

RECR - 10

Windmill Oil

Memo

Oil Contamination of Fresh Water Strata, HD McKinley Lease

September 27, 1957

Oil Contamination of Fresh Water
Strata, H. D. McKinley Lease,
Hobbs Pool, Lea County, New Mexico

Messrs: R. H. Coe & W. J. Haugh - Tulsa

Production

Hobbs

H. C. Mesberry & H. E. Wendt - Midland
Jack Jones - Tulsa

September 27, 1957

S. E. Cavanaugh, Los Angeles, Calif. (610 S. Main St.)

After extensive study by "Industrial Committee
Studying the Fresh Water Contamination in Hobbs Pool
Area", the attached map was compiled. This map
supersedes the contour map of the base of caliche
attached to our letter of August 8, 1957 concerning
subject lease.

E. W. Hogue
E. W. Hogue

/EH

Attachment

Oil Contamination of Fresh Water
Strata, B. D. McKinley Lease,
Hobbs Pool, Lea County, New Mexico

Mr. E. H. Coe & Mr. D. J. Haugh - Tulsa

Production

Hobbs

Mr. H. G. Mesberry & Mr. H. E. Wendt

August 6, 1957

Mr. Jack Jones - Tulsa

Mr. S. E. Cavanaugh, Los Angeles, Calif. (610 S. Main St.)

Please find attached a copy of the analysis on several samples of oil and water, which were collected on and around the Getty McKinley lease. These analysis were run by Southwestern Laboratories of Fort Worth, Texas, which was the nearest location to Hobbs.

As you will recall, a meeting was called by the NMOCC on July 9, 1957 to discuss the contamination of fresh water in the area of the Hobbs Pool. This meeting was initiated by a field trip which showed Mr. Ellison's oil contaminated water well and numerous surface pits scattered over the Hobbs Pool, the purpose being to show other possible sources of contamination beside casing leaks in oil wells. Those present representing Tidewater and Getty interests were: Mr. Cavanaugh, Mr. Jones, Mr. Melvin Neal, Mr. Miller and myself.

Mr. Ellison et al, has conducted an extensive water well drilling campaign around the Getty Oil Co. McKinley well #6, a Bowers sand producer, and southeastward to his home site. Water wells on the south side of the McKinley #6 were contaminated with oil. During the previously mentioned field trip, it was noted that the physical properties of the contaminating oil (gravity & color) resembled more closely that of San Andres crude oil rather than Bowers.

At the conclusion of the NMOCC meeting, Tidewater representatives agreed that an analysis of crude oils would be made in this area. Mr. Cavanaugh also suggested that samples of water from both Ellison's wells and the disposal pits be analyzed to determine if any salt water contamination was present in the fresh water strata.

A map of the McKinley lease is attached showing Ellison's water wells and will aid in locating the wells where samples were taken. Samples were also obtained from the Humble Bowers lease burn pit, located one-half mile south of the McKinley, which contained both oil and water. From the Pan American disposal pit, one-half mile southeast of Tidewater's Grimes, a sample of water was obtained. No samples could be obtained on Ellison water well #2. No water sample could be obtained from Ellison well #L 2230 #1.

Mr. Eric Engbrecht, NMOCC engineer, collected all samples. They were placed in containers and labeled by Mr. Miller and witnessed by Mr. Engbrecht.

Reviewing these analysis, the following conclusions can be drawn:

- (1) Contamination in the fresh water wells of Mr. Ellison's is a result of oil and gas, rather than salt water.
- (2) Analysis of the crude indicate the contaminating oil to be San Andres, rather than Bowers. This is readily apparent from gravity, sulphur content & initial boiling point. It can also be noted that the Bowers crude had 5% naptha, while the San Andres showed no naptha, but 15% wax distillates. The sample from Ellison L 2230 #1, had 10% wax distillates and no naptha. All water wells except #13 had sulphur contents of 1.2 % as did the San Andres, while the Bowers crude showed 0.56%.
- (3) The oil in the Humble pit was typical tank bottom draw-off and is not believed to have caused any contamination. All light ends were gone from the oil and indicated a gravity of 17.3°.
- (4) That McKinley #6, being drilled and completed in 1947 as a Bowers sand well, has never been drilled to a sufficient depth to encounter the San Andres and could not have possibly caused the contamination of this fresh water bearing strata.

We are also enclosing a contour map of the base of caliche and top of the red beds, the interval between containing the fresh water strata. Wells which had casing leaks are shown. We would call your attention to one error in these maps. This is the location of the houses and the water wells on the east edge of the McKinley lease. These should be moved 700' west.

Should you desire any other information, or if you would like Mr. Melvin Neal to have a copy of this letter and analysis, please advise.


H. P. Shackelford

RME:bb

Attachments

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

PHONE ED-9321
L. D. ED-9720

P. O. Box 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 27, 1937

File: 69.2

Sample Of: Crude Petroleum

To: Tidewater Oil Company, Hobbs, New Mexico, Mr. R. N. Miller

Marked: Ellison L-2230 #1

DISTILLATION:

<u>PERCENT OVER</u>	<u>TEMPERATURE OF CUTS</u>	<u>GRAVITY OF CUTS @60°F</u>
5	206°F	74.0° A.P.I.
10	244	67.2
15	278	60.4
20	306	55.6
25	338	51.6
30	382	47.2
35	422	43.0
40	470	39.5
45	510	36.5
50	542	34.3
55	588	31.5
60	592	28.7
65	596	27.7
70	620	25.0
75	630	24.2
80	634	25.7
85	590	27.1

NOTE: Gravity of Crude @60°F-----33.8° A.P.I.

Steam Admitted at-----510°F

Initial Boiling Point-----110°F

Last two cuts cracked

Residue-----Semi Solid

SUMMARY:

<u>FRACTION</u>	<u>PERCENT</u>	<u>GRAVITY @60°F</u>
Gasoline	30	59.3
Kerosene	15	39.7
Gas Oil	20	30.6
Wax Distillate	10	24.6
Cracked	10	----
Residue	15	Semi-Solid

Respectfully submitted

Lab. #M-5295

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

C. L. Manning

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

PHONE ED-9321
L. D. ED-9720

P. O. Box 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 27, 1937

File: 69.2

Sample of: Crude Petroleum

To: Tidewater Oil Company, Hobbs, New Mexico - Mr. R. H. Miller

Marked: H.D. McKinley Lease. San Andres Crude Tank #4832

DISTILLATION:

<u>PERCENT OVER</u>	<u>TEMPERATURE OF CUTS</u>	<u>GRAVITY OF CUTS @60°F</u>
5	204°F	73.7°A.P.I.
10	240	66.9
15	272	60.9
20	300	56.3
25	330	52.0
30	374	47.5
35	416	43.5
40	462	40.1
45	505	37.1
50	527	33.8
55	518	31.4
60	548	29.1
65	554	26.5
70	570	25.0
75	614	24.3
80	622	21.9
85	624	19.9

NOTE: Gravity of Crude @60°F----- 34.3°A.P.I.

Steam Admitted at----- 505°F

Initial Boiling Point----- 112°F

Last two cuts solid at room temperature (76°F)

Residue ----- Semi-Solid

SUMMARY:

<u>FRACTION</u>	<u>PERCENT</u>	<u>GRAVITY AT 60°F</u>
Gasoline	30	59.6°A.P.I.
Kerosene	15	40.2
Gas Oil	25	29.2
Wax Distillate	15	22.0
Residue	15	Semi Solid

Respectfully submitted

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. #M-5297

By-

C. L. Manning

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

PHONE ED-9321
L. D. ED-9720

P. O. Box 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 27, 1957

File: 69.2

Sample of: Crude Petroleum

To: Tidewater Oil Company, Hobbs, New Mexico, Mr. R. N. Miller

Marked: H.D. McKinley #6. Bowers Crude

DISTILLATION:

<u>PERCENT OVER</u>	<u>TEMPERATURE OF CUTS</u>	<u>GRAVITY OF CUTS @60°F</u>
5	222°F	70.6°A.P.I.
10	256	64.0
15	282	59.4
20	306	55.8
25	334	53.5
30	367	50.7
35	406	48.1
40	446	45.4
45	490	42.7
50	528	40.9
55	536	38.5
60	608	36.6
65	612	34.0
70	618	33.0
75	624	30.3
80	628	28.7
85	590	29.5

NOTE: Gravity of Crude @60°F----- 38.4°A.P.I.

Steam Admitted at----- 528°F

Initial Boiling Point----- 196°F

Trace water in crude.

Last cut cracked.

<u>SUMMARY:</u>	<u>FRACTION</u>	<u>PERCENT</u>	<u>GRAVITY @60°F</u>
	Gasoline	30	59.6°A.P.I.
	Naphtha	5	48.1
	Kerosene	25	40.8
	Gas Oil	20	31.5
	Cracked	5	----
	Residue	15	Semi-Solid

Respectfully submitted

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. #M-5296

By *C. L. Manning*

THE FORT WORTH LABORATORIES

SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

PHONE ED-9321
L. D. ED-9720

P. O. Box 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 29, 1957

File: 69.2

Sample of: Crude Petroleum

To: Tidewater Oil Company, Hobbs, New Mexico, - Mr. R. N. Miller

Marked: Surface Pit on Humble Bowers Lease

DISTILLATION:

<u>PERCENT OVER</u>	<u>TEMPERATURE OF CUTS</u>	<u>GRAVITY OF CUTS @60°F</u>
5	324°F	32.7° A.P.I.
10	556	31.1
15	558	30.1
20	560	28.9
25	572	27.6
30	568	26.0
35	570	24.8
40	576	23.9
45	576	23.2
50	576	22.3
55	594	21.0
60	594	20.3
65	588	18.5
70	588	18.4
75	588	18.0
80	576	7.1

NOTE: Gravity of Crude @60°F----- 17.3° A.P.I.
 Steam Admitted at----- First cut
 Initial Boiling Point----- Unable to obtain
 Last five cuts solid at room temperature (86°F)
 Residue-Solid at room temperature---- 86°F
 Crude contained about 50% water; Distillation made after water removed.

<u>SUMMARY:</u>	<u>FRACTION</u>	<u>PERCENT</u>	<u>GRAVITY @60°F</u>
	Gas Oil	30	29.4° A.P.I.
	Wax Distillate	50	19.8
	Residue	20	Solid at room temperature

Respectfully submitted

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

By *C. L. Manning*

**THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES****CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS**

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 26, 1957**File: 69.2****REPORT**Sample of **Petroleum** Date Received **7/15/57**To **Tidewater Oil Company,**Received from **Hobbs, New Mexico - Mr. R. N. Miller**Marked **ELLISON L-2230 #1****Total Sulphur (Bomb)----- 1.40%****THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES**Lab. No. **M-5214**

Per

C. L. Manning

**THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES****CONSULTING ANALYTICAL CHEMISTS
AND TESTING ENGINEERS**

ESTABLISHED 1912

ED 5-9321
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ED 5-9323P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 26, 1957**File: 69.2****REPORT**

Sample of **Petroleum** Date Received **7/15/57**
To **Tidewater Oil Company,**
Received from **Hobbs, New Mexico - Mr. R. N. Miller**
Marked **ELLISON #1**

Total Sulphur (Bomb)----- 1.50%**THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES**Lab. No. **K-5222**

Per

C. L. Manning

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SOUTHWESTERN LABORATORIES****CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS**

ESTABLISHED 1912

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2900 CULLEN

FORT WORTH 1, TEXAS

July 26, 1957**File: 69.2****REPORT**

Sample of **Petroleum** Date Received **7/15/57**
To **Tidewater Oil Company,**
Received from **Hobbs, New Mexico**
Marked **ELLISON #4**

Total Sulphur (Bomb)----- 1.15%**THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES**Lab. No. **N-5220**

Per

C. L. Manning

**THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES****CONSULTING ANALYTICAL CHEMISTS
AND TESTING ENGINEERS**

ESTABLISHED 1912

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2900 CULLEN

FORT WORTH 1, TEXAS

July 26, 1957**File: 69.2****REPORT**

Sample of **Petroleum** Date Received **7/15/57**
To **Tidewater Oil Company,**
Received from **Hobbs, New Mexico - Mr. R. N. Miller**
Marked **ELLISON #5**

Total Sulphur (Bomb)----- 1.43%**THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES**Lab. No. **M-5221**

Per

C. L. Manning

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

CONSULTING ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

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ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 26, 1957

File: 69.2

REPORT

Sample of Petroleum Date Received 7/15/57
To Tidewater Oil Company,
Hobbs, New Mexico, Mr. R. N. Miller
Received from
Marked ELLISON #12

Total Sulphur (Bomb) ----- 1.29%

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Per

C. L. Manning

Lab. No. **M-5216**

Our letters and reports are for the exclusive use of the client to whom they are addressed. The use of our names must receive our prior written approval. Our letters and reports apply only to the sample tested and are not necessarily indicative of the qualities identical or similar products.

**THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES****CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS**

ESTABLISHED 1912

ED 5-9321
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2900 CULLEN

FORT WORTH 1, TEXAS

July 26, 1957**File: 69.2****REPORT**Sample of **Petroleum** Date Received **7/15/57**To **Tidewater Oil Company,**Received from **Hobbs, New Mexico, Mr. R. N. Miller**Marked **ELLISON #13****Total Sulphur (Bomb)----- 0.45%****THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES**Lab. No. **M-5215**

Per

C. L. Manning

**THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES****CONSULTING ANALYTICAL CHEMISTS
AND TESTING ENGINEERS**

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2900 CULLEN

FORT WORTH 1, TEXAS

July 26, 1957**File: 69.2****REPORT**Sample of **Petroleum** Date Received **7/15/57**To **Tidewater Oil Company,**Received from **Hobbs, New Mexico - Mr. R. N. Miller**Marked **H.D. McKinley Lease-San Andres Crude-Sample from Tank 4832****Total Sulphur (Bomb)----- 1.26%****THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES**Lab. No. **M-5219**Per **C. L. Manning**

**THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES****CONSULTING ANALYTICAL CHEMISTS
AND TESTING ENGINEERS**

ESTABLISHED 1912

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2900 CULLEN

FORT WORTH 1, TEXAS

July 26, 1957**File: 69.2****REPORT**

Sample of **Petroleum** Date Received **7/15/57**
To **Tidewater Oil Company,**
Received from **Hobbs, New Mexico - Mr. R. N. Miller**
Marked **H.D. McKinley #6 Bowers Crude**

Total Sulphur (Bomb)----- 0.53%**THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES**Lab. No. **M-5218**

Per

C. L. Manning

**THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES****CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS**

ESTABLISHED 1912

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ED 5-9323P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 26, 1957**File: 69.2****REPORT**

Sample of **Petroleum** Date Received **7/15/57**
To **Tidewater Oil Company,**
Received from **Hobbs, New Mexico - Mr. R. N. Miller**
Marked **Surface Pit on Humble Bowers Lease**

Total Sulphur (Bomb)----- 1.98%**THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES**Lab. No. **M-5217**

Per

C. L. Manning

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
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ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 24, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/15/57To Tidewater Oil Company,Received from Hobbs, New Mexico, - Mr. R. N. MillerMarked ELLISON #1

	<u>Parts per Million</u>	<u>Grains per Gallon</u>
Silica-----	32.0	1.86
Iron & Aluminum Oxides-----	6.0	0.35
IONS OF:		
Calcium-----	138.9	8.11
Magnesium-----	25.6	1.50
Sodium-----	84.0	4.91
Bi-Carbonate-----	405.0	23.63
Sulfate-----	167.9	9.81
Chloride-----	90.3	5.27
TOTAL	949.7	55.46

HYPOTHETICALLY COMBINED AS:

Calcium Bi-Carbonate-----	538.1	31.43
Calcium Sulfate-----	19.7	1.15
Magnesium Sulfate-----	126.6	7.39
Sodium Sulfate-----	78.4	4.58
Sodium Chloride-----	148.9	8.70

pH----- 7.9

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No. **M-5230**

Per



THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 24, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/15/57

To Tidewater Oil Company,

Received from Hobbs, New Mexico - Mr. R. N. Miller

Marked ELLISON #3

	<u>Parts per Million</u>	<u>Grains per Gallon</u>
Silica-----	40.0	2.34
Iron & Aluminum Oxides-----	6.0	0.35

IONS OF:

Calcium-----	120.5	7.04
Magnesium-----	31.0	1.81
Sodium-----	54.2	3.17
Bi-Carbonate-----	514.8	30.06
Sulfate-----	23.9	1.40
Chloride-----	69.4	4.05

TOTAL 859.8 50.21

HYPOTHETICALLY COMBINED AS:

Calcium Bi-Carbonate-----	487.2	28.45
Magnesium Bi-Carbonate-----	177.9	10.39
Magnesium Sulfate-----	5.9	0.34
Sodium Sulfate-----	28.4	1.66
Sodium Chloride-----	114.4	6.68

pH----- 7.8

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No. **M-5229**

Per

C. L. Manning

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
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P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 23, 1957

File: 68.7

REPORT

Sample of WaterDate Received 7/15/57To Tidewater Oil Company,Received from Hobbs, New Mexico - Mr. R. N. MillerMarked ELLISON #4

	<u>Parts per Million</u>	<u>Grains per Gallon</u>
Silica-----	23.0	1.34
Iron & Aluminum Oxide-----	1.0	0.06
IONS OF:		
Calcium-----	153.2	8.95
Magnesium-----	24.3	1.42
Sodium-----	2.4	0.14
Bi-Carbonate-----	402.6	23.51
Sulfate-----	28.8	1.68
Chloride-----	90.2	5.27
TOTAL	725.5	42.37

HYPOTHETICALLY COMBINED AS:

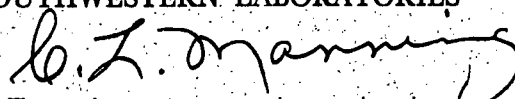
Calcium Bi-Carbonate-----	534.9	31.24
Calcium Sulfate-----	40.9	2.39
Calcium Chloride-----	24.4	1.42
Magnesium Chloride-----	95.2	5.56
Sodium Chloride-----	6.1	0.36

pH----- 8.0

Lab. No. **M-5236**

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Per



THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 24, 1937

File: 68.7

REPORT

Sample of Water Date Received 7/15/37

To Tidewater Oil Company, Hobbs, New Mexico, Mr. R. N. Miller

Received from Same

Marked ELLISON #5

	<u>Parts per Million</u>	<u>Grains per Gallon</u>
Silica-----	25.0	1.46
Iron & Aluminum Oxides-----	9.0	0.53

IONS OF:

Calcium-----	140.9	8.23
Magnesium-----	28.2	1.65
Sodium-----	60.9	3.56
Bi-Carbonate-----	517.3	30.21
Sulfate-----	74.1	4.33
Chloride-----	69.4	4.05
TOTAL	924.8	54.01

HYPOTHETICALLY COMBINED AS:

Calcium Bi-Carbonate-----	569.6	33.26
Magnesium Bi-Carbonate-----	106.4	6.21
Magnesium Sulfate-----	51.4	3.00
Sodium Sulfate-----	49.0	2.86
Sodium Chloride-----	114.4	6.68

pH----- 7.8

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No. **M-5232**

Per

C. L. Manning

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 24, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/15/57
To Tidewater Oil Company,
Received from Hobbs, New Mexico - Mr. R.N. Miller
Marked ELLISON #6

	<u>Parts per Million</u>	<u>Grains per Gallon</u>
Silica-----	47.0	2.74
Iron & Aluminum Oxides-----	7.0	0.41

IONS OF:

Calcium-----	151.1	8.82
Magnesium-----	28.0	1.64
Sodium-----	128.3	7.49
Bi-Carbonate-----	561.2	32.77
Sulfate-----	156.4	9.13
Chloride-----	104.2	6.09

TOTAL	1183.2	69.09
-------	--------	-------

HYPOTHETICALLY COMBINED AS:

Calcium Bi-Carbonate-----	610.9	35.68
Magnesium Bi-Carbonate-----	121.8	7.11
Magnesium Sulfate-----	37.6	2.20
Sodium Sulfate-----	187.1	10.96
Sodium Chloride-----	171.8	10.03

pH----- 7.7

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No. **M-5228**

Per

C. L. Manning

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 25, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/15/57
To Tidewater Oil Company,
Received from Hobbs, New Mexico - Mr. R. N. Miller
Marked ELLISON #7

	<u>Parts per Million</u>	<u>Grains per Gallon</u>
Silica-----	33.0	1.93
Iron & Aluminum Oxides-----	2.0	0.12
IONS OF:		
Calcium-----	94.0	5.49
Magnesium-----	11.4	0.67
Sodium-----	127.3	7.43
Bi-Carbonate-----	378.2	22.09
Sulfate-----	144.0	8.41
Chloride-----	69.4	4.05
TOTAL	859.3	50.19

HYPOTHETICALLY COMBINED AS:

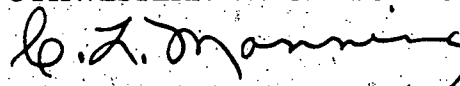
Calcium Bi-Carbonate-----	380.0	22.19
Magnesium Bi-Carbonate-----	68.6	4.01
Sodium Bi-Carbonate-----	48.2	2.81
Sodium Sulfate-----	213.1	12.45
Sodium Chloride-----	114.4	6.68

pH----- 7.8

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No. **M-5227**

Per



THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 24, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/15/57
To Tidewater Oil Company,
Received from Hobbs, New Mexico - Mr. R. N. Miller
Marked ELLISON #8

Parts per Million Grains per Gallon

Silica-----	30.0	1.75
Iron & Aluminum Oxide-----	4.0	0.23

IONS OF:

Calcium-----	136.8	7.99
Magnesium-----	25.8	1.51
Sodium-----	88.8	5.19
Bi-Carbonate-----	590.5	34.49
Sulfate-----	56.0	3.27
Chloride-----	69.4	4.05

TOTAL	1001.3	58.48
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HYPOTHETICALLY COMBINED AS:

Calcium Bi-Carbonate-----	553.1	32.30
Magnesium Bi-Carbonate-----	155.2	9.06
Sodium Bi-Carbonate-----	61.7	3.60
Sodium Sulfate-----	82.9	4.84
Sodium Chloride-----	114.4	6.68

pH----- 7.9

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No. **M-5234**Per *C. L. Manning*

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 24, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/15/57

To Tidewater Oil Company,

Received from Hobbs, New Mexico, - Mr. R. N. Miller

Marked ELLISON #9

Parts per Million Grains per Gallon

Silica-----	40.0	2.34
Iron & Aluminum Oxides-----	5.0	0.29

IONS OF:

Calcium-----	134.8	7.87
Magnesium-----	25.8	1.51
Sodium-----	86.2	5.03
Bi-Carbonate-----	378.2	22.09
Sulfate-----	184.4	10.77
Chloride-----	90.3	5.27

TOTAL	944.7	55.17
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HYPOTHETICALLY COMBINED AS:

Calcium Bi-Carbonate-----	502.5	29.35
Calcium Sulfate-----	35.7	2.08
Magnesium Sulfate-----	127.6	7.45
Sodium Sulfate-----	85.0	4.96
Sodium Chloride-----	148.9	8.70

pH----- 8.0

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No. **M-5231**

Per

C. L. Manning

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 23, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/15/57To Tidewater Oil Company,Received from Hobbs, New Mexico - Mr. R. N. MillerMarked ELLISON #10

	<u>Parts per Million</u>	<u>Grains per Gallon</u>
Silica-----	47.0	2.74
Iron & Aluminum Oxide-----	8.0	0.47
IONS OF:		
Calcium-----	110.3	6.44
Magnesium-----	36.0	2.10
Sodium-----	78.0	4.56
Bi-Carbonate-----	390.4	22.80
Sulfate-----	144.0	8.41
Chloride-----	86.8	5.07
TOTAL	900.5	52.59

HYPOTHETICALLY COMBINED AS:

Calcium Bi-Carbonate-----	445.9	26.04
Magnesium Bi-Carbonate-----	65.8	3.84
Magnesium Sulfate-----	123.8	7.23
Sodium Sulfate-----	66.9	3.91
Sodium Chloride-----	143.1	8.36

pH----- 8.0

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No. **M-5235**Per *C. L. Manning*

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 25, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/13/57

To Tidewater Oil Company,

Received from Hobbs, New Mexico - Mr. R. N. Miller

Marked ELLISON #11

	<u>Parts per Million</u>	<u>Grains per Gallon</u>
Silica-----	43.1	2.51
Iron & Aluminum Oxides-----	4.0	0.23

IONS OF:

Calcium-----	147.1	8.59
Magnesium-----	27.7	1.62
Sodium-----	150.1	8.77
Bi-Carbonate-----	622.2	36.34
Sulfate-----	144.0	8.41
Chloride-----	104.2	6.09

TOTAL 1242.3 72.56

HYPOTHETICALLY COMBINED AS:

Calcium Bi-Carbonate-----	594.7	34.73
Magnesium Bi-Carbonate-----	166.7	9.74
Sodium Bi-Carbonate-----	49.0	2.86
Sodium Sulfate-----	213.1	12.43
Sodium Chloride-----	171.8	10.03

pH----- 7.7

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No. **M-5226**

Per

C. L. Manning

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 24, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/15/57To Tidewater Oil Company,Received from Hobbs, New Mexico - Mr. R. N. MillerMarked ELKISON #12

	<u>Parts per Million</u>	<u>Grains per Gallon</u>
Silica-----	24.0	1.40
Iron & Aluminum Oxides-----	8.0	0.47

IONS OF:

Calcium-----	100.1	5.85
Magnesium-----	15.1	0.88
Sodium-----	33.0	1.93
Bi-Carbonate-----	361.1	21.09
Sulfate-----	55.1	3.22
Chloride-----	20.9	1.22

TOTAL	617.2	36.04
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HYPOTHETICALLY COMBINED AS:

Calcium Bi-Carbonate-----	404.7	23.63
Magnesium Bi-Carbonate-----	67.9	3.97
Magnesium Sulfate-----	18.3	1.07
Sodium Sulfate-----	59.9	3.50
Sodium Chloride-----	34.4	2.01

pH----- 7.9

Lab. No. **M-5233**

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Per



THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 23, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/15/57
To Tidewater Oil Company,
Received from Hobbs, New Mexico - Mr. R. N. Miller
Marked ELLISON #13

	<u>Parts per Million</u>	<u>Grains per Gallon</u>
Silica-----	18.0	1.05
Iron & Aluminum Oxides-----	1.0	0.06
IONS OF:		
Calcium-----	140.9	8.23
Magnesium-----	25.3	1.48
Sodium-----	69.4	4.05
Bi-Carbonate-----	546.6	31.92
Sulfate-----	53.4	3.12
Chloride-----	76.4	4.46
TOTAL	931.0	54.37

HYPOTHETICALLY COMBINED AS:

Calcium Bi-Carbonate-----	569.6	33.26
Magnesium Bi-Carbonate-----	141.6	8.27
Magnesium Sulfate-----	7.9	0.46
Sodium Sulfate-----	66.9	3.91
Sodium Chloride-----	126.0	7.36

pH----- 8.1

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No. **M-5237**

Per

C. L. Manning

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 25, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/15/57
To Tidewater Oil Company,
Received from Hobbs, New Mexico - Mr. R. N. Miller
Marked WELL NEAR MCKINLEY #7

	<u>Parts per Million</u>	<u>Grains per Gallon</u>
Silica-----	61.0	3.56
Iron & Aluminum Oxides-----	3.0	0.18
IONS OF:		
Calcium-----	112.2	6.55
Magnesium-----	23.4	1.37
Sodium-----	164.9	9.63
Bi-Carbonate-----	329.4	19.24
Sulfate-----	210.7	12.30
Chloride-----	173.6	10.14
TOTAL	1078.2	62.97

HYPOTHETICALLY COMBINED AS:

Calcium Bi-Carbonate-----	437.7	25.56
Calcium Sulfate-----	13.3	0.78
Magnesium Sulfate-----	115.7	6.76
Sodium Sulfate-----	161.3	9.42
Sodium Chloride-----	286.2	16.71

pH----- 8.0

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No. **K-5225**

Per *C. L. Manning*

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 25, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/15/57

To Tidewater Oil Company,

Received from Hobbs, New Mexico - Mr. R. N. Miller

Marked Surface Pit on Humble Bowers Lease.

	<u>Parts per Million</u>	<u>Grains per Gallon</u>
Silica-----	23.0	1.34
Iron & Aluminum Oxides-----	4.0	0.23
IONS OF:		
Calcium-----	171.5	10.02
Magnesium-----	117.1	6.84
Sodium-----	2459.1	143.61
Carbonate-----	19.2	1.12
Bi-Carbonate-----	231.8	13.54
Sulfate-----	151.4	8.84
Chloride-----	4166.4	243.32
TOTAL	7343.5	428.86

HYPOTHETICALLY COMBINED AS:

Calcium Carbonate-----	32.0	1.87
Calcium Bi-Carbonate-----	308.0	17.99
Calcium Sulfate-----	215.0	12.56
Calcium Chloride-----	52.4	3.06
Magnesium Chloride-----	458.6	26.78
Sodium Chloride-----	6250.5	365.03

pH----- 8.3

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No. **M-5223**

Per

C. L. Manning

THE FORT WORTH LABORATORIES SOUTHWESTERN LABORATORIES

CONSULTING, ANALYTICAL CHEMISTS
AND TESTING ENGINEERS

ESTABLISHED 1912

ED 5-9321
ED 5-9322
ED 5-9323

P. O. BOX 1379
2900 CULLEN

FORT WORTH 1, TEXAS

July 25, 1957

File: 68.7

REPORT

Sample of Water Date Received 7/15/57To Tidewater Oil Company,Received from Hobbs, New Mexico - Mr. R. N. Miller

Marked Landreth Co., et al Pan American Surface Disposal pit on State G. Lease
Battery 1 & 2 NW/4 Section 33-185-38E.

Parts per MillionGrains per Gallon

Silica-----	64.0	3.74
Iron & Aluminum Oxides-----	24.0	1.40

IONS OF:

Calcium-----	714.8	41.74
Magnesium-----	189.7	11.08
Sodium-----	2795.6	163.26
Bi-Carbonate-----	744.2	43.46
Sulfate-----	2070.1	120.89
Chloride-----	4166.4	243.32

TOTAL

10768.8

628.89

HYPOTHETICALLY COMBINED AS:

Calcium Bi-Carbonate-----	988.8	57.75
Calcium Sulfate-----	1597.5	93.29
Magnesium Sulfate-----	938.1	54.79
Sodium Sulfate-----	287.7	16.80
Sodium Chloride-----	6868.7	401.13

pH----- 7.7

THE FORT WORTH LABORATORIES
SOUTHWESTERN LABORATORIES

Lab. No: **M-5224**

Per

C. L. Manning