W A T E R F L O O D I N V E S T I G A T I O N

NORTH SHUGART FIELD

EDDY COUNTY, NEW MEXICO

For

WORTH DRILLING COMPANY, INC.
Fort Worth, Texas

R. W. Tesch
Electric Bldg.
Ft. Worth, Texas

I N D E X

R. W. TESCH
PETROLEUM ENGINEER AND GEOLOGIST
ELECTRIC BUILDING
FORT WORTH, TEXAS

January 18, 1952

Worth Drilling Company, Inc.
Continental Life Building,
Fort Worth, Texas.

Gentlemen:

I have completed an office examination of your properties in the North Shugart Field, Eddy County, New Mexico, to determine the feasibility of injecting water into your Taylor A 3.

The properties involved consist of three leases with a total of twelve pumping wells. The gross recovery of these leases as of January 1, 1952 was 460,203 barrels, and it is estimated that an additional 84,000 barrels (gross) will be recovered by primary production.

Due to absence of reservoir data it is not possible to predict the volume of oil that may be recovered by a water flood. Nevertheless the information available indicates that there is an excellent chance for the flood to be successful, and it is accordingly recommended that the proposed pilot flood be instigated at an early date. It is further recommended that in the event this pilot flood proves successful, the flood be expanded to the entire properties.

Additional discussion, data and exhibits will be found in the following pages.

Respectfully submitted,

R. W. Tesch

R. W. Tesch

General Discussion and Purpose

The properties involved are those of the Worth Drilling Company, Inc. (Fort Worth, Texas) in the North Shugart Field, Eddy County, New Mexico. These leases, all of which are located in Sections 12 and 13, T-18-S, R-31-E, are as follows:

	No. Wells
A. C. Taylor 'A'	7
A. C. Taylor 'B'	1
Malco Taylor 'A'	4
	12*

The purpose of this investigation is to determine the feasibility of injecting water into Taylor A 3 as a pilot flood in an inverted five spot pattern.

*All wells are pumping and produce no water.

GEOLOGY AND ACCUMULATION

Production in the North Shugart Field originates from the 'Red Sand', which is a part of the Queen formation (Permian). The average depth of this sand is approximately 3,500'. This sand is the equivalent of sands in Winkler and Ward Counties, Texas, which are being successfully water flooded at this time.

The overall thickness, as determined from sample logs, is approximately fifty feet; however, it appears that only 10' - 15' is oil productive. It is evidently of low permeability, as all of the wells have responded to nitroglycerine shots. Furthermore, the permeability appears to be lenticular as was demonstrated when a dry hole (Taylor A 8) was obtained in the middle of productive wells. The absence of core data precludes further discussion of the sand's characteristics.

There appears to be no structural trap, and the accumulation is evidently stratigraphic as a result of permeability pinchouts. It is believed that the limits of the field have been delineated.

A structure map, prepared by Mr. Kennedy, contoured on the top of the 'Red Sand' is included in the appendix.

RECOVERY AND RESERVOIR DATA

Recovery

The past recovery of the leases involved in this report is best illustrated by a decline chart included in the appendix which shows average monthly production (composite) plotted on semilog graph paper. As will be noted, the average decline during the past three years (after drilling ceased), has been 34% per year. This decline is believed to be an accurate representation, as all of the wells are producing at capacity. The following figures are the result of this projection.

	1-1-52	Primary Future	Primary Ultimate
Gross Recovery	460,203	84,000*	544,203
Gross Recovery per well	38,400	7,000	45,350
Gross Recovery per acre (440 acres)	1045	191	1236

With a productive sand thickness of 10' to 15' the estimated ultimate recovery per acre foot will vary between 82 and 123 barrels per acre foot. Lack of data precludes a more definite estimate, but the range indicated appears to be reasonable.

The above estimates are conservative, as it has been observed in similar production that the decline rate has decreased in the later stages of production. During these latter periods the reserves are controlled by economics which are without the scope of this investigation. The reserves as estimated above are realistic and it is believed present a firm basis for future plans.

*This figure is broken down to the following individual lease data:

Taylor 'A'	34,500
Taylor 'B'	7,000
Malco Taylor 'A'	42,500
	84,000

Reservoir

Information is completely lacking as to bottom hole pressure data, reservoir fluid data, core data and gas-oil ratio history.

It is believed, however, on the basis of data available that the reservoir fluid is undersaturated with gas, as the wells today produce very little gas and apparently had very little gas when completed. A few of the wells flowed for a short time after being shot (all wells have been shot), but soon went on the pump, thus indicating a low gas-oil ratio.

The produced oil is sweet and has a gravity of 37°. None of the wells produce water, and it is concluded that there is no water drive. The reservoir is undoubtedly of a depletion type.

WATER FLOOD

Injection Well

The proposed injection well Taylor 'A' 3, now producing approximately three barrels per day, appears to be advantageously located for a pilot flood. It is recommended that a maximum of 150 barrels of water per day be injected into this well and that this rate be much lower at the inception. The rate should be carefully observed and adjustments made as information is developed.

Water Analysis

It is understood that a water well now producing from a depth of 450' is available for this pilot flood. An examination of the analysis (enclosed in the appendix) of this water indicates that no treatment is needed; however, precautions should be taken to isolate this water from air before injection. This can easily be done by keeping a layer of oil on top of the water in the storage tanks.

Future Flood Pattern

In the event the pilot flood indicates that the flood is feasible, the pattern should be changed to a regular five spot pattern by adding the following wells to the pattern:

Taylor 'A' 1, 4 and 5
Malco Taylor 'A' 2, 3 and 4

This program is of course flexible and will depend to a large extent on the results obtained by the pilot flood, the availability of water and the cooperation of offset operators.

Additional Reserves

In the Winkler and Ward Counties floods of the equivalent sand, it is generally estimated that the volume of oil to be recovered by water flooding will equal the volume recovered by primary methods. In those areas, however, the primary recoveries have been higher and the projects therefore had a better chance for success.

In the particular area being discussed it would be extremely hazardous to estimate the additional oil to be recovered as a result of a flood due to the complete lack of reservoir data. Nevertheless, if the area proves adaptable to flooding, it would not be unreasonable to predict a recovery equal to the primary recovery.

R. W. TESCH

WELL DATA

Well	Date of Completion	Initial Production
Taylor A 1	12-3-38	45 pump
2	10-22-40	43 pump
3	6-22-47	81 pump
4	4-10-48	160 flow
5	7-5-48	200 flow
6	9-27-48	105 flow
7	3-18-50	65 flow
Taylor B 2	1-4-49	70 pump
Malco Taylor A 1	10-7-47	100 flow
2	6-28-48	150 flow
3	9-14-48	50 flow
4	7-8-49	25 pump

WATER ANALYSIS

Eddy County, New Mexico

Worth Drilling Company, Inc.

Water Well #1, A. C. Taylor Lease

RADICALS	Parts per million	HYPOTHETICAL COMBINATIONS	Parts per million
Sodium and Potassium	53.2	Silica	
Calcium	40.	Calcium Chloride	
Magnesium	43.8	Magnesium Bicarbonate	
Chloride	20.	Magnesium Chloride	
Sulfate	98.8	Sodium Sulfate	
Bicarbonate	323.	Sodium Chloride	
TOTAL	578.8	Iron Chloride	
Total Solids at 150° C			
Fixed Solids		Hydrogen Sulfide	none
Silica		pH	7.9
Iron	none	Density	1.005 @ 72° F.

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PRODUCTION DATA

Lease	No. Wells	No. Productive acres	Recovery 1-1-52 Gross	Per Well	Per Acre	Decline Rate Per Year	Primary Reserves 1-1-52	Primary Estimated Ultimate Recovery Gross	Per Well	Per Acre
Taylor 'A'	7	240	307,480	43,925	1,281	38%	34,500	341,980	48,854	1,425
Taylor 'B'	1	40	21,572	21,572	539	29%	7,000	28,572	28,572	714
Malco Taylor 'A'	4	160	131,151	32,787	819	30%	42,500	173,651	43,412	1,085
Total	12	440	460,203	38,400	1,045		84,000	544,203	45,350	1,236

COMPOSITE PROD.

WORTH DRILLING CO.
NORTH SHUGART FIELD
EDDY CO., N.M.

TAYLOR 'A'
" 'B'
MALCO TAYLOR 'A'

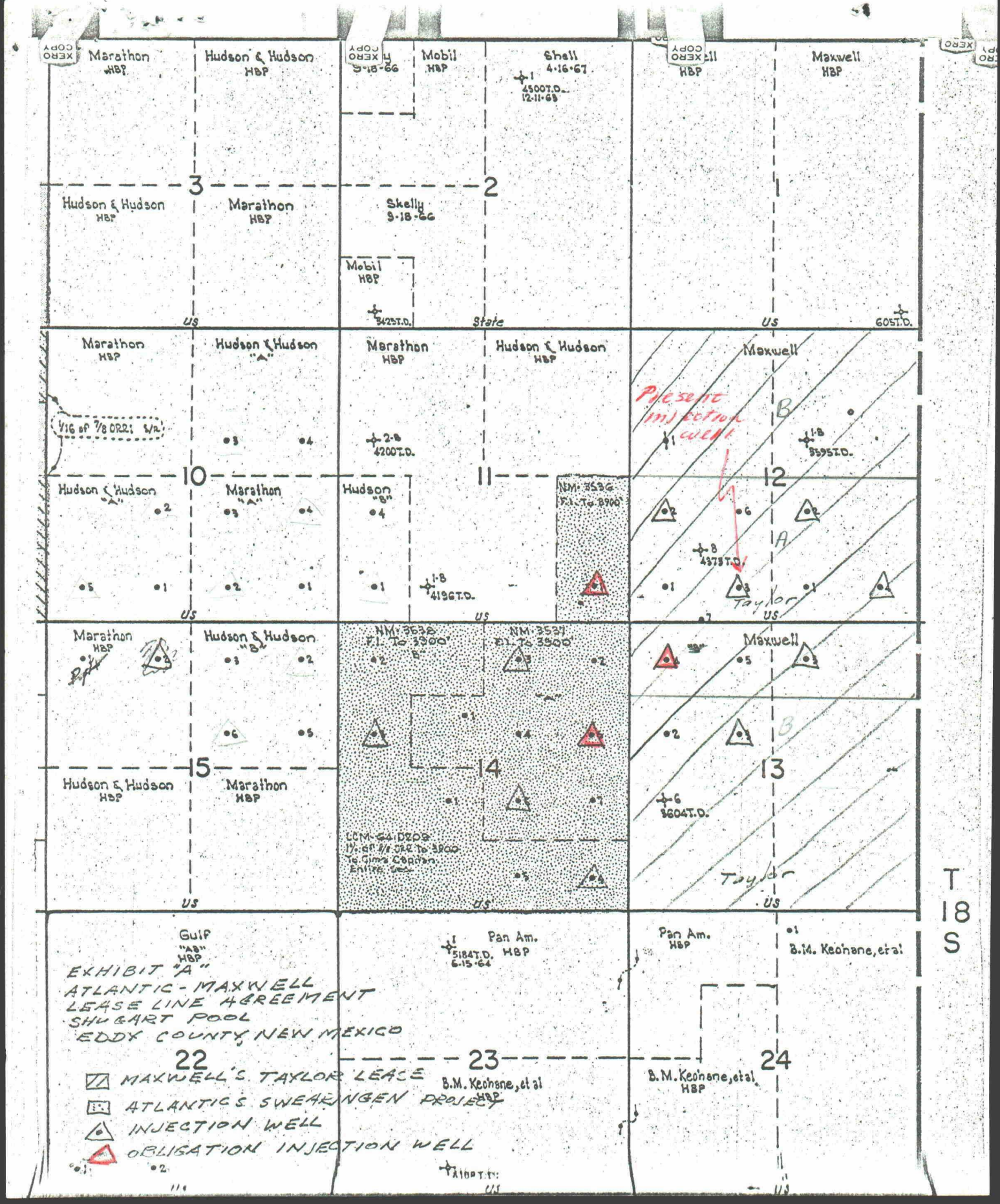
34%

Est.

ALL GRASS MONTHLY BBLS

Net Wells 1 2 2 2 3 2 4 7 11 12

RWT


Marathon HBP
Hudson & Hudson HBP
Mobil HBP
Shell 4-16-67
4500 T.D. 12-11-68
Maxwell HBP
3
2
1
Hudson & Hudson HBP
Marathon HBP
Skelly 9-18-66
Mobil HBP
3425 T.D.
State
US
605 T.D.
Marathon HBP
Hudson & Hudson "A"
Marathon HBP
Hudson & Hudson HBP
1/16 of 7/8 ORRI WI
2-8 4200 T.D.
Maxwell
Present injection well
B
1-8 3595 T.D.
10
11
12
Hudson & Hudson "A"
Marathon "A"
Hudson "B"
NM-3536 F.I. To 3900'
1-8 4196 T.D.
8 4375 T.D.
A
Taylor
Marathon HBP
Hudson & Hudson "B"
NM-3538 F.I. To 3900'
NM-3537 F.I. To 3500'
Maxwell
B
15
14
13
Hudson & Hudson HBP
Marathon HBP
6 3604 T.D.
LCM-641 D209 1/16 GR W/I ORR To 3900 To Simo Canyon Entire Sec.
Taylor
T 18 S
Gulf "AB" HBP
Pan Am. HBP
5184 T.D. 6-15-64
Pan Am. HBP
B.M. Keohane, et al
EXHIBIT "A"
ATLANTIC - MAXWELL
LEASE LINE AGREEMENT
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MAXWELL'S TAYLOR LEASE
ATLANTIC'S SWEARINGEN PROJECT
INJECTION WELL
OBLIGATION INJECTION WELL