DANIEL B. STEPHENS & ASSOCIATES, INC.

CONSULTANTS IN GROUND-WATER HYDROLOGY SOCORRO, NEW MEXICO

TECHNICAL REPORT TO

Petro-Thermo Corporation

ON

HYDROGEOLOGIC CONDITIONS NEAR LAGUNA PLATA, NEW MEXICO RELEVANT TO THE APPLICATION TO THE OIL CONSERVATION DIVISION TO DISPOSE OILFIELD WASTE BY PETRO-THERMO CORPORATION

December 1985

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 8781 Exhibit 9
Submitted by
Hearing Date

HYDROGEOLOGIC CONDITIONS NEAR LAGUNA PLATA, NEW MEXICO, RELEVANT TO THE APPLICATION TO THE OIL CONSERVATION DIVISION TO DISPOSE OILFIELD WASTE BY PETRO-THERMO CORPORATION

Prepared for:

Petro-Thermo Corporation
P.O. Box 1978
Hobbs, New Mexico

By:

Daniel B. Stephens and Associates
600 Neel Avenue
Socorro, New Mexico

December 1985

TABLE OF CONTENTS

Summary.....1
Introduction.....2
Site Description.....2
Hydrogeologic Conditions.....4
    Geology.....4
    Principal Water-Bearing Units.....5
    Groundwater Movement.....10
Summary of Waste Disposal Plan.....15
References.....16

LIST OF FIGURES

Figure 1. Location Map 3
Figure 2. Chloride Concentrations.....12
Figure 3. Water Level Elevations and Depths to Water..13

LIST OF TABLES

Table 1. Thickness of Alluvium and Redbeds.....6
Table 2. Well Inventory.....7
Table 3. Chloride Concentrations.....8
Table 4. Chemical Analyses of Selected Wells.....11

APPENDIX

Appendix 1. Well Logs

SUMMARY

Petro-Thermo Corporation is proposing to discharge oil field wastes at a site adjacent to Laguna Plata in southwestern Lea County. On the basis of available hydrologic data, an exemption to Oil Conservation Commission Order No. 3221 is requested.

At the site, ground water occurs at shallow depths in redbeds and possibly in alluvium. The direction of flow is northward toward Laguna Plata, a salt lake located within a collapse structure. Springs indicate that ground water discharges to Laguna Plata. The thickness of the very low-permeable redbeds beneath the site is about 750 feet.

After separation in a gunbarrel, brine and oilfield fluids will be diverted to unlined pits where additional free oil will be skimmed for recovery. Much of the waste water will seep into the subsurface and migrate toward Laguna Plata. The concentration of dissolved solids in the waste water is expected to be less than that of the native water in Laguna Plata. The average evaporation of Laguna Plata is more than 60 times the estimated average sustained rate of fluid waste disposal. Thus, seepage from the disposal operation will evaporate from Laguna Plata.

INTRODUCTION

This report was prepared at the request of Mr. Robert W. Abbott, Vice President of AGUA Inc., a division of Petro-Thermo Corporation. Petro-Thermo Corporation is applying to the NM Oil Conservation Division for a permit to discharge ground water from proposed oilfield waste disposal ponds to be constructed near Laguna Plata, New Mexico.

The purpose of this report is to evaluate present hydrogeologic conditions in this vicinity of the proposed waste disposal site. The scope of work of this report includes a brief review of available literature, survey of existing well records, compilation of existing chemical analyses of water samples, and a field reconnaissance of the site.

SITE DESCRIPTION

The proposed oilfield waste ponds comprise approximately 4 acres located in the SW 1/4 of the SE 1/4 of the NE 1/4 of Section 16, Township 20 South, Range 32 East, Lea County, New Mexico. This site is approximately 2.5 miles northwest of Halfway, New Mexico, which is about 37 miles west of Hobbs, NM on US Highway 180 (Figure 1). The site is about 0.15 miles south of Laguna Plata, a natural salt lake.

The land surface topography at the site slopes to the northeast with a gradient of approximately 230 feet per mile, toward Laguna Plata. Vegetation at the site is very sparse, consisting mostly of grasses and mesquite.

Mean annual precipitation in the area is about 9 inches per year, much of which falls in the summer months during intense thunderstorms. Average annual temperature for the nearby towns of Maljamar and Pearl is approximately 61 degrees Fahrenheit.

The average rate of evaporation from open bodies of fresh water is about 6.1 feet per year (Hunter, 1985); these rates are enhanced during the spring when the winds are strongest. A study in the potash mining district to the southwest of the site found that the evaporation rate from a brine pond ranged from about 10.9 feet per year in the summer to about 2.9 feet per year in the winter (Geohydrology Associates, Inc, 1979). In a previous study in the same area, the average evaporation rate from a brine lake was determined to be about 4.4 feet per year (Geohydrology Associates, Inc., 1978). The evaporation rate from brine is less than that for fresh water, owing to the lower vapor pressure of the brine. The annual rate of evaporation from Laguna Plata is

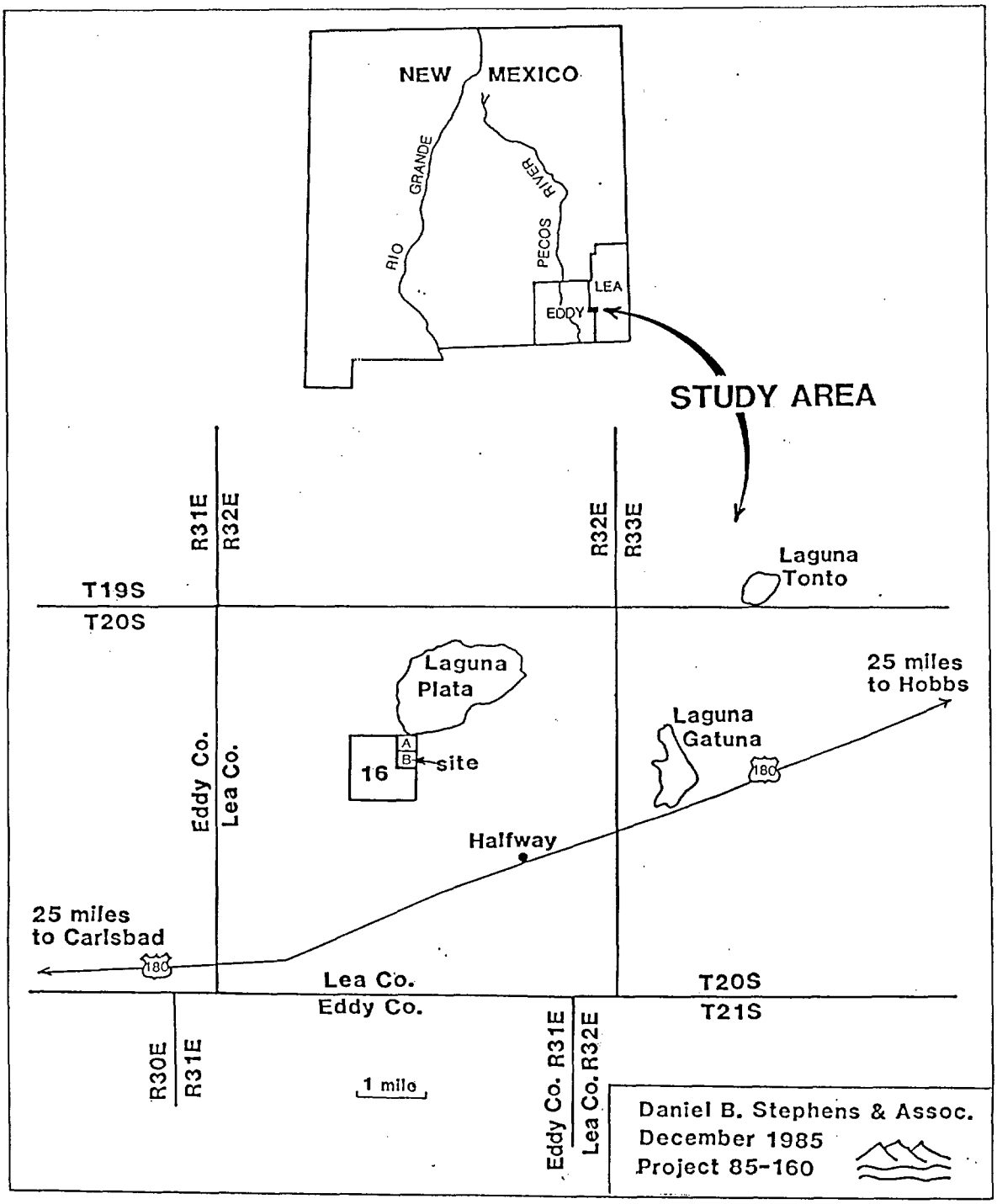

Figure 1 - Location Map

approximately 5630 acre-feet per year (3490 gallons per minute), based on a lake surface area of 2 square miles (1280 acres) shown on topographic maps and the 4.4 feet per year estimate of evaporation rate.

The area is very sparsely populated. The dwellings which comprise Halfway, New Mexico are abandoned. Except for Halfway, the only dwelling within two miles of the proposed discharge site is a ranch on the east side of Laguna Plata.

HYDROGEOLOGIC CONDITIONS

Geology

The site lies within the Permian basin, a subsurface structural feature, which has been a target of oil and gas exploration. The rocks within the basin include Precambrian to Recent age strata. The units which have hydrologic significance are of Triassic age and younger, inasmuch as no potable water is known to occur in older rocks anywhere in the basin.

The Paleozoic section which overlies the Precambrian basement is reported to be as much as 16,800 feet thick on the west side of Lea Co. (Nicholson and Clebsch, 1961). The geologic units in this section include mostly limestone and dolomite, however evaporite deposits of Permian age, such as salt and anhydrite, occur in the upper parts of the section. The youngest Paleozoic unit beneath the site is the Rustler formation, chiefly anhydrite with salt and "redbeds". Drill logs in T20S.R32E.Sec 16. (Appendix 1) indicate the depth to the top of the Permian section is approximately 800 feet below land surface.

The Dewey Lake red-beds, a Triassic or Permian age siltstone, shale and sandstone overlies the Rustler formation. Its thickness may range from 40 to 400 feet (Nicholson and Clebsch, 1961).

The Dockum group, which overlies the Dewey Lake formation, includes the Santa Rosa sandstone in the lower part of the section and the Chinle shale in the upper part. These two units comprise the "Triassic redbeds". The Santa Rosa sandstone is reported to include some shale, and the unit ranges in thickness from 140 to 300 feet (Nicholson and Clebsch, 1961). The Chinle formation consists of claystone and fine-grained sandstone. Gypsum is reported to be a common secondary mineral associated with the redbeds. At the site, the thickness of the Santa Rosa and Chinle is difficult to determine from drillers logs, owing to the interbedded nature of the shale and sandstone which occur within each formation. However, the available logs (Appendix 1)

show that the combined thickness of redbeds is about 750 feet, consisting mostly of shale and sandstone.

The regional dip of the Triassic redbeds is approximately one to two degrees to the east or southeast. The Santa Rosa formation outcrops south of the Laguna Plata. A shale, assumed to be the Chinle, outcrops just north of the Laguna Plata, and the redbed surface is exposed in arroyos at the southwest end of the Laguna Plata at an estimated elevation of 3460 feet, about 30 feet above the lake surface. Drill holes in Laguna Plata indicate that the redbed surface is 20 to 41 feet below the surface of Laguna Plata (Nicholson and Clebsch, 1961). The surface of the redbeds is depressed in the vicinity of Laguna Plata, as well as near Laguna Gatuna, Laguna Tonto, and Laguna Toston. This structural feature is attributed to localized dissolution of the underlying Permian halite and anhydrite, with subsequent collapse of the overlying redbeds into the depression. Thus, the dip of the redbeds is locally reversed near the collapse depressions. The dip of the redbeds is northeast at the site.

In many parts of the region the Ogallala formation overlies the Triassic units. However, in the vicinity of the site this formation has been removed by erosion. Quaternary alluvium was deposited in the topographic depressions where the Ogallala was removed (Nicholson and Clebsch, 1961). The alluvium consists of poorly-sorted, unconsolidated sand with some clay. In places caliche occurs within the alluvium; the escarpment at the south edge of the site is underlain by a thick caliche layer. The thickness of the alluvium ranges from 15 to 130 feet in the northeast quarter of T20S.R32E.Sec.16 (Table 1), based on drillers logs. Exposures in arroyos just north of the site suggest that the alluvial cover may be less than 10 feet thick beneath the site. There is also a thin veneer of dune sand and small stabilized dunes at the site.

Principal Water-Bearing Units

Potable ground water is reported to occur in Triassic and younger units in parts of southern Lea County. However, there are only scattered occurrences of potable ground water in areas surrounding the proposed site of waste disposal (Tables 2 and 3). Regionally, the Santa Rosa sandstone is the principal water-bearing unit. Ground water may also occur in sandstone layers within the Chinle. Well yields are typically very low, owing to the low permeability of the formation. Nicholson and Clebsch (1961) report that well 20.32.18.233 which tapped the Santa Rosa had a specific capacity of 0.2 gallons per minute per foot of drawdown. Some of the well logs in Appendix 1 show the occur-

TABLE 1. Thickness of Geologic Units Determined from Well Logs

Well Number	Thickness of Alluvium (ft)	Thickness of Redbeds (ft)
20.32.6.22	40	826
20.32.8.44	12	828
20.32.12.44	25	1020
20.32.16.33	40	835
.16.144	15	860
.16.124	44	808
.16.411	30	835
.16.243	130	700
.16.213	130	710
.16.341	50	813
.16.233	50	815
.16.134	20	850
.16.31	35	840
.16.32	45	828
.16.244	15	765
20.32.18.32	35	760

TABLE 2. Well Inventory Data

Location No.	Owner	Aquifer	Depth of Well	Altitude of Well	WT Depth Below LS	Date of Measurement
19.32.34.42322	Halfway Water Co.	TRS	575	3559.0	247.38	12/14/76
19.33.17.11224	-----	QAL	131	3650.0	116.84	2/05/84
19.33.26.42221	Mark Smith	QAL	100	3608.0	92.97	1/29/81
10.32.01.314114	W. N. Snyder	QAL	30	3452.0	89.2	3/24/54
20.32.17.13	-----	QAL	90	3449.0	9.0	2/28/79
20.32.18.233	Freeport Sulfur	TRS	400	3452.0	89.2	3/24/54
20.32.22.33	-----	TRC	160	3513.0	30.0	2/28/79
20.32.23.33132	-----	QAL	-----	3541.0	39.83	2/19/81
.23.43312	B. Stanford	TRC	78	3551.0	36.78	2/19/81
.24.3333	T. Bingham	QAL	65	3555.0	37.69	2/19/81
.27.14332	J. Frey	QAL	25	3539.0	23.32	2/19/81
.27.32322	T. Bingham	QAL	-----	3530.0	15.33	2/19/81
20.32.30.142	-----	QAL	-----	3505.0	9.94	6/11/54
20.32.31.13	-----	TRC	240	3550.0	135.12	3/15/79
.36.21442	B. Smith	QAL	50	3581.0	43.88	9/18/72
.36.22311	B. Smith	QAL	65	3586.0	45.82	2/19/81
20.33.04.43211	-----	QAL	58	3556.0	33.19	3/19/68
.05.34321	Pan Amer. Petr. Co.	TRS	680	3552.0	277.52	2/19/81
.15.22143	-----	TRS	-----	3582.0	335.10	4/20/55
.18.12322	-----	TRS	-----	3521.0	245.58	7/25/72
.20.22224	-----	QAL	52	3536.0	35.0	2/19/81
21.32.6.11	I. A. Allred	QAL	55	3597.0	46.21	3/10/81

TABLE 3. Chloride Concentrations
(Source: N.M. State Engineer's Office, Roswell, NM, and Geohydrology Associates, Inc., 1979, 1984)

Well Number	Geologic Formation	Chloride Concentration* (ppm)	Date Sampled	Use
19.32.08.22411	TRS	16	3/13/85	Stock
19.33.18.133223	TRS	312	2/15/83	OWD
.26.42221	QAL	326	1/16/78	Stock
.26.42221	QAL	306	10/08/76	Stock
20.31.13.412433	QAL	635	12/22/48	Stock
.13.414	Williams Lake	110,750	2/27/84	Lake
.13.414411	QAL	6,660	2/27/84	----
.16.234441	TRS	785	12/22/48	Stock
.16.24331	TRC	673	11/30/65	Stock
.16.421111	TRC	355	11/30/65	Stock
20.32.	Laguna Plata	196,012	12/13/85	Lake
20.32.17.13	QAL	172,828	12/22/78	----
.22.33	TRC	5,136	12/19/78	----
.23.43312	TRC	362	2/69	Commercial
.24.333	QAL	85	2/69	Windmill
.24.333	QAL	42	9/11/72	Stock
.36.21442	QAL	290	9/18/72	Stock
20.33.	Laguna Gatuna	158,000	2/69	----
20.33.04.43211	QAL	12,978	10/24/68	Stock
.21.22224	QAL	3,518	----	----
20.31.01.13143	QAL	57	8/18/72	Domestic
Spring #1	SE end of Laguna Plata	8,864	2/12/69	
Spring #2	E end of Laguna Plata	7,446	2/12/69	
Spring #3	E end of Laguna Plata	7,446	2/12/69	
Spring #4	E end of Laguna Plata	7,978	2/18/69	
Spring #5	S end of Laguna Gatuna	163,105	2/18/69	
Sample #6	Gatuna, in draw North of Highway	72,333	2/18/69	
Sample #7	Gatuna, NW end at oil well, NW of well in ravine	27,657	2/18/69	

TABLE 3 - continued

Well Number	Geologic Formation	Chloride Concentration* (ppm)	Date Sampled	Use
Sample #8	Gatuna, NW end at oil well NE of well in ravine	10,992	2/18/69	

Explanation: Aquifer - QAL = Quaternary Alluvium; TRS = Triassic Santa Rosa; TRC = Triassic Chinle.
Use - OWD = Oil Well Drilling Well

* Recommended drinking water standard is 250 ppm.

rence of ground water within sandstones of the redbeds. Where it is saturated, the alluvium also may yield water to wells. However, the areal extent of the saturated portions is limited as a result of the irregular nature of the redbed surface. Thus ground water in the alluvium near the site is not sufficient in volume to comprise a laterally extensive aquifer which has potential for development, except locally for domestic and stock watering uses. At the north end of the site and along the southwest side of Laguna Plata, there are a few seeps which occur at the contact between a dense red shale within the Chinle and an overlying sandstone member. This shale horizon apparently serves as a barrier to water which infiltrates the sandy surficial deposits. There is no evidence of an alluvial aquifer beneath the site, based on field reconnaissance. Any significant water-bearing unit beneath the site is expected to occur in the Triassic redbeds.

The depth to the water table is about 37 feet near Halfway and about 22 feet at the ranch one mile east of Laguna Plata. The depth to water decreases toward Laguna Plata. Topographic maps show that there are numerous springs on the east side of Laguna Plata which mark the intersection of the water table with the land surface. These springs also mark the locations of points of groundwater discharge to the Laguna Plata. This discharge presumably originates, in part, from seepage from Laguna Gatuna, which is about 60 feet higher in elevation. There are few available data on the chemical quality of ground water (Tables 3 and 4). No wells are known to produce potable ground water within approximately three miles of the site. A well in the alluvium (20.32.1.322) at the ranch northeast of Laguna Plata produces water which is not potable. East of Halfway, an alluvial well (20.32.18.32) yields potable water having chloride concentrations of 42 ppm (parts per million) (Table 2). This well is reported to be used to water stock. In the Triassic redbeds the chemical quality of ground water in wells is also variable, ranging from 21 to 785 ppm (Table 4 and Figure 2). Well 20.32.23.433, completed in the Chinle at Halfway, has a chloride concentration of 200 ppm.

Groundwater Movement

Based on available water level elevation data, shallow ground water in alluvium and upper redbed formations flows toward Laguna Plata (Figure 3). The springs also suggest that ground water moves toward this topographically low area. In the deeper Triassic units, ground water also moves toward the area containing the salt lakes (Nicholson and Clebsch, 1961). There is a vertical component of hydraulic gradient downward from the

TABLE 4. Chemical Analyses of Selected Wells Near The Site. Values in parts per million except pH and E (micromhos). (Source: Nicholson and Clebsch, 1961.)

Well #	Date	Depth (ft)	SiO_2	Ca	Mg	Na+K	HCO_3	SO_4	Cl	F	NO_3	TDS	E.C.	pH
Laguna Plata														
	12/13/85	0	----	940	3,317	124,644	71	10,124	192,012	__	___	335,108	----	7.34
Alluvium														
230.32.1.322	7/1/54	----	----	---	---	----	---	---	--	--	---	---	----	---*
Triassic Redbeds														
19.32.8.224	12/9/58	----	19	10	13	131	306	74	21	1.2	6.4	426	682	8.0
19.34.9.114	12/9/58	33	41	430	65	675	189	1,680	560	0.3	139	3,680	4,660	7.1
20.32.23.433	12/13/85	78	----	51.3	48.6	123	292	54	200	---	---	770	----	7.94
21.33.2.231	9/4/58	1150	----	----	----	---	336	95	20	---	---	---	3,370	----

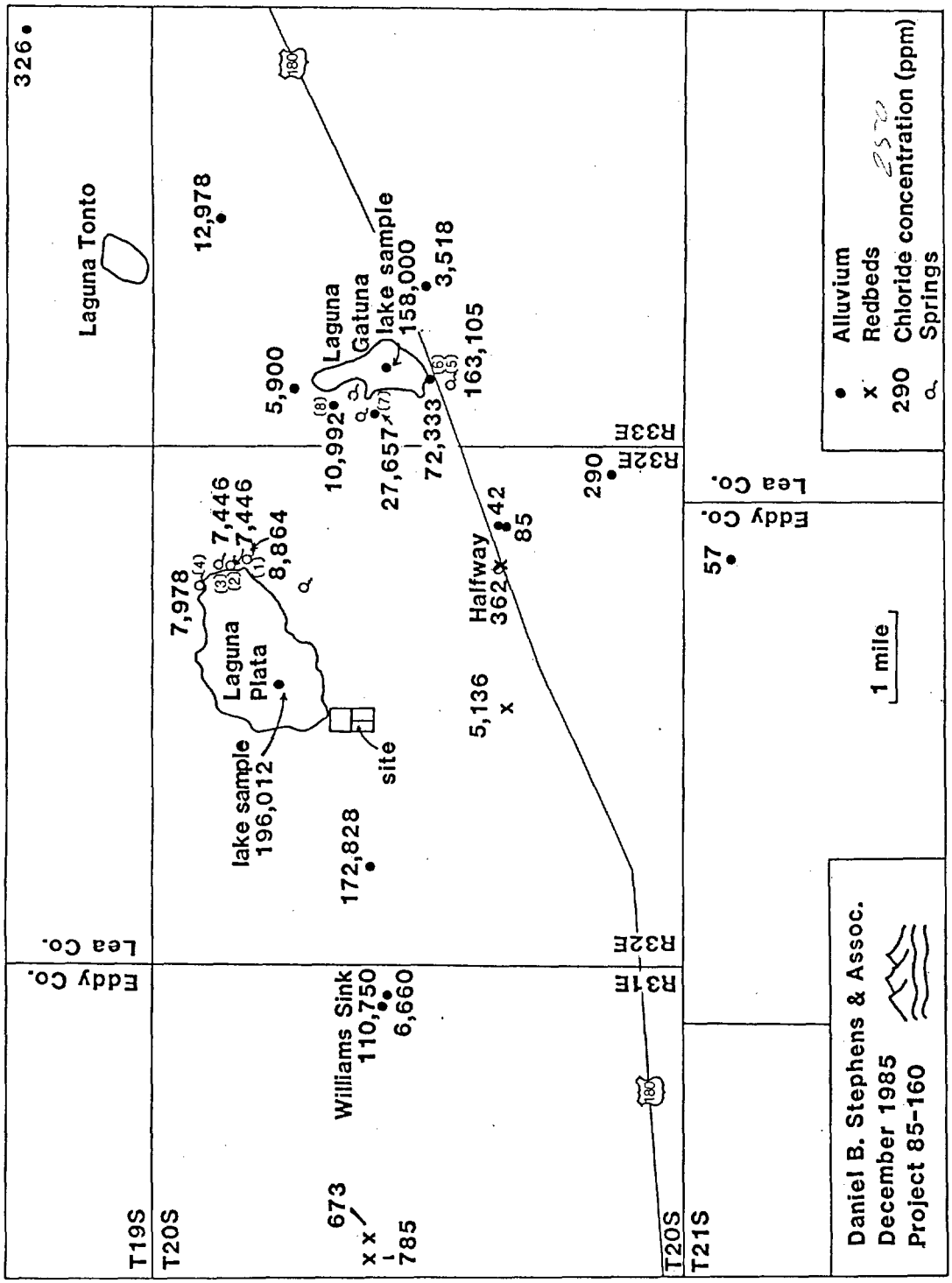

Figure 2 - Chloride Concentrations

Daniel B. Stephens and Associates

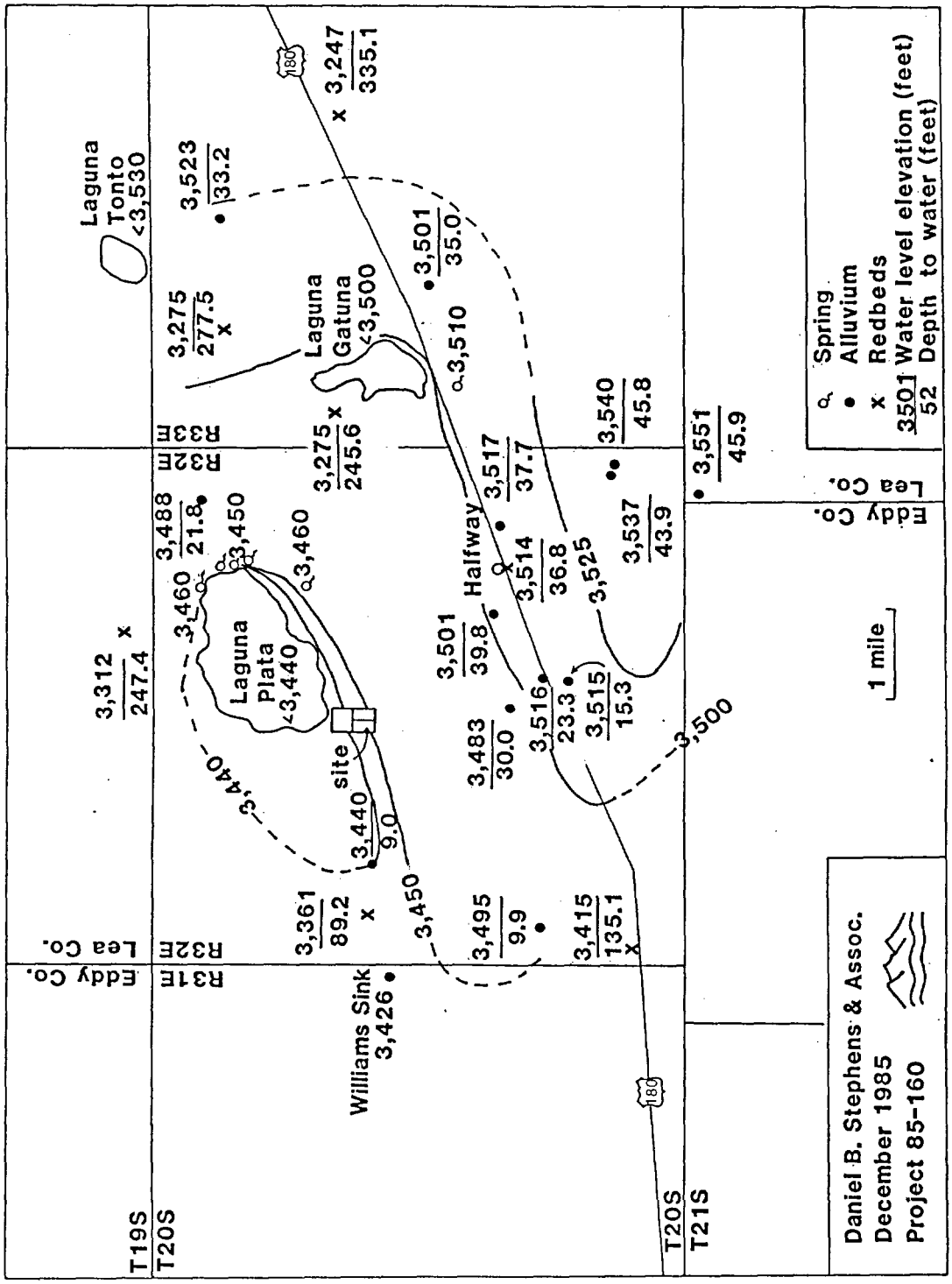

Figure 3 - Water Level Elevations and Depths to Water

shallow aquifer and Laguna Plata toward the deeper Triassic water-bearing units. If there were downward movement across the low-permeable shales, the quality of groundwater in the water-bearing Triassic sandstones would be poor, owing to the high salinity of Laguna Plata.

The proposed waste disposal site is situated within about 0.15 miles of the south shore of Laguna Plata. Seepage from the impoundments is expected to infiltrate through the underlying dune veneer, alluvium, and shallow sandstone toward the water table. The depth to the water table beneath the site is expected to be approximately 20 to 30 feet. Shallow ground water which may occur at present beneath the site may be perched on the Chinle shale layer observed in arroyos in the field reconnaissance. This layer would cause a ground water mound to develop beneath the waste pits and divert seepage northward and down-dip toward Laguna Plata or to an arroyo draining toward the lake.

The time for seepage to reach the Laguna Plata is difficult to estimate, owing to the absence of aquifer properties and water level data. However, the rate of ground water movement is likely to be on the order of not more than 100 feet per year; thus, the time for seepage to reach Laguna Plata would be on the order of 8 years. The shallow depth to the water table and the relatively permeable nature of the surficial materials will result in relatively rapid transport of seepage through the vadose zone.

There are no water users downgradient from the disposal site. After the seepage reaches the Laguna Plata, practically all of the seepage will evaporate. A minor amount of seepage may move downward toward the lower Triassic water-bearing units. However, regional ground water flow in these units also converges toward the salt lakes. There are no known sources of potable groundwater in sediments underlying the Triassic redbeds at Laguna Plata.

SUMMARY OF WASTE DISPOSAL PLAN

The disposal plan includes wastes which fall into three general groups. Group I includes brine, salt water, and water contained in drilling mud and cement. Group II wastes include oil and basic sediment (low quality oil which separates from gun barrels). Group III includes solid wastes. The estimated maximum possible volumes of wastes from these three groups are 26,500, 2250, and 1100 bpd (barrels per day), respectively, for a total of 30,000 bpd. However, on a sustained basis, under normal operating conditions, the total rate of waste disposal for all three groups is anticipated to be only about 2250 bpd (106 acre-feet per year) from all three waste types.

The wastes will be separated mechanically in a gunbarrel upon arrival at the site. The liquids from the separation, Group I, will be diverted to a series of five shallow ponds, 60 x 100 feet each. Their depths will range from about 7 to 10 feet. Oil which was not separated in the gunbarrel will be skimmed from the surface of the ponds and pumped to tanks. There is an additional pit downstream of the Group I and II waste pits to contain unexpected overflow.

A significant portion of seepage from the Group I pits will infiltrate the soil and migrate to the Laguna Plata. The salinity of the seepage is not likely to exceed that of Laguna Plata, inasmuch as produced oilfield fluids are expected to have total dissolved solids concentrations in the range of 25,000 to 75,000 ppm. The total dissolved solids at Laguna Plata is 335,100 ppm (Table 3). Thus, the seepage will dilute the concentration of the total dissolved solids in Laguna Plata. The total annual rate of evaporation from Laguna Plata is about 5360 acre-feet per year. Under anticipated normal operating conditions, the total rate of Group I waste disposal will be only about 93 acre-feet per year. Therefore, there is ample storage and evaporation potential in Laguna Plata to accommodate the waste seepage. No significant change in the hydrologic regime is expected as a result of the proposed discharge.

Group II wastes will be stored in tanks and removed from the site for reprocessing and recovery.

Group III solid wastes will be spread into a series of four shallow pits, each about 24 x 100 feet and ranging in depth from 6 to 8 feet. The solids will be alternately dried during the filling of the pits. The dried materials will be excavated and spread on a caliche caprock pad for long-term storage.

REFERENCES

Geohydrology Associates Inc., 1978, Ground-water study related to proposed expansion of potash mining near Carlsbad, New Mexico, prepared for U.S. Bureau of Land Management, 127 pp.

Geohydrology Associates Inc., 1979, Water-Resources Study of the Carlsbad Potash Area, New Mexico, prepared for U.S. Bureau of Land Management, 90 pp.

Geohydrology Associates Inc., 1984, Hydrologic Assessment of the Salt Lakes Area Western Lea County, New Mexico, prepared for Pollution Control, Inc., Lovington, New Mexico, 48 pp.

Hunter, R., 1985, A preliminary regional water balance for the WIPP site and surrounding area, Sandia National Laboratory, SAND84-2233, 98 pp.

Nicholson A. and A. Clebsch, 1961, Geology and Ground-Water Conditions in southern Lea County, New Mexico, NM Bur. Mines and Mineral Resources, Ground-Water Report 6, 120 pp.

APPENDIX 1 - Well Logs

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

NEW MEXICO WELL LOG DIVISION

Casing Record:
8¼" 1132'

I. P. Abandoned

New Mexico
Lea County
Argo Royalty Co.
Burner Well #1
Sec. 6 T.20S R.32E
750 N. L. - 990 E. L.
Elevation: 3513
Commenced: 1-31-35
Completed: 3-12-35

Formation	Bottom
Red sand	40
Red beds	100
Red sand	115
Red beds	125
Red sand & shale	190
Red beds	235
R. sand	280
R. water sand	290
Red sandy shale	335
Water sand	340
Red sandy shale	350
Red sandy shale	385
Red rock & red beds	730
Red rock and red beds	866
Anhydrite	890
Anhydrite	945
Gr. shale	955
Anhydrite	1005
Salt	1040
Salt and anhy.	1065
Shale, red	1075
Anhy.	1090
Gr. lime	1105
Anhydrite	1112
Brown shale	1117
Red beds	1128
Salt and anhy.	1130
Shale	1175
Salt	1190
Shale	1245
Salt	1255
Skip in Log	
Salt	1625
Salt	1870
Salt and anhy.	1880
Salt	2330
Anhy.	2510
Br. Lime	2534
Gray lime	2611
Hard gray lime	2639
Brown lime	2653
Broken gray lime	2664
Gray sand	2679
Gray sand	2700
Shale breaks	2704
Hard gray lime	2718
Lime and shale breaks	2727
Hard brown sandy lime	2754
White lime	2785
Sand	2805
TD	2725'

Note: Last report T. D. 2810
Lime fishing bit.

NEW MEXICO SCHOOL OF MINES

STATE BUREAU OF MINES AND MINERAL RESOURCES

SOCORRO, NEW MEXICO

NEW MEXICO WELL LOG DIVISION

COUNTY Lea
FIELD Wildcat
COMPANY Argo Royalty Company
LEASE Burner permit No. 2 Well
LOCATION (¼) C SE SE
SEC. 8 T. 20S R. 32E
660 feet from south line and
660 feet from east line of Section

CASING RECORD

Diam., in.	Bottom
10-3/4"	433'
8¼"	1155'

ELEVATION 3484 (L&S) FEET
INITIAL DAILY PRODUCTION:
Open bbls. Oil
Open cu. ft. Gas
Tbg. bbls. Oil
Tbg. cu. ft. Gas

COMMENCED 6-13-35
COMPLETED 7-23-35
ABANDONED
REMARKS: D&A.

FORMATION	BOTTOM, FEET
Rock	12
Red rock	195
Water sand	205
Red rock, sand, wtr.	230
Red rock	235
Red sand and shale, 10 BWPH	280
Red bed	315
Red bed and red rock	350
Red rock and sand	390
Red sand and rock	420
Red bed	515
Hard sand	545
Red rock	590
Hard sand	625
Red rock	670
Sand and red shale	710
Red rock and red shale	750
Red rock and gyp	795
Red rock	880
Anhydrite	915
Red rock and salt	935
Anhydrite	955
Blue shale	973
Anhydrite and lime	995
Anhydrite	1025
Salt	1065
Anhydrite and potash	1070
Potash	1075
Brown shale	1080
Anhydrite and lime	1085
Anhydrite	1118
Blue shale	1123
Red rock	1142
Salt	1155
Anhydrite	1160
Blue and red shale	1180
Red rock and salt	1200
Red rock, salt and anhydrite	1235
Salt and red rock	1290
Salt and potash	1330
Salt and red rock	1360
Hard anhydrite	1370
Salt and potash	1550
Salt	2060
Salt and potash	2080
Salt	2130
Salt and potash	2170
Salt	2215
Anhydrite and salt	2245
Salt	2330
Anhydrite and salt	2345
Anhydrite	2385
Lime	2417
Lime and red sand	2426
Hard lime	2517
Hard lime and blue shale	2527
Broken lime and sand	2540
Lime and red sand	2549
Red lime and red sand	2588
Lime	2610
Broken lime and blue shale	2618
Red and white lime, hard	2624
Hard white lime	2645
XXXXXXXXXXXXXXXXXXXX	XX
Blue shale and lime	2676
Hard white lime and green shale breaks	2685
Lime	2798
Sand T. D.	2803

Log. No. 128

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

CASING RECORD

Diam., in	Bottom
8¼	1117

ELEVATION FEET

INITIAL DAILY PRODUCTION:

Open bbls. Oil
Open P. & A. cu. ft. Gas
Tbg. bbls. Oil
Tbg. cu. ft. Gas

COUNTY Lea
FIELD Halfway
COMPANY Brewer Drilling Co.
LEASE Monroe Well No. 1
LOCATION (¼) SE SE
SEC. 12 T. 20 S , R. 32 E
660 feet from South line and
660 feet from East line of Section
COMMENCED 6-8-43
COMPLETED 7-16-43
ABANDONED
REMARKS:

FORMATION	BOTTOM, FEET
Lime	10
Red sand	25
Red bed	250
Red shale	300
Red rock	340
Red rock	415
Red shale	425
Sand	440
Red shale	465
Red bed	475
Sand	487
Red rock	500
Red bed	515
Red sand - water	535
Red rock	665
Shale, red	730
Red rock	1045
Anhydrite	1121
Red rock and shale	1135
Anhydrite and red rock3	1150
Shale	1180
Anhydrite	1210
Salt	1280
Anhydrite	1295
Salt and shale	1305
Anhydrite	1320
Gray lime	1340
Red shale	1350
Salt	1380
Anhydrite	1386
Salt and shale	1510
Salt	1715
Anhydrite	1725
Anhydrite and salt	1740
Salt	1805
Salt and potash	2330
Salt and anhydrite	2410
Salt and potash	2485
Anhydrite	2520
Salt amd anhydrite	2566
Salt	2610
Anhydrite	2620
Salt and potash	2650
Anhydrite	2690
Lime	2705
Pink lime	2720
White lime	2770
Lime	2815
Brown lime	2830
Gray lime	2845
Gray shale	2865
Lime	2870
Red bed	2875
Red shale and lime shells	2885
Lime	2910
Lime	2925
Shale and gypsum	2935
Lime and red shale	2945
Lime and shale breaks	2960
Lime	2992
Sandy lime	3022
Lime	3055
Lime, showing oil and gas	3056
Sandy lime	3120
Water sand	3126 T.

Red beds 10 to 1045 ft

Log. No. 4633

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

CASING RECORD

Diam., in	Bottom
10 3/4"	459
8 5/8"	940

ELEVATION FEET

INITIAL DAILY PRODUCTION:

Open	D&A	bbls. Oil
Open		cu. ft. Gas
Tbg.		bbls. Oil
Tbg.		cu. ft. Gas

COUNTY Lea
FIELD Halfway
COMPANY Argo Oil Corp.
LEASE Texas-State "A" Well No. 2
LOCATION (¼) SW SW
SEC. 16 T. 20S , R. 32E
660 feet from South line and
660 feet from West line of Section
COMMENCED 6-11-41
COMPLETED 7-12-41
ABANDONED D&A
REMARKS:

FORMATION	BOTTOM, FEET
Cellar	8
Caliche	40
RedBed and Sand	70
Sandy shale	80
Red Rock	120
Sandy shale	125
Red Rock	155
Red Shale	182
Sand, Red	220
Sandy Shale, Red	250
Red Rock	295
Sand	305
Red Rock	355
Sandy Shale, Red	385
Sand, Red	405
Shale, Red	430
Red Rock	470
Shale, Red	505
Red Rock	545
Shale, Red	640
Red Rock	745
Shale, Red	810
Red Shale	875
Anhydrite	900
Red Rock	915
Salt	930
Anhydrite-hard	1020
Salt	1070
Anhydrite	1130
Red Rock	1140
Salt	1170
Anhydrite	1190
Salt and Potash	1250
Anhydrite	1265
Salt and Shale	1290
Salt and Potash	1380
Anhydrite	1398
Slat and Potash	1520
Salt	2105
Anhydrite	2120
Salt	2182
Anhydrite	2205
Slat	2270
Salt and Potash	2290
Salt	2292
Anhydrite	2332
Lime-medium	2370
Red Rock-Soft	2372
Lime-hard-gray	2468
Lime-Meduim-bronw	2505
Lime-gray-hard	2520
Lime-Sandy-Red-Medium	2525
Lime-hard-gray-show oil at 2530	2535
Shale-soft-red	2545
Lime-hard-gray	2577
Lime,brown	2581
Lime,gray,hard	2590
Lime & sand-gray, meduim	2600
Lime, brown & gray-soft	2609
Lime, gray-hard	2646
Lime, gray-medium	2666
Lime, pay-soft gray	2674
Sand-gray-soft	2676
Lime, gray-medium	2694
Sand, gray medium T.D.	2696

Log. No. 4574

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

CASING RECORD

Diam., in	Bottom
10-3/4	450
8-5/8	946
7	2613

ELEVATION 3510 FEET

INITIAL DAILY PRODUCTION:

Open 25 per hr. bbls. Oil
Open cu. ft. Gas
Tbg. bbls. Oil
Tbg. cu. ft. Gas

COUNTY Lea
FIELD Halfway
COMPANY Argo Oil Corp.
LEASE State Well No. 1
LOCATION (¼) S/2 E/2 NW/4
SEC. 16 T. 20S , R. 32E
2310 feet from North line and
1980 feet from West line of Section
COMMENCED 1-7-40
COMPLETED 2- -40
ABANDONED
REMARKS:

FORMATION	BOTTOM, FEET
Caliche	15
Sandy shale, red	75
Red rock	145
Red shale	215
Sand	225
Red rock	235
Red shale	245
Water sand	260
Red shale	285
Red rock, sandy	330
Red sahle, sandy	400
Red rock	455
Red shale	610
Red rock	630
Red shale, hard	685
Red rock	755
Red shale	800
Red rock	845
Red shale	875
Anhydrite	910
Red shale	920
Anhydrite	1020
Salt	1070
Potash, hard, red	1080
Red rock	1090
Anhydrite	1125
Red rock	1140
Salt	1160
Anhydrite	1177
Salt	1190
Salt and red rock	1235
Salt	1275
Salt and potash	1325
Salt	1380
Anhydrite	1395
Salt	1500
Anhydrite	1517
Salt	1990
Anhydrite	2002
Salt	2017
Anh ydrite	2030
Salt	2175
Anhydrite, hard	2195
Salt	2300
Anhydrite, hard	2325
Lime, hard, gray	2366
Red rock	2369
Limer, hard gray	2426
Lime, hard, brown	2450
Sandy lime	2478
Lime, hard, brown	2486
Lime, hard, gray	2497
Lime, hard, brown	2507
Lime, hard, gray	2519
Lime, hard, gray	2546
Lime, hard, gray	2583
Soft sand, Show GAS	2625
Gray lime, hard	2625
Lime, soft, OIL T.D.	2627

Log. No. 4555

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

CASING RECORD

Diam., in	Bottom
10-3/4	431
8-5/8	920
7"	2547

ELEVATION 3489 FEET

INITIAL DAILY PRODUCTION:

Open	400	bbls. Oil
Open		cu. ft. Gas
Tbg.		bbls. Oil
Tbg.		cu. ft. Gas

COUNTY Lea
FIELD Halfway
COMPANY Argo Oil Corp.
LEASE State Well No. 3
LOCATION (¼) NE NW
SEC. 16 T. 20S , R. 32E
990 feet from North line and
2310 feet from West line of Section
COMMENCED 2-9-41
COMPLETED 3-15-41
ABANDONED
REMARKS:

FORMATION	BOTTOM, FEET
Cellar	8
Caliche	15
Red sand	44
Red shale	100
Red rock	183
Sand 5 BWPH @ 205'	214
Red shale	220
Red sandy shale	300
Red rock 12 BWPH	335
Red sandy shale 18 BWPH	375
Red sandy shale	435
Red rock	520
Red shale	565
Red rock	640
Red shale	685
Red rock	740
Red rock and shale	780
Red rock	810
Red shale	852
Anhydrite	875
Red shale	880
Anhydrite	955
Anhydrite, white	985
Salt, white	1050
Anhydrite	1098
Red and blue shale	1105
Red shale and salt	1115
Salt and red shale	1135
White anhydrite	1150
Salt and red shale	1155
Salt and red rock	1255
Salt and potash	1315
Salt and anhydrite	1355
Salt and potash	1475
Anhydrite	1490
Salt	1510
Salt and potash	1560
Salt	1575
Salt and potash	1805
Salt	1850
Salt and potash	1980
Anhydrite	1990
Salt and potash	2172
Anhydrite	2193
Salt	2220
Salt and potash	2265
Salt, white	2295
Anhydrite	2330
Hard gray lime	2340
Lime	2355
Gray lime	2366
Red shale	2370
Gray lime	2382
Blue shale	2385
Gray lime	2387
Hard gray lime	2397
Gray lime	2423
Hard gray lime	2430
Gray lime	2450
Broken lime	2478
Lime	2485
Red lime	2494
Gray lime	2547
Brown lime	2550
Gray lime	2584
Broken brown lime	2593
Gray lime	2630
Hard gray lime	2635
Broken lime	2650
Lime	2663
Total depth	2681

Log. No. 4528

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

CASING RECORD

Diam., in	Bottom
10-3/4	456
8-5/8	932
7	2477

ELEVATION 3511 FEET

INITIAL DAILY PRODUCTION:

Open In 8 hr. 85 bbls. bbls. Oil
Open cu. ft. Gas
Tbg. bbls. Oil
Tbg. cu. ft. Gas

COUNTY Lea
FIELD Halfway
COMPANY Argo Oil Corp.
LEASE Texas-State "B" Well No. 3
LOCATION (¼) NW NW SE
SEC. 16 T. 20S , R. 32E
2310 feet from South line and
2310 feet from East line of Section
COMMENCED 1-3-41
COMPLETED 2-2-41
ABANDONED
REMARKS:

FORMATION	BOTTOM, FEET
Caliche	30
Red shale	45
Gravel	65
Red rock	105
Red rock sandy 1/2 bailer w.p.h,	125
Red rock	180
Sand	190
Red rock	200
Water sand	230
Red rock sandy	280
Sandy shale	345
Red rock	365
Sand with water	370
Red rock	390
Sand with 25 bailers water per hr.-	395
Red rock	459
Shale	485
Red rock	600
Shale shale	615
Red rock	745
Shale	795
Red rock	865
Anhydrite	895
Shale, red	905
Anhydrite	939
Salt	945
Anhydrite	1012
Salt	1060
Anhydrite	1125
Salt and red rock	1155
Anhydrite	1170
Salt and red rock	1175
Anhydrite, salt and potash	1230
Red rock and salt	1275
Salt and potash	1365
Anhydrite	1400
Salt and potash	1425
Salt	1485
Salt and potash	1540
Salt	1630
Salt and potash	1700
Anhydrite	1710
Salt and potash	1820
Salt	1870
Salt and potash	1995
Anhydrite and potash	2010
Salt	2085
Anhydrite	2135
Salt	2170
Anhydrite	2190
Salt---Base of salt	2285
Anhydrite	2322
Anhydrite	2322
Lime, gray	2445
Lime, broken, sandy	2462
Lime, brown	2497
Lime, gray	2516
Shale, gray	2519
Lime, broken sandy	2525
Lime, brown	2541
Lime, gray	2597
Lime, sandy - hole full OIL	T.D.2604

Log No. 4483

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

CASING RECORD

Diam., in	Bottom
12	420
10	930
8	2400

ELEVATION 3496 FEET

INITIAL DAILY PRODUCTION:

Open	Dry	bbls. Oil
Open		cu. ft. Gas
Tbg.		bbls. Oil
Tbg.		cu. ft. Gas

COUNTY Lea
FIELD Halfway
COMPANY North Shore Corp.
LEASE Texas-State "B" Well No. 1
LOCATION (¼) SW SE NE
SEC. 16 T. 20-S , R. 32-E
2310 feet from North line and
990 feet from East line of Section
COMMENCED 10-7-40
COMPLETED 11-6-40
ABANDONED
REMARKS:

FORMATION	BOTTOM, FEET	FORMATION	BOTTOM, FEET
Caliche	100		
Sand	130		
Red bed	400		
Sand and shale	770		
Sand and red bed	830		
Anhydite	870		
Anhy. sand and salt	892		
Anhydrite	900		
Lime	925		
Anhydrite	982		
Salt	1035		
Anhy. salt and sand	1065		
Lime	1100		
Anhy. salt and sand	1175		
Salt	1270		
Anhy. salt sand and potash	1355		
Salt	1445		
Anhy. salt and potash	1460		
Salt	1575		
Anhy. salt and potash	1725		
Salt	1785		
Anhy. salt and potash	1820		
Salt	1860		
Salt anhy. and potash	2020		
Salt	2180		
Anhydrite	2210		
Salt	2330		
Anhydrite	2371		
Lime	2410		
Lime and sand	2420		
Lime	2485		
Limeand sand	2535		
Sand	2585		
Sand and lime	2648		
Lime sand and benite	2700		
Lime	2705		
Limeand sand	2715		
Lime	T.D. 2728		

Log No. 4459

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

CASING RECORD

Diam., in	Bottom
10"	420
8-5/8	901' 9"
5½	2494

ELEVATION 3481 FEET

INITIAL DAILY PRODUCTION:

Open	480	bbls. Oil
Open		cu. ft. Gas
Tbg.		bbls. Oil
Tbg.		cu. ft. Gas

COUNTY Lea
FIELD Halfway
COMPANY North Shore Corporation
LEASE Texas-State "A" Well No. 1
LOCATION (¼) SW NW NE
SEC. 16 T. 20-S , R. 32-E
990 feet from North line and
2310 feet from East line of Section
COMMENCED Sept. 1, 1940
COMPLETED Sept. 28, 1940
ABANDONED
REMARKS:

FORMATION	BOTTOM, FEET
Sand & Caly.	110
Water Sand	130
Red Beds	250
Sand & red shale	800
Sand	840
Anhydrite	875
Sand & salt	890
Anhydrite	910
Anhydrite & lime	925
Anhydrite	975
Salt	1040
Anhydrite Shale & salt	1070
Lime	1100
Potash	1110
Sand & Anhydrite	1120
Anhydrite	1140
Sand & anhydrite	1170
Anhydrite & salt	1200
Salt	1275
Salt & Potash	1330
Anhydrite	1345
Salt & Potash	1470
Salt	1540
Salt & Potash	1765
Anhydrite	1785
Salt & Potash	1930
Anhydrite Potash & Salt	1980
Salt	2035
Anhydrite	2065
Salt & Anhydrite	2130
Anhydrite	2160
Salt	2245
Anhydrite	2290
Lime & Anhydrite	2310
Brown Lime & sand	2342
Brown lime & grey	2388
Sand & lime	2430
Sand Brown & grey Lime	2467
Sand	2490
Lime T.D.	2505

sienca made
Log No. 4407

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

CASING RECORD	
Diam., in	Bottom
10-3/4	450
8-5/8	893
7	2606

ELEVATION 3511 FEET

INITIAL DAILY PRODUCTION:

Open	bbls. Oil
Open	cu. ft. Gas
Tbg.	bbls. Oil
Tbg.	cu. ft. Gas

COUNTY Lea
FIELD Halfway
COMPANY Argo Oil Corporation
LEASE Texas-State "D" Well No. 2
LOCATION (¼) [illegible] S.
SEC. 16 T. 20 , R. 32
990 feet from South line and
1650, feet from West line of Section
COMMENCED 3-12-40
COMPLETED 7-8-40
ABANDONED
REMARKS: Swabbed only water.

FORMATION	BOTTOM, FEET
Caliche	6
Anhydrite & Red Rock	50
Red Shale	115
Red Rock	205
Red Sand	215
Red Rock	255
Red Sand - water	280
Red Shale	325
Red Rock	390
Sand - water	400
Red Rock	410
Red Shale	490
Red Rock	550
Sandy Shale	560
Red Rock	570
Red Rock & Shale	625
Red Shale	690
Red Rock	820
Red Shale	863
Anhydrite	868
Red Shale	877
Anhydrite	915
Anhydrite & Salt Shells	935
Anhydrite	970
Gray Anhydrite	1020
Salt	1080
Anhydrite (gray)	1135
Anhydrite & Potash	1145
Anhydrite & Salt	1170
Anhydrite	1175
Red Rock Broken	1225
Salt - Potash	1295
Salt & Red Shale	1510
Salt	1580
Anhydrite	1600
Salt-potash & blue shells	1655
Anhydrite, salt & potash	1695
Anhydrite Salt & Shells	1785
Salt & Potash	1800
Salt	1845
Salt & Potash	1920
Salt & Potash	2010
Anhydrite Salt & Potash	2050
Salt & Potash	2120
Salt & Anhydrite Shells	2150
Anhydrite	2210
Salt & Potash	2270
Salt	2275
Anhydrite	2325
Lime	2422
Lime	2460
Lime & Sandy	2476
Lime	2491
Red Lime	2512
Sand-Show Dead Oil 2518	2518
Lime	2521
Broken Sandy Lime	2533
Lime	2579
Red Sandy Lime	2586
Lime -show oil 2629	2640
Lime & Bentonite	2662
Lime - show oil 2685 T.D.	2683

ILLEGIBLE

✓ Stencil mu

Log No. 4408

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

CASING RECORD	
Diam., in	Bottom
8-5/8	926
7	2367

ELEVATION FEET

INITIAL DAILY PRODUCTION:

Open	360	bbls. Oil
Open		cu. ft. Gas
Tbg.		bbls. Oil
Tbg.		cu. ft. Gas

COUNTY Lea
FIELD Halfway
COMPANY Sam Weiner
LEASE Wentz State Well No. 1
LOCATION (¼) S.. S.. ..
SEC. 16 T. 20 , R. 32
2310 feet from North line and
2310 feet from East line of Section
COMMENCED 5-30-40
COMPLETED 7-11-40
ABANDONED
REMARKS:

FORMATION	BOTTOM, FEET	FORMATION	BOTTOM, FEET
Caliche	15		
Red Sand	40		
Sand & Gravel	50		
Red Bed	200		
Sand	240		
Red Bed & Sand	360		
Sandy Shale	400		
Red Bed	500		
Shale & Gyp	530		
Red Rock & Red Bed	865		
Anhydrite	910		
Shale & Salt	920		
Salt & Anhydrite	1090		
Anhydrite & Potash	1110		
Salt & Anhydrite	2294		
Anhydrite	2332		
Lime (Show of Gas at 2338)	2394		
Brown Lime	2405		
Lime	2444		
Grey Sandy Lime	2467		
Brown Lime	2482		
Brown & Gray Lime	2495		
Lime - Show of Oil	2520		
Broken Lime	2530		
Hard Gray Lime	2556		
Soft Lime - Hole filled with Oil	2559	T.D.	

ILLEGIBLE

Log No. 4276

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

CASING RECORD	
Diam., in	Bottom
10-3/4"	450
8-5/8"	950
7"	2026

ELEVATION 3510 FEET

INITIAL DAILY PRODUCTION:

Open	460	bbls. Oil
Open		cu. ft. Gas
Tbg.		bbls. Oil
Tbg.		cu. ft. Gas

COUNTY Lea
FIELD Halfway
COMPANY Argo Oil Corporation
LEASE State Well No. 2
LOCATION (¼) S½W½ NW
SEC. 16 T. 20-S R. 32-E
2310 feet from North line and
4290 feet from East line of Section
COMMENCED 2-2-40
COMPLETED 3-17-40
ABANDONED
REMARKS:

FORMATION	BOTTOM, FEET
Caliche	20
Shale Soft Red	115
Red Rock	170
Sandy Shale Red	330
Red Rock	365
Sand	385
Sandy Red Shale	425
Shale Red	475
Red Rock	525
Red Shale	580
Sandy Shale Red	710
Red Rock	725
Anhydrite	735
Sandy Shale Red	805
Red Rock	870
Anhydrite	910
Shale Soft Red	915
Anhydrite & Shale	935
Anhydrite Hard	1018
Salt	1075
Potash	1080
Shale Blue Soft	1085
Anhydrite Hard	1125
Red Rock	1135
Salt	1160
Anhydrite Hard	1175
Salt & Potash	1260
Salt & Red Rock	1315
Salt	1375
Anhydrite Hard	1390
Salt	1500
Anhydrite Hard	1520
Salt	1900
Salt & Potash	1940
Salt	2000
Anhydrite	2010
Salt	2030
Anhydrite	2038
Salt & Potash	2070
Salt	2175
Anhydrite	2205
Salt	2300

FORMATION	BOTTOM, FEET
Anhydrite	2315
Anhydrite & Brown Lime Hard	2333
Lime Hard Gray	2385
Shale Soft Blue	2388
Lime Hard Gray	2438
Lime Hard Brown	2449
Lime Hard Gray	2475
Lime HardBrown	2502
Lime Hard Gray	2509
Lime Hard Brown	2545
Lime Hard Gray	2589
Sand	2599
Lime Hard Brown	2610
Lime Hard Gray	2677
Lime Hard Brown	2689'9"
Lime Soft Gray	2682
Lime Hard Gray	2688
Lime Med. Gray T.D.	2689'6"

Log No 4018

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

CASING RECORD

Diam., in	Bottom
10-3/4	420
8-5/8	931
7"	

ELEVATION 3510 FEET

INITIAL DAILY PRODUCTION:

Open	240 bbls. Oil
Open	cu. ft. Gas
Tbg.	bbls. Oil
Tbg.	cu. ft. Gas

COUNTY Lea
FIELD Halfway
COMPANY Argo Oil Coporation
LEASE Texas-State Well No. 1
LOCATION (¼) NW SW
SEC. 16 T. 20-S . R. 32-E
1980 feet from Sth line and
660 feet from West line of Section
COMMENCED 10/17/39
COMPLETED 11/14/39
ABANDONED
REMARKS: Texas Co. farm-out

FORMATION	BOTTOM, FEET	FORMATION	BOTTOM, FEET
Caliche	35		
Red Rock Red Shale & Sand	165		
Red Shale & Sandy	454		
Red Rock and Shale	875		
Anhyd. & Red Rock	1025		
Salt Potash & Red Rock	1095		
Anhyd. & Salt	1185		
Red Rock & Salt	1230		
Salt & Anhyd.	2330		
Lime Hard Gray	2450		
Lime Red Gray	2475		
Lime Hard Gray	2527		
Soft Lime	2610		
Lime	2657	TD	

Log. No. 3924

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

CASING RECORD

Diam., in	Bottom
10 3/4"	421'
8 5/8"	1000'
7"	2590'

ELEVATION 3512 FEET

INITIAL DAILY PRODUCTION:

Open bbls. Oil
Open P. & A. cu. ft. Gas
Tbg. bbls. Oil
Tbg. cu. ft. Gas

COUNTY Lea
FIELD Halfway
COMPANY Argo Oil Corporation *
LEASE Texas-State "B" Well No. 1 **
LOCATION (¼) NE SW
SEC. 16 T. 20S R. 32E
1980 feet from south line and
1980 feet from West line of Section
COMMENCED 9-13-39 - Deepened 5-25-
COMPLETED 2-21-40 - Deepened 8-19-
ABANDONED *Formerly West Lea Oil C
REMARKS: *Formerly F. M. Farley.
**Formerly Tex-State No. 1

FORMATION	BOTTOM, FEET
Lime	10
Caliche	25
Yellow sandy shale	45
Red shale	85
Red shale and sand	190
Lime	200
Red shale and sand	215
Lime, sand and shale	265
Red sand; water	270
Red mud	290
Red sand	325
›d bed	355
›ed shale	420
Red rock	421
Red rock and shells	455
Red shale and shells	530
Lime and red rock	670
Red rock and shells	760
Red shale and shells	873
Anhydrite	910
Red rock and salt shells	920
Anhydrite	938
Anhydrite and lime	1020
Anhydrite and salt	1040
Salt	1085
Red shale	1090
Anhydrite	1105
Lime	1135
Red rock	1140
Red rock, salt and shells	1250
Anhydrite, salt and red rock	1315
Salt	1390
Anhydrite	1405
Salt	1460
Salt and shells	1525
Salt	2000
Salt and anhydrite	2030
Salt, white	2090
Anhydrite, salt and potash	2105
Salt and shells	2160
Anhydrite	2200
Anhydrite and salt	2225
Salt and shells	2285
Anhydrite	2320
Lime, brown	2360
Lime, gray	2380
Lime, brown	2452
Shale and shells	2470
Lime, red	2512
Shale and shells	2525
Lime	2575
Sandy lime	2595
Gray lime	2615
Gray lime	2629
Lime	2719
Sandy lime, sharp	2733
Lime, hard, gray	2765
Lime and gypsum	2780
Lime	3032
Sand, soft	3036
Lime; HFW	3763 T.

ILLEGIBLE

Log No. 1129

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

COUNTY Lea
FIELD
COMPANY Western Drilling Co.
LEASE State Well No. 1
LOCATION (¼) SE NE NE
SEC. 16 T. 20S. R. 32E
feet from line and
feet from line of Section
COMMENCED 1-29-31
COMPLETED 9-10-31
ABANDONED
REMARKS:

Abandoned and Plugged.

CASING RECORD

Diam., in.	Bottom
15½	455'
12½	935'
8½	2459'
6 5/8	3213

ELEVATION 3460 FEET
INITIAL DAILY PRODUCTION:

Open		bbls. Oil
Open		cu. ft. Gas
Tbg.		bbls. Oil
Tbg.		cu. ft. Gas

FORMATION	BOTTOM, FEET
Light gyp	15
Red beds	160
Water	165
Red rock	230
Water	235
Red rock	425
Water sand	430
Red rock	455
Red beds	505
Red rock	535
Red rock and gyp	615
Red rock	720
Red rock and red beds	755
Red rock	780
Anhydrite	925
Red beds	930
Salt	935
Anhydrite	940
Salt	950
Anhydrite	980
White salt	985
Anhydrite and salt	1020
Anhydrite	1035
Anhydrite and lime shells	1050
Red mud	1060
Salt and anhydrite	1125
Red shale	1135
Salt and anhydrite	1265
Salt	1285
Anhydrite	1295
Salt	1325
Salt and anhydrite	1390
Anhydrite and slat	1460
Salt and anhydrite	1705
Salt	1855
Salt and anhydrite	1975
Salt	1995
Anhydrite air pocket	2000
Salt	2105
Anhydrite and salt	2145
Salt	2170
White salt and anhydrite	2185
Salt	2190
Anhydrite	2210
Salt and anhydrite	2260
Salt	2300
Salt and anhydrite	2315
Anhydrite	2360
Gray sandy lime	2375
Gray hard lime S.G. 2390	2385
Gray lime	2405
Broken lime with red and brown shale	2410
Anhydrite	2425
Gray lime	2435
Gray lime and anhydrite	2445
Gray lime	2448
SLM	2459
Gray lime	2500
Gray lime and blue shale	2505
Lime and shale	2515
Red and green shale	2520
Hard lime and shale	2530
Lime shells and brown shale	2545
Gray lime	2555
Shelly lime and shale	2575
Gray sand S.dead 0 at 2575-80	2580
Hard white lime	2600
White lime	2625
Brown sandy lime and blue shale	2645
White lime	2655
White lime and bentonite	2705
White lime	2740
Gray lime 400' sulphur water in 1½ hours from 2745'	2750
White water sand and lime	2760
White lime	2780
Dark lime increase water	2790
Gray lime	2810
Dark gray lime	2820
Gray lime	2830
Blue sandy lime	2845
Gray sandy lime	2865
Gray lime	2880

NEW MEXICO SCHOOL OF MINES
STATE BUREAU OF MINES AND MINERAL RESOURCES
SOCORRO, NEW MEXICO

WELL LOG DIVISION

COUNTY Lea
FIELD
COMPANY Western Drilling Co.
LEASE State Well No. 1
LOCATION (¼)
SEC. 16 T. 20 . R. 32
feet from line and
feet from line of Section
COMMENCED
COMPLETED
ABANDONED
REMARKS:

CASING RECORD

Diam., in.	Bottom

ELEVATION FEET
INITIAL DAILY PRODUCTION:
Open bbls. Oil
Open cu. ft. Gas
Tbg. bbls. Oil
Tbg. cu. ft. Gas

FORMATION	BOTTOM, FEET
White lime	2895
Gray lime	2910
White lime	2925
Gray lime	2975
White lime	2990
Hard white lime	3010
White lime	3020
Gray sandy lime	3035
Gray lime	3045
White lime	3120
White lime	3166
Gray lime	3175
White lime	3184
Gray lime	3192
White lime	3200
SLM	3208
Gray lime	3213
White lime	3225
Gray lime	3248
White lime	3265
White lime	3275
Anhydrite	3282
Anhydrite and white lime	3303
Gray and white lime	3324
Brown lime	3411
Brown and hard gray lime	3431
White lime	3474
Gray lime	3505
White sandy lime salt water	3520
White lime	3638
White lime 1730' water	3705
White sandy lime increase water	3718
White lime and sand	3723
White sandy lime	3747
Gray sandy lime	3760
White lime	3769
Gray sandy lime and bentonite	3776
Gray lime	3857
Gray lime	3865
Gray sandy lime	3889
Gray sand	3900
Gray sandy lime	3905
Gray lime	3922
White lime	3945
Hard white lime	3955
White lime	3983
White lime	4013
SLM TD	4005

NEW MEXICO SCHOOL OF MINES

STATE BUREAU OF MINES AND MINERAL RESOURCES

SOCORRO, NEW MEXICO

NEW MEXICO WELL LOG DIVISION

74??

COUNTY Lea
FIELD Saint Lawrence
COMPANY The Texas Company
LEASE Humphreys No. 1 Well
LOCATION (¼) NE NE SW
SEC. 18 T. 20 S R. 32 E
2310 feet from S line and
2310 feet from W line of Section
COMMENCED 4-26-29
COMPLETED 7-11-29
ABANDONED
REMARKS:

3465 SW
ELEVATION 3475 Approx FEET
INITIAL DAILY PRODUCTION:
Open bbls. Oil
Open P. & A. cu. ft. Gas
Tbg. bbls. Oil
Tbg. cu. ft. Gas

CASING RECORD

Diam., in.	Bottom
24	18
15½	434
12½	798
8¼	2540

FORMATION	BOTTOM, FEET
Gypsum and caliche	35
Red sandy shale	130
Red sand	210
Red Sandy shale	795
White and gray anhydrite	820
Red shale and salt	845
Gray and white anhydrite	865
Brown dolomite	875
Brown dolomite, little anhydrite	885
Gray and white anhydrite	945
Pure white salt	1005
Salt, anhydrite and gray shale	1015
Salty, red shale	1025
Pink salt	1035
Gray and white anhydrite	1055
Brown dolomite	1075
Salty red shale	1085
Pink salt	1105
Pink and white anhydrite	1115
Pink salt	1125
Pink salt; some red shale	1135
Red shaly sand	1155
Pink and white salt	1185
Pink salt	1305
Pink and white salt; some gray shale	1330
White salt	1350
Salt and red and gray shale	1360
Pink salt	1580
Red shale and salt	1590
Pink salt	1740
Pink salt, little red polyhalite	1850
White salt	1870
Brown dolomite and anhydrite	1900
Pink salt and polyhalite	2140
White salt	2200
Pink salt	2300
White salt; little anhydrite	2330
White salt; trace of brown shale	2425
White salt	2445
White salt and brown shale	2455
Brown and gray anhydrite	2470
White and gray anhydrite	2525
Tan and brown dolomite	2575
Gray sand, little lime	2585
Gray sand and green sandy shale	2595
Buff lime and bentonitic shale	2615
Light and buff lime	2630
Light and buff lime and green sandy shale	2640
Light and buff lime and black sandy shale	2660
Brown lime, some red and green sandy shale	2670
Gray and tan lime	2690
Red and green sand	2700
Red and green sand, little red shale, some gray lime	2710
White lime and dolomite, some red lime and red sandy shale	2770
White and red sandy shale	2795
Red sandy lime, little white lime	2816
White and pink dolomite	2840
Grayish white dolomite	2850
White dolomite, trace red shale	2885
White and red dolomite and red sand	2905
White dolomite	2910
Red and white dolomite	2919
White dolomite	2960
White dolomite and bulish gray bentonite shale	2985
White and red dolomite and bluish gray bentonitic shale	2995
Red sandy dolomite, white dolomite and green bentonitic shale	3000
Green bentonitic shale, red sandy dolomite and little white dolomite	3005

743

NEW MEXICO SCHOOL OF MINES

BUREAU OF MINES AND MINERAL RESOURCES

SOCORRO, NEW MEXICO

NEW MEXICO WELL LOG DIVISION

COUNTY Lea

FIELD

COMPANY The Texas Company

LEASE Humphreys No. 1 Well

LOCATION (¼) NE NE SW

SEC. 18 T. 20 S R. 32 E

3210 feet from S line and

3210 feet from W line of Section

COMMENCED 4-26-29

COMPLETED 7-11-29

ABANDONED

REMARKS:

CASING RECORD

Diam., in.	Bottom
24	18
15½	434
12½	798
8¼	2540

ELEVATION 3475 Approx FEET

INITIAL DAILY PRODUCTION:

Open bbls. Oil

Open cu. ft. Gas

Tbg. bbls. Oil

Tbg. cu. ft. Gas

FORMATION	BOTTOM, FEET
White dolomite, little green bentontic shale	3020
White dolomite and green bentonitic shale	3028
Green bentonitic shale, trace white sand	3031
White dolomite, some green bentonite and little sand	3036
White dolomite	3100
White dolomite, porous and showing dead oil, hole full of sulphur water. Plugged and abandoned 7-10-28	3105