-000
	6-22-7									•
vation of lai	nd surface or			at '	well is	•	_ ft. Total dep	th of well	19	
mpleted wel	lis 🗆 sł	nallow 🔲	artesian.		Depth t	o water i	upon completi	on of well _	0	1
		Sec	tion 2. PRIN	NCIPAL WAT	TER-BEAR	ING ST	RATA			
	in Feet	g.	Description	of Water-Bo	earing Fo	ormation		Estimated Yield allons per minute)		
From	То	in Feet			_			Gand	ns per	ninuis)
	<u> </u>						 	- -		
					N/A					
		·				٠.				•
			Section	on 3. RECOF	OF CAS	SING				
Diameter (inches)	Pounds per foot	Threads per in.		in Feet	-	ngth Type of St		hoe		ations
		1	Тор				9.15		From	To
<u>89D</u>	4	PIE	2	19	21		P/E		3	18
·	-	<u> </u>								
•		7	ion 4. RECC	RD OF MUI			ENTING			
Conth	in Feet To	Hole Diameter		ks lud	Cubic Fee of Cemen		Met	hod of Place	ment	
From									*	
			+			_			*	
	ź		1							
	ž .	·	-		N/A	-				
	-				N/A					
	-		Secti	on 5. PLUGO	7	ORD.				
From	actor				7	ORD				
From Ugging Control Idress Ugging Metho	actor				7	No.	Depth i	n Fcet Bottom		bia Feet Cement
From Ugging Control Idress Ugging Methotice Well Plug	actor				7	· · · · · · · · · · · · · · · · · · ·				
From Ugging Conta	actor				7	No.				

	Navaj	io Reliniu		. GENERAL				412		er.
Street or	well <u>Navaj</u> Post Office Ad State <u>Ar</u>	dress U.	rawer 159 w Mexico							
Well was drilled										
	<u> </u>							tange2	16E	N.M.P.M
	No					-		-		
	0									
Subdiv	vision, recorded	l in			County.				=	
d. X= the		_ feet, Y=		(cet, l	N.M. Coo	rdinate S	ystem			Zone in Grant
(B) Drilling C	Contractor	& W Ente	nprises				_ License No:	WD-675	_	······································
Address P.										
Drilling Began .	6-23-77	Соп	pleted6-	<u> 23 - 77</u>	Type	tools	cable	Size	of hole_	897)_in
Elevation of lar	nd surface or _			at w	rell is		_ ft. Total dep	th of well_	21	ft.
Completed well	lis 🗆 sh	allow 🔲	artesian.		Depth t	o water	upon completi	on of well.	0	ft.
		Se	ction 2. PRIN	CIPAL WAT	ER-BEAR	ING ST	RATA			
Depth From	in Feet To	Thicknes in Feet	- 1 *	Description o	f Water-B	earing F	ormation		stimated ' lons per n	
					N/A					
									•	
		, 		n 3. RECORI	D OF CA	SING				
Diameter (inches)	Pounds per foot	Threads per in.	Depth Top	in Feet Bottom		et)	Type of S	hoe	Perfor From	ations To
890	4	P/E	2	21		23	P/E		3	20
					<u>. </u>]				
	:- FA		ion 4. RECOI				ENTING			
From	in Feet To	Hole Diameter	Sack of Mi		Cubic Fee of Cemen		Met	hod of Pla	cement	
									*	
	•	,	<u> </u>		N/A				•	
Plugging Contr	actor		Sectio	n 5. PLUGG	ING REC	ORD				
Address Plugging Metho	od				<u> </u>	No.	Depth Top	in Feet Bottom		bic Feet Cement
Date Well Plug Plugging appro		<u></u>				1 2				
		State En	gineer Repress	entative	F	3 4				
			FOR USE	OF STATE E	ENGINEE	R ONLY	·			
Date Received		•	. 1	Qua	b		FWL		FSL-	

Revised June 1972 FIELD ENGS. LUG

Section 1	CENER	Αľ	INFO	DM A	TION

A) Owner of	well	LAVAN dress	O REFINI Box 1	NG COMPAN 59	Υ	Owner	's Well No	16	
City and S	State	A	rtesia.	New Mexic	a 88210				
	_				••				
a. Slil	% <u>SE</u> %	NE %_	<u>Nill</u> ¼ of Se	ection 12	Township	<u>17 S</u> Ran	ge <u>26</u>	FN.M.P	
b. Tract l	 No	of Map No		of the	:				
N.	*	of Black No		af sh					
								-	
	·	_ feet, Y=				: System			
3) Drilling C	ontractor	Cly	de Tiriue	11		License No	<u>ШD-486</u>	<u>.</u>	
ddress		x 17. Rc	ute 1. A	rtesia. N	ew_Mexico	88210		_	
						Cable			
levation of lan	d surface 🗱 🕳			www.com.com/com/		ft. Total depth	of well	60	
ompleted well	:- [V] -:	nallow 🗆	setacion		Denth to water	er upon completion	of well	10	
ompleted wen	15 42 11	<u>.</u>			•	•	OI WELL		
Depth i	n Feet	See Thickness		CIPAL WATE	R-BEARING S	TRATA	¥	and Vista	
From	To	in Feet		Description of	Water-Bearing	Formation	Estimated Yield (gallons per minute)		
10	25	15	R	ed Sand			NA NA		
28	35	. 7		rāy Sand			NA -		
			_					•	
			Section	n 3. RECORD	OF CASING				
Diameter	Pounds	Threads	Depth	in Feet	Length	Type of Shoe	P	erforations	
(inches)	per feot	per in.	Тор	Bottom	(feet)	Type of Silve	Fror	n To	
8 5/8	28		0	60	60	Texas Patte	rn N	А	
		Sect	ion 4. RECO	RD OF MUDD	ING AND CE	MENTING			
ပင်မှth i From	n Feet To	Hole Diameter	Sactof M		ubic Feet Cement	Method	of Placemen	nt.	
	<u>ن</u>							-	
	:							•	
	-		-			,			
		<u> </u>	<u> </u>						
			Section	on S. PLUGGIN	G RECORD				
	actor					Depth in F	eet	Cubic Feet	
					No.	Тор	Bottom	of Cement	
ddress lugging Metho					<u> </u>	1			
ddress lugging Metho ate Well Plugg	ed	- -							
ddress lugging Metho ate Well Plugg	ed								
	ed		gineer Repres	entative					
ddress lugging Metho ate Well Plugg	ed				3 4	LY			
ddress lugging Metho ate Well Plugg	ed	State En		OF STATE E	3 4	LY			

FIFT DENGR LOG

STATE ENGINEER OFFICE WELL RECORD

			REFINING	COMPANY		Owner's	Well No. 17	
Street or City and	Post Office Add	Art	esia. Ne	159 u Mexico	88210]		
•	under Permit N							
a. <u>SE</u>	% <u>NE</u> %	NE ¼ N	네 ¼ of Sec	tion12	Township _	17 5 Range	. 76 E	N.M.P.
b. Tract !	No	_ of Map No.	· · · · · ·	of the				
	vision, recorded				•		ă	
		feet, Y=		feet, N.	M. Coordinate	System		Zone :
Drilling C	ontractor	Clyde	Tiduell		<u>.</u>	License No	3-406	- -
ddress	. Ro	× 17, Ro	ute 1. Ar	rtesia, N	ем Мехісо	88210		
rilling Began .	3/29/81	Comp	oleted3/	29/81	_ Type tools	Cahle	_ Size of hole	<u> </u>
evation of lan	nd surface ar			at wel	l is3305_	ft. Total depth of	well3	f
ompleted well	lis 🗔 sh	allow 🔲 a	rtesian.		Depth to water	r upon completion o	f well1	f
				IPAL WATE	R-BEARING S	TRATA ,		
Depth From	in Feet To	Thickness in Feet	מ	escription of '	Water-Bearing I	Formation	Estimated ' (gallons per n	
10	28	18	R	ed sand			NA	•
-								
			Section	3. RECORD	OF CASING			
Diameter (inches)	Pounds per foot	Threads per in.	Depth i	n Feet Bottom	Length (feet)	Type of Shoe	Perfor From	ations To
8 5/8"	28		0	30	30	Texas Patte		
								1
		Secti	on 4 RECOR	D OF MUDD	ING AND CEM	AENTING		
	in Feet	Hole Diameter	Sack of Mu	s Ci	bic Feet		of Placement	
From	То	Diameter	OI MU	01	Cement			
	-		 	_				
	-		 				<u>_</u>	
*	<u> </u>		 					
				n 5, PLUGGIN	G RECORD			
ddress	actor	<u> </u>			No.	Depth in Fe		bic Feet
Ivaniaa Mathe	od ged				No.	Top E	lottom of	Cement
					2			
	wed by:							
ate Well Plug	wed by:	State Eng	uneer Represe	ntative	3			
Pate Well Plug						LY		
ate Well Plug				OF STATE EN	4 IGINEER ONI	LY FWL	FSI	

EIELD ENGR. LOG

A) Owner of Street or I	Page Office Add		80x 159				Own	er's Well No	18	
City and s Well was drilled							n the: Obs	ervation	/Mont	itor wel
a. <u>Niu</u>	<u> </u>	Nid ¼	¼ of Se	ction 9	To	wnship <u>1</u>	75 R	inge <u>26 (</u>		N.M.P.M.
b. Tract ?	No	_ of Map No		of th	ne					
		of Block No								
Subdiv	ision, recorded	in			County					
		. (cet, Y=		feet, l	N.M. Co	ordinate S	ystem			Zone in Grant
3) Drilling C	ontractor	Hughes D	rilling	Company			_ License No	WD 749		
ddress		Box 199A	, Route	1, Artes	sia,	N M 8	3210			•
rilling Began	6/8/82	- Compi	leted6	/8/82	Тур	e tools A1:	rotary	Size of	hole 7	- 7/8 in
levation of lan	d surface or _	casing	·	at w	ell is	3364	_ ft. Total dept	h of weil	19	ft.
ompleted well	477	allow 🗆 ar					ipon completio			
ompleted wen	15 42 31			.c.p. 1 W. 7		·		n 01 wen 111		
Depth i	n Feet	Thickness		CIPAL WATI	•		*****	Esti	mated Y	'ield
From	То	in Feet		Description of				+	s per π	inute)
16	19	3	Pin	e anhydr:	itic	sand a	nd red sha	18	NA	
						; ·				
							<u>-</u> ·			
										·
. <u>.</u>				3 DECODE					·	
Diameter	Pounds	Threads		in Feet	Г	ength	Tues of Sh		Perfor	ations
(inches)	per foot	per in.	Тор	Bottom	-	feet)	Type of Sh	F	rom	То
6	PVC		<u></u>			20			15	19
								· .		
			. •							
, .		Section	n 4. RECO	RD OF MUD	DING A	ND CEMI	INTING			
Depth		Hole Diameter	Sac of M	ks (Cubic F	cet		od of Places	nent .	
From	To 12 ₹	Prameter	OI M	40	or Cem	ent	hand			
0							Hariu		<u> </u>	
			Section	on 5. PLUGGI	ING RE	CORD				
lugging Contra	ictor									
ddress	d -					No.	Depth in	Feet Bottom		bic Feet Cement
ate Well Plugg	ed					1	100	Bottom	- Oi	Cement
gging approv		Cana Feet	B	,	···········	3			-	
		State Engi	neer Repres	entative		_4				
ate Received	June 22.	1982	FOR USE	OF STATE	ENGINE	ER ONL	•			
110001104				Qua	ıd bı		FWL		_ FSL.	
File No	RA-6969			Use Obs .	/Moni	toring	ocation No.	17.26.9.	13111	

EIELD ENGR. LOG

Street or I	Post Office Add	dress	Bax	159			Owner	's Well No	19	
	under Permit I						in the: Observa	ation/Mo	nito	r
							1.75 Ran			
						-		_		
	_									
c. Lot No	ision, recorded	of Block No in		of ti	County.				=	
	•			•			System		=	Zone iz
		. 1001, 1 =	····			IGINALE	System		_	Grant
B) Drilling C	ontractor	Hugh	es Orill	ing Comp	апу		License No	WD 749		···
ddress		Route	1, 80× 1	99A, Art	esia,	NM	88210	· · · · · · · · · · · · · · · · · · ·		
rilling Began	6/9/82	Comp	ieted <u>6</u> /	9/82	Туре	tools A	ir Rotary	Size of I	hole 7	7/8 in
levation of lan	d surface or	casi	na	at w	ell is 33	67	ft. Total depth	of well	19	ft
							upon completion			
ompleted well	is 🔯 sh							or well	10	п
Depth i	n Feet	Sec Thickness		CIPAL WAT	ER-BEAR	ING ST	RATA	Fetim	ated Y	rield.
From	То	in Feet	1	Description o	f Water-B	earing F	ormation	(gallons		
15	18	3	fin	e anhydr	itic s	and a	and shale	NA 		
					"-	:				
								•		
										<u>-:</u>
1										
	D 4-			n 3. RECOR			 	-	Perfor	
Diameter (inches)	Pounds per foot	Threads per in.	Тор	Bottom		et)	Type of Sho	·	om	To
6	PVC					20			15	19
•										
	,	·.		<u> </u>						-
		Secti	on 4. RECO	RD OF MUD	DING AN	ID CEM	ENTING			
	in Feet	Hole Diameter	Sac of M	ks	Cubic Fee	et		d of Placem	ent *	
From	To 12 ±	Diameter	01.54	40	3	-	hand	· · · · · · · · · · · · · · · · · · ·	-	
	12 ±						118110			
	*		ļ							
		<u> </u>	<u> </u>					<u> </u>		
Physics Control	actor		Section	on 5. PLUGG	ING REC	ORD	•			
Address					<u> </u>	No.	Depth in l			bic Feet
ate Well Plugg	•					1	Тор	Bottom	of	Cement
negrus approv	ved by: 				F	2				
		State Eng	incer Repres	entative		4				
Date Received	June 22,	1982	FOR USE	OF STATE	ENGINE	R ONL	Y			
							FWL _			
File No	RA-6970			_{Use} Mon1	itoring		Location No. 17	.26.8.24	234	

STATE ENGINEER OFFICE

WELL RECORD

FIELD ENGR. LOG

			_
 •	CENERAL	INFORMATION	

l was drilled کے ک		No	RA 6972		and is located	in the: observ	/ation/mor	nitor
		Nm %	¼ of Se	ction 9	Township	17 S Ran	ge <u>26 E</u>	N.M.P.
b. Tract	No	_ of Map No.		of the				···········
c. Lot No	_	Elock No	·	of the				
	•			с				-
d. X= the		. feet, Y=		feet, N.	M. Coordinate S	System		Zone Gran
Drilling C	ontractor	Hughe	s Drilli	ng Compan	/	License No	<u> WD 749</u>)
tress		Route 1	. Box 19	9A. Artes	ia, N M	88210		
ng Biguni.	<u> </u>	Comp	pleted <u> </u>	/9/82	Type toolsE	ir rotory	Size of hol	e <u>77/8</u>
vation of lar	nd surface or	casing		at wel	is3366_	_ ft. Total depth	of well2[
npleted well	lis 🔀 sh	ailow 🗆 a	artesian.		Depth to water	upon completion	of well	11
.,,				CIPAL WATER	-	•		
Depth	in Feet	Thickness		Description of \	**************************************			ed Yield
From /	To 18	in Feet				itic send	(gations pe	er minute)
	10		121	e 180 u g.	ay amiyut	1010 3840	·	·· · · · · · ·
								
								· · · · · · · · · · · · · · · · · · ·
			Ì					
			Section	on 3. RECORD	OF CASING			
Diameter	Pounds	Threads		in Feet	Length	Type of Sho	Per	rforations
(inches)	per foot	per in.	Тор	Bottom	(feet)	0,700	From 16	
6	PVC			 	20			
				ļ				
							<u>. </u>	
		Secti	on 4. RECO	RD OF MUDDI	NG AND CEM	ENTING		
Depth 1-rom	in Feet To	Hole Diameter	Sac of M		bic Feet Cement	Metho	d of Placemen	· 🚅
0	12 =				3	hand		-
	á							
			 					
	L		1	1		· · · · · · · · · · · · · · · · · · ·	······································	
			Section	on 5. PLUGGIN	G RECORD			
	actor					Death in I	200	
• -					No.	Depth in I	Bottom	Cubic Feet of Cement
dress gging Metho		_			— <u> </u>			
dress gging Metho	ged				1 2			
dress gging Metho Well Plug	ged		ineer Repres	entative	- 2 3 4			

Section 1 GENERAL INFORMATION

FIELD ENGR. LOG

NAMATO GESTAINS COMBANY	
Owner of well NAVAJO REFINING COMPANY Owner's Well No Street or Post Office Address Bax 159	21
City and State Artesia N M 88210	
ell was drilled under Permit No. RA 6971 and is located in the: Observation/	monitor
(1) a. NE % Nltt % SE % % of Section 9 Township 17 5 Range 26	
b. Tract No of Map No: of the	·
c. Lot No of Block No of the County.	-
d. X= feet, Y= feet, N.M. Coordinate System	- -
the	Zone
Drilling Contractor Hughes Drilling Company License No. UD	749
dress Route 1, Box 199A, Artesia, N.M. 88210	
illing Began6/11/82 Completed6/11/82 Type tools Air_rntary Size o	
evation of land surface or <u>Casing</u> at well is <u>3362</u> ft. Total depth of well	
mpleted well is 🔀 shallow 🗆 artesian. Depth to water upon completion of well	f
Section 2. PRINCIPAL WATER-BEARING STRATA	
Description of Water-Bearing Formation	imated Yield ns per minute)
From 10	
16 20 4 fine gray anhydritic sand & shale	NA
·	
. Section 3. RECORD OF CASING	
Diameter Pounds Threads Depth in Feet Length (inches) per foot per in. Top Bottom (feet) Type of Shoe	Perforations To
	29 33
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Sacks Cubic Feet	· ·
Depth in Feet	ment 🔹
0 12 3 hand	-
12 33 gravel pack	
12 33 gravel pack	
Section S. PLUGGING RECORD	
ugging Contractor Denth in Feet	Cally East
ugging Method No. Top Bottom	Cubic Feet of Cement
rice Well Plugged	
State Engineer Representative 3	
FOR USE OF STATE ENGINEER ONLY	
te Received June 22, 1982	
Quad FWL FWL FWL 17.25.0	

EIELD ENGR. LUG

A) Owner of	well	VAVAJO REF	INING COMP	ANY		Owne	r's Well No.	22
Street or	Post Office Add	dress	<u>Drawer l</u> rtesia. N		210			
ell was drilled	under Permit !	No. RA b	975	a	nd is located	in the:		
					-	Rai	•	
	-							
								=
•					-			-
					Coordinate	System		Zone Gran
Drilling (Contractor	S. Dale H	ughes			License No	ШО 749	
ddress	Routi	9 1. Box 1	9 9 A. Arte:	sia. NM	88210]		
rulling Began	June 1	4. 182 omple	ted June	14. '82 ₁	ype tools	Air Rotary	Size of I	nole 7 7/8 i
evation of la	nd surface or			at well is	3359	ft. Total depth	of well	19f
ompleted wel						r upon completion		
ompietea wei	115 250 51					-	or wen	
Denth	in Feet	Section Thickness	on 2. PRINCIPAL	_WATER-B	EARING S	TRATA	Estim	ated Yield
From	To	in Feet	Descrip	tion of Wa	ter-Bearing	Formation		per minute)
16	18	2	gyp sar	nd.	,		пе	Ľ
					,	- april		
				 	·		 	· · · · · · · · · · · · · · · · · · ·
	1					•	L	
Diameter	Pounds	Threads	Section 3. R Depth in Fee		Length			Perforations
(inches)	per foot	per in.		ottom	(feet)	Type of Sho	œ <u>├</u> ──	om To
6					26		16	20
							~	
								-
		Section	4. RECORD OF	MUDDING	G AND CEN	1ENTING	 	
Depth From	in Feet To	Hole Diameter	Sacks of Mud		Feet	Metho	od of Placem	ent -
0	4 =	8			3	hand		<u> </u>
····	:		-					
						······································		
		<u> </u>				· · · -		
			Section 5. P	LUGGING	RECORD			
					-`	Denth in	Foot	
	od bo				No.	Top Depth in	Bottom	Cubic Feet of Cement
ate Well Plug	ged				- 💷			
reging appro	oved by:		•		2			
		State Engin	eer Representativ	e	$-\frac{3}{4}$	+		
			FOR USE OF ST	TATE ENG	NEER ON	LY		
ate Received	August 1	9, 1982		04				For
		· .		-		FWL _		
File NoR	A-6975		Use	<u>Obser</u>	vation	Location No.	17.26.9	9.31222 -

EIELD ENGR. LOG

Street of Po	ost Office Add	ress	Draw	er 159		Owner'	s Well No	23
City and St	ate	Art	esia. N	M 8821	88			
· ·					and is located i	in the:		
a. <u>NE</u>	% <u>Nill</u> %	<u> </u>	¼ of Se	ction9	Township	17 5 Rang	e <u>26 F</u>	N.M.P.M
b. Tract No	O	of Map No		of the				
c. Lot No. Subdivis	sion, recorded	of Block No		of the	ounty.			
d. X=						ystem	· ·	Zone in Grant.
3) Drilling Co	ntractor	S. Dala	Hughes			License No. 1	749	
ddress	Rout	2 1, Box	199 A.	Artesia.	N M 8821	.0		<u></u>
rilling Began <u> </u>	6/28/82	Compl	eted <u>6/</u>	'28/82	_ Type toolsB	ir Rotary	Size of h	ole <u>7 7/</u> 8in.
levation of land	surface or			at wel	is3363	_ ft. Total depth o	of well	ft.
ompleted well i	is 🗔 sh	allow 🗆 ar	tesian. Mo	nitor	Depth to water t	upon completion o	of well	9 ft.
Depth in	Feet	Secti Thickness	1		R-BEARING STI		Estima	ted Yield
From	То	in Feet			Water-Bearing Fo	ormation	(gallons ;	per minute)
15	17	2	Anh	yritic sa	nd .			na
					-			·
					 			
						•		
				n 3. RECORD	T			
Diameter (inches)	Pounds per foot	Threads per in.	Depth Top	in Feet Bottom	Length (feet)	Type of Shoe	Fron	erforations n To
6	PVC				20		15	20
					-			
			•					
D	- Fire				ING AND CEME	NTING		
Depth in From	To	Hole Diameter	Saci of M		bic Feet Cement	Method	of Placeme	nt 靠
0	7 z	8			3	Hand		
	å							
lugging Contrac				on 5. PLUGGIN	G RECORD	. ,		
ddress	 				No.	Depth in F	eet	Cubic Feet
lugging Method Jace Well Plugge						Тор	Bottom	of Cement
ng approve				•	2 3			
		State Engit	neer Repres	entative	4			
			FOR USE	OF STATE EN	GINEER ONLY	·		
ate Received	August 19	, 1982				FWL	•	Eci
				Quad			7.26.9.3	

EIELD ENGR. LOG

Street or Post Office Address	() Owner of	well	DLAVAN	REFININ	G COMPANY		Own	er's Well No.	2	4
Il vas drilled under Permit No. RA 6975 X 2 and is located in the: RA 6915 X 2 and is located in the: RA 6915 X 2 and is located in the: RA 6915 X 2 and is located in the: RA 6915 X 2 and is located in the: RA 6915 X 2 and is located in the: RA 6915 X 2 and is located in the: RA 6916 X 2 and is located in the: RA 6916 X 2 and is located in the: RA 6916 X 2 and is located in the: RA 6916 X 2 and is located in the: RA 6916 X 2 and is located in the: RA 6916 X 2 and is located in the: RA 6916 X 2 and is located in the: RA 6916 X 2 and is located in the: RA 6916 X 2 and is located in the: RA 6916 X 2 and is located in the: RA 6916 X 2 and is located in the: RA 6916 X 2 and is located in the: Cannot be compared to the compared of the county.	Street or	Post Office Add	dress	<u>Drawi</u>	er 159 m	88210			·	
b. Trect No of Map No. of the County. c. Lot No. Fof Block No. of the County. d. Xe feet, Ye feet, NM. Coordinate System Zone: County. d. Xe feet, Ye feet, NM. Coordinate System Zone: Gran Disting Contractor S. Dale Hughes License No. UD 749 dires Rauta 1, Box 199A, Artesia, N M 88210 dires Rauta 1, Box 199A, Artesia, N M 88210 dires the stream of land surface the stream of the strea	•					•				
b. Tract No of Map No of the	ell was drilled	under Permit !	No		5975 X 2	_ and is located	in the:			
c. Lot No For Block No Country	aE	<u> </u>	SW % NW	¼ of Se	ction 9	Township _	<u>17 5</u> R	inge <u>26 F</u>	•	N.M.P.N
c. Lot No For Block No Country	b. Tract	No	_ of Map No.		of the	·				
Subdivision, recorded in										
Drilling Contractor S. Dale Hughes License No. LUD 749 Drilling Contractor S. Dale Hughes License No. LUD 749 Grant							······································		=	
The Section 3. RECORD OF CASING Diameter Pounds Threads Depth in Feet (inches) per foot per in. Top Bottom To Diameter of Mud Castes Section 4. RECORD OF MUDDING AND CEMENTING Section 4. RECORD OF MUDDING AND CEMENTING Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Section 6. PUC Section 7. PLUGGING RECORD Section 7. PLUGGING RECORD Section 7. PUGGING RECORD Section 8. PLUGGING RECORD Section 9. PUGGING RECORD Section 9. PLUGGING RECORD FOR USE OF STATE ENGINEER ONLY FWL FSL	d Y=	•	feet Y=		feet_N	M. Coordinate	System		-	Zone
Raute 1, Box 199A, Artabla, N M 88210										
Raute 1, Box 199A, Artabla, N M 88210) Drilling C	ontractor	S. Dale	Hughes			License No	ШО 749		
Section 3. RECORD OF CASING Depth in Feet Length Type of Shoe Perforations From To Depth in Feet Pounds Perform To Depth in Feet Perform To Perform	-									•
Section 2. PRINCIPAL WATER-BEARING STRATA										
Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet Thickness in Feet Description of Water-Bearing Formation Estimated Yield (gallons per minute) 16	illing Began	7/5/82	Comp	leted	5/82	_Type tools 41	r rotary	Size of	hole	<u>8</u> i
Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet Thickness in Feet Description of Water-Bearing Formation Estimated Yield (gallons per minute)	evation of la	nd surface &r _			at we	li is 3362	ft. Total dept	h of well		<u>19</u> f
Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet Thickness in Feet Description of Water-Bearing Formation Estimated Yield (gallons per minute)	ampleted wel	lis 🛣 sh	allow 🗆 a	rtesian.		Depth to water	upon completio	n of well		8 f
Depth in Feet Thickness in Feet Description of Water-Bearing Formation Estimated Yield (gallons per minute)										`
From To in Feet Description of Water-Bearing Formation (gallons per minute) 16 18 2 Anhy sand na Section 3. RECORD OF CASING Section 4. RECORD OF CASING Diameter (inches) Pounds per in. Top Bottom (feet) Type of Shoe From To 6 PUC 20 15 20 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Sacks of Mud of Cement of Cement of Mud of Cement of Ceme	Depth	in Feet					 	Estin	nated \	/ield
Section 3. RECORD OF CASING Diameter Pounds (inches) Per foot Per in Top Bottom (feet) Type of Shoe From To 6 PUC 20 15 20 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Diameter of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Cement Method of Placement of Cement Method of Placement of Cement Method					Description of	Water-Bearing F	ormation			
Section 3. RECORD OF CASING Diameter Pounds (inches) Per foot Per in Top Bottom (feet) Type of Shoe From To 6 PUC 20 15 20 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Diameter of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Mud of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Placement of Cement Method of Cement Method of Placement of Cement Method of Placement of Cement Method	16	18	2	Ani	hy sand				na	
Diameter (inches) Pounds per foot Per in. Top Bottom (feet) Type of Shoe From To 6 PUC 20 15 20 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Diameter of Mud Cement Of Ceme										
Diameter (inches) Pounds per foot Per in. Top Bottom (feet) Type of Shoe From To 6 PUC 20 15 20 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Diameter of Mud Cement Of Ceme										
Diameter (inches) Pounds per foot Per in. Top Bottom (feet) Type of Shoe From To 6 PUC 20 15 20 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Diameter of Mud Cement Of Ceme							 			
Diameter (inches) Pounds per foot Per in. Top Bottom (feet) Type of Shoe From To 6 PUC 20 15 20 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Diameter of Mud Cement Of Ceme								<u> </u>		
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Sacks Cubic Feet of Mud of Cement Method of Placement of Mud of Cement Method of Placement as a hand Section 5. PLUGGING RECORD Section 6. PUG Section 7. Section 6. PLUGGING RECORD Section 8. PLUGGING RECORD Section 9. PLUGGING RECORD FOR USE OF STATE ENGINEER ONLY Section 9. PLUGGING RECORD FOR USE OF STATE ENGINEER ONLY Cuad FWL FSL FSL	•			Sectio	n 3. RECORD	OF CASING				
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Sacks Cubic Feet of Mud of Cement Method of Placement 0 7 8 3 3 hand Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Jagging Contractor Iddress No. Depth in Feet Cubic Feet of Cement of Cement Sagging Method Interval Section S		1 -) 		,		Type of Sh	0e		
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Sacks Cubic Feet of Mud of Cement Indicated	(inches)	per root	per III.	Гор	Bottom	(reer)		Fr	om	То
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet	6	PVC		··································		20			15	20
Depth in Feet Hole Diameter of Mud of Cement Method of Placement From To Diameter of Mud of Cement Method of Placement From To Barrier of Mud of Cement Method of Placement From To Barrier Of Mud To Cement Method From To Barrier Of Mud To Cement Diameter Of Cement Diameter Of Cement Diameter Of Cement Diameter Of Mud To Cement Diameter Of Cement Diameter Diameter Of Cement Diameter Diameter Diameter O				•						
Depth in Feet Hole Diameter of Mud of Cement Method of Placement From To Diameter of Mud of Cement Method of Placement From To Barrier of Mud of Cement Method of Placement From To Barrier Of Mud To Cement Method From To Barrier Of Mud To Cement Diameter Of Cement Diameter Of Cement Diameter Of Cement Diameter Of Mud To Cement Diameter Of Cement Diameter Diameter Of Cement Diameter Diameter Diameter O	_	,					,	.]		
Depth in Feet Hole Diameter of Mud of Cement Method of Placement From To Diameter of Mud of Cement Method of Placement From To Barrier of Mud of Cement Method of Placement From To Barrier Of Mud To Cement Method From To Barrier Of Mud To Cement Diameter Of Cement Diameter Of Cement Diameter Of Cement Diameter Of Mud To Cement Diameter Of Cement Diameter Diameter Of Cement Diameter Diameter Diameter O		<u> </u>	<u></u>	4 2500					ابا	· · · · · ·
From To Diameter of Mud of Cement Method of Placement O 7 8 3 hand Section 5. PLUGGING RECORD Ingging Contractor Ingging Method Inter Well Plugged Ingging approved by: State Engineer Representative FOR USE OF STATE ENGINEER ONLY Ouad FWL FSL	Depth	in Feet	·							
Section 5. PLUGGING RECORD Jagging Contractor Jagging Contractor Jagging Method Jagging Method Jagging Method Jagging approved by: State Engineer Representative FOR USE OF STATE ENGINEER ONLY Top Bottom of Cement 2 3 4 FOR USE OF STATE ENGINEER ONLY Top Bottom of Cement 1 2 3 4 FOR USE OF STATE ENGINEER ONLY Top Bottom of Cement 1 2 5 2 7 3 7 4 FOR USE OF STATE ENGINEER ONLY Top Bottom of Cement 1 2 7 Top Bottom of Cement 2 7 Top Bottom of Cement 1 2 7 Top Bottom of Cement 2 7 Top Bottom of Cement 2 8 Top Bottom of Cement 2 9 Top Bottom of Cement 3 9 Top Bottom of Cement 4 9 Top Bottom of Cement 5 9 Top Bottom of Cement 5 9 Top Bottom of Cement 1 9 Top Bottom of Cement 1 9 Top Bottom of Cement 1 9 Top Bottom of Cement 2 9 Top Bottom of	From	То	Diameter			f Cement	Meth	od of Placen	nent =	
Section 5. PLUGGING RECORD Ingging Contractor Iddress Ingging Method Inter Well Plugged	0	7 ±	8			3	hand		÷	
Section 5. PLUGGING RECORD Jugging Contractor Jugging Contractor Jugging Method Jugging Method Jugging Method Jugging approved by: State Engineer Representative FOR USE OF STATE ENGINEER ONLY Top Bottom of Cement 1 2 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4										
Integrating Contractor Indicess Integrating Method Interest		-								
Integrating Contractor Indicess Integrating Method Interest	·····	<u> </u>		<u> </u>	l					
Integrating Contractor Indicess Integrating Method Interest				Section	s PHICGI	IC RECORD				
FOR USE OF STATE ENGINEER ONLY te Received August 19, 1982 No. Depth in Peer Cubic Peer	ugging Contr	actor								
Top Bottom of Cement the Well Plugged	ddress	···								
State Engineer Representative 2 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4							Тор	Bottom	of	Cement
FOR USE OF STATE ENGINEER ONLY te Received August 19, 1982 QuadFWLFSL					•	2				
FOR USE OF STATE ENGINEER ONLY te Received August 19, 1982 QuadFWLFSL		-	State Engi	neer Repres	entative		 			
te Received August 19, 1982 Quad FWL FSL										
Quad FWL FSL	ate Received	August 1	0 1087	FOR USE	OF STATE E	_	Y			
			J, 1904	,	Quad		FWL		. FSL	
			••				•			

EIELD ENGR. LOG

	,			Section	I. GENERAL	INFORMAT	ION				
(A)	Owner of	well						Owne	r's Well No	25	
	Street or	Post Office Ad State	dress		awer 15						
	City and	State		HI.PERTY.	<u> </u>						
Well	was drilled	under Permit	No. RA F	975 X 3		end is loc	ated i	n the:			
	a	4 <u>NE</u> 4	SE 4	NE % of S	ection <u>8</u>	Townsh	ip	17 5 Rar	ige2 <u>5</u>	Ε	"N.M.P.M
	b. Tract	No	of Map No	0	of ti	he					
		rision, recorder									
		, ,								~	
					feet, I			stem			
(B)	Drilling C	ontractor	S. Da	le Hughe	15			License No	MD 749		
Add	ress		inute 1,	Box 199	A , Art	esia, N	m_8	8210	· · · · <u></u>		
Drill	ling Began .	7/13/8	1 <u>7</u> Con	npleted7	/13/ 82	Type too	ls <u>Ai</u>	r rotary	Size of I	10le	8in.
Eiev	ation of las	nd surface or _			at w	/ell is33	64_	ft. Total depth	of well	20	ft.
Com	pleted wel	lis 🖾 sl	hailow 🔲	artesian.		Depth to v	vater u	pon completion	of well	8	ft.
			Se	ction 2. PRI	NCIPAL WAT	ER-BEARIN	G STR	ATA			
F	Depth From	in Feet To	Thickness in Feet		Description o	f Water-Bear	ing Fo	rmation		ated Yi	
	15	17	2	а	nhydriti	c sand .		· · · · · · · · · · · · · · · · · · ·	n	3	
			-								
					•						
		`									
				Section	on 3. RECOR	D OF CASIN	iG				
	Diameter (inches)	Pounds per foot	Threads per in.	Depth Top	in Feet Bottom	Lengti (feet)		Type of Sho	e Fro	Perforat	tions To
	6	POC				20				.6	20
_	,	•	·Sec	tion 4. RECC	RD OF MUD	DING AND	СЕМЕ	NTING			
	Depth From	in Feet To	Hole Diameter			Cubic Feet of Cement		Metho	d of Placem	ent _	
	0	8	8			4		hand		-	
	•	•						_			
				Secti	on 5. PLUGG	ING RECOR	α				
-		actor									
	iress gging Metho	od				N	o. -	Depth in Top	Feet Bottom		c Feet ement
	e Well Plug gging appro	-			·		1 2				
			State F	oinese Banca		[3				
		V	State Ef	igineer Repre	ociitaliv e		1				
Date	n Danaina d		1007		OF STATE	ENGINEER	ONLY				
שונים	- Vecessed	August 19,			Qua	ıd		FWL _		FSL_	
F	ile No. <u>RA</u>	-6975 x 3		·	Use Obi	ervation	L	ocation No	17.26.8.2	4241	

EIELD ENGR. LOG

		816111	Section 1.	TNG 61					_	
	Post Office Ad					-	Owne	r's Well No	<u> 7</u>	ı
City and	State	.uress				210				
Vall was deille	d under Permit	No. 88 60	75 Y 4		20	·. d is located i	n the			
a. <u>SE</u>	_ % NE_ %	. SE % _A	E_ ¼ of Sec	tion	<u>A</u> T	owuspib —	17 S Rai	nge <u>26</u>	-	_N.M.
b. Tract	No	of Map No.			of the					
a Tat N	.	of Block No			of the					
	vision, recorded									
d Ya	•	feet V¤		fe	et N.M. (Coordinate S	, ystem			Zor
							, 3.0			Gr
B) Drilling (Contractor	S. Dal	e Huches				_ License No	ш0 749		
_										
Address	Ro	nrs T. Ho	X 199 A.	Artes	ila, N	M 882	10			
Orilling Began	7/15/82	Comp	pleted7/	15/82	Ту	pe tools Ai	r Rotary	Size of I	hole	я
Elevation of la	nd surface or				at well is_	3364	_ ft. Total depth	of well	20	
Completed wel	llis ဩ sl	hallow 🔲 a	rtesian.		Dep	th to water	ipon completion	of well	8	
		Sec	tion 2. PRINC	CIPAL W	ATER-BE	ARING ST	RATA			
	in Feet	Thickness)escrintia	n of Wate	r-Bearing Fo	emation	Estim (gailons	ated Y	
From	To	in Feet						1 	<u> </u>	mute
16	18	. 2	aı	nnyarı	tic sa	and ·	 	na	l 	
				·	-					
								Ì		
	<u> </u>		- 					<u> </u>		
L								<u> </u>		
		•	Section	a 3. REC	ORD OF	CASING				
Diameter	Pounds	Threads	Depth	in Feet	·	Length	Type of Sho		Perfora	tions
(inches)	per foot	per in.	Тор	Botto	m	(feet)	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Fre	om	To
6	PVC				.	20		1	6	20

		<u> </u>		<u> </u>	<u> </u>					
			4 BECOL	OF M	UDDING	AND CEME	NTING			
		Secti	on 4. RECUR	TD OF M						
	in Feet	Hole	Sack	s	Cubic	Feet	Meth	od of Placem	ent	
From	То	Hole Diameter		s	Cubic of Cer	Feet		od of Placem	ent	
		Hole	Sack	s	Cubic	Feet	Meth hand	od of Placem	ent	
From	То	Hole Diameter	Sack	s	Cubic of Cer	Feet		od of Placem	ent	
From	То	Hole Diameter	Sack	s	Cubic of Cer	Feet		od of Placem	ent	
From	To 9	Hole Diameter	Sack	s	Cubic of Cer	Feet		od of Placem	ent	
From	To 9	Hole Diameter	Sack of Mu	s id	Cubic of Cer	Feet		od of Placem	ent	
From Ø	To 9	Hole Diameter 8	Sack of Mu	s id	Cubic of Cer	Feet		od of Placem	ent	
From	To 9	Hole Diameter 8	Sack of Mu	s id	Cubic of Cer	Feet	hand Depth in	Feet	Cut	
From D Plugging Cont: Address Plugging Meth	To 9	Hole Diameter 8	Sack of Mu	s id	Cubic of Cer	Feet	hand		Cut	
From D Plugging Cont: Address Plugging Meth	To 9 ractor	Hole Diameter 8	Sack of Mu	s id	Cubic of Cer	Feet ment	hand Depth in	Feet	Cut	
From D Plugging Cont: Address Plugging Meth Date Well Plug	To 9 ractor	Hole Diameter 8	Sack of Mu	n 5. PLU	Cubic of Cer	ECORD No.	hand Depth in	Feet	Cut	
From D Plugging Cont: Address Plugging Meth Date Well Plug	To 9 ractor	Hole Diameter 8	Sack of Mu	n 5. PLUG	Cubic of Cei	ECORD No. 1 2 3 4	Depth in	Feet	Cut	pic Fee
From D Plugging Cont: Address Plugging Meth Date Well Plug	To 9 ractor od gged oved by:	Hole Diameter 8	Sack of Mu	n 5. PLUG	Cubic of Cei	ECORD No 1 2 - 3	Depth in	Feet	Cut	

FIELD ENGR. LOG

STATE ENGINEER OFFICE WELL RECORD

l was drilled	under Permit	NoRA_	6975 X ⁴	5	and	i is located i	n the:		
a. SF	% NE %	SE % NE	¼ of Se	ction8	т	ownship	<u> 17 S</u> Ra	nge26	N.M.
b. Tract	No	_ of Map No.		of	the				
c Lot N		of Block No		of	the		···		
	vision, recorded							•	-
d. X= the		. feet, Y=		feet	, N.M. C	oordinate S	ystem		Zon
Drilling C	ontractor	S. Da	le Hughs	25			_ License No	шо 7	49
lress		Route 1.	80x 199	a, Ar	tesia	NM 8	8210		
ling Began	7/15/82	Comp	leted	/15/82	Ту	pe tools <u>Ai</u>	r Rotary	Size of	hole 8
-	*						ft. Total depth		
ration of la		_							
nplet ed we l	lis LX sh	nallow 🔲 a	rtesian.		Dep	th to water i	pon completion	n of well	9
D	in Feet		ion 2. PRIN	CIPAL WA	TER-BE	ARING STI	RATA		
From	To	Thickness in Feet	1	Description	of Wate	r-Bearing Fo	rmation		nated Yield s per minute)
17	19	2	ar	nhydriti	lc sar	nd			па
<u>-</u>									÷
									•
·								 	
	<u></u>				<u> </u>			<u> </u>	
	,			n 3. RECO	RD OF	CASING			
Diameter (inches)	Pounds per foot	Threads per in.	Top	in Feet Bottom		Length (feet)	Type of Sh	oe Fr	Perforations om To
6	PVC					20		:	16 20
						•			
	•	Section	on 4. RECO	RD OF MU	DDING	AND CEME	NTING		
	in Feet	Hole Diameter	Saci	ks	Cubic of Cer	Feet		od of Placen	nent ,
From	To 8	8	OI M	-	01 CE1	nent	hand		
			ļ	·					-
	-	ł		Ì		ŀ		•	
				on 5. PLUG	GING R	ECORD			
	ractor					- [Depth in	Feet	Cubic Fee
	od					No.	Тор	Bottom	of Cemen
gging appro	-					2			
		State Eng	ineer Repres			- 3			

EJELD ENGR. LOG

		LAVAJ		THE COME			0	47_11	v - 7	•
Street or	Post Office Ad	dress	Огаше	r 159						
·		Art				•				
ell was drilled	under Permit	No. RA 65	775 X 6		and	is located i	n the:			
a. NE	_ % _NE_ %	SE % 51	⊥_¼ of Se	ction 9	To	wnship	1 <u>7 5</u> F	Range	98 26	EN.M.P.I
b. Tract	No	of Map No		of ti	he					
		of Block No								
	•	1 in							2	
d. X= the		_ feet, Y=		feet, 1	N.M. Co	ordinate S	ystem			Zone Gran
Drilling C	ontractor	S. Nale !	lughes				_ License No	WD 7		
dress		- Route 1,	8ax 1	99 4 4-	tasia	N. M	88717			
		Comple								
		Compa					•			
vation of las							·			
mpleted wel	lis 🗓 si	hallow 🔲 are	tesian.		Depth	to water	ipon completi	on of well	1	1
Denth	in Feet		on 2. PRIN	CIPAL WAT	ER-BEA	RING ST	ATA	- I	F .:	37: 14
From	To	Thickness in Feet		Description o	f Water-	Bearing Fo	ormation		Estimated allons per	
10	12	2	2 anhydritic s						па	
					*					
							•			
						····	· · · · · · · · · · · · · · · · · · ·			
		<u> </u>								
Diameter	Pounds	Threads		in Feet		ASING ength			Perfe	orations
(inches)	per foot	per in.	Тор	Bottom		feet)	Type of S	hoe	From	То
6	PVC] :	30			25	30
,								-		
		Section .	n 4 PECO	RD OF MUD	DINC A	ND CEME	NTING	·		
	in Feet	Hole	Sac	ks	Cubic F	eet		thod of Pl	acement	
From	То	Diameter	of M	ud	of Ceme	ent				.
0	10	8			4		hani	d 		-
	:								·	
	-									
			Section	on 5. PLUGG	ING RE	CORD				
agging Contr	actor									
ldress	od					No.	Depth Top	in Feet Botton		ubic Feet f Cement
te Well Plug	ged						100	BORRO	"	a coment
igging appro	ved by:					3				
		State Engin	eer Repres	entative		4				
			FOR USE	AC 07 4 7C 1	CNCINE					
le Received	August 19	9, 1982	. UR USE	OF STATE I	- - IAGINE	.ER UNL1				
	-			· Qua	ıd		FWL	· — ·	FSI	L
					•					

EIELD ENGR. LOG

	Post Office Ad	dress	Ora	WET	159		0w			
City and	State	· · · · · · · · · · · · · · · · · · ·	Artesia,	N M	88210					
	d under Permit									
a, <u>-NE</u>	_ % _ }/	SW_ ¼ _N	llil ¼ of Se	ction	_ 	wnship	17 S F	Range <u>25</u>	Ε	_N.M.
b. Tract	No	of Map No.			of the					
	lo									•
	vision, recorded									.
					et, N.M. Co	ordinate (System		_	Zor Gi
B) Drilling	Contractor	S. Dale	Hughes	····			License No	шо 74	9	
ddress		Route 1.	Box 199	A. Ar	tesia, i	n w G	9213			
Orilling Began	7/20/82	Comp	pleted7/	21/87	- "	ئے شادار		Size o	f hole_	8
levation of la	nd surface or _	_			at wei: :::	3343	fr. Fotal den	via of well	21.5	i
	_									
ompleted we	llis K st	nallow L a	urtesian.		Depth	to water	upon completi	ion of well	_11	
Densh	in Feet	Sec Thickness	tion 2. PRIN	CIPAL W	ATER-BEA	RING ST	RATA	E-4:	mated \	/inld
From	To	in Feet	1	Description	on of Water-	Bearing F	ormation		nated i	
	21.5	1.5	Anh	ydri ti	ic sand				a.	
20										
20										
20										·
20										
20										
			Sectio	n 3. REC	ORD OF C				Parfor	
Diameter (inches)			Sectio		ORD OF C	ASING ength feet)	Type of S	Shoe F	Perfor	
Diameter	Pounds	Threads	Sectio. Depth	n 3. REC	ORD OF C	ength	Type of S	F		То
Diameter (inches)	Pounds per foot	Threads	Sectio. Depth	n 3. REC	ORD OF C	ength feet)	Type of S	F	rom	
Diameter (inches)	Pounds per foot	Threads	Sectio. Depth	n 3. REC	ORD OF C	ength feet)	Type of S	F	rom	То
Diameter (inches)	Pounds per foot	Threads per in.	Sectio Depth Top	n 3. REC in Feet Botto	ORD OF C	ength feet)		F	rom 13	То
Diameter (inches)	Pounds per foot	Threads per in. Secti	Section Depth Top	n 3. REC in Feet Botto	ORD OF C. LOM (UDDING A Cubic F	ength feet) 22	ENTING	F	19	To 22
Diameter (inches)	Pounds per foot PVC	Threads per in. Secti Hole Diameter	Sectio Depth Top	n 3. REC in Feet Botto	ORD OF C.	ength feet) 22	ENTING	F	19	To 22
Diameter (inches) 6	Pounds per foot PVC	Threads per in. Secti	Section Depth Top	n 3. REC in Feet Botto	ORD OF C. LOM (UDDING A Cubic F	ength feet) 22	ENTING	F	19	70 22
Diameter (inches) 6 Depth	Pounds per foot PVC	Threads per in. Secti Hole Diameter	Section Depth Top	n 3. REC in Feet Botto	ORD OF C. Dom (ength feet) 22	ENTING Met	F	19	To 22
Diameter (inches) 6 Depth	Pounds per foot PVC	Threads per in. Secti Hole Diameter	Section Depth Top	n 3. REC in Feet Botto	ORD OF C. Dom (ength feet) 22	ENTING Met	F	19	To 22
Diameter (inches) 6 Depth	Pounds per foot PVC	Threads per in. Secti Hole Diameter	Sectio Depth Top on 4. RECOI Sacion of Mi	n 3. REC in Feet Botto RD OF M ss ud	ORD OF C. Dom (OUDDING A Cubic F of Ceme	ength feet) 22 ND CEMeet ent	ENTING Met	F	19	To 22
Diameter (inches) 6 Depth From	Pounds per foot PVC	Threads per in. Secti Hole Diameter	Sectio Depth Top on 4. RECOI Sacion of Mi	n 3. REC in Feet Botto RD OF M ss ud	ORD OF C. Dom (ength feet) 22 ND CEMeet ent	ENTING Met	F	19	70 22
Diameter (inches) 6 Depth	Pounds per foot PVC in Feet To B	Threads per in. Secti Hole Diameter	Sectio Depth Top on 4. RECOI Sacion of Mi	n 3. REC in Feet Botto RD OF M ss ud	ORD OF C. Dom (OUDDING A Cubic F of Ceme	ength feet) 22 ND CEM eet ent	ENTING Met hand	thod of Placer	rom 13	To 22
Diameter (inches) 6 Depth From 0	Pounds per foot PVC In Feet To 8	Secti Hole Diameter	Section Depth Top Section 4. RECOI Sacion Miles Section Sect	n 3. REC in Feet Botto RD OF M ss ud	ORD OF C. Dom (OUDDING A Cubic F of Ceme	ength feet) 22 ND CEM eet ent CORD	ENTING Met	thod of Placer	rom 13	To 22
Diameter (inches) 6 Depth From 0	Pounds per foot PVC in Feet To 8	Secti Hole Diameter	Sectio Depth Top on 4. RECOI Sack of Me	n 3. REC in Feet Botto RD OF M ss ud	ORD OF C. Dom (OUDDING A Cubic F of Ceme	ength feet) 22 ND CEM eet ent CORD No. 1 2	ENTING Met hand	thod of Place	rom 13	To 22
Diameter (inches) 6 Depth From 0	Pounds per foot PVC in Feet To 8	Secti Hole Diameter 8	Sectio Depth Top on 4. RECOI Sack of Me	n 3. REC in Feet Botto RD OF M cs ud	ORD OF C. Dom (OUDDING A Cubic F of Ceme	ength feet) 22 ND CEMeet ent CORD	ENTING Met hand	thod of Place	rom 13	To 22

EIELD ENGR. LOG

			Section I	. GENERAL IN	NFORMATION			√	
) Owner of	well	DLAVAN	REFINI	NG COMPANY		Owner	's Well No	30	
Street or	Post Office Ad	dress	Grawer	159			= :		
City and	State		rtesia.	N M 882	Ш	· · · · - · · · · · · · · · · · · · · ·			
ll was drilled	under Permit	NoRA_69	75 X 8		and is located	in the:			
					_	<u> 17 S</u> Ran			
b. Tract	No	_ of Map No.		of the					
c. Lot No	o. ====================================	of Block No		of the	ounty.			<u> </u>	
d. X=						ystem		Z_Zone	
		6 Onle	Husbas			_ License No			
=						_ License No			
Iling Began .	7/21/82	Comp	leted7	/22/82	_ Type toois _A	ir Rotary	Size of ho	lei	
vation of lar	nd surface or			at well	is 3358	_ ft. Total depth	of well	21.5	
mpleted well	lis UXL sh	nailow 🔲 as	rtesian.		Depth to water	upon completion	of well	d1	
		Sect	ion 2. PRIN	CIPAL WATER	R-BEARING ST	RATA			
	in Feet	Thickness in Feet	1	Description of V	Water-Bearing F	ormation		ted. Yield per minute)	
From 18	. To	2		nhydritic	ave1	(gallons per minute)			
	20				38114 & 91	aver	116	.	
	1	_		<u>-</u>			L		
			_ 					······································	
				······································					
			Sectio	n 3. RECORD	OF CASING				
					Length	Type of Sho	Pe	rforations	
Diameter	Pounds	Threads	Depth	in Feet					
Diameter (inches)	Pounds per foot	Threads per in.	Depth Top	Bottom Bottom	(feet)	Type of Sno	Fron	To To	
	i				(feet) 22	Type of Sno	Fron 17	70 22	
(inches)	per foot				 	Type of Sho	Fron		
(inches)	per foot				 	Type of Sno	Fron		
(inches)	per foot	per in.	Тор	Bottom	 		Fron		
(inches) 6 Depth	PVC PVC	Section Hole	Top on 4. RECO	RD OF MUDDI	22 ING AND CEMI	ENTING	17	22	
(inches)	per foot PVC	per in.	Top	RD OF MUDDI	22	ENTING	Fron	22	
(inches) 6 Depth	PVC PVC	Section Hole	Top on 4. RECO	RD OF MUDDI	22 ING AND CEMI	ENTING	17	22	
Depth	per foot PVC	Section Hole Diameter	Top on 4. RECO	RD OF MUDDI	ING AND CEM	ENTING Metho	17	22	
Depth	per foot PVC	Section Hole Diameter	Top on 4. RECO	RD OF MUDDI	ING AND CEM	ENTING Metho	17	22	
Depth	per foot PVC	Section Hole Diameter	Top on 4. RECO	RD OF MUDDI	ING AND CEM	ENTING Metho	17	22	
Depth	per foot PVC	Section Hole Diameter	Top On 4. RECO Saci	RD OF MUDDI	ING AND CEMPLE Comment 2	ENTING Metho	17	22	
Depth From O	per foot PVC	Section Hole Diameter	Top On 4. RECO Saci	RD OF MUDDI	ING AND CEMPLE Comment 2	ENTING Metho	17	22	
Depth From O	per foot PVC	Section Hole Diameter	Top On 4. RECO Saci	RD OF MUDDI cs Cu ud of	ING AND CEMPLE Comment 2	ENTING Metho	17	22	
Depth From O O O O O O O O O O O O O	in Feet To 4 actor ged	Section Hole Diameter	Top On 4. RECO Saci	RD OF MUDDI	ING AND CEMPLE ING AND CEMPLE ING	ENTING Metho hand	d of Placemer	22	
Depth From O gging Contributes legging Metho	in Feet To 4 actor ged	Section Hole Diameter 8	Top On 4. RECO Saci	RD OF MUDDI cs Cu ud of	ING AND CEMPLE Cement 2	ENTING Metho hand	d of Placemer	22	

EJELD EHGR. LOG

Street or i	Post Office Ad	Idress DI	awer 1	5 9		Ow	ner's Wei	l No31	•
		ARTESIA No. <u>RA-697</u>			٠.	ted in the:			
							2 7)	NMB
						17.5			
	*								
		of Block No d in							
	•	_ feet, Y=		feet, N	I.M. Coordina	ite System			Zone
(B) Drilling C	ontractor _S_	Dale Hugh	69			License No.	7	149	
Address	Rt.	1, Box 19	9 A, Ar	tesia, N	M. 882	10			
Drilling Began .	10/19/8	Z Compl	eted10	/19/82	Type tools	Auger	Sị	ze of hole_	8
Elevation of lan	id surface or _			at we	ll is 3365	ft. Total dep	th of we	122	
Completed well	is 😧 s	hallow 🔲 ar	tesian.		Depth to wa	iter upon complet	ion of we	u <u>10</u>	
		Secti	on 2. PRINC	IPAL WATE	R-BEARING	STRATA	- , - -		
Depth i	n Feet To	Thickness in Feet	D	escription of	Water-Bearin	g Formation	(g	Estimated sallons per s	
14	16	2	dolom	ite grav	el w gra	y-brown sil	ty cla	ıy N	А
									
L			Section	3. RECORD	OF CASING	;			
Diameter (inches)	Pounds per foot	Threads per in.	Depth i		Length (feet)	Type of S	Shoe		rations
2	per 1001	PVC	Тор	Bottom	18			From 13	18
			,					-	
		Sectio	n 4. RECOR	D OF MUDI	DING AND C	EMENTING			
Depth From	in Feet To	Hole Diameter	Sacks of Mu		Lubic Feet of Cement	Ме	thod of F	Placement	
O	12	8			4 sx	hand place	ment	-	
	-				•				
			Section	S. PLUGGU	NG RECORE	· · · · · · · · · · · · · · · · · · ·			
					No.	Depth Top	in Feet Botto		bic Feet Cement
Date Well Plugg	-								
Plugging approv		State From	neer Represe	ntative	$\frac{2}{3}$				
					4		L		
Date Received	Novembe	er 9, 1982		_	NGINEER O	NLY FWI		FSL	
File No	RA-6975	-x-9		Use Obse		Location No			

GR. LOG

		3,	WELL RE		EJELD EIN
		Section	I. GENERAL	LINFORMATION	
Owner of well	DLAVAN	REFINING	COMPANY		Owner's Well No
Street or Post Office					

(A) Owner	of well	IN ULAVAI	FLINING	CUMPAN	<u> </u>			Owne	er's Well N	o. <u> </u>	<u> </u>
Street	or Post Office Add	dress aver	rswer	159							
City an	d State	ARTES.	IA, 10 PI	002.	10						
Well was drill	ed under Permit !	No. RA-	7098-x-6	i	and	 d is loca	ted in th	ie:			
									76	_	
	% <u>NE</u> %										
b. Trac	t No.	_ of Map No	0		of the						
c. Lot	- ± No	of Block No.			of the						
	division, record e d									=	,
d X≃		feet. Y=		fe	et. N.M. C	Coordina	ite Syste	m			Zоле і
the.											Grant
(A) Drilling	Contractor5	Oale H	uohes				Li	cense No	шо 749		
-			_								
	St. 1		•	•							
Drilling Bega	n <u>10/20/8</u>	32 Con	npleted	10/20	/82 _{Ty}	pe tools	Aug	er	Size	of hole	<u>8</u> in
Flavation of	land surface or _				at well is	3363	ft	Total depth	of well	24	ft
Completed w	ellis 🖾 sh	allow 🗆	artesian.		Dep	th to wa	iter upo	n completion	n of well		ft
		Se	ction 2. PRI	NCIPAL W	ATER-BE	ARING	STRAT	ГА			
Dept	h in Feet	Thicknes		Danninti	f W-+-	. D	- F			timated Y	
From	То	in Feet		<u>.</u>	on of Wate				(gallo	ons per m	inute)
16	22		dritic mish r						NA		
									1		
									<u> </u>		
			Sect	ion 3. REC	ORD OF	CASINO	•				
Diameter	Pounds	Threads		h in Feet		Length		T . 5.00		Perfor	ations
(inches)	per foot	per in.	Top			(feet)		Type of Sh	<u>ое</u>	From	То
2	PVC			1 .	}	22				17	22
				1.							
							_				
											<u></u>
		Sec	tion 4. REC	ORD OF M	IUDDING	AND C	EMENT	ING			
Dept	h ın Feet	Hole	Sa	cks	Cubic	Feet			od of Plac		
From	То	Diameter	of	Mud	of Cer					ement .	
0	16	8			5 :	SX	Rose	Gravel	truck	·	
	:										
	<u> </u>					- ;					
							<u> </u>				
			San	ion S. PLU	CCINC P	ECORE					
Div C			Sect		GOING R	ECURL	•				
Address	itractor					_		Depth in	Feet	1 0	bic Feet
Plugging Met	hod					No		Тор	Bottom		Cement
Date Well Plugging app						- 1					
ingRtug ahb						$\frac{2}{3}$				+	
		State En	igineer Repre	esentative		4	\Box				
			FOR HE	E OF STA	TE ENCIN	IEED O	NI V				
			FUR US	F OL 21 V	TE EUCIL	TEER O	IVLI				

_Use Observation

Date Received November 9, 1982

FIELD EIVER. LOG

Section	I. GENERAL INFORMATION

(A) Owner of Street or I	well Post Office Add	NAVAJO F	REFINING Orawer	COMPANY 159		Ow	ner's Well No.	33	3
					••				
Well was drilled									
					-	<u>175</u> R			_N.M.P.M
b. Tract?	Vo	_ of Map No	· _ ·	of the					
	ision, recorded								
		•	······	-	M. Coordina	te System	•	_	
B) Drilling C	ontractor	S. Dale	Hughes			License No	שם 749		
Address	P	t. Teox 1	99 <u>A.</u> Ar	tesia. N	M 882	ľ0			
Drilling Began _	19720/	<u>92</u> Com	pleted	/20/82	_ Type tools	Auger	Size of	hole	8 in.
Elevation of lan	d surface or			at wel	l is336	ft. Total dep	th of well	195	ft.
Completed well						ter upon completi			
		Sec	tion 2. PRIN	CIPAL WATE	R-BEARING	STRATA			
Depth i From	n Feet To	Thickness in Feet	ı	Description of	Water-Bearing	Formation		nated Y s per m	
147	17	2 1	Anhy.	. sand wii	th white	gray silty	dlav	NA	
	-								
					· · · · · · · · · · · · · · · · · · ·				
			Section	n 3. RECORD	OF CASING				·
Diameter	Pounds	Threads	Depth	in Feet	Length	Type of S	100 L	Perfora	tions
(inches)	per foot	per in.	Тор	Bottom	(feet)	Type of 3	Fr	om	То
2	PVC		····		18	-	1	.3	18
									
		Sect	ion 4. RECOI	RD OF MUDD	ING AND CE	MENTING		L	
Depth From -	n Feet To	Hole Diameter	Sack of Mu		bic Feet Cement	Met	hod of Placeπ	nent .	
0	12	8			4 sx	Rose Grave	el truck	-	
	•								
	.								
<i></i>			Sectio	n 5. PLUGGIN	G RECORD				
Plugging Contra						Donah :	- F	1	
Plugging Metho	d				No.	Depth i	Bottom		ic Feet Cement
Date Well Plugg Liugging approv			•		$\frac{1}{2}$				
		State Eng	gineer Represe	entative	$-\frac{2}{4}$				·
				· · · · · · · · · · · · · · · · · · ·	4_				
Date Received	Novembe	r 9, 198		OF STATE EN	GINEER OF	NLY			
		-, -, -, -, -, -, -, -, -, -, -, -, -, -		Quad		FWL		FSL_	
File No	RA-7098	l		Use_Obset	rvation_	_ Location No	7.268.	242	2

FIELD EAGK. LUG

(A) Owner of Street or	f well Post Office	Add	NAVA	Orawei	ING COM	PANY		Owner	's Well No	34
City and Well was drilled							locate	ed in the:		
										·
	-						•	17_S Rang	_	<u>FN.M</u>
		-								
			of Block No in							=
			feet, Y=			N.M. Coc	ordinat	e System	······································	
(B) Drilling (Contractor_		<u>s. n</u>	ale Hugh	188	•		License No	un 749	
Address		Rt.	80x 199	A. Arte	sia. N	m 8	8210			
Drulling Began	10/2	0/5	2 Comp	leted _10/	/20/82	Туре	tools.	Auger	Size of h	noie 8
Elevation of la	nd surface o	or			at w	vell is	3363	ft. Total depth	of well	22
Completed wel	ll is 🔀	sh	allow 🔲 a	rtesian.		Depth	to wat	ter upon completion	of well	9
Denth	in Feet		Sect Thickness	ion 2. PRIN	CIPAL WAT	ER-BEAI	RING	STRATA	Estim	ated Yield
From	To	_	in Feet	1	Description o	of Water-E	Bearing	Formation		per minute
16	20		4	Anhyd.	sand in	n gray	sil	ty clay & gy	o NA	
								·		
	1				n 3. RECOR					
Diameter (inches)	Pounds per foot		Threads per in.	Top	in Feet Bottom		ngth eet)	Type of Shoo	Fro	Perforations om To
2 .		PV				2	1		16	
	<u> </u>									
	. 				RD OF MUD			MENTING		
Depth From	in Feet To	\dashv	Hole Diameter	Saci of M		Cubic Fe of Ceme		Metho	d of Placem	ent *
0	15	:	8			5 sx		Rose Gravel	Truck	-
		3								
				Sectio	on 5. PLUGG	ING REC	CORD	-		
	ractor					 ,		A		
Address				······································			No.	Depth in F	eet Bottom	Cubic Fe of Cemer
Plugging Conti Address — Plugging Meth Date Well Plug	od			······································			1			
Address Plugging Meth	od				entative					

HELD ENGR. Luc

City and State	Street or	Post Office Ad	NAVAJO I	Urawe	2r 159	ΙΥ	_	Own	er's Weil No	o	5
a SU	City and	State	Ar	tesia, N	9 m	8210					
b. Tract No. of Map No. of the	vell was drilled	under Permit	No. RA 709	3 X 2	<u> </u>	and	s locate	d in the:			
c. Lot No of Block No of the Subdivision, recorded in County. d. X= feet, Y= (eet, N.M. Coordinate System Zone the the feet, Y= (eet, N.M. Coordinate System Zone						_	•		_		
Subdivision, reconded in	b. Tract?	No	of Map No		of 1	the					
Continue Continue											
the Section 4. RECORD OF MUDDING AND CEMENTING Section 4. RECORD OF MUDDING AND CEMENTING Section 4. RECORD OF MUDDING AND CEMENTING Prometer Hole Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Section 6. Performance Section 6. Performance Section 7. Performance Section 8. RECORD OF CASING Section 9. RECORD OF MUDDING AND CEMENTING Section 9. RECORD OF MUDDING AND CEMENTING Section 1. RECORD OF MUDDING AND CEMENTING Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Section 6. RECORD OF MUDDING AND CEMENT OF METHOD OF CEMENT OF C											
Address Rt. 1, Box 199 A, Artesia, N M 88210 Intiling Began 10/20/82 Completed 10/20/82 Type tools Auger Size of hole 8 10/20/82 Type tools Auger Size of hole 8 10/20/82 Type tools Auger Size of hole 8 10/20/82 Type tools Auger Size of hole 8 10/20/82 Type tools Auger Size of hole 8 10/20/82 Type tools Auger Size of hole 8 10/20/82 Type tools Auger Size of hole 8 10/20/82 Type tools Auger Size of hole 8 10/20/82 Type tools Total depth of well 21						N.M. Co	ordinate				
rilling Began 10/20/82 Completed 10/20/82 Type tools Auger Size of hole 8 evation of land surface or at well is 3362 ft. Total depth of well 21+ completed well is 3362 ft. Total depth of well 7.	B) Drilling C	ontractor	S. Dale H	ughes				License No	WD 749		
Section 2 PRINCIPAL WATER-BEARING STRATA	ddress		Rt. 1. Bo	× 199 A	<u>. Artesi</u>	a, N	M 88	210			
Depth in Feet	rilling Began .	10/20/	/82 Compl	eted	LO/20/82	Тур	tools_	Auger	Size o	of hole_	8
Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet Thickness in Feet Description of Water-Bearing Formation Estimated Yield (gallons per minute)	levation of lar	nd surface or _			at v	well is	3362	ft. Total dept	h of weil_	2:	<u>l.)</u>
Depth in Feet Thickness in Feet Description of Water-Bearing Formation Estimated Yield (gallons per minute)	ompleted well	is 🖾 sl	hallow 🗖 ar	tesian.		Depth	to wate	r upon completio	n of well		·
Section 3. RECORD OF CASING Perforations				on 2. PRIN	CIPAL WAT	ER-BEA	RING S	TRATA			
Section 3. RECORD OF CASING Diameter Pounds per foot per in. Top Bottom (feet) Type of Shoe From To 2 PVC 20 15 20 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole From To Diameter of Mud of Cement Method of Placement, 1 14 8 4½ SX Rose Gravel Truck Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Section 6.				1	Description (of Water-	Bearing	Formation -			
Section 3. RECORD OF CASING Diameter (inches) Pounds (per in. Top Bottom (feet) Type of Shoe From To 2 PVC 20 20 15 20 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Diameter of Mud of Cement Method of Placement, of Mud of Cement Method of Placement, of Mud of Cement Method of Placement, of Cement Method of Cement Method of Cement Method of Cement Method of Cement Method of Placement, of Cement Method of Cement Me	15	20	5	Oolo g					K	NA	
Section 3. RECORD OF CASING Diameter Pounds per foot Perforations Top Bottom (feet) Type of Shoe From To 2 FUC 20 15 20 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Sacks Cubic Feet of Mud of Cement Method of Placement, 10 14 8 4½ sx Rose Gravel Truck Section 5. PLUGGING RECORD Section 5. PLUGGING RECORD Lugging Contractor ddress Lugging Method Lugging And Cement Lugging Method Lugging approved by: State Engineer Representative 2 3 3 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5						,					
Diameter (inches) Pounds per in. Threads per in. Top Bottom (feet) Type of Shoe Perforations From To					,			•	 		
Diameter (inches) Pounds per in. Threads per in. Top Bottom (feet) Type of Shoe Perforations From To										-	
Diameter (inches) Pounds per in. Threads per in. Top Bottom (feet) Type of Shoe Perforations From To		· · · · · · · · · · · · · · · · · · ·			······					<u> </u>	-
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Diameter of Mud of Cement of Cement	Diameter	Pounds	Threads					T		Perfo	rations
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet		per foot						Type of Sh	oe		
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Diameter of Mud of Cement Method of Placement 1 14 8 4½ sx Rose Gravel Truck Section 5. PLUGGING RECORD Rugging Contractor ddress No. Depth in Feet Cubic Feet Cubic Feet No. Top Bottom of Cement of Cement No. State Engineer Representative 4 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	_ 2	F	PVC				20			15	20
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Diameter of Mud of Cement Method of Placement 1 14 8 4½ sx Rose Gravel Truck Section 5. PLUGGING RECORD Rugging Contractor ddress No. Depth in Feet Cubic Feet Cubic Feet No. Top Bottom of Cement of Cement No. State Engineer Representative 4 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		İ									
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet							•				-
From To Diameter of Mud of Cement Method of Placement D			Sectio					MENTING			
Section 5. PLUGGING RECORD lugging Contractor didress								Meth	od of Place	ment	
No. Depth in Feet Cubic Feet	0	14	8			4 1 s	×	Rose Grav	el Truc	:k _	
lugging Contractor ddress No. Depth in Feet Cubic Feet Top Bottom of Cement ate Well Plugged. lugging approved by: State Engineer Representative 4		1.1								-	
No. Depth in Feet Cubic Feet											
No. Depth in Feet Cubic Feet			L								
Depth in Feet Cubic Feet				Section	n 5. PLUGO	ing re	CORD				
lugging Method								Depth in	Feet	T 6	hic Feet
State Engineer Representative 2 State Engineer Representative 4	lugging Metho	d									
State Engineer Representative 3 4								 		-	
	coming approx		State Fnei	neer Renress	entative		3			#	
FOR THE OF STATE ENGINEER ONLY			arare migh								
FOR USE OF STATE ENGINEER ONLY ate Received November 9, 1982 QuadFWLFSL	ate Received	November	9, 1982	FOR USE						ee.	
File No. RA-7098-X-2 Use Observation Location No. 17. 26, 9.1323	• .				-						

STATE ENGINEER OFFICE

WELL RECORD

EIELD Elven. Luc

.) Owner a	f well	CAVAN	O REFINING	COMPA	VY	Owi	ner's Well N	io30	5
Street or	Post Office Ad	dress	Orawer TESIA, NO	159					
City and	State	AB	IESIA. M	1882.	<u> </u>				
ell was drüled	d under Permit	No. RA 70	98 X 3		and is locate	d in the:			
a. <u>NF</u>	_ % <u>SE_</u> %	Sul 14 Nu	% of Section	n <u> </u>	Township.	<u>17 S</u> R	ange 26	5 E	N.M.
b. Tract	No	_ of Map No		of the					
	•					•		=	
					M. Coordinate	: System			Zor Gr
) Drilling (Contractor	S. Dale	Hughes			License No	HID 7	749	
idress		Rt. 1, 8	nx 199 A.	Artes	ia, N M	88210			
ulling Began	10/21/8	32 Compl	eted <u>10/2</u>	1/82	. Type tools _	Auger	Size	of hole_	8
			•						
evation of la	nd surface or			at well	is	ft. Total dep	th of well_		
mpleted wel	llis 🗓 sh	allow 🗆 ar	tesian.	1	Depth to wate	er upon completio	on of well_	7_	
			on 2. PRINCIP	AL WATER	BEARING S	TRATA			
Depth From	in Feet	Thickness in Feet	Desc	ription of V	Vater-Bearing	Formation		st <u>i</u> mated `lons per n	
.14	151	1-1/2	Anhyd.	clavev	and in t	ight gype o		NA	
	-		 				+		
			Section 3.	RECORD	OF CASING				
Diameter (inches)	Pounds per foot	Threads	Depth in F		Length (feet)	Type of Si	hoe -	Perfor	
2	PVC	рег ш.	Тор	Bottom	17	+		From 12	To
	-				17	 			1/
						ļ			
	<u> </u>					<u> </u>			
		Section	n 4. RECORD	OF MUDDI	NG AND CE	MENTING			
•.								cement .	
	in Feet	Hole Diameter	Sacks of Mud		bic Feet Cement	Meti	hod of Plac		
Depth		Hole		of		Met Rose Grav		:k	
Depth From	То	Hole Diameter		of	Cement			k _	
Depth From	11 :	Hole Diameter		of	Cement			:k	
Depth From	To 11	Hole Diameter		of	Cement			k	
Depth From	11 :	Hole Diameter		of	Cement			:k	
Depth From	11 :	Hole Diameter	of Mud	of 4	Cement			:k	
Depth From ()	11 :	Hole Diameter 8	of Mud	of 4	SX	Rose Grav	el Truc		
Depth From O Jugging Contiduress Jugging Metho	To 11	Hole Diameter 8	of Mud	of 4	SX		el Truc	Cu	
Depth From O lugging Conti	To 11 2 3 7 ractor	Hole Diameter 8	of Mud	of 4	G RECORD No.	Rose Grav	el Truc	Cu	
Depth From O lugging Conti	To 11 2 3 7 ractor	Hole Diameter 8	of Mud	of 4	G RECORD No.	Rose Grav	el Truc	Cu	
Depth From ()	To 11 2 3 7 ractor	Hole Diameter 8	of Mud	PLUGGIN	G RECORD No. 1 2	Rose Grav	el Truc	Cu	bic Fee Cement

FIELD FIGH. LUG

A) Owner of	weil	DLAVAN	REFINING		<u> </u>	Owr	er's Well No.	37
Street or	Post Office Ad	dress ARTESI	Drawer A. N M	159 88210				
City and S	State	HRIESI	M , 18 14	80210			·	
ell was drilled	under Permit	No. RA 70	98 X 4		and is locat	ed in the:		
a. NE	_ % _SE_ %	SW % NW	¼ of Secti	on <u>9</u>	Township	<u>17 S</u> R	ange <u>26</u>	EN.M.
b. Tract !	No	of Map No		of the		····		
Subdiv	ision, recozded	! in		с	ounty.			=
d. X≃		_ feet, Y=		feet, N.	M. Coordina	te System		Zor
the								G:
) Drilling C	ontractor	S. Dale	Hughes			License No	MD 749	
idress		Rt. Rox	199 A. A	rtesia,	N M 88	210		· .
rilling Began .	10/21/8	Comple	eted <u>10/2</u>	1/82	_ Type tools	HUDEL	Size of	hole 8
evation of lan	d surface or _	·		at wel	1 is3361	ft. Total dept	h of well	20 1
ompleted well	is 🗓 sł	nallow 🗆 art	esian.		Depth to wa	ter upon completic	n of well	8
		Section	on 2. PRINCI	PAL WATER	R-BEARING	STRATA		
Depth 1	n Feet	Thickness	Do	mintion of 1	Vatas Bassia	Earnation		nated Yield
From	To	in Feet	De	scription of	water-pearing	Formation	(gallon	s per minute)
14	18	4-	Anhydri	tic san	d in lt.	gray silty	clay w c	Jyp N
							<u> </u>	
								
		<u> </u>	L	PECOPD	OF CASING			
Diameter	Pounds	Threads	Depth in		Length			Perforations
(inches)	per foot	per in.	Тор	Bottom	(feet)	Type of Sh	ioe Fr	om To
2	PVC				17			12 1
							:	
							•	
•		Section	n 4. RECORE	OF MUDD	ING AND CE	MENTING '		
Depth From	n Feet To	Hole Diameter	Sacks of Mud		bic Feet Cement	Meth	od of Placen	ient,
0	11	8		4	SX	Rose grave:	Ltruck	-
								
***	-							
		<u> </u>			<u> </u>			
ussins Contr				5. PLUGGIN	G RECORD			
ddress						Depth is	1 Feet	Cubic Fee
•					No.	Тор	Bottom	of Cemen
ate Well Plugg ugging approv								<u> </u>
PRINK approv	———	Ctata Easi-	eer Represen	Intiva				
	T - The - The -	State Engin	eet vebtezeu	LALITE	4			
			FOR USE O	F STATE EN	GINEER OF	NLY		
te Received	уолетре:	r 9, 1982			•	FWL		
	•							
File No	RA-7098	-X-4		Use Obser	vation	_Location No	7:26.9	.1342

EIELD ENER LOG

WELL	RECORD	

			Section 1. (GENERAL	NFORMATIO	. ис		
.) Owner of	weli	OLAVAD	REFINING	COMPAN	Y	Owner'	s Well No	38
Street or I	Post Office Ad	dressART	<u>Drawer</u> ESIA. N	159 M 88	210			-
-								
ell was drilled	under Permit	No. RA 709	8 X 5		_ and is local	ted in the:		
a. <u>SE</u>	% <u>SE</u> %	_SW_ %_NW	¼ of Sect	on <u>9</u>	Township	17 5 Rang	e <u>26</u>	EN.M.P.N
b. Tract N	No	_ of Map No		of th	e			
		of Block No					<u> </u>	
				•	-			_
		. feet, Y=		feet, N	.M. Coordina	te System		ZZone : Gran
		C 0-1-	11			License No		•••
•			-					•
dress		Rt. 1, Box	199 A,	Artesia	, AI M E	88210		
lling Began _	10/21/8	32 Comple	ted <u>10/</u>	21/82	_ Type tools	Auger	Size of h	ole <u>8</u> i
vation of lan	d surface or			at we	ılı is 3361	ft. Total depth o	f well	23 1 f
	œ	allow 🔲 art				ter upon completion o		
mpleted well	15 123 55	3110 W 1718.	enan.		Depth to wa	ter upon completion c	11 Meri	1
Donah :	- Foot		on 2. PRINCI	PAL WATE	R-BEARING	STRATA	P	
Depth i	To	Thickness in Feet	De	scription of	Water-Bearing	g Formation		ited Yield per minute)
16	21	5	Anhydr	itic sa	nd & dele	pebbles with	N.	Δ
			gray s	ilty cl	ЭУ	7333333		
			Section	RECORD	OF CASING			
Diameter	Pounds	Threads	Depth in		Length	Type of Shoe	P	erforations
(inches)	per foot	per in.	Тор	Bottom	(feet)	1790 01 3800	Fro	
2	PVC				21		1.0	5 21
			ļ					
					-			
Donah .	- E				ING AND CE	MENTING		
Depth :	To	Hole Diameter	Sacks of Mud		ubic Feet of Cement	Method	of Placeme	nt •
a	15	8			5 sx	Rose Gravel	Truck	-
	:							_
		9	6	e Di licon	uc arconn			
gging Conte	etot		Section	J. FLUGGI	NG RECORD	•		
	letor					Depth in F	eet	Cubic Feet
	d				No.		ottom	of Cement
te Well Plugg gging approv					$\frac{1}{2}$			
		State Engin	eer Represen	tative				
	Manage - 1	0 1092	FOR USE O	F STATE E	NGINEER OI	NLY		
e Received	November	7, 1704		Ouse		FWI		FS1
ile No	ra-7098-	Y_5		-		Location No. 17.		

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

Well	= 1	Sample Log	Page / of
Project_	Navajo Refi	nery Location SW corner	of Colony Landfarm
Drilling (Contractor D	Anderson Driller Richard	Helper Eddie
Rig Type_	Hollow Sten	Hole Diameter 8 inches D. Date and Time 10/19/82	rilling Fluid NA
Type of Sa	ample Split Spea	Shelly Drilling Began 1:30 pm	Drilling End 3:00p
Geraghty a	and Miller R	epresentative T Dauchy T	Bourette
Blows per 6 inches	% Recovery	Sample Description	Depth Feet to Feet
		fill - brown topsoil w/ gravel :	concrete 0-Z
		brittle brown silty day, poorly so	
·		brittle brown silty day, dense, noped	
		tan silty clay, plastic, moist	سر.
9-11-16	Split Spoon 8/2-10 orapnic smell		
6-6-8	Spit Spoon 14-1542	dolmite gravel water bearing seams (w/ gray brown silty clay, saturated,	(zn) interbed 14-16
4-4-5	Split Spoon 17/2-19	brown brittle sandy silty clay of red;	
	Shelby Tube 20-22	red clay, well sorted, unsaturat	
	,		
·	·		
	·	·	
		·	

Well 32	Sample Log	Page Z of
Project Navajo F	Refinery Location SE corner of	Telephone Storage
Drilling Contracto	r D. Anderson Driller Richard He	3 '
Rig Type Hollow St.	Hole Diameter 8" inches Dril Date and Time 10/20/82	lling Fluid N/A
Type of Sample Salt	Speen Shelly Drilling Began 7:202m	Drilling End 9:00am
Geraghty and Mille	r Representative J. Dauchy T. 3	Bouvete
Blows per % 6 inches Recove	ry Sample Description	Depth Feet to Feet
	Dark brown topsoil	0 - 2Y ₂
	light brown silty day of unweather poor	f-4 242 - 4
3-4-5 Split Spe 5-67	ion (4 - 6
	red silty clay	6 - 64z
5-6-10 Split Spo 10-11		zd 64z-104z
organic sm		
	tan sittychy, same as above	10/2-13
5-8-12 Split Spe 5-8-12 15-16	/2 gray silty day, well sorted, less done	se 13-16
9-16-17 Split Spe 17/2-1		16-22
6-7-9 Split Spor	on	
7-8-9 Split Spee	n	221/2-24
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
		٠ - ٠ - ٠ - ٠ - ٠ - ٠ - ٠ - ٠ - ٠ - ٠ -

Well	¥ 33	Sample Log	Page_3_of
Project_h	Vavajo Refin	nery Location NF of Colony	C Entrance Gate
		Anderson Driller Richard I	
Rig Type	tollow Stem	Hole Diameter 6" inches Dri Date and Time 10/20/82	lling Fluid NA
Type of S	ample <u>SpitSpo</u>	on Shelby Drilling Began 10:00Am	_Drilling End 11:30
Geraghty	and Miller R	epresentative J. DauchyT.	Bouvete
Blows per 6 inches		Sample Description	Depth Feet to Feet
		Brown trascil	0 - 4
	der H. Th	light brown silly day of amplifite, so	
	1	gray brittle silty by w/ white red core Analydritic sand interbedded in white	
3-7-8	15-16/z	Analydritic sand interbedded in white sity clay and reditan silty clay	14/2 - 17
5-5-7	Split Span 17-18/2-	red day	17 - 19/2
	·		
	·		
-	•		
		·	

Well	4	Sample	e Log	Pa	age 4	of
Project_1	Vavajo Refin	nery Lo	cation <u>Fas</u>	t Fence of	Tolony	
Drilling	Contractor_D	Anderson Di	ciller Rich	nard Help	per Ed.	lie
Rig Type	Hollow Stem ample <u>SplitSpo</u>	Hole Diameter Date a ShelbyDrilli	: 8" ind and Time / ing Began_	ches Drill: o-zo-8z Da <u>z:b_{pM} D</u> r	ing Flui ate and rilling	d N/A Time End 3:30p
Geraghty	and Miller R	epresentative_	J. Dauch	y T.Bo	ovete	
Blows per 6 inches	% Recovery	Samp]	le Descrip	tion	Feet	Depth to Feet
		Brown Topso	1) 3 Fill			0-6
	organic smell	Gray brown mot	led silty day	w unweather	booth	6-10
7-12-16	Split Spoon 10-11/2 Shelby Tube	very brittle gyp				
	15-17	silty day & gy	P	STUCK INTEL 1311	, ,, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	16-20
		gray clay-w		- ,		20-22
	·					·
			·	· · · · · · · · · · · · · · · · · · ·	·	
				,		
		·				
					···	
					,	
			•			

Project Navajo Refinery Location 5W corner C TEL weathering Drilling Contractor D. Anderson Driller Richard Helper Eddic Rig Type Hollow Stem Hole Diameter 8" inches Drilling Fluid N/A Date and Time 10-20-52 Date and Time Type of Sample Split Speen Shelp Drilling Regai. 4:25 m Drilling End 5:45 Geraghty and Miller Representative T. Dauchy T. Bouvete Blows per 6 inches Recovery Sample Description Feet to Feet Brown white top 11 0 - Z brown gay sityclay w/ gravel (1) squeet 5 - 10 3-4-6 Split Speen Split Drown altyclay w/ gravel Moist 10-11/2 white sity clay w/ arthydrite, very wet not saturated 11/2-15 7-16-37 15-16/2 downite gravel Scams in tight grav Sandysityclay 15-70 Split Speen dry tight white sitty clay w/ anhydrite 20-21/2 dry tight white sitty clay w/ anhydrite 20-21/2	Well	35	Sample Log	Page_5_of
Rig Type Hollow Stem Hole Diameter 6" inches Drilling Fluid N/A Date and Time 10-20-82 Date and Time Type of Sample Spit Speen Shelly Drilling Begai: 4:25pm Drilling End 5:45p Geraghty and Miller Representative T. Dauchy T. Bouvete Blows per 8 Brown white top: Brown white top: Brown white top: Depth Feet to Feet Depth Feet to Feet Brown gray sityclay w/ gravel (1) s gypsum 2-5 light brown sityclay w/ gravel (28) mixed 5-10 3-4-6 Split Speen Jo-11/2 light brown sityclay w/out gravel moist 10-11/2	Project_N	Vavajo Refin	nery Location SW corner G	2 TEL westhering
Geraghty and Miller Representative J. Dauch y T. Bouvete Blows per 8 6 inches Recovery Sample Description Feet to Feet Brown white top:// 0-Z brown gray sittyclay w/ gravel(1) 5 gypsum 2-5 light brown sityclay w/ gravel (8) mixed 5-10 3-4-6 Split Speen light brown sityclay w/out gravel moist 10-11/2	Drilling (Contractor D	.Anderson Driller Richard E	lelper Eddie
Geraghty and Miller Representative J. Dauch y T. Bouvete Blows per 8 6 inches Recovery Sample Description Feet to Feet Brown white top:// 0-Z brown gray sittyclay w/ gravel(1) 5 gypsum 2-5 light brown sityclay w/ gravel (8) mixed 5-10 3-4-6 Split Speen light brown sityclay w/out gravel moist 10-11/2	Rig Type H	Iollow Stem	Hole Diameter 8" inches Dri Date and Time /0-20-82	.lling Fluid N/A Date and Time
Blows per 6 inches Recovery Sample Description Feet to Feet Brown white top:// 0-Z brown gray sitty clay w/ gravel (1) 5 gypsum 2-5 light brown sitty clay w/ gravel (8) mixed 5-10 3-4-6 Split Speen light brown sitty clay w/out gravel moist 10-11/2				A
Brown white topsill O-Z brown gray sitty clay w/ gravel (i) squpeum 2-5 light brown sitty clay w/ gravel (b) mixed 5-10 3-4-6 Split Speen light brown sitty clay w/out gravel moist 10-11/2		8		
brown gray sitty clay w/ gravel (1) is gypsum 2-5 light brown sitty clay w/ gravel (38) mixed 5-10 3-4-6 split Spoon 10-11/2 light brown silty clay w/out gravel moist 10-11/2		Recovery	Sample Description	
3-4-6 Split Speen light brown silty clay w/out gravel moist 10-11/2			Brown white topsill	0-2
3-4-6 Split Speen light brown silty clay w/out gravel moist 10-11/2			brown gray sitty clay w/ gravel (1) 5 gy	2-5
3-4-6 Spiri speen 10-11/2 light brown silty day wout gravel moist 10-11/2				
	3-4-6	spin speen		
7-16-37 SplitSpeen domite gravel seams in tight grave sandysiltyday 15-20 S-5-10 SplitSpeen dry tight white silty day w/ anhydrite 20-21/2 15-16/2 domite gravel seams in tight grave sandysiltyday 15-20 20-21/2				"1 · F1 · · · ·
5-5-70 Split Speen dry tight white silly day w/ anhydrite 20-21/2	7-16-37	15-16/2	water bearing domite gravel seams in tight grave san	dysiltyday 15-20
	5-5-10	Split Spoon 20-21/2	dry tight white silty oby w/ anh	ydrite 20-21/2
		ć		
				-
3				

Well	#36	Sample Log	Page 6 of
Project	Vavajo Refi	nery Location North of	TEL in NonHazardous Landf
Drilling (Contractor D	Anderson Driller Richard	Helper Eddic
Rig Type F	dollow Stem ample Spit Spo	Hole Diameter 8" inches Date and Time 10/21 on ShellyDrilling Began 7:2	Drilling Fluid N/A/62 Date and Time Oam Drilling End 8:35a
		epresentative J. Dauchy	
Blows per 6 inches	% Recovery	Sample Description	Depth
		Brown topsoil . fill	0-41/2
	organic smell	light brown silty clay w/ gravel	
	locganic and	gray silty ala, w/ black, red white	marsegrains 8-14
			14-15/z
10-8-7	5pli+5poon 17/2-19	whitegray day w/ anhydritic nodule	25, gypsum _ 15/2-19
			19-25
	•	·	

Well	#37	Sample Log	Page 7 of
Project_h	Vavajo Refin	Location NE Com	er of TEL
Drilling (Contractor D	.Anderson Driller Richard	Helper Eddie
Rig Type H	lollow Stem ample Sdit Spo	Hole Diameter 8" inches Date and Time 10/21/63 ShellyDrilling Began 1:05	Drilling Fluid N/A Date and Time Drilling End 2:35
		epresentative J. Dauchy	
Blows per 6 inches	% Recovery	Sample Description	Depth Feet to Feet
	· 	brown topsoil - fill	0-242
		cart brown siltyclay mottled	242-5
	7	light brown silty clay white black neb	bles sorted 5-14
13-62-25	large Split Spoon 14-151/2	anhydritic sand in light y pay w/ gyp.	14 - 18
12-13-16	Split Speen 19-20/2	tight gray day well sorted	/8-26Yz
		·	
	ţ		
	,		
	/		

Well	<u>#8</u>	Sample Log	Page 8 of
Project_1	Vavajo Refin	nery Location Est Fence	of TEL
Drilling (Contractor_D	Anderson Driller Richard E	lelper <u>Eddic</u>
Rig Type	Iollow Stem	Hole Diameter 8" inches Dri Date and Time 10-21-82	.lling Fluid N/A Date and Time
		on Shelby Drilling Began	
Geraghty a	and Miller R	epresentative J. Dauchy T.	Bouvete
Blows per 6 inches	Recovery	Sample Description	Depth Feet to Feet
		Brown topsoil	0-4
	organic smell	proun silly clay marbled w/ gray sof	tsillyday 4-6/z
	organic smell	light brown silty clay soft, poorly sor	
	Shellay Tube 10-12	very hard anhydrite (cement/crystals) w/	***
9-17-19	Solit Speen	,	
4-8-9	Split Spoon 20-21/2	aray soft sitty oby reddish tint, per anhydritic large grain sand : domite per bearing zones (1-2") interbed w/ dense gran	oblementer vailty clay 16-21
8-13-13	5plit5poon 22-23/2	l	
		, , , , , , , , , , , , , , , , , , , ,	
	. 6		
	·		-
		,	
	·		
		·	
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		-	

Well #39 Navajo Refining Company - Monitor wells

Orilling Contractor - D. Anderson, El Paso

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

Date 6-13-84

Fasio & Chancey

Depth - Sample description

0-6-L+ Rod clay soil	
- 10 3 gyp anhy publes, clay	
14 gry gyp. oder gas	
174 gragyp, anhy 0: 1 elor and stein	
18 /r anky, gyp, clay 20 Red tgry shale, anky + anky x/s, Red shale	
20 Red + gry shale, anhy + anhy x/s, Red shale	wa
- 21 h Red Clay + anhy mixed with pebbles - wa	
-24 14 mixed red & white anhy + clay- some pebble.	s
26 fine red 4 wht anhy with clay-dry	•
	-

Well #40	Navajo	Refining Company	y – Monitor ω	ells	•
Orilling Co	ntractor - D.	Anderson, El Pa	aso		
_	ow stem auger 14-84	8" diameter - 7asio	Split spoon		. 18"
Depth	Sample descrip	tion .	333		

0-4 50.1 82 gyp, anhy, gry shale dry

13 gyp, anhy, gry shale water

16 anhy, shale, gyp: Bleeding O:1

18 th L+ gry fine anhy - no o:1 19 14 L+ gry, tan, granular anhy-0:1 20 3/4 gyp - water 23 4 gyp, anhy - water 25 1/4 Tan, fine, xln anhy 28 1/4 Tan fxln onhy - sand - gravel at 25.55' 31'h Red sandy silt

Well # 4 / Navajo	Refining Compan	y – Monitor wells	•
Orilling Contractor - D.	Anderson, El P	aso	
Rig - Hollow stem auger		Split spoon core	barrel 18"
Date 6-15-84	76510	4 Chaney	

Depth Sample description

0-15 Soil - Wet at 13 feet 16's wh++ Tau only + gyp - water 21 wht gyp with anhypieces (gravelly) 25' wht+ gry gyp + anhy - deuse 272 gry sandy clay tight 29 Red 4 gry sandy clay 31 Red soudy shale (clay)

Well # 42 Navajo Refining Company - Monitor wells	. •
Orilling Contractor - O. Anderson, El Paso	
Rig - Hollow stem auger 8" diameter Split spoon core barrel	18"
Date 6-18-84 Tasio & Chaney	
Booth Sample description	

0-10 Soil damp at 9'
0-10 Soil damp at 9' H' wht gup, anhy & Clay - Light
19/2 wht gyp, anny pebbles, clay water
221/2 gyp + gry, red sanly silt
24 vy fine gry shaley silt with pobbles
29 gry shaley, sandy, silt
29 Red Shaley, sandy, silt

Well #42 Navajo Refining Company - Monitor	wells
Orilling Contractor - O. Anderson, El Paso	
Rig - Hollow stem auger 8" diameter Split spoon Date 7-17-84 Chancy - 5-from	core barrel 18"
7:15 aux - 12:10 pm Depth Sample description	

0-42 50:1		
6 mixed soil(Red + qub. danit)-		-
7 = mixed Red Shale + gyp - vy red Shale at botto	PLC.	
9 .67 mixed so; 14 gyp88 gyp w HCR. odo	$\left - \right $	gas
10 = gyp with anky pebbles HCR- odor - no blag	0.	/
12 .75 gyp walauly polities HCR- ,75 wht gyp		
13= 1- gypw pebbles - gas stritder -0= gyp - 51.94	1	y wet
15 0 gyp+gravel-oil +wtr 12 gyp, gravel-wet-to	re	ecets
16 0-gyptgravel-wt-12 gry gyp-tight-u	Je	7
18 0=gyptgravel-wtr-1=grygyp-tight-1 18 0=gyptgravelwtr-1=gypwthdopes-0x Rd-	\$ /;	Sul
195 0 Rds, 1ty Sauly + tobbes - 0 PRoffine S. 14	2	auly
195 0 Rds, 14 Sandy + places - 0 - Red fine 5, 14, 225 Or 1 Rd 5, 14y Sand - TD.		
, and the second		
		1

Well # 4# 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 - Stroud Depth Sample description
John 5:25m Sample description
Depth/ Sample description

0-165	Red Silty-saudy Soil
17	whtaus - Water
	wht-sup-deuse-dres
20	o'whtgypons - 1 - Red silty souly clay
225	Rel Clay - T.D.
	,
	•
. '	
1	

The state of the s

Well #45

g.,

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-Ledesma	
Depth Sample description By Effluent ditch	١
at NW Corner farme	1
11'So. & ditch	1
	ļ
0-45 Red Soil dry	
5 gyp- dry	
6-6- wht gyp. dry - 6-914 shale dry 5961.00	
8 gry sky skelo w very /ge anhy pes- dry 95 188 gry skale + gyp. 2 anhy grave/- 95 gry skale + anhy dr	
95 gry shale + gyp. 2 anhy grave 1-95 gry shale + anhy de	2
-10 2'core dry	
11 = 108 - 9 Ty Shale is early pes - 11 anny gravel - 11 9 Ty sh 1 49 Hows	
13 gry shale w gyp-anhy pas - daup. 3/2' whom dry stem	
13 gry shale w gyp-anly pcs - daup. 3/2' whom to blows 145 grave at top: 14' and at 145 - gry sil w grave sheeks 27 blows	
16 14-15 - grysh + gravel - 15-16-gry shalo - wt	
\overline{D}	.•
16 casing	
gravel 16-10 ^E Pellets 10-8 ^E	
Pellets 10-85	_
cmy+ 850	

Bowbre Fog

Well #46 Navajo Refining Company - Monitor wells
Drilling Contractor - O. Anderson, El Paso
Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"
Date 8/22/84 Stroud-Ledesman
11:55 2
Depth Sample description Center north sede
navago-collier Farm
0-65 Dark red 50:1
8 Lite Red soil 494 ps drug
11 gry clay w gyp
1350- de out out out
125 ga, clay, gyp, anky pc tight-dra
14 gryclay-gyp. auky gravel - wtr
15 14-15 - gry sly-shale 153 -5 Rel shale
17 Fine Red Shale.
7
.*
C.sq-17'
gravel + Red 17-17
gravel + Rerts 17-12 Pellets 12-10
Cunt 10-0

1

Sawbre rad

41
Well # Navajo Refining Company - Monitor wells
Orilling Contractor - D. Anderson, El Paso
Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"
Date 8/22/84 Stroud-Ledesma
Date 8/27/84 Stroud-Ledesma Depth Sample description SE Cornel Navago Collier
Depth gample description 32 Country 1000 100
0-5 derk Red soil deup
10 lite Red soil dauge
115 Rel Shale
13 Craige Red Angle Sauf
12/ 11 10 11
1D
14
Casing 17
gravel + texp - 14-9
Rellets 9-8
Cun+ 8-0

Well # AA Navajo Refining Company - Monitor wells

Orilling Contractor - D. Anderson, El Paso

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

Date 6/8/83 11:15 am

Depth Sample description

SANTA FE

		_
0 - 5	Fill - clay & gravel	
5 - 6 1	Red clay - fill?	
6½ - 8	81k oil stained soil or fill Rec. 1' lost $\frac{1}{2}$ '	- hi
8 - 9½	Heavy HCR (hydrocarbon residue) in gypsum – oil odor Rec. 1' lst $\frac{1}{2}$ '	Red Clay
9½ - 10	Orill gyp	BIK O'I
$10 - 11\frac{1}{2}$	1.1' gyp ail adar .4' gyp & red clay ail adar	HEAVY HCR
$11\frac{1}{2} - 13$.5' porous gyp heavy gasoline odor. l' gyo with gasoline odor	12 949
$13 - 14\frac{1}{2}$.5' porous gyp gasoline dripping. l' gyp	Gasoline
$14\frac{1}{2} - 16$.3' porous gyp with free gasoline. l.2' gyp sli por gasoline odor. Tr gray clay	-
$16 - 17\frac{1}{2}$	1' gyp & 1st gravel with gasoline5' gyp no odor	15
17½ - 19	gyp & 1st gravel - water	gyp + arrowl
19 - 19½	Orill gyp	Water
$19\frac{1}{2} - 21$	1.2' gravel & gyp; water3' dry gravel - solid	20
21+	No go core. Rec. + .25' very crs gravel & gyp	Soli 740
		•
	-19 WH	•
. III MAR	-1094 -107/20	
OIL CONSE	RVATION DIVISION 306	

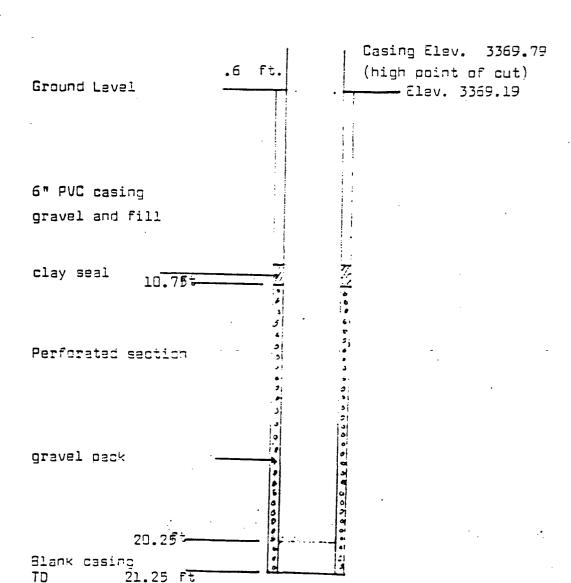
DETRILE OF WELL CONSTRUCTION

Data	6/8/93	
	-, -, -,	

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₩sl1 # 2A

Company <u>Navajo Refining</u>



Well #	4 AB	Navajo f	₹cf:	ining Compa	ny – Mor	nitor (uells		
Orilli	ng Contracto	or - 0.	Апі	derson, El	Paso				
Rig -	Hollow stem	auger	9#	diameter	Split	spoon	core	barrel	18°
Date _	6/9/83	7:15 am	1		•				¥.

Depth Sample description

0 - 9 Soil - Fill - Red	
9 - 10½ dk. gry gyp & clay with 1st pebbles and blk sli gas odor	HCR seams.
$10\frac{1}{2}$ - 12 gravel (crs 1st pebbles in gyp) free gasol	ine
12 - $13\frac{1}{2}$ crs. 1st pebbles in gyp free gasoline	<u> </u>
$13\frac{1}{2}$ - 15 crs 1st pebbles in gyp ffee gasoline	
15 - 16½ gyp & med gravel - gasoline & water	- Is
$16\frac{1}{2} - 19\frac{1}{2}$ Orill gyp % gravel	10- 94 No R
Tap	Gasoline Gasoline
	tranch see Maravel
	15 + 12 CARLE MC
-16.5 wh	gast war
-11.34 Top flot 7/23	
5.13	
4450 00 1000	- I i i i i i i i i i i i i i i i i i i
MAR 06 1985	
OIL CONSERVATION DIVISION SANTA FE	

DETAILS OF WELL CONSTRUCTION

Date 6/9/93	<u></u> Hell # <u>A3</u>
Company <u>Navajo R</u> efi	ning
Ground Level	1.6 ft. Casing Elevation 3369.79 Elev. 3368.18
6* PVC casing gravel and fill	
clay seal 9.5 ft	77
Perforated section	
gravel pack	
13.5ft	
Blank casing _{19.5} ft	

Well # AC Navajo Refining Company - Monitor wells

Orilling Contractor - D. Anderson, El Paso

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

Date 6/9/83 10 am

Oepth Sample description

0 - 5	Fill dirt. Top lt red soil @ 5'	_
5 - 8	Lt red soil. Too gravel 3 8'	-
8 - 10	gravel & red soil	
$10 - 12\frac{1}{2}$	gravel & red soil or clay - top gyp gas odor	5
$12\frac{1}{2} - 13$	Orill gyp	
$13 - 14\frac{1}{2}$.5' gyp w gas & water some gry clay l' gyp	grave! Soil
$14\frac{1}{2} - 15\frac{1}{2}$	gyp & gry clay. Sli gravel 14½-2 water	10-000
$15\frac{1}{2} - 17$	1.4' gyp wet .1' dry gyp	- 94P+41al
		gas a water
· ;		15 Water
		TD
	-14.75 who	
	- 15.47 All 125	20-
	4.74	-
1	ENGIBLE TO THE PROPERTY OF THE	- .
De Caracian de la Car	MAR 06 1985	
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DETAILS OF WELL COMSTRUCTION

Oata 6/9/83		Well #	<u> </u>
Company <u>Maveio Refir</u>	iing		
Graund Level	1.1ft.	Casing ElevElev. 336	•
6* PVC casing gravel and fill		·	
clay seal 8.0 ft	7/2		
Perforated section			
gravel pack	000000000000000000000000000000000000000		
		.*	

Blank casing TD

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17

SAMPLE LOS

Well # AD Na	vajo Refining Comp	eny – Monitor wel	lls ·
Orilling Contractor	- D. Anderson, El	. Paso	
Rig – Hollow stem au	ger 9° diameter	Split spoon co	ore barrel 19°
Date 6/9/83	1:55 pm	4 - 4	

Oepth Sample description

•		
$0 - 7\frac{1}{2}$ F:	ill	
$7\frac{1}{2} - 11\frac{1}{2}$ Sa	andy gravel	
$11\frac{1}{2} - 12$ Di	rill gyp odor gas	
$12 - 13\frac{1}{2}$ gy	yp w lst pebbles (gravel) gasoline - fair porosity	N
13½ - 15 g) Od	yo w anhydrite pcs - no gravel. Fair to poor porosity dor gasoline l' - No odor bottom .5'	
$15 - 16\frac{1}{2}$ gy	yp ω anhydrite pcs – water	Sandy gravel
$16\frac{1}{2} - 17\frac{1}{2}$ gy	yp w ahhydrite pcs – water	•
$17\frac{1}{2} - 19$ gy	/P TD	der que
		anhyarile pes
	16	
·		Water
	20	TD
(F)		
	MAR 06 1985	and the second
	OU CONSERVATION DIVISION	74.74

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DETAILS OF MELL CONSTRUCTION

Date <u>6/9/33</u>

Wall # _ 30

Company <u>Javajo Rafir</u>	<u>nins</u>	·	
Ground Level	1.5 ft.		Elev. 3376.59
6" PVC casing	: 1		
gravel and fill	:		
clay seal 9.0 ft		77	
Perforated section	2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	6 v 2 _j	
Ferrarated Section	اف اس ف	3 5	
gravel pack	; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;		
	• • • • • • • • • • • • • • • • • • • •	0000	
18.0ft	[s]		
Slask carina	17	lei	

Well # AE Mavajo Refining Company - Monitor wells

Orilling Contractor - D. Anderson, El Paso

Rig - Hollow stem auger 8" diameter Split spoon core barrel 19"

Date 6/10/83 7:15 am

Depth Sample description

0 - 5 Fill & soil	
5 - 7 Gry clay & gyp	- i
7 - 9 Gry clay & gyp - change at	- 7.
9 - 10 Orill	s chu
10 L 11 ¹ granular gyp & anhy .8'. porous gyp .45' gasoline in whole core	941
11½ – 12.7 med gravel & gyp – porous gasoline	
12 ⁷ – 14 ² l' med gravel & gyp5' gran gyp. gasoline	gran 941
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.
18 - 18 ⁸ hard gyp	Water
18 ⁸ - 20 ³ Orill hard gyp	- 11997
	20- TO
	-
MAR 06 1985 OIL CONSERVATION DIVISION SANTA FE	

DETAILS OF WELL CONSTRUCTION

Wsl1 # AE

Date <u>6/10/33</u>		Well # AE
Company <u>Mavaio Refini</u>	ins	
	•	
•	-	Casing Elev. 3369.67
Ground Level	2.1ft.	Elev. 3366.57
		•
6" PVC casing		
gravel and fill		
clay seal 9.3 for		
Perforated section	5 6 7	
gravel pack	000000000000000000000000000000000000000	
19.3ft— Blank casing TD 20.3 ft	0 0 0	

The state of the s

Well # AF Navajo Refining Company - Monitor wells

Orilling Contractor - D. 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 gyo w med gravel - gasoline saturated	5	
$13 - 13\frac{1}{2}$	Drill gyp & gravel	-	
$13\frac{1}{2} - 14$	Orill gyp	- 12	gup & grave
$14 - 15\frac{1}{2}$	gry gyp w med gravel 1.2' water. Hard gyp .3'	10-1	Moio
$15\frac{1}{2} - 17\frac{1}{2}$	Orill gyp	000	Gasoline gip a ines
	F	- 6 6	
		15.2	Hater .
•		-	Hard gyp
		-	TD
:.		2.9-	50 g.
	, i	-	
		-	
	DEGIETOVIETI	-	
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• •	OIL CONSERVATION DIVISION SANTA FE	٠	

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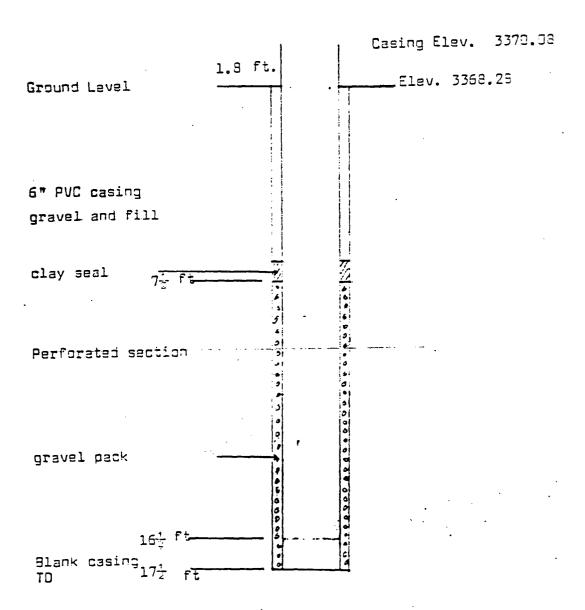
DETAILS OF WELL CONSTRUCTION

Date	6/19/53

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'Uell # _ AF __

Company <u>Naveio Refining</u>



Well	#_AG	Navajo	Ref:	ining Compa	any – Moi	nitor (nelle		
Orilling Contractor - D. Anderson, El Paso									
Rig -	- Hollow stem	snöst	g#	diameter	Split	socon	core	parral	19"
Date	6/10/83	3:00	pm				•	*	

Depth Sample description

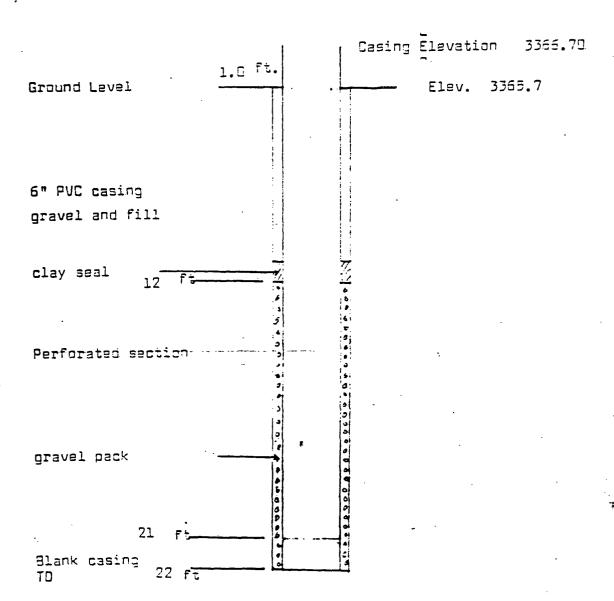
	 .
0 - 7½ gravel & clay	
$7\frac{1}{2}$ - 9 gyp & clay - tight	
9 - $10\frac{1}{2}$ gyp & clay - slight odor. Tight clay last $\frac{2}{4}$.	
$10\frac{1}{2}-12$ gyp and gry clay no fluid	5
12 - 13½ gyp & gry clay " "	- 15
13½ - 15 gyp & gry clay " "	Ho flaid
$15 - 16\frac{1}{2}$ gry clay & gyp " "	di des gas
$16\frac{1}{2}$ – 18 gry clay & gyp .5'. gry sand l' sli wet at bottom	•
18 - $19\frac{1}{2}$ gry sand 1.4' gyp & gry clay .1' fluid in ss water	•
$19\frac{1}{2}$ - 20 drill gyp	15
$20 - 21\frac{1}{2}$.6' sand wat .9' gyp & clay water	
21½ - 22 Orill to TO	. Same Water
	20-
	55 Water
	3.
MAR 06 1985	were the
OIL CONSERVATION DIVISION SANTA FE	

DETAILS OF WELL CONSTRUCTION

Data <u>6/10/33</u>

Well # _ 45

Company <u>Mavaio Refinino</u>



Well # AH Navajo Refining Company - Monitor wells

Drilling Contractor - D. Anderson, El Paso

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

Date <u>6/11/83 7:30</u> am

Depth Sample description

$0 - 4\frac{1}{2}$ Crs gravel fill & valley fill	
4½ – 5 gry clay & gyp	
5 – 6½ Pnk sdy clay & gravel	200
6½ – 8 Crs gravel & gyp	gup + gavel
$8 - 9\frac{1}{2}$ gyp – dry – no gravel	—
$9\frac{1}{2}$ – 11 gyp & gry shale – no gravel	No Gravel
11 - $12\frac{1}{2}$ gravel & gran. gyp & gry shale. Tr fluid odor gas	
$12\frac{1}{2}-14$.2' gravel, gyp 2 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
$18\frac{1}{2}$ - 20 lt red clay & gyp - water	
20 - $20\frac{1}{2}$ Orill	ZS- Watel
$20\frac{1}{2}$ - 22 clay & gyp - tight - no fluid. Red shale on bottom	
70	- TO PLAK
MAR 06 1925	
CIL CONSERVATION DIVISION SANTA FE	

DETRILE OF MELL CONSTRUCTION

Data <u>6/11/83</u>	<u>-</u>	Well # _HA
Company <u>Mavajo Refi</u>	nina	
Ground Level	1.75 ft.	Casing elevation 3367.25 Elev. 3365.5
6" PVC casing gravel and fill		
clay seal 12 fa-	4, 2 3 4	1 77 77 2/2 1-6 1-6 1-6
Perforated section	2) 3) 4) 4)	2; .e. .e. .e. .e. .e. .e.
gravel pack	7	000000000000000000000000000000000000000

Blank casing TD 2

ft

22

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

Depth Sample description

a	_	9	Valley fill	
9	-	$10\frac{1}{2}$	clay & gyp - no fluid; no gravel	
101/2	_	12	l' clay & gyp5' gyp & gravel odor gas .	
12	_	$13\frac{1}{2}$	1' gyp & gravel - sli odor- damp5' hard dry gyp 5	d .
131/2	-	15	.5' gyp & gravel - water ; l' red clay & gyp. dry	
15	_	151/2	Orill	C 64 4 941
151/2	_	17	रं gyp & red clay w gravel - wtr. रं dk gry clay & gyp, w gravel	948
17		18	gyp w little gravel at top. Balance tight	Ilo Gravel
18	_	20	Orill • TO	Hater
			15	
		- (*		
				99 Tight
			2 <i>0</i> -	
	:	0/		
-	••••	· · · ·		
			MAR 06 1985	
			OIL CONSERVATION DIVISION SANTA FE	

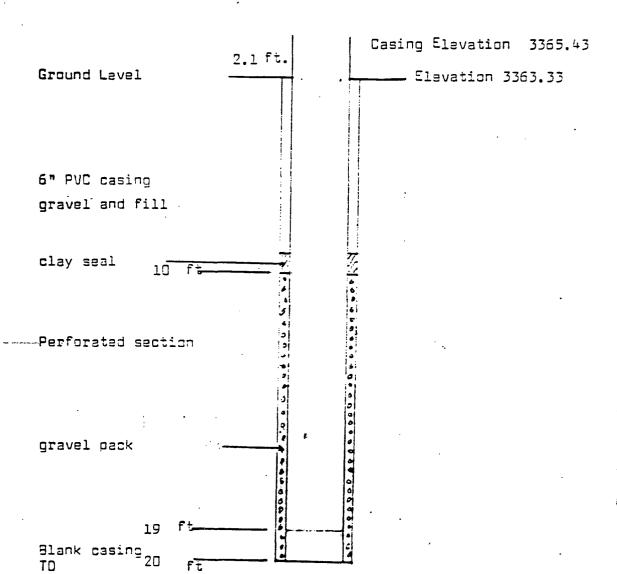
DETAILS OF WELL CONSTRUCTION

Date 6/11/83

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Well # _ 4I

Company <u>Navajo Refining</u>



Well #	R	Navajo F	₹cf:	lning Compan	y – Mor	itor i	Jells		
Orilli	ng Contracto	or - D.	And	derson, El P	350				
Rig -	Hollow stem	auger	9"	diameter	Split	spoon	core	barrel	18"
Date _	6/7//83	10:15	am			•			

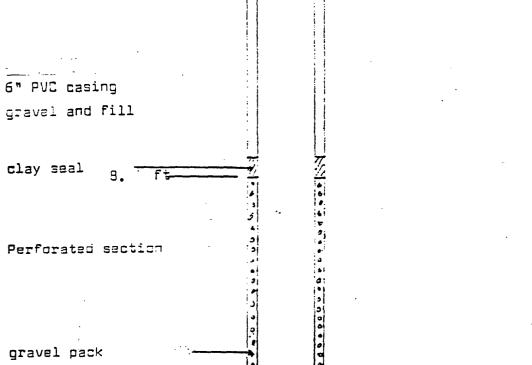
Depth Sample description

0 -	41/2	Red soil	
41/2 -	6	Red clay & gyp no porous zone	
6 -	. 7 1	gyp & anhydrite - l ¹ / ₄ ': gyp ¹ / ₄ ' w oil odor	
7 -	834	gyp & anhy — gil stained — sli porosity	Redcky
83 -	9	drill	94701
9 -	192	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	
12 -	13½	tred gravelly shale - water: .5' gry gyp water: .3' red anny, gravel dry odor: .4' rd hard limey shill	-water
$13\frac{1}{2}$ -	15	.4' rd-gry shly gyp: .9' gravel w water: .2' red shale	
15 -	16½	.7' red shale	
16½ -	18	Red shale TO	Red shale
•			TD
1		20-	
	11		
		MAR 06 1985	28. 100
•	•	CIL CONSERVATION DIVISION	ाल्य्यस्य व
		SANTA FE	•

A STATE OF THE STA

DETAILS OF WELL CONSTRUCTION

Date <u>5/7/93</u>	변ell # <u>유</u>
Company <u>Navajo Refining</u>	•
Ground Level	Casing Elevation 3363.09 Elev. 3362.49



16.25ft
Blank casing
TO 18 ft

Sample description

Depth

Well # <u>S</u>	Navajo P	Refining	Company - Mor	nitor wells		
Orilling Contracto	or - 0.	Andersor	, El Paso			
Rig - Hollow stem	auger	9° diame	eter Split	spoon core	barrel	18"
Date <u>6/7/83</u>	3:05	pm				

$0 - 4\frac{1}{2}$ Soil	
$4\frac{1}{2}$ - 6 Lt rd sdy gyp dry .7' : dk gry clay .8'	1:0
6 – 7½ gy shl & gyp – oil stain & odor	S me almostil
7½ - 9 dk gy shly gyp ¼' ail stn & ador : 1¼' lt gy shly gyp ∠ ail ador	Rd sayashi
9 – 10½ lt & dk gy shly anhy & gyp – granular – bldg oil	941-01
$10\frac{1}{2} - 12$ drill	
12 - 13½ lt & dk gy shly gyp, sli porous - oil & wtr)
13½ - 15 lt gy gravel l' w wtr : lt gy gyp w oil & wtr .5': at bottom tight.	oil & Water
15 - 16½ gravel, clay & gyp - water	
15 15 ₂ graver, erdy a gyp adder	Bas Water
$16\frac{1}{2} - 19 \text{Orill to TO}$	gab-tight
	Fue
	Fue
$16\frac{1}{2} - 19$ Orill to TO	TD
16½ - 19 Orill to TO /5	TD
$16\frac{1}{2} - 19$ Orill to TO	TD
16½ - 19 Orill to TO 20	TD
16½ - 19 Orill to TO /5	TD

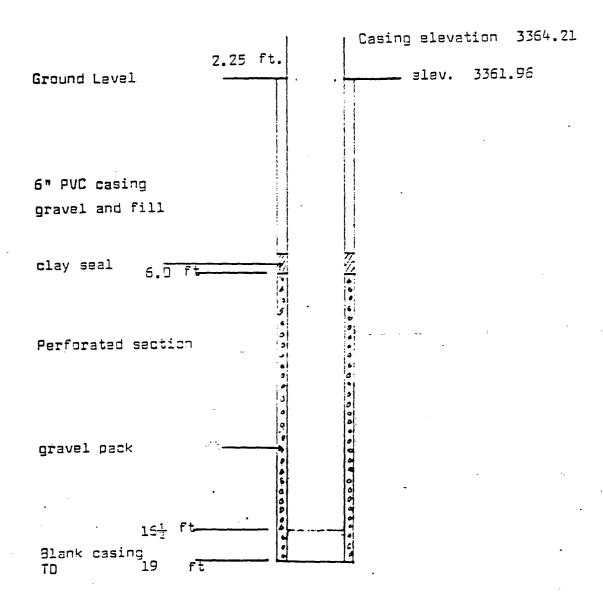
DETAILS OF WELL CONSTRUCTION

Date	6/7/83	
2222	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	

STATE OF THE STATE

Well # _ S

Company Navajo Refining



Well #_T	Navajo f	Refinin	ō Combsuà	<u> – Mor</u>	itor u	vells		-
Orilling Contract	or - D.	Anders	on, El Pa	so		•		
Rig – Hollow stem	anger	9" dia	meter	Split	spaan	core	barrel	18"
Date <u>6/8/83</u>	8:45 ar	n .						

Depth Sample description

Red soil - clay 8 - 10 Pnk clay w gravel - valley fill 1': .5' gyp 10 - 11½ gyp + .15'; gry clay â gravel + 1. : .15' dk gy gyp oil odor 11½ - 13 ¼ dk gry gyo, cil odor, core bbl wet w cil : 1¼' gy gyp sli odor tight 13 - 13¼ lt gy gyp â gravel - water - core blocked 13¼ - 18 dk gy clay â gyp 18 - 19 Red clay TD 10 39P - cil 30				
10 - 112 gyp + .15': gry clay & gravel + 1. : .15' dk gy gyp oil odor 112 - 13	0	- 8	Red soil - clay	
oil odor 11½ - 13 ½' dk gry gyp, dil odor, core bbl wet w dil : 1½' gy gyp sli odor tight 13 - 13½ lt gy gyp & gravel - water - core blocked 13½ - 18 dk gy clay & gyp 18 - 19 Red clay TO 10 34P-isht Water MAR 06 ISSS OIL CONCENTATION DIVISION	8	- 10	Pnk clay w gravel - valley fill l' : .5' gyp	
gy gyp sli odor tight 13 - 13t It gy gyp & gravel - water - core blocked 13t - 18 dk gy clay & gyp 18 - 19 Red clay TO 10 gyp - cil gyp - cil	10	- 112		
13 - 13 t 1t gy gyp & gravel - water - core blocked 13 - 18 dk gy clay & gyp 18 - 19 Red clay TO 10 gyp i ght Water 15 clay MAR 06 1835 OIL CONCERNATION DIVISION	11-1/2	- 13		5
18 - 19 Red clay TD 10 3/P - 0/1 Sypeistr Water 15 Class MAR 06 1885 OIL CONCERNATION DIVISION	13	- 13		- 2
MAR OG 1885 OIL CONSERVATION DIVISION	134	- 18	dk gy clay & gyp	elag, grand
MAR OG 1085 OIL CONSCIONATION DIVISION	18	- 19		10- 94P-011
MAR OG 1085 OIL CONCERNATION DIVISION				gyp-tight
MAR OG 1895 OIL CONSERVATION DIVISION		,		Weder
MAR 06 1985 OIL CONSERVATION DIVISION				15
MAR 06 1095 OIL CONSCRIVATION DIVISION				- cle &
MAR 06 1035 OIL CONSCRIVATION DIVISION				
MAR OG 1085 OIL CONCERNATION DIVISION				
MAR OG 1085 OIL CONCERNATION DIVISION				_
OIL CONCERVATION DIVISION				
OIL CONCERVATION DIVISION				
OIL CONCERVATION DIVISION SANTA FE				
	•		OIL CORDERVATION DIVISION SANTA FE	

DETAILS OF WELL CONSTRUCTION

Date <u>6/3/93</u>	_	Well #T
Company <u>Navajo Rafi</u>	ning	
Ground Lavel	1.4 ft.	ing ^E levation 3364.14 _ Elev. 3362. 7 4
6" PVC casing gravel and fi		
clay seal 9 ft		
Perforated section		
gravel pack	00000	
Blank casing TO 19 ft		

WELL LOGS USED ON THE EAST - WEST CROSS SECTION

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		(4) 0		City	of Artesia		
	ГТ		Street and					
1	1 1		•				StateN.	Ma
 	 - -						suteand is	
	1-1		Men Mar	CLINEC. ST	Mer Per Vr	MIL NO	Twp_17	nor 26
			1				-	
1			1	_			cumb License	· No
L		*						
		€					State:	
}	1 1	3	Drilling w	vas comm	enced		June 21	19 09
<u>(</u>	Tat of 640 ac	res)	Drilling w	as comple	eted		Aug. 24	19, 09
-			feet above se	e level	> .	2 Total de	pth of well	68
							ter upon completio	
						•		
Section 2	2.			CIPAL WA	TER-BEA	RING STRATA		•
No.	Depth in	Feet:	Thickness in: Fast		D	escription of Water	r-Bearing Formation	••
	Prom	10						
1				lst fl	ow 890	· · · · · · · · · · · · · · · · · · ·		
2	•			2nd fl	ow grad	ual increase	890-920	
3								-
•								
5.								
		<u> </u>	·				:	•
Section	3			RECOR	D OF C	ring.		
Dis	Pounds	Thread			Post	Type Shoe	Perforat	
<u>ia.</u>	n.	in.	Top	Bottom	<u> </u>		Prom:	To
11 5/	/B	 			121			
8	ļ	ļ		ļ	727			·
6	<u> </u>	 			211			
	<u> </u>	acker b	etween 6" x	8"	<u> </u>			
Section ·	4		RECOR	D OF MU	DING A	ND CEMENTING		
	h in Feet	Diamet		No. Se				
From	To	Hole in	-	Cess	Mathada Wash			
	+	 						
	 			+	+	,		
		†		+				
		<u>·</u>		····				-
Section :	5	_		PLUGG	ing re	CORD		-
Name of	Plugging	Contract)r				License No_	<u> </u>
Street a	nd Number	·			_ City_		State	
Tons of	Clay used_	<u>, </u>	Tons of R	oughage u	bec	Ty	pe of roughage	
	method u					Date Plu	gged	19
Plugging	z approved	by:				Cement Plu	s were placed as fo	llows:
			-			Depth of P	ine I	
_			Basin Sup	ervisor	*		No. of Si	icks Used.
	TOR INCE	OF STAT	ENGINEER O	NT.Y	7 [
	FUR USE	OF SIAL] [
Date	Received				_ -	1-1-		
					-			
.	from c	iriller'	s log 12-6-	62	-			
					Harris			
File No		•	•	_Use		Location	no. 17.26.17.2	10

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	l.			(A) Own	r of well	.)	Albert 1	P. Woods,	
				Street and					
		1		City				Artesia State No	w Mexico
				Well was	drilled. uz	der Per	mit No	and	is located in the
ŀ			-		NW: 1/4	No.	% of Section 16	Twp. 178	Rge_26E
 	<u> </u>			(B) Drill	ng Contra	ector	M.S.Bruning	Licen	se No
F			:	Street and	Number			·	
 		1	-	City				State	
ŀ		1	-	Drilling v	zas comm	enced		April 15.	1930
	<u> </u>	<u> </u>		Drilling w	as comple	ted		June 1.	1930
•	Plat of 64		-			→ : •. •			
	_							pth of well 123	
State wi	ether: v	vell is	shallov	v or artesian			Depth to wa	ter upon complet	ion
Section :	2.	•	*	PRIN	CIPAL WA	TER-BEA	RING STRATA		
No.	Depti	h in F	To	Thickness in Feet		ې پ	escription of Wate	r-Bearing Formation	
1		+							
2		+-							
3		1					···		
•		1		,		7			
5.	,	+-		· ·			• ;		
					75566				
Section :	,	. 1		Der		D OF CA	SING.		
Dia:	Poun		Thread: in.	Top	Bottom	Peet:	Type Shoe	Perfor From	To
121	50	一十		0	1233	1233			
							·		
		$\neg \uparrow$							
•						-			
Section 4	.			RECOR	D OF MUD	DING A	ND CEMENTING		
Depti	in Feet	T	Diamete	r Tons	No. Se	clas of			
From	To	.	Hole in i	22. Clay	Cem	ent		Methods Used	
								-	
								-	
				•					
	i								
Section !					PILICA	ING REC	CORD.		
	_	C		_ .	12000			Tinama Na	
Name of Street a	-	_				<u>~</u>		License No_ State	
				Tons of R					
Pluggins					onfluere o			pe of roughage	
rmgging Plugging							**	gged gs were placed as	
	approv								TOTTOMS:
				Basin Sup	ervisor	N	o. Depth of P	No. of	Sacks Used
	TOP 1	157 (1	PSTATE	ENGINEER O	VT Y	7			
				MONTES C					
	Receive				· ··	_			·
						-	 		
1	=	·	4 2		er .		, , , , , , , , , , , , , , , , , , ,		
	Lia Tes			-		-			
EVIA MA	DA.	_1 090	_		TTee			- No 17 06 16	7,7

Section 1. GENERAL INFORMATION

ATT THE PARTY OF

E FIAMILIEUS OF LICE	
	t
VELL RECORD	1

(A) Owner of	weil Fred	Jones dress F	n 40, 1.22)		Owne	er's Well No	R1-661.
City and S	itate <u>inte</u>	sia. Nº	0 40 1:23 88210					
					and is located :	in the:		•
<u> </u>	16. <u>Sil</u> 16	<u>"!#- XXX</u>	(F % of Sect	ion 9	Township	75 Ra	nge <u>25°</u>	N.M.P
					e <u>Hilcrest</u>			
• >	3	of Block No.	•		. Dailled	east center	ot Lot	
c. Lot No	ision, recorded	in		OI U	county.		<u> </u>	
			•		V.M. Coordinate S			
						,		Gn
(B) Drilling C	ontractor	4 1 1 Ent	enoninen			_ License No	<u> </u>	
Address	P	n Bin 47	7	Anten	in NI 8821	0	•	
		_			Type tools			***
					ell is 📑 📑			
Elevation of lan	a surrace or _						2	?5
Completed well	is. 🗓 sh	allow 🔲 a	rtesian.		Depth to water	upon completion	of well	
		Sec	tion 2. PRINC	IPAL WATE	R-BEARING ST	RATA		**
Depth i		Thickness in Feet	. De	escription of	Water-Bearing Fo	ormation		d Yield
From	То				17 1		(gallons per minu	
273	303	30	30	re snad o	and fravel			
l					•	•		
			Section	3. RECOPT	OF CASING		·	
Diameter	Pounds	Threads	Depth ir	Feet	Length	Type of She	Per	forations
(inches)	per foot	per in.	Тор	Bottom	(feet)		From	
7"	26	جع ا	1	302	303	PE	27.	3 303
			.					
		<u> </u>			<u></u>			
Depth i	n Feet	Secti Hole	on 4. RECORI		DING AND CEME	NTING ·		· · · · · · · · · · · · · · · · · · ·
From	To	Diameter	of Muc		of Cement	Metho	od of Placemen	.
			+					
	 		+			- 		
			<u> </u>	<u> </u>				
			Section	5. PLUGGE	NG RECORD			
Plugging Contra	ctor					778		
Address					No.	Depth in		Cubic Feet
Plugging Methor Date Well Plugg						Тор	Bottom	of Cement
Plugging approv	ed by:				2			
		State Eng	ineer Represer	ntative	3 4	-		
	448 85	1000	FOR USE C	F STATE E	NGINEER ONLY	?		
	OF TEMPER	1 480						
Date Received	white sa	, 2300		 Oua	d	FWI		SI
Date Received	RA-6612			Qua	Dom. I	•	F	

I

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I

RECOR

or in the office of the Artasian Well Supervisor, Roswell, New Mexico. Section 5 should be answered only if an m plugged. All other sections should be answered in full in every case, regardless of whether the

		1					
		7. Owner of w	n Br	itton C	011		
		Street and N	B+	T Bow	30		• • • • •
- 104	NF	47 T					
NA		Post: Office.	Ar	tesia N	ew Mexi	.co	
		Well was dri	lled under	Permit No.	RA-2723	5	
		→				,	
		is located in	the DE	¥_ _ B	W %	SE.	% of Section 9
- cw	SE	Township	17 Sou	th	, Range	26_	EASt
		Drilling Con	tractor	Blount	& Coll		
(April	X	P .					
(Files of 6	40 Acres)	Street and N					
	Accurately	Post Office		Artes1	8 New M	exico	
				illing.was c	ompleted_J	uly 2	3 1951 19
Elevation at top of o	asing in feet abo	ve ses level	77.5				······································
State whether well is	shallow or artes	ian S	hellow	Dome	stic		
Total depth of well	518	•	•	•			feet below land surfa-
Sec. 2		PRINCIPAL '				_	
No. I, from 2				•			
No. 2, from	to	Thick	iness-in: fee	t	Form	estion	· · · · · · · · · · · · · · · · · · ·
No. 3, from	to	Thick	mess in fee	<u> </u>	Forn	ation	·
No. 4, from	to	Thick	mess in fee		Form	ation	
No. 5, from		, Thick					
Sec. 3		REC	ORD OF C	CASING:	•••	- ··· -	
							
Diameter Pour in Inches per F		Name of: Manufacturer	Feet of Casing	Type of Shoe	Perfora From		Purpose
	_}		242				
7" OI			240	<u> </u>			
5"0D :	Perforate		85	1	1 1		Liner
1							
Sec. 4		RECORD OF M		AND CEME	NTING		
	Number of	Secto	UDDING /			Gravity	Tops of
Sec. 4		Sacks			Specific	: Gravity	Tons of Clay Used
Sec. 4 Diameter of	Number of	Sacks	UDDING /		Specific	-	l .
Sec. 4 Diameter of	Number of	Sacks	UDDING /		Specific	-	l .
Sec. 4 Diameter of	Number of	Sacks	UDDING /		Specific	-	l .
Sec. 4 Diameter of	Number of	Sacks	UDDING /		Specific	-	l .
Sec. 4 Diameter of	Number of	Sacks	UDDING /		Specific	-	l .
Sec. 4 Diameter of	Number of	Sacks	UDDING /		Specific of 1	-	l .
Sec. 4 Diameter of Hele in Inches	Number of of Conces	Sacks mt.	Methode U		Specific of 1	-	Clay Used
Sec. 4 Diameter of Hele in Inches-	Number of ed. Cases	Racks mt. PLUGGING	Methods Un	of OLD W	Specific of 1	Mud.	Clay Used
Sec. 4 Diameter of Hele in Inches-	Number of ed. Connection	PLUGGING	RECORD (of OLD W	Specific of 1	Mud.	Clay Used
Sec. 4 Diameter of Hele in Inches Sec. 5 Well is located in the secon	Number of ed. Connection	PLUGGING	RECORD (OF OLD W	Specific at 1	Mud.	Clay Used
Sec. 4 Diameter of Hele is Inches- Sec. 5 Well is located in the Range. Street and Number.	Number of ed. Connection	PLUGGING	RECORD (OF OLD W Section	Specific at 1	Town	Clay Used
Sec. 4 Diameter of Hele is Inches- Sec. 5 Well is located in the Range. Street and Number.	Number of ed. Censes	PLUGGING Slugging contractor	RECORD (OF OLD W Section	Specific at 1	Town	Clay Used
Sec. 4 Diameter of Hele in Inches Sec. 5 Well is located in the second of the second Number. Tons of clay used. Coment plugs were placed at:	Number of ed. Casses ad. Casses Name of p	PLUGGING blugging contractor. Tons of roughag	RECORD (OF OLD W Section	Specific of 1	Town	Clay Used
Sec. 4 Diameter of Hele in Inches Sec. 5 Well is located in the secon	Number of ed. Cases In Marie of p	PLUGGING blugging contractor. Tons of roughag	RECORD (""" "" "" "" "" "" "" "" ""	OF OLD W Section	Specific of 1	Town	Clay Used:
Sec. 4 Diameter of Hele in Inches- Sec. 5 Well is located in frança. Street and Number. Tons of clay used. Cament plugs were p No. 2 was placed at: No. 2 was placed at:	Number of ed. Cases In Marie of p	PLUGGING blugging contractor. Tons of roughag	RECORD ("" "" "" "" "" "" "" "" ""	OF OLD W. Section	Specific at 1 ELL. Type- pproved by a cf coment to coment to coment to coment to coment to coment to come the coment to come	of rough	Clay Used:
Sec. 4 Diameter of Hele in Inches Sec. 5 Well is located in the second of the second Number Tons of clay used Coment plugs were p No. 1 was placed at the second of t	Number of ed. Cases In Marie of p	PLUGGING Valuaging contracto	RECORD (Was Feet, Num Feet, Num	OF OLD W Section P plugging a ber of sacks her of sacks	Specific of 1	Town	Clay Used:
Sec. 4 Diameter of Hele in Inches Sec. 5 Well is located in frança. Street and Number. Tons of clay used. Cament plugs were p No. 2 was placed at: No. 2 was placed at: No. 4 was placed at: No. 4 was placed at:	Number of ed. Cases In Marie of p	PLUGGING Valuaging contracto	RECORD (Was Feet. Num Feet. Num	OF OLD W Section It Office In plugging a Der of sacks Act of sacks Act of sacks Act of sacks Act of sacks Act of sacks	Specific of 1	Town of rough Artesian	Clay Used
Sec. 4 Diameter of Hele in Inches Sec. 5 Well is located in the second of the second Number Tons of clay used Coment plugs were p No. 1 was placed at the second of t	Number of ed. Cases In Marie of p	PLUGGING Valuaging contracto	RECORD (Was Feet Num feet Num feet Num	OF OLD W Section It Office In plugging a Ther of sacks Ther of sacks Ther of sacks Ther of sacks	Specific of 1	Town of rough Artesian	Clay Used:
Sec. 4 Diameter of Hele in Inches Sec. 5 Well is located in frança. Street and Number. Tons of clay used. Cament plugs were p No. 2 was placed at: No. 2 was placed at: No. 4 was placed at: No. 4 was placed at:	Number of ed Cases the Name of p	PLUGGING Valuaging contracto	RECORD ("Y of ! "Foet Num "Feet OF OLD W Section It Office In plugging a Ther of sacks Ther of sacks Ther of sacks Ther of sacks	Specific of 1	Town of rough Artesian	Clay Used:	
Sec. 4 Diameter of Hele in Inches Sec. 5 Well is located in frança. Street and Number. Tons of clay used. Cament plugs were p No. 2 was placed at: No. 2 was placed at: No. 4 was placed at: No. 4 was placed at:	Number of ed Cases the Name of p	PLUGGING PLUGGING Valuaging contractor Tons of roughau	RECORD ("Y of ! "Foet Num "Feet OF OLD W Section It Office In plugging a Ther of sacks Ther of sacks Ther of sacks Ther of sacks	Specific of 1	Town of rough Artesian	Clay Used:	
Sec. 4 Diameter of Hele in Inches Sec. 5 Well is located in frança. Street and Number. Tons of clay used. Cament plugs were p No. 2 was placed at: No. 2 was placed at: No. 4 was placed at: No. 4 was placed at:	Number of ed Cases the Name of p	PLUGGING PLUGGING Valuaging contractor Tons of roughau	RECORD ("Y of ! "Foet Num "Feet OF OLD W Section It Office In plugging a Ther of sacks Ther of sacks Ther of sacks Ther of sacks	Specific of 1	Town of rough Artesian	Clay Used:	
Sec. 4 Diameter of Hele in Inches Sec. 5 Well is located in frança. Street and Number. Tons of clay used. Cament plugs were p No. 2 was placed at: No. 2 was placed at: No. 4 was placed at: No. 4 was placed at:	Number of ed Cases the Name of p	PLUGGING PLUGGING Valuaging contractor Tons of roughau	RECORD ("Y of ! "Foet Num "Feet OF OLD W Section It Office In plugging a Ther of sacks Ther of sacks Ther of sacks Ther of sacks	Specific of 1	Town of rough Artesian used	Well Supervisor?	
Sec. 4 Diameter of Hele in Inches Sec. 5 Well is located in frança. Street and Number. Tons of clay used. Cament plugs were p No. 2 was placed at: No. 2 was placed at: No. 4 was placed at: No. 4 was placed at:	Number of ed Cases the Name of p	PLUGGING PLUGGING Valuaging contractor Tons of roughau	RECORD ("Y of ! "Foet Num "Feet OF OLD W Section It Office In plugging a Ther of sacks Ther of sacks Ther of sacks Ther of sacks	Specific of 1	Town of rough Artesian used	Clay Used:	

STATE ENGINEER OFFICE

WELL RECORD

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(A) Owner of well Bruce Harris Street and Number Box 642 City Artesia State New Mexico Well was drilled under Permit No. RA-4196 and is located in the SW. y. SW. y. SW. y. of Section 10 Twp 17-S Rge. 26E (B) Drilling Contractor Willard Beaty License No.WD-62 Street and Number 1102 Merchant City Artesia State New Mexico Drilling was commenced April 26 19.60 (Plat of 840 acres) Elevation at top of casing in feet above sea level 7 Total depth of well 294 State whether well is shallow or artesian Shallow Depth to water upon completion 50 Section 2 PRINCIPAL WATER-BEARING STRATA No. Depth in Feet Thickness in Peet Description of Water-Bearing Formation 1. 280 292 12 Sand & Gravel 2. 3. 1 Description of Water-Bearing Formation RECORD OF CASING Die Pounds Threads Depth Feet Type Shoe Perforations in fit in Top Bottom Feet Type Shoe From To 700D 20 & Round 294 294 Steel 275 294
City Artesia State New Mexico Well was drilled under Permit No. RA=4196 and is located in the SW. 45W 45W 4 of Section 10 Twp.17-S Rge. 26E (B) Drilling Contractor Willard Beaty License No.WD=62 Street and Number 1102 Merchant City Artesia State New Mexico Drilling was commenced April 26 19.60 (Plat of 640 acres) Elevation at top of casing in feet above sea level 7 Total depth of well 294 State whether well is shallow or artesian Shallow Depth to water upon completion 80 Section 2 PRINCIPAL WATER-BEARING STRATA No. Depth in Feet Thickness in Description of Water-Bearing Formation 1 280 292 12 Sand & Gravel 2 3
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Section 3 RECORD OF CASING Dia Pounds Threads Depth Fest Type Shoe From To
Dia Pounds Threads Depth Feet Type Shoe Ferforations To Top Bottom Top
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Section 4 RECORD OF MUDDING AND CEMENTING
Depth in Feet Diameter Tons No. Sacks of Methods Used
From To Hole in in. Clay Cement
8 th
Section 5 PLUGGING RECORD
Name of Plugging Contractor License No
Tons of Clay usedTons of Roughage usedType of roughage
Plugging method used
Plugging approved by: Cement Plugs were placed as follows:
Basin Supervisor No. Depth of Plug No. of Sacks Used
FOR USE OF STATE PAGINGER ONLY
II JOISTRICT
Date Received 31110 V31N19N3 114.
61 :8 MA 8- NUL DE CAL
01 -0 NN 0-1111 US/
File NGA-0196 Tree Dom Location No. 17.26 101. 8.53

WELL RECORD

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	l description: 3	Thealm]] out	well is located in		30
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			of hole,	ī	
depth to water upo	on completion,	feet;	drilling was commenced		4 19
and completed	John E	3 19. 5 3 -19	me of drilling contractor	D. I. Gra	.
	; Ad	dressartes	il. How more :	riller's License No.	-8019
Principal Water-t			1		
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	To Tool	Thickness	Description of W	ster-basring Fernation	
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Se- LGES-2** 7**OD 5**ID	tion replaces of	Top Bott	167'8" 257'9" 62'9"	X	•
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Section Section	tion replaces of	Id well to be abandahip Ra	167'8" 257'9" 62'9" 62'9" med, give location: mage; name a	physical Port 10 physic	ng contrac
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PD-2253

17.26.15, 121

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	er of well	10D. 8	ullivan Den		
			Street and					
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<u> </u>	 		City				State	
1]	Ì				_		27 19 0
			Drilling w				-	19
•	Plat of 640 ac	•	_	_		ORIGINAL FLO	W 900 GPM	
Elevatio	n at top of	casing in	feet above se	a level	23.00	Total de	pth of well	1007'
State wi	hether well	is shallov	r or artesian_			Depth to wa	ter upon com	pletion
Section:	2.		PRIN	CIPAL WA	ATER-BEAF	RING STRATA		
No.	Depth in.	To To	Thickness in Feet		De	escription of Wate	r-Bearing Forms	ation.
1								· · · · · · · · · · · · · · · · · · ·
2								
3								
4.		 -						
5								
3 1			<u> </u>					
Section	3		· ·		D OF CA	SING		
Dia.	Pounds ft.	Threads in	Top	Bottom	Feet	Type Shoe	From	To To
8			·o	783	783			
4			0	244	244			
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		<u> </u>	1		<u> </u>	<u> </u>	<u>i</u>	
Section 4	4		PECOP:	D OE MUI	ארואב או	ND CEMENTING		
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Section !	5			PLUGE	SING REC	ORD		
Name of	Plugging	Contracto	r				License	No
Street as	nd Number.				_ City		State	
Tons of	Clay used_		Tons of R	oughage v	used	Ту	pe of roughag	e
Plugging	method us	ed				Date Plu	rgged	19
Plugging	approved	by:			_	Cement Plu	gs were placed	as follows:
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			Basin Sup	ervisor	No.		ro No	of Sacks Used
	FOR USE	OF STATE	ENGINEER OF	NLY	7			
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WELL RECORD

File No.

INSTRUCTIONS: This form should be typewritten, and filed in the office of the State Engineer, (P.O. Box 1979) 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. 3				RECO	RD OF CA	SING						
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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 before a Notary Public.

			Owner of v	vell	W. L. W	ebb			
			Street and	Number	1801 Os	k Stre	et		
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		! ! !							and
			-4					of Section	12
	<u>, i l l </u>	3E	Township	17	South	_, Range	26 E	ast	
			Drilling Cor	atractor	Wills	rd Bea	ty		
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(F	lat of 640 A	Acres)							
Loca	te Well Ac	curately	Post Office		Artes	ia, Ne	w Mext	co	<u> </u>
Drilling was	commenced		ve saa laval	, 1 <u>3_の</u> は、ひr -> _ ・ -	illing was co	mpleted	8_3	,	19_30
Elevation at	top of casin	g m reer 722		-:17.77			·	····	
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Sec. 2			PRINCIPAL						
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Sec. 3				CÓRD OF (•	
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Diameter in Inches	Pounds per Foot	Threads per Inch	Name of Manufactures	Feet of Casing	Type of Shoe	Perfora From	ted.	Purpose	
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							·		
Sac. 4			RECORD OF J	MUDDING A	AND CEMEN	ITING			
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Diamete Hole in	and in the used were place	of Come	PLUGGING plugging contract	Record Special	OF OLD WE	Specific of 1	AUG Town OF I	15 1950	
Diamete Hole in	umber used at the control of the con	of Come	PLUGGING Augging contract	Methods U RECORD G RECORD No of the company of t	OF OLD WE Section. It Office is plugging ap	Specific of 1	AUG TOFF	To 1950	
Diamete Hole in Hole i	umber used were place	of Come	PLUGGING PLUGGING Tons of roughs	Methods U RECORD RECORD Age used Was Yest Num feet Num	OF OLD WE Section. To Office	Specific of 1	AUG Town OF I of rough	Cay Used	
Diamete Hole in Soc. 5 Vell is locate Range Street and N Tons of clay Cament plugs No. 1 was pla No. 2 was pla No. 3 was pla No. 4 was pla	umber used at the ced at ced at ced at	Name of p	PLUGGING PLUGGING Tons of roughs	Methods U RECORD RECORD Age used Was Yest Num feet Num	OF OLD WE Section. or Office.	Specific of 1	AUG Town OF I of rough	To 1950	
Diamete Hole in Soc. 5 Vell is locate Range Street and N Tons of clay Cament plugs No. 1 was pla No. 2 was pla No. 3 was pla No. 4 was pla	umber used at the ced at ced at ced at	Name of p	PLUGGING PLUGGING Tons of roughs	Methods U RECORD Age used Was Test Num feet Num feet Num	of OLD WE Section T Office plugging ap Der of sacks aber of sacks aber of sacks	Specific of 1	AUG TOWN ATTENDED TO THE MENT OF THE MENT	Cay Used	
Diamete Hole in Manage Street and No. 1 was pla buc spheiw No. 2 was pla	umber used at the ced at ced at ced at	Name of p	PLUGGING PLUGGING Tons of roughs	Methods U RECORD RECORD Record Rec	of OLD WE Section T Office plugging ap Der of sacks aber of sacks aber of sacks	Specific of 1	AUG TOWN OFF OFF of roughs afrecian to the story of the story of the story of the story of the story of the story of the story of the story of the story of the story of the s	Cay Used	
Diamete Hole in Soc. 5 Vell is locate Range Street and N Tons of clay Cament plugs No. 1 was pla No. 2 was pla No. 3 was pla No. 4 was pla	umber used at the ced at ced at ced at	Name of p	PLUGGING PLUGGING Tons of roughs	Methods U RECORD RECORD Age used Wa Test Num feet Num feet Num feet Num feet Num feet Num feet Num feet Num feet Num feet Num feet Num feet Num feet Num	OF OLD WE Section. It Office. It Office. It office. It office. It of sacks abor of sacks ber of sacks ber of sacks	Specific of 1	AUG TOWN OFF OFF of roughs afrecian to the story of the story of the story of the story of the story of the story of the story of the story of the story of the story of the s	Cay Used	

File No..

STATE ENGINEER OFFICE

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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) O	er of well	<i>.</i> ,	•	<u> </u>	
			Street and					
		ļ	City	-			State	
 		_	Well was	drilled un	der Pen	nit No	and	is located in the
1			4			4 of Section	Twp	Rge
			(B) Drilli	ing Contra	ctor		Licen	se No. WD-342
ļ			Street and			•		
		_	City				State	
Į			1 '					19
			Drilling T	os comple	+ad			19
	Plat of 640 ac							
Elevation	n at top of	casing in	feet above se	a level	<u> </u>	Total de	pth of well	
State wh	ether well	is shallo	w or artesian		17	Depth to wa	pth of well ter upon complet	ion130
Section 2				CIPAL WA	/IEK-REVI	RING STRATA		
No.	Depth in	To	Thickness in Feet		D	scription of Wate	r-Bearing Formation	
	From				-			
1								
2								
3	T							
4								
5								
	<u>'</u>							
Section 3	3			RECOR	D OF CA	SING		
Dia	Pounds	Thread			Feet	Type Shoe	Perfor	
in.	, fL	in	Тор	Bottom			From	То
•					· - ·	• ``		
		1	<u> </u>				<u> </u>	
7 4: 4			PECOP	0 OE MIT	DING A	ND CEMENTING		
Section 4	·	1 31				TO CEMENTING	· <u></u>	
From	in Feet	Diamet Hole in		No. Sa Cem			Methods Used	
	+						•	
		 						
								
	<u> </u>			-				
		<u> </u>		<u>'</u>			···	
Section :	5			PLUGG	ING REC	ORD		
Name of	Plugging	Contracte	or				License No.	
	nd Number				_ Citv		State	
							pe of roughage	
	method us						igged	
-	/approved						gs were placed as	
reggme	, approved	- ,.						10110#3.
			Besin Sup	ervisor	N	Depth of P	No. of	Secks Used
		'Y71			7			
	FOR USE	TAN TECHO	E PHOLINEER O	NLY		- 		
	Received	H(G)	IIATZIO		1 -			
Date		,	STATE ENGIN	7	- _			
	32	:8 MA 1	1 JUL 1981	aph		<u> </u>		
				7.				
File No	RA.	443	8	_Use	۔۔۔ ہ	Toestic	n No. /7. 16.	13.244

بمحوه

Location No. /7.11.12.244

WATER WELL LOGS USED ON NORTH-SOUTH 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) Owner	r of well_		Howard R. St.	oup	
				Street and	Number_				
. [,							lew Mexico
			. ,						is located in the
	1		- 1-	WW 1/4	5W 1/4	SW 1/	of Section	Twp. 17	Rge 26
			_	(B) Drillii	ng Contra	ctor	Buck Bros.	Licer	se No
ł l				Street and	Number_				
			┥,	City				State	
1 1	•		1	Drilling w	as comme	nced		ril 20,	19 36
			: لــــــــــــــــــــــــــــــــــــ	Drilling w	as comple	ted	<u>M</u>	y 20,	19 36
(P	lat of 640	2CTES)				.	5 .4-1 3	41 -411	212 _
Elevation	at top o	of casing i	n feet	above sea	i levei		lotal dep	oth or well	tion
state wh	ether we	ll is shall	ow or	artesian_			Depth to war	ter upon comple	tion
Section 2	2			PRIN	CIPAL WA	TER-BEAR	ING STRATA		
	Depth	n Feet	; -	ckness in	-	De	scription of Water	-Bearing Formatio	n
No.	From	To	! !	Feet					
1			ĺ	1					
2									
3									
4						•			
			├						
5		!	1						
Section 3	3				RECOR	D OF CA	SING		
Dia	Pounds			Deg		Feet	Type Shoe		rations
in.	ft.	in		Top	Bottom		ļ	From	То
121						196			<u> </u>
10						30			·
	ļ								
	<u> </u>					<u> </u>			<u> </u>
Section 4	4			RECOR	D OF MUI	DING A	ND CEMENTING		•
	in Feet	Diam	oter	Tons	No. Sa				
From		Hole is		Clay	Cerr	-		Methods Used	
		+		 					
	-	_		 					······
				 					
		<u> </u>		·		<u>, , ,</u>			
Section !						SING REC			
Name of	f Pluggin	g Contrac	ctor_					License No)
Plugging	g method	used				· · · · · · · · · · · · · · · · · · ·	Date Plu	igged	19
Pluggin	g approve	ed by:					Cement Plu	gs were placed a	s follows:
						N	Depth of P	No o	d Sacks Used
				Basin Sur	ervisor	→ ¨	From	ro No. o	
	FOR U	SE OF STA	TE E	ngineer o	NLY	_			
Date	Received					-!			
		PA-1380							37 06 4 ***
File No	0	-V-1900			Use		Locatio	n No. Lie	11.80.4.231

WELL RECORD

dpt			!	Per	mit No. RA-32	262
permittee,		-BStophe	n s		· ·	
0	Box 121		City and State	Artesi	a, New Mez	100
tion and de	ecription: The	hallow well	is located in :	SE	SR	·
% of Se	ection5	, Township	17S , Rar	ge 26E	; Elevatio	n of top of
bove sea lev	vel,	feet; diameter	of hole,	inches; t	otal depth,10	10 feet;
water upon	completion, 40	feet; dri	ling was comme	nced _Sepi	tember 12	1854
oleted Sep	tember 14	19.54; nan	as of drilling co	entractor W	llard Pes	ty
M. rchen	.t; Address, .	Artesia,	N. K.	; Driller's L	icense No. <u>VID</u>	62
Water-bear	ing Strata:	•				
-		Thickness	Descri	ption of Water-i	bearing Formation	
		10		cond		
	_					
	90			Banu	······	
	· · · · · · · · · · · · · · · · · · ·					· · · · · · · · · · · · · · · · · · ·
-	·	,				
ecord:		•				
Pennde per fl.	Threads Depth per tack Top	of Casing or Liner Bottom	Fuot of Casing	Type of Shoo	Perter Prom	ation To
14	welded_0	100	100_	none		96
						
						
						· · ·
eonet miction	replaces old well	l to be abandon e	i give location	ı. 1 <u>/</u>	1 1/	¥
		Range	: N	ame and add	ress of plugging	contractor,
			. :	···		
						
dugging	* ** ** ** ** ** ** ** ** ** ** ** ** *			well was plug	ged:	
dugging			· •			
	obove sea let water upon bleted Sen Water-bear Depth in From 20 87	permittee, Box 121 tion and description: The	permittee. J. B. Stephe D. Box 121 tion and description: The Shallow well canalism or arressan) List of Section 5. Township bove sea level, feet; diameter water upon completion, 40. feet; drift oleted September 14. 19.54; name the recherch strains: Depth in Feet Thickness From To To Bottom To Bottom List Pounds Threads Depth of Chains or Liner per fit. per lach Top Bottom List Welded 0. 100 construction replaces old well to be abandoned to Township Range.	permittee. J. B. Stophons Depth of Contag or Liner Foot of per fit. pur lacks Depth of Contag or Liner Foot of per fit. pur lack Depth of Contag or Liner Foot of per fit. pur lack Depth of Contag or Liner Foot of per fit. pur lack Tophon Depth of Contag or Liner Foot of per fit. pur lack Tophon Depth of Contag or Liner Foot of per fit. pur lack Tophon Depth of Contag or Liner Foot of per fit. pur lack Tophon Depth of Contag or Liner Foot of per fit. pur lack Tophon Depth of Contag or Liner Foot of per fit. pur lack Tophon Depth of Contag or Liner Foot of per fit. pur lack Tophon Depth of Contag or Liner Foot of per fit. pur lack Tophon Depth of Contag or Liner Foot of Contag or Liner Foot of per fit. pur lack Tophon Depth of Contag or Liner Foot of Contag or Liner Foot of per fit. pur lack Tophon Depth of Contag or Liner Foot or Liner Foot or Liner	permittee. J. B. Stephens O. Box 121 City and State Artesia tion and description: The Shallow well is located in SE where the section ST Township 17S, Range 26E bove sea level, Seet; diameter of hole, SE inches; towater upon completion, LO feet; drilling was commenced Sapinoted September 14, 1954; name of drilling contractor William Phent; Address, Artasia, N. M., Driller's L. Water-bearing Strata: Depth in Feet Press Threate Depth of Castag or Liner Feet of per fit, per back Top Bottom Castag Type of Shee 14, Yielded O. 100 100 none construction replaces old well to be abandoned, give location:	Description: The Shallow well is located in SE %, SR (assisted of Section and description: The Shallow or artesian) We of Section 5 Township 17S, Range 26E ; Elevation over sea level, feet; diameter of hole, Se inches; total depth, 10 water upon completion, 40 feet; drilling was commenced Saptember 12 pleted Saptember 14, 1954; name of drilling contractor Willard Personal Property of Strates: Depth in Feet Thickness Depth of Chains or Liner Feet of Type of Shee From 14 per fit, per help Top Section Casing Type of Shee From 14 wellded 0 100 100 none 70 construction replaces old well to be abandoned, give location: %, %, %, construction replaces old well to be abandoned, give location: %, %, %, %, %, mane and address of plugging to the state of the

FILED

OCT 26 1954

OFFICE GROUND WATER SUPERVISOR BOSWELL NEW MERICO

17.71.5.444

RA-3212

(This form to be executed in triplicate)

WELL RECORD

Date of Receipt		·		Permit No. RA-	1225
Name of permitte	J. C. Col	eman	• •	· · · · · · -	
Street or P. ORt_	1, Box 307	City	and State ATTE	1a, New Yes	1100
1. Well location and	description: The S	hallow or artesian)	ocated in NR		¥.
	Section9	Township175	Range20	Elevati	on of top of
casing above sea	level, , - 2 3	_ feet; diameter of h	ole, <u>R</u> inch	es; total depth,]	OC feet;
depth to water upo	n completion,2		was commenced Ki	7 17	19_54
and completed	ву 19	, 1954; name o	f drilling contractor	Willerd Bos	ty
1102 Mercha	nt; Address,	Artesia, Nev	Mext oo ; Drille	r's License NoET	62 -
2. Principal Water-be	aring Strata:	• •	:	•	` -
Depth Fram	to Post	Thickness	Description of W	attr-bearing Fermation	
No. 1	70	5	Send		·
No. 2	94	. 14	Sand		
No. 3	-				
No. 4					
No. 5			· · · · · · · · · · · · · · · · · · ·		
2. Casing Record: Disaster Founds in inches per ft. 6 ID 17	Threads Dooth per Inch Top	•	t of Type of 1	Perio Press	To
			 , 		
		· ·	·		
	,				
 , -			·	. ,	· — · · · · · · · · · · · · · · · · · ·
L If above constructi	on replaces old we	il to be abandoned, g	ive location:	<u></u>	×
of Section	Township	Range	; name and	address of plugging	r contractor,
		<u> </u>	·		·
date of plugging _		; d	secribe how well was	plugged:	·
			•		
• • •		.e: "	i nie i grun zową	77 7 7	7
				JUN 28 1	954
				JUN 20 1	

July .

GROUND WATER SUPERVISOR

17269, 112

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.

							C. Stende	rd	
		-		Street and					
	-			City	oc: 411	1.5		State Nev	Rexico
			į	Well was	drilled ur	der Perm	it No. RA 3	282 and :	is located in the
		.						7Twp <u>17</u> 9	
				(B) Drilli	ng Contra	actor_ <u>P:4</u>	Lierd Bost	Licens	e No62
1			l	Street and	Number.	Box 38	2 110	12 Merchant	
 	 		\neg	City _	tesia_			State _Ke	ne liexico
1	1	1	- 1	Drilling w	as comm	enced	August 28		19 5
L				Drilling w	as comple	ted Se	tember 2		19 5
•	Plat of 640	•		4 - 1			Makai da		
								pth of well 125	
State wi	iether w	en 12 sus	пом о	r artesian	-Sarlie	*	Depth to wa	ter upon completi	on_09
Section 2	2			PRIN	CIPAL WA	TER-BEAR	ING STRATA		~-
No.	Depth	in Feet	Thi	ickness in		De	cription of Water	r-Bearing Formation	
No.	From	To		Feet					
1					T.4	22 22		-	
2		92	1	<u>s</u>			•		······································
3	105	1-2-	3	22	₩.	ter Su	n d & Gravo :		
4			 					,	
5		 	+		·				
3 1			<u> </u>						·
Section 3	3				RECOR	D OF CAS	ing .		**
Dia	Pounds	Thr	eads	Dep	th.	Feet	Type Shoe	Perforations	
in.	ft	1	D.	Top	Bottom		1,70 0000	From	To
ري: 7	17		11-		125	125	collar	105	125
, ,,							001101		
	<u> </u>						<u> </u>		
Section 4				DEC (DE	OE MUE	DING AN	D CEMENTING		
		Diag	neter		· 1		DOLMETING		
From	in Feet		in in.	Tons No. Sacks of Clay Cement				Methods Used	
,	+			 	_				
	+				.				
	+				+		·		
	 			 					
	.'	'		<u> </u>	.				
Section 5	5				PLUGG	ING REC	ORD		
Name of	Pluggin	g Contra	ctor_					License No	
Street a	nd Numb	er				_ City		State	
Tons of	Clay use	d		Tons of Re	oughage u	sed	Ту	pe of roughage	
	-	used						gged	19
Plugging	approve	d by:					Cement Plug	s were placed as f	ollows:
						·	Depth of P	lug	
_			7.3	pBapin Sup	rvieor	No		No. of S	Sacks Used
	FOR ITS	SE OF ST	TE E	IGINEER OF	NLY I	7			-
		7		IG 3 1 195			1	•	
Date :	Received		AU		,,	_ -			
	• •		ROLINI	OFFICE WATER SUP	FDVASCO		+		
3 7		. [MELL NEW ME		. '-	<u>'</u>		
		328	·		- A	-		-	
File No	XH	1228	<u>د</u>		_Use_ FC :	C - MET	Locatio	n No. 17.26.9	1/2 -

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) Ow	mer of well	N.	E. Carrett				
		Well wi	as drilled ur	nder Per	nit No	and is	located in th		
		75/4	14_NW1	. <u></u>	4 of Section_9_	Twp17F	lge 26		
		(B) Dr	illing Contra	actor	G. R. Dubli	n License N	vo		
		Street a	nd Number.						
		City _				State			
		Drilling	was comple	eted	······	December 4,	19 09		
	•			2 :	Origina	1 flow: 576 GPM	-		
-	-					_			
ether we	ll is shall	ow or artesia	n		Depth to wa	ter upon completion			
2		PR	INCIPAL WA	ATER-BEA	RING STRATA		-		
Depth :	in Feet	Thickness in		70	essistian of Water	- Beering Fermetics	/		
From	To	Feet			escription of water	-pearing Formation			
			100	4 1	000 44				
									
			2nd	flow at	940 ft.	·			
									
							·		
	·	<u></u>							
3		·	RECOR	ED OF CA	SING	· · · · · · · · · · · · · · · · · · ·			
1		·		Feet	Type Shoe	Perforation			
n.	in			ļ		From	To		
		0	528		 				
			·	ļ <u>.</u>	-				
				ļ					
<u> </u>					<u> </u>				
<u> </u>		RECO	ORD OF MU	DDING A	ND CEMENTING				
					of Methods Used				
To	Hole II	1 In. Clay	Cen	sent					
<u> </u>							<u> </u>		
<u> </u>									
<u>i </u>	1		1						
			PI UGO	LING PEC	-C0D		•		
	. .								
	-								
				-					
-									
approve	d by:				Cement Plu	gs were placed as follo	ows:		
		Basin S	upervisor	N	0.	No of Saci	us Used		
			ONT.Y	7					
FOR US	e of Stat	re engineer	01122						
FOR US	e of stat	re engineer	0.1.01						
FOR US		re engineer		_ -					
		TE ENGINEER		_					
		PE ENGINEER							
	Depth : Depth : From Pounds ft. Plugging and Numb Clay used : method	Depth in Feet From To By Pounds Three in In Feet Diameter Hole in Plugging Contract and Number Clay used	City — Well with Mark (B) Dr. Street a City — Drilling Dr	Well was drilled us Well was drilled us	City Well was drilled under Personal Well was drilled under Personal Well was drilled under Personal Well was drilled under Personal Well was drilled under Personal Well was drilled under Personal Well was commenced. Drilling was commenced. Drilling was completed. Prilling was completed. PRINCIPAL WATER-BEAST Depth in Feet	Well was drilled under Permit No. NW	City Las Vegas, State New M Well was drilled under Permit No. and is 1 NW W W W W W Of Section 9 Twp. 17 I (B) Drilling Contractor G. R. hublin License N Street and Number City Drilling was commenced October 10. Drilling was commenced Decomber 4. Original flow: 576 GPM Total depth of well 1 Depth in Feet Precipion of Water-Bearing Formation Prom To Precipion of Water-Bearing Formation RECORD OF CASING Pounds Threads Depth Feet Type Shoe Perforation RECORD OF MUDDING AND CEMENTING		

WELL RECORD



INSTRUCTIONS: This form-should be typewritten, and filed in the office of the State Engineer, P. O. Box 1079, Santa Fe, New Maxico, or in the office of the Artesian Well Supervisor, Roswell, New Mexico. Section 5 should be answered only if an old arisaian 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.

		-			TXXXXX	rong & Son	II
			1		_	_	ell, New Mexico
8		NF				_	•
NOW			Post Office	Rosw	oll. No	w Kexico	
			Well was dri	lled under	Permit No	RA- 2568	
-			is located in	the ST		W 14 EX	14 of Section 16
			-4			Range 26E	
SM		SE	7		_		
			Drilling Con	tractor .K.	yes Dri	lling Co.	
للنا			Street and ?	Vumber 10	12 Sout	h Perm. Ave)
(P	lat of 640 A to Well Ac	Lores) curately	Post Office -	Ro	avell.	tem Kextoo	· -
Drilling was	commenced	Januar	7 21,	19 50 Dr	illing was co		ry 26, 1950
Elevation at 1	top of casing	g in feet abo	ve sea level	3353	2		
State whether	well is aba	llow or arte	MOLLEGE		·		
	of well 23	Z				•	_feet below land surface
Sec. 2	21.6	. 22	PRINCIPAL '				Water Sand
•							
						, Formation_	
						Formation_	
No. 5, from		to			•	, Formation_	······································
Sec. 3			REC	ORD OF C	ASING		
Diameter	Pounds	Threads	Name of	Feet of	Type of	Perforated '	
in Inches	per Foot	per Inch	Manufacturer	Casing	Shoe	From To	Purpose
7*	24	8	Used	216'	Texas	None	Surface
5 3/16	18 .	8 ·	used	301	none	all	Liner
		:					·
11							T
							<u>t</u>
Sec. 4		·	RECORD OF M	UDDING A	ND CEME	NTING	<u> </u>
		Number of		UDDING A	ND CEME		
Sec. 4 Diameter	1	Number of of Come	Secks	Mothods Vi		NTING Specific Gravity of Mad	Tons of Clay Used
Diamete	1		Secks			Specific Gravit	' I
Diamete	1		Secks			Specific Gravit	' I
Diamete	1		Secks			Specific Gravit	' I
Diamete	1		Secks			Specific Gravit	' I
Diamete Hole in 1	1		Sacks wat	Methods Us	od .	Specific Gravity of Mad	' I
Diamete Hale in 1	Inches	of Comm	Sectors and	Methods Un	DF OLD WI	Specific Gravity of Mad	Clay Used
Diamete Hale in 1	od to the	of Comm	Sectors and	Methods United States ARECORD (DF OLD WI	Specific Gravity of Mad	'
Diamete Hole in 1 Sec. 5 Vall is local	od in the	of Comm	PLUGGING	RECORD (OF OLD WI	Specific Gravity of Mad	Clay Used
Diameter Hole in 1 Sec. 5 Vell is locate Range.	ed in the	of Com	PLUGGING	RECORD (OF OLD WI	Specific Gravity of Mad	Clay Used
Diameter Hole in 1 Sec. 5 Vell is locate Range.	ed in the	of Com	PLUGGING Plugging contractor	RECORD (OF OLD Willection	Specific Gravity of Mad ELL Total	Clay Used
Diamete Hale in 1 Sec. 5 Vell is locale Range Street and N Tons of Clay	ed in the	of Cem	PLUGGING Plugging contracto	RECORD (OF OLD Willection	Specific Gravity of Mad	Clay Used
Diameter Hale in 1 Sec. 5 Vell is locate Range Street and N Tons of Clay	ed in the umber used	of Com	PLUGGING Plugging contracto Tone of rougha	RECORD (DF OLD WI	Specific Gravity of Mad	Clay Used
Diameter Hale in 1 Sec. 5 Vell is locate Range	ed in the umber used	of Comme	PLUGGING PLUGGING Tons of rougha	RECORD ("Y of 8 "Per used Was	OF OLD Willection	Specific Gravity of Mnd ELL Town Type of roug proved by Artesias of coment used	Clay Used
Diamete Hale in 1 Sec. 5 Vell is locate Range	ad in the umber used were place at	of Cem-	PLUGGING PLUGGING Tone of roughau	RECORD ("X of 8 "Pum "Y used	OF OLD Willection	ELL Tou Type of roug proved by Artesias of coment used	Clay Used
Diamete Hale in 1 Sec. 5 Vell is locale Range Street and N Tons of Clay Cament plugs No. 1 was play No. 2 was play No. 3 was play	were place	of Cema	PLUGGING PLUGGING Tone of rougha	RECORD ("X of 8 "Pure 1 "Y of 8 "T end "Was feet. Num feet. Num	OF OLD Willection	ELL Torest and a comment used of comment used of comment used of comment used of comment used of comment used of comment used of comment used of comment used of comment used of comment used of comment used of comment used	Clay Used
Diameter Hole in 1 Sec. 5 Vell is locate Range. Street and N Tons of clay Cament plugs No. 1 was play No. 2 was play No. 3 was play No. 4 was play	were place and at cord	of Com-	PLUGGING PLUGGING Y Plugging contracto Tone of rougha	RECORD ("K of ! "Four was feet. Num feet. Num feet. Num	DF OLD Willection	Specific Gravity of Mnd Type of roug proved by Artesian of coment used of coment used of coment used of coment used of coment used of coment used of coment used of coment used of coment used of coment used of coment used	Clay Used
Diamete Hale in 1 Sec. 5 Vell is locale Range Street and N Tons of Clay Cament plugs No. 1 was play No. 2 was play No. 3 was play	were place and at cord	of Cem-	PLUGGING PLUGGING Plugging contracto Tone of rougha	RECORD ("X of 8 "Feet. Num feet. Num feet. Num feet. Num	DF OLD Willection	ELL Tope of roug proved by Artesian of cement used	Clay Used

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	r of well	City	01	Artesia				
			- 1					<u> </u>				
L				City		· •			St	tate		·
	1 1	l		_				No. RA-215				
								of Section 17	-		_	
				(B) Drilli: Street and	_			on Wintheis	er	_ Licens	se No	
										nto No	ew Mexi	CO
	1 1	ŀ						ober 5				
				_				ber 22				
	Plat of 640				-							
	_							Total de				
State wi Section :		II IS SNAU	DW 01					Depth to wa	ter upon (complet	ion	
Section :	Depth i	n Feet	Thi	ckness in	OIFAL WA			·				
No	From	To		Feet		•	Desc	ription of Water	r-Bearing F	ormation	ı	٠
1	933	939		6	lime							
2	943	948		5	lime '	<u> </u>						
3	981	1002		21	lime i	cress	<u>e 21</u>	995				
4	1 035	1040		5	lime			·				
5	1040	1055 1068		15	lime in							
Section 3		1000				D OF C						
Dia in.	Pounds ft.	Threa	ds	Top	th Bottom	Feet		Type Shoe	From	Perfor		Го
10 3/4	40.5	8				668	1	arkin floa	none			
13 3/8	48.0	8				174	_					
						442	<u>- </u>					
	1			1 1					<u> </u>			
	1			<u> </u>								
Section 4	4	!		RECOR	OF MUE	DING A	AND	CEMENTING		•		
	4 h in Feet	Diame		Tons	No. Sa	cks of	AND	CEMENTING	Vethoda	Treed		
		Diame Hole in				cks of	AND	CEMENTING	Methods	Used		
	n in Feet			Tons	No. Sa Cem	cks of	AND	CEMENTING		Used		
Depti	n in Feet	Hole in		Tons Clay	No. Sa Cem	cks of ent				Used		
Depti	n in Feet	Hole in		Tons Clay	No. Sa Cem	cks of ent		Halliburt		Used		
Depti	n in Feet	Hole in		Tons Clay	No. Sa Cem	cks of ent		Halliburt		Used		
Prom	To To	Hole in		Tons Clay	No. Sa Cem 10	cks of ent	meni	Halliburt		Used		
Depti From	To To	Hole in	in.	Tons	No. Sa Cem 10 Purpose	cks of ment 00 to ce	ment	Halliburt	on'			
Depti From	To To To To To To To To To To To To To T	Hole in 16	tor	Tons	No. Sa Cem 10 Parpose	cks of eent 00 to ce	ment	Halliburto	Licer	nse No		
Depth From	To To To To To To To To To To To To To T	Hole in 16	tor	Tons	No. Sa Cem 10 Purpose	cks of sent 00 to ce	men1	Halliburton casing	Licer State	nse No		
Depth From Section ! Name of Street as Tons of	To To Plugging and Number	Hole in	tor	Tons Clay	No. Sa Cem 10 Purpose PLUGG	cks of sent 00 to ce Ging Ri City_ used	men 1	Halliburton casing	Licer State.	nse No		
Depti From Section : Name of Street ar Tons of Plugging	To To Plugging and Number	Hole in 16	tor	Tons Clay	No. Sa Cem 10 Purpose PLUGG	cks of sent 00 to ce Ging Ri City_ used	men 1	Halliburton to casing	Licer State pe of roug	nse No		19
Depti From Section : Name of Street ar Tons of Plugging	To To To Plugging Ind Numbe Clay used g method	Hole in 16	tor	Tons Clay	No. Sa Cem 10 Purpose PLUGG	cks of sent 00 to ce	ment	Halliburto t casing RD Ty Date Plu Cement Plu Depth of P	Licer State pe of roug ggged ggs were plu	nse No	follows	19
Depti From Section : Name of Street ar Tons of Plugging	To To To Plugging Ind Numbe Clay used g method	Hole in 16	tor	Tons Clay	No. Sa Cem 10 Purpose PLUGG	cks of sent 00 to ce	men 1	Halliburto t casing RD Ty Date Plu Cement Plu Depth of P	Licer State pe of roug	nse No		19
Depti From Section : Name of Street ar Tons of Plugging	To To To Plugging and Number Clay used genethod gapproved	Hole in 16 g Contracter used d by:	in.	Tons Clay	No. Sa Cem 10 Purpose PLUGG	cks of sent 00 to ce	ment	Halliburto t casing RD Ty Date Plu Cement Plu Depth of P	Licer State pe of roug ggged ggs were plu	nse No	follows	19
Depti From Section : Name of Street ar Tons of Plugging	To To To Plugging and Number Clay used genethod gapproved	Hole in 16 g Contracter used d by:	in.	Tons of Ro	No. Sa Cem 10 Purpose PLUGG	cks of sent 00 to ce	ment	Halliburto t casing RD Ty Date Plu Cement Plu Depth of P	Licer State pe of roug ggged ggs were plu	nse No	follows	19
Depti From Section : Name of Street au Tons of Plugging	70 Plugging and Number Clay used g method g approved	Hole in 16 g Contracter used d by:	ttor	Tons of Ro	No. Sa Cem 10 Purpose PLUGG	cks of sent 00 to ce	ment	Halliburto t casing RD Ty Date Plu Cement Plu Depth of P	Licer State pe of roug ggged ggs were plu	nse No	follows	19
Depti From Section : Name of Street au Tons of Plugging	70 Plugging and Number Clay used g method g approved	Hole in 16 g Contracter used i by:	ttor	Tons of Ro	No. Sa Cem 10 Purpose PLUGG	cks of sent 00 to ce	ment	Halliburto t casing RD Ty Date Plu Cement Plu Depth of P	Licer State pe of roug agged gs were pla	nse No	follows: Sacks U	19

WELL RECORD

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Section: 1			(A) O	- of mall:		J. B.	Vallace		
1		İ	E .			Artesia			
-						it No. R			
]. :			Lot. 4, , 81	k. 4, 1	oselavy	Moderation 1	Two	17 Ree	26
			1.			Roe L. Newl	•	_	
<u> </u>	- -		Street and	_					
<u> </u>			1				State		
	ļ. ļ	1.							
<u> </u>	<u>l </u>		Drilling wa	s comple	ted		April 20,		19 40
•	Tat of 640 ac	-	•	_					
Elevation	nat top of	casing in fe	et above sea	level	<u> </u>	Total de	oth of well	105	
State wi	ether well	is shallow:	or artesian_			Depth to wa	ter upon com	pletion	
Section 2	,		PRINC	IPAL WA	TER-BEAR	NG STRATA			
Jechon 2	Depth in	Fait T	hickness in						
No.	From i	To	Feet		Des	exiption of Water	-Bearing Form	acion	•
1									
							t de la companya de l	<u>.</u>	
									
3.									
4.						-			
5									
Section	3.			RECOR	D OF CAS	ING			
Dia	Pounds	Threads	Dept	h		1	Pe	erforations	
in.	ft.	in	Top	Bottom	Feet.	Type Shoe	From		°o.
6	<u> </u>		: .		105				

		·	<u> </u>			<u></u>		i	
Section 4	<u> </u>		RECORD	OF MUE	DING AN	D CEMENTING			
	in Feet	Diameter Hole in in	Tons	No. Sa Cem			Methods Uses	d	
From	То	Hote III III		Cen					
									
	ļ		<u> </u>	<u> </u>					
				ļ		·			
	<u> </u>			<u> </u>					
Section (t [.]			PLUGG	SING RECO	מפר			
		Ct					**	\7 _	
	Plugging								
	nd Number					<u> </u>			
	_		_Tons of Ro	ugnage u	sea		pe of roughag		
							gged		
Plugging	approved i	by:				Cement Plug	s were placed	as follows:	
			Basin Supe		No.	Depth of P	Nio	. of Sacks Us	ed
	<u></u>		Death Supe	. 41301	→ -	From 1	6		
	FOR USE	of State 1	engineer on	LY		 			
_						 			
Date:	Received				-				
į						1			
İ					1				
E41_ M-	BA-1749		4	Use		Tanatia	n No17.2	26.17 400	

ADDITIONAL WELL LOGS

1

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2

photos 259

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STATE ENGINEER OFFICE: WELL RECORD

FIELD EROR. LOS

Section 1. GENERAL INFORMATION

Cteant or	Dan Office Ad	e Dilbeck Idress 210	(entre	. //			0			
		Ante							······································	
I was drilled	t under Permit	No	0		and	is located	in the:			
SV	× NE ×	NE K	¼ of Sec	tion	<i>10</i> To	wnship	175	Range	26E	N.M.P.
	-		•			•				
		of Map No								
c. Lot N Subdi	vision, recorde	of Block No d in		°	County		·			
a: X=		_ feet, Y=		fee	et, N.M. Co	ordinate S	ystem			Zone
		11 0:11 6			·····			1110/00		Gra
Drilling (Contractor	# & W Ent	erprises		<u>.</u>		_ License No	WU0/5	<u> </u>	
re ss :	P.O. Box 4	437 Antes	ic NM	88210	E.04	Art-	216	796-4	516	
ling Began	8-1-79	Compl	eted	10-79	Тур	e tools	Cable	Siz	e of hole.	7"
ation of la	nd surface or _			8	t well is		_ ft. Total de	enth of well	125	
		hallow 🔲 ar								
spicica wel	انسة ۱۱۵ -							HOR IO HOLE		
Depth	in Feet	Secti Thickness	on 2. PRING						Estimated	Yield
From	То	in Feet	r	Descriptio	n of Water-	Bearing F	ormation	4	illons per	
95	120	25	Wat	er Sari	d.				10	
		9 -	}		,					
			1					_		· · · · · · · · · · · · · · · · · · ·
	<u> </u>	<u> </u>								
N	Pounds	Threads	Section Depth		ORD OF C				Darf	orations
Diameter (inches)	per foot	per in.	Top	Botto		ength feet)	Type of	Shoe	From	To
7"	29 Lb	P/E	1	125	1	26	P/E		90	120
									•] .
		· Sentin	n 4. RECOF	PD OF W	UDDING	ND CEN	ENTING			
Depth	in Feet	Hole	Sack	s	Cubic F	eet		ethod of Pl	acement	
From	То	Diameter	of Mu	1d	of Cem.	int				
		ļ ·								·
- <u></u>	<u></u>							. -		
			Sectio	n S. PLUC	GGING RE	CORD			-	_
ging Contr	actor	<u></u>								•
iress				` `		No.	Depth Top	in Feet Botton		ubic Feet
e Well Plug	ged					1	• • • • • • • • • • • • • • • • • • • •	201101		
	wed by:					$\frac{2}{3}$		+		<u></u>
sarug appro		State Engi	neer Represe	ntative		4				
tigung appro										15,7%
· · · · · · · · · · · · · · · · · · ·	8/16/	> <i>G</i>	FOR USE	OF STAT	E ENGINE	ER ONL	4			
-	8/14/3 A-655	79	FOR USE	•	E ENGINE	ER ONL	/ FW	'L	FSI	L

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)). Own	er of well.	Н.	G.	Southwo	rth			,	
					Number.					-:	· · · · · · · · · · · · · · · · · · ·	W W-	
					Art						_ State	New Me	
											wp 17		
			(B)	Drill	ing Contra	actor	Myr	on Bruni	ng		Licen	se No	
-			Str	eet and	l Number.	Во	x 8	81					
				•							_ State Nev		
'													
	lat of 640	acres)	—— Dri	lling w	as comple	eted	N	ovember	5				19 43
•		-	n feet al	ove se	a level	<u> </u>		Total	l de	oth of	well /2	114	
itate wh	ether we	ll is shall	ow or at	tesian.	Artesi	lan		_Depth to	wa	ter up	on complet	ion	-
					ICIPAL WA			-		_	_		
ection 2		- Feet	Thickne		I W								
No:	From	n Feet:	Fee				Desc	ription of \	Veter	-Beari	ng Formation	ı	•
1													
2													
3:-			 										
-			 										<u> </u>
			 										·
5		<u> </u>	<u> </u>		<u> </u>					-			
ection 3	.		· · ·		RECOR	D OF	CASI	NG					
Dia	Pounds		_	,De		Feet	.]	Type Sho	æ			rtions.	
in.	ft.	in		Top	Bottom						From		0
3" 0, 1		8				80).)		n one str		
0 3/4	O.D. 40	8		· · · · · · ·		795	-	Drive	<u>}.</u>	1	sledge ni		
	 				<u> </u>		-+)	tota]	length 8	75	
	<u> </u>				1	i				<u> </u>		<u> </u>	
Section 4	ļ.			RECOR	D OF MU	DING	AND	CEMENTI	NG				
Depth	in Feet	Diam		Tons	No. Sa				•	Mat	nods Used		
From	To	Hole i	7 12-	Clay	Cem	ent				1445			
	ļ	13 3/4	<u> </u>	540			L	pumped 11	a by	plug	<u> </u>		
					<u> </u>		<u> </u>						
	 _						<u> </u>						
	<u> </u>				<u> </u>								
ection 5	j				PLUGE	ING R	ECO	RD					
iame of	Pluggin	g Contrac	tor					·			icense No.		
treet ar	ad Numb	er									tate		
Cons. of (Clay used	i	To	as of R	oughage u	used			_Ty	pe of :	roughage		
lugging	method	used						Date	Plu	gged_			19
lugging	approve	d by:						Cement	Plug	gs wer	e placed as	follows:	:
_						ſ	No.	Depth			No. of	Sacks U	red
			- 31	sin Sur	72TV150T	┱╏	-	From		07			
	FOR US	e of Sta	te engi	VEER O	nly			 					
								 					
Date 1	Received					-							
							/	<u> </u>					
					• •	<u> </u>							
File No	RA-	768			Use		• •	Ţ.	atio	n No	17.28.9.3	23	

L.B.

WELL RECORD

THE NO. BL-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	, but s Notes y Fund			10.534	
	x				
NW	-NE	race of well	. J. Jack	BOB	
	8ta				· · · · · · · · · · · · · · · · · · ·
	Po	ell was drilled under Per	270018, 1	1440	• •
	W	located in the ST	mit No		and
W2	To	waship 178/ -	Rane	263.	_ % or Section
3,1	Dr	illing Contractor Ros	L. Hewbe	rry and W. P.	Black
		eet and Number			
(Plat of 640 a		et Office			
					26th 19 41 -
		a 3350			
Elevation at top of case	hellen en enterion	Shallow 37	<u> </u>		
State whether well is a		•			
SEC. 2		PRINCIPAL WATER-BEA		•	
		Thickness in feet			
No. 2, from	to	, Thickness in feet	•	Formation	•
No. 8, from	to	, Thickness in feet		, Formation	<u> </u>
No. 4, from	to	, Thickness in feet		, Formation	
No. 5, from		, Thickness in feet	•	Formation	
SEC. 3		RECORD OF C	•		
DIAMETER POUNDS		NAME OF FEET OF			PURPOSE.
	1 PER INCH INCH			FROM TO	· · · · · · · · · · · · · · · · · · ·
12		106	 	 	
10			 		
1779	e alle ales es	rch ,6 slits per	CITCLE.	 -	
		1		1 .	
SEC. 4	NUMBER OF SACIES	ECORD OF MUDDING A		SPECIFIC GRAVITY	
HULL IN INCHES	OF CEMENT	METHODS US	SED-	OF MUD	TONS OF CLAY USED
		-			
		•			
	• •				
SEC. 5		PLUGGING RECORD OF	FOLD WELL	· Marin or Ballion	
Well is located in the _	x <u>:</u>	*	of Section	, Tow	mahip
Range	Name of pluggi	e contractor	ىنىچ « _ق ىر		
Street and Number			of Office		24 22
Tone of clay used		ons of roughage used		Type of rough	
	Martine Control	200 CA	- Section Alberta	proved by Artesian	المسروي فورية في ويزيم البحثية
Coment plugs were place	d as follows:			e Committee	3.75
No. I was placed at any	A STATE OF THE PARTY.	No.	ober of suchs of		
No. 2 was placed at	And the same of th	lest Nur		coment used Peri	
hand a state of	San All Contraction	fact Name	وأعتممه أمحمل	f coment used 47. 12	विकास मा मानाभागा करियो
No. 4 was placed at				coment used 2	The state of the state of the state of
Same			-		

L,	B.
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1.

WELL RECORD

Tibe	Ne	

INSTRUCTIONS: This form should be typewritten, and filed in the office of the State Engineer; P. O. Box 1079, Santa Fe. New Maxico, or in the office of the Artesian Well Supervisor, Roswell, New Maxico. 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.

	• • •				· · · · ·					
	1			per of w	n Br1	tton Co	11			
<u>-</u>			Stre	et:and: N	lumber	outo 1	Box - 30-		· .	
	• : •	NE	Pos	t, Office .	Ar	tesia,	New Mc	rico -		٠.
		* * *	-4			-			bad	
			_ is 1	ocated in	the SE.		5 <u>1:</u> 14	-NE-	s of Section 9	
	<u> </u>	SF	Tou	vaship	17 S	 	Range_	-56 F		
			1			-Bloun				
			I.			Route				
	Plat of 64	Acres)				seia, N		_		
Drilling was	commenc	•4 Jul	T-28		19 Dr	illing was co	mpleted	.00 -311 v	31 151	
Elevation at	top of cas	ing in feet abo	ove sea l	evel 3				0413	<u> </u>	
		ballow or arte		s	hellow	, Stock	Well-			
	of well	-14C		Pater leve	l upon com	pletion of w	~10		feet below land surface.	
Sec. 2						ARING STI				
No. 1, from	-18	to	30	Thicl	chess in: fee	12	Fort	nation	3 yp	
No. 2, from.	50	to	80	, Thiel	iness. 15. fee	50	Fore	retion C	Lay & Gravel	
No. 3; from	.30	to	140	, Thick	these in fee	10	Form	G.	revel	
		to								
•		to					Form	nation.	·	
Sec. 3.	_	Ť		REC	ORD OF C	ASING				
Diameter in: Inches	1			me of	Foot of Caning.	Type of Shoe	Perfora From	To	Purpose	
8			·		40				Shut off	
7	 	 			-23				Meet domestic	
<u></u>	<u> </u>	<u> </u>				}			well requirese	nts
Sec. 4			RECOR	RD OF M	UDDING A	AND CEMEI	NTING			
Diamei Hole in		Number of of Come			Methods V	ned:		Gravity Mad	Tons of Clay Used	
:					•					
					· · · · · · · · · · · · · · · · · · ·					
							· · · · · · · · · · · · · · · · · · ·			

Sec. 5			PLI	UGGING	RECORD (OF OLD WI	IL.			
Well is local	ted in th	ъ		¥		Section		Town	ship	
Range			plugging	contracto	*					
Street and N	fumber				Pos	t Office				
Tons of clay			_ Tons o	rf roughe	re wed		Туре	of rough		<i>:</i> •
					WM				Well Supervisor?	
Coment plugs	mere pin	ewollot as bec						- ;	·	
No. 1 was pla	cod st				_feet_Num	ber of sacks	of coment	-		1
No. 2 was pla		-1				ber of sacks	•	1		'
No. 3 was pla		<u></u>				ber of sacks	• •		DEC 12 1951 .	1
No. 4 was pla					4	ber of sacks		الأعد		
w									OFFICE .	- 1
No. 5 was pla						ber of sacks			OFFICE TSIAN WELL SUPERVISOR OSWELL, NEW MEXICO	B

BA-2698

17.26. 9.244

WELL RECORD	€.
ould be executed in triplicate, preferably typewritten, and	submitted to the
te Engineer. All sections, except Section 5, shall be answered	

ection 1	•		Section 5		e comp		0 7/	/	•	
	· ·		(A) (Owner (of well	1	J. He	and		
			Street	t and N	umber.	Be	1416			
	! .	. .	City-	La	<u> </u>	Hie	esi	·	_ State	nim
	F	•	Well	was dr	illed ur	ider Perr	ait No.AA	_4	12 2 and	is located in t
				147			of Section.	. .		1 Rge 2 6 E
			(B) 1	Drilling	Contra	actor	7.7.	Ame	Ilicen	se No.Ludi
				t and N		-	oy 12	2 =		
			City		See	sa_		·	_ State	n. m.
			1	ng, was			die-	<u> </u>		19.6
	lat.of 640 s		— Drilli	ng: was	comple	eted	dee	<i></i>		19_6_
•		-		1	a	3.5-0	Total	danth ad		18'
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ection 2		•.	-				ING STRATA	•	•	
».	Depth in	Feet	Thickness	in		De	scription of Wa	iter-Beari	ng Formation	
No.	From	To	Feet							-
1.	25	35	10			au				
2. (96	139	43			que.	R			
3		/							A second soften Annual Livering	
4	+									
5								• • • • •		
- 				<u> </u>	•	b .				
ection 3	Ţ				RECOR	D OF CA	SING			
Dia	Pounds:	Three		Depth	lottom	Feet	Type Shoe	, 	Perior From	
in.	IL.	in:	- 10		0.000	120			7//	To
7"				-+		139	Mose	4	18	139
		 -	 		-		100			
						· · ·				
			1	<u>ا .</u>		<u> </u>	<u> </u>			
ection 4	<u>.</u>		RE		OF MUE	•	D CEMENTIN	S		
			ter T	ons -	'No. Sa	cles of				
Depth	in Feet	Diame								
Depth From.	in Feet	Diame Hole in	in. C	lay	Cem			Metl	oods Used	: •
			in. C	lay				Meti	oods Used	: •
			in. C	lay				Meti	oods Used	: •
			in. C	lay				Metl	sods Used	•
			in. C	lay				Meti	oods Used	
From	То		in. C	lay	Cem	ent		Metl	oods Used	
From Section 5	То	Hole in		lay	Cem		ORD	Metl	oods Used	•
From 5	Plugging	Hole in		lay	PLUGG	ent			sicense No.	
From section 3	Plugging d Number	-Contract	or		PLUGG	Gity			icense No.	
ection 5 ame of creet an ons of (Plugging ad Numbe	Contract	or		PLUGG	Gity		I S Type of :	icense No	
ection 3 ame of creet an ons of congging	Plugging ad Number	Contract	or		PLUGG	Gity		SType of :	icense No.	19
From. ection 3 ame of reet an ons of (Plugging ad Numbe	Contract	or		PLUGG	Gity		SType of :	icense No	19
ection 3 ame of creet an ons of congging	Plugging ad Number	Contract	Tons		PLUGG	Gity	Date F	I S S Type of a lugged lugs were	icense No tate roughage e placed as	19
ection 3 ame of creet an ons of congging	Plugging ad Number Tlay used: method used approved	Contract	Tons	of Roug	PLUGG	Gity	Date F Cement P	I S S lype of the long were lings were	icense No tate roughage e placed as	19 follows:
ection 3 ame of creet an ons of (Plugging ad Number Tlay used: method used approved	Contract	Tons	of Roug	PLUGG	Gity	Date F Cement P	I S S lype of the long were lings were	icense No tate roughage e placed as	19 follows:
ection 5 ame of treet an	Plugging ad Number Tlay used: method used approved	Contract	Tons	of Roug	PLUGG	Gity	Date F Cement P	I S S lype of the long were lings were	icense No tate roughage e placed as	19 follows:
ection 5 ame of (lugging	Plugging ad Number Clay used method used approved	Contract sed by:	Tons Basic Jacquist Jac	of Roug	PLUGG	Gity	Date F Cement P	I S S lype of the long were lings were	icense No tate roughage e placed as	19 follows:
ection 5 ame of (lugging	Plugging ad Number Clay used method used approved	Contract sed by:	Tons	of Roug	PLUGG	Gity	Date F Cement P	I S S lype of the long were lings were	icense No tate roughage e placed as	19 follows:
ection 5 ame of creet an ons of (nugging nugging	Plugging ad Number Clay used: method used approved	Contract sed by:	Tons Basic Jacquist Jac	of Roug	PLUGG	City	Date F Cement P Cement P Prom	S Type of : Plugged_lugs were	icense No tate roughage e placed as	19 follows:

V. L. Gates

Form: WR-23:

Section 1.

STATE ENGINEER OFFICE:

(A) Owner of well_____ Street and Number____

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.

State New Mexico

	1		- 1							No RA-							
			_	_ -	8W 1/4								_			_	
-1				ŀ	(B) Drill	_			ear	son Bros	-			Licen	se N	O	
				1	Street and								C4-4				
	-				City Drilling, v					-15-26				e			
					Drilling w												
•	lat of 640		-		.=									,			
	-		_		above se												
ate who	ether we	ll is	shallo	W OI	artesian	artes	1ar			Depth to	wat	er up	on cor	mplet	ion_		
ction 2					PRIN	CIPAL	WA	TER-BE	ARIN	IG: STRAT	A			-	- -		
:	Depth i				deness in				Desc	ription of	Water	-Bearin	g For	mation			
	ž rom		То		Feet						•						
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ction 3	-			٠.,		REC	OR	DOF	CASI	NG .		_					
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ction 4	in Feet	- 1	p abo	ter	<u> </u>	D OF I	MUE	DING				Meth	ods U	sed			
ction 4		- 1	Diame	ter	RECOR	D OF I	MUE Se	DING				Meth	ods U	sed			
ction 4	in Feet	- 1	Diame	ter	RECOR	D OF I	MUE Se	DING		CEMENT		Meth	ods U	sed			
ction 4	in Feet	- 1	Diame	ter	RECOR	D OF I	MUE Se	DING		CEMENT		Meth	ods U	sed			
ction 4	in Feet	- 1	Diame	ter	RECOR	D OF I	MUE Se	DING		CEMENT		Math	ods U	sed			
Depth From	in Feet	- 1	Diame	ter	RECOR	D OF I	MUD Sa Cem	DDING chas of sent	AND	CEMENT		Math	ods U	sed			
Depth From etion 5	in Feet To		Diams Hole in	ter in.	RECOR	D OF I	MUD Sa Cem	DING	AND	CEMENT							
ction 4 Depth From etion 5	in Feet To	g C	Diame Hole in	ter tn.	RECOR Tons Clay	D OF I	MUC Sec	DDING char of sent	AND	CEMENT	ING	1	icens	e No.			
ction 4 Depth From ction 5 me of	in Fest To	g C	Diame Hole in	ter tn.	RECOR Tons Clay	D OF I	MUC. Sa Cem	DDING chas of	AND	CEMENT	ING		icens	e No.			
ction 4 Depth From ction 5 ame of	in Feet To Pluggin d Numb	g C er_i	Diame Hole in	in.	RECOR Tons Clay Tons of F	D OF) No	MUC. Sa Cem	DDING chas of	AND	CEMENT	ING		icense	e No.			
etion 4 Depth From etion 5 ame of reet an one of ougging	in Feet To Pluggin d Numb	g C er_	Diame Hole in	in.	RECOR Tons Clay	D OF) No	MUC. Sa Cem	DDING chas of	AND	CEMENT	Typ	S be of a	icense	e No.			
ction 4 Depth From ction 5 ame of reet an one of ougging	in Feet To Pluggin ad Numb	g C er_	Diame Hole in	in.	RECOR Tons Clay Tons of F	D OF) No	MUC. Sa Cem	DDING chas of	AND	CEMENT	Tyl	Spe of a	icens tate_ rough	e No.	follo	₩8:	_19
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ction 4 Depth From ction 5 ame of reet an one of ougging	r Feet To Pluggin d Numb Clay used method approve	g C er_used by	Diame Hole in	dor_	RECOR Tons Clay Tons of F	PLU coughage	JGG	DDING chas of	AND	CEMENT RD Date Cement	Tyle Plug	See of a	icens tate_ rough	e No.	follo	₩8:	_19
ction 4 Depth From ction 5 ame of reet an ugging	Pluggin d Numb	g C er_used by	Diame Hole in	dor_	RECOR Tons Clay Tons of F	PLU coughage	JGG	DDING chas of	AND	CEMENT RD Date Cement	Tyle Plug	See of a	icens tate_ rough	e No.	follo	₩8:	_19
ction 4 Depth From ction 5 ame of reet an ugging	r Feet To Pluggin d Numb Clay used method approve	g C er_used by	Diame Hole in	dor_	RECOR Tons Clay Tons of F	PLU coughage	JGG	DDING chas of	AND	CEMENT RD Date Cement	Tyle Plug	See of a	icens tate_ rough	e No.	follo	₩8:	_19
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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	<u> </u>			(A) Own	- of well		D. D.	Sul11	Lven			
			1	-								
'							Arti		Str	itei	lev Mer	rico.
	1-1			Well was	drilled un	nder Pern	nit NoR	A-1300	<u>o,</u>	and :	is locate	ted in the
		1					% of Section.					
	+++				_		RER		ing Co.	· Licens	e No	
!	1 1											
	+											
'	1 "											
				Drilling w	as comple	eted		Aprı	12,			19 37
	Plat: of: 640		in for	-+ shows ga	^ 1eve]	200	Total	l depth	of well	210	ft.	
							Depth to					
State wn Section: 2							RING STRATA	•		Att gran		
No:	Depth.	in Feet	MT .	ickness in Feet	ĺ	Dr	escription of V	Water-Br	earing Fo	rmation		
1		18.	181	t flow	i							
2		36 to	46 :	2nd: flow	ĺ				***************************************			
3			 									
•		 	+-		ſ							
5		 	+-									
Section 3	3				RECOF	RD OF CA	SING		····	•		
Dia	Pounds			Dep		Feet	Type Sho		<u> </u>	Periors		
in	æ.	100		Top	Bottom				From			To
				 /	 '							
				1	 '	 	 					
	 				 '	 	 					•
				PECOR	P OF MU	DOING A	ND CEMENTI			1		
Section 4	th in Feet.	Diam	netes:	Tone		acks of	U VEIVIE					***************************************
From		Hole :				nent		7	Methods T	Jack		
	1						·					·
	1											
Section !	5				PLUGE	GING REC	ORD					
		og Contrac				· ·						·
		ber				•	·				-	
_	•				oughage v	neq			_	_		
	-	used			<u> </u>				red			
Physins	g approve	ed by: ·-			• •	<u> </u>	Cement	Plugs v	were pla	ced as	follows:	··
				Basin Sup	ervisor		o. Prum	of Plug To		No. of	Sacks Ü	and
			ATE E	NGINEER OF	NLY	7	•					
					,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		T					
Date	Received	ı				- [:			I			
<u> </u>	1-1-	:				1 [
Depu	in in Pec:	THE	ickr-co-							-		
File No	0	RA-130	0		_Use			cation	No1	7.26	10.430	

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

134	ANALYTE	S'AMPLE ID	ANALYTICAL RESULT	'S
		11101	103107	102107
		11184 1330	103184	1.03184
			1432	1240
17		Well 28	Well 45	Well 46
	Benzene	<0.005 mg/l	<0.005 mg/l	/ // 005 ==/1
	Toluene	<pre><0.005 mg/1 <0.005 mg/1</pre>	<0.005 mg/l	<0.005 mg/l
97	Ethylbenzene	<0.005 mg/1	<pre><0.005 mg/1</pre>	<0.005 mg/l <0.005 mg/l
	Xylenes	<0.005 mg/1	<0.005 mg/1	<pre><0.003 mg/1 <0.005 mg/1</pre>
1	11, 201100	(0:00.3. mg/ L.	(0.00) mg/I	/0 *003 mg/T
(48)		103184	1.0318.4	
i i i		1520	1550	
		Well 47	Fire Pond	
	Poncono	10 005 11		
	Benzene		<0.005 mg/l	
-(Toluene	<0.005 mg/l	<0.005 mg/l	
	Linylbenzene	<0.005 mg/1	<0-005 mg/l	
Ě	Xylenes	<0.005 mg/1	<0.005 mg/l	
		Well 3	Well 5	Well 12
T	·			***************************************
1	NO 3 as N	<0.01 mg/1	<0.01 mg/l	<0.01 mg/1
نند	NH 4	1.16 mg/1	2.5 mg/l	0.25 mg/l
_	CN T	<0.01 mg/I	<0.01 mg/l	<0.01 mg/l
T	Benzene	<0.005 mg/L	<0.005 mg/l	<0.005 mg/l
نط	Toluene	<0.005 mg/1	<0.005 mg/l	<0.005 mg/l
	Xylenes	<0-005 mg/l	<0.005 mg/l	<0.005 mg/l
1	Ethylbenzene	<0-005 mg/l	<0.005 mg/l	<0.005 mg/l
			C ,	J .
•		Well 13	Pond 1	Pond 3
T				
	NO 3 se N	<0.01 mg/l	<0.01 mg/l	<0.01 mg/1
26.0	NH 4	5.6 mg/l	10-6 mg/L	13.87 mg/l
5 73	CN	0.09 mg/l	0-4 mg/l	0.2 mg/1
	Benzene	0.254 mg/l	0.711 mg/1	0.027 mg/1
أتنظ	Toluene	0.345 mg/l	0.588 mg/l	<0.005 mg/1
	Xylenes	0-389 mg/1	0.591 mg/l	<0.005 mg/1
	Ethylbenzene	<0.100 mg/l	0.240 mg/1	<0.005 mg/1

ADDRESS Box 526 city Artesia, NM 88210 ATTENTION Ed Kinney INVOICE NO. 104223

K. NALY-

ANALYSIS

AMPLES RECEIVED 4/24/8T	CUSTOMER ORDER NUMBER P	.0. #20030	
YPE OF ANALYSIS Water			
Sample Identification	Type of Analysis	mg/liter	11/21/80 10/
Navajo Well #1	Acidity Alkalinity, "P" (A Barium Biochemical Oxygen Cadmium	0.1	
190 6	Chemical Oxygen De Chloride Chromium Chromium 6+ Copper Fluoride	mand 145 8313 0.002 < 0.01 0.001	5900
169	Hardness (as CaCO ₃ Iron Lead Magnesium Nickel	5760 -0.05 0.006 850 0.02	-
	pH Units Phenols Alkalinity , "M" Solids, Total Diss Sulfate Sulfide	4920	15800
	Zinc	0.21 < 0.1	

Sample Analysis by: B.P.

Date and Time of Analysis: BOD₅ - 4/24/8T @ 1600 hrs. pH: 4/30/81 @ 1400 hrs. Method of Analysis: BOD₅ - 5 day incubation

pH: electrode

C. Acciliate



4/30/81

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

CUSTUMER
ADDRESS
CITY
ATTENTION
INVOICE NO

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



SAM	PLES RECEIVED	4/24/81	c	CUSTOMER ORDER NUMBER P.O. # 200	30		
ТҮР	E OF ANALYSIS.	Water				· .	_
	Samp Iden	le tification	•	Type of Analysis	mg/liter	11/20/80	14/3
	: Nava	jo WeTî # 3	-	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium Chromium Chromium	32 < 1.0 < 0.1 40 0.009 73 2652 < 0.001 < 0.01	<u></u> -	V/e.
			,98	Copper FTuoride Hardness (as CaCO ₃) Iron Lead Magnesium NickeT pH Units Phenols Alkalinity, "M"	<pre>< 0.001 1.6 2760 0.01 < 0.001 250 < 0.01 7.4 < 0.001 356</pre>	5. u	3.2
		.6		Solids, Total Dissolved Sulfate Sulfide Zinc	7730 2720 0.10 < 0.1	7640	677

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



Elmer D. Martinez, Director of Quality Assurance
PAGE 6 OF 13 PAGE

4/30/81

Controls for Environmental Pollution, Inc.

P.O. Box 5351 • 1925 Rosina • Santa Fe, New Mexico 87502

ADDRESS Drawer 159
CITY Artesia, NM 88210
ATTENTION Ed Kinney

104223

NVOICE NO.

ı DE IA

AMAYGE AMAYGE

SAMPLES RECEIVED	4/24/81	CUSTOMER ORDER NUMBER P.O. # 200	030	
TYPE OF ANALYSIS	Water			
	ple ntification	Type of Analysis	mg/liter	11/21/10 10/3/
" : Nav	ajo Well #5	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand	36 < 1.0 0.1 24 0.05 176	
	163	Chloride Chromium Chromium 6+ Copper	7089 0.002 < 0.01 0.001	8600 412.
_	:	FTuoride Hardness (as CaCO ₃) Iron Lead	0.44 4660 0.04 0.007	0.96 b.4
		Magnesium Nickel pH Units Phenols Alkalinity, "M"	650 < 0.01 7.7 < 0.001 506	
		Solids, Total Dissolved Sulfate Sulfide Zinc	16,800 4290 0.13 < 0.1	21.100 736

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



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

Controls for Environmental Pollution, Inc.

P.O. Box 5351 • 1925 Rosina • Santa Fe, New Mexico 87502 Telephone 505/932-9841 *CUSTOMER ADDRESS

VOICE NO.

Navajo Refining Co.

Drawer 159

Artesia, NM 88210

Ed Kinney 104223

SAMPLES RECEIVED

CITY ATTENTION

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 WeTT # 7	Acidity	36		
,	Alkalinity, "P" (as CaCO ₃)	< 1.0		1
	Barium Rischemical Owesen Remod	< 0.1	•	
•	Biochemical Oxygen Demand Cadmium	38		
	Chemical Oxygen Demand	0.04 136		
	Chloride Chygen Bessand	3570	3400	80:
.•	Chromium	0.002		
	Chromium 6+	< 0.01		1 .
•	Copper	0.004	_	
, L	FTuoride	0.3	0.92	0.4
,64	Hardness (as CaCO ₃)	3160		
r	Iron	0.05		
	Lead	0.001		1
	Magnesium Nickel	370		1
	pH Units	< 0.01 8.0		
	PhenoTs	< 0.001		
	Alkalinity, "M"	596		
··	Solids, Total Dissolved	14,200	21,500 2	28.00
	Sul fate	5600		
•	Sulfide	0.05	•	
	Zinc	< 0.1	•	

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



Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 8 OF 13 PAGE.

Controls for Environmental Pollution, Inc.

P.O. Box 5351 • 1925 Rosina • Santa Fe, New Mexico 87502

CUSTOMER
ADDRESS.
CITY
ATTENTION
INVOICE NO

Navajo Refining Co ny Drawer 159 Artesia, NM 88210 Ed Kinney

104223

REFORT OF AVALUSES

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 36 Alkalinity, "P" (as CaCO ₃) < 1.0 Barium 0.1 Biochemical Oxygen Demand 36 Cadmium 0.01 Chemical Oxygen Demand 88	,
la	Chloride 2703 Chromium 0.002 Chromium 6+ 0.01 Copper 0.006 Fluoride 0.7 Hardness (as CaCO ₃) 3120	2200 1.8
	Tran	
•	Solids, Total Dissolved 10,400 Sulfate 4160 Sulfide 0.03 Zinc < 0.1	9820

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 9 OF 13 PAGE CUSTOMER **ADDRESS** CITY ATTENTION Ed Kinney INVOICE NO. 104223

Tree!

Navajo Refining Con Drawer 159 Artesia, NM 88210

mg/liter 11/21/80 10/3/

6700

730 i

1:49

29,000 2980

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

TYPE OF ANALYSIS

Identification

Sample:

Navajo Well # 12

Type of Analysis

Acidity Alkalinity, "P" (as CaCO3) Biochemical Oxygen Demand

Cadmium

Chromium 6+ Copper

Magnesium Nickel" pH Units

Phenols :

Sul fate Sulfide. Zinc

Chemical Oxygen Demand Chloride Chromium

Fluoride

Hardness (as CaCO₃) Iron Lead:

Alkalinity, "M" Solids, Total Dissolved

28,900

11,500 0.05 < 0.1

55

1.0 < 0.1

38

256

< 0.01

0.07

8058

0.002

0.002

0.9

8920

0.04

0.007

1330.

0.02

*<0.00I

7.6

545

* Data will follow on 5/6/81.

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_{κ} - 5 day incubation

pH:electrode

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

CUSTOMER
ADDRESS
CITY
ATTENTION
NVOICE NO

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



TYPE OF AN	ALYSIS Water			
	Sample	Type of		
	<u>Identification</u>	Analysis	mg/liter /1/21/8	c 16/1/7
	Navajo Well # 13	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium Chromium	11 < 1.0 0.1 22 0.002 48 357 0.002 < 0.01	/23
		Lead Magnesium Nickel pH Units	0.001 1.2 3.5 1570 0.02 0.003 79 < 0.01 7.4	1.47
		Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide	< 0.001 146 3200 3060 1810 0.04	253

Sample Analysis by: BP

Date and Time of Analysis: BOD₅: 4/24/81 @ 1600 hrs.

Zinc

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 11 OF 13 PAGE

< 0.1

ADDRESS CITY ATTENTION INVOICE NO.

Navajo Refining Cor Drawer 159

Artesia, NM 88210 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 # 16	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium	«	13 1.0 0.1 44 0.002
	Chemical Oxygen Demand Chloride Chromium Chromium 6+	<	0.01
.62	Copper Fluoride Hardness (as CaCO ₃) Iron	<	0.44 1610 0.01
	Lead Magnesium Nickel pH Units	<	0.002 140 0.01 7.7
	Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate		0.016 425 4,770 1,890
	Sulfide Zinc		0.10 0.1

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



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

CUSTOMER **ADDRESS** CITY ATTENTION VOICE NO. Navajo Refining Cor Drawer 159

Artesia, NM 88210

Ed Kinney 104223

1			•	
SAMPLES RECEIVED	4/24/81	CUSTOMER ORDER NUMBER	P.O. # 20030	· .
		,		
1	Water			•

TYPE OF ANALYSIS

Sample Identification	Type of Analysis	mg/liter
Navajo Well # 17	•	17 1.0 0.1 42 0.03 88 4692 0.002 0.01 0.001
16	Fluoride Hardness (as CaCO ₃) Iron Lead: Magnesium Nickel pH Units	0.3 4470 0.03 0.005 470 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.

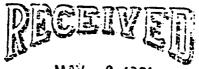
Method of Analysis: BOD_5 - 5 day incubation

pH:electrode



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

ADDRESS CITY ATTENTION AVOICE NO navajo Refining Cor Drawer 159 Artesia, NM 88210 Ed Kinney 104223



10/3/-

1430

132

6/62

MAY 6 198

		NAVAJO REFINING CO.	
SAMPLES RECEIVED	4/24/81	CUSTOMER ORDER NUMBER P.O. # 20030	·
TYPE OF ANALYSIS	Water	Windmill (Fig 4-9 Reviged)	

Sample Identification		Type of Analysis		mg/liter	
Well Water		Acidity		13	
\		Alkalinity, "P" (as CaCO ₂)	<	1	
1000		Barium 3'	<	0.1	
- 509 (Biochemical Oxygen Demand		38	
		Cadmium		0.002	
While		Chemical Oxygen Demand		88	
		Chloride	•	1632	
		Chromium		0.002	
•		Chromium 6+	<	0.01	
	,	Copper		0.004	
•		Fluoride		0.25	
		Hardness (as CaCO ₃)		2400	
		Iron		0.06	
	<i>6</i> 8 .	Lead		0.005	•
		Magnesium		310	
·	U	Nickel	<	0.01	
		pH Units	-	7.8	
		Phenois		0.022	
		Alkalinity, "M"		205	
	•	Solids, Total Dissolved		6860	
		Sulfate		2830	
		Sulfide		0.03	•
•		72		0.03	

Sample Analysis by: BP

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

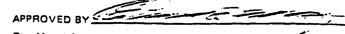
Zinc

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: $BOD_5 - 5$ day incubation

pH:electrode





0.2

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

CUSTOMER Navajo Refining Co. any Drawer 159
CITY Artasia, NN 38210
Ed Kinney
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

Navajo Well #12

PhenoTs

< 0.007

4/30/81 APRELIMET D. Hartinez, Director of Quality
PAGE OF 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 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 oluene 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	<0.01 mg/l 1.16 mg/l <0.01 mg/l <0.005 mg/l	<0.01 mg/1 2.5 mg/1 <0.01 mg/1 <0.005 mg/1	<pre><0.01 mg/1 0.25 mg/1 <0.01 mg/1 <0.005 mg/1</pre>
Toluene Xylenes Ethylbenzene	<0.005 mg/1 <0.005 mg/1 <0.005 mg/1	<pre><0.005 mg/1 <0.005 mg/1 <0.005 mg/1 <0.005 mg/1</pre>	<0.005 mg/1 <0.005 mg/1 <0.005 mg/1
	Well 13	Pond 1	Pond 3
NO 3 as N NH 4 CN Benzene Toluene Xylenes Ethylbenzene	<pre><0.01 mg/l 5.6 mg/l 0.09 mg/l 0.254 mg/l 0.345 mg/l 0.389 mg/l <0.100 mg/l</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/l 13.87 mg/l 0.2 mg/l 0.027 mg/l <0.005 mg/l <0.005 mg/l <0.005 mg/l</pre>
	Toluene Ethylbenzene Xylenes Benzene oluene Ethylbenzene Xylenes NO 3 as N NH 4 CN Benzene Toluene Xylenes Ethylbenzene	Benzene	1330

ASSAIGAI -

ANALYTICAL LABORATORIES, INC.

TO: Geo Science
Artn: Randy Hicks
500 Copper N.W.
Albuquerque, NM 87105

DATE: 3 December 1984 1111

	ANALYTE	SAMPLE IDENTI	FICATION/ANALYT	CICAL RESULTS
		Fire Pond	Well 47	Well 28
		10/31/83	10/31/84	11/1/84
		1550	1520	1330
1	Phenols	20.0 ug/l	33.0 ug/1	20.0 ug/l
į	Cl	134.0 mg/l	122.0 mg/l	101.0 mg/l
,	80	1800.0 mg/l		2150.0 mg/1
1	TDS	3664.0 mg/l	2728.0 mg/l	5192.0 mg/l
	TSS	96.0 mg/l	13588.0 mg/1	720-0 mg/1
<i>)</i>	NO	2-18 mg/l	1.79 mg/1	
	NH	1.0 mg/L	0.3 mg/1-	
I	Cr ·	<0.01 mg/1		
	CN	<0.01 mg/L		<0.01 mg/1
	·	1	-	
1		Well 45	Well 46	
		10/31/84		OMINAL DETECTION
	•	1432	1240	LIMIT
Ì	Phenols	16.0 ug/1	13.0 ug/1	0.01 ug/1
٤	C1.	495.0 mg/1	446.0 mg/l	1.0 mg/l
	SO	1650.0 mg/1	2100.0 mg/l	1.0 mg/1
•	TDS	3836.0 mg/l	3988.0 mg/l	1.0 mg/1
	TSS	2004.0 mg/l	4084.0 mg/1	1.0 mg/1
_	NO	0.10 mg/1	0.80 mg/1	0.1 mg/1
**	NH	11.6 mg/1	1.0 mg/1	
	Cr	<0.01 mg/1	<0.01 mg/l	0.01 mg/1
.	CN	<0.01 mg/1	<0.01 mg/1	0.01 mg/l

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

Geraghty 8	k Miller	Inc. Opgradient. Well		Downgradient Wells	
	-	35 35	36	· 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	ь	-	-	-	-
Radio	(**)	•	-	•	-
Coliform	,	1	1	2700	1

Table 5. 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 &	Mill	er, Inc. Upgradient		Downgradient	•
		Well 31	32	Wells 33	34
рН		7.31	7.41	7.41	7.30
Spec Cond.		25544.5	2693	3590	2563
TOC mg/1	. (*)	2489			
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 ND
Radio	(**)	-	-	_ /	-
Coliform	(*)				

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

^{*} 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	S'AMPLE I	D/ANALYTICAL RESU	ILTS
1	•			
		11184	103184	103184
		1330	1432	1240
971		Well 28	Well 45	Well 46
ساق	Benzene	<0.005 mg/1	<0.005 mg/l	<0.005 mg/l
	Toluene	<0.005 mg/1	<0.005 mg/1	<0.005 mg/1
T	Ethylbenzene	<0.005 mg/l	<0.005 mg/l	<0.005 mg/L
بل	Xylenes	<0.005 mg/1	<0.005 mg/1	<0.005 mg/1
1		103184	103184	
A		1520	1550	
		Well 47	Fire Pond	
	Ponsone	40 00E/1	40.005 m. /1	
	Benzene	<0.005 mg/l	<0.005 mg/l	
-(oluene	<0.005 mg/l	% <0.005 mg/1	
_	Ethylbenzene	<0.005 mg/l	<0.005 mg/l	
	Xylenes	<0.005 mg/l	<0.005 mg/l	•
4				
		Well 3	Well 5	Well 12
I,	NO sa v	40 01 m. /1	40.01.43	
A	NO 3 as N	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
	NH 4 CN	1.16 mg/L	2.5 mg/1	0.25 mg/l
177		<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
	Benzene	<0.005 mg/l	<0.005 mg/1	<0.005 mg/l
نط	Toluene	<0.005 mg/l	<0.005 mg/1	<0.005 mg/1
_	Xylenes	<0.005 mg/l	$\langle 0.005 \text{ mg/l} \rangle$	<0.005 mg/l
I	Ethylbenzene	<0.005 mg/l	<0.005 mg/1	<0.005 mg/l
اسلال				
		Well 13	Pond 1	Pond 3
T	ио зав и	<0.01 mg/1	<0.01 mg/1	<0.01 mg/l
تناآل ا	NH 4	5.6 mg/l	10.6 mg/l	13.87 mg/l
i i	CN 4	0.09 mg/1	0.4 mg/1	
7	Benzene	0.254 mg/l	0.711 mg/1	0.2 mg/l
,	Toluene	0.345 mg/1	-	0.027 mg/l
B.	Xylenes	0.389 mg/l	0.588 mg/1	<0.005 mg/1
	Ethylbenzene		0.591 mg/l	<0.005 mg/l
	nentroene	<0.100 mg/l	0.240 mg/l	<0.005 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		0.0 L mg/1 0.1 mg/1
CN Benzene	0.617 mg/l	0.01 mg/l 0.000 mg/l
Toluene Xylenes	0.467 mg/l 0.463 mg/l	0.005 mg/l 0.005 mg/l
Ethylbenzene	0.201 mg/1	0.005 mg/l

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
CITY
ATTENTION

Navajo Refining Co. 1 Drawer 159 Artesia, NM 88210

ATTENTION Ed Kinney
INVOICE 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 West Pond	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium C	13 1 0.2 116 0.003 102 918 0.04 < 0.01 < 0.001 6.6 760 0.06 0.002 60 0.01 7.7 0.04 173 2930 885 25.1
	Zinc	< 0.1

Sample Analysis by: BP

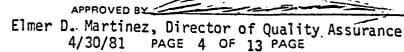
Date and Time of Analysis: BOD₅: 4/24/81 @ 1600 hrs.

pH: 4/30/81 @ 1400 hrs.

Method of Analysis: $BOD_5 - 5$ day incubation

pH:electrode





CUSTUMER
ADDRESS
CITY
ATTENTION

OICE NO

Navajo Refining Com

Drawer 159

Artesia, NM 88210

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 Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride Chromium	< <	29 1 0.1 116 0.002 363 1468 0.1
	Chromium 6+	- {	0.01 0.001
- 14º	Copper Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium Nickel pH Units Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	<	7.4 1060 0.06 0.001 96 0.01 7.4 0.027 349 4020 1050 13.4 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 3 OF 13 PAGE

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



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

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	«	10 1 0.1 72 0.002 225 1632 0.1
	Chromium 6+ Copper Fluoride Hardness (as CaCO ₃) Iron Lead	•	0.01 0.002 5.8 1160 0.1 0.001
	Magnesium Nickel pH Units Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	<.	110 0.01 7.2 0.001 214 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



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

Discharge Plan
Naveto Refinery
(CCD WORK Copy)

Baca

WORK COPY

DIL CONSERVATION DIVISION

DEC 11 1984

RECEIVED

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.

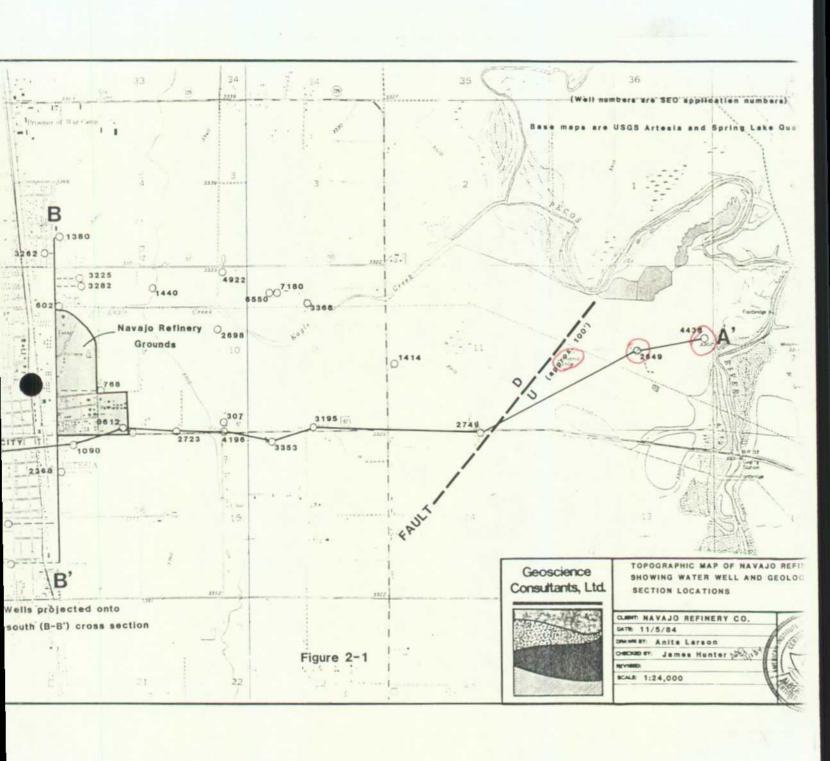
2.0 LOCATION AND PHYSIOGRAPHY

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

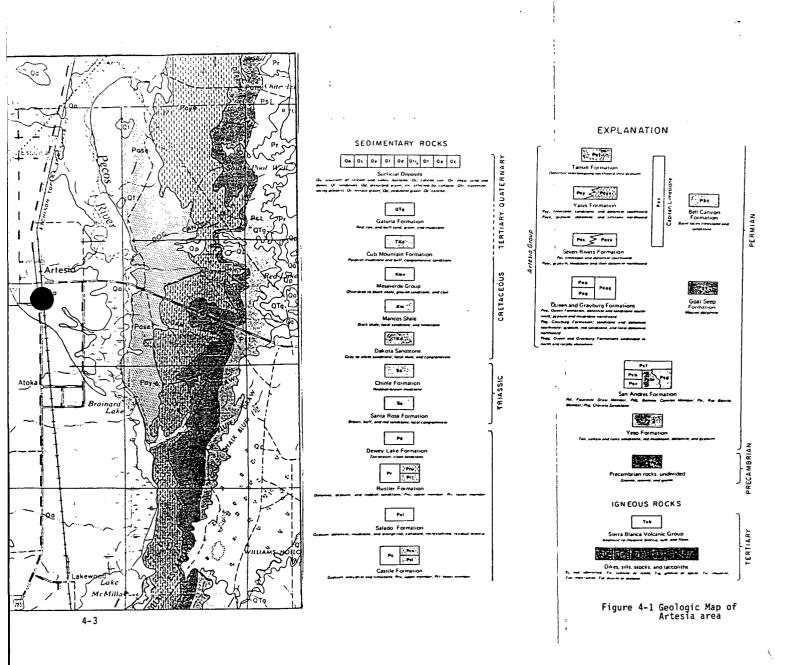
isolated permeable sands and fractured evaporites will produce small quantities of poor quality water. These isolated units may show a few feet of artesian head. One such unit is present about 15 feet below the Refinery. The evaporation ponds and portions of the conveyance ditch lie on the flood plain 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.

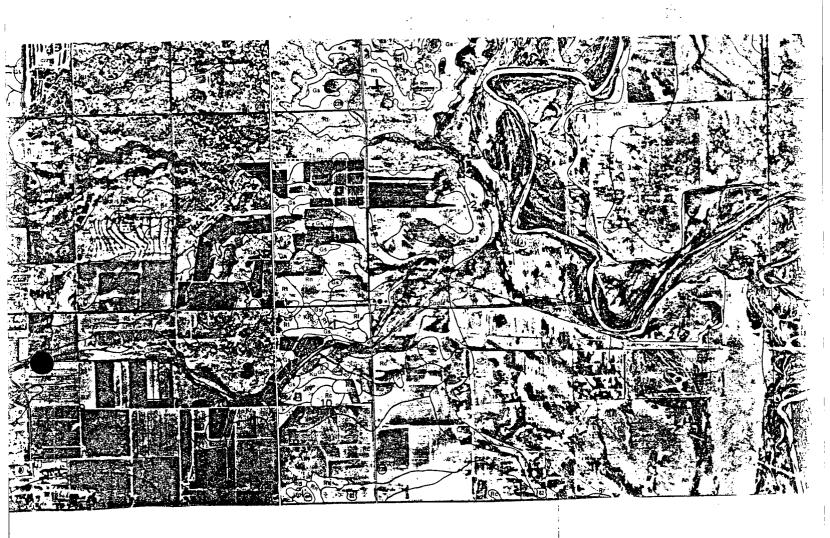


Although the fault may cut across all known and potential aquifers, there are several reasons why the fault is not a potential conduit for ground water contamination. First, faults in evaporites (Queen, Seven Rivers) typically "heal" or self-seal by flowage and recrystallization of gypsum and anhydrite. 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	fication		Perce	entage passii		Permea- bility	Avellable water capacity	Reaction	Electrical Conductivity (Ec x 103)	Corrosivity (Untreated Steel pipe)	Shrink-swell potential
USDA teature	Unified	AASHO	10 a (1.7 mm.)	No. 10 (2.0 cm.)	No. 200 (0.074 mm.)		Capacity				
Sitty clay loam Silty Clay	CH	A-6 A-1	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	Kigh High	Moderale High
rery fine sandy toom, Loam and sili loam,	. •	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	Lo-
Loam Clay loam	M -CL	A-4 4-6	001	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	Moderale Moderale
Stit losm to silty	cr	4-6	100	100	85-95	0.2-0.8	0.18-0.70	7.4-7.8	0-4.0	Moderate	Moderale

' 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

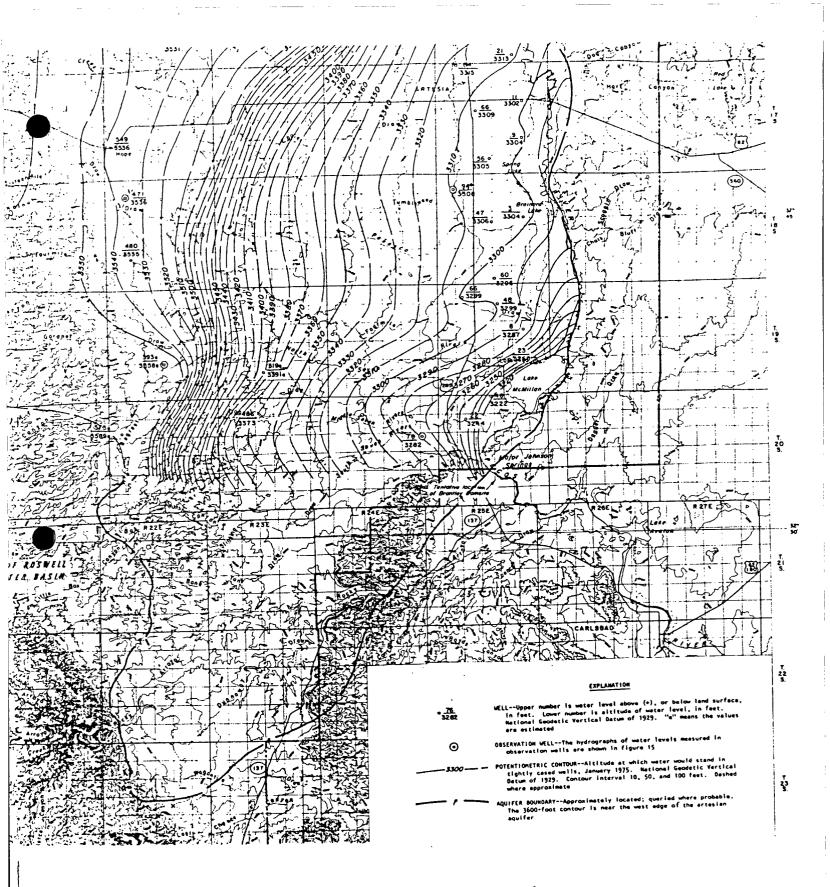


Figure 4-4 Potentiometric surface of deep aquifer (Welder, 1983)

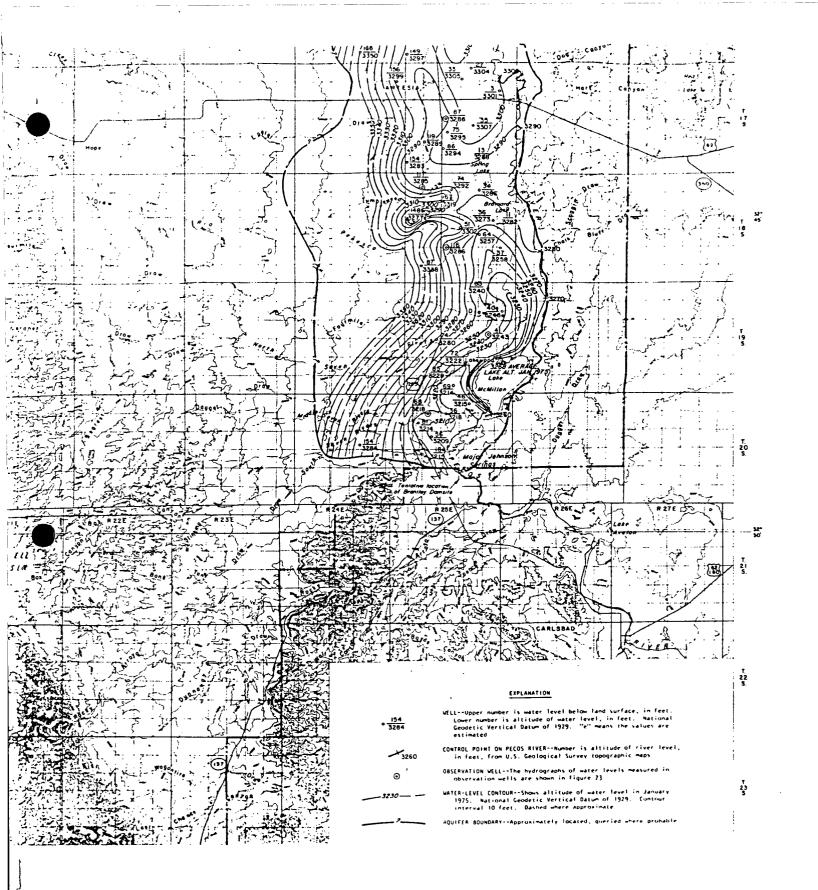


Figure 4-5 Potentiometric surface of shallow aquifer (Welder, 1983)

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 shallowaquifer'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).

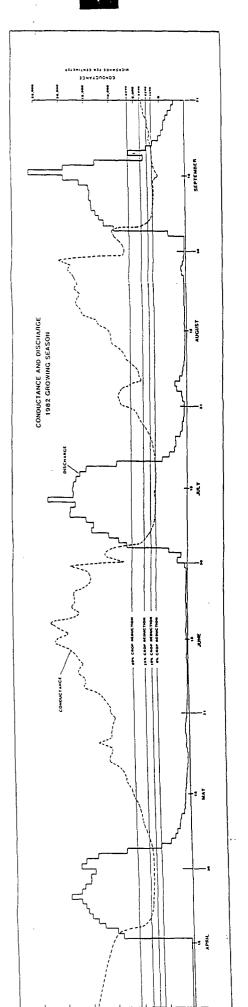
In some areas there is evidence for the existence of an isolated, discontinuous perched-water aquifer, which lies on top of clay or anhydrite lenses above the confined shallow aquifer. Very shallow (10-30 feet), low-production wells may have tapped this "gyp water" in the past and used the production 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



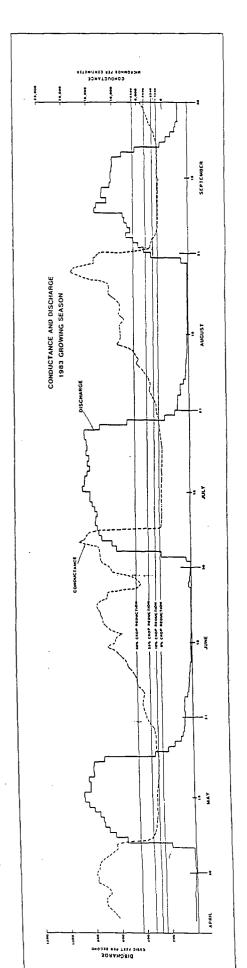


Figure 4-8 Relationship between conductance and discharge in Pecos River near Artesia (unpublished data from USGS).

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. 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 Modern "floods" in the Pecos are now has exceeded 7000 cfs. 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.

Shows by how

4.6 GROUND WATER QUALITY

Four separate hydrogeologic units are present at the Navajoria

- 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.

quality in the perched terrace/regolith water-bearing ounit 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. 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 Boiler Blowdown Desalter Process Units and Water Softener 60% } Taroland alconomics 20% } 8%

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.

or where with

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

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 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).

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

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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 5-1 PROCESS UNITS AND WASTEWATER TREATMENT/DISPOSAL UNITS

LOCAT	ION	PROCESS UNIT	WASTE STREAM DISPOSAL/ SOURCE NUMBER TREATMENT SYSTEM
South	Division	Cooling Tower	1 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)	3 To south division API separator
South	Division	Crude Unit Overhead Accumulator (D-140)	4 / To south division API separator
South	Division	Crude Unit Stabilizer (D-202)	5 To south division API separator
South	Division	Alkylation Unit Regenerator	6 To API separator
	Division Unit	Cooling Tower and Vacuum Unit	d 7 To south division API separator
South	Division	Crude Unit Straig Run Gasoline stabilizer (W-58	
North	Division	Crude Unit Desalters (D-1, D-2	9 To north division oil/water separator
North	Division	Cooling Tower	10 morth division oil/water separator

			Table 5-1 Continued
North	Division	Crude Unit Overhead Accumulator (D-5)	111 To oil/water separator
North	Division	Low Pressure Boiler	12 To North division oil/water separator
North	Division	Crude Unit Overhead Accumulator (D-4)	North division oil/water separator
North	Division	Desulfurizers (D-15)	141 North division oil/water separator
North	Division	Fluidized Cat. Cracker Unit Cooling Tower	North division oil/water separator
North	Division	Sour Water Stripper Bottom	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

Nood Brown Cola 7

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 SEFORE SOUR WATER STRIPPER	SOUR WATER STRIPPER EFFLUENT (#17)	ALKY. NEUTRALIZING SEWER (#6)	ND & SD DESALTERS (#3, #9)
As C.0 Ea 1:2 Cd O.01); 	the second	William Wa		
Cr 6.03 CN 6.2	<0.1 <0.1	<0.1 <0.1	<0.1 <0.1	7.8 (0.1	<u>(</u> (1.0
F 146 Pb 0.0000 Hg 0.0000 NOs 160 Se 0.0000 Ag 170 C1 460 Cu 1.00	1.3	0.5	0.4	10.8	
Fe 5.67 Mn (2.45 SD* (1.09)	<0.1	5.9	17.0	7.8	
TDS (************************************	805 <0.1 6.3	(0.1 9.0	560 0.12 9.5	2 <u>872</u>) 1 <u>18.8</u> 3.6	2524
Phenols (3005) TSS ON	<u>. 9.9 </u>	§ 710 x	[250]	0.26	
Cond. COD & P NH. S	78 64	#8379 2320 180	(1702) 256 7.7	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	5.0 (1.0

Table 5-2 (continued)

BOILERS

M&CC 3-103	S.D.	N.D.	N.D.
PARAMETERS	BOILER	HIGH	LOW
	BLONDOWN	PRESSURE	PRESSURE
		BOILER	BOILER
	(#2)	(#18)	(#12)
۸۰	.004	.005	.003
As Ba	(.1	.003 <.1	.003 <.1
Dd Cd	⟨.01	⟨.01	₹.01
Cr	⟨.05	₹.05	₹.05
CN		(* 00	
F	3-1	2.2 }	1.5
f'b	1.18	.14	.05
Hg	V 23 5324	. ••••	. 747 * 1
NO ₃	. 2	.1	.05
Se			
Ag	<.05	<.05	₹.05
ย	<.05	<.05	<.05
Cl	127	73	44
Cu	<.03	<.03	<.03
Fe	1.9	0.65	0.25
Mn	.07	<.03	(.03
SO	1549	1242	693 "
TDS	4220 1	2873 🖔	1807
Zn	.06	₹.01	<.01
pH Al	7 11.6 (1.0	11.6 ¹ (1.0	11.2 <1.0
B ₁	11.0	11.0	71.0
Co	<.01	.02	.01
Ma	⟨.5	(.5	⟨.5
Ní	<.05	₹.05	₹.05
Phenols	_	· -	
TSS	\ <u>20</u>	0	0
Cond.	6000	5000	2800
COD	1116	0	0
NH4	And the state of t		
S		•	

Table 5-2 (continued)

	00	OLING TOWERS	J. S.		
WECC 3-103 STANDARDS	N.D. COOLING TOWER BLOWDOWN (#10)	S.D. ALKY COOLING TOWER BLOWDOWN (#1)	S.D. TCC COOLING TOMER BLOWDOWN	N.D. FCC COOLING TOWER BLOWDOWN (#16)	
As	.004	<.001	.011	.001	
Ba	<.1	₹.1	<.1	⟨.!	
Cd	<.01	<.01	<.01	₹.01	
Cr	100.	(1.05)	⟨.05	$\sqrt{\frac{10.22}{0.22}}$?	
CN				1 0122.	
F	11.6	(4.4)	2.2	1.6	
Pb	₹.05 \	.05 ∜	₹.05	√ .05D	
Hg	,	N. C. Common		(• A°T°);	
N 03	.5	.75	.2	.3	
Se			• •	• 0	
Ag	<.05	<.05	<.05	<.05	
U	<.05	<.05	₹.05	<.05	
Cl	48	53	44		
Cu	<.03	<.03	<.03	47	
Fe	.05	.5	⟨.05	<.03	
Mn	<.03	.07	⟨.03	<.05	
SO	1077	1461	1236	<.03	
TDS*	1906	2732	1694.	1067	
Zn	.46	28 /	<.01	1973	
pН	7.6	6.9	7.7	.17	
Al	<1.0	<1.0	1.0	8.0	
B		\\	1.0	<1.0	
Co	<.01	.01	.02	5.4	
Ко	<.5	⟨.5	.02 <.5	.01	
Ni	⟨.05	<.07	₹.5 ₹.05	<.5	
Phenols		V+V1	1.00	<.05	
TSS	113	Ō	1-67 1		
Cond.		0	`	0	
COD	0 1850	V	108	1800	
NH.				15	

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 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 SE New Mexico crude is generally found in marine formations, this water is highly saline.

wholl hopewa

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 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 pumps face in order to create a gradient toward the skimmer pump in trench. This 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 How Fing the RCRA landfarm.

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

Info. Rec. Tuello Amalysia Rocal. Recovered

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 11

a two-pond system. The ponds cover an area of approximately 85 acres square feet and are generally less than 3 feet deep. 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 Upsets in the refinery and minor modifications of the operation could result in a variable quality of discharge. 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.

Total Eggluent = 0.627 c5s= 405,200 gpd 1 Acre = 43,560 th

Vol = 85 Acres (43,560) (3'dap) = 11.1(106) 8t3

 $\dot{V} = 0.627 \frac{5t^3}{3} \left(\frac{60s}{1 \text{ min}} \right) \left(\frac{50 \text{ min}}{1 \text{ ln}} \right) \left(\frac{24 \text{ hr}}{1 \text{ day}} \right) = 5.4 (18) \frac{5t^3}{0 \text{ day}}$

 $T = V = 11.6(16)5t^3 = 204 \text{ days}.$ $5.4(16^4)5t^3 \text{ day}.$

Assume 3 gt. depth for \$5 acres

Evaporation Coloulations Om BACCK

Val Evap in Pondo =
$$94 \frac{\text{in}}{\text{yr}} \left(\frac{15t}{12 \text{in}}\right) \left(85 \text{ Aurs}\right) \left(\frac{43560}{400}\right)$$

$$= 2.9 \left(10^{7}\right) \text{ ft}^{3}/\text{yr}$$

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- 1. Kelley, V.C., 1971 Geology of the Pecos Country, Southeastern New Mexico: New Mexico Bureau of Mines and Mineral Resources, Memoir 24, Socorro, New Mexico, 77p. 7 maps.
- 2. New Mexico Environmental Improvement Division, 1980, Chemical Quality of New Mexico Community Water Supplies, 256 p.
- 3. Patterson, J.L., 1965, Magnitude and Frequency of Floods in the United States, part 8: United States Geological Survey Water Supply Paper 1682, Washington, D.C., 506 p., 1 map.
- 4. United States Soil Conversation Service, 1971, Soil Survey of Eddy Area, New Mexico: United States Department of Agriculture, Washington, D.C. 82 p., 152 maps.
- 5. Welder, E.G., 1983, Geohydrologic Framework of the Roswell Ground-Water Basin, Chaves and Eddy Countries, New Mexico: New Mexico State Engineer's Technical Report 42, Santa Fe, New Mexico, 28 p, 28 maps.

2-200. PECOS RIVER BASIN. (Continued)

B. Standards:1

- 1. In any single sample: dissolved oxygen shall be greater than 5.0 mg/l, pH shall be within the range of 6.6 to 8.8, and temperature shall be less than 32.2 C (90 F).
- 2. The monthly logarithmic mean of fecal coliform bacteria shall be less than 200/100 ml, and no more than 10% of the samples shall exceed 400/100 ml.
- 3. The open water shall be free of algae in concentrations which cause nuisance conditions or gastrointestinal or skin disorders.
- 2-206. The main stem of the Pecos River from the headwaters of Lake McMillan upstream to Acme, including flow from below the perennial reaches of the Rio Penasco, the Rio Hondo, and the Rio Felix which enters the main stem of the Pecos River.
- A. <u>Designated Uses</u>: irrigation, livestock and wildlife watering, secondary contact recreation, and warmwater fishery.

B. Standards:

- 1. In any single sample: dissolved oxygen shall be greater than 5.0 mg/l, pH shall be within the range of 6.6 to 8.8, and temperature shall be less than 32.2 C (90 F).
- 2. The monthly logarithmic mean of fecal coliform bacteria shall be less than 1,000/100 ml, and no more than 10% of the samples shall exceed 2,000/100 ml.
- 3. At all flows above 50 cfs: TDS shall be less than 14,000 mg/l, sulfate shall be less than 3,000 mg/l, and chloride shall be less than 6,000 mg/l.
- 2-207. The main stem of the Pecos River from Acme upstream to Summer Dam.
- A. <u>Designated Uses</u>: fish culture, irrigation, limited warmwater fishery, livestock and wildlife watering, and secondary contact recreation.

WQCC 31-1 -19- June 4, 1981

These standards do not apply at pool sizes below 6,000 acre feet.

WATER QUALITY CONTROL COMMISSION
Post Office Box 968 - Crown Building
Santa Fe, New Mexico 87503
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WQCC 81-1

WATER QUALITY STANDARDS FOR INTERSTATE AND INTRASTATE STREAMS IN NEW MEXICO

(Supersedes WQCC 80-1 filed August 28, 1980)

PART 1

1-100. INTRODUCTION AND AUTHORITY.

- A. The purpose of these standards is to designate the uses for which the surface waters of the State of New Mexico shall be protected and to prescribe the water quality standards necessary to sustain the designated uses.
- B. These standards are consistent with Section 101 (a)(2) of the Federal Clean Water Act, as amended, (33 U.S.C. 1251 et. seq.) which declares that "it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983...." Agricultural, municipal, domestic and industrial water supply are other essential uses of New Mexico's water; however, water contaminants resulting from these activities will not be permitted to lower the quality of streams below that which is required for recreation and maintenance of a fishery, where practicable.
- C. These standards are adopted by the Water Quality Control Commission under the authority of Paragraph C, Section 74-6-4 of the New Mexico Water Quality Act (Chapter 326, Laws of 1973, as amended).
- D. Part 3 of the Water Quality Control Commission Regulations includes standards to protect ground water and regulations controlling discharges onto or below the surface of the ground.
- E. Adopted August 22, 1973; Revised September 29, 1975, January 13, 1976, February 8, 1977, March 14, 1978, May 23, 1979, July 8, 1980, and April 22, 1981.

1-101. ANTIDEGRADATION POLICY.

Degradation of waters the quality of which is better than the stream standards established by the New Mexico Water Quality Control Commission is not reasonable degradation and is subject to abatement under the authority granted the Commission by the New Mexico Water Quality Act, as amended, unless it is justifiable as a result of necessary economic and social development. Existing instream water uses shall be maintained and protected. No degradation shall be allowed in high quality waters of designated national and state parks and wildlife refuges if such degradation would impair any of the qualities which caused designation of the parks and wildlife refuges. To protect the existing quality of water, the Commission under that Act will require the highest and best degree of effluent treatment practicable. In those cases where potential water quality impairment associated with a thermal discharge is involved, this antidegradation policy shall be consistent with Section 316 of the Federal Clean Water Act. In implementing this section, the Commission through the appropriate regional offices of the Federal Environmental Protection Agency will keep the Administrator advised and provided with such information concerning the waters of New Mexico as he will need to discharge his responsibilities under the Federal Clean Water Act.

1-102. GENERAL STANDARDS.

The following general standards apply at all times (unless otherwise specified in Part 2) to all surface waters of the State which are suitable for recreation and support of desirable aquatic life presently common in New Mexico waters:

- A. Stream Bottom Deposits: The stream shall be free of water contaminants from other than natural causes that will settle and adversely inhibit the growth of normal flora and fauna or significantly alter the physical or chemical properties of the bottom. Siltation resulting from the reasonable operation of irrigation and flood control facilities is not subject to these standards.
- B. Floating Solids, Oil and Grease: Receiving water shall be free of objectionable oils, scum, grease and other floating materials resulting from other than natural causes.
- C. Color: Color-producing materials resulting from other than natural causes shall not create an esthetically undesirable condition nor should color impair the use of the water by desirable aquatic life presently common in New Mexico waters.
- D. Odor and Taste of Fish: Water contaminants from other than natural causes shall be limited to concentrations that will not impart unpalatable flavor to fish, or result in offensive odor arising from the stream or otherwise interfere with the reasonable use of the water.



- E. Plant Nutrients: Plant nutrients from other than natural causes shall not be present in concentrations which will produce undesirable aquatic life or result in a dominance of nuisance species in receiving waters.
- F. Hazardous Substances: Toxic substances such as, but not limited to, pesticides, herbicides, heavy metals, and organics, shall not be present in receiving waters in concentrations which will change the ecology of receiving waters to an extent detrimental to man or other organisms of direct or indirect commercial, recreational, or esthetic value. Toxicities of substances in receiving waters will be determined by appropriate bioassay techniques, or other acceptable means, for the particular form of aquatic life which is to be preserved with the concentrations of toxic materials not to exceed 5% of the 96-hour LC-50 provided that: toxic substances which, through uptake in the aquatic food chain and/or storage in plant and animal tissues, can be magnified to levels which are toxic to man or other organisms, shall not be present in concentrations which result in this biological magnification. Waters used for domestic water supplies shall not contain hazardous substances in concentrations that exceed drinking water standards set forth in Section 202B of the New Mexico Regulations Governing Water Supplies.
- G. Radioactivity: The radioactivity of surface waters shall be maintained at the lowest practical level and shall in no case exceed the standards set forth in Part 4 of New Mexico Environmental Improvement Board Radiation Protection Regulations, adopted April 18, 1980.
- H. Pathogens: The stream shall be virtually free of pathogens. In particular, waters used for irrigation of table crops such as lettuce shall be virtually free of Salmonella and Shigella species.
- I. Temperature: Maximum temperatures for each stream reach have been specified in Part 2 of these standards. However, the introduction of heat by other than natural causes shall not increase the temperature, as measured from above the point of introduction, by more than 2.7 C (5 F) in a stream, or more than 1.7 C (3 F) in a lake or reservoir. In no case will the introduction of heat be permitted when the maximum temperature specified for the reach [generally 20 C (68 F) for cold water fisheries and 32.2 C (90 F) for warm water fisheries] would thereby be exceeded. These temperature standards shall not apply to impoundments constructed offstream for the purpose of heat disposal. High water temperatures caused by unusually high ambient air temperatures or the reasonable operation of irrigation and aquacultural facilities are not violations of these standards.
- J. <u>Turbidity</u>: Turbidity attributable to other than natural causes shall not reduce light transmission to the point that desirable aquatic life presently common in New Mexico waters is inhibited or that will cause substantial visible contrast with the natural appearance of the water. Turbidity attributable to natural causes or the

reasonable operation of irrigation and flood control facilities is not subject to these standards.

- K. Salinity: Where existing information is sufficient, numerical standards for total dissolved solids (or conductivity), chlorides and sulfates, have been adopted in Part 2 of these standards.
- 1. For the tributaries of the Colorado River system, the State of New Mexico will cooperate with the Colorado River Basin States and the Federal Government to support and implement the salinity policy and program outlined in the report "Water Quality Standards for Salinity Including Numeric Criteria and Plan of Implementation for Salinity Control, Colorado River System" dated August 1978, and the supplement thereto dated December 18, 1978.
- 2. Numeric criteria for salinity are established at three points in the Colorado River Basin as follows: below Hoover Dam, 723 mg/l; below Parker Dam, 747 mg/l; and at Imperial Dam, 879 mg/l.
- 3. As a part of the program, objectives for New Mexico shall include the elimination of discharges of water containing solids in solution as a result of the use of water to control or convey fly ash from coal-fired electric generators, wherever practicable.
- 4. In determining compliance with the numeric criteria hereby adopted, salinity (TDS) is determined by the "calculation method" (sum of constituents) as described in the latest edition of "Techniques of Water-Resources Investigations of the United States Geological Survey Methods for Collection and Analysis of Water Samples for Dissolved Minerals and Gases":
- L. <u>Dissolved Gases</u>: Surface waters shall be free of nitrogen and other dissolved gases at levels above 110% saturation when this supersaturation is attributable to municipal, industrial or other discharges.
- M. <u>Mixing Zones</u>: In any waters receiving a waste discharge, a continuous zone must be maintained where the water is of adequate quality to allow the migration of all desirable aquatic life presently common in New Mexico waters with no significant effect on their populations. Wastewater mixing zones, in which the standards in Part 2 may be exceeded, shall generally be less than 1/4 of the cross-sectional area of a receiving stream or the volume below 1/100 of the surface area of a receiving reservoir.
- N. Reservoirs: Unless specified, standards for reservoirs apply only to the epilimnion or, in the absence of an epilimnion, to the upper 1/3 of the reservoir.

AN EVALUATION OF THE NAVAJO REFINERY WASTEWATER TREATMENT FACILITIES, ARTESIA, NEW MEXICO

Prepared for
The New Mexico Water Quality
Control Commission
January 14, 1974

By
-- Earl Backenstow, P. E.
Water Quality Division
New Mexico Environmental Improvement Agency

I. SUBJARY

On site investigations were conducted of the wastewater treatment facilities at the Navajo Refinery, and drawings of the system were reviewed. A layout of the complete system was prepared, since, at the time of this study, one did not exist.

A determination of the source of wastewater flows from the refinery was made, and the refinery effluent flow was found to be approximately 0.32 mgd. A determination was also made of the COD and suspended solids of the refinery effluent.

In addition, a simultaneous monitoring of the flows entering and leaving the treatment system was conducted. Further, an estimation for the percolation and evaporation rates from the lagoons was made. The strength of the wastewater through various stages of the treatment system was determined, and the reduction in COD was found to be between 25 and 50 per cent. Suspended solids were reduced by 80 to 90 per cent.

Also, test holes were dug to determine the depth of the groundwater, which was found to be five to six feet beneath the bottom of the lagoons. Since groundwater contamination by the lagoons was suspected, the water in the test holes, along with the water from a nearby stockwell, was sampled and tested. However, the test data was inconclusive.

A review of USGS flood flow data for the Pecos River for a period of 1941 to 1965 was conducted and compared with survey elevations of the three lagoons. This comparision illustrated the fact that lagoon three is flooded almost every year by the Pecos River.

A discussion with refinery personnel was held concerning the history of breaks occurring in the system. For example, a December, 1972, break in the effluent ditch resulted in untreated refinery effluent combining with treated domestic sewage from the Artesia sewage treatment plant, and the combined wastewater flowed into the Pecos River. The ensuing publicity focused attention on the Navajo Refinery Wastewater System and helped to precipitate this investigation.

The entire effluent ditch was visually inspected. Photographs were taken at various locations along the ditch. The photographs are included in Appendix B as an integral part of this report.

The proposed effluent regulations for refineries, promulgated under the Federal Water Quality Act Amendments of 1972 (PL 92-500), were reviewed and compared with effluent data obtained in this investigation. The investigation data also were compared to effluent criteria in the proposed New Mexico Permit Regulations.

Also discussed in this report, are the oil spill regulations applicable to the Navajo Refinery situation.

In addition, this report discussed alternatives for improving the effluent from the Navelo Refinery.

II. CONCLUSIONS

- 1. The Navajo Refinery wastewater treatment system is not a total retention facility. Significant amounts of wastewater effluent finds its way into the Pecos River through seasonal flooding. An additional amount finds its way into the groundwater through percolation.
- 2. The third lagoon in series (Lagoon 3) in the treatment system is situated at ground level. As a result, it is regularly flooded by the Pecos River. The flooding occurs with sufficient frequency to consider the effluent from Lagoon 2 a surface discharge as defined by the Federal Water Quality Act Amendments of 1972 (PL 92-500). Navajo Refinery is, therefore, legally obligated to obtain a permit to discharge under the Act.
- 3. Preliminary effluent regulations for oil refineries have been promulgated under PL 92-500. The effluent from lagoon two at Navajo Refinery does not comply with these regulations.
- 4. Effluent regulations have been proposed as part of a State Discharge Permits Program in New Mexico. The effluent from lagoon number two does not comply with these proposed regulations.
- 5. The lagoons are situated in very close proximity to the Pecos River, and there has been a history of untreated refinery effluent spills making their way into the Pecos River. Moreover, a reasonable probability exists that the spills will continue to occur, which will necessitate the preparation, by the refinery, of a Spill Prevention Control and Countermeasure (SPCC) Plan in accordance with Federal Regulations published in the Federal Register on December 11, 1973.
- 6. There is some percolation of wastewater into the soil beneath lagoons one, two, and three. The amount is relatively small compared to the amount of water entering the system each day. However, lagoons one, two, and three are only five to six feet above groundwater. Therefore, it is likely that the groundwater in the immediate area of the lagoons is being contaminated.

Water from a stock well, 100 yards away from lagoon one on the side of the lagoon away from the river, was sampled. The test data indicated that the well was not contaminated. Tests conducted on the groundwater immediately adjacent to the lagoons were inconclusive because of the manner in which they were sampled.

7. The wastewater treatment facilities at Navajo Refinery will have to be improved before they will be capable of meeting effluent regulations.

III. RECOMMENDATIONS

- 1. The owners of Navajo Refinery must apply for a Federal permit to discharge their wastewater. This permit can be obtained through the Dallas Regional office of the Environmental Protection Agency. Information regarding the permit can be obtained through the New Mexico Environmental Improvement Agency in Santa Fe. New Mexico.
- 2. The owners of Navajo Refinery must write a spill prevention control and countermeasure plan for the wastewater treatment system. Information regarding this plan can be obtained from the Dallas Regional office of the

Environmental Protection Agency.

- 3. The owners of Navajo Refinery must take steps to develop a wastewater treatment system at the refinery which will produce a treated wastewater capable of meeting State and Federal wastewater effluent requirements. If it is decided to upgrade the existing total retention facilities, the following should be accomplished:
 - a. Replace the effluent ditch with a pipeline;
 - b. Provide sufficient lined lagoon area at the site to retain the wastewater and to prevent any percolation into the soil;
 - c. Provide lagoon embankments of sufficient height and width to withstand the largest flood on record.
- 4. Prior to construction of any facilities, the plans, specifications, and design calculations must be submitted to the New Mexico Environmental Improvement Agency, Water Quality Division for review and comment.

30,380 feet northwest of lagoon number one. The river valley in which the two stations are located is sufficiently broad and flat to justify the assumption that the grade of water between the two stations is uniform during major floods (6). Thus, flood levels at the lagoons were estimated by multiplying the ratio of 6500 ft./30380 ft. by the difference in level of the flood waters at the two stations (reference Appendix A). The water level of the three lagoons and the level of the embankments of lagoons one and two were determined by surveying their elevations in relation to a USGS bench mark located very near to gaging station No. 3965 on the Highway 82 bridge across the Pecos River (reference Figure 1).

Those years where the USGS recorded elevations approached or exceeded the lagoon embankment elevations are tabulated in Table VIII. Data from gauging station 3965 are available from 1941 to 1965. During these years, the elevation of the river has never exceeded the elevation of lagoon one and two embankments. However, in 1941 and 1955, the river rose to within one foot of the top of the embankments. It is probable that water this near to the top of the lagoons would breach the embankments. The embankments are relatively narrow at the top and it wouldn't take much erosion to breach them.

Lagoon three does not have any embankment to speak of. It is situated much lower than lagoons one and two. Comparison of river elevation data with the elevation of lagoon three shows that the lagoon is flooded routinely.

There were breaks in the first two lagoons due to flooding in 1964 and 1966. The refinery effluent ditch was flooded with runoff water which in turn flooded the lagoons. The Eagle Draw drainage ditch was constructed in 1966 to divert runoff.

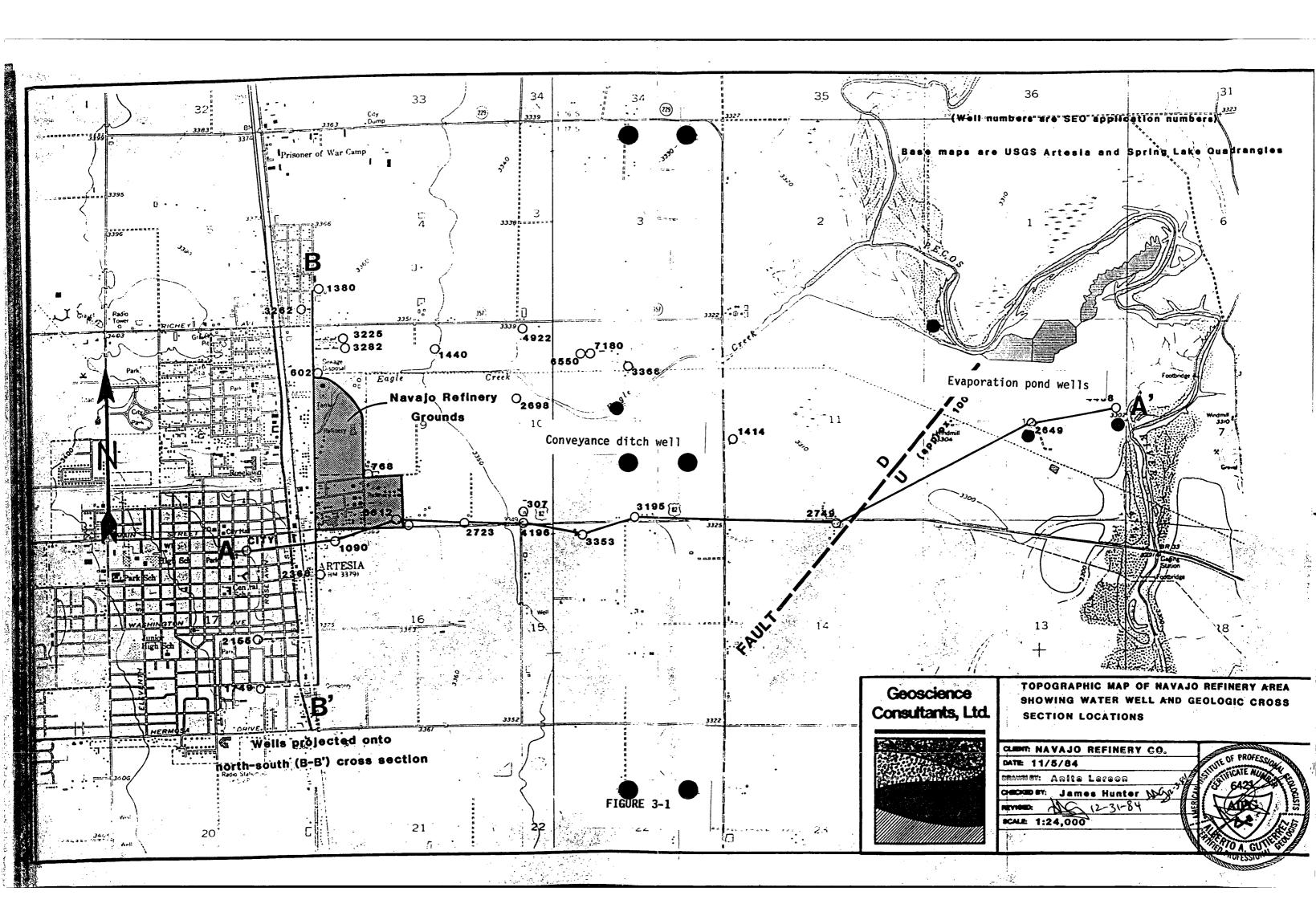
There have been breaks in the system from time to time resulting in spills. The most recent occurred in December, 1972, when untreated refinery effluent flowed through a break in the refinery effluent ditch into an adjacent ditch which was carrying treated domestic sewage to the Pecos River.

The refinery effluent ditch is very susceptible to spills and breaks. The writer walked the entire length of the ditch and took several photos of the ditch (reference Appendix C, photo locations B through K). Several areas were observed where small spills had occurred onto adjoining pasture-land. One of the photos taken at location E illustrates this. Some evidence of spills were also observed at location H. The photo taken at location I shows the concrete and steel consturcted at the site of the December, 1972, spill to prevent any future spills at this location. The photo taken at location K shows a diversion in the ditch which was apparently constructed to bypass a spill problem area.

The spill problem was discussed with a local rancher (8) who owns irrigated land along the last two miles of the ditch. He stated that spills occur routinely along the ditch onto his land. He has complained to the refinery with limited success.

In the writer's opinion, the spills from the ditch will continue to occur until the ditch is eliminated. It should be replaced by a pipeline completely protected from any exfiltration or infiltration.

(B) V. Halderman



1974) The plan is to be implemented not later than one year after the effective date.

Navajo Refinery, because of its history of spills and because of its proximity to the Pecos River, will be required to implement a SPCC plan.

There is a provision in Section 402 of the Act whereby the authority to issue permits can be delegated to the State. The State of New Mexico has drafted Proposed Permit Regulations for the purpose of obtaining the authority to issue permits. The proposed program, if adopted, will require a discharger to comply with all State and Federal laws pertaining to Water Quality and Effluent Standards. Minimum acceptable effluent criteria which permit holders must meet or exceed on a routine basis are given in the proposed regulations. Table X is a comparison of the Navajo effluent parameters of COD, chromium, and suspended solids to equivalent proposed State permit effluent criteria. The Navajo effluent falls short of meeting the proposed regulations.

The State standard definition for water addresses all water situated within the borders of New Mexico both surface or subsurface. Thus, any percolation into the groundwater at the Navajo Refinery would be subject to these regulations.

VI. IMPROVEMENTS TO THE TREATMENT SYSTEM

The preceding sections have served to illustrate the need and the obligation of the owners of Navajo Refinery to improve their wastewater treatment system. The refinery owners are aware of the shortcomings of their system and realize something must be done. The following discussions explore some of the alternatives for improvement.

The refinery personnel have suggested a deep disposal well as a solution to their wastewater problem. It is stated in the Act and the proposed State Regulations that a deep disposal well can only be used to dispose of waters generated in the production of crude oil or gas. Both regulations define a well as a point source. Thus, a disposal well cannot be used to dispose of refinery wastewaters.

Much could be accomplished in improving the Navajo wastewater treatment system if the cooling tower and boiler blowdown water were segregated from the Process water. Boiler blowdown and cooling water amounts to 68 per cent of the entire refinery wastewater flow. Depending on the quality, these waters could Possibly be discharged without further treatment. The separation technique is used routinely throughout the industry.

Another method routinely used is removal and recovery of oil solids from process water by flotation. Tiny air bubbles are introduced into a tank through which the wastewater is continuously fed. As the bubbles rise to the surface, they carry the emulsified oil solids with them to form a scum on the surface. The scum is skimmed off the surface and sent back through the refining process. This process can be very effective. If the cooling tower waters are initially segregated, a correspondingly smaller flotation unit could be used.

The effluent ditch is totally unacceptable. In its present form, it is a very real source of pollution of surface or groundwater through either percolation into the soil or spills. The ditch must be replaced with a lined channel or a pipeline. A force main from the plant to the wastewater treatment area may be the most economical method, especially if the flows are reduced as described earlier.

LITHOLOGIC AND COMPLETION LOGS OF NAVAJO'S MONITORING WELLS

STATE ENGINEER OFFICE

FILLD DUX LIG

WELL RECORD Section 1. GENERAL INFORMATION (A) Owner of well Navajo Refining Co.
Street or Post Office Address P.O. Drawer 159 _ Owner's Well No. _ City and State Artesia, New Mexico Well was drilled under Permit No. M-6143-X-2 and is located in the: a. NW 1/4 NW 1/4 NW 1/4 NW 1/4 of Section 12 Township 175 Range 268 N.M.P.M. ___ of Map No. _____ of the ___ c. Lot No. ____ of Block No. ____ of the_ County. Subdivision, recorded in _____ feet, Y=______feet, N.M. Coordinate System___ . Zone in _ Grant. (B) Drilling Contractor H & W Enterprises License No. WD-675 Address P.O. Box 437 Arteria, New Mexico Drilling Began 6-16-77 Completed 6-16-77 Type tools cable Size of hole 890 in. Elevation of land surface or ______at well is _____ft. Total depth of well ______ft. Completed well is shallow artesian. Depth to water upon completion of well _____ ft. Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet Thickness Estimated Yield --Description of Water-Bearing Formation (gallons per minute) From To N/A Section 3. RECORD OF CASING Depth in Feet Perforations Pounds Threads Diameter Length Type of Shoe (feet) (inches) per foot per in. Тор Bottom From To P/e 20 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Sacks Cubic Feet Method of Placement Diameter of Mud of Coment NIA Section 5. PLUGGING RECORD Plugging Contractor . Address Depth in Feet Cubic Feet No. Plugging Method. Top of Cement Date Well Plugged_ Plugging approved by: 2

FOI Date Received	USE OF STATE ENGINEER ONLY
	Quad FWL FSL
File No. <u>RA-6143-X-2</u>	Use OBS. \$ EXPL. Location No. 17, 26, 12 111113
	Common of the Organization

State Engineer Representative

-			Section 6. LOG OF HOLF
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Section 7. REMARKS AND ADDITIONAL INFORMATION

STATE ENGINEER OFFICE

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

Driller Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted the appropriate district office of the State Engineer. Stions, except Section 5, shall be answered as completely and accurate the spossible when any well is drilled, repaired or deepen. When this form is used as a plugging record, only Section 1(a) and Section 2 need be completed.

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STATE ENGINEER OFFICE WELL RECORD

FIELD ENGR. 100

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					L INFORMATION		#3		-	
(A) Owner o	fwell Nav	raio Reli	n ino Co			Owner's	Well No	;	-	
Street or	Post Office Ad	dress	Drawer 15	9					•	
City and	State	enia, nei	U TIPKITU						•	
					and is located					
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c. Lot N	lo	of Block No.		of	the					
	ivision, recorded							=		
				feet,	, N.M. Coordinate	System		Zone in Grant.	l	
						Lianna No. WZ)-675			
(B) Drilling	Contractor	<u>πα ν τια</u>	<u>equates</u>		<u> </u>	License No <i>WD</i>			•	
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Drilling Began	6-17-7	77 Con	npleted	6 <u>-17</u> -77	Type tools	cable	_ Size of h	ole <u>890</u> in.	gerra n	
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(inches) 89D	per foot	per in.	Depth Top	in Fect Bottom	Length (feet)	Type of Shoe	Fro	m To	23 Sand	
(inches)	per foot	per in.	Depth Top	in Fect Bottom	Length (feet)	Type of Shoe	Fro	m To	23 Sand	
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File No. <u>RA-6/43</u>

Section 6. LOG OF HOLE

Color and Type of Material Encountered

Sand

Depth in Feet

To

From

Thickness

in Feet

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.

Jones Half

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 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 and Section and Section and Section are described by the section of the State Engineer.

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STATE ENGINEER OFFICE WELL RECORD

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(A) Owner of	well <u>Navo</u> Post Office Ad	yo Refini dress	ny Ca.	иел 15	?		Owner	s Well No		
City and	Post Office Ad Stateflate	sia, New	Dexica							
Well was drilled	under Permit	NoM-	6143-X-5	·	and is	located i	n the:			
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b. Tract	No	_ of Map No.	· 	0	(the					
	o vision, recorded									
d. X= the		feet, Y=		fee	et, N.M. Coo	rdinate S	ystem		Zone in Grant.	
(B) Drilling C	Contractor	4 & W Ente	rprises				License No /	B-675		
Address P.O.	Box 437	Ant	esia, Ne	n Mexic	σ			·		
Drilling Began	6-18-7	2 Com	pleted <u>6</u>	18-77	Z Type	tools 🌊	able	Size of he	ole <u>890</u> in.	
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-		Sec	tion 2. PRIN	CIPAL W	ATER-BEAL	RING ST	RATA			Th
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Plugging appro					ı	2				1
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			FOR USE	OF STA	TE ENGINE	ER ONL	Y			a
Date Received	I				Quad		FWL _		FSL	_
File No	Rd. 611	<u> </u>			,		Location No.			-

STATE ENGINEER OFFICE WELL RECORD Section 1. GENERAL INFORMATION (A) Owner of well Navajo Refining (o. Street or Post Office Address Drawer 159 City and State Interview New Mexico Well was drilled under Permit No. Niew Mexico Well was drilled under Permit No. Niew Mexico	
d. X= feet, Y= feet, N.M. Coordinate System Zone in the Grant.	.:
(B) Drilling Contractor	Dopth
Depth in Feet Thickness in Feet Description of Water-Bearing Formation Estimated Yield (gallons per minute)	Dop/4 0-2251 22 Sect Sond
Section 3. RECORD OF CASING Diameter (inches) Pounds per foot Perforations	
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet	
Section 5. PLUGGING RECORD Plugging Contractor Address Plugging Method Date Well Plugged No. Depth in Feet Cubic Feet Top Bottom of Cement	

FOR USE OF STATE ENGINEER ONLY

State Engineer Representative

Date Received

RA- KN3-4-7

STATE ENGINEER OFFICE WELL RECORD

FIELD ENGR. LOS

	N	- · . D . P : -			AL INFOR		_	#9	_	
(A) Owner of	Post Office A	dana Dao	urg [o.				Owr	ner's Well N	¥o	
City and	StateAnt	esia, Neu	Mexico							
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b. Tract	No.	of Map N	0		of the					
c. Lot N Subdi	o	of Block No. din		·	of the County					
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(B) Drilling (Contractor		squares				_ License No			
Address	.0. Box 4	37 Ar	<u>tesia. Ne</u>	o Mexic	<u>o</u>					
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(inches)	per foot	per in. <i>P/Ε</i>	Depth Top	Botto	L L	ength (feet)	P/E	100		
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(inches) 890 -	per foot	per in. <i>P/Ε</i>	Depth Top 2 tion 4. RECO	Botto 21 RD OF M ks	L L	ength (feet) 23 AND CEME	P/E	noe	From 3	T
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Section 6. LOG OF HOLE

			Section 6. LOG OF HOLE
Depth From	in Feet To	Thickness in Feet	Color and Type of Material Encountered
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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 and correspond 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 2 need be completed.

0-19 19 Sand

STATE ENGINEER OFFICE WELL RECORD

הצנט באנות נסס

					AL INFOR			# 12	
A) Owner of	well Navag	o Kefiri	ra (0.				Ow	ner's Well No.	
Street or P	Post Office Ad	idress <u>urai</u> esia. New	Mexico		·- · · · · · · · · · · · · · · · · · ·				
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Well was drilled								265	
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c. Lot No). <u>‡</u>	of Block No.		۰	f the				_
	₹								=
		_ feet, Y=		fee	t, N.M. Co	ordinate S	ystem		
•••								UE :	_ (
(B) Drilling Co	ontractor	H & W Ent	erprises			-	_ License No	-675 •	
Address P.O.	Box 437	A	stesia, Ne	w Mexic	0				
Drilling Began	6-22-7	7 Cor	npleted <u>6-</u>	<u> 22-77</u>	Турс	tools	cable	Size of	hole <u>890</u>
Elevation of land									•
Elevation of land	u surlace or _			8	. WEH 15		it. i otal dep	us or well	•.7
Completed well	is 🗆 sl	hallow 🗆	artesian.		Depth	to water	upon completi	on of well	0
		c.	ection 2. PRIN	Clbvi m	ATFR.DF.	RINC CT	RATA		
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		Sec	tion 4. RECO	RD OF MU	UDDING A	ND CEM	ENTING		
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			Section	on 5. PLUC	GGING REG	CORD			
Plugging Contra	ictor								
Address						N-	Depth	n Feet	Cubic Fe
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Plugging Method Date Well Plugg Plugging approv	red by:					3			+
Date Well Plugg	red by:	<u> </u>	noine P	a= *c * '					
Date Well Plugg	red by:	State E	ngineer Repres	entative		_4			
Date Well Plugg Plugging approv		State E			E ENGINE	4	·		
Date Well Plugg	red by:	State E		OF STAT		4 ER ONL	/ FWL		

			Section 6, LOG OF HOLE
Depth	in Feet	Thickness in Feet	Color and Type of Material Encountered
From	То	m reet	,
	19	19	Sand
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Section 7. REMARKS AND ADDITIONAL INFORMATION TATE ENGINEER OFFICE

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.

in Chymr

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted the appropriate district office of the State Engineer. ctions, except Section 5, shall be answered as completely and accur. s possible when any well is drilled, repaired or deepe. When this form is used as a plugging record, only Section 1(a) and Section 2 need be completed.

STATE ENGINEER OFFICE WELL RECORD

Fifty Ca

A) Owner of	well Navay	io Refini dress	rg (o. rawer 159			Owne	r's Well No					
	Post Office Ad State											
					_ and is located		•	_				
					-	<i>175</i> Rai	-					
Subdiv	rision, recor de d €	i in		c	ounty.			æ.				
		_ feet, Y =		feet, N.	M. Coordinate	System			Zone in Grant.			
B) Drilling C	ontractor <u>H</u>	& W Ente	nprises_	 	 	License No	WD-675					
ddress P.	O. Box 43	7	Antenia,	New Mexic	a		•					
rilling Began	6-23-77	Com	pleted <u>6</u> .	<u> 23 - 77</u>	_ Type tools	cable	Size o	f hole_	897) in.			
ilevation of lan	id surface or			at we	1 is	ft. Total depth	of well	21	ft:			
ompleted well	is 🗆 st	nallow 🗆	artesian.		Depth to water	upon completion	of well	0	ft.	0-21	21	•
			ction 2. PKIN	CIPAL WATE	R-BEARING ST	RATA		mated		i		
Depth i	To	Thicknes in Feet	3 1	Description of '	Water-Bearing F	ormation			ninute)			
			_									
				N	<u>IA</u>							
		·						·				
				4								
Diameter	Pounds	Threads		n 3. RECORD in Feet	Length	Type of Sho		Perfo	rations			
(inches)	per foot	per in.	Тор	Bottom	(feet)		F	rom	То			
890	4	1 7/8		21	23	P/E		3	20	· 		
	·	.								!		
		<u> </u>		<u> </u>					Ĺ	•		
Depth	in Feet	Sect Hole	tion 4. RECO		ING AND CEM		ad of Pi-					
From	То	Diameter	of M	ud of	Cement	Metho	od of Place	ment				
								- -		, •		
	Ā		 		IA.							
	<u>-</u>	<u></u>					···					
			Section	n 5. PLUGGIN	G RECORD							
Plugging Contro	actor				No.	Depth in	Feet		bic Feet	1		
Plugging Contro							Bottom	i of	Cement			
	od					Тор		+	Content			
Address Plugging Metho	od					100						

Section 6. LOG OF HOLE

		T	Section 6.	LOG OF HOLE	***************************************			
	in Feet	Thickness		Color and Type of M	aterial Enc	ountered		
From	То	in Feet						
0	21	21	Sand					•
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	'	Santina *	7 DEMARKS AND	ADDITIONAL INFORMA	THOUSE	<u>,</u>		
		ection (REMAKKS AND	ADDITIONAL INFORM	E =	ω	*	
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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 Driller

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J

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

Revised June 1972 FIELD ENGR. LDG

STATE ENGINEER OFFICE WELL RECORD

Section 1. GENERAL INFORMATION

Well was drilled	_					d in the:	<u></u>		
							26.5		
					-	<u>175</u> Range		N.M.	
	*								
		of Block No I in							
					-	: System		_	
the								Gi	
(B) Drilling C	ontractor	Cly	de Tidwel	1		License No	WD-406	•	
Address		х 17, Rai	ite 1. Ar	tesia. N	ew Mexico	88210			
Drilling Began	3/21/81	Comp	oleted3/	29/81	_ Type tools _	Cable	_ Size of hole.	8	
						ft. Total depth of			
		nallow 🗆 a				-			
Completed well	اء ل ک ا دا				·	r upon completion of	well	Ц	
Depth 1	n Feet	Sec Thickness	tion 2. PRINC				Estimated	Yield	
From	То	in Feet	D	escription of	Water-Bearing	Formation	(gallons per		
10	25	15	Re	d Sand			NA	NA	
28	35	. 7	Gr	ay Sand	•		NA		
<u> </u>			Section	3. RECORD	OF CASING				
Diameter	Pounds	Threads	Depth is		Length	Type of Shoe	Perf	orations	
(inches)	per foot	per in.	Тор	Bottom	(feet)		From To		
8 5/8	28		0	60	60	Texas Patter	n NA		
						<u> </u>			
		Secti	on 4. RECOR	D OF MUDD	ING AND CE	MENTING			
Depth From	n Feet To	Hole Diameter	Sacks of Mu		bic Feet Cement	Method	of Placement	,	
								<u> </u>	
									
	· •		<u> </u>						
<u> </u>	· · · · · ·	_							
			Section	5. PLUGGIN	G RECORD				
Plugging Contra						Depth in Fe	·· T-	ubic Fee	
Plugging Metho	d				No.			f Cemen	
Date Well Plugg Plugging approv		,			$-\frac{1}{2}$				
DON'S TREE		State Eno	incer Represer	- itative	3				
		State Life	*		4				
Date Received	April 6	1981	FOR USE C	F STATE EN	GINEER ON	LY			
				Ouad		FWL	re		

Revised June 1972 FIELD ENGS. LOG

STATE ENGINEER OFFICE WELL RECORD

Section 1. GENERAL INFORMATION

		dressAr	·							····	
		NoRA_		•			•				
a. <u>Slil</u>	% <u>SE</u> %	<u>NE % N</u>	<u>lul_</u> ¼ of Se	ctionL	2 Towns	hip_	17 S R	ange	26 F	N.M.P.M	
										*	
c. Lot No Subdiv	ision, recorded	of Block No		of	the		<u> </u>				
		•					System			Zone ir Grant	
Drilling C	ontractor	Clyc	le Tidwe	11			License No	<u> </u>	406		
		••		-			88210				
							Cable				
vation of lan	id surface 🗱			at	well is 33	n 7	ft. Total dep	th of well	ı£	Π ft	
npleted well		hallow 🖂 a					r upon completic				
	-				TER-BEARI						
Depth		Thickness in Feet			of Water-Bea				Estimated	Yield minute)	
From 10	<u>To</u> 25	15		ed Sand			•	- '46	NA	mmate,	
28	35	. 7						 	NA:		
- 20				ray San	<u>u</u>				IVA	<u> </u>	
		1						- 			
		<u> 1</u>		1 DECC	PD 05 646			<u> </u>	· · · · · · · · · · · · · · · · · · ·		
Diameter	Pounds	Threads		in Feet	RD OF CASI		Type of Si		Perf	orations	
(inches)	per foot	per in.	Тор	Bottom	n (fee	t)	Type of Si	106	From	То	
8 5/8_	28		0	60	60		Texas Pat	tern	NA		
				 						 	
				<u></u>		<u> </u>				<u> </u>	
th	in Feet				DDING AND		MENTING				
From	in Feet To	Hole Diameter		Sacks Cubic Fe of Mud of Ceme					of Placement		
	•				Œ	١,	-	() 1920 F			
							- STILL PROPERTY	ر مسمد الم			
		· ·	 			+	MAR 08	<u>985</u>			
	l	<u>. L </u>	<u> </u>			4	Line Co.	אום אכ	S.CN		
egging Coate	actor		Secti	on 5. PLUG	GING RECO	RB ^{IL}	SANTA		:		
dress						No.	Depth			ubic Feet	
igging Metho te Well Plug						1	Top	Botto	om (of Cement	
gging appro	ved by:					2					
		State Eng	incer Repre	sentative		3					
	April 6	5, 1981	FOR USI	E OF STATI	E ENGINEE					1	
te Received	14.17.1										
te Received		5-E					Location No. 1		FS		

Section 6. LOG OF HOLE

Depth in Feet Thickness Thickness To 16	٠, مو	<u> </u>		Section 6, LOG OF HOLE
0 25 25 Fine red sand 25 28 3 8lue-gray clay 28 35 7 Fine gray sand 35 46 11 Coarse gravel 46 60 14 med to fine gravelly sand			Thickness in Feet	Color and Type of Material Encountered
28			25	Fine red sand
35 46 11 Coarse gravel 46 60 14 med to fine gravelly sand	25	28	3	8lue-gray clay
35 46 11 Coarse gravel 46 60 14 med to fine gravelly sand	. 28	35	7	Fine gray sand
	35	46	11	Coarse gravel
	46	60 .	14	med to fine gravelly sand
	•			·
		-		
			4. 3.	
				·
			,	

Section 7. REMARKS AND ADDITIONAL INFORMATION

MAR 06 1935

OIL DUNG WATTON DIVISION
SANTA FE

*81 APR 6 AH 8 03
STATE ENGINEER OFFICE
ROSWEFFENDM.

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.

o lyle J. Julier
Driller

INSTRUCTIONS: This for ould be executed in triplicate, preferably typewritten, and submitted troof the State Engineer. All ons, e ot Section 5, shall be answered as complete od accurate drilled, repaired or deepened. When the im is used as a plugging record, only Section 1,2, and Sectic

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

STATE ENGINEER OFFICE

FIFTH ENGR LING

WELL RECORD	٠
Section 1. GENERAL INFORMATI	ON

Street or	well Post Office Ad State	dress	Box_	159	ANY ca 88210		ner's Well N	o. <u>17</u>				
					and is located	d in the:						
a. <u>SF</u>	_ ¼ _NE ¼	NE % I	اللا ¼ of Se	ction	17 Township_	<u>17 S</u> R	ange	6 E	_N.M.P.M.			
	-				f the							
	ovision, recorded				f the County.			=				
					t, N.M. Coordinate	System			Zone in Grant.			
B) Drilling C	ontractor	Clyde	Tiduell			License No	WD-406					
		•			, New Mexico							
Ŧ -					Type tools _							
					t well is 3305					Ó	-28	
ompleted well	lis 🔀 s≀				Depth to wate		on of well _	- 10	ft.			
Depth	in Feet	Se Thicknes	s		ATER-BEARING S	•	Es	timated Y	ield	28	-30	c
From	То	in Feet			of Water-Bearing	Formation	(gall	ons per m				
10	28	18		led san			-	NA				
	· ·						-			*	Fine	red s
		1	-								$\overline{\Omega}$	0.
		1	Section	on 3. RECC	ORD OF CASING						Fine	L'lay
Diameter (inches)	Pounds per foot	Threads per in.	Depth	in Feet Botton	Length	Type of Si	10e	Perfora	ations To			1
8 5/8	28	P	Тор	30	30	Texas Pat	i	From NA	10			U
											·	
										İ		
D	in East				JDDING AND CEN	MENTING		<u></u>		ļ		
Depth in Feet From To		Hole Diameter	Sac of M		Cubic Feet of Cement	Met	hod of Plac	ement _	_,			
								-				
		•	Section	on S. PLUC	GING RECORD					•		
	actor											
ddress	od bo				No.	Depth i	n Feet Bottom		bic Feet Cement			
lugging metho	=		 -		1 2							
Date Well Plug	ved hv:				$\frac{1}{3}$	 						
Plugging Metho Date Well Plug Plugging appro	ved by:	State En	gineer Repres	entative	4	+						

			Section 6. LOG OF HOLE
Depth From	in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	28	28	Fine red sand
28	30	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.

ions, except Section 5, shall be answered as completely and accurat

When this form is used as a plussing record column form. INSTRUCTIONS: This fo of the State Engineer. A. drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section

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ed be completed.

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EIELD ENGR. LOG

Sirect of Post Office Address Box 159 Artesia, N M 68210	A) Owner of	well	NAVAJO R	EFINING COMP	ANY		Owne	er's Well No.	18	
Section 3. RECORD OF CASING Depth in Feet From To Depth in Feet Description of Water-Bearing Formation Top Section 3. RECORD OF CASING Depth in Feet Description of Water-Bearing Formation Top South Top Top South Top Top South Top	City and	State	Ar	tesia, N M	88210					
b. Tract Noof Block No							n the: Obse	ervation,	/Monito	or t
c. Lot No						-		•		
Subdivision, recorded in	b. Tract !	No	_ of Map No.		of the					
the feet, Y= feet, N.M. Coordinate System	c. Lot No	o	of Block No	· · · ·	of the					
the Bo Drilling Contractor Hughes Orilling Company License No. 100 749 Box 199A, Route 1, Artesia, N M 88210 ralling Began 6/8/82 Completed 6/8/82 Type tools 1r rotary Sue of hole 7- 7/8 levation of land surface or casing at well is 3364 ft. Total depth of well 19 ompleted well is		•							- -	
Box 199A, Route 1, Artesia, N M 88210 Pruling Began 6/8/82 Completed 6/8/82 Type tools Air rotary Size of hole 7- 7/8 (and the property of land surface or Casing at well is 3354 ft. Total depth of well 19 (and surface or 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet			feet, Y=		feet, N.M. Coord	dinate S	ystem			
Section 3. RECORD OF CASING Depth in Feet Depth in Feet Type of Shoe Perforations From To Top Bottom Top Bottom Top Bottom Top Depth in Feet Top Bottom Top Bottom Top Bottom Top Depth in Feet Top Bottom Top	· -		_							
Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet Description of Water-Bearing Formation Estimated Yield (gallons per minute)	ddress		Box 199A	, Route 1, A	rtesia, N	M 88	3210			
Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet Thickness in Feet Name 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 Performance (feet) Top Bottom (Geet) Top Inameter of Mud of Cement Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Sacks Of Mud of Cement Of Mud of Cement Of Mud of Cement On Mud of Cement On Muddress Section 5. PLUGGING RECORD No. Depth in Feet Cubic Feet Of Cement Of Cement Of Cement On Mud of Cement On Mud of Cement On Muddress Top Bottom (Geet) Top Bottom of Cement On Mud of Ceme	ordling Began .	6/8/82	Comp	leted <u>6/8</u> /82	Type to	ools Air	rotary	Size of	hole <u>7-</u>	7/8
Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet Thickness in Feet Thickness in Feet Description of Water-Bearing Formation Estimated Yield (gallons per minute)	levation of lar	nd surface or	_casing		_ at well is	3364	ft. Total depth	of well	19	
Section 2. PRINCIPAL WATER-BEARING STRATA Depth in Feet	ompleted well	lie (VT) sh	allow 🗀 ar	tecian	Denth to	n water i	inon completion	n of well	10	
Depth in Feet Thickness in Feet Description of Water-Bearing Formation Estimated Yield (gallons per minute)	Ompleted wen	الد نيمب دين								
Section 3. RECORD OF CASING	Depth	ın Feet		T1			- ·	Estin	ated Yiel	d
Section 3. RECORD OF CASING Diameter Pounds per foot per in. Top Bottom (feet) Type of Shoe From To 6 PUC 20 15 19 Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Diameter of Mud of Cement of C			ın Feet					(gallon	per minu	
Diameter (inches) Pounds (per foot Per foot Top Bottom Cleent Type of Shoe Perforations From To Top Bottom Cleent Top Section Top	16	19	3	fine anh	ydritic sa	and ar	nd red sha	le	NA	
Diameter (inches) Pounds (inches) Per foot Per foot Top Bottom (feet) Type of Shoe Perforations From To To To To To To To										
Diameter (inches) Pounds (per foot Per foot Top Bottom Cleent Type of Shoe Perforations From To Top Bottom Cleent Top Section Top								 	···-	
Diameter (inches) Pounds (per foot Per foot Top Bottom Cleent Type of Shoe Perforations From To Top Bottom Cleent Top Section Top		ŀ								
Diameter (inches) Pounds (inches) Pounds (inches) Per foot Top Bottom (feet) Type of Shoe Perforations From To						•		 		
Diameter (inches) Pounds (inches) Pounds (inches) Per foot Top Bottom (feet) Type of Shoe Perforations From To										
Diameter (inches) Pounds (inches) Per foot Per foot Top Bottom (feet) Type of Shoe Perforations From To To To To To To To				Section 3. RE	CORD OF CAS	ING				
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Diameter of Mud of Cement Method of Placement Of Cement Method of Placement Of Cement Method of Placement Of Cement Method of Placement Of Cement Method of Placement Of Cement Method of Placement Of Cement Method of Placement Of Cement Method of Placement Of Cement Method of Placement Of Cement Method Of Cement Meth	Diameter	Pounds	Threads				Type of Sh	04	Perforation	ns
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet Hole Diameter of Mud of Cement Method of Placement Address Section 5. PLUGGING RECORD Plugging Contractor Address No. Depth in Feet Cubic Feet Address No. Depth in Feet Cubic Feet Address No. Depth in Feet Of Cement No. Depth in Feet Of Cement No. Depth in Feet Of Cement No. Depth in Feet No.	(inches)	per foot	регіл.	Top Bot	tom (fee	et)	1,700 01 311	Fr	om	То
Section 4. RECORD OF MUDDING AND CEMENTING Depth in Feet	6	PVC			20	נ	· · · · · · · · · · · · · · · · · · ·		15	19
Depth in Feet Hole Diameter of Mud of Cement Method of Placement Address Of Mud Of Cement No. Depth in Feet Cubic Feet Of Mud Of Cement No. Depth in Feet Cubic Feet Of Mud Of Cement No. Depth in Feet Of Cement No. Depth in Fee							·			
Depth in Feet Hole Diameter of Mud of Cement Method of Placement Address Of Mud Of Cement No. Depth in Feet Cubic Feet Of Mud Of Cement No. Depth in Feet Cubic Feet Of Mud Of Cement No. Depth in Feet Of Cement No. Depth in Fee										
From To Diameter of Mud of Cement Method of Placement O 12	Denth	in Feet		r						
Section 5. PLUGGING RECORD Plugging Contractor Address Plugging Method Date Well Plugged Plugging approved by: State Ferral Plugging approved by: State Ferral Plugging Agency							Meth	od of Placem	ient 💂	
Section 5. PLUGGING RECORD Plugging Contractor Address Plugging Method Date Well Plugged Plugging approved by: Section 5. PLUGGING RECORD No. Depth in Feet Cubic Feet Top Bottom of Cement 1 2 3	0				3		hand		-	
Plugging Contractor Address No. Depth in Feet Cubic Feet Top Bottom of Cement Plugging Approved by: 2 3		1								
Plugging Contractor Address No. Depth in Feet Cubic Feet Top Bottom of Cement Plugging Approved by: 2 3		-								
Plugging Contractor Address No. Depth in Feet Cubic Feet Top Bottom of Cement Plugging Approved by: Contractor				Section 5 PI	UGGING RECO	ORD		· · ·		
Plugging Method		actor								
Date Well Plugged.		od				No.				
State Factor Page 3	Date Well Plug	ged						200011		
Canas Engineer December 1	Plugging appro	ved by:			·					
			State Engi	neer Representative	:					
FOR USE OF STATE ENGINEER ONLY										

			Section 6. LOG OF HOLE
	in Feet	Thickness in Feet	Color and Type of Material Encountered
From	To 2	2	Red soil
	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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		· · · · · · · · · · · · · · · · · · ·	
			<u>.</u>

Section 7. REMARKS AND ADDITIONAL INFORMATION

observation/monitoring well

STATE OF MARIE

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.

Highes

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

STATE ENGINEER OFFICE

WELL RECORD

EIELD ENGR. LOG

City and S	Post Office Ad State	aressAr	tesia,	N_M	88210				
Well was drilled	under Permit	NoR	A 6970		and is loca	ted in the: Obser	vation/M	ionito	r
a. <u>NE</u>	_5:SE_ 1/4	<u>NE</u> ¼	¼ of Se	ction 8	Township	_ <u>175</u> R	ange <u>26 E</u>		N.M.P
b. Tract ?	No	_ of Map No.		of	the				
c. Lot No	o	of Block No		of	the				
Subdiv	ision, recorded	1 in			_ County.			-	
d. X=		_ feet, Y=	_	feet,	, N.M. Coordina	ite System			Zone
(B) Drilling C	ontractor	Hugh	es Drill	ing Com	рапу	License No	<u>WD 749</u>		
Address		Route	1, 8ox 1	.99A, Ar	tesia, N	n 88210			
						Air Rotary	Size of	f hole	7/8
Elevation of lan	d surface or _	casi	ng	at	well is 3367	ft. Total dep	th of well	19	
Completed well	ie DT e)	allow 🗀 s	ertecian		Denth to w	ater upon completic	on of well	10	
Completed well	. 15 - 22 51						on or wen		
Depth i	in Feet	Sec Thickness			TER-BEARING		Esti	mated \	ield /
From	То	in Feet			of Water-Bearir		(gallor	ns per n	
15	18	3	fir	e anhyd	ritic san	d and shale	NA		
			_						
			Section	n 3. RECOI	RD OF CASING		 .		
Diameter	Pounds	Threads		in Feet	Length	Type of S	hoe	Perfor	
(inches)	per foot	per in.	Тор	Bottom	(feet)		F	tom	To_
6	PVC				20			15	19
		Secti	on 4. RECO	RD OF MUI	DDING AND C	EMENTING			
Depth	in Feet To	Hole Diameter	Sac of M	ks	Cubic Feet of Cement		hod of Place	ment _	
From	12	Diameter			3	hand			
<u> </u>	12 =	-	+						
	Ä	-	ļ		· · · · · · · · · · · · · · · · · · ·				
			e	6 DI UCA	CINC DECOR				
Plugging Contra	actor			JN 3. FLOCK	GING RECORE	, .			
Address					No	Depth i	n Feet	Cu	bic Feet
Plugging Metho Date Well Plugg						Тор	Bottom	of	Cement
Date well Finish									
Plugging approv		State Fno	incer Repres	entative				1	
		Diate Ling							
		State Chi			4				
	June 22.				ENGINEER O	NLY			

			Section 6. LOG OF HOLE
Depth i	in Feet To	Thickness in Feet	Color and Type of Material Encountered
D	3 1	3 1	gravel
	6	21/2	brown soil
	9	3	дур
	18	9	gray clay & gyp
	19	1	Red clay
	-		
	-		
	-		
	·		

Section 7. REMARKS AND ADDITIONAL INFORMATION

re:	20.	observation/monitor well
<u> 1</u>	==	
-=:	60	
- =;	ဘ	
75.5	Jun 72	

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. All the control of the State Engineer. All the control of the State Engineer is considered as completely and accurate the control of the State Engineer. drilled, repaired or deepent hen this form is used as a plugging record, only Section 1(a) and Section select be completed.

FIELD ENGR. LOG

Section 6, LOG OF HOLF

	in Feet	Thickness	Color and Type of Material Encountered
From	То	in Feet	
	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
			•
			

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.

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

ed be completed.

			Section 1. GEN	ERAL INF	ORMATION		Ele	LD EN	GR. LU
A) Owner of	f well	LAVAN	REFINING C	OMPANY		Ow	ner's Well l	No21	
Street or	Post Office Ad	ldressA:	Box 15	882:	10.				
•								_ /	
		(U)	RA 6971						
aNE	_ ¼ <u>_Nul ¼</u>	<u>-se </u>	¼ of Section_	9	. Township	17_5 R	Range	26 E	N.M.P.
b. Tract	No	of Map No:		_ of the _				· · ·	
						· .			
				•				-	
		_ feet, Y=			. Coordinate S			<u> </u>	Zone Gran
		Hunt	nes_Drilling	Comes	1v	Lianna Na	feti		
			L. Box 199A.						
Filling Began	6/11/	82 Comp	leted <u>6/11/</u>	<u>′82</u> 1	Type tools Ai	r rotary	Size	of hole_7	7/8
levation of la	nd surface or _	casing		at well is	s 3362	_ ft. Total dep	th of well_	33	
ompleted wel	lis ⊠ si	hallow 🔲 a	rtesian.	De	epth to water	upon completi	on of well.	7	
		Sect	ion 2. PRINCIPAL	WATER-	BEARING ST	RATA			
	in Feet	Thickness in Feet	Descrip	ption of Wa	iter-Bearing F	ormation		stimated \	
From	To	4	Fina						
16	20	4	i ine g	ray and	iyori ti c	sand & sh	are	NA .	
		ļ			· -				
· · · · · · · · · · · · · · · · · · ·		-							
									
			Section 3. R	ECORD O	F CASING				
Diameter (inches)	Pounds per foot	Threads per in.	Depth in Fee	ottom	Length (feet)	Type of S	hoe	Perfor From	ations To
6	PVC				33			29	33
							- +		
	<u> </u>								
Depth	ın Feet	Section Hole	on 4. RECORD OF		G AND CEM			·	
From	То	Diameter	of Mud		ement	Met	hod of Pla	cement	·
	12				3	hand		-	
12	33					gravel	pack		
		-							
									
No anima Cart			Section 5. P	LUGGING	RECORD				
Address					No.	Depth	in Feet	Cu	bic Feet
lugging Metho Date Well Plug	od ged				_ · No.	Тор	Botton	of	Cement
lugging appro	-				2				
		State Eng	ineer Representativ	/e	4				
			FOR USE OF ST	TATE ENG	INEER ONL	<u> — — </u>			
ate Received	June 22,	1982		0		Emilio La		Eer	
TO No.	RA-6971	1302	••	Quad Monito		FWL		FSL.	

Section 6, LOG OF HOLF

Depth i	n Feet	Thickness	Color and Type of Material Encountered
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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			•
, f.			

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.

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 hossible when any well is drilled, repaired or deepent en this form is used as a plugging record, only Section 1(a) and Section . Led be completed.

ř

EIELD ENGR. LUG

				feet, N.M.		ystem		Zone
B) Drilling	Contractor	S. Dale	Hughes		,	_ License No. <u>WD</u>		
Address	Rout	e 1. Box	19 9 A. Artes	sia. NM	88210			
Drilling Began	June l	4. !82comp	leted June 1	<u>4. 18</u> 2r _{>}	pe tools	Air Rotary s	Size of hole_	7 7/8
Elevation of la	nd surface or _			_ at well is_	3359	_ ft. Total depth of w	ell 19	
Completed we	llis 🍱 sh	nallow 🔲 as	rtesian. Monit	or Dep	th to water	upon completion of w	ell <u>5</u>	
		Sect	ion 2. PRINCIPAL	.WATER-BE	EARING ST	RATA		
	in Feet	Thickness in Feet	Descrip	tion of Wate	er-Bearing F	ormation	Estimated (gallons per i	
From 16	18	2	дур заг	ıd			па	
				 ·			 .	
			,					
	<u> </u>	<u> </u>						
			Section 3. R	ECORD OF	CASING			
Diameter (inches)	Pounds per foot	Threads	Depth in Fee	tom	Length (feet)	Type of Shoe	Perfo From	rations To
6	-				20		16	20
							 	
	1	1	į .			· · · · · · · · · · · · · · · · · · ·	 	
		 -					1	
				•			<u> </u>	<u> </u>
		Section	on 4. RECORD OF	MUDDING	AND CEMI	ENTING		<u></u>
Depth	in Feet	Hole	on 4. RECORD OF	Cubic	Feet		Placement	,
Depth From	in Feet To		1		Feet		Placement	
		Hole	Sacks	Cubic	Feet ment	Method of		
From	To 4 =	Hole Diameter	Sacks	Cubic of Ce	Feet ment	Method of		
From	To 4 =	Hole Diameter	Sacks	Cubic of Ce	Feet ment	Method of		,
From	To 4 =	Hole Diameter	Sacks	Cubic of Ce	Feet ment	Method of		
From	To 4 =	Hole Diameter	Sacks of Mud	Cubic of Ce	Feet	Method of		
From O	14 =	Hole Diameter	Sacks of Mud	Cubic of Ce	Feet ment	Method of		
From O	To 4 =	Hole Diameter	Sacks of Mud	Cubic of Ce	Feet ment RECORD	Method of		
From O Plugging Cont Address — Plugging Meth	To 4 5 Fractor	Hole Diameter	Sacks of Mud	Cubic of Ce	RECORD No.	Method of	C.	abic Feet
From O Plugging Cont Address Plugging Meth Date Well Plu	To 4 =	Hole Diameter	Sacks of Mud	Cubic of Ce	RECORD No.	Method of hand	C.	abic Feet
From O Plugging Cont Address — Plugging Meth	To 4 =	Hole Diameter B	Sacks of Mud	Cubic of Ce	RECORD No.	Method of hand	C.	ubic Feet

	Section 6. LOG OF HOLE							
Depth From	in Feet To	Thickness in Feet	Color and Type of Material Encountered					
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					
			·					
			·					
		•						
			·					
			·					
• ;			·					
		2	• [
			i .					

Section 7. REMARKS AND ADDITIONAL INFORMATION

So, thrice of strong grant and the strong grant and

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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.

Note Hugher

INSTRUCTIONS: This for of the State Engineer. All district of the State Engineer. All 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

-			tesia, N M						
ell was drilled	d under Permit	No. RA	6975 X		and is located	in the:			
a. <u>NE</u>	_ ¼ <u>_ NIIL</u> ¼	_Nbl_ ¼ _SI	ı∟ ¼ of Sectio	n <u>9</u>	_ Township	17 5 Ran	ige <u>26 F</u>	·N	N.M.P
b. Tract	No	_ of Map No.		of the _					
	_								
Subdi	vision, recorded	l in		. Co	unty.			-	
		feet, Y=		feet, N.M	. Coordinate !	System			Zone Gra
B) Drilling (Contractor	S. Dale	Hughes			License No	<u> </u>		
ddress	Rou	te 1. Box	199 A. A	rtesia.	N M 882	10			
Ordling Began	6/28/82	Comp	leted <u>6/28</u>	/82	Type tools	Air Rotary	Size of h	ole _7	7/8
levation of la	nd surface or			at well :	is 3363	_ ft. Total depth	of well	20	
	T3 a		tesian, Moni	+an n	anth to water	upon completion	of well		
ompieted wel	lis ∟xa sn	iallow 🗀 ai	tesian. Piulit	tor D	epin to water	upon completion	or well		
Denth	in Feet	Sect Thickness	ion 2. PRINCIP	AL WATER-	BEARING ST	RATA	Esti-	ated Yiel	d
From	To	in Feet	Desc	cription of W	ater-Bearing F	ormation		per minu	
15	17	2	Anhyr	itic san	d			na	
					-				
						•			
							L		
				RECORD O	F CASING				
Diameter (inches)	Pounds per foot	Threads per in.	Depth in F	Bottom	Length (feet)	Type of Sho	e Fro	Perforatio	To
6	PVC				20			5	20
					· · · ·				
	:				-				
	<u> </u>								
Denth	in Feet	Section Hole	Sacks		IG AND CEM				
From	То	Diameter	of Mud		Cement	Metho	od of Placeme	ent 😎	
0	7 =	8			3	Hand		-	
	غ ف						-		
									
	<u> </u>	<u> </u>							
				n. uconic					
			Section 3	. PLUGGING	KECOKD				
						Depth in	Feet	Cubic	F4
lugging Contr					No.	Тор	Bottom	of Cer	
Address	od bo			·	<u> </u>				
Address lugging Metho Date Well Plug	ged								
Address	ged				2				
Address lugging Metho Date Well Plug	ged		neer Representa	itive .					
Address lugging Metho Date Well Plug	ged		neer Representa		3 4	V			

Section 6, LOG OF HOLE

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

Driller

INSTRUCTIONS: This for—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 deepene. When this form is used as a plugging record, only Section 1(a) and Section need be completed.



A) Owner of	f well	NAVAJD F	REFINING	COMPAN	VY		0	wner's Wel	l No	24
Street or	Post Office Ad	dress	werd N ei	<u>∍r 159</u> m	9.6	3210				
								-		
Vell was drilled	under Permit	No	<u>RA 1</u>	5975_X_2	2 and i	s located i	in the:			
a. <u> </u>	_ ¼ <u>_SW</u> ¼	-SIII - ¼ NIII	¼ of Se	ction9	Tov	vnship	17.5	Range	26 E	N.M.P
b. Tract	No	of Map No		of	the					
	-	of Block No								
		in ni t								=
d. X=	•	_ feet, Y=		feet,	N.M. Coo	ordinate S	ystem			Zone
the										_ = Gra
B) Drilling (Contractor	S. Oale	Hughes				_ License No). <u>WD</u>	749	
Address		loute 1, Bo	x 199A	, Artes	sia, M	U M 88	3210			
rilling Regan	7/5/82	Comple	eted 7/	5/82	Type	toolsAi	r rotary	Si	ize of hol	. 8
levation of la	nd surface or			at	well is	2002	ft. Total de	epth of we	ш	
ompleted wel	li s sl	nallow 🗆 art	esian.		Depth	to water	upon comple	tion of we	11	88
		Section	on 2. PRIN	CIPAL WA	TÉR-BEA	RING ST	RATA			
	in Feet	Thickness in Feet	1	Description	of Water-I	Bearing Fo	ormation	(Estimate	d Yield r minute)
From	To		 							
16	18	2	Anr	ny sand					na	
										
	!		Section	n 3. RECOI	PD OF C	SINC				
Diameter	Pounds	Threads		in Feet		ngth	Turn of		Per	forations
(inches)	per foot	per in.	Тор	Bottom	(1	eet)	Type of	31106	From	То
6	PVC					20			15	20
	1			<u> </u>		<u> </u>			<u> </u>	
Depth	in Feet	Section Hole	1 4. RECO	RD OF MUI	DDING A Cubic Fe					
From	То	Diameter	of M		of Ceme		М	ethod of I	lacemen	(-
0	7 =	8			3		hand	<u> </u>		Ť.
- 										-
	-		:		. .					
	L	L								
			Section	n 5. PLUG	GING RE	CORD				
								Liu Fri		<u> </u>
lugging Metho	od bo					No.	Depti Top	n in Feet Botte	om	Cubic Feet of Cement
Date Well Plug Plugging appro						1 2			$ \vdash$	
- 200-110 abbio		State Engin	eer Danser	entative		3				
		State Engin	cer vebies			4				
Nata Barrier d	A •	0 1000	FOR USE	OF STATE	ENGINE	ER ONL	(
Date Received	August 1	9, 1982			ad		FW	/L	F	SL

			Section 6. LOG OF HOLE
Depth	in Feet	Thickness	Color and Type of Material Encountered
From	То	in Feet	
0	5	5	gyp & gran. anhydrite
	10	5	w n n
	16	6	gyp & clay
	18	2	anhydritic sand and gravel
	19	1	gyp and gravel
	•		
			·
			•
			
			<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.

Dale Hughia

EIELD ENGR. LOG

Section	1	GENERA	1 11	NEORN	MATION

Street or	Post Office Ad	NAV	Ora	wer 159			r's Well No	25
City and	State	Ar	tesia,	<u> N M 8</u>	8210	 		
Well was drilled	l under Permit	No. RA 697	5 X 3		and is located	in the:		
a. <u> </u>	4 NE 4	SE % NE	_ % of Sec	tion8	Township	17 S Rar	nge <u>25</u>	EN.M.
b. Tract	No	of Map No		of the	·			
c. Lot N	o	of Block No.		of the		·		
	, `	d in						=
		_ feet, Y=						
B) Drilling (Contractor	S. Dale	Hughes	i		_ License No	ып 749	
Address	£	Route 1, 8	nx 199	A , Arte	sia, N M	38210		
Orilling Began	7/13/8	3.2 Comple	ted7/	/13/ 82	_ Type tools _A:	ir rotary	Size of t	nole8
Elevation of la	nd surface or _			at we	ll is 3364	_ ft. Total depth	of well	20
Completed wel		hallow 🔲 arte			-			
Sompleted wer					_		or well	<u> </u>
Depth	in Feet	Thickness	T		R-BEARING ST		Estim	ated Yield
From	To	in Feet	-		Water-Bearing F	ormation	<u> </u>	per minute)
15	17	2	ar	hydritic ———	sand ———————		na	<u> </u>
				· ·				,
				•				
			<u> </u>				<u> </u>	
_			Section	n 3. RECORD	OF CASING			
Diameter (inches)	Pounds per foot	Threads per in.	Depth Top	in Feet Bottom	Length (feet)	Type of Sho	e Fro	Perforations om To
6	POC		. <u> </u>	20000	20			.6 20
		Section	4. RECO	RD OF MUDD	ING AND CEMI	NTING		
Depth From	in Feet To	Hole Diameter	Sack of Ma		ubic Feet Cement	Metho	od of Placem	ent "
0	8	8			4	hand		-
								-
						<u> </u>		
		<u> </u>				· · · · · · · · · · · · · · · · · · ·		
Blussiae Coste	-			n 5. PLUGGIN	IG RECORD			
Address						Depth in	Feet	Cubic Fee
		·			No.	Тор	Bottom	of Cement
Date Well Plug Plugging appro	-			<u> </u>	$-\frac{1}{2}$			
)	- -	State Engine	er Represe	ntative	$-\frac{2}{3}$			
	·····		EOB UCE	OF STATE TO		-		
Date Received	August 19,	1982		OF STATE E	NGINEER ONL'	Ţ		
	- '			Quad		FWL _		FSL
-	-6975 X 3			Oba		ocation No	17 26 9 2	24241

Section 6, LOG OF HOLE

Depth is	n Feet	Thickness	Section 6. LOG OF HOLE Color and Type of Material Encountered
From	То	in Feet	
0	5	5	oil soaked soil
	12	7	дур
	15	3	gyp & clay
	17	2	anhydritic sand
	20	3	red gyp clay
	₹		
			·-
	,		
			-
-			
			· · · · · · · · · · · · · · · · · · ·
		,	

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

T

EIELD ENGR. LOG

Street or	Post Office Ad	dress	AJO REFINIA Drawer	159		Own	er's Well No.	<u>26</u>	
City and	State		Artesia,	<u> </u>	PDZIII				
Well was drilled	under Permit	No. RA 65	975 X 4		and is located i	n the:			
a. <u>SE</u>	4 <u>NE</u> 4	_SE%_1	VE_ ¼ of Section	n <u> </u>	Township	17 S R	ange26_	€	_N.M.I
b. Tract	No	of Map No	· -	of the					
									
			·			•		= ,	
				feet, N.	M. Coordinate S	ystem		-	_ Z on Gr
(B) Drilling C	ontractor	S. Dal	e Hughes	-		_ License No	<u> WO 749</u>		
Address	Ro	ute 1, Bo	x 199 A. A	rtesia,	N.M. 882	10			
Drilling Began .	7/15/82	Com	pleted <u>7/15</u>	/82	_ Type tools Ai	r Rotary	Size of	hole	g
Elevation of lar	nd surface or			at wel	l is_3364	_ ft. Total dept	h of well	20	
Completed well	lis ⊡a sl	nallow 🗆 :	artesian.		Depth to water i	upon completio	on of well	8	
mpieree Well			tion 2. PRINCIP		-				
Depth		Thickness			Water-Bearing Fo			nated Yi	
From 16	To 18	in Feet		ydritic			(gallon	s per mi	nu(e)
			2.71						
								·	-,
							-		
					OF CASING			D. C	
Diameter (inches)	Pounds per foot	Threads per in.	Depth in I	Bottom .	Length (feet)	Type of Sh	roe F	Perfor at	To
6	PVC				20		- :	16	20
		<u> </u>							
D +t	in Fact		ion 4. RECORD			NTING			
From	in Feet To	Hole Diameter	Sacks of Mud		bic Feet Cement	Meth	od of Placer	nent	
0	9	8			5	hand		-	
								-	
	Ŧ								
		· · · · · · · · · · · · · · · · · · ·		1					
Plugging Contr	actor		Section 5	. PLUGGIN	G RECORD				
Address					No.	Depth is			c Fee
						Тор	Bottom	of C	emen
	-				2				
Plugging Metho Date Well Plugg Plugging appro	ved by:								
Date Well Plugg	ved by: 	State Eng	gineer Representa	itive	3 4				
Date Well Plugg	ved by: 	State Eng			4	,			
Date Well Plugg	-				IGINEER ONLY	•			

			Section 6. LOG OF HOLE
Depth From	in Feet To	Thickness in Feet	Color and Type of Material Encountered
D	6	6	oil soaked gyp
	10	4	дур
	12	2 .	gyp & clay
	16	4	gyp & clay
	18	2	anhydritic sand
	20	2	gyp & gravel
	_		
		·	
<u></u>	•		
	·		

C. ... 7 DEMANUS AND ADDITIONAL INCORMATION

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 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 accura spossible when any well is drilled, repaired or deepens. When this form is used as a plugging record, only Section 1(a) and Section speed be completed.

FIELD ENGR. LOG

S	treet or	Post Office Ad	Idress		er 159		Owner	's Well No	_27
			•	esia, N M		•			
Vell wa	as drilled	under Permit	No. RA 6	1975 X 5	and	is located	in the:		
a	_SE_	NE 4	SE % NE	¼ of Section	<u>8</u> To	wnship	<u>17 S</u> Rang	3e <u>26 E</u>	N.M.I
b	. Tract	No	of Map No		of the				
c	. Lot No	0	; ₂of Block No		of the		·		
	Subdiv	vision, recorder	‡ in		Сочлту	1.			~
đ				f	feet, N.M. Co	oordinate S	ystem		
					-				Gr
	-			e Hughes					
				Box 199 A. A					
Orilling	g Began .	7/15/82	Comple	eted <u>7/15/82</u>	7 Тур	e tools Ai	ir Rotary	Size of hol	e8
levati	on of lar	nd surface or _			. at well is_	_3363_	_ ft. Total depth o	of well	20
Comple	eted well	lis □3 st	nallow 🗆 art	esian.	Depti	h to water	upon completion	of well	9
			Section	on 2. PRINCIPAL V	WATER-BEA	ARING ST	RATA		
F-		in Feet To	Thickness in Feet	Descript	ion of Water	-Bearing F	ormation		ed Yield er minute)
	om 17	19	2	anhvdri	itic san	d		п	
			_	+					<u>-</u>
					- 				
				Section 3. RE	CORD OF C	ASING			
	meter	Pounds	Threads	Depth in Feet	1	ength	Type of Shoe	:	rforations
	ches)	per foot	per in.	Top Bott	tom	(feet)	- 7 - 7	From	
	6	PVC				20		16	. 20
		l	Cantin	n 4. RECORD OF I	MIDDING	AND CENT	ENTING		1
	Depth	in Feet	Hole	Sacks	Cubic F			1 of Dis-	
	rom	То	Diameter	of Mud	of Cem	ent		of Placemen	-
	0	8	8		4		hand		<u>.</u>
		:							
		-					·		
		ł			.L				
				Section 5. PL	UGGING RE	CORD			
		actor					Danah in E		Cuti 5
Pluggir	ng Metho	od bo				No.	Depth in F	Bottom	Cubic Feet of Cement
	Vell Plug ng appro	ged ved by:		<u> </u>	<u> </u>	1 2			
		· · ·	State Engi-	Page Danson	••	3			
			State Engin	ieer Representative		4			
	acaived	August 19	<u> </u>	FOR USE OF STA		EER ONL			

Section 6 LOG OF HOLF

Depth	in Feet	Thickness	Section 6. LOG OF HOLE
From	То	in Feet	Color and Type of Material Encountered
0	8	- 8	oil soaked gyp
	13	5	дур •
	17	4	gyp & clay
	19	2	anhydritic sand
,	20	1.	anhydritic sand & gravel
			·
			-
-	!		_
•	!		
	i		
	1	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.

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

EJELD ENGR. LOG

b. Tract No c. Lot No Subdivision, d. X= the B) Drilling Contract Address Drilling Began Clevation of land surf Completed well is Depth in Feet From 10	recorded /7/82 ace or To 2	of Map No. of Block No d in feet, Y= S. Dale Route 1	Hughes Box 1 Poleted 7/ Intesian. Section 2. PRIN	99 A, /8/82	of the Cou To	Township	System Ricense No 8821fl ft. Total dept upon completic RATA	Size of the of well Size of well	f hole	Zone_Grade8
b. Tract No c. Lot No Subdivision, d. X= the B) Drilling Contract Address Drilling Began Clevation of land surf Completed well is Depth in Feet From 10	recorded recorded /7/82 ace or	of Map No of Block No d in feet, Y= S. Dale Route 1 Comp hallow	Hughes Box 1 Pleted 7/ Intesian. tion 2. PRIN	99 A, /8/82 NCIPAL W Description why drit	of the Country	Coordinate Size N. M. Type tools Ai sph to water BEARING ST ter-Bearing F	Eystem License No 88210 FROTARY ft. Total dept upon completic RATA	Size of the of well Size of well	f hole	Zon_Gra
c. Lot No	recorded /7/82 ace or _ X sh	of Block No d in feet, Y= S. Dala Route 1 Companion A Sect Thickness in Feet 2	Hughes Box 1 Poleted _7/ Intesian. tion 2. PRIN	99 a, /8/82 NCIPAL W Description hydrit.	Artes De ATERE	ia, N M. Fype toolsAi epth to water BEARING ST ter-Bearing F	License No	Size of the of well Estite (gallor)	f hole	Zone Gra
Subdivision, d. X= the B) Drilling Contract Address Orilling Began Elevation of land surf Completed well is Depth in Feet From Diameter	recorder /7/82 ace or To 2	feet, Y=	Hughes Box 1 Pleted 7/ Intesian. tion 2. PRIN	99 A, /8/82 NCIPAL W Description thydrit	Artes De ATER-E	ia, N. M. Type toolsAi Epth to water BEARING ST ter-Bearing F	License No	Size of the of well Estimoral (gallor)	f hole	Zon Gra
d. X=	/7/82 ace or X sh Fo 2	feet, Y=	Hughes Box 1 Pleted 7/ ritesian. tion 2. PRIN	99 A, /8/82 NCIPAL W Description thydrit	Artes De ATER-E	ia, N M. Type toolsAi s 3361 epth to water BEARING ST ter-Bearing F	License No 8821	Size of the of well Estimoral (gallon)	f hole	Zon Gra
the	A/7/82 ace or X sh Fo 2	S. Nale Route 1 Comparison a Sector Thickness in Feet 2	Hughes , Box 1 pleted _7/ resian. tion 2. PRIN	99 A, /8/82 NCIPAL W Description thydrit	Artes T at well is De ATER-E on of Wa i C Sa	ia, N.M., Type toolsAi s 3361 spth to water BEARING ST ter-Bearing F	License No 8821	Size of the of well Estimoral (gallon)	f hole	Grand
Drilling Began	I/7/82 ace or _ X sh Fo 2	Route 1 Comp nallow a Sect Thickness in Feet 2	rtesian. tion 2. PRIN	NCIPAL W Description thydrit	Artes Tat well is De ATER-E on of Wa	rype toolsAi s 3361 epth to water BEARING ST ter-Bearing F	ROTARY ft. Total dept upon completic	Size of the of well on of well Esti	f hole	8
Drilling Began	Y7/82 ace or X sh Fo Z	Companallow a Section Thickness in Feet 2	rtesian. tion 2. PRIM	NCIPAL W Description Thydrit.	Teat well is De ATER-E on of Wa ic Sa	Type toolsA1 3361 Epth to water BEARING ST ter-Bearing F	r Rotary _ ft. Total dept upon completic	Size of well on of well Esti (gallor	f hole	8
Depth in Feet From Diameter Po (inches) Depth in Feet From Diameter Po From Diameter Po From Diameter Po From Diameter Po From Depth in Feet From	ace or	Section Feet 2	stesian. tion 2. PRIN an Section	NCIPAL W Description Thydrit.	De ATER-E	s 3361 epth to water BEARING ST ter-Bearing F	_ ft. Total dept upon completic	on of well	30 10 mated Y	/ield
Depth in Feet From 10 1 Diameter Po (inches) per 6 PU Depth in Feet From	Σ st	Sector Thickness in Feet 2	stion 2. PRIN	Description thy drit	De ATER-E on of Wa ic sa	EPIT TO WATER BEARING ST ter-Bearing F	upon completic	Esti (gallor	mated Y	/ ield
Depth in Feet From 10 1 Diameter Po (inches) per 6 PU Depth in Feet From	Σ st	Sector Thickness in Feet 2	stion 2. PRIN	Description thy drit	De ATER-E on of Wa ic sa	EPIT TO WATER BEARING ST ter-Bearing F	upon completic	Esti (gallor	mated Y	/ ield
Depth in Feel From 10 1 Diameter Po (inches) per 6 PV Depth in Feel From	Fo 2	Section Thickness in Feet 2	Section Depth	Description thy drit.	ATER-E	BEARING ST	RATA	Esti (gallo	mated Y	/ ield
From 10 1 Diameter Po (inches) per 6 PV Depth in Fee	To 2 unds foot	Thickness in Feet 2 Threads	Section Depth	Description thydrit	on of Wa	ter-Bearing F		(gailo	ns per m	
From 10 1 Diameter Po (inches) per 6 PV Depth in Fee	To 2 unds foot	in Feet 2 Threads	Section Depth	nhydrit	ic sa	nd	ormation	(gailo	ns per m	
Diameter Po (inches) per 6 PV Depth in Fee From	unds foot	Threads	Section	on 3. REC				r	าล	
Diameter Po (inches) per 6 PU Depth in Fee From	foot	I	Depth						- 	
Objection (inches) per 6 PV Depth in Fee From	foot	I	Depth		ORD OF					
Depth in Fee	foot	I	Depth		000 00					
Depth in Fee	foot	I	Depth		000 00				***	
Depth in Fee	foot	I	Depth		000 01					
Depth in Fee	foot	I		in Feet	OKD OI	F CASING				
Depth in Fee		,		Botto	,	Length (feet)	Type of Sh	ioe C	Perfora rom	ations To
From		{ !				30			25	30
From										
From								-		
From	•	Section	on 4. RECC	RD OF M	UDDIN	G AND CEM	ENTING			
0 1	To	Hole Diameter	Sac of M	ks Iud		c Feet ement	Meth	od of Place	ment	
	0	8			4	4	hand		-	
	:								-	
	3						_		· · · · · · · · · · · · · · · · · · ·	
		<u> </u>	<u> </u>						<u> </u>	
			Secti	on 5. PLU	GGING	RECORD				
Plugging Contractor		·								
Address Plugging Method						No.	Depth in	n Feet Bottom		bic Feet Cement
Date Well Plugged							100	Bottom	1 01	Cement
Plugging approved by	: 					_ 3				
		State Engi	ineer Repre	sentative		- 3 4			\pm	
	-		FOR HISE	OFSTAT	TE ENC	INEER ONL	<u> </u>			
Date Received Aug	ust 19	, 1982		J. J. A.		LLR ONL	•	· · · · · · · · · · · · · · · · · · ·		

Section 6. LOG OF HOLE						
	in Feet	Thickness in Feet	Color and Type of Material Encountered			
From	To	5	gyp & red clay			
	10	5	77 19 19			
·	12	2	anhydritic sand & gravel			
	25	13	gyp & gravel			
	30	5	дур			
	•		*			
			•			
· ·						
			V 7			
	1	ł	, , , , , ,			

Section 7. REMARKS AND ADDITIONAL INFORMATION

THU OF C. FI WAS

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 Augher Driller

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

3

EIELD ENGR. LOG

b. Tract N	4 2	No. RA 6	975 X 7							
b. Tract N	4 -NE- 4									
		<u> </u>	llil ¼ of Se	ction 9	Tow	nship	17 S Ra	nge <u>26</u>	<u> </u>	_N.M.P.
c. Lot No	No	_ of Map No.		of th	he					
	;	of Block No		of tl	he					
Subdiv	ision, recorde	i ín			County.				~	
		_ feet, Y=					ystem			
B) Drilling Co	ontractor	S. Dale	<u>Hughes</u>	,		-	_ License No	₩0 749	-	
ddress		Route 1.	Box 199	A. Artes	sia, N	m 88	210			
rilling Began _	7/20/82	Com	pleted7/	/21/82	Туре	tools Ai	r rotary	Size of	hole	
							_ ft. Total depti			
levation of lan	d surface or _			at w	eli is	1,70,7	_ II. I OTAL depti	of well	Z1.5	
ompleted well	is K sl	hallow 🗖 a	artesian.		Depth 1	to water	upon completion	n of well	11	
		Sec	tion 2. PRIN	CIPAL WAT	ER-BEAR	RING ST	RATA			
Depth i		Thickness in Feet	·	Description o	f Water-B	earing Fo	ormation	1	ated Yi	
From 20	To 21.5	1.5	Anh	Anhydritic sand na						
								 		
Ì			·					<u> </u>		
		L								
Diameter	Pounds	Threads		n 3. RECORI		SING			Perfora	ions
(inches)	per foot	per in.	Тор	Bottom		eet)	Type of Sh	œ 	om	То
6	PVC				2	22		1	.9	22
-						-				
							·	•.		
		Secti	ion 4. RECOI	RD OF MUD	DING AN	ID CEME	ENTING			
Depth i		Hole Diameter	Sac) of M	ks	Cubic Fee	et		od of Placem	ent 🕳	
From	То	 	OI M	-		-	.	· · · · · · · · · · · · · · · · · · ·		
	8	8	-		6		hand		_	
			<u> </u>							
 	-	1	-							
										
			Section	on 5. PLUGG	ING REC	ORD				
lugging Contra		···		<u> </u>	г	<u>, 1</u>	Depth in	Feet	Cub	ic Feet
lugging Metho	d b					No.	Тор	Bottom		ement
Date Well Plugg lugging approv			-	• •		2		-		
20 · 0 - FF- 9	-	State Fno	ineer Represe	entative	— ‡	3				-
		State Dile	co. Repres			4				

			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
	=		
	₹		
			~
•			
	·		
		•	
			

Section 7. REMARKS AND ADDITIONAL INFORMATION

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EJELD ENGR. LOG

ost Office Ad	dress	Orawer 15	9					
tate		rtesia, N F	88210					
ander Permit	No. RA 6	975 X 8	ar	nd is located i	n the:			
и NE и	SW 42 F	J∐ ¼ of Section	9	Township	17 S	Range 26	Ε	N.M.F
				-		•		
0	_ of Map No.		_ of the				 -	
	of Block No		of the					
sion, recordêd	in		Cour	ity.			~	
	feet, Y=		feet, N.M.	Coordinate S	, stem		- -5	Zone
ntractor	S. Dale	Hughes			License No.	₩D 749		
Ro	iute L.	30X 199 A.	Artesla	<u>. אין אין אין א</u>	1210			-
7/22/82	Comp	oleted	<u>82</u> т	ype tools _Ai	r Rotary	Size of	hole	3
				3350	fo Total day	- 4h 6 11	u .	71 5
surface or			at wen is		. It. I Otal de	out of well		
is 🗓 sh	iallow 🗆 a	rtesian.	De	pth to water i	pon complet	ion of well	_8	
	Sec	tion 2. PRINCIPAL	L WATER-B	EARING STE	RATA			
Feet	Thickness	T				Esti	mated Y	ield
То	in Feet	Descri	ption of Wat	er-Rearing F	rmation	(gallor	ns per m	inute)
20	2	anhyd	ritic s	end & gra	ivel		na	
	,			CASING				
	, –				Type of	Shoe		To
		p		22			_	22
	٠						1	
F	·				NTING			
To	Hole Diameter	Sacks of Mud			Me	thod of Place	ment #	
	Ω			2	hans	<u> </u>	-	
•				-	114110	•		
<u>.</u>								
-								
	L	1						
•	• •	Section 5. F	LUGGING	RECORD				
ctor				_				
				No.		in Feet		oic Feet
				- 101	Тор	Bottom	of	Cement
				_ , , ,		1		
				2				
1			ve	- 3			-	
1		ineer Representati	ve					
1	State Eng	ineer Representati		MEER ONLY				
	ost Office Ad tate under Permit NE NE NA o	ost Office Address tate	ost Office Address Drawer 15 fate Artesia, N M under Permit No. RA 6975 X R W NE W SW W NW W of Section o of Map No. = = of Block No. sion, recorded in feet, Y= ontractor S. Dale Hughes Route I., Box 199 A, 7/22/82 Completed 7/22/ disurface or is X shallow artesian. Section 2. PRINCIPAL a Feet Thickness in Feet Description Feet 20 2 anhyd Section 3. R Pounds per in. Top Be PVC Section 4. RECORD Office To Diameter of Mud 4 8	ost Office Address Drawer 159 Artesia, N M 8821D under Permit No. RA 6975 X 8 ar y NE	OST OFFICE Address Artesia, N M 88210 Junder Permit No. RA 6975 X R and is located in which will be added to the sion, recorded in country. Junder Permit No. RA 6975 X R and is located in which will be added to the sion, recorded in country. Junder Permit No. RA 6975 X R and is located in which will be added to the sion, recorded in country. Junder Permit No. RA 6975 X R and is located in which will be added to the sion, recorded to the sion, recorded in country. Junder Rect. Y= feet, N.M. Coordinate Sylvatractor South Rect. Rect. Rect. N.M. Coordinate Sylvatric state of the sion, recorded in country. Junder Rect. Rect. Rect. N.M. Coordinate Sylvatric state of the sion, recorded in country. Section 2. PRINCIPAL WATER-BEARING STR. Section 2. PRINCIPAL WATER-BEARING STR. Section 3. RECORD OF CASING Pounds per foot per in. Top Bottom (feet) PUC 22 anhydritic sand & graded section and s	Section 2. PRINCIPAL WATER-BEARING STRATA	Section 2. PRINCIPAL WATER-BEARING STRATA IF Feet Thickness To in Feet Description of Water-Bearing Formation (gallor perin) Section 4. RECORD OF MUDDING AND CEMENTING Section 4. RECORD OF MUDDING AND CEMENTING Section 4. RECORD OF MUDDING AND CEMENTING Teet Hole To Diameter of Mud of Cement Method of Place of Mud of Cement Method of Place is a many size of Many and is part of Cement Method of Place is a many size of Many and is part of Cement Method of Place is a many size of Many and is part of Cement Method of Place is a many size of Many and size of Ma	Artesia, N. M. 88210 under Permit No. RA 6975 X. 8

_		-	Section 6. LOG OF HOLE
Depth From	in Feet To	Thickness 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
	-		
-			
		,	

Section 7. REMARKS AND ADDITIONAL INFORMATION

STREET 3 29 M'90

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 Drille

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

EJELD ENGR. LOG

Well was drille	d under Permit	No. RA-697	5-X-9		a	nd is loca	ted in	the:			
		-SE 14 -NE							2	. -	N M
											N.M
b. Tract	No	of Map No			of the _						
c. Lot N	o	of Block No			of the_						
		d in								=	
d. X= _		_ feet, Y=		fe	eet, N.M.	Coordina	ate Sy	stem		-	Zo
the _							 -			-	G
(B) Drilling	Contractor <u>5.</u>	Dale Hugh	23	 		·		License No.	₩0 7	49	
Address	Rt.	1, Box 19	9 A. Ar	tesia	N M	882	10_				
		2 Compl	•		•						
									'	•	
Elevation of la	nd surface or _				at well is	3365		ft. Total dep	th of wel	22	<u> </u>
Completed we	ll is 👿 s	hallow 🗆 arı	esian.		De	pth to wa	ater uj	on completi	on of wel	110	
		Secti	on 2. PRINC	IPAL W	ATER-E	BEARING	STR	ATA			
Depth	in Feet	Thickness				ter-Bearir				Estimated	
From	То	in Feet					<u> </u>	· · · · · · · · · · · · · · · · · · ·		allons per	
14	16	2	dolom:	ite g	ravel	w gra	y-bi	rown sili	ty cla	y N	IA
					-:						
	 	 	1			•			+		
	ļ.·	}									
			Section	3. REC	ORD OF	-CASING	3				
Diameter	Pounds	Threads	Depth i	n Feet		Length		Type of S	hoe	Perfo	rations
(inches)	per foot	per in.	Тор	Bott	om	(feet)	+			From	To
2		PVC				18				13	18
										•	
l <u></u>	I		1								<u> </u>
Denth	ın Feet	Section Hole	n 4. RECOR Sack		Cubi		EMEN	TING	 -		
From	То	Diameter	of Mu	d d	of C	ement		Met	hod of P	lacement	
0	12	8			4	sx	har	nd placem	nent	-	
	 	-			 					-	
	<u> </u>	-		-	<u> </u>		-				
	<u> </u>				<u> </u>		<u></u>				
			Cantin	. 5 51 1	ICCINC	RECORI	`				
Plugging Cont	ractor		Section		.551110	KLCOKL	-				
Address							, L	Depth	n Feet		ıbic Fe
Plugging Meth Date Well Plug							,. <u> </u>	Тор	Botto	m of	Cemer
Plugging appro	-					$-\frac{1}{2}$		_			
		State Engir	eer Represe	ntative		$-\frac{3}{4}$					
	· · · · · · · · · · · · · · · · · · ·		**************************************								
	Voucebo	r 9, 1982	FOR USE	OF STA	TE ENG	INEER O	NLY				
Date Received	иолешре	1 7, 1702									

			Section 6. LOG OF HOLE
Depth	in Feet	Thickness	
From	То	in Feet	Color and Type of Material Encountered
0	2	2	brown topsoil with gravel & concrete
2	3	11	brown silty clay w white pebbles
3	7	4	brown *** silty clay dense
7	8-3	1+	tan silty clay
8 1	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
	-		
			•
			
		:	
	•	,	
			·

Section 7. REMARKS AND ADDITIONAL INFORMATION

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Driller

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1...2

Well	# / :!	Sample Log	Page / of
Project_	Navajo Ref.	nery Location SW corner of	Colony Landfarm
Drilling	Contractor D	Anderson Driller Richard H	elper_Eddie
Rig Type_	Hollow Sten	Hole Diameter 8 inches Dri Date and Time 10/19/82	lling Fluid NA Date and Time
		n Shelly Drilling Began 1:30pm	
	and willer k	epresentative T Dauchy T.Br	
Blows per 6 inches	Recovery	Sample Description	Depth Feet to Feet
		fill - brown topsoil of gravel ico	ncrete 0-Z
	·	brittle brown silty day, poorly sorte	
		brittle brown silty day, dense, nopebble	s 3-7
	Sdit Span	tan silty clay, plastic, moist	
9-11-16	Split Spaon 8/2-10 arapnic smell	gray silty day w/ gyp. & unweather sinhy	drite poorly-8/2-14
6-6-8	Split Spoon 14-151/2	gray silty day in gyp. i unweather anhy dolamite gravel water bearing seams (2' in gray brown silty day, saturated,	") interbed 14-16
4-4-5	Split Spoon 17/2-19	brown brittle sandy silty clay w/ redi cos	
·	Shelby Tube 20-22	red clay, well sorted, unsaturated	<u>.</u>
		·	

EIELD ENGR. LOG

Section	I.	GENERAL	INFORMATION
	• •		

(A) Owner of	well	VAVAJO REF	INING C	OMPANY	·			Owner's We	il No	32
Street or I	Post Office Ad State	dress ARTESIA	urawer , N M	8821	.0					
Well was drilled						is locat	ed in the:			
		SE % NE							26 F	
						_		_		N.N
	1	of Map No								
		of Block No in								
		 _ feet, Y=								
d. X= the		_ ieet, Y=			et, N.M. C	oraina	te System			
(B) Drilling C	ontractor <u>5</u>	Dale Hug	ghes				License N	ю. ШО	749	
Address	Rt. 1	, Box 199	A, Arte	sia, N	<u> </u>	8210				· •••
Drilling Began .	10/20/	82 Comp	leted	10/20/	/82 Typ	e tools	Auger		Size of hole	8
Elevation of lan	nd surface or _			a	ıt well is	3363	ft. Total	iepth of w	ell 24	.
		nallow 🗆 ar					ter upon comp			
Completed well	. 15 LA SI							enon oi w	en	
Depth	in Feet	Sect: Thickness	ion 2. PRING	CIPAL W.	ATER-BE	ARING	STRATA		Estimate	d Yield
From	То	in Feet					Formation		(gallons pe	
16	22	6					ebbles with NA			
						-				
								!		
Diameter	Pounds	Threads	Depth		ORD OF C	ength		. C	Per	forations
(inches)	per foot	per in.	Тор	Botto	om	(feet)	Type o	3110e	From	Т
2	PVC					22	<u> </u>		17	. 2
							_			
·										
·		Section	on 4. RECOF	RD OF M	UDDING .	AND C	EMENTING			
Depth From	n Feet To	Hole Diameter	Sack of Mu	s	Cubic I	Feet		Method of	Placement	
0	16	8			5 s		Rose Grav	/el tru	ck	-
	:									•
	·	<u></u>	<u> </u>		<u></u>					
			Section	n S. PLU	GGING RI	CORD				
Plugging Contra										
Address Plugging Metho						No.	Top	th in Feet Bot		Cubic Fe of Ceme
	ged					1		-		
Date Well Plugg	vea ov:					3		-		
Date Well Plugg Plugging appro-		C4-4- F - 1	P :							
		State Engi	neer Represe	entative		4				
	, C _ 1 del	State Engi	FOR USE		re engin	4	NLY			

			Section 6. LOG OF HOLE
	in Feet	Thickness	Color and Type of Material Encountered
From	To S1	in Feet 2 1/2	Dark brown topsoil
0	2 1		
2 1	4	1 1/2	lt. brown silty clay with unweathered anhydrite
4	6	2	tan silty clay
6	6 1 2	1/2	red silty clay
61/2	10 1	4	lt brown silty clay with pebble seam at bottom
16 1	13	2 1	tan silty clay
13	16	3	BUSY REFIER CENTRAL CONTRACTOR
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.

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 accurate possible when any well is drilled, repaired or deepen. When this form is used as a plugging record, only Section 1(a) and Sectio. ... ieed be completed.

Wall 4	57	Sample Ica	Page 7 of
	32		•
	_	nery Location SE corner of	J
Drilling (Contractor D	Anderson Driller Richard 1	Helper Eddie
Rig Type	Iollow Stem	Hole Diameter <u>8</u> inches Dr. Date and Time 10/20/82	illing Fluid N/A
Type of Sa	ample Spit Spo.	on Shelly Drilling Began 7:202M	_Drilling End_9:0030
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 - 2Y ₂
		light brown silty day of unweather po	porty 242 - 4
3-4-5	Split Spoon 5-6/2	tan silty clay, brittle, poorly sorted	
	Split Spoon	red silty clay	
5-6-10	10-111/2	light brown sity by, mothed, poorly so	Hed 6/2-10/2
	organic smell	Pebble seam wet, dobnite gravel,	2" 10Y2
		tan sittyclay, same as above	101/2-13
5-8-12	Split Spoon 15-16/2 organic smell	•	
0 1/ /7	Solit Space	gray silty day, well sorted, less der anhydritic sand !pebble seams interbe	13 - 16 ed w/
9-16-17	11/2 11	brownish red sandy silty day	16-22
6-7-9	Split Spoon 20 - 211/2		
7-8-9	Split Spoon 221/2 - 24	ted clay, well sorted, dry & hard	22/2-24
			,
			
			
			مانسد،،سو

ELELD ENGR. LOG

(A) Owner of Street or	Post Office Ad	drace	Orawer	159			0	wner's we	1 NO	33
City and	State	ARTES	SIA, N	7 88	3210				•	
Well was drilled	under Permit	No. RA 70	198		and	is locate	d in the:			
a NE	% NE %	SE % NE	% of Sec	tion 8	To	wnship	17 S	Range	26 E	N.W
		of Map No.				•		J		
- 1 - N	*	of Block No								
		in								 5
. V-		. feet, Y=		f	N.M. Ca		· C			
					, N.M. CO	оганац	system		_	
(B) Drilling C										
Address	<u> </u>	t. 190x 199	A. Ar	tesia.	NM	8821	0			
Drilling Began .	19795/	92Compl	eted10,	/20/82	Тур	e tools _	Auger	Si	ze of hole.	8
Elevation of lan	id surface or			at	well is	3363	ft. Total d	epth of we	u <u>19</u>	<u>1</u>
Completed well	is □X sh	allow 🗆 ar	esian.		Depth	to wate	er upon comple	etion of we	, 10	
- Junpictud well	31							01 #0		
Donet	n Feet	· · · · · · · · · · · · · · · · · · ·	on 2. PRINC	IPAL WA	TER-BEA	RING S	TRATA	т	E	Vista
From	th in Feet Thickness in Feet D		D	escription	ription of Water-Bearing Formation			Estimated Yield (gallons per minute)		
147	17	2 1	Anhy	sand :	aith a	hite	gray silt	v dlav	NA	
142		- 2	y•		U	.,_ 06	3147 3116	, 4-09	1417	
									·	
								1		
				3. RECOI						
Diameter (inches)	Pounds per foot	Threads per in.	Depth in	Bottom	Length (feet)		Type of Shoe		Perfe From	orations T
2	PVCX					18			13	18
-	'						 			+
		Section	1 4. RECOR	D OF MUI	DDING A	ND CF	MENTING		<u> </u>	1
Depth		Hole	Sacks		Cubic Feet		Method of Placement			
From	То	Diameter	of Mu	d	of Cement		method of riacement			
0	12	8			4 8X		Rose Gra	vel tru	1 truck _	
	:									
						-+	· · · ·			<u></u>
										
			Section	5. PLUGO	GING RE	CORD				
Plugging Contra	ictor									
Address						Depth in Feet			ubic Fe	
Plugging Metho			No.	Тор	Botto		f Cemer			
Date Well Plugg Plugging approv						1 2	-	 	-	
		State Engli	per Denses	tative		3				
		State Engir	eer Represer	ILALIVE		4		1		
		_	FOR USE C	F STATE	ENGINE	ER ON	LY			
		0 1000								
Date Received	Novembe	r 9, 1982		_) ad		FW			

Section 6, LOG OF HOLF

D15:	- F	1	Section 6. LOG OF HOLF
Depth i	To	Thickness in Feet	Color and Type of Material Encountered
٥	4	4	Brown topsoil
4	13	9	lt brown silty clay w anhy.
13	141	11/2	gray silty clay
141/2	17	2 1 /2	anHyd. eend in white gray silty clay & red-tan clay
17	19 1	2 1	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.

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

Well	* 33	Samp	le Log		Page 3	_of
Project_h	Vavajo Refi	nery	Location N	E of Colony	C Entrance	2 Gate
Drilling	Contractor D	Anderson	Driller_R;	chard H	elper E	die
Rig Type	tollow Stem	_Hole Diamet	er <u>8</u> " i	nches Dri /0/20/82	lling Flu Date a nd	id N/A
Type of S	ample Split Spo	on Shelby Dril	ling Began	10:00 AM	_Drill in g	End 11:30
		epresentativ	e J. Davel	~ y T .	Bouvete	
Blows per 6 inches		Sam	ple Descri	ption	Feet	Depth to Feet
/		Brown top	soil		0	- 4
	Shelloy Tube 10-11	light brown si				- 13
	organic smell	gray brittle sill Analydritic san				
3-7-8	1/3-16/z	Analydritic sai	id interbedd	ed in white silty clay	9124	2-17
5-5-7	Split Span 17-18/2	red day		_ · ·	17	- 19/2
	<u> </u>					·
· · · ·						
			·		•.	-
					•	
		-				

STATE ENGINEER OFFICE WELL RECORD

FIELD ERGK. LUG

Section	1	CEN	FR	AI.	INFO) R M	A	TIO	N

		MAMA	OF PEETNIT	MC COMP.	DNV	Own	. 1. 10	3/	L
Street o	Post Office Ad	dress	Drawer	159		Own	er's Well No.		·
City and	State	ART	ESIA, N M	882	10				
Well was drille	d under Permit l	No. RA-709	8-X		_ and is locat	ed in the:			
a. <u>SF</u>	_ ¼ <u>NE</u> ¼	_SF_ ¼ _N	IE ¼ of Sect	ion <u>8</u>	Township	<u>175</u> R	ange26.	E	_N.M.
b. Tract	No	_ of Map No.		of th	e				
c. Lot?	Vo vision, recorded	of Block No.		of th	e				
								-	_
		. leet, Y=		leet, N	.M. Coordina	te System			Cor Gr
B) Drilling	Contractor	sc	lale Hughe	·s		License No	<u> 140 749</u>		
Address	Rt	. Box 199	Artes	ia. NM	88210]			
Drilling Began	10/20/	32 Com	pleted <u>10/2</u>	0/82	Type tools	Auger	Size of	hole	8
Elevation of la	and surface or _			at we	ell is3363	ft. Total dept	th of well	22	
Completed we	ellis 🗓 sh	nallow 🗆 a	artesian.		Depth to wa	ter upon completio	on of well	9	
		Sec	tion 2. PRINC	IPAL WATE	R-BEARING	STRATA			
Depth From	in Feet To	Thickness in Feet	De	escription of	Water-Bearing	Formation		nated Yi s per mi	
16	20	4	Anhyd.	sand in	gray sil	ty clay & g	lyp N	A	
						· · · · · · · · · · · · · · · · · · ·			
			Section	3. RECORI	OF CASING		<u> </u>		
Diameter (inches)	Pounds per foot	Threads per in.	Depth in	n Feet Bottom	Length (feet)	Type of Si	hoe E.	Perforation	tions To
	F	 	TOP	Bottom	21		1.		21
2	PVI	T 1			+				
· · · · · · · · · · · · · · · · · · ·	PVI							1	
· · · · · · · · · · · · · · · · · · ·	PVI							•	
` -	PVI		ion 4. RECOR	D OF MUDI	DING AND CE	EMENTING			
2	PVI		ion 4. RECOR Sacks of Mu		DING AND CE		hod of Placen	nent "	
2 Depth	. in Feet	Sect:	Sacks	d c	Cubic Feet			-	
2 Depth From	in Feet To	Secti Hole Diameter	Sacks	d d	Cubic Feet of Cement	Met		ment *	
2 Depth From	To 15 :	Secti Hole Diameter	Sacks	d d	Cubic Feet of Cement	Met		-	
2 Depth From	To 15 :	Secti Hole Diameter	Sacks of Mu	d d	Cubic Feet of Cement 5 sx	Met Rose Grave		-	
Depth From	To 15 :	Section Hole Diameter 8	Sacks of Mu	d d	Cubic Feet of Cement	Met Rose Grave		-	
Depth From D Plugging Con Address	To 15 :	Section Hole Diameter 8	Sacks of Mu	d d	Cubic Feet of Cement 5 sx	Met Rose Grave	l Truck	Cub	
Depth From O Plugging Con Address — Plugging Metl Date Well Plu	tractor	Section Hole Diameter 8	Sacks of Mu	d d	Dubic Feet of Cement 5 sx NG RECORD No.	Rose Grave	l Truck	Cub	ic Fee
Depth From	tractor	Section Hole Diameter 8	Sacks of Mu	S C C C C C C C C C C C C C C C C C C C	Dubic Feet of Cement 5 sx NG RECORD	Met Rose Grave	l Truck	Cub	

			Section 6. LOG OF HOLE
Depth	in Feet	Thickness	
From	То	in Feet	Color and Type of Material Encountered
D	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.
	===		
	•		
<u></u>			
<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.

Male Hugher

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 accura' possible when any well is drilled, repaired or deepen. When this form is used as a plugging record, only Section 1(a) and Section are deepen.

Well	1	Sample Log Page 4	_of
Project N	avajo Refir	nery Location East Fence of Colony	
Drilling Co	ontractor D	Anderson Driller Richard Helper E.	ldie
Rig Type H.	mple <u>SplitSpoo</u>	Hole Diameter 8" inches Drilling Flu Date and Time 10-20-82 Date and ShellyDrilling Began 2:0pm Drilling	id N/A Time End 3:30pn
		epresentative J. Dauchy T. Bouvete	·
Blows per 6 inches	% Recovery	Sample Description Feet	Depth to Feet
		Brown Topsoil & Fill	0-6
		Gray brown mottled silty day w/ unweather poorly	
	Split Spoon 10 - 11/2 Shelby Tube	very britle gyp in silty day w/ unwesthered anhydri water bearing analydritic sand inter lain in grailty day \$940.	te 10-16
	15-17	silty day sayp.	16-20
		gray clay, well sorted	20-22
	í		- Andrewson - Andr
	·		
			
			
			·

STATE ENGINEER OFFICE WELL RECORD

HELD ENGR. LUG

Section 1. GENERAL INFORMATION

			REFINING COM	PANY		Ow	ner's We	II No3!	5	
Street or City and	Post Office Ad State	dress Ar	Orawer 1: tesia, N M	88210						
•			8 X 2	and is	located	in the:				
a. <u>SW</u>	_ ¼ <u>SE</u> ½	<u>Su v Ni</u>	비_ ¼ of Section		nship	17 S R	lange	26 E	N.M.	
b. Tract	No	of Map No		of the						
	*	-								
								=		
	•	_ feet, Y=	f	eet, N.M. Coor	dinate S	System				
the		S Dale H	ughes				ND 7/	_	G:	
_			x 199 A, Art							
•			leted10/20						-	
Elevation of lar	id surface or _	-	·	at well is 3	362	ft. Total dep	th of we	112.	15	
Completed well	is 🔯 s	hallow 🔲 ar	tesian.	Depth t	o water	upon completi	on of we	ıı <u> </u>	<u>. </u>	
Depth	n Feet	Secti Thickness	ion 2. PRINCIPAL \	WATER-BEAR	ING ST	RATA		Estimated	Viald	
From To in Feet Description of Water-Bearing Formation						ormation .	(1	gallons per		
15	20	5	1 -	l in tigh Clay	-	y sdy sil	ty	NA		
i										
						•				
									•	
		<u>, , , , , , , , , , , , , , , , , , , </u>	Section 3. RE	CORD OF CAS	SING					
Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet	Len	igth et)	Type of S	h oe	$\overline{}$	rations	
2	· · · · · · · · · · · · · · · · · · ·	PVC	Top Bott	21				From 15	20	
		 							 	
								 	-	
	· · · · · · · · · · · · · · · · · · ·		1			<u>, </u>		<u> </u>	<u>.</u>	
Depth	in Feet	Section Hole	n 4. RECORD OF I	Cubic Fee				Placement		
From	То	Diameter	of Mud	of Cemen						
0	14	8		4 ½ SX	_	Rose Gra	vel T:	ruck -		
	· · ·			<u> </u>						
			Section 5. PL	UGGING REC	ORD					
		-								
					No.	Depth Top	in Feet Botte		bic Fee	
Address Plugging Metho			•		. 1					
Plugging Metho Date Well Plug	•									
Plugging Metho	•	State Engi	neer Representative		3					
Plugging Metho Date Well Plug	•	State Engi	neer Representative		3 4					
Plugging Metho Date Well Plug	ved by: 		neer Representative		3 4 R ONL	Y FWL				

Section & LOC OF HOLE

		i	Section 6. LOG OF HOLE
Depth From	in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	2	2	Brown-white 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
1112	15	3 1	white silty clay w anhydrite
15	20	5	dolomite seams in tight gray sand-silty clay
20	21 1/2	1 1/2	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.

Hale Higher Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. It ions, except Section 5, shall be answered as completely and accurated to the appropriate district office of the State Engineer. It is ions, except Section 5, shall be answered as completely and accurated to the appropriate district office of the State Engineer. It is ions, except Section 5, shall be answered as completely and accurated to the appropriate district office of the State Engineer. It is in the s

Well	3 5	Sample Log	Page_5_of
Project_h	Vavajo Refir	nery Location 5W corner	e TEL weathering
Drilling (Contractor D	Anderson Driller Richard	Helper Eddie
Rig Type	dollow Stem	Hole Diameter 8" inches D Date and Time 10-20-8 ShellyDrilling Began 4:25	rilling Fluid N/A Date and Time Drilling End 5:45
	•	epresentative J. Dauchy 7	d
Blows per 6 inches	% Recovery	Sample Description	Depth Feet to Feet
		Brown white topsill	0-2
		brown gray sitty clay w/ gravel (i) ?	14psum 2-5
		light brown siltyclay w/ gravel (38) mi	
3-4-6	Don Speek	light brown silty clay wout gravel me	·- -
		11 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
7-16-37	SplitSpoon 15-16/2	water bearing domite gravel seams in tight gray s	andysiltyday 15-20
5-5-10	Split Spoon 20-21/2	white silty clay in sonhydrite, very we water bearing domite gravel seams in tight gray so dry tight white silty clay w/ 20	hydrite 20-21/2
	•		
			-

STATE ENGINEER OFFICE

WELL RECORD

ELELD Elvan. Log

					MATIO				
(A) Owner of	well	LAVAN	REFINING	COMPANY		Owner	's Well No	36	
Street or	Post Office Ad State	dressAR	<u>Drawer</u> TESIA. NM						
			.,						
Well was drilled	under Permit	No. <u>RA_70</u>	98 X 3	and	is locate	in the:			
a. <u>NE</u>	_ % <u>SE_</u> %	<u> 511 ¼ NH</u>	¼ of Section _	<u> </u>	wnship _	17 5 Ran	ge <u>26 F</u>	N.N	
b. Tract!	No	of Map No		of the					
- Lot No	3	of Block No		of the					
Subdiv	vision, recorded	in		County				<u> </u>	
d. X=		_ feet. Y=		feet, N.M. Co	ordinate	System		z	
		· · · · · · · · · · · · · · · · · · ·						<u></u>	
(B) Drilling C	ontractor	S. Dale	Hughes			License No	1:10 749	<u>-</u>	
1 ddraee		Rt. 1. A	nx 199 A.	Artesia.	N M	88210			
								•	
• •			•			Auger			
Elevation of lar	nd surface or	·		at well is	3360	ft. Total depth	of well	25	
Completed well	lis 🛛 sh	nallow 🗆 ar	esian.	Depth	i to wate	r upon completion	of well	7	
			on 2. PRINCIPAL						
Depth	ın Feet	Thickness		· · · · · · · · · · · · · · · · · · ·			Estima	ated Yield	
From	To	in Feet	 	tion of Water-		(gallons per infinite			
.14	15½	1 2	Anhyd. cl	ayey and	in ti	ght gype cl	ay N.	A 	
								-	
					•				
			Section 3. R	ECORD OF C	ASING		·		
Diameter (inches)	Pounds per foot	Threads	Depth in Fee		ength feet)	Type of Shoe	Fro	erforations m T	
2	PVC		190		17		12		
						<u></u>			
	_	_		MUDDING A	ND CEN				
٠.		Section	n 4. RECORD OF	MODDING A	IND CEN	IENTING			
Depth	in Feet	Hole	Sacks	Cubic F	eet		d of Placeme	ent	
Depth From	То	Hole Diameter		Cubic F of Cem	eet	Metho		ent .	
Depth		Hole	Sacks	Cubic F	eet			ent .	
Depth From	To 11 :	Hole Diameter	Sacks	Cubic F of Cem	eet	Metho		ent ,	
Depth From	To 11 = 5	Hole Diameter	Sacks	Cubic F of Cem	eet	Metho		ent .	
Depth From	To 11 :	Hole Diameter	Sacks of Mud	Cubic F of Cem 4 sx	eet	Metho		ent ,	
Depth From O	To	Hole Diameter 8	Sacks of Mud	Cubic F of Cem	eet	Metho		ent ,	
Depth From O	To 11	Hole Diameter 8	Sacks of Mud	Cubic F of Cem 4 sx	cord	Metho	L Truck	Cubic Fe	
Depth From O Plugging Contra Address Plugging Metho	To 11 2 3 actor	Hole Diameter 8	Sacks of Mud	Cubic F of Cem 4 sx	CORD No.	Method Rose Gravel	L Truck		
Depth From O Plugging Contra Address Plugging Metho Date Well Plugg	actor	Hole Diameter 8	Sacks of Mud	Cubic F of Cem 4 sx	cord	Method Rose Grave	L Truck	Cubic Fe	
Depth From O Plugging Contra Address Plugging Metho	actor	Hole Diameter 8	Sacks of Mud	Cubic F of Cem-	CORD No.	Method Rose Grave	L Truck	Cubic Fe	

Section 6 LOC OF HOLE

T

Depth	in Feet	Thickness	Section 6. LOG OF HOLE
From	То	in Feet	Color and Type of Material Encountered
0	41/2	41/2	Brown soil & fill
41/2	8	31/2	lt brn silty clay with gravel
8	14	6	gray silty clay
14	15 1	11/2	anhydritic clayey sand in tight gyp clay
15½	19	3½	white clay with anhydritic nodules, gyp
19	25	5	red-gray clay
	_		
		·	
		·	
	-		
<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.

ale Hugher

INSTRUCTIONS: This form of the State Engineer. All one 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 seed be completed.

Well	#36	Sample Log	Page 6 of
Project_	Navajo Refin	nery Location North of	TEL in NonHazardous Landf
Drilling	Contractor D	Anderson Driller Richard	Helper Eddic
Rig Type	Hollow Stem	Hole Diameter 8" inches I Date and Time 10/21/6 on ShelpDrilling Began 7:20	Prilling Fluid N/A Date and Time Drilling Fnd 8:35
	•	epresentative J. Dauchy	
Blows per 6 inches		,	Depth
		Brown topsoil : fill	
	organic smell	light brown silty alsy w/ grovel (4/8	
	1	gray silty day w/ black red, white of water bearing. anhydritic dayey	
18-33-5	15-16/2	in tight gyp alay	14-15/z
10-8-7	5pli+ Spoon 17/2-19	whitegray clay w/ anhydritic nodules	, gypsum 15/2-19
		red gray day	19-25
	·		·
		· ·	

STATE ENGINEER OFFICE WELL RECORD

TELD, ENCK. TOG

Section 1. GENERAL INFORMATION

(A)	Street or	well Post Office Ad State	dress		OMPANY 59 88210		O	wner's Well	No3'	7		
Wel				098 X 4	aı	nd is locate	ed in the:					
	a. NE	% <u>SE</u> %	<u>SW % NW</u>	¼ of Section_	9	Township	<u> 17 S</u>	Range	26 E	N.M.P		
	b. Tract !	No	of Map No.		_ of the	**						
								-				
									_			
(B)	Drilling C	ontractor	S. Dale	Hughes	 		License No	_ ыо 7	49	-		
Add	iress		Rt. Box	199 A. Art	esia, N	M 882	210	*****				
Dril	lling Began _	10/21/8	Compl	leted <u>10/21/</u>	82т	ype tools.	Huger	Siz	e of hole_	8		
Elev	vation of lan	d surface or _			_ at well is	3361	ft. Total de	pth of well	20	<u> </u>		
Con	npleted well	is 🗴 sl	nallow 🔲 ar	tesian.	Dep	pth to wat	er upon comple	tion of well	8			
	Depth 1	- Fact	1	ion 2. PRINCIPAL	WATER-B	EARING :	STRATA	.		371.11		
L	From	h in Feet Thickness in Feet Description of Water-Bearing Form							Estimated Ilons per i			
	14	18	4.	Anhydriti	c sand :	in lt.	gray silt	y ¢lay	ш дур	NA		
										<u> </u>		
							•			·		
<u> </u>				Section 3. R	ECORD OF	CASING						
	Diameter (inches)	Pounds per foot	Threads per in.	Depth in Fee	ttom	Length (feet)	Type of	Shoe	Perfo From	rations To		
	2	PVC		ТОР	ATOM!	17			12	17		
					·							
\vdash							 		•	 		
<u></u>						·		- 1		1		
	Depth	ın Feet	Sectio	n 4. RECORD OF		AND CE						
<u> </u>	From	То	Diameter	of Mud	of Co	ment		thod of Pl				
	0	11	8		4 5	×	Rose grav	el truc	K -			
	_	-										
		7										
				Section 5. P	LUGGING	RECORD						
		actor					Denth	in Feet		bic Feet		
Plu	gging Metho e Well Plugg	d b		• :		No.	Тор	Bottor		Cement		
	gging approv			•		$-\frac{1}{2}$						
			State Engir	neer Representativ	e	- <u>3</u>						
				FOR USE OF ST	ATE ENGI	NEER ON	ILY					
Dat	e Received	Novembe	r 9, 1982				-					
Date	e Received	Novembe	r 9, 1982					L	FSL			

Section 6, LOG OF HOLE

		Section 6. LOG OF HOLE
Depth in Feet From To	Thickness in Feet	Color and Type of Material Encountered
	$\frac{1}{2}$ $2\frac{1}{2}$	Brown topsoil & fill
21/2 5	2 1 /2	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 2½	Tight gray clay
		. *
		*

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 Hughes

INSTRUCTIONS: This for of the State Engineer. Al. ons, except Section 5, shall be answered as completely and accurate of deepened. When this form is used as a plugging record, only Section 1(a) and Section 5 need be completed.

Well	# ₃ 7		Sample Log	Page 7 of
Project_h	Vavajo	Refir	nery Location NE Co	rner of TEL
Drilling (Contrac	tor D	Anderson Driller Richard	Helper Eddie
Rig Type	dollow S	stem.	Hole Diameter 8" inches Date and Time 10/21/6	Drilling Fluid N/A Date and Time
		•	·	
	and Mil	Tel K	epresentative J. Dauch y	
Blows per 6 inches	Reco	very	Sample Description	Depth Feet to Feet
		·	Frown topsoil - fill	0-24z
	organie	عتواا	dark brown silty clay mattled	242-5
			light brown silty clay white! black no sinhydritic sand in light y ray	bles sorted 5-14
13-62-25	largesplit	Spoon 151/2	anhydritic sand in light y ray w/ gyp.	/ sitty clay 14-18
12-13-16	1-1:45	poon	tight gray day well sorted	- 18-20 ^y z
		í		
		7		

STATE ENGINEER OFFICE WELL RECORD

EJELD ENGR. LUG.

Section 1. GENERAL INFORMATION

	Owner of	well	DEAVAN	REFINING C	DIPANY		Own	er's Well N	۷o. <u> </u>	8
	Street or I	Post Office Ad State	G1C33 ———	<u>Drawer 15</u> ESIA, N M		.0				
				0 V E	•					
Well	was drilled	under Permit	No. <u>RH. /US</u>	8 X 5		and is loca	ed in the:			
	a. <u>SE</u>	<u> 4 SE 4</u>	_5U_ ¼ _NU	% of Section	9	_ Township	<u>17_5</u> R	ange	26 F	N.M.P.N
	b. Tract N	No	of Map No		_ of the .					
		*								
									=	
	d. X=		_ feet, Y=		_ feet, N.M	I. Coordina	te System		<u>-</u>	Zone i
	the									Gran
(B)	Drilling C	ontractor	S. Dale	Hughes			License No	MD.	749	
A ddı	ress		Rt. 1. Box	199 A Ar	tecia.	N M	38210			•
			· ·	•	•		Auger			_
	-									
Eleva	ation of lan	d surface or _			at well	is336.	ft. Total dept	th of well	23	1 f
Com	pleted well	is 🛭 sh	nallow 🗆 ar	tesian.	D	epth to wa	ter upon completio	n of well_	6	f1
			Secti	on 2. PRINCIPA	. WATER	BEARING	STRATA			
	Depth 1	n Feet	Thickness				g Formation	_	stimated '	
	From	То	in Feet	 				1	lons per r	ninute)
<u> </u>	16	21	5	Anhydrit gray sil			pebbles wi	th	NA	
1	1			gray sii	uy clay					
-										
<u> </u>			<u> </u>	ــــــــــــــــــــــــــــــــــــــ						
				Section 3. I			 		Df.	
	inches)	Pounds per foot	Threads per in.	Depth in Fe	ottom	Length (feet)	Type of Sh	10e	From	ations To
	2	PVC			İ	21			16	21
	-								_	
-										
L	_ ·									L
				n 4. RECORD O			EMENTING			
-	Depth :	To	Hole Diameter	Sacks of Mud		bic Feet Cement	Meth	hod of Pla	cement .	
	0	15	8			5 sx	Rose Grave	1 Truck	, -	
-	-	` _								
-					-					
									.,	
				Section 5, I	LUGGING	RECORD				
L_							•			
Plug	ging Contra	actor								
Add	ress					— No	Depth is			bic Feet
Add Plug	ress ging Metho	d				No	Depth is	n Feet Bottom		bic Feet Cement
Addi Plug Date	ress	d				1 2				
Add Plug Date	ress ging Metho Well Plugg	d		neer Representat	ve	$\begin{array}{c c} - & 1 \\ \hline 2 \\ \hline - & 3 \end{array}$				
Addi Plug Date	ress ging Metho Well Plugg	d			ve	1 2				
Addi Plug Date Plug	ress ging Metho : Well Plugg ging approv	d ed red by:	State Engir			1 2 3 4	Тор			
Addi Plug Date Plugi	ress ging Metho Well Plugg	d	State Engir	neer Representati	TATE EN	1 2 3 4 GINEER O	Тор	Bottom	of	Cement

Section 6. LOG OF HOLE

			Section 6. LOG OF HOLE
From	in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	4	4	Brown topsqil
4	6 1	21/2	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
	. ₹		
			·
			· ·
	,		

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 troof the State Engineer. Ali ons, except Section 5, shall be answered as completely and accurate. possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section 5 need be completed.

Hughes Friller

Well	<u>#8</u>	Sample Log	Page 8 of					
Project	Vavajo Refin	nery Location Est Fence	of TEL					
Drilling (Contractor D	Anderson Driller Richard 1	Helper Eddie					
Rig Type Hollow Stem Hole Diameter 8" inches Drilling Fluid N/A Date and Time 10-21-82 Date and Time Type of Sample Shit Spoon Shelly Drilling Began Drilling End								
Geraghty and Miller Representative J. Dauchy T. Bouvete								
Blows per	% Recovery	Sample Description	Depth Feet to Feet					
		Brown topsoil	0-4					
	organic smell	poorly sorted brown silty clay marbled w/ gray sof	······································					
	organic smell Shelloy Tube	light brown silty clay soft, poorly so	***					
	10 - 12 Solit Space	very hard suhydrite (cement/crystals) w	graysilly clay 10 -11					
9-17-19	15-16/z	gray soft sitty cby reddish tint, po	porty sorted 11-16					
4-8-9	Split Spoon 20-21/2	Shydritic large grain sand : domite per bearing zones (1-2") interbed w/ dense gra	obles water v silly clav 16-21					
8-13-13	Split Spoon	very tight gray clay narbled w/ Shh						
			·					
		·						
	·							
·								
·								
		-						

Well #39 Navajo Refining Company - Monitor wells Orilling Contractor - D. Anderson, El Paso

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

Fasio & Chancey Date <u>6-/3-84</u>

Sample description

0-6-L+ Red Clay 50:1	
103 gyp anhy publes, clay	
14 gry gyp- oder gas	
174 gra gyp, anhy 0:1 abor and stain	
18 /r anky, gyp, clay	
20 Redagry shale, anny & anny x/s, Red shale was	Len
21th Red Clay + anhy mixed with pebbles - water	
24 14 mixed red & white anhy + clay- some pebbles	
26 fine red 4 wht anhy with clay-dry.	
	-

Well #40 Navajo	Refining Compar	ny – Monitor wel	ls	•
Orilling Contractor - D	. Anderson, El F	aso		
Rig – Hollow stem auger	8" diameter	Split spoon co		18"
Date <u>6-14-84</u>	70510	4 chaner	1	
Death Sample descri	ption	7 7	<i>-</i> ;	

0-4 Soil

8'2 gyp, anhy, gry shale dry

13 gyp, anhy, gry shale water

16' anhy, shale, gyp- Bleeding Oil

18th L+ gry fine anhy - no oil

19'4 L+ gry, tan, granular anhy- oil

20'4 gyp - water

23'4 gyp, anhy - water

25'k Tan, fine, xln anhy

28'L Tan fxln anhy - sand- gravel at 25.55'

31'h Red sandy silt

Well # <u>4</u> /	Navajo Refining Company	/ – Monitor wells
Drilling Contracto	or – D. Anderson, El Pa	350
Rig – Hollow stem	· -	Split spoon core barrel 18
Date 6-15-8	76510	4 Chaney

Depth Sample description

0-15 Soil - Wet at 135 feet
161/2 wht + Tau only + gyp - water
21 wht gyp with anhypieces (gravelly)
252 u-h++ gra gyp+anhy-deuse
272 gry sandy clay tight
29 Red 4 gry sandy clay
31 Red sandy shale (c/ay)

Well # <u>42</u>	Navajo	Refining Compar	ny – Moni	tor well	Ls	. 1
Orilling Contrac	tor - D.	Anderson, El F	^D aso			
Rig – Hollow ste						18"
Date <u>6-18-8</u> 6-19-8	4 .00	70310	401	lanec	1	
Depth Sampl	e descrip	tion		,		

0-10 Soil damp at 9'

14th wht gyp, anhy & Clay - Light

19th wht gyp, anhy pebbles, clay water 22/2 gyp + gry, red sandy silt
24 by fine gry shaley silt with publes
29 gry shaley, sandy, silt 29 Red Shaley, Sauley, 5.14

Well #42 Navajo Refining Company - Monitor wells	
Orilling Contractor - D. Anderson, El Paso	
Rig - Hollow stem auger 8" diameter Split spoon core barrel 18" Date 7-17-84 Chancy - 5-trock	
7:15 aux - 12:10 pm Depth Sample description	

0-42 Soil	
6 mixed so; (Red & gyp- Lamb-	· · · · · · · · · · · · · · · · · · ·
7 = mixed Red Shale + gyp - vy red Shale at bottom	
9 .67 mixed soil & gyp88 gyp w HCR. odor	gas
10 = gyp with anky pebbles HCR-odor-no blage.	/
12 .75 gys wanty belbles HCR- ,75 wht gyp	
13= 1- gypw pebbles - gas stritchor -0= gyp - 51.94+	y wet
15 0 gyp+gravel-oil +wtr 12 gyp, gravel-wet-free	e cet
16 0-gyptgravel-wH-12 gry gyp-tight-we	<i>†</i>
16 0-gyptgravel-wty-12 gry gyp-tight-we 18 02-gyptgravel-wty-12 gypwthopes-02 Rolsh	Sul
195 0 Rds, 14 Sandy + places - 0 - Rolfing S. 14, 8	auly
225 Or / Rd 3.14y Sand - TD.	

STATE OF THE STATE

Well # 4 B Navajo Refining Company	y – Monitor wells
Orilling Contractor - D. Anderson, El Pa	aso
MIG - HOTIOM aren adder	Split spoon core barrel 18°
Date 7-17-84 Chaney Depth Sample description	- stroud
Depth Sample description	Z, Z/

O-16 Red silty-sandy soil
185 wht-gyp-deuse-dry 20 o'whtgypdus-14 Red silty Souly Class
20 o'whtgypans - 1 + Red sitty sauly clas
225 Reldey - T.D.

THE RESERVE OF THE SECOND OF T

Well #45 Navajo Refining Company - Monitor wells

Drilling Contractor - D. Anderson, El Paso

Rig - Hollow stem auger 8" diameter Split spoon core barrel 18	3 "
Date 8/22/84 Stroud-Ledesma	
Depth Sample description By Effluent ditch at NW Corner farme 11' So. & ditch	7.
0-45 Red Soil dry	
5 gyp- dry	2
6-63 wht gyp. dry - 6 gry shale dry s	96/200
5 gyp- dry = 6 gry shale dry s 8 gry shy shele w very 1 ge anhy pes- a 9 gry shale rgyp. I anhy gravel-9 gry shale +	rej
10 2'core shale & gup. & anhy grave -9- gry shale +	anky as
11 = 108 - 974 Shalows auby pas - 11 anhy gravel - 115 gry shi	49 Hows
13 gry shale w qyp-anhy pos - damp. 31/2 wtong 145 gravel at top; 14' and at 145- gry stil w gravel street	40 blows
14- grade at top: 14' and at 143- gry sil w grave street	65 27 blows
16 147-15-gryshl + gravel - 15-16-gry shelo - wt	-
<u> </u>	-
	-
18 casing	- -
18 casing gravel 18-10 ⁵ Pellets 10-8 ⁵	-
Pellets 10-8	-
cmy+ 8-0	-
1	

Bowbre Fod

Well # 46 Navajo Rafining 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
11:652
Depth Sample description Center north sede
navago-collier Farm
0-65 Dark red 50:1
8 Lite Red soil 494 p dry
11 gry clay w gyp damp
125 gry clay, gyp, anky pc tight-dry
14 gryclay-gyp. auky gravel - wtr
15 14-15 = gry sly-shale 153-5 Red shale
17 Fine Red Shalo.

Csq-17'

gravel+ Rerfs 17-12

Pellets 12-10

Cunt 10-0

Bawbre rad

41		
Well #### Navajo Refining Company - Monitor wells		
Orilling Contractor - D. Anderson, El Paso		
Rig - Hollow stem auger 8" diameter Split spoon core barrel 18	111	
Date 8/22/84 Stroud-Ledesma		•
Date 8727/84 Stroud-Ledesma 3:05 Fample description SE Conner Navago Colli	er -	Fara
Depth Bample description 32 Contex 1000 1000		`
	- 1 1	
0-5 derk Red soil deup	-	
10 lite Red soil dauge		
115 Rol Shale		
	-	
13 Crange Red Shel Lang.	-	
124 11 15 11	-	
1 D		
	-	
•	-	
	-	· - .
	.	
Casing 14'		
Danel +Pa 1 = 14-9	•	
gravel + Respo - 14-9 Rellets 9-8	-	
	-	
Cun+ 8-0	_	

Well # AA Navajo 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

Depth Sample description

		_
0 - 5	Fill - clay & gravel	
5 - 6½	Red clay - fill?	
$6\frac{1}{2} - 8$	Blk oil stained soil or fill Rec. 1' lost $\frac{1}{2}$ '	-
8 - 9½	Heavy HCR (hydrocarbon residue) in gypsum – oil odor Rec. l' lst $\frac{1}{2}$ '	Red Clay
$9\frac{1}{2} - 10$	Orill gyp	ajk o d
$10 - 11\frac{1}{2}$	1.1' gyp oil odor .4' gyp & red clay oil odor	HEAVY HCR
$11\frac{1}{2} - 13$.5' porous gyp heavy gasoline odor. l' gyp with gasoline odor	12 948
$13 - 14\frac{1}{2}$.5' porous gyp gasoline dripping. l' gyp	Gasoline
$14\frac{1}{2} - 16$.3' porous gyp with free gasoline. 1.2' gyp sli por gasoline odor. Tr gray clay	-
16 - 17½	l' gyp & lst gravel with gasoline5' gyp no odor	15
17½ - 19	gyp & 1st gravel - water	- gyp+anul
19 - 19½	Drill gyp	- Water
$19\frac{1}{2} - 21$	1.2' gravel & gyp;water3' dry gravel - solid	70 cos
21+	No go core. Rec. + .25' very crs gravel & gyp	- Solid 745
	· · · · · · · · · · · · · · · · · · ·	-
ma	-19 wf1 -10 24 24.(7/27)	- .
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ENVATION DIVISION 306	·

Well # AA Navajo Refining Company - Monitor wells

Drilling Contractor - D. Anderson, El Paso

Rig - Hollow stem auger 8" diameter Split spoon core barrel 19"

Date 6/8/83 11:15 am

Depth Sample description

0 - 5	Fill - clay & gravel
5 - 6½	Red clay - fill?
$6\frac{1}{2} - 8$	Blk oil stained soil or fill Rec. 1' lost ½'
8 - 9½	Heavy HCR (hydrocarbon residue) in gypsum – oil odor Rec. l' lst $\frac{1}{2}$ '
$9\frac{1}{2} - 10$	Orill gyp
$10 - 11\frac{1}{2}$	1.1' gyp oil odor .4' gyp å red clay oil odor
11-7 - 13	.5' porous gyp heavy gasolina odor. l' gyp with gasoline odor
$13 - 14\frac{1}{2}$.5' porous gyp gasolina dripping. l' gyp
$14\frac{1}{2} - 16$.3' porous gyp with free gasoline. 1.2' gyp sli por gasoline odor. Tr gray clay
$16 - 17\frac{1}{2}$	1' gyp & 1st gravel with gasoline5' gyp no odor
$17\frac{1}{2} - 19$	gyp & lst gravel – water
19 - $19\frac{1}{2}$	Orill gyp
$19\frac{1}{2} - 21$	1.2' gravel & gyp;water3' dry gravel – solid
-	

130 pt. 41 14

5,030/1/-

1000

ン.

The transfer of the second state of the second

DETAILS OF WELL CONSTRUCTION

Data 6/8/83	Well #AA
Company <u>Navajo Refini</u>	ng
Ground Level	Casing Elev. 3369.7 (high point of cut) Elev. 3369.19
6" PVC casing gravel and fill	
clay seal 10.75t	77.
Perforated section	5 61 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
gravel pack	
20.25 ^t Blank casing TD 21.25 ft	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

The constraint of the constrai

Well <u>#_A8</u>	Navajo Re	fining	Company	– Mor	nitor u	Jells		
Orilling Contracto	or - D. A	nderson	, El Pa	.so				
Rig - Hollow stem	auger 8	" diame	ter	Split	spoon	core	barrel	18"
Date <u>6/9/83</u>	7:15 am							

Depth Sample description

0 - 9	Soil - Fill - Red	
$9 - 10\frac{1}{2}$	dk. gry gyp & clay with 1st pebbles and blk HCR seams. sli gas odor	
10½ - 12	gravel (crs 1st pebbles in gyp) free gasoline	
$12 - 13\frac{1}{2}$	crs. 1st peobles in gyp f ree gasoline f))
$13\frac{1}{2} - 15$	crs lst pebbles in gyp free gasoline	<i>X</i>
$15 - 16\frac{1}{2}$	gyp & med gravel – gasoline & water	
$16\frac{1}{2} - 19\frac{1}{2}$	Orill gyp & gravel	94 p. 0101
:	Tap Sasoline -	Gasoline austili
	ind tronch	TIGYAVE
	15.	COLUMN TO A NORMAL MA
	-16.5 x 1	gasi war
}	-11,34 Top fld 7/25	
	5.13	TD
	ZC-	Fr 425
6° .	The state of the s	
 	The second of th	
	MAR OC 1805	

OL CONSERVATION DIVISION SANTA FE

*#**17**93

Samers ros

Well <u># A8</u>	Navajo R	Refining Compa	any - Monitor	wells		
Orilling Contrac	ctor - 0.	Anderson, El	Paso			
Rig — Hollow sta	aw snöer	9" diameter	Split spoo	in core	barrel	18"
Date <u>6/9/83</u>	7:15 am					

Depth Sample description

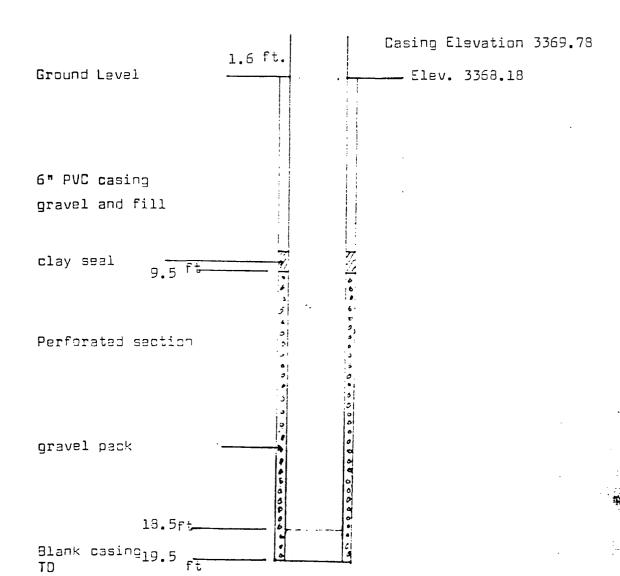
		
0 - 9	Soil - Fill - Red	
$9 - 10\frac{1}{2}$	dk. gry gyp & clay with 1st pebbles and blk HCR seams sli gas odor	
$10\frac{1}{2} - 12$	gravel (crs 1st pebbles in gyp) free gasoline	
$12 - 13\frac{1}{2}$	crs. 1st peobles in gyp free gasoline	- 5-
$13\frac{1}{2} - 15$	crs lst pebbles in gyp ffee gasoline 	
$15 - 16\frac{1}{2}$	gyp & med gravel – gasoline & water	-
$16\frac{1}{2} - 19\frac{1}{2}$	Orill gyp & gravel	167
	Top Gasaline	-
	Lyone.	- 3 4 4 4 6
		15
:	- 3.C 300	-
,		
		- **-
		-
		-
		-
		_

DETAILS OF WELL CONSTRUCTION

Date	6/9/93	

Well # AB

Company <u>Navajo Refinino</u>



Well #_	AC S	lavajo Ref	ining Company	/ - Monito	or wells		
Drillin	g Contractor	- D. An	derson, El Pa	350	•		
Rig - H	ollow stem a	auger 9"	diameter	Split spo	on core	barrel	18'
Date <u>6</u>	5/9/83	10 am					

Depth Sample description

O - 5 Fill dirt. Top lt red soil @ 5'	
5 – 8 Lt red soil. Too gravel 3 8'	
8 - 10 gravel & red soil	;
9 - In Alasei a Leg Port	N N
10 - $12\frac{1}{2}$ gravel & red soil or clay - top gyp gas odor	5
$12\frac{1}{2}$ - 13 Drill 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 $14\frac{1}{2}-\frac{3}{4}$ water	10-000
$15\frac{1}{2} - 17$ 1.4' gyp wet .1' dry gyp	- 15. 15. 25.
	gas 4 water
	15 Water
	TD
- 14.75 wfi	_
1-10-47 All There	20-
4.77	
OIL CONSERVATION DIVISION SANTA FE	

Sample LDG

Well #_	AC	Navajo R	lefi	ning Company	/ - Mor	itor w	ells		
Drillin	og Contracto	or - 0.	Anc	ierson, El Pa	150				
Rig - H	lollow stem	snāer	9"	diameter	Split	spoon	core	barrel	18"
Date	5/9/83	10 am							

Depth Sample description

and the second s

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 1	gravel & red soil or clay — top gyp gas odor	ار -
$12\frac{1}{2}$ -	- 13	Drill gyp	
13 -	- 14 1 / ₂	.5' gyp w gas & water some gry clay l' gyp	
$14\frac{1}{2}$ -	· 15½	gyp & gry clay. Sli gravel 14 water	10.
15½ -	- 17	1.4' gyp wet .1' dry gyp	
			 15
		- 18/2/2 11/2	
			<u>*:</u>
	٠		

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TD

DETAILS OF WELL CONSTRUCTION

Date 6/9/83	well # <u>AC</u>
Company <u>Mavajo Refin</u>	ing
Ground Level	1.1 ft. Casing Elev. 3369.60 Elev. 3368.5
6" PVC casing	
gravel and fill	
clay seal 8.0 ft	
Perforated section	
gravel pack	
16.0ft— Blank casing TO 17 ft	

17 ft

The state of the s

Sample 108

Sample description

Depth

Well # <u>AD</u> Navajo Refining Compan	y - Monitor wells
Orilling Contractor - D. Anderson, El P	aso
Rig - Hollow stem auger 9" diameter	Split spoon core barrel 18
Date <u>6/9/83 1:55</u> pm	

	∽		•
0 - 7½	Fill	-	
$7\frac{1}{2} - 11\frac{1}{2}$	Sandy gravel	-	
$11\frac{1}{2} - 12$	Drill gyp odor gas	-	
12 - 13½	gyp w lst pebbles (gravel) gasoline - fair porosity	- N	
$13\frac{1}{2} - 15$	gyp w anhydrite pcs - no gravel. Fair to poor porosi Odor gasoline l' - No odor bottom .5'	Ēy	
15 - $16\frac{1}{2}$	gyp w anhydrite pcs – water	- 50	Sanly gravel
$16\frac{1}{2} - 17\frac{1}{2}$	gyp w ahhydrite pcs – water	- IC*	gravei
$17\frac{1}{2} - 19$	дур ТО		dor go
		-	anhyd ei
		15-	Ge sol in
		•	Water
		-	
		20-	TD
9			*******
			}
	MAR 06 1985		
	OIL CONSERVATION DIVISION SANTA FE	•	1.5
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Depth Sample description

Angeles and Angeles and French and

Well # AD	Navajo P	Rafining Company	/ — Monitor	wells	
Drilling Contract	or - 0.	Anderson, El Pa	350		
Rig – Hollow stem	auger	9" diameter	Split spoon	core barral	18"
Date <u>6/9/83</u>	1:55 F	m			

$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
$11\frac{1}{2}-12$ Drill gyp odor gas $12-13\frac{1}{2}$ gyp w 1st pebbles (gravel) gasoline - fair porosity $13\frac{1}{2}-15$ gyp w anhydrite pcs - no gravel. Fair to poor porosity Odor gasoline 1' - No odor bottom .5' $15-16\frac{1}{2}$ gyp w anhydrite pcs - water $16\frac{1}{2}-17\frac{1}{2}$ gyp w anhydrite pcs - water $17\frac{1}{2}-19$ gyp TD	
12 - $13\frac{1}{2}$ gyp w 1st pebbles (gravel) gasoline - fair porosity (13 $\frac{1}{2}$ - 15 gyp w anhydrite pcs - no gravel. Fair to poor porosity Odor gasolina 1' - No odor bottom .5' 15 - $16\frac{1}{2}$ gyp w anhydrite pcs - water 16 $\frac{1}{2}$ - $17\frac{1}{2}$ gyp w anhydrite pcs - water 17 $\frac{1}{2}$ - 19 gyp TD	
$13\frac{1}{2}-15$ gyp w anhydrite pcs – no gravel. Fair to poor porosity Odor gasoline 1' – No odor bottom .5' $15-16\frac{1}{2}$ gyp w anhydrite pcs – water $16\frac{1}{2}-17\frac{1}{2}$ gyp w anhydrite pcs – water $17\frac{1}{2}-19$ gyp TD	
Odor gesoline 1' - No odor bottom .5' $15 - 16\frac{1}{2}$ gyp w anhydrite pcs - water $16\frac{1}{2} - 17\frac{1}{2}$ gyp w anhydrite pcs - water $17\frac{1}{2} - 19$ gyp TD	-
$16\frac{1}{2}-17\frac{1}{2}$ gyp w anhydrite pcs – water	,
17½ – 19 gyp TD	!
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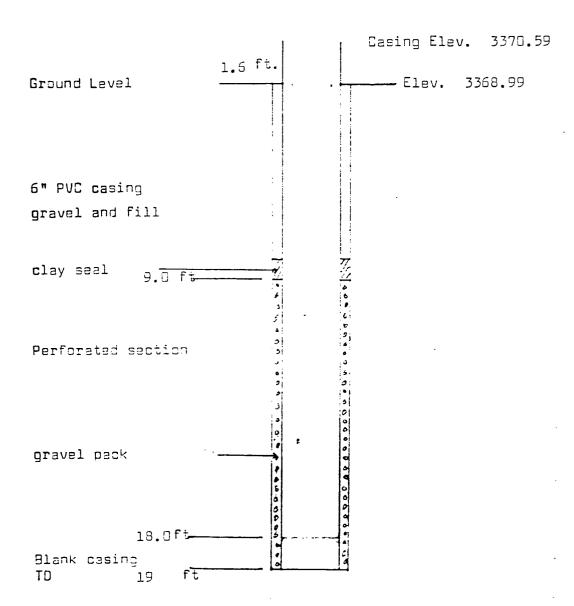
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Date	6/9/33	

₩ell # __AD___

Company <u>Mavajo Refinino</u>



Well	# AE	Navajo	Ref	ining Comp	any – Monito	r wells		
Oril	Ling Contrac	tor - D.	An	derson, El	Paso			
Rig -	- Hollow ste	w ander	3"	diameter	Split spo	on core	barrel	19'
Oate	6/10/83	7:15	am					

Depth Sample description

		_	
0 - 5 Fi	ll & soil		
5 - 7 Gr	y clay & gyp); }	
7 - 9 Gr	y clay & gyp – change at bottom	, i	
9 - 10 Or	ill .	5	Clau
10 - 11 ¹ / ₄ gr	anular gyp & anhy .8'. porous gyp .45' gasoline whole core		941
11 1 - 12.7 me	d gravel & gyp - porous gasoline		
127 - 142 1'	med gravel & gyp5' gran gyp. gasoline	10-	gran gup
14 ² - 15 gr	avel & gyp gasoline		Gasoline
$15 - 16\frac{1}{2} 1'$	grav seams in gyp9' gyp w water	و دو د - د -	
$16\frac{1}{2} - 18$ $\frac{3}{4}$	gravel & gyp w water. 🛂 tight gyp	15.	
18 - 18 ⁸ ha	rd gyp	, ,	Water
18 ⁸ - 20 ³ Or	ill hard gyp	•	rigap
	€	20-	Th
			, • • • • • • • • • • • • • • • • • • •
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:	0.000		APON A
, · · ·	MAR 06 1985 OIL CONSERVATION DIVISION)	•
	OIL CONSERVATION SANIA FE		

Well # AE	Navajo Refining Company	– Monitor և	rells	
Orilling Contract	or – D. Anderson, El Pa	S0		
Rig - Hollow stem	auger 9" diameter	Split spoon	core barrel	18"
Date <u>6/10/83</u>	7:15 am			
Depth Sample	e description			

				 ,
D	-	5	Fill & soil	
5	_	7	Gry clay & gyp	_
7	_	9	Gry clay & gyp — change at bottom	-
9	-	10	Drill .	-5
10	<u>_</u>	114	granular gyp & anhy .8'. porous gyp .45' gasoline in whole core	-
114	-	12.7	med gravel & gyp – porous gasoline	 !
127		142	l' med gravel & gyp5' gran gyp. gasoline	10-
142	_	15	gravel å gyp gasoline	: 5
1 5	_	16 1	l' grav seams in gyp3' gyp w water	<u> </u>
16½	_	18	्रै' gravel & gyp w water. ३' tight gyp	15-
18	_	188	hard gyp	
188		203	Orill hard gyp	
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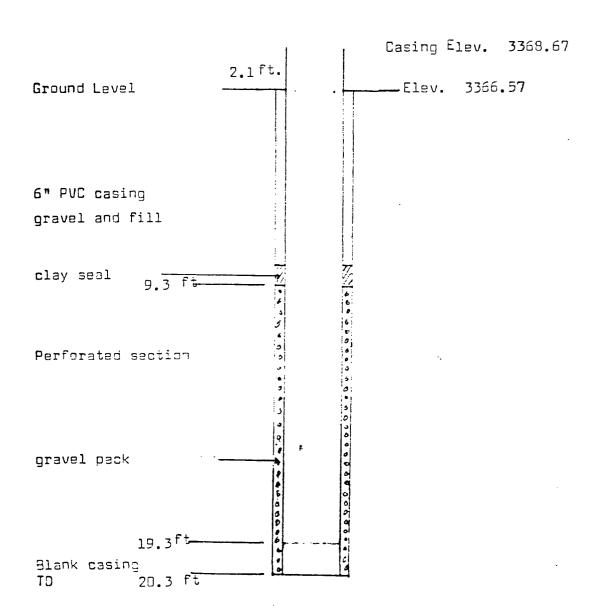
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Something and

Date	6/10/33

Well # AE

Company <u>Navajo Refinino</u>



Well :	# AF	Navajo R	₹efi	ining Compan	y - Monitor (nells	٤	
Drill:	ing Contracto	or - 0.	And	derson, El P	aso			
Rig -	Hollow stem	auger	3"	diameter	Split spoon	core	barrel	18"
Date _	6/10/83	10:30 a	am					

Depth Sample description

_	·		
$0 - 7\frac{1}{2}$	Fill – $27\frac{1}{2}$ ' too 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 ω med gravel – gasoline saturated	-	
$12\frac{1}{2} - 13$	gry gyp w med gravel – gasoline saturated	-5	
$13 - 13\frac{1}{2}$	Drill gyp & gravel	-	
$13\frac{1}{2} - 14$	Orill gyp		crs grave
$\frac{14 - 15\frac{1}{2}}{}$	gry gyp w med gravel 1.2' water. Hard gyp .3'	- 10-	71-10
$15\frac{1}{2} - 17\frac{1}{2}$	Drill gyp	•	Gasoline gypaines gypaines
	F	- 19 7 b	•
		15.	water w
		-	Hard Jup
		- F	TD
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· · · · · · · · · · · · · · · · · · ·	OIL CONCILIVATION DIVISION		
	SANIA FE		en en en en en en en en en en en en en e

SEN STANGE

Well # AF	Javajo R	Pafining Company	– Monitor ι	uells	
Orilling Contractor	- 0.	Anderson, El Pa	150		
Rig – Hollow stem a	snāei	9" diameter	Split spoon	core barrel	18"
Date <u>6/10/83</u>	<u>10:30</u> a	am .			

Depth Sample description

$0 - 7\frac{1}{2}$	Fill - $\Im 7\frac{1}{2}$ ' too gry clay (gyp) & pebbles
!	
$\frac{7\frac{1}{2}}{1}$ - 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 gyo w med gravel - gasoline saturated
$13 - 13\frac{1}{2}$	Drill gyp & gravel
$13\frac{1}{2} - 14$	Orill gyp
14 - 15½	gry gyp w med gravel 1.2' water. Hard gyp .3' /0
$15\frac{1}{2} - 17\frac{1}{2}$	Drill gyp
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	15
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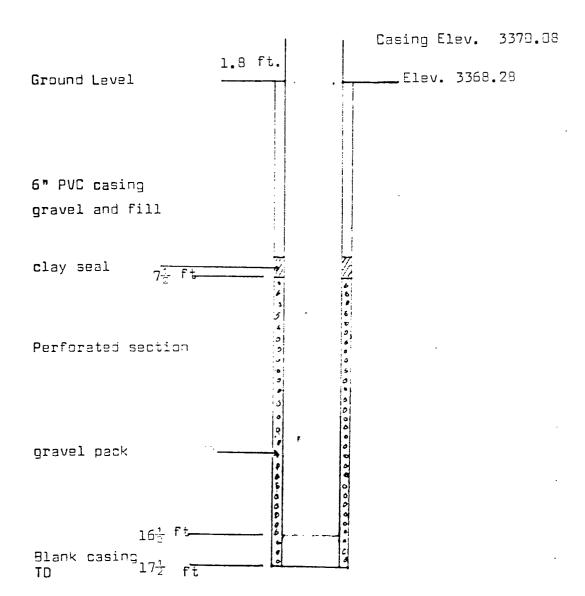
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Date	6/10/83
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Well # AF

Company <u>Mavajo Refining</u>



Sample description

Well # AG	Navajo Ro	afining Company	y – Monitor (Jells	
Orilling Contract	or - D.	Anderson, El Pa	360		
Rig - Hollow stem	anõe r	3" diameter	Sòlit sooon	core parral	19"
Date 6/10/83	<u>3:00</u> p	n m			

0 - 7½ gravel & clay	_
7½ - 9 gyp & clay - tight	- <u> </u>
9 - 10½ gyp & clay - slight odor. Tight clay last दं	
$10\frac{1}{2}$ – 12 gyp and gry clay no fluid	5.
12 - 13½ gyp & gry clay " "	- G
13½ – 15 gyp & gry clay " "	- gyp&cky
15 - 16½ gry clay & gyp " "	di dorgas
$16\frac{1}{2}$ – 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	
$21\frac{1}{2}$ - 22 Orill to TO	water
	20- Sawatan
	- 55 WALLAND
MAR 03 1088	-
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Sample description

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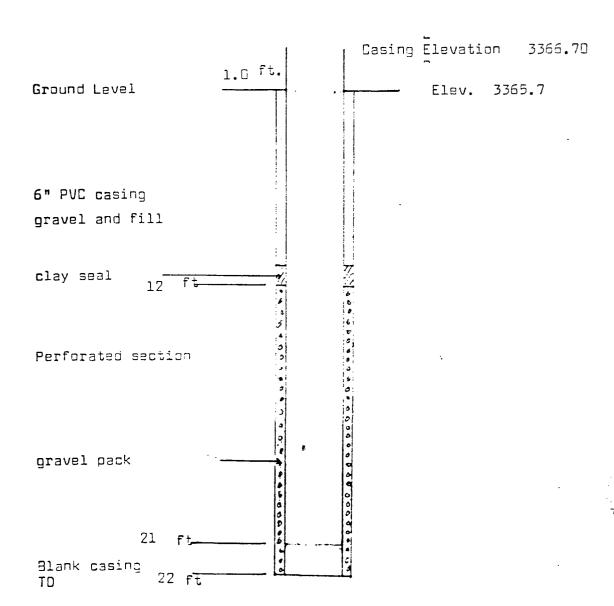
Well # AG	Navajo F	lefining (lompany – M	onito r (mells		
Or illing Contract	or - D.	Anderson	, El Paso				
Rig – Hollow stem	auger	9" diame	cer Spli	t spoon	core	barrel	18"
Date <u>6/10/83</u>	3:00	pm					

0		$7\frac{1}{2}$	gravel & clay	_
$7\frac{1}{2}$		9	gyp & clay - tight	_
9	-	101/2	gyp & clay – slight odor. Tight clay last 🖧	-
10-1		12	gyp and gry clay no fluid	سی
12		$13\frac{1}{2}$	gyp å gry clay " "	
13½	<u>-</u>	15	gyp & gry clay " "	
15		16 ½	gry clay & gyp " "	 10
$16\frac{1}{2}$	- -	18	gry clay & gyp .5'. gry sand l' sli wet at bottom	
18		191/2	gry sand 1.4' gyp & gry'clay .1' fluid in ss water	
19 <u>1</u>		20	drill gyp	- 15
20	_	21 1 /2	.6' sand wet .9' gyp & clay water	
$21\frac{1}{2}$	-	22	Orill to TO	-
				- 22
				_
			• • • • • • • • • • • • • • • • • • • •	_

Date	6/10/93

Well # AG

Company <u>Navajo Refinino</u>



Well # AH Navajo Refining Company - Monitor wells

Drilling Contractor - O. Anderson, El Paso

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

Date 6/11/83 7:30 am

Depth Sample description

0 - $4\frac{1}{2}$ Crs gravel fill & valley fill	
$4\frac{1}{2}$ - 5 gry clay & gyp	
5 – 6½ Pnk sdy clay & gravel	
6½ – 8 Crs gravel & gyp	gupt gavel
8 – 9½ gyp – dry – no gravel	
9½ – 11 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 å gry shale. 1.3' med gravel å 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
$18\frac{1}{2}$ - 20 lt red clay & gyp - ω_a ter	
$20 - 20\frac{1}{2}$ Orill	zc- Watel
$20\frac{1}{2}$ - 22 clay & gyp - tight - no fluid. Red shale on bottom	- 1.0 Bah
	_
	-

Well #_	АН	Navajo A	lefi	lning Company	· – Mor	nitor u	ells		
Drillir	ng Contracto	r - 0.	And	derson, El Pa	150				
Rig - F	Mollow stam	suger	g "	diameter	Split	spoon	core	barrel	18"
Date _	6/11/83	<u>7:30</u> ar	n						

Depth Sample description

Maria Committee

$0 - 4\frac{1}{2}$	Crs gravel fill & valley fill	
$4\frac{1}{2} - 5$	gry clay & gyp	
$5 - 6\frac{1}{2}$	Pnk sdy clay & gravel	
$6\frac{1}{2} - 8$	Crs gravel & gyp	-5
8 - 9½	gyp – dry – no gravel	
$9\frac{1}{2} - 11$	gyp & gry shale – no gravel	
11 - $12\frac{1}{2}$	gravel & gran. gyp & gry shale. Tr fluid odor gas	/2"=
$12\frac{1}{2} - 14$.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	
$18\frac{1}{2} - 20$	lt red clay & gyp - watar	
$20 - 20\frac{1}{2}$	Drill	2:5-
20½ - 22	clay ¾ gyp – tight – no fluid. Red shale on bottom	
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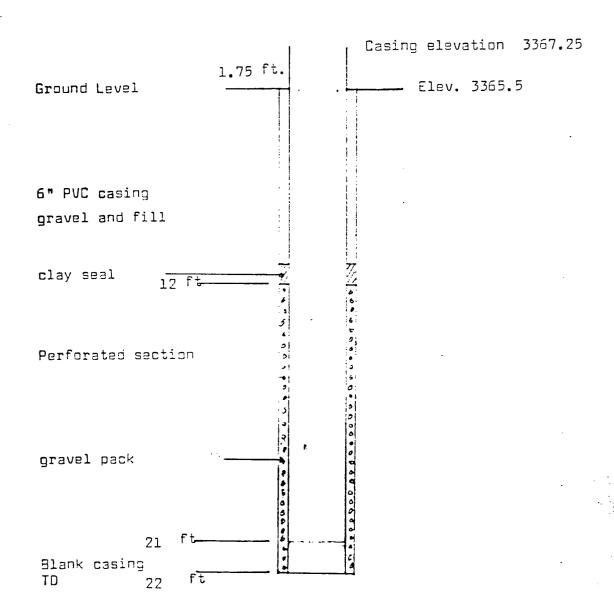
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Date	6/11/83	

Well # AH

Company <u>Navajo Refinino</u>



Well #_AINavajo	Refining Company	/ – Monitor (wells	
Dr illing Contractor - D.	Anderson, El Pa	aso		
Rig – Hollow stem auger	9" diameter	Split spoon	core barrel	18"
Date <u>6/11/83 10:35</u>	am		,	

Sample description Depth

0	-	9	Valley fill		
9	_	$10\frac{1}{2}$	clay & gyp – no fluid; no gravel		
101/2	_	12	l' clay & gyp5' gyp & gravel odor gas		
12	_	13 <u>1</u>	l' gyp & gravel – sli odor– damp5' hard dry gyp	5	
13½	-	15	.5' gyp & gravel - water ; l' red clay & gyp dry		
15	-	$15\frac{1}{2}$	Orill		al. d GIII
15½·	_	17	3' gyp & red clay w gravel – wtr. ई' dk gry clay & gyp w gravel	آ	064 4941 94 P
17 .	-	18	gyp w little gravel at top. Balance tight	الشريع الامرا	110 Grave
18 -	_	20	Orill * TO		rlater
			/-	5	444.50
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BAMALE FOR

dell # AI	Navajo R	efining Company	/ – Monitor w	Jells	
Orilling Contract	or - D.	Anderson, El Pa	350		
Rig — Hollow stem	suger	9" diameter	Split spoon	core barrel	13"
Date <u>6/11/83</u>	<u>10:35</u> a	ım			

Depth Sample description

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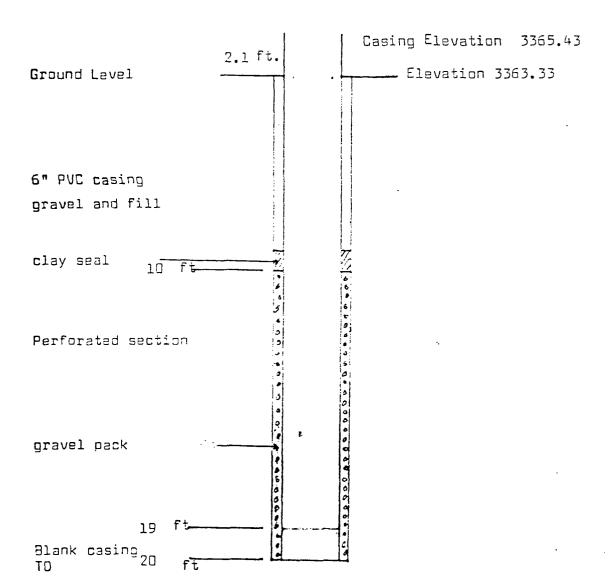
	- 9	Valley fill		
9 -	$-10\frac{1}{2}$	clay & gyp - no fluid; no gravel		
101 -	- 12	l' clay & gyp5' gyp & gravel odor gas .		
12 -	- 13 ¹ / ₂	l' gyp & gravel — sli odor— damp5' hard dry gyp		
$13\frac{1}{2}$ -	- 15	.5' gyp & gravel – water ; l' red clay & gyp dry	,,,,	
15 -	- 15½	Orill		۰
15½ -	- 17	है। gyp & rad clay w gravel – wtr. है। dk gry clay & gyp w gravel		
17 -	- 18	gyp w little gravel at top. Balance tight	7.4	ر فو ال
18 -	- 20	Drill F		nater
		/-	5-	<u>ئۆلۈلۈ</u>
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Date	5/11/83	
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Well # AI

Company <u>Navajo Refinina</u>



Well # R Wavajo R	Refining Company – Monitor wells
Orilling Contractor - D.	Anderson, El Paso
Rig – Hollow stem auger	8" diameter Split spoon core barrel 18
Date 6/7/83 10:15	am .

Depth Sample description

				_	
0	_	41/2	Red soil		
41/2	_	6	Red clay & gyp no porous zone		,
6	_	71/2	gyp & anhydrite — l¼': gyp ¼' w oil odor	-	
7 1 /2	_	834	gyp & anhy — oil stained — sli porosity	5	Redcky
834	_	9	drill	-	941
9	_	101	l' ail wet gyp - porous5' tight gyp oil odor	- 12	
101/2		12	.7' dk gry gyp & gravel wet - oil5' dk gry gyp & gravel sli wet: .3' gry & rd shly gyp	10	
12 -	•	131/2	1 red gravelly shale - water: .5' gry gyp water: .3' red anny, gravel dry odor: .4' rd hard limey:	sh 1	-water
131/2		15	.4' rd-gry shly gyp: .9' gravel w water: .2' red sha	· .	1
15	-	16 1	.7' red shale	15	
16 1		18	Red shale		Redshale
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				201	

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Well # R	Navajo A	Refi⊓i	ng Company	y – Mor	nitor u	nella		
Drilling Contracto	or - D.	Ander	son, El P	aso				
Rig – Hollow stem	auger	9" di	ameter	Split	spaan	core	barrel	18"
Date 6/7/83	10:15	am						

Depth Sample description

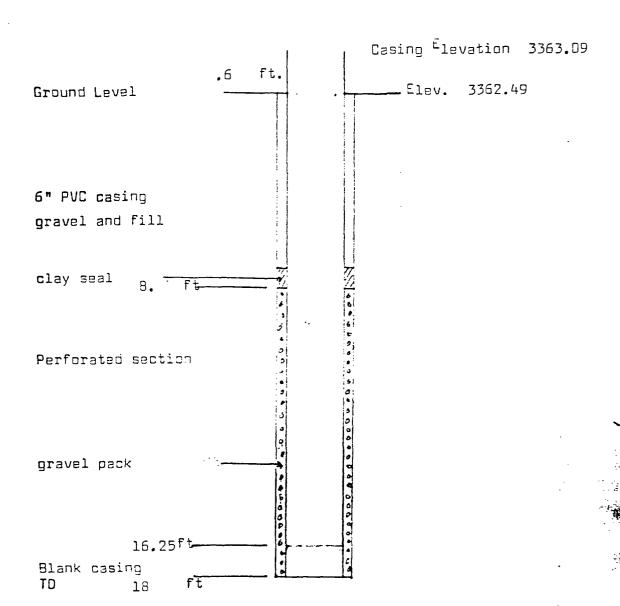
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$0 - 4\frac{1}{2}$ Red soil	_	
4½ – 6 Red clay & gyp no porous zone	-	1
$6 - 7\frac{1}{2}$ gyp & anhydrite $-1\frac{1}{4}$: gyp $\frac{1}{4}$! w oil odor	-	
$7\frac{1}{2}$ – $8\frac{3}{4}$ gyp & anhy – oil stained – sli porosity	-51	Roy Blild
$8\frac{3}{4}$ - 9 drill		29,50
9 – $10\frac{1}{2}$ l' ail wet gyp – porous5' tight gyp ail ador		ļ
$10\frac{1}{2}$ - 12 .7' dk gry gyp & gravel wet - oil5' dk gry gyp & gravel sli wet: .3' gry & rd shly gyp	10	
12 - $13\frac{1}{2}$ red gravelly shale - water: .5' gry gyp water: .3' red anny, gravel dry odor: .4' rd hard limey.	shl	-water
$13\frac{1}{2}$ – 15 .4' rd-gry shly gyp: .9' gravel w water: .2' red sh	ale	
15 - 16½ .7' red shale	15	***
$16\frac{1}{2}$ – 18 Red shale	_	Red Stale
	-	170
	204	
	-	
	-	
	-	- ক্ষান্ত ্র

Date	6/7/83

Well # _ R

Company <u>Navajo Refinino</u>



Well # s Navajo R	Refining Company	/ - Monitor w	ells	
Orilling Contractor - D.	Anderson, El Pa	150		
Rig – Hollow stem auger	9° diameter	Split spoon	core barrel	18"
Date <u>6/7/83 3:05</u>	pm			

Depth Sample description

$0 - 4\frac{1}{2}$ So	oil	
$4\frac{1}{2} - 6$ Lt	t rd sdy gyp dry .7' : dk gry clay .8'	1::0
6 - 7½ gy	y shl & gyp – oil stain & odor	المام المام
	k gy shly gyp ¼' ail stn & ador : l¼' lt gy shly gyp oil odor	AKATH CLEU
9 - 10½ 1t	t & dk gy shly anhy & gyp – granular – bldg oil	941-0:1
$10\frac{1}{2} - 12$ dr	rill	
$12 - 13\frac{1}{2}$ 1t	: & dk gy shly gyp, sli porous - oil & wtr /	
$13\frac{1}{2} - 15$ 1t	gy gravel l' w wtr : lt gy gyp w oil & wtr .5': at bottom tight.	o:1 & Water
15 - 16½ gr	avel, clay & gyp - water	B31 Water
16 1 - 19 Or	rill to TO	S- 20 July 1
		Na-er
		TD
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	The state of the s	ANTON THE

Sample description

Depth

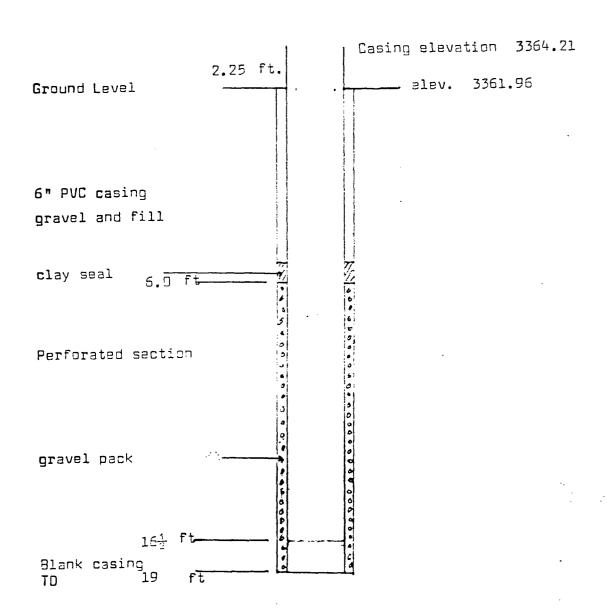
Well <u>#</u> S Navajo	Refining Compan	y – Monitor we	ells
Orilling Contractor - D	. Anderson, El P	aso	
Rig – Hollow stem auger	9" diameter	Split spoon o	core barrel 18"
Date <u>6/7/83</u> 3:05	pm		

$0 - 4\frac{1}{2} $ Soil	
$4\frac{1}{2}$ - 6 Lt rd sdy gyp dry .7' : dk gry clay .8'	-
$6 - 7\frac{1}{2}$ gy shl & gyp - oil stain & odor	
7½ - 9 dk gy shly gyp ½' ail stn & ador : 1½' lt gy shly gyp ail ador	E= 1K + 14 1 1 1
9 – $10\frac{1}{2}$ lt & dk gy shly anhy & gyp – granular – bldg oil	- gup.c.
$10\frac{1}{2} - 12$ drill	
12 - 13½ lt & dk gy shly gyp, sli porous - oil & wtr	10-10
$13\frac{1}{2}$ – 15 lt gy gravel l' w wtr : lt gy gyp w oil & wtr .5': at bottom tight.	OII & WA
15 – $16\frac{1}{2}$ gravel, clay & gyp – water	Gov water
$16\frac{1}{2}$ - 19 Drill to TD	15-30 June 15
	- ma-er
	TD ZC
	-
	- Later Car

Date <u>6/7/83</u>	
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Well # S

Company <u>Navajo Refinino</u>



Well #_T	Navajo A	Refining Company	y - Monitor	wells	
Orilling Contracto	or - D.	Anderson, El P	aso		
Rig - Hollow stem	auger	9" diameter	Split spoon	core barrel	18"
Date <u>6/8/83</u>	8:45 an	n .			

Depth Sample description

0 - 8	Red soil – clay		
8 - 10	Pnk clay w gravel – valley fill l' : .5' gyp	- 30	
$10 - 11\frac{1}{2}$	gyp ÷ .15': gry clay & gravel ÷ l. : .15' dk gy gyp oil odor		
$11\frac{1}{2} - 13$	$\frac{1}{4}$ ' dk gry gyp, oil odor, core bbl wet w oil : $1\frac{1}{4}$ ' gy gyp sli odor tight	5	
$13 - 13\frac{3}{4}$	lt gy gyp & gravel – water – core blocked 	5	
13 3 - 18	dk gy clay & gyp	000	elay, grand
18 - 19	Red clay	10-11	94P-011
			gyp-tight
		2000	wder
		15	
			91/2
			Red clay
		20-	TD
(s) s ²		-	
		-	
		-	
,	Color Color	-	

SAMPLE LIG

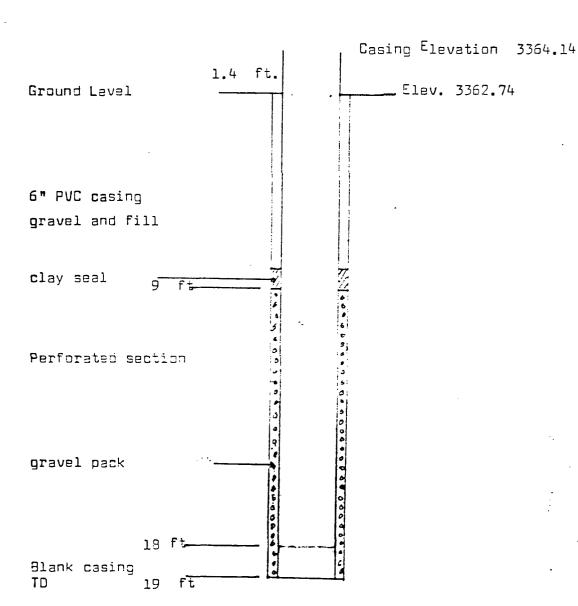
Well # T		Navajo f	₹efi	ning Company	/ – Mor	itor 4	ells		
Orilling Co	ntrasto	or - D.	And	erson, El Pa	3SO				
Rig - Holls	u stem	auger	3"	diameter	Split	spoon	core	barrel	18"
Date6/8/	/83	<u>8:45</u> ar	n						
Depth	Sample	descrip	tior	1					

D - 8	Red soil - clay	_		
8 - 10	Pnk clay w gravel – valley fill l' : .5' gyp	_		
$10 - 11\frac{1}{2}$	gyp ÷ .15': gry clay å gravel ÷ l. : .15' dk gy gyp oil odor		<i>3</i>	
11½ - 13	$rac{1}{4}$ ' dk gry gyp, oil odor, core bbl wet w oil : $1rac{1}{4}$ ' gy gyp sli odor tight	<u> </u>		
$13 - 13\frac{3}{4}$	lt gy gyp % gravel – water – core blocked 		16.35	
133 - 18	dk gy clay å gyp	_		o se ofia.
18 - 19	Red clay TO	10.		9110-6
				साहे होती-
			, , , o c ,	maer
		15.		
			~:	21/2
				Brieley
		_ 20·		TD
ولين المساردين الإرسال المراجع المارين والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع				The state of the s
	• • • • • • • • • • • • • • • • • • • •			
:				`. ••
			1	

Date 6/8/83

Well # T

Company <u>Mavajo Refining</u>



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	er of well	City	of	Artesia				
1				=	Street and	Number.	··						
				•	City				Artesia		State	N.M.	
	•								No				
			_ļ	_					of Section 17		_	_	
	_	١.	.			_			esler & Slo	CUMD	Licen	se No	
											State		
		:	£	ı									
			·										
(P	lat of 64	0 20	es)		Driming w	as comple	etea					-	19_03
Elevation	at top	of c	asing i	n fee	t above se	a level	<u> </u>	<u>۔ د</u>	Total der	oth of	well	968	
									Depth to wat				
Section 2									G STRATA	_	_		
W-	Depth	in F	'eet	Th	ickness in		D)escr	iption of Water	-Bearin	Formation	<u> </u>	
No	From	1	To		Feet								
1		T				lst fl	ow 890						
2	,	\top							l increase	800-02	0		
3		+				2	Ow Blac		I Increase	030-32			-
4		+											
		+-											·
5													
Section 3	3			_			D OF C	ASIN	1e		· · · · · · · · · · · · · · · · · · ·		
Dia. in.	Pound	<u> </u>	Threa	de	Top	Bottom	Feet		Type Shoe		Perfor	*tions	To
						20	101	+				├	
11 5/	3	\dashv					121	十					
8	 	\dashv			 		727	- -					
6	<u> </u>	_	-1		veen 6" x	9"	211	+				 	
	1	P	cker	betv	veen 6 x	1 0	<u></u>					<u> </u>	
Section 4	l .				RECOR	D OF MU	DDING A	ND	CEMENTING				
Depth	in Feet		Diame	ter	Tons	No. Sa	cks of			Math	ods Used		
From	To		Hole in	in.	Clay	Cen	nent			M.C.	ALS USER		
	<u> </u>												
								·					
	i .					1							
							TIME BE			_	_	Ø.	• ·
Section 5		;	Ė			PLUGG	SING RE		-			-	
Name of		_	•	tor_							cense No.		
Street ar	-		•				_						
Tons of					Tons of R	oughage t	used		Туз				
Plugging				ž.					Date Plu				
Plugging	approv	red b	A:		•				Cement Plug	2 Mele	placed as	follows	l:
_				-	Basin Sup	ervisor	N	Va.	Depth of Pi	ins	No. of	Sacks T	Joed
	FOR U	JSE C	F STAT	E	NGINEER O	NLY	7 -	\Box					
Date 1	Receive	d					_ -	\dashv					
	_							工					
	fro	ne da	riller	's 1	log 12-6-	62							
File No	ı		•			Use			Location	n No.	17.26.17	,210	

Depth is		Thickness	Color	Type of Material Encountered
From	To	in Feet	Color	Type of Material Encountered
_ 0	13		: : · ·	soil
13	30		1	rock
30	40			sand
40	100			gyp
100	121	·	21.00	sand
121	141		2.2	rock
141	205		•	shale
205	228			rock
228	698	1	2	Shale
698	768	ī		rock
768	830	-	•	shale _
830	856			rock
856	877			shale
877.	890			rock
890	920			water rock, hard
920	968			Rock-hard
				·
	_ <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.

327 all	Dwillen	

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	r of well		Albert I	. Woods,	
			- 1	City				rtesia State Net	Mexico
				Well was	drilled un	der Perm	it No	and :	s located in the
								Licens	_
				• •	-		·		
<u> </u>			-	City				State	
			- 1	Drilling w	as commo	enced		April 15.	1930
				Drilling w	as comple	ted		June 1.	1930
	Plat of 640		.	+ aberra co	n lovol	マチンご	Total de	pth of well 1233	į 1
	_							ter upon completic	
State wh	semer w	SIT IR SITET	10W 0					ter upon completi	/ /
Section 2	2				CIPAL WA	TER-BEAR	ING STRATA	·	· · · · · · · · · · · · · · · · · · ·
No.	Depth From	in Feet To	Thi	ickness in Feet		De	scription of Water	r-Bearing Formation	
1				:					· · · · · · · · · · · · · · · · · · ·
2									
3									
4									_
5							•		
Section 3	3 -	-				D OF CA	SING		
Dia	Pounds		ads		pth.	Feet	Type Shoe	Perfora	
in.	ft.	<u>1</u>	1	Тор	Bottom		ļ	From	То
123	50			0	1233	1233			
		-		 -	·				
:-	 			 	· · · · · ·	-			
Section 4	4	•		RECOR	D OF MUI	DING AN	ID CEMENTING	· <u></u>	
	h in Feet	1	neter in in.	Tons Clay	No. Sa			Methods Used	
From	To					-		<u>.</u>	
	+			 					
	+			 					
									···
Section !	_ 5				PLUGG	SING REC	ORD		
Name of	f Pluggir	g Contra	ctor_				·	License No_	
Street a	nd Numb	_ per				_ City		State	
Tons of	Clay use	d	-	_Tons of R	oughage u	13ed	Ту	pe of roughage	
Plugging	g method	used			;		Date Ph	gged	19
Plugging	g approve	ed by:		-		,	Cement Plu	gs were placed as	follows:
			-	Basin Sur		No	Depth of P	No. of :	Sacks Used
						- 7 - ├-	From .	ro -	
	- FOR U	SE OF STA	ATE E	ngineer o	NLY .		 		
Data	Received		-	-			+ · - +		
Date	ToeretAEC					- -	++		
1		4	1.			_			
Der'	i, ila Fest		r.cue:		201 . 				
File No	RA-	1090			Use		Locatio	n No. 17 26,16	.110

LOG OF WELL

Depth is		Thickness	Color	Type of Material Encountered		
rom	To	in Feet		-		
	15	26.65		soil		
	30	3345		EXP		
	30			ВУР		
	35	3395	* *	sand .		
	450	2 - 2		gyp and clay		
50	460			gyp rock		
50	490			sandy shale and gyp stratas		
90	690			sandy sable and gyp strates		
90	710			rock		
LO	740			red sand		
40	770			rock		
70	820			red sand		
20	840			rock lime		
40_	876		-	shale		
76	912			lime rock		
12	913	•		water rock		
13	958			lime rock		
58	960			water rock		
60	996			line rock		
96	1000			water rock		
000	1027			lime rock		
27	1032			water rock		
32	1058		· · · · · · · · · · · · · · · · · · ·	lime rock		
58	1060			water rock		
060	1118			lime rock		
	1132		 	water rock		
118	1218			lime rock		
132	1218			water rock		
220	1232			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.

 Wall	Delle	

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بغ.،

المناكبات المستداد

STYLE ENTRESPOSION

STATE ENGINEER OFFICE WELL RECORD

1		:
1 1112-40	أحلامتها والأسا	

Section	1,	GENERAL	INFORMATION

A) Owner of		d Jones ddress <u>F</u> 1	NU LO	7.7			Ow	ner's Well N	10	K1-6512
City and	State	ddress <u>F</u> () enia, Nit	88210							
'ell was drilled	l under Permit	No. 24	-6612		and i	is located	in the:			
F. 2	× 50 3	4 194 XXX S	L ¼ of Se	ction 9	To	wnship	<u>75</u> F	lange2	5°	N.M.P.N
b. Tract	No	of Map No		of	the	Lcrest	acre subo	livision		
		of Block No								
		d in								Y
d. X=		_ feet, Y=		feet,	, N.M. Co	ordinate S	System			Zone i
	·									Gran
		# P ! Ente								
ddress	<u>p</u>	0 Blox 437	·	Ante	nic, M	1 8821	0			·
tilling Began .	4-7-50	Comp	leted <u>4-2</u>	<u>-50</u>	Тура	tools	Cable	Size	of hole_	<u>7"</u> ir
levation of las	nd surface or	. <u> </u>		at '	well is	-راء ت	_ ft. Total dep	th of well_	<u> 325</u>	fr
ompleted well		thallow 🔲 ar					upon completi		225	
mpjereu wei	115 42 8				•		•	on or went		
Depth	in Feet	Thickness	T -	CIPAL WAT				Es	stimated '	Yield
From	To	in Feet		Description			ormation		ons per n	ninute)
273	303	30	3.	ine snad	and yo	ravel		-	<i>&</i>	
					·					
,										
			Sectio	n 3. RECOI	RD OF CA	ASING				
Diameter	Pounds	Threads	Depth	in Feet	L	ngth	Type of S	hoe		ations
(inches)	per foot	per in.	Тор	Bottom		feet)			From	70 202
<u>7"</u>	26	PE		302	3!	03	<i>PE</i>		273	303
		Sectio	n 4. RECO	RD OF MUI	DDING A	ND CEM	ENTING			<u>.</u>
Depth From	in Feet To	Hole Diameter	Saci		Cubic Fo		Met	hod of Plac	ement	
										
						-+				
		<u> </u>								
			Section	n 5. PLUGO	GING RE	CORD				
lugging Contri	actor					r 1	Depth	n Feet		bie Feed
ugging Metho						No.	Тор	Bottom		bic Feet Cement
ate Well Plugg lugging appro	*		·			1 2			\pm	
		State Engir	neer Repres	entative		3 4				
			FOR USF	OF STATE	ENGINE		Y			
ate Received	April 30	1, 1980							-	
	;-	•					FWL			
File No	RA-6612	·- <u>·</u>	·	Use	DOM.		Location No	CH Corne		1 19.20

Section 6 LOG OF HOLE

D	Section 6, LOG OF HOLE Depth in Feet Thickness Control of the section 6.								
From	To	Thickness in Feet	. Z Z 6 Z ' <u>C L</u>	Color and Type of Mat	erial Encountere	d			
0	10	10	Jop Soil		25 £ 5		i		
10	70	60	ς υρω π	•	3 <i>2 ° 5</i>				
70	190	120	Sypsim and o	clay aard	3 / 75				
190	240	50	Llay		3125				
240	270	30	(Lay and Sa	rd	2015	- ند- و	- 293		
270	290	20	tine (navel	and Sand	2074	10th F	- 3.7.		
290	325	35		clay Ked Ved					
 				<u>,, 1984</u>	<u> </u>	•			
					· · · · · · · · · · · · · · · · · · ·	•			
		·							
	<u> </u>								
		·							
						*80 NPR			
					ROSE	33	·····		
		Section	7. REMARKS AND ADD	DITIONAL INFORMAT	ION HE WOLL	30			
					STATE ENGINEER OF ROSWILL, N. N.	A 8			

[]

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

1.5.

WELL RECORD

ile 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 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.

•			· - · · · · ·	· · · • ·			•			
:	:	<u>, 1844 ji</u>	<u>.</u>				- ;· ·			
	: 1			reil Br						
	Street and Number Rt. 1 Box 30									
NW-	Post Office Artesia New Mexico									
	Well was drilled under Permit No.RA-2723 and									
	is located in the SE ½ SW ½ SE ½ of Section 9									
W2	Township 17 South Range 26 EASt									
	Drilling Contractor Blount & Coll									
	4400	x	Street and	Number	Rt. 1	Box 30				
	at of 640 A		Post Office Artesia New Mexico							
					illing was co	mpleted	uly 2	3 1951 , 19		
Elevation at to	p of casin	g in feet abov	e sea level	2 <i>2.75</i>			<i>-</i>			
State whether	well is she	llow or artesi	ian	Shallow						
Potal depth of	well	318	feet. Water lev	el upon com	pletion of w	vell_40		feet below land surface		
Sec. 2			PRINCIPAL							
								and rock		
No. 2, from			•							
No. 8, from		to	, Thic	kness in fee	t	Forz	nation			
No. 4, from		-	Thic					· ·		
No. 5, from		to	, Thic	kness in fee	t	, Fort	nation			
Sec. 3			RE	CORD OF C	CASING		·• · ·			
Diameter in Inches	Pounds per Foot	Threads per Inch	Name of Manufactures	Feet of Casing	Type of Shoe	Perfora From		Purpose		
7" OD			· -	240	-					
5" OD	Pe	forated		85				Liner		
					<u> </u>					
Sec. 4			RECORD OF	MUDDING .	AND CEME	NTING	:			
Diamete Hole in I		Number of i		Methods U	sed	•	Gravity Mud	Tons of Clay Used		
		-			·					
								·		
			<u>`</u>							
Sec. 5			PLUGGIN	G RECORD	OF OLD W	ELL				
	d in the	¥_	¥				Town	nship		
Range		Name of p	lugging contrac	tor						
Street and No	mber			Po	st Office					
Cons of clay	•		Tons of rough			Туре	of rough	age.		
							•	Well Supervisor?		
Cament plugs		d as follows:								
No. I was place	ed at				aber of mack	of cement	used			
		3	Zelet et en en en en en en en en en en en en en	Ieet_Nun	aber of sack		weed			
No. 3 was plac	ed at			feet. Nuz	nber of sack	s of cement	used	oti isaamoosii tii aa		
No. 4 was place	ed at							GAA 1,377.77 31.67		
No. 5 was plac					nber of sack					
-			i al Nimose i	(over)			تبلاك كا	والأوالية المطابعية الشداسة		
		, •	உரைவாக கூளி: - ஆக்கார் நி	. v s ave.	् का 😁 ५	5, 46°S				

24-2723

17, 26.9. 434

From (Depth in Feet)	To (Dopin in Front)	/Intokness in Fossy	Classification of Formation
			d Flunda reach GET o MOTTON
Address to the second	33 <i>5</i> 5 0,	وداف مع ومعتم والإمراب الرا	und ode to moude his sunterior of the
fotonic ti cat beken. O = 30	⁹⁹⁰⁰ ය. හරා මණය 33ම්රි	arthiten. The report :	ni distatta no vista ta si silità Sunface & clay
50 - 40	3315		gravel & gyp
10 - 164	£19, mas .	Ser to tank	clay & gyp
54 - 200		The street top topics	sand rock
00 - 225	·	1771 (1. 1911) (1. 1)	loose sand
25 - 260	- 30 .9 6	heady congress of	shells & clay
50 - 274	. <u>३</u> ०४।	. <u> </u>	clay
74 - 318	3037	, -	sandrock & clay
	-		
			·
			·
		: ,	

	- 	75.55	:
·	,		A STORY SERVE
:	· · · · · · · · · · · · · · · · · · ·	<u> </u>	
•			
		7,7 15 70 257 3	
			The material and the second
		,	
		- ;	
		:	
			-
<u> </u>		we have been	Control of the Contro
	:		

belief, the foregoing information is a true and correct record of the can be determined from all available records. SUBSCRIBED AND SWORN TO BEFORE ME this

Notary Public

My Commission Expires / Dug. 1952

Post Office attende new Mexico

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) Ourne	er of well	Br	uce Ha	rris			
				• •			x £42				
			. Id	City Artesia						e New	Mexico
			_ ,	Well was drilled under Permit No. RA-4196					96		located in the
1			-	<u> </u>	sw_4	SW	% of Sect	ion	Twp		Rge. 26E
					ing Contra	73.	02 Mer	Beaty chant		License	No.WD-62
				Street and City	l Number				Stat	New	Mexico
			- [City Deilling s	vas comm	annod .			Stat	·E	19.60
					as comple		May 12		***************************************		19 60
•	Plat of 640	•		_	_						
Elevation State wi	n at top (hether we	of casing is	n feet ow or	above se artesian	a level Shallow		∠T Depth	otal dej 1 to wa	pth of well ter upon co	mpletio	n 80
Section	2			PRIN	ICIPAL WA	TER-BEA	RING STR	ATA			
No.	Depth From	in Feet		kness in Feet		D	escription	of Water	r-Bearing For	mation	
1	280	292]	L2	Sand &	Grav	el				
2											
3											
4							_				
5											
Section	3				RECOR	D OF C	ASING				
Dia	Pounds	Three	ds	Depth			Type Shoe			Perforations	
in.	ft.	in		Top	Bottom				From		То
"OD	20	E Ro	und		294	294	Stee	<u> </u>	275		294
					-	<u> </u>	-				
	1	_			 		+ -				
Section	<u> </u>			RECOR	D OF MUI	DING A	ND CEME	NTING			
	h in Feet	Diame	eter	Tons	No. Sa						
From	To	Hole is		Clay	Cen	ent	Methods Used				
		811									
											· · ·
									-		
		!		J							
Section						SING RE			T :	- N-	
		g Contrac									
	-	used									19
	g approve								gs were plac		
_				Basin Sur		7	To. Prop	pth of P	Nug To	No. of S	acks Used
						7	2100			·	
FOR USE OF STATE PAGINGUR ONLY II 10181810											
Date	Date Received 301110 1031NION 3 317.										
[61 :8 W	8-	NUL DE	(The second			1			
01 4.01									.10		

LOG OF WELL

Depth in Feet		Thickness	Color	Type of Material Encountered				
From	To	in Feet	Color	3350 44				
0	2	2	Brown	Top Soil 3345				
2	25	23	Red	Clay 332 5				
25	30	5	Gray	Gravel				
30	40	10	Red	Clay				
40	70	30	Red	Sandy Clay 3480				
70	140	70	Red	Clay				
140	160	20	Brown	Sand 3/40				
160	200	40	Red	Clay 3/50				
200	240	40	Brown	Sand 3/10				
240	250	10	Red	Clay 3/00				
250	270	20	Brown	Sand 3086				
270	260	10	Red	Clay 3030				
280	292	12	Brown	Sand & Gravel				
292	294	2	Red	Clay 3046				
	T							
	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 well

Name of permitte			•••••	Permit No
	ee, <u>.</u>	t. D. Joy		······································
reet or P. O.,	· e i A le		City and State	rtesia. N. M.
Well location and	description:	The	well is located in	
1.3				
				ge26k; Elevation of top of
				ches; total depth, feet;
				d
and completed	Jan.	19 52	name of drilling contracto	r D. E. Gray
	; Ad	dress,arte	sie, Now Mex.	Driller's License No
Principal Water-b	earing Strata	:	1	a National Lawrence
Depth From	in Feet	Thickness	Description of	Water-bearing Permation
No. 1 260	295	35		
No. 2	200		SOUTH B	Clay streaks
No. 3				
No. 4	 		· -	
No. 5				
NO. 0	<u>[</u>			
Bu February	ft, per inc	h Tep B	167 ¹ 8*	e of Shoe Press To
			=	
7*0D			257'9"	
7*0D 5*ID		·····	25719* 6219*	232 to 295
				232 to 295
				232 to 295
				232 to 295
5"ID	tion replaces o			232 to 295
5*ID If above construct		ald well to be aban	62'9"	
5*ID If above construct		ald well to be aban	62'9"	4, 4. 4
5*ID If above construct	Towns	ald well to be aban	62'9" Idoned, give location:	and address of plugging contractor,
5*ID If above construct of Section	Towns	old well to be aban	62'9" Idoned, give location: Range : name	and address of plugging contractor,
5"ID If above construct of Section	Towns	old well to be aban	62'9" Idoned, give location:	and address of plugging contractor,
5*ID If above construct of Section	Towns	ald well to be aban	62'9" Idoned, give location: Range : name	and address of plugging contractor,
f"ID If above construct of Section date of plugging	Towns	ald well to be aban	62'9" Idoned, give location: Range : name	and address of plugging contractor,
f above construct of Section date of plugging	Towns	and well to be aban	doned, give location: Range ; name in the second contract of the s	and address of plugging contractor, 117 20 20 20 20 10 20 20 12 20 20 20 20 20 20 20 20 20 20 20 20 20
B*ID If above construct of Section date of plugging salve s reasurges we	Towns	and well to be aban	62'9" idoned, give location: Range ; name idoned; name idoned; name idoned; name idoned; name	and address of plugging contractor, 117 20 20 20 20 10 20 20 12 20 20 20 20 20 20 20 20 20 20 20 20 20
If above construct of Section date of plugging	Towns	and well to be aban	doned, give location: Range ; name in the second contract of the s	and address of plugging contractor, 177 200 200 200 200 200 200 200 200 200 2

PD-2253

17.26.15,121

Permit No ... infe-3568-

Dake of Receipt

5. Log of Well

			Name of permittee.
egilk in for			Description of Permation 3:45 Green and
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5 DUE 2	40	B Rec	A Gravel 3305
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	208	8 cla	3 <i>137</i> 3.55
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	276	28	3/69 / 4
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- 4 - 14	tergio in		12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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.

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.

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) Owner	of well	12.2 · _ 8u	llivan Den		
	Street and		, .			
					State	
1	•				and is loc	
					0 Twp. 178 Rge	
1 1 1 1 1					Slacumb License No.	
					-	
1 1 1 1					State	
					July 27,	
1 1 1 1	Drilling wa					19
(Plat of 640 acres)	_	_		ORIGINAL FLO	W 900 GPM	
Elevation at top of casing in feet	t above sea	level	33.10	Total de	pth of well 1007'	,
State whether well is shallow or	r artesian_			_Depth to wa	ter upon completion	
Section 2	PRINC	IPAL WA	TER-BEAR	ING STRATA	·	
No. Depth in Feet This	ckness in Feet		Des	scription of Water	r-Bearing Formation	
1						<i>D</i> -
2						
3						٠.
						
5		<u>.</u>				
						
Section 3		RECOR	D OF CA	SING		
Dia Pounds Threads in. ft. in	Top	Bottom	Feet	Type Shoe	Perforations From	To
8	0	783	783			
4	0	244	244			
Section 4	RECORD	OF MU	DING AN	ID CEMENTING		
Depth in Feet Diameter	Tons	No. Sa Cerr			Methods Used	
From To Hole in in.						
	 	 				
<u> </u>		 				
		 				
1 1	<u> </u>	<u> </u>				
Section 5		PLUGG	SING REC	ORD		
Name of Plugging Contractor					License No	
Street and Number			_ City		State	
Tons of Clay used	Tons of Ro	ughage v	med	Ту	pe of roughage	
Plugging method used				Date Plu	ugged	19
Plugging approved by:				Cement Plu	gs were placed as follow	78:
·			No	Depth of P	Tug No of South	
	Basin Supe	rvisor		From ?	No. of Sacks	Used
FOR USE OF STATE EX	GINEER ON	ILY	1 _			
		•			1 1 1 1 1	
Date Received	 	<u> </u>	- [. ~
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kria. 7 1100 il		 				

Depth in Feet		Thickness	Color	Type of Material Encountered			
From	To	in Feet	Color 3 3 4 0 6 4	Type of material Encountered			
0	10		3330	soil			
10	22	-	33/8	gyp rock			
22	34		3306	sand			
34	44		2276	boulders			
44	78		3262	rock			
78	120		3220	sand			
120	302		3032	abalo			
302	320		3020	gumbo			
320	340		3200	clay			
340	420			shale			
420	480			rock			
480	757			shale			
757	764			rock			
764	789			rock			
789	837			rock			
837	856			shale			
856	865			water rock			
865	891			rock			
891	956			shale			
956	968			rock			
968	988			shale			
988	1007			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.

	Well Driller
· · · · · · · · · · · · · · · · · · ·	

TT BECKLIN

Form WE-25 STATE LINGUISTER OFFICE

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File No.

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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			is located in	the	.w	¥X	B	of Secti	on14
···SW			Township	17 Sou	th	Range	26 5 8	st	
!			Drilling Con	tractor	D. N.	GIBY			
	<u> </u>		Street and N		1007				
	Plat of 640 a ata Well Ac				Artesi		Lex.		-
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Range Name of plugging contractor

Street and Number Post Office

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

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belief, the foregoing information is a true and correct record be determined from all available records.	of the well for which report is hereby made, insofar as can
SUBSCRIBED AND SWORN TO BEFORE ME this day of	Signed & D. M. Spay
Notary Public My Commission Expires	Street and Number / 0.0.7. Ma.
My Commission Expires	Post Office MITERIA MILIT

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.

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te whether	r well is si	hallow or arte	olan	St	ellow					
al depth	of well	150	"žec	STEEL SON S	upon som	pietron of w	ell 85		eet below land	i surface
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nge oct and N us of clay nent plugs	were plan		144: 700	es Alumai	Test North	ber of sacks	of Cement	DTELL		
s of clay	were place to the control of the con		144: 700	es Alumai	Test Num	ber of sacks ber of sacks	Tramed to	used and and the last	the manufactures of	
I was pla one spheiw 2 was pla 3 was pla	were placed at the conduction of at the conduction		144: 700	ismaly sq	Test Num	ber of sacks ber of sacks abr	of Cement to Italia recu	Dear bear Ta Uc en	d bestmarch	d ses
nge of clay nent plugs I was pla was pla	were placed at the conduction of at the conduction		144: 700	ismaly sq	Test Num	ber of sacks ber of sacks abr	of Cement to Italia recu	Dear bear Ta Uc en		d ses
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Pd- 2649

17. 26.12.411

LOG OF WELL To Chapity th (Fale) H / Thickender by Holes 175 -181 Part 5 - 116 -1 מוציביותואלי היים Soil ביים לאחדים בחודים בחודים בחודים בחודים בחודים בחודים בחודים בחודים בחודים בחודים בחודים nt fift Lin Mesico. or to the office of the Art Art Cleache & Gravel SEA Well Supervisor, Ho-Red Clay be subscribed and sworn des ther. This rep 00 3210 10 114 3086 <u>-- 90-</u> ----Red Clay 1581¹, to 0**51** 256 Mater Sand & Grave 150 3/50 Red Clay & Cheache W. Sarak 0 , Ξ Selection of the to the took before the end

belief, the foregoing information is a true and correct reco	., do solemnly swear that, to the best of my knowledge and ord 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	Blenod Mila J / Jes- 4
14they of August AD, 18 50	Position Drilling Contractor
Mrs. Johnnie Aeith Notary Public	Street and Number 1102 W. Merchant St.
My Commission Expires March 2, 1952	Post Office Artesia, New Mexico

FOITE	wn	

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.

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-	+		— (B)	Drilli	ing Contr	actor		Licer	nse No. 1:D-342		
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	1 1		Dril	ling w	as comm	enced		V. 2.3	19		
<u></u>			Dril	ling W	as comple	eted			19		
	(Plat of 640) acres)		_							
Elevati	on at top	of casing i	m feet abo	ve sea	a level	<u> </u>	Total de	epth of well ater upon comple			
State w	/hether w	ell is shall	low or art	esian_		<u>.2.7.</u>	Depth to w	ater upon comple	tion 130		
Section						ATER-BEA	RING STRATA				
No.	Depth From	in Feet To	Thicknes Feet	- 1	Description of Water-Bearing Formation						
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Section	1 5				PLUGE	GING REC	CORD				
Name (of Pluggi	ng Contrac	ctor					License No	· 		
	_	ber				_ City_		State			
Tons of	f Clay use	edbe	Ton	s of R	oughage 1	used	Т	ype of roughage_			
Pluggir	ng method	i used					Date Pl	lugged	19		
Pluggir	ng/approve	ed by:					Cement Pla	ugs were placed as	s follows:		
			Be	≤in Sur	pervisor	. 🕟	To. Depth of I	Plug No. o	C Secks Used		
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Section 6

LOG OF WELL

Depth	in Feet	Thickness	Colon	The of Material Property					
From	To	in Feet	Color	Type of Material Encountered					
0	10 32.90	10	white	Calechie and Gravel					
10	783, 22	6º	white	White Clay and Gravel					
78	ا معرفها	12	viite	Sand and Gravel					
	1 32/	25		Clay and Gravel					
125	3/60	15		Sand and Gravel					
140	3,45 155	15	Grey	Conclomerate					
155	150	5	נג זטעם	Pand and Gravel (water)					
160	175 175	15	Red	Clay					
				-					
				the state of the s					
	 								
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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

WATER WELL LOGS USED ON NORTH-SOUTH CROSS SECTION

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) Own	er of well.		Howard P	t. St	roup				
					i Number.								
1 .				_						State _	New	Mexic	co
	 				drilled un								
1					5W 1/4								
-	-		•		ing Contra					_		_	
1 1		ł		Street and	l Number								
										_ State _			
))	.		ł	Drilling v	was comm	enced			pril	20,			19_36
		Ļ			vas comple								
•	Plat of 640	•				2.2					21!	n	
	_			et above se									
State wh	ether we	ll is shau	0 ₩ 0:	or artesian_			Depin t	o Wa	iter up	on comp	etion_		
Section 2	!			PRIN	ICIPAL WA	TER-BEAR	ING STRAT	ΓA	·				
No.	Depth i	in Feet	Thi	ickness in Feet	1	De	scription of	Wate	r-Beari	ng Formati	ion		
			-										
1			├										
2			<u> </u>		ļ								
3			<u> </u>			•							-
4			<u> </u>		<u> </u>								
5		<u> </u>	<u> </u>										
Section 3	3		-		RECOR	D OF CAS	SING						
Dia	Pounds			Dep	<u>-</u>	Feet '	Type Si	hoe			foration		
in.	It.	in		Top	Bottom					From	工	To	5
121	 	<u> </u>		 	 	196	ļ		ـ		 		
10	ļ			 		30	<u> </u>		—		-		
				-	<u> </u>	 	 		 	· · · · · · · · · · · · · · · · · · ·	—		
	1			<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u> </u>				
Section 4	l	-		RECOR	D OF MUE	DING AN	ID CEMENT	TING					
	in Feet	Diame		Tons		icks of			Met	hods Used		·	
From	То	Hole in	ı in.	Clay	Cem	ient							
				 					· ·				
	<u> </u>			<u> </u>									
													
	<u>i</u>			<u> </u>	<u> </u>								
Section 5	i				PLUGE	SING REC	ORD						
		σ Contrac	tor_				- <u> </u>		I	icense N	ía		
		-											
				_Tons of R									
		used					Dat		-				
	approved								-	e placed a			
•	. 	,					Denth			, ,			
				Basin Sup	ervisor	No	From		To To	No.	of Sack	us Use	d
	FOR IIS	T OF STAT	יינע איי	NGINEER O	NLY	7							
	- CI. U.	E VA		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			1						
Date 3	Received.					_	1						
							1	 					
										•			-
File No.		RA-1380			Use	 		ocatio	n No.	<u> </u>	17.2	<u> 6.4.</u> :	331

J.		LOG OF WELL						
• .	14.00 . 14.0	The cors	e in t al En la Sala e E		Type of Material Encountered			
•	جر: ۱	32.7			Soi1			
		i ∓545			Gravel - water			
•					Red clay			
5	. 5	2142			Send			
	' 1	2101		_	Rock			
	. 2	2 4 2			Red clay			
	1.33	3/47			Red clay			
د 1.		¹			Red sand			
245	i .	3.42	:		White gyp			
		· · · · · · · · · · · · · · · · · · ·						
					· · · · · · · · · · · · · · · · · · ·			
·	1		-					
		-	:					
		1						

re or the light of ground grown to be a best of his knowledge and belief, the foregoing is a true and corect record of the above described and is

Buck	Bros.	
	Well Driller	

aria di di D

vame of	permittee,		B. Stophe	ns		:	.
or P. C)	Box 121		City and State	Artesia	New Mex	100
ell loca	tion and de	escription: The .E	hallow well	is located in :	SE	XSR_	•
		ection5_	•		:	•	
		vel,					
•					•		
		completion, _40		-			
	_	otember 14					-
102.1	M. rcher	1t; Address,	Artesia,	N. K.	; Driller's Lie	cense No. LiD-	62
incipal	Water-bear	ring Strata:		•			
	Depth i	r Foot To	Thickness	Descri	ption of Water-be	aring Formation	
1	70	80	10		sand	<u> </u>	
2	87	96	9		send		
3		·				•	
4							
5		-	***		-		
sing R	ecord:		•	•			
noter iches	Pennds per ft.	Threads Depth per inch Top	ef Castag or Liner Bottom	Fact of Cusing	Type of Shoe	Perters From	tion To
	14	welded 0	100	100	none	70	96
				:			
						:	
					•		
above	constructio	n replaces old we	l to be abandon	ed, give location	n:¥	,¼, .	···
Section	<u> </u>	Township	, Range	; p	ame and addr	ess of plugging	contrac
: .					· · · · · · · · · · · · · · · · · · ·		
	olugging	n was a see .	, 19	_; describe how	well was plugg	red:	
ate of p				• •			
ate of p							
ate of p							

FILED

OCT 26 1954

OFFICE .

GROUND WATER SUPERVISOR
ROSWELL, NEW MEXICO

17.71.5.404

RA-3717

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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.

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.

ate of Receipt		····		-	Permit No. RA	-1225
Name of permittee,	J. C. Col	Lemen		• •		i.
rest of P. ORt	1, Box 30;	7	. City and State	Artes	La, New V	ex1co
Well location and de	escription: The S	hallow wel	i is located in	NE		r
107 4 of 8		hallow or artesian)		3-1		
	•	Township				
casing above sea le	rvel, , <u>– – – – – – – – – – – – – – – – – –</u>	feet; diameter	of hole,	inches	; total depth, _	_100 fee
depth to water upon			•	_		
and completed	7-19	, 19 54 .; 11	me of drilling	contractor \$	illard B	ety
1102 Merchan	t; Address,	Artemia, 1	ler Mexic	Driller's	License No	D 62 -
Principal Water-bear	ring Strata:				•	- 140
Depth is From	rest	Thickness	Deec	ription of Wat	P-bearing Formst	•
a.1	70		Ç.	nd		
a. 2 	94	14		เกดี		
a. 3						
o. 4		,		·		
a. 5				·		
nameter Pounds (names per ft.	Threads Dopti	h of Costng or Lines p Bettoro		Type of Sh		rioration To
	- <u></u>					
					:	
			:			
	,					
				•		
If above construction	n replaces old w	all to be abandon	ed, give location	n:	-%.	4. '
of Section	Township	Range		name and a	dress of plugg	ing contracto
					·	
date of plugging			; describe how	r well was pl	ugged:	·
	24 A 14	ust To the second				T1 T)
					FIL	שונד
			•	1	JIIN 28	1954 .

Dopti. From	In Post 20	Thickness in fact	Description of Furnation
0_		3	Top Soil 2557
3	10	7	Cleachie 3340
10	26	16	Red Cley 322-
26	42	16	Yellow Clay 22/6
<u> 42 </u>	50	8	Red Clay 33/5
50	65	15	Red Bed FITE
65	70	5	Water Sand 3270
T O "	08	10	Red Clay
80	94	14	Water Sand 3200
94	100	6	Red Clay 25%
		 	
<u> </u>	-		
	 	-	
		-	
· · · · · · · · · · · · · · · · · · ·	 	 	
		4	
	 		
	 	-	
<u></u>			
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	 	1	
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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.

This form shall be executed, preferably typewritten, in triplicate and filed with the State Engineer's Office at Roswell, New Maxico, 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.

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) Owner of well Cecil C. Stendard

		1 '		nd Number_								
	~						State Nev					
						•	282and					
			-NE-	<u> </u>	<u> </u>	of Section	7Twp <u>17</u> 9	Rge265				
			(B) Dri	lling Contra	ctor_P'1	Lierd Bosty	Licens	e No				
[Street a	nd Number_	Box 38:	2 110	2 Merchent					
			City _A	rtesia			State _ <u>k</u> .c	ne liexico				
			Drilling	was comm	enced	August 28		19				
			Drilling	was comple	ted Se	tember 2		195				
evation		casing in	n feet above s	sea level	<u> </u>	Total dep	oth of well 125 ter upon completi					
ection 2						NG STRATA		<u>-</u> .				
No.	Depth in	To Thickness in Feet			Description of Water-Bearing Formation							
1	£9-	92	-\$-	F1	ne San	1						
2	105	1.3	72		ter Su	n d & Cravo l	<u>!</u>					
3												
4							•					
5												
				PECOD.	D OF CAS	INC						
ection 3	}				RECORD OF CASING Perforations							
Dia in.	Pounds ft.	Threa in	· .	Bottom Bottom	Feet	Type Shoe	From	To				
7 :33	17	1	1 0	125	125	collar	105	125				
		+										
		1										
ection 4	<u> </u>		RECC	ORD OF MUI	DDING AN	D CEMENTING						
	in Feet	Diame	ter Tons	No. Sa	cks of							
From	To ·	Hole in	in. Clay	Cem	nent	Methods Used						
	† 	+					· · · · · · · · · · · · · · · · · · ·					
		1	l l		1							
		╁										
ection 5				PLUGG	SING RECO	ORD						
		Contract	tor	PLUGG	SING RECO	ORD	License No.					
ame of	j		tor		Gity	ORD	License No.					
ame of	Plugging	r	tor		City							
ame of treet ar	Plugging	r			City	туј	State					
ame of treet ar ons of (Plugging ad Numbe	r			City	Ty Date Plu Cement Plug	State pe of roughage gged gs were placed as	19				
ame of treet ar ons of (Plugging nd Numbe Clay used method u	r		Roughage u	City	Typ Date Plu Cement Plu Depth of P	State pe of roughage gged gs were placed as	19				
ame of treet ar ons of (lugging	Plugging and Number Clay used a method used approved	sed by:	Tons of	Roughage u	Gty	Typ Date Plu Cement Plu Depth of P	pe of roughage gged gs were placed as	19				
ame of treet ar ons of (Plugging and Number Clay used a method used approved	sed by:	Tons of	Roughage u	Gty	Typ Date Plu Cement Plu Depth of P	pe of roughage gged gs were placed as	19				
ame of treet ar ons of (lugging lugging	Plugging and Number Clay used a method used approved	sed by:	Tons of	Roughage u	Gty	Typ Date Plu Cement Plu Depth of P	pe of roughage gged gs were placed as	19				
treet ar	Plugging Ind Number Clay used In method use approved FOR USE	by:	Tons of Pagin S RE ENGINEER AUG 311	Roughage u	Gty	Typ Date Plu Cement Plu Depth of P	pe of roughage gged gs were placed as	19 follows: Sacks Used				
ame of treet ar ons of (lugging lugging	Plugging Ind Number Clay used In method use approved FOR USE	by:	Tons of	Roughage u	Gty	Typ Date Plu Cement Plu Depth of P	pe of roughage gged gs were placed as	19 follows: Sacks Used				

Depth in Feet		Thickness	Color	Type of Material Encountere	d i
From	To	in Feet	Color	Type of Material Encountere	u 1
_ 0	2	. 2	Brown	Top Soil	3 <i>255</i>
2	9.2	-10	<u> </u>	Cleachie	3348
12	50	- 38	Red	Clay	z 2/0
50	60	10	Brown "	Sand, Showing of Water	2300
60	£3	20	Red	Clay	3290
20	- 92	12	Brown	Water Sand	3269
92	105	13	Red	Clay	১ বুজু র
105	1-3	18	Brown	Yater, Sand & Gravel	3237
1.73	125	2	Red	Clay	2235
	-				
					,
				·	
				,	
					
					
					•
				<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.

Well Deiller

مأغة المام الماله المستحدم

BUTTO THE CALLS

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) Own	er of well	N.	E.	Carrett					
					l Number								
	1 [LAS Veg	25,	State	New	Mexic	0
				-				No					
			.	_w%	_NW4	<u></u>	¾ o	of Section_9		Гwp	17_	_Rge	26
	-		\neg	(B) Drilli	ing Contra	actor		G. R. Dubl	in.	L	icense	. No	
					-								
	 		\dashv	City						State			
1 1	1 1			Drilling w	was comme	enced			Octo	ober 10	,		19_09_
	Plat of 640			_		7 :		Origin	al flo	ow: 57	6 GP	M.	-
	-	_						Total d					
State wb	iether we	ell is sha	llow o	r artesian.				Depth to w	ater u	pon com	pletio	<u>n</u>	
Section 2					ICIPAL WA	ATER-BEA	RIN	G STRATA					_
No.	Depth From	in Feet To	- Thi	ickness in Feet		Description of Water-Bearing Formation							
1			\top		lst	flow at	t 8f	80 ft.					
2		 	+					40 ft.					
3		 	+-		4.0 0	IION E.	<u> </u>	W.IL.					
4		 											
5		+	+-		 				· <u></u>				-
<u> </u>		<u> </u>			<u> </u>							·····	
Section 3	3				RECOR	D OF CA	ASIN	1G	- 	****	<u></u>		
Dia	ia Pounds Threads Dej				pth	Feet		Type Shoe			erforat		
in.	n.	i	in.	Top	Bottom	ottom				From	\Box	T	o.
6"	<u></u>			0	528	ļ	_		 				
	<u> </u>			<u> </u>	ļ	<u> </u>	_ _						
	<u> </u>	—↓—			<u> </u>		\bot						
	<u> </u>			<u> </u>		<u> </u>		 -					
Section 4	4			RECOR			ND	CEMENTING) .				
	h in Feet		neter in in.	Tons Clay		ecks of length			Met	thods Use	đ		
From	То	Hote	ш	Liay		Texts							
		-		 		\longrightarrow							
		$-\!\!\!\!+\!\!\!\!-\!\!\!\!-$		ļ		\longrightarrow							
				 		\longrightarrow							
	1			<u> </u>									
Section 5	5				PLUGE	SING REC	COP	RD					
		o Contra	ector						· · ·	License	No		
								т					
	-	used			···			Date P	_				
Plugging	-				,			Cement Pl					
· *=00	, -FF	J				Г	- -	Depth of		1			
-				Basin Sup	pervisor	N	Vo.	From	To	. No). of S	acks Us	ed
	200 11	05 cm				7	ヿ						·
l	FOR U	SE OF BL	ATE L	NGINEER O	NLY		一			 			
Date :	Receiv e d	ı				_ -	一			1			,
						-1 -	\dashv			 			
						-				1			
,,			2 ¥ 44			<u> </u>	_				, -		
File No	<u>, (8-3</u>	5) P	4 - 6	02	Use		<u>.</u>	Locat	ion No)	22. 12	8.9.11	er

Depth i		Thickness	Color	Type of Material Encountered
From	To	in Feet		1
0	5			Sandy loam 3355
. 5	8			Clay 3352
8	15			Gyp rock 2 345
15	21			Gyp rock 3339
21	29			Clay 333/
29	8			Clay 33/7
43	51			Gumbo . 3309
51	59			Sand 330/
59	89			Gumbo 327/
89	91			Gyp rock 2269
91	109			Gumbo 3 25)
109	120			Sand 324 5
120	156			Gumbo 3 2041
156	241			Gyp rock 5// e
241	246			Sand 3,/4
246	391			Guzabo 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	833			Gray lime rock
દ33_	852			Soft shale rock
852	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	

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	r of well	H. G	. Southworth				
1	. 1	1		Street and							
			·	City	Art	esia.		Sta	ate	New M	exico
							nit No. RA-768				
			-1				ron Bruning				
	.						881				
<u></u>	,								ate <u>Ne</u> v	w Mexi	co
1 .	.			Drilling w	vas cómme	enced	September 20				19.43
<u></u>	lat of 640			Drilling w	as comple	ted	November 5				. 19.43
			in fee	t above ser	a level		Total dep	oth of well	1_17	14	
State wh	ether we	ll is shall	low o	r artesian_	Artesi	an	Depth to wa	ter upon c	omplet	ion	-,
		A.	•				RING STRATA	-	•		- ·
Section 2			I my	ickness in	GIFAL WA				, 		
No	Prom	To To	Tin	Feet	ļ		escription of Water	r-Bearing Fo	rmation		·
1	!	<u> </u>			ļ	<u>,,, </u>					
2											
3					I						
4		ſ			1						
5			1				···-				
Section 3					RECOR	RD OF CA	SING				
Dia	Pounds			Dep		Feet	Type Shoe			ations	
in.	ft.	in		Тор	Bottom			From			To
13" 0.1	50	8		↓	 	80	 	set in o			
10 3/4	O.D 40	8		1	 	795	Drive)	with sle			
				↓		 	 	total le	ngth 8	75	
	<u> </u>			11	<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u> </u>	
Section 4							ND CEMENTING				
Depth From	in Feet To	Hole is		Tons Clay	No. Sar Cem	1	•	Methods	Used		
	1	13 3/4	4	540	1		pumped in by	y plug			
	1	1			1						
	+	1									
	1	1									
Section 5	<u> </u>				PLUGE	SING REC	ORD				
Name of	Pluggin	g Contrac	ctor_								
		oer				-					
Tons of	Clay use	d		_Tons of R	oughage v	ısed	Ту	pe of roug	hage		
	-	used						ugged			
Plugging	approve	d by:					Cement Plu	gs were pla	aced as	follow	s:
_	·			Basin Sup	pervisor	N	o. Depth of P	Plug	No. of	Sacks T	Used
	5-78 II	~~ ^ ~		NGINEER O	art V	7					
l	FOR US	E OL SIV	TE -m	IGINEER C	NLI		1				
Date :	Received	l				_	-				
	100000					<u> </u>				•	
ł						-	<u></u>				
1	_ •				::>						
File No.	RA-	-768			Use		Location	on No. 17.	26.9.	323	

				· · · · · · · · · · · · · · · · · · ·
Depth	in Feet	Thickness		
From	To	in Feet	Color	Type of Material Encountered
0	.5	33 6 0		soil
5	30	2335		sandy gyp & clay
30	80	3 - 2 -		sand & gyp
80	290	30°5		gyp & sandy clay
290	385	23.53		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
total	derth of	vell is 12	4 feet.	
			·	
	·			
	<u> </u>			
	 			
	<u> </u>			
	<u> </u>			

The undersigned hereby certifies that, to the best of his	knowledge and belief, the foregoing is a true and cor-
rect record of the above described well.	•

S	<u> </u>	Myron	Bruning	 	
		Well Dr	iller		

7



INSTRUCTIONS: This form-should be typewritten, and filed in the office of the State Engineer, P. O. Box 1079, Santa Fe, New Maxico, 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.

			7 Owner of w	.,	*****	rong &	ie XXX	T					
								ll, New Mexico					
	/	NE	Post Office.			-		•					
			.1					and					
			_1			-							
			-4	is located in the SV 14 MW 14 MV 15 of Section 16 Township 178 Range 26E									
54	(- -	SE	1										
			1	-		_							
ننا	44	<u> </u>	Street and	Number. 10	12 Sout	h Penn.	AY.0.						
Loci	Plat of 640 ate Well A	ecurately											
Drilling was	COLDMANCE		7 21.	19 50 Dr	lling was co	mpleted	anuar	7. 26, 1950					
			ve sea level		·								
					pletion of w			feet below land surface.					
Sec. 2			PRINCIPAL	WATER-BE	ARING STI	RATA	•						
No. 1, from_								ater Sand					
No. 2, from													
No. 8, from.			Thic			-							
			, Thic										
		10		ORD OF C		, FORE	#110H_,						
Sec. 3													
Dismeter in Inches	Pounds per Foo		Name of Manufacturer	Foot of.	Type of Shoe	Perfora From	ro ro	Purpose					
7*	24	8	Used	216'	Texas	None		Surface					
5 3/10	<u> 18 -</u>	8 .	need	30'	none	all		Liner					
<u> </u>		 		 									
	<u> </u>		22000 05 1	117701116	-								
<u></u>			RECORD OF A	AUDDING A	UND CEWE								
Sec. 4				Diameter of Number of Sacks Methods Used Specific Gravity Tons of Hole in Inches of Cement Methods Used of Mad Clay Used									
Diamet				Methods U	led.			Clay Used					
Diamet				Methods U	led			Clay Used					
Diamet				Methods U	led			Clay Used					
Diamet				Methods U	red			Clay Used					
Diamet			· ·	Methods U		et 1		Clay Used					
Biamet Hole in Sec. 5	Inches	of Cem	PLUGGING	is RECORD (OF OLD W	ef 1							
Diamet Hole in Sec. 5	Inches	of Cem	PLUGGING	is RECORD (OF OLD W	et 1	Kod						
Diamet Hole in Sec. 5 Vall is loca Range Street and 7	inches	of Cem	PLUGGING	FRECORD (OF OLD W Section	et 1	Town	nahip					
Diamet Hole in Sec. 5 Vall is loca Range Street and 7	inches	of Cem	PLUGGING	For Portings used	OF OLD W	et 1	Town	uship.					
Diamet Hole in Sec. 5 Vall is loca Range Street and 1 Tons of clay	inches	of Cem	PLUGGING Plugging contract Tone of roughs	For Portings used	OF OLD W	et 1	Town	nahip					
Diamet Hole in Sec. 5 Vall is loca Range Street and 7	inches ted in the	Name of	PLUGGING plugging contract Tons of roughs	For Portings used	OF OLD W. Section	ELL Type pproved by	Town	uship.					
Sec. 5 Vall is loca Range Street and ? Tons of clay No. 1 was plu	Inches ited in the Number	of Cem	PLUGGING A plugging contract Tone of roughs	For ward	OF OLD W. Section	ELL Type pproved by of coment of coment	Town	well Supervisor?					
Sec. 5 Vall is loca Range Street and ? Tons of clay No. 1 was plu	Inches In	of Cem	PLUGGING plugging contract Tons of roughs	Por used Wallet Num	OF OLD W. Section	ELL. Type pproved by a of coment:	Town of rough Artesian	Well Supervisor?					
Sec. 5 Well is loca Range Street and 2 Tons of clay Cement plug No. 1 was pl	Inches ited in the Number used s were pla aced at aced at	of Cem	PLUGGING A plugging contract Tone of roughs	RECORD ("% of ' "Y of ' "Poor Poor Poor Poor Poor Poor Poor Poor	OF OLD W Section	Type pproved by of coment	Town of rough Artesian	well Supervisor?					
Sec. 5 Vell is loca Range Street and ? Tons of clay No. 1 was pl: No. 2 was pl: No. 3 was pl:	inches ited in the Yumber used were pla aced at aced at aced at	Name of	PLUGGING Plugging contract Tone of rought	Feet. Num	OF OLD W. Section	ELL Type pproved by of cement of cement of cement	of rough	Well Supervisor?					

FROM (Depth in Feet)	TO (Depth is	r Feet)	THICKNESS IN FEET	CLASSIFICATION OF FO
0	4	5 <i>27</i> 6	4	Top Soil
4	18	3892	24	Sandstone
18	40	3340	22	Sandy clay
40	56	5324	16	Send and clay
56	60	3220	4	Gravel
60	118	3282	58	Sand
118	140	3240	22 ·	Sandy clay
140	148	3232	8	Red elay
148	170	32 /0	22	Sand and Grav
170	172	3203	2	Red clay
172 .	190	3,40	18	Conglomerate
190 .	. 200	2150	10	Sand and clay
200	216	2168	16	Sandstone
216	220	2160	4	Water sand
220	232	3,43	12	Conglomerate
				
				
				
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				+
				
 				
		+		
				
				
				+

belief, the foregoing information is a true and correct record be determined from all available records.	of the well for which report is hereby made, insofar as can
SUBSCRIBED AND SWORN TO BEFORE ME this	Signed.
day of, A.D., 19	Position_Driller
Notary Public	Street and Number 1012 So. Penn. Ave.
My Commission Expires	Post Office

I Conrad G.

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	r of well	City	of	Artesia					
	1									
	City									
					NoRA-215					
					of Section 17		-		_	
	(B) Drilling				on Wintheise R	er		License	• No	
							Ctot	- Ne	w Wext	
					ober 5					
					ober 22					
(Plat of 640 acres)	_	_								
Elevation at top of casing in f										
State whether well is shallow	or artesian	artesis	an		Depth to wa	ter up	on co	mpletic	n	
Section 2		CIPAL WA	TER-BE	ARIN	IG STRATA					i, -
No. Depth in Feet To	Thickness in Feet			Desc	ription of Water	r-Bearin	ng For	mation		·
1 933 939	6	lime								
943 948	5	lime '		<u>:</u>	<u> </u>					
3 981 1002	21	lime ir	creas	<u>a</u> :	t_995				**	
4 1035 1040	5	lime								
5 1040 1055 1055 1068	15	lime in								
1055 1068 Section 3			D OF C		_					
Dia Pounds Threads in. ft. in	Top	th Bottom	Feet	ī	Type Shoe	ļ	From	Perforat		Го
10 3/4 40.5 8	1		668	1	Larkin float	no	one			
13 3/8 48.0 8			174	7						
			947							
			<u> </u>							
Section 4	RECORE	OF MUE	DING	AND	CEMENTING					
Depth in Feet Diameter From To Hole in ir	1	No. Sa Cen	icks of nent			Meth	hods U	sed		
16		10	00		Halliburt	on'				
		Purpose	to ce	nen	t casing					
		T_{-}		•						
il			(
Section 5		PLUGG	SING RI	co	RD .					
Name of Plugging Contractor						I	icens	e No		
Street and Number										
Tons of Clay used										
Plugging method used					Date Plu	-	_	-		
Plugging approved by:					Cement Plu					
	Basin Supe	envisor	Γ	No.	Depth of P			No. of S		
			-7		210111					
For use of state	ENGINEER ON	VLY								
Date Received			1 +	_						
Date Deceived			─ ┃		 			<u> </u>		<u> </u>
	•		L		<u> </u>		H05,	HAT U	jett."	
rether y		10	با ج	_	 -		' :			211
File No. RA-2155		_Use	• •	1	Locatio	n No	17.	26,17	233	~ ii

From	To To	Thickness in Feet	Color	Type of Material Encountered
			<u> </u>	
	36	36	334-1	soil & caliche
36	50	14	3330	caliche
50	65	15	- 3/ <u>5</u>	sand
65	94	34	3296	sand & gyp
94	98	4	295	hard shell
98	175	85	3205	gyp & sand
175	200	25	3180	sand & gravel
200	205	5	3175	shell
205	234	29	3146	sand & gravel
234	260	26	3120	sand gyp
260	300	40	3e5 o	gyp & red rock
300	323	23	30£7	hard ford rock
323	350	27	3060	sandrock
350	400	50	2983	shale & gyp
400	580	180		clay
580	585	5		hard shell
585	609	. 24		red sand
609	685	76		red rock & shale
685	695	10		hard gyp shell
695	700	5		red shale
700	704	4		lime shell
704	715	11		gyp shell
715	720	5		
				shale
720	758	38		red sand & rock
792	810	18		hard shale
810	830	20		7ed sand
830	832	2		hard sand & shale
832	837	Б		lime shell
837	862	25		hard gray lime
862	875	13		hard gray lime
875	880	5.		water rock (lime)
880	882	2		soft sand
882	885	3		lime
885	895	10		hard gray lime
895	925	30		hard lime
925	933	8		lime
933	939	6		lime (water rock)
939	943	4		lime
943	948	5		increase in water (lime)
948	955	7		lime lime with shale streaks
955	981	26		TIME ATTH ONUTE BALAND
981	. 1002	21		white lime (increase in water)
1002	1010	8		hard white lime
010	1 035	25		white lime
	1040	5		lime (water rock)
1035				· · · · · · · · · · · · · · · · · · ·
	1055	15_		lime (increase in water at 1052)
035 1040 1055	1055	15 13		lime (increase in water at 1052) lime (increase in water at 1068)

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_		J. B.	Wallace		
						Artesia,			
-	 					it No. RA			
			Lot 4, B1	k. 4, 18	oselawn	Addn SET 17	Twp	17 Rge.	26
	+					Roe L. Newb			
			Street and I	_					
<u> </u>	 						State		
		.	Drilling wa	s comme	enced		April 15,		19.40
			☐ Drilling wa	s comple	ted		April 20,		19.40
•	Plat of 640 ac	-	_				*		
	_					Total der			
State w	hether well	is shallov	v or artesian			Depth to was	ter upon com	pletion	
Section	2		PRINC	IPAL WA	TER-BEAR	ING STRATA			-
No.	Depth in	To To	Thickness in Feet		Des	scription of Water	-Bearing <u>Fo</u> rm.	ation	
1					-				_
2								e miner der den gelennig grup gelen gesten sommen sommen.	
3									_
4								·	
5	 					<u>.</u>			
	<u> </u>		<u> </u>						
Section	3		·		D OF CAS	ING			
Dia	Pounds	Thread:		h Bottom	Feet	Type Shoe	From	erforations	Го.
in.	ft.		Top	Bottom			From	-	ro.
		 			105	 			
	-							_	
	 	 							
Section	4	_!	RECORD	OF MUE	DING AN	ID CEMENTING	<u> </u>		
	th in Feet	Diamete	er Tons	No. Sa	cks of		20-11-1-71		
From		Hole in	in. Clay	Cem	ent		Methods Use	d	
	1	T		T					
Section	5			PLUGG	ING REC				
)r						
Street a	and Number	·			_ City		State		
	-			ughage u	sed	Туј			
	g method u						gged		
Pluggin	g approved	pa:				Cement Plus	gs were placed	d as follows:	:
			Basin Supe	rvisor	No	Prom 7	lug No	o. of Sacks U	sed
	FOR USE	OF STATE	engineer on	LY	7 -				
Date	Received								
Deve	Veces Aer -				-	 			
İ					-	1			
•					<u> </u>				
File N	RA-1749)	. 4	Use		Locatio	n No. 17.	26.17.400	i

Section 6

LOG OF WELL

Depth i		Thickness	Co.)	Type of Material Encountered
From	To	in Feet	Color	Type of material Encountered
0	1			Soil
1	17			Sand
17	23		·	Gravel
23	37			Pink clay
37	53			Gravel
53	105			Water, sand and gravel
				•
		1		_
		1		
		1		
		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.

Roe	Newberrry	
	Well Deiller	

ADDITIONAL WELL LOGS

أتنت

Phony 259

STATE ENGINEER OFFICE WELL RECORD

	₽ ,	
FIELD:	efick.	2.54

Section 1. GENERAL INFORMATION

) Owner of	well Le	e Dilbeck Idress 210	C4			Ov	rner's Well No	. <i>RA 6550</i>
Street or City and	Post Office Ad	idressAnte	esia. Neu	Mexico	88210			
ll was drilled	d under Permit	No/\d-05			and is located	in the:		£N.M.P.
a <u>SW</u>	_ ¾ <u>NE</u> _ ¥	- 4°	¼ of Se	ction	Township	<i>175</i> 1	Range <i>26</i> (£N.M.P.
b. Tract	No	of Map No.	 	of t	he			· · · · · · · · · · · · · · · · · · ·
Subdiv	vision, recorde	đ in			County.			
d. X=		_ feet, Y=		feet, !	N.M. Coordinate	System	•	Zone
tne		H & W Ens	ennni ses	· · · · · · · · · · · · · · · · · · ·				
Drilling C	PAR Roy A	427 Anta	ia NA	88210		License No.	711 - 45	16 .
lling Began .	8-1-79	Comp	leted <u> </u>	10-79	Type tools	Cable	Size o	of hole
vation of lar	nd surface or _			at w	vell is 3355	ft. Total dej	oth of well	125
 unleted wel	lis 🛵 s	hallow 🗆 a	rtesian.		Depth to water	unon complet	ion of well	50
pieces well	ه سعه ی							
Depth	in Feet	Sect Thickness			ER-BEARING ST		Fet	imated Yield
From	То	in Feet		Description o	of Water-Bearing F	ormation		ons per minute)
95	120	25	Wat	er Sard			10	
		2						
		L						· · · · · · · · · · · · · · · · · · ·
		,			D OF CASING	,	· · · · · · · · · · · · · · · · · · ·	
Diameter (inches)	Pounds per foot	Threads per in.	Depth Top	in Feet Bottom	Length (feet)	Type of S	Shoe	Perforations From To
7"	29 16	P/E		125	126	P/E		90 120
		 	· · · · · · · · · · · · · · · · · · ·			,,,		,- ,
	<u> </u>							
	 		7		DING AND CEM	ENTING		
Depth From	in Feet To	Hole Diameter	Sacl of M		Cubic Feet of Cement	Me	thod of Place	ement
		 	 					· · · · · · · · · · · · · · · · · · ·
	<u> </u>	<u> </u>	<u> </u>					
			Section	n 5. PLUGG	ING RECORD			
	actor					,		
	•				No.	Top	in Feet Bottom	Cubic Feet of Cement
dress								
dress gging Metho te Well Plug	od ged	· · · · · · · · · · · · · · · · · · ·					1	
dress gging Metho te Well Plug	od ged		· · · · · · · · · · · · · · · · · · ·					
eging Contri dress eging Metho te Well Plug eging appro	od ged ved by: 		: neer Repres		3 4			
dress gging Metho te Well Plug gging appro	od ged ved by: 				3 4	Y		
dress egging Metho te Well Plug egging appro	od ged ved by: 				3 4	Y FWI		FSL

		<u> </u>	Section 6. LOG OF HOLE
Depth From	in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	20	20	Jop Soil
20	60	40	Calicher-Clay
60	85	25	Fine Brown Sand
85	95	10	Coarse Sard
95	120	25	Water & Sand
120	125	5	Red Bed JD
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	-	-	
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	<u> </u>		
		-	
		1	
	-1 ac. -	Section	7. REMARKS AND ADDITIONAL INFORMATION
			

ENCH FER OFFICE

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- would be executed in triplicate, preferably typewritten, and submitted to repropriate district office of the State Engineer. Al ons, except Section 5, shall be answered as completely and accurately essible when any well is drilled, repaired or deepened. Then this form is used as a plugging record, only Section 1(a) and Section 5 n ed be completed.

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

Owner of well Street and Number Poet Offices Artesia, New Mexico Well was drilled under Permit No. 24-1440 is located in the ST N M M M MANUFACTURER CASING (Plat of 60 acres) (Plat	C. 1		efore a Notary			•	•			
Street and Number Post Office Artesia, New Next co Well was drilled under Permit No. 24-1346 is located in the ST N N N N N N N N N N N N N N N N N N	1 1	1 :		•		r				
Street and Number Post Office Artosia, Row Mexico Well was drilled under Permit No. 24-1340 is located in the ST N B N of Section 9 Township 1787 Renge 268. Drilling Contractor Roe L. Nowberry and V. P. Elack Street and Number (Pits of 660 acree) Drilling Contractor Roe L. Nowberry and V. P. Elack Street and Number Post Office Post Office Street and Number Post Office Post Offi							J Jack		· · · · · · · · · · · · · · · · · · ·	
Post Office	NW	\	NE							
Well was drilled under Permit No. Rate 1440 is located in the ST N N N N N N Section 9 Township 178/ Reage 258. Drilling Contractor EOP L. Newberry and V. P. Elack Street and Number Locate Well Accurately Port Office Street and Number Locate Well Accurately Port Office Street and Number Port Office Street and Number Drilling was completed February 26th 10 11 Drilling was completed February 26th 10 12 FRINCIPAL WATER-BEARING STRATA Thickness in feet , Formation 1. from to , Thickness in feet , Formation 2. from to , Thickness in feet , Formation 3. from to , Thickness in feet , Formation 3. from to , Thickness in feet , Formation 3. from to , Thickness in feet , Formation 3. from to , Thickness in feet , Formation 4. from to , Thickness in feet , Formation 5. from to , Thickness in feet , Formation 5. from to , Thickness in feet , Formation 6. from to , Thickness in feet , Formation 6. from to , Thickness in feet , Formation 7. Thickness in feet , Formation 8. RECORD OF CASING RECORD OF CASING RECORD OF CASING RECORD OF MUDDING AND CEMENTING PLIANTIES OF MUD TO SACKS OF MUDDING AND CEMENTING PLIANTIES OF MUD TO SACKS OF MUDDING AND CEMENTING PLIANTIES OF MUD TO SACKS OF MUDDING AND CEMENTING PLIANTIES OF MUD TO SACKS OF MUDDING AND CEMENTING PLIANTIES OF MUD TO SACKS OF MUDDING AND CEMENTING PLIANTIES OF MUD TO SACKS OF MUDDING AND CEMENTING PLIANTIES OF MUD TO SACKS OF MUD TO				Street a	ia numi	<i></i>				
is located in the ST M M M M Not Section 9 Township 178/ Renge 26E. Drilling Contractor Boe L. Newberry and T. P. Mack Street and Number (Plat of 640 across) Drotting Contractor Boe L. Newberry and T. P. Mack Street and Number Post Office Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Street and Number Post Office Post Off				Post Off	.ce		7916,	1440	,	·
District of 640 screen (Pits of 640 screen) Drilling Contractor (Pits of 640 screen) Drotte Well Accurately Poot Office Poot Office Poot Office				Well was	s drilled	under Perm	t No.			
District of 640 screen (Pits of 640 screen) Drilling Contractor (Pits of 640 screen) Drotte Well Accurately Poot Office Poot Office Poot Office		† <u>†-</u>	-11	is locate	d in the		XX		## H	of Section9
Plat of 640 serves) Coult Well Accurately Poet Office	S.W	 	-S.E	Townshi	ip	[9]	, Ran	E021		_ ·
Cpat of 60 acrow Locate Well Accurately Post Office										
Locate Well Accurately Pot Office Pot Office	<u> </u>		لنن	·· Street a	nd Numb	er	<u> </u>	<u> </u>	 	·
Section at top of casing in feet above aca level Shallow 370				Post Of	fice					
PRINCIPAL WATER-BEARING STRATA 1. 1, from to										th 19 41
DAMPITER OF NUMBER OF SACKS DIAMPITER OF OF NUMBER OF SACKS DIAMPITER OF NUMBER OF SACKS DIAMPITER OF NUMBER OF SACKS DIAMPITER OF NUMBER OF SACKS DIAMPITER OF NUMBER OF SACKS DIAMPITER OF NUMBER OF SACKS DIAMPITER OF NUMBER OF SACKS DIAMPITER OF NUMBER OF SACKS DIAMPITER OF OF SACKS DIAMPITE	-							•		
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Thickness in feet Formation 1. 1, from to Thickness in feet Formation 2. 2, from to Thickness in feet Formation 3. 3, from to Thickness in feet Formation 4. 4, from to Thickness in feet Formation 5. 5, from to Thickness in feet Formation 6. 3 RECORD OF CASING DIAMETER FOUNDS THREADS MANUFACTURER CASING SHOE FROM TO PURPOSE 122 10 106 106 FROM TO PURPOSE 123 10 106 Pipe with torcit, 6 silts per circle. 6. 4 RECORD OF MUDDING AND CEMENTING DIAMETER OF MUMBER OF SACKS METHODS USED OF MUD DIAMETER OF NUMBER OF SACKS METHODS USED OF MUD C. 5 PLUGGING RECORD OF OLD WELL C. 5 PLUGGING RECORD OF OLD WELL Township The Office The Original Supervised By Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised and comment used Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging supervised by Artesian Well Supervised Was plugging		#EI 79 PD-	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		•					
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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 Maxico, 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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I 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
	Position
Notary Public	Street and Number
My Commission Expires.	Post Office
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WELL RECORD		•		
xecuted in triplicate, preferably typewritten,	and	submitted	to	the
Alltime		1-4	-3	

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.

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					• • .			<u> </u>			
						•₹ •₹	20110 41	ID CELVENITING			
ection								ID CEMENTING			
Prom	th in Feet	_	Diame Hole in		Tons - Clay		icks of		Methods Use	ed :	
71011		-			-					· · · · · · · · · · · · · · · · · · ·	
						-				<u> </u>	
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	-	\dashv									
					<u>'</u>						
ection	5					PLUG	SING REC	ORD			
		ıg -C	Contract	tor			·		License	No	
							_ City				
										ge	
	g method									19	
-	g approve							•	zs were place		
	o -rr		- -								
-					Basin Sup	ervisor	No	- Depth of P	No No	o. of Sacks Used	
			<i>بر</i> ت	ΙŢ.	129 8514		7	 			
	FOR US		Ш	الأأن	IGINEER O			1			
Date	Received	30i.	770 A	BNIS	HATT EN	3 /	-	 			
Pare					3e3 DEC		_	+			
			~ ~	16	257 DEC	i	-		I		
	, .						<u> </u>				
File N	<u>. R A</u>	4	122			_Usel	Lan.	Locatio	n No. <u>/ 2</u>	610.110	

Drm-ok

Depth in Feet		Thickness	Color	Type of Material Encountered		
From	To	in Feet	Color	Type of material Encountered		
0	25	25		bed Class		
25	35	10		00-10		
	06	11		hed Flan		
9/	120	112		20-14		
150	230	7		10 66		
27	12/0	19		ped call		
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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

ts .

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 record, only Section 1A and Section 5 need be completed.

Section 1	- 					. Gates		
			-					
			•				State No	
ł							and	
							Twp. 175	_
	j		• •	_			Licer	ise No
			Street and					
			City				State	
1			_					
Elevation	-	res) casing in fee	et above sea	level	2250	Total de	pth of well 126	i3
Section 2		20 000000000000000000000000000000000000				LING STRATA		
Ī	Depth in	Feet Th	ickness in					
No	From	То	Feet		и	scription of water	r-Bearing Formatio	n.
1								
2								
3								
4								
				 				· · · · · · · · · · · · · · · · · · ·
5						- <u></u>		
Section 3	i		*	RECOR	D OF CA	SING		
Dia	Pounds	Threads	Dep	th	Feet	Type Shoe	h	rations
in.	ft.	in	Тор	Bottom		1,50 5250	From	То
121					452			
10					930		•	
10 11	ch comes	up about	15 feet i	n 123 ir	ch cas	ng no seal.		
		<u> </u>			<u> </u>			<u> </u>
Section 4			RECORD	OF MU	DDING A	ND CEMENTING		
	in Feet	Diameter	Tons	No. Sa	cks of			
From	To	Hole in in.	Clay	Cerr	nent		Methods Used	
-								
		·						
······································								
	1			1				
Section 5					SING REC			
							License No	
							State	
	-		_Tons of Ro	oughage u	used		pe of roughage_	
	method us		*				ıgged	
Plugging	approved	by:				Cement Plu	gs were placed a	s follows:
					N	o. Depth of P	Non	f Sacks Used
			Basin Supe	ervisor	-,	From	ro	
					a 1	1 1		
-	FOR USE	of state e	ngineer of	VLY	-			
-				TLY				
Date I		of state e		NLY	_			
Date I					_			

Section	0		OF WELL		
	pth in Feet	Thicks		Color	Type of Manager V
From	To	in Fe	et	Cotos	Type of Material Encountered
0	21	<u> </u>			soil and gyp
	4:	3			gravel
45	5.5	·			clay
55	60)			rock
60	75	<u>. </u>			White gumbo
75	94	1			white gumbo
94	118				white gumbo
118	139				war to Kumbo
139	159				white gumbo
			\dashv		gumbo
159	177		\dashv		gumbo
177	197		-		sand
197	217		\dashv		sand rock
217	239	' 			sand
239	276				sand
276	295		[sand shale
295	314				Sandy shale
314	334		_1		sand
334	353				rock
353	373		\neg		rock
373	393		+		
			\dashv		gumbo and rock caving
393	411		\dashv	***	gumbo
411	432		-		sand
432	452		-+		rock and sand
452	471		\dashv		rock and sand
471	491		_		red clay
491	512				sand
512	531				sand
531	552		T		gumbo
552	572		\exists		gumbo
572	586		1		clay and typ rock
586	645		Τ	i	sand
645	664				clay
664	685	 	+-		clay
685	705		1		sand
705	720	 	+-		sand
		 	+-		
720	740	 	╁		sand rock
740	759	<u> </u>	╀		sand rock
759	779				sand rock
779	799	<u> </u>	1_		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		T		hard rock
928	947	t	T		hard rock
928	969		+		sand 4 or rock 17
			+		hard rock
969	990	1	+-		
990	1010	+	+-		hard rock
1010	1067	 	+-		hard rock
1067	1086		+-		rough rock
1086	1106	ļ <u>.</u>	+-		first flow
1106	1124	<u> </u>	1		rock
1124	1143		1_		limerock
1143	1160		1_		limerock
1160	1184		1		limerock
1184	1202		П		limerock rough streaks
1202	1222		Т		limerock rough streaks
1222	1242	<u> </u>	1		limerock rough streaks
1242	1263		٠		limerock tough atreaks

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

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.

			一,'	(A) Owne	er of well_		<i>D. D.</i> 341		
1		İ			Number_				
1 1	, ,								New Mexico
									is located in the
	1		1_	8W 1/4	SE 14	%	of Section	10 Twp 17	Rge. 26
			-17						se No
1				• •	Number				
			1 -					State	
									19_37
1									
	lat of 640	acres)	i	Orilling w	as comple	ted		,	19_37_
			n feet	ahove ser	a level	2000	Total der	oth of well 210	0 <u>ft.</u>
								ter upon complet	
State wn	etner we	II 12 SHarr	JM OF	ar (corar-			Thehm to the	ter apon compac.	
Section 2	3			PRIN	CIPAL WA	TER-BEAR	ING STRATA		
T	Depth :	in Feet	Thic	kness in		De	erription of Water	-Bearing Formation	n
No.	From	To	:	Feet	i		haryware or		•
1		18'	1st	flow			- to 1	·	
 -								······································	
2		36 to 4	0 21	nd flow					
3			<u> </u>						
4					i				
5									
-			<u></u>				-		
Section 3	3				RECOR	D OF CAS	ing		
Dia	Pounds	Threa	ıds	Deg		Feet	Type Shoe		retions
in.	n.	in		Тор	Bottom		-7,50	From	To
			-						
	 		\neg						
	!			<u></u>			·····		
Section 4	4			RECOR	D OF MUD	DING AN	D CEMENTING		
Depth	in Feet	Diame	eter	Tons		cks of		Methods Used	
From	To	Hole in	ı in.	Clay	Cem	ent		menion care	
	1	7			7				
	1				٠, -				
	+	+		·				····	
	- 	+							
	<u> </u>			<u></u>	<u>- </u>				
Section 5	5				PLUGE	SING REC	ORD		
		- Contrac	-4		• -			License No	
								State	
						ised		pe of roughage_	
		used						igged	
Plugging	g approve	ed by:			•	<u>.</u>	Cement Plu	gs were placed as	s follows:
					<u>-</u>		Depth of F	lug	22
	· · · · ·	•-		Basin Sur	pervisor	No	From	ro No. o	f Sacks Used
<u> </u>		SE OF STA	···= E.V.	TOTAL C	***** V	7	7.		
		SE OF STA			WLI		1		
Date	Received			•			+		
	Veceived	:			•	- -			
	17.41		 -			- _			
	n in Fee:	12 				<u> </u>			•
		BA-1300						n No. 17.26	

Feet	Thickness	Color	Type of Material Encountered
To	in Feet	2243 E Z	Approx manage automitted
23		5217	Gypsum rock
25		3 <i>3/5</i> 7	Water sand .
36		2204	Send and gravel
- 40		. 2200	Gravel (water)
43		3 29 <i>7</i> .	Water sand
48 .		2 <i>29</i> 2	White clay
55		3234	White clay
70		3270	Water sand
76		3734	White clay
80		3210	8and
90		2250	White clay
125		F 215	White clay
132		3228	Sand rock
145		3175	White clay
150	٠	3/90	Sand
157	7.5	3/53	Sand rock
175		I/6£	Water sand
195		3,45	White clay
206		3/24/	Sand rock
210			Water sand
			,
	70 23 25 36 40 43 48 55 70 76 80 90 125 132 145 150 157 175 195 206	To in Feet 23 25 36 40 43 48 55 70 76 80 90 125 132 145 150 157 175 195 206 210	To in Feet , Color 22/3 23 22/7 25 25 22/7 26 22/7 27 25 22/7 28 22/7 28 22/7 40 22/00 43 22/0 48 22/7

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.

R & R Drilling Co.
Well Driller

1

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- • • •		مدينر، ١٠١٠) لــ		1217
,	•	Bred by		e e e e e e e e e e e e e e e e e e e
	•	, GH-	· · · - ·	, , , , , , , , , , , , , , , , , , ,
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		<u>.</u>		
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to organize em local a como o local organização en en em meso o como estados en tornos como o organização estados en em em estados en tornos como ATOMES (ATO RELEGIO) EN EXECUTA EN EXPERIMENTO ELLO (CO) 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 I	D/ANALYTICAL RESUI	ZTS
1		11184	103184	103184
		1330	1432	1240
		Well 28	Well 45	Well 46
	Benzene	(0.005 / 1.		
	Toluene	<0.005 mg/1	<0.005 mg/l	<0.005 mg/l
3	Ethylbenzene	<0.005 mg/l	$\langle 0.005 \text{ mg/l} \rangle$	<0.005 mg/1
	Xylenes	<0.005 mg/1	$\langle 0.005 \text{ mg/l} \rangle$	<0.005 mg/1
نظا	Aylenes	<0.005 mg/l	<0.005 mg/1	<0.005 mg/1
. <u>A</u>		103184	103184	
		1520	1550	
_		Well 47	Fire Pond	
	Benzene	<0.005 mg/l	/0 005 ma/1	
	Toluene	<0.005 mg/1	<0.005 mg/l <0.005 mg/l	
	Ethylbenzene	<0.005 mg/1	<0.005 mg/1 <0.005 mg/1	
à	Xylenes	<0.005 mg/1		
	•	(0000) 116/1	<0.005 mg/1	
		Well 3	Well 5	Well 12
T	NO - ee N	20 01 × 11		
نگ	NO 3 as N	<0.01 mg/1	<0.01 mg/l	<0.01 mg/1
	NH 4 CN	1.16 mg/1	2.5 mg/1	0.25 mg/l
T	Benzene	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
	Toluene	<0.005 mg/1	<0.005 mg/1	<0.005 mg/1
Legen 1	Xylenes	<0.005 mg/1 <0.005 mg/1	<0.005 mg/1	<0.005 mg/1
J. J.	Ethylbenzene	<0.005 mg/1 <0.005 mg/1	<0.005 mg/1	<0.005 mg/l
		(0•00) шg/I	<0.005 mg/1	<0.005 mg/l
		Well 13	Pond 1	Pond 3
1	NO 3 as N	<0.01 mg/l	<0.01 mg/1	/O O1 ===/1
(A L)	NH 4	5.6 mg/l	10.6 mg/1	<0.01 mg/l
	CN T	0.09 mg/1	0.4 mg/l	13.87 mg/1
4	Benzene	0.254 mg/l	0.711 mg/1	0.2 mg/1
نا	Toluene	0.345 mg/1	0.588 mg/1	0.027 mg/1
	Xylenes	0.389 mg/l	0.500 mg/1 0.591 mg/1	<0.005 mg/1
j j	Ethylbenzene	<0.100 mg/1	0.240 mg/1	<0.005 mg/1
1			0 4 2 4 0 mg/ I	<0.005 mg/1

ADDRESS Box 526
CITY Artesia, NM 88210
ATTENTION Ed Kinney
NINVOICE NO. 104223

K. NMey

REPORT OF 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 "/">mg/liter "/"	180
Navajo Well #1	Acidity 179 Alkalinity, "P" (As CaCO ₃) < 1	
,	Barium 0.1 Biochemical Oxygen Demand 44	
	Cadmium 0.05 Chemical Oxygen Demand 145	•
V	Chloride 8313 5800 Chromium 0.002	
	Chromium 6+ < 0.01 Copper 0.001 Fluoride 0.9	? ·
,69	Hardness (as CaCO ₃) 5760 Iron -0.05	
	Lead 0.006 Magnesium 850	-
	Nickel 0.02 pH Units 7.8	
	Phenols 0.015 Alkalinity, "M" 700 Solids, Total Dissolved 19700	20
	Sulfate 4920 Sulfide 0.21	
	Zinc < 0.1	
Sample Analysis by: B. Date and Time of Analys	.P. sis: BOD ₅ - 4/24/81 @ 1600 hrs.	
pH: 4/30/81 @ 1400 hrs Method of Analysis: BO	s.	
pH: electrode	5	



4/30/81

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

CUSTOMER
ADDRESS
CITY
ATTENTION
NVOICE NO

Navajo Refining Comprawer 159
Artesia, NM 88210
Ed Kinney
104223



SAMPLES	RECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.O. # 200	30		
TYPE OF A	ANALYSIS Water			•	
	Sample Identification	Type of Analysis	mg/liter	11/21/80	16/3
:	Navajo Well # 3	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand	32 < 1.0 < 0.1 40 0.009 73		Andrewson and the special spec
		Chloride Chromium Chromium 6+ Copper Fluoride Hardness (as CaCO ₃) Iron Lead	2652 < 0.001 < 0.01 < 0.001 1.6 2760 0.01 < 0.001	2200	3.2
		Magnesium Nickel pH Units Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	250 < 0.01 7.4 < 0.001 356 7730 2720 0.10 < 0.1	7640	677

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

CUST ONER **ADDRESS** CITY

Navajo Refining Cor.

Drawer 159

Artesia, NM 88210

Ed Kinney ATTENTION 104223 IVOICE NO.

SAMPLES RECEIVED

4/24/81

CUSTOMER ORDER NUMBER

P.O. # 20030

TYPE OF ANALYSIS

1.

Water

Sample Identification	Type of <u>Analysis</u>	mg/liter	1/21/20	10/3/-
Navajo Well # 5	Acidity	36		
	Alkalinity, "P" (as CaCO ₃)	< 1.0		j
	Barium	0.1		
	Biochemical Oxygen Demand	24		
	Cadmi um	0.05		İ
	Chemical Oxygen Demand	176	_	
•	Chloride	7089	8600	4163
/	Chromium	0.002		į
رخبا	Chromium 6+	< 0.01		İ
	Copper	0.001		
·	Fluoride	0.44	0.96	p.4:
	Hardness (as CaCO ₃)	4660		
	Iron	0.04		i
	Lead	0.007		
•	Magnesium	650		
	Nickel	< 0.01		
	pH Units	7.7		
	Pheno1s	< 0.001		
	Alkalinity, "M"	506		Į
•	Solids, Total Dissolved	16,800	21.100	7367
	Sulfate	4290		
	Sulfide	0.13	•	

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



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

< 0.1

*CUSTOMER **ADDRESS**

Navajo Refining Co.

Drawer 159

Artesia, NM 88210

Ed Kinney ATTENTION! INVOICE NO. 104223

CITY

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	36		
	Alkalinity, "P" (as CaCO ₃) Barium	< 1.0	,	1
	Biochemical Oxygen Demand	< 0.1 38		
•	Cadmium	0.04		
	Chemical Oxygen Demand	136		1
	Chloride	3570	3400	80:
•	Chromium	0.002		1
	Chromium 6+	< 0.01		
	Copper	0.004		1
,	Fluoride	0.3	0.92	0.4
,6 ⁴	Hardness (as CaCO ₃)	3160		1
, •	Iron	0.05]
	Lead	0.001		1
	Magnesium	370		
	Nickel	< 0.01		
	pH Units	8.0		
	Phenols	< 0.001		
	Alkalinity, "M"	596		
	Solids, Total Dissolved	14,200	21,500 2	28.03
	Sulfate	5600		
•	Sul fide	0.05	• •	1
•	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



Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 8 OF 13 PAGE

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



PE OF ANALYS	sis Water					
Ç ₂	mple		Tuna of			
	entification		Type of Analysis		mg/liter	11/21/80
· Na	vajo Well # 9		Acidity		36	, ,
	-		Alkalinity, "P" (as CaCO ₃)	<	1.0	
	•		Barium	<	0.1	
			Biochemical Oxygen Demand		36	
			Cadmium		0.01	
•			Chemical Oxygen Demand		88	2200
			Chloride Chromium		2703	2 200
			Chromium 6+	_	0.002	
			Copper		0.01 0.006	
		,	Fluoride		0.7	1.8
		,6	Hardness (as CaCO ₃)	•	3120	• -
		رس ا	Iron		0.01	
		•	Lead		0.001	
	-		Magnesium		370	
			Nickel	<	0.01	
			pH Units		7.7	
			Pheno1s	<	0.001	
			Alkalinity, "M"		322	_
		• ,	Solids, Total Dissolved		10,400	9820
			Sul fate		4160	
	•		Sulfide	_	0.03	
			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



APPROVED BY Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 9 OF 13 PAGE

Controls for Environmental Pollution, Inc.

P.O. Box 5351 • 1925 Rosina • Santa Fe, New Mexico 87502 _Telephone_505/982-9841_

ADDRESS Drawer 159
CITY Artesia, NM 88210
ATTENTION Ed Kinney
INVOICE NO 104223

REPORT OF ANALYSIS

SAMPLES RECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.O. # 2003	30
TYPE OF ANALYSIS Water		
Sample <u>Identification</u>	Type of Analysis	mg/liter 11/21/80 10/3/
Navajo Well # 12	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand Chloride	55 < 1.0 < 0.1 38 0.07 256 8058 6700 7300
	Chromium Chromium 6+ Copper Fluoride Hardness (as CaCO ₃) Iron Lead	0.002 < 0.01 0.002 0.9 8920 0.04 0.007
	Magnesium Nickel pH Units Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide	1330 0.02 7.6 *<0.001 545 28,900 29,000 29,000 11,500 0.05

* Data will follow on 5/6/81.

Sample Analysis by: BP

Date and Time of Analysis: BOD₅: 4/24/81 @ 1600 hrs.

Zinc

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

< 0.1

CUSTOMER
ADDRESS
CITY
ATTENTION
NVOICE NO

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



SAMPLES RECEIVED 4/24/81	CUSTOMER ORDER NUMBER P.O. # 200	30	
TYPE OF ANALYSIS Water			
Sample Identification	Type of Analysis	mg/liter /1/21/80	10/1/7:
Navajo Well # 13	Acidity Alkalinity, "P" (as CaCO ₃) Barium Biochemical Oxygen Demand Cadmium Chemical Oxygen Demand	11 < 1.0 0.1 22 0.002 48	
	Chloride Chromium Chromium 6+ Copper	357 350 0.002 < 0.01 0.001	123
,20	Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium Nickel pH Units Phenols	1.2 3.5 1570 0.02 0.003 79 < 0.01 7.4 < 0.001	1-47
	Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide	146 3200 <i>3060</i> 1810 0. 04	2521

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



Elmer D. Martinez, Director of Quality Assurance 4/30/81 PAGE 11 OF 13 PAGE

< 0.1

+CUSTOMER
ADDRESS
CITY
ATTENTION

VOIÇE NO.

Navajo Refining Cor Drawer 159 Artesia, NM 88210

Ed Kinney 104223 REPORT OF AMALYSIS

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
navajo navi " 10	Alkalinity, "P" (as CaCO ₃)	<	
•	Barium (as caco ₃)	~	
,	Biochemical Oxygen Demand		44
	Cadmium		0.002
	Chemical Oxygen Demand		152
	Chloride		1173
	Chromium		0.001
	Chromium 6+	<	0.01
	Copper	<	0.001
	Fluoride		0.44
.67	Hardness (as CaCO ₃)		1610
<i>1</i> Y	Iron	<	0.01
•	Lead		0.002
	Magnesium		140
	Nickel	~	0.01
	pH Units	_	7.7
	Phenols		0.016
	Alkalinity, "M"		425
•	Solids, Total Dissolved		4,770
	Sulfate		
•	Sulfide		1,890
	Zinc		0.10
•	LIIIC		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: ${\rm BOD}_5$ - 5 day incubation

pH:electrode



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

- CUSTOMER ADDRESS CITY

NOITHATT

IVOIÇE NO.

Navajo Refining Cor Drawer 159

Artesia, NM 88210

Ed Kinney 104223 REPORT OF AWALVSIS

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 Cnioride Chromium Chromium	<	17 1.0 0.1 42 0.03 88 4692 0.002 0.01
	Copper	<	0.001
	Fluoride Hardness (as CaCO ₃) Iron Lead Magnesium Nickel		0.3 4470 0.03 0.005 470 0.01
	pH Units Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	<	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



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

ADDRESS CITY

ATTENTION

IVOICE NO

77

Navajo Refining Cor Drawer 159 Artesia, NM 88210 Ed Kinney





NAVAJO REFINING CO.

SAMPLES RECEIVED 4/24/81

104223

CUSTOMER ORDER NUMBER

<u>P.O. # 20030</u>

TYPE OF ANALYSIS

Water

Windmill (Fig 4-9 Reriged)

Sample Identification	·	Type of Analysis	, .	mg/liter	10/3/-
Well Water		Acidity		13	
`		Alkalinity, "P" (as CaCO ₃)	<	ī	
1000		Barium	<	0.1	
Which w		Biochemical Oxygen Demand		3 8	
		Cadmium		0.002	
White		Chemical Oxygen Demand		88	
		Chloride	•	1632	1430
		Chromium		0.002	
		Chromium 6+	<	0.01	
	,	Copper		0.004	
·		Fluoride	•	0.25	6.37
		Hardness (as CaCO ₃)		2400	
		Iron		0.06	
	68	Lead		0.005	•
	0	Magnesium		310	
	U	Nickel	<	0.01	
		pH Units		7.8	
		Pheno1s		0.022	
		Alkalinity, "M"		205	
		Solids, Total Dissolved		6860	6/67
		Sulfate		2830	
		Sulfide		0.03	
•	•	Zinc		0.2	Į

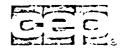
Sample Analysis by: BP

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 4/30/81 PAGE 1 OF 13 PAGE

customer Navajo Refining Co. any Drawer 159
CITY Artesia, NM 38210
Attention Ed Kinney 104223

SAMPLES RECEIVED	4/24/81	CUSTOMER ORDER	NUMBER P.O. #20030
TYPE OF ANALYSIS	Water		
Sampl Ident	e <u>ification</u>	Type of Analysis	mg/liter
Navaj	o Well #12	Phenols	< 0.001

4/30/81



PAGE OF PAGE Assurance

WATER QUALITY OF MONITOR WELLS IN REFINERY AREA



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/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	
بعد		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>
ar n		Well 13	Pond 1	Pond 3
	NO 3 as N NH 4 CN Benzene Toluene Xylenes	<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</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</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</pre>
: ٦	Ethylbenzene	<0.100 mg/l	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 IDENTI	FICATION/ANAL	YTICAL RESULTS
/MET		Fire Pond	Well 47	Well 28
		10/31/83	10/31/84	11/1/84
1Li		1550	1520	1330
I	Phenols	20.0 ug/1	33.0 ug/1	20.0 ug/1
L	C1	134.0 mg/1	122.0 mg/1	101.0 mg/l
	S 0	1800.0 mg/1	1400.0 mg/l	2150.0 mg/1
T	TDS	3664.0 mg/1	2728.0 mg/l	5192.0 mg/1
I	TSS	96.0 mg/l	13588.0 mg/1	720.0 mg/l
التبط	NO	2.18 mg/1	1.79 mg/1	1.63 mg/1
457	NH	1.0 mg/1	0.3 mg/l	0.3 mg/1
	Cr	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
	CN	<0.01 mg/1	<0.01 mg/l	<0.01 mg/1
		Well 45	Well 46	
		10/31/84	10/31/84	NOMINAL DETECTION
		1432	1240	LIMIT
	Phenols	16.0 ug/l	13.0 ug/1	0.01 ug/1
36	C1	495.0 mg/1	446.0 mg/l	1.0 mg/1
	\$0	1650.0 mg/1	2100.0 mg/1	1.0 mg/1
T	TDS	3836.0 mg/1	3988.0 mg/l	1.0 mg/1
4.	TSS	2004.0 mg/1	4084.0 mg/l	1.0 mg/1
	NO	0.10 mg/1	0.80 mg/1	0.1 mg/1
T	NН	11.6 mg/1	1.0 mg/1	0.1 mg/l
1.	Cr	<0.01 mg/1	<0.01 mg/1	0.01 mg/1
· •	CN	<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.

Labdratory Director

Geraghty &	Miller	Inc. 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 & Herb		-	-	-	-
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.

Colony Landfarm

eraghty &	Mill	er Inc. Upgradient Well		Downgradient Wells	
		31	32	33	34
рН		7.31	7.41	7.41	7.30
Spec Cond.		25544.5	2693	3590	2563
TOC mg/1	(*)	2489			
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	(*)				

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

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

QUALITY OF WATER IN EVAPORATION PONDS



ANALYTICAL LABORATORIES, INC.

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

DATE: 8 November 1984

1080, 1040

<u>l</u>			
ANALYTE	SAMPLE	ID/ANALYTICAL RESU	JLTS
F			
** .	11184	103184	103184
است	1330	1432	1240
OPC3	Well 28	Well 45	Well 46
1			
4 Benzene	<0.005 mg/1	<0.005 mg/l	<0.005 mg/l
Toluene	<0.005 mg/l	<0.005 mg/1	<0.005 mg/1
Ethylbenzene Xylenes	<0.005 mg/1	<0.005 mg/1	<0.005 mg/l
<u>l</u> Xylenes	<0.005 mg/l	<0.005 mg/l	<0.005 mg/1
		-	•
15 0	103184	103184	
	1520	1550	
	Well 47	Fire Pond	
Benzene	<0.005 mg/l	<0.005 mg/l	
Toluene	<0.005 mg/1	<0.005 mg/1	•
Ethylbenzene	<0.005 mg/1	<0.005 mg/1	
Xylenes	<0.005 mg/1	<0.005 mg/l	•
1		_	
	Well 3	Well 5	Well 12
T'	_		
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/l	0.25 mg/l
CN	<0.01 mg/1	<0.01 mg/1	<0.01 mg/1
Benzene	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l
Toluene	<0.005 mg/1	<0.005 mg/1	<0.005 mg/1
Xylenes	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l
Ethylbenzene	<0.005 mg/l	<0.005 mg/1	<0.005 mg/l
4		_	
	Well 13	Pond 1	Pond 3
NO 35 N	(0 01 mg/1	40.01.41	
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/1	13.87 mg/1
3 Benzene	0.09 mg/1	0.4 mg/1	0.2 mg/1
m - 1	0.254 mg/l	0.711 mg/1	0.027 mg/l
Xylenes	0.345 mg/1	0.588 mg/1	<0.005 mg/1
Echylbenzene	0.389 mg/1	0.591 mg/1	<0.005 mg/l
ben's roenzene	$\langle 0.100 \text{ mg/1} \rangle$	0.240 mg/l	<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 #1 floating film	NOMINAL DETECTION LIMIT
	NO 3 as N NH 4 CN		0.01 mg/1 0.1 mg/1 0.01 mg/1
I	Benzene Toluene Xylenes Etnylbenzene	0.617 mg/1 0.467 mg/1 0.463 mg/1 0.201 mg/1	0.005 mg/l 0.005 mg/l 0.005 mg/l

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

CITY ATTENTION HVOICE NO Navajo Refining Co. n Drawer 159

Artesia, NM 88210 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 West Pond	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 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 ADDRESS

Navajo Refining Con

Drawer 159

Artesia, NM 88210

ATTENTION IVOICE NO

CITY

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+	<	
	Copper	<	0.001
	Fluoride		7.4
	Hardness (as CaCO ₂)		1060
	Iron		0.06
40	Lead	<	0.001
	Magnesium		96
·	Nickel	<	0.01
	pH Units	_	7.4
	Phenols		0.027
	Alkalinity, "M"		349
•	Solids, Total Dissolved		4020
	Sulfate		1050
•	Sul fide		13.4
	Zinc	<	0.1
•	41116	~	Ual

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 3 OF 13 PAGE

USTOMER

ATTENTION VOICE NO

Navajo Refining Con

ADDRESS

CITY

Ed Kinney 104223

Drawer 159 Artesia, NM 88210

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 Chromium Chromium Chromium 6+	< < <	10 1 0.1 72 0.002 225 1632 0.1 0.01
	100	Copper Fluoride Hardness (as CaCO ₃) Iron Lead		0.002 5.8 1160 0.1 0.001
		Magnesium Nickel pH Units	<	7.2
		Phenols Alkalinity, "M" Solids, Total Dissolved Sulfate Sulfide Zinc	< <	214 4920 1520 0.36

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 4/30/81 PAGE 2 OF 13 PAGE

CERTIFIED MAIL RETURN RECEIPT REQUESTED

Mr. Joel M. Carson, Esq. Losee, Carson & Dickerson Attorneys at Law P.O. Drawer 239 Artesia, New Mexico 88211-0239

Discharge Plan for Navajo Re: Refinery

Dear Mr. Carson:

By letter dated August 21, 1984, the Oil Conservation Division granted an extension of time until October 3, 1984, to Navajo Refining Company for submission of a ground water discharge plan for its Artesia refinery. The letter also stated that if further extensions of time were to be needed, Navajo should submit a description of the work needing to be done to complete the discharge plan together with a time schedule for plan submission. On September 13, 1984, Geoscience Consultants, Ltd., consultants to Navajo, submitted a request for a further extension of time together with a description of proposed work and a timetable for submission of discharge elements to OCD for review. Following a meeting on September 17, between OCD, Navajo officials, their attorney and consultant, a slightly revised work schedule was submitted to OCD on September 18.

Pursuant to Section 3-106.A. of the New Mexico Water Quality Control Commission Regulations and for good cause shown, Navajo Refining Company is hereby granted an extension of time until June 17, 1985, to submit a final discharge plan to OCD for review. Further, Navajo is granted approval until December 19, 1985 to discharge without an approved discharge plan. This extension is granted with the condition that the deadlines for Navajo's submittals to OCD (as shown in the attached development and implementation schedule) are met. Also, if a public hearing

needed on the proposed discharge plan, an additional extension will be granted consistent with the timeframe of any public hearing.

If you have any questions concerning this extension, please contact me at the above address or at 827-5804.

Sincerely,

RICHARD L. STAMETS Acting Director

RLS/DB/dp

cc: Paul Biderman, Secretary, EMD
David Griffin, Navajo Refining Co.
Alberto Gutierrez, Geoscience Consultants

Enc.

WAVAJO REFINERY, ARTESIA, NEW MEXICO

DATE

ACTION ITEM

September 14, 1984

Navajo submits to OCD the justification for extension to discharge without an approved plan pursuant to schedule of compliance and the preliminary discharge plan outline.

September 17, 1984

Meet with OCD to finalize schedule of compliance pursuant to justification.

December 7, 1984

Navajo submits detailed report on geohydrology and process description to OCD.

No later than February 7, 1985

Navajo receives comments from OCD on December 7 submission.

February 25, 1985

Navajo submits report on effluent flow and chemical characteristics of waste streams which will be regulated by the OCD plan.

No later than April 22, 1985

Navajo receives comments from OCD on February 25 submission.

June 17, 1985

Navajo submits final wastewater management plan to OCD for review. Plan includes design of waste management system and response to OCD comments on previous submissions.

June 21, 1985

Publication of Public Notice by OCD.

July 22, 1985

Public comment period expires.

No later than August 19, 1985

Navajo receives any comments of OCD on final dischage plan.

13 x + 100 \$ \$ 100 m

December 19, 1985

Date as provided by approved discharge plan

Mavajo responde to OCD comments.

OCD decision on discharge plan approval

Navajo submits plans and specifications for any new construction for waste management system. Construction of any facilities begins pursuant to schedule in approved plan.

This schedule of compliance depends on prompt OCD response to Navajo's timely submissions. Delays in receipt or specificity of OCD comments may result in delays in subsequent submissions from Navajo to OCD.