

CASE 3126: Application of MURPHY
OIL CORP. for a pressure mainten-
ance project, San Juan County.

CASE No.

3126

Application,
TRANSCRIPTS,
SMALL Exhibits
ETC.

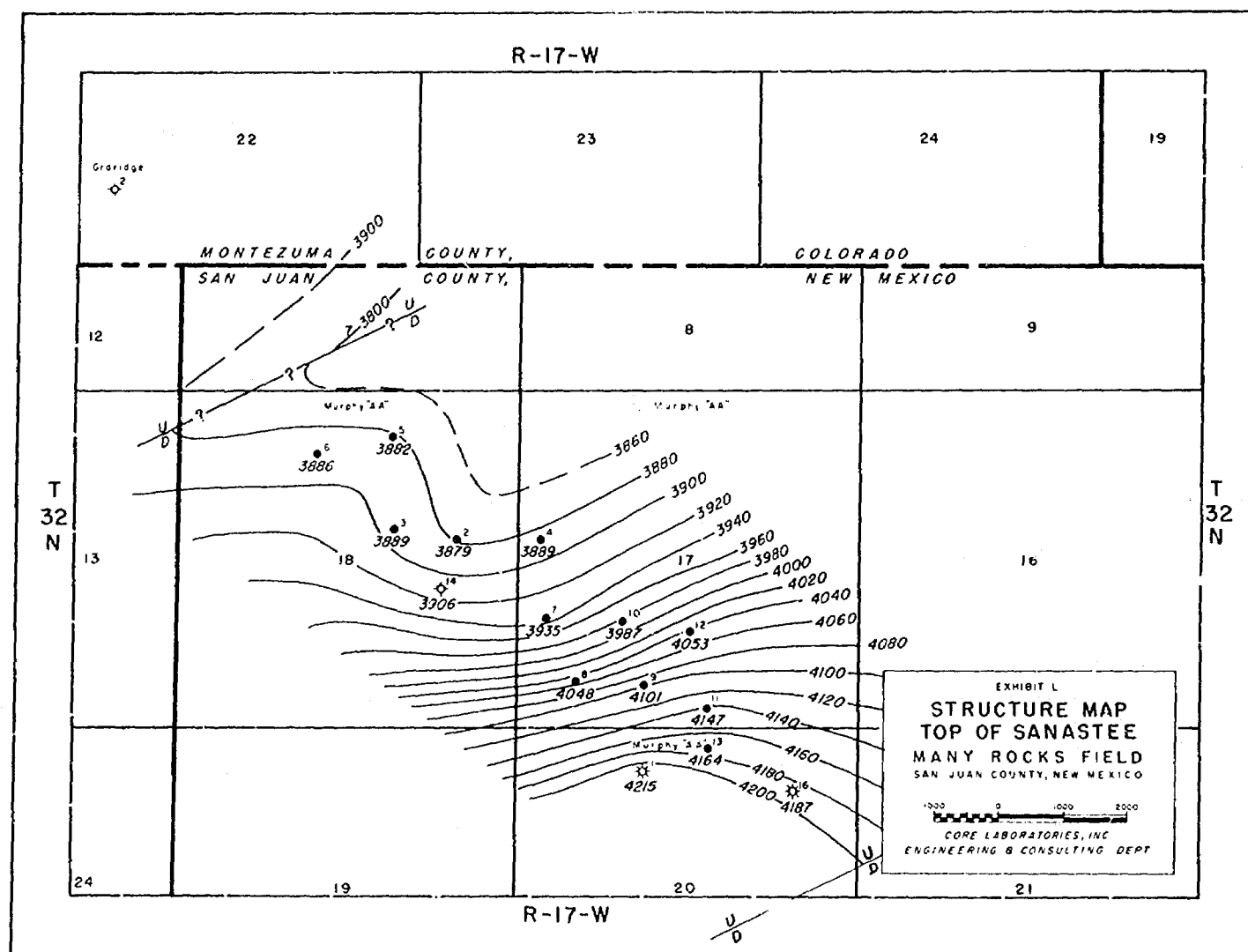
WELL STATUS AND PRODUCTION DATA
Murphy Oil Corporation Navajo AA Lease
Many Rocks Field
San Juan County, New Mexico

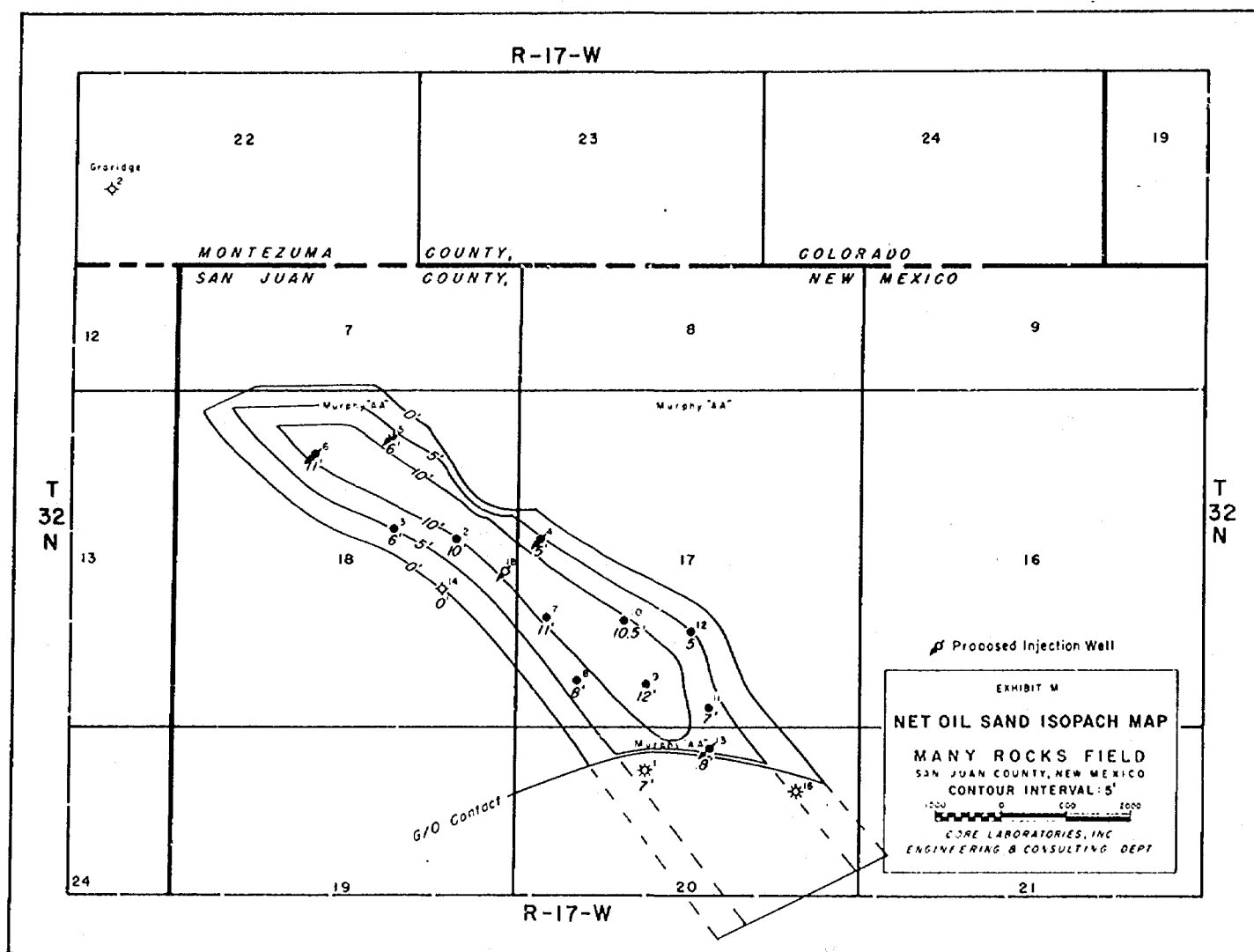
Lease and Well No.	Total Depth Feet	Production Size In.	Casing Depth Ft.	Perf. Interval, A.	Completion Date	Initial Potential BOPD	Potential GOR	Current Test Date	Data BOPD	Cumulative Prod. to 9-1-64	September 1964 Allowable BOPM
Navajo "AA" #2	1,524	4½	1,523	1,473-77	6-21-63	60	TSTM	7-2-64	21.68	15,900	1,980
Navajo "AA" #3	1,492	4½	1,483	1,443-46	7-3-63	65	TSTM	7-3-64	16.62	10,024	1,230
Navajo "AA" #4	1,794	5½	1,794	1,743-47	6-28-63	5	TSTM	5-17-64	5.00	1,170	150
Navajo "AA" #5	1,484	4½	1,478	1,440-53	8-15-63	20	TSTM	5-20-64	5.85	2,938	1,230
Navajo "AA" #6	1,454	4½	1,447	1,405-07	11-20-63	12	TSTM	5-10-64	6.90	2,024	390
Navajo "AA" #7	1,720	4½	1,708	1,664-66	10-6-63	85	TSTM	7-8-64	55.09	20,781	2,100
Navajo "AA" #8	1,473	4½	1,453	1,427-29	11-1-63	45	TSTM	5-21-64	11.69	6,062	1,290
Navajo "AA" #9	1,703	4½	1,697	1,643-45	11-8-63	102	TSTM	7-5-64	81.40	25,499	2,100
Navajo "AA" #10	1,744	4½	1,740	1,697-99	11-21-63	92	TSTM	5-20-64	57.57	18,086	2,100
Navajo "AA" #11	1,620	4½	1,619	1,585-88	11-29-63	72	TSTM	5-14-64	12.10	6,431	2,100
Navajo "AA" #12	1,715	4½	1,709		Pmpg Frac Oil	-	-	7-8-64	5.01	Rec. Frac Oil	-
Navajo "AA" #13	1,420	4½	1,410	1,374-78	6-4-64	20	510	7-8-64	20.04	858	630
Navajo "AA" #16	1,653	4½	1,647	None	6-28-64	SI	- To be completed later as an injection well and/or a fuel gas supply well.				

Total Cumulative 109,773

Exhibit K

Handwritten note:
Sulfur
gas is in the minerals which is 77 psi
700 psi at 1500 ft





RESERVOIR PARAMETERS
Murphy Oil Corporation Navajo AA Lease
San Juan County, New Mexico

Estimated Reservoir Conditions:

Initial Reservoir Pressure, psig	470
Reservoir Temperature, °F	107
Oil Formation Volume Factor	1.1
Initial Oil Viscosity, cp.	1.4

Core Analysis Average Values:

Porosity, per cent	15.5
Water Saturation, per cent	31.4
Residual Hydrocarbon Saturation per cent	34.3

Oil Zone Volumes:

Net Reservoir Volume, acre-feet*	3009
Initial Oil in Place, STB	2,257,000

Approximate Original Cap Gas in Place, MMCF 96

Cumulative Production to 10-1-64, STB 115,490

Estimated Increase in Oil Recovery
Due to Pressure Maintenance, STB 300,000

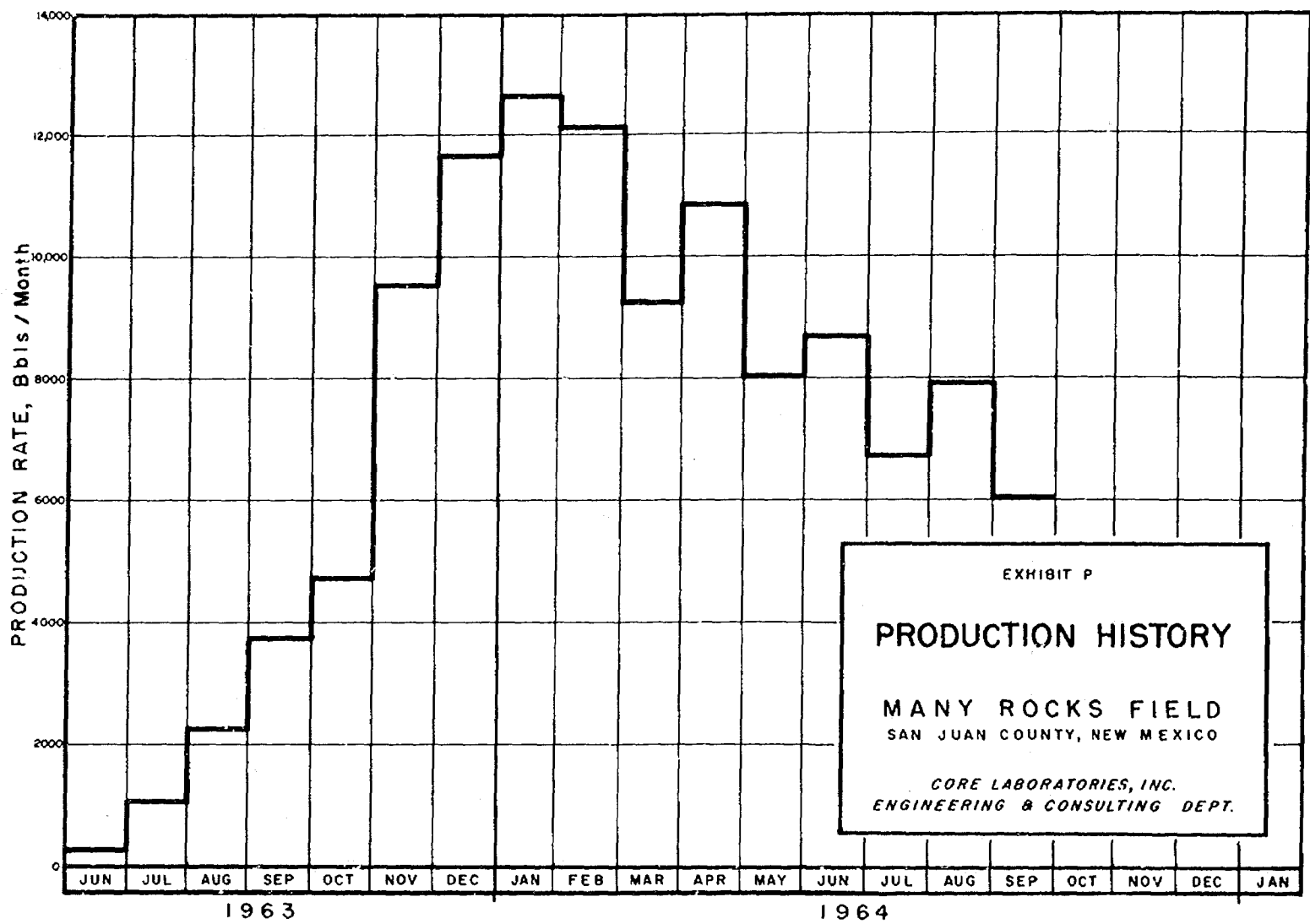
* Includes only sand having permeability greater than 1 md. and porosity greater than 9.2 per cent.

PRODUCTION HISTORY
 Murphy Oil Corporation Navajo AA Lease
 Many Rocks Field
 San Juan County, New Mexico

<u>Year</u>	<u>Month</u>	<u>Oil Production Barrels</u>
1963	June	262
	July	1,054
	August	2,247
	September	3,757
	October	4,719
	November	9,515
	December	<u>11,649</u>
	Sub Total	33,203
1964	January	12,631
	February	12,126
	March	9,242
	April	10,830
	May	8,050
	June	8,691
	July	6,754
	August	7,916
	September	<u>6,047*</u>
	Total	115,490

* Approximation

EXHIBIT O



SCHEMATIC DIAGRAM
PROPOSED WATER INJECTION WELL
MURPHY OIL CORPORATION
NAVAJO "AA" No. 4

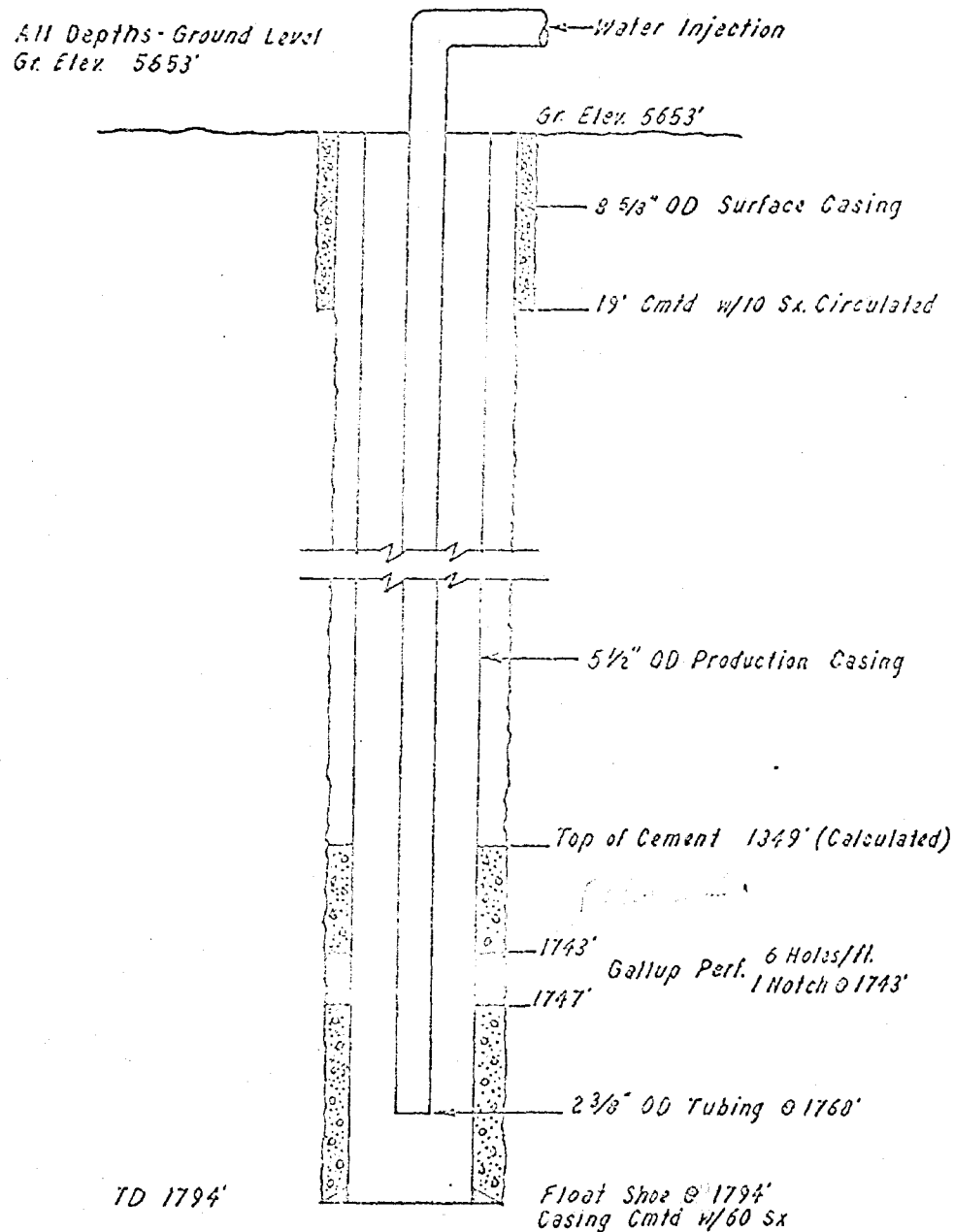


EXHIBIT B

TO APPLICATION OF MURPHY OIL CORPORATION
FOR
APPROVAL OF MANY ROCKS - GALLUP PRESSURE MAINTENANCE PROJECT
MANY ROCKS POOL
SAN JUAN COUNTY, NEW MEXICO

SCHEMATIC DIAGRAM
PROPOSED WATER INJECTION WELL
MURPHY OIL CORPORATION
NAVAJO "AA" No. 5

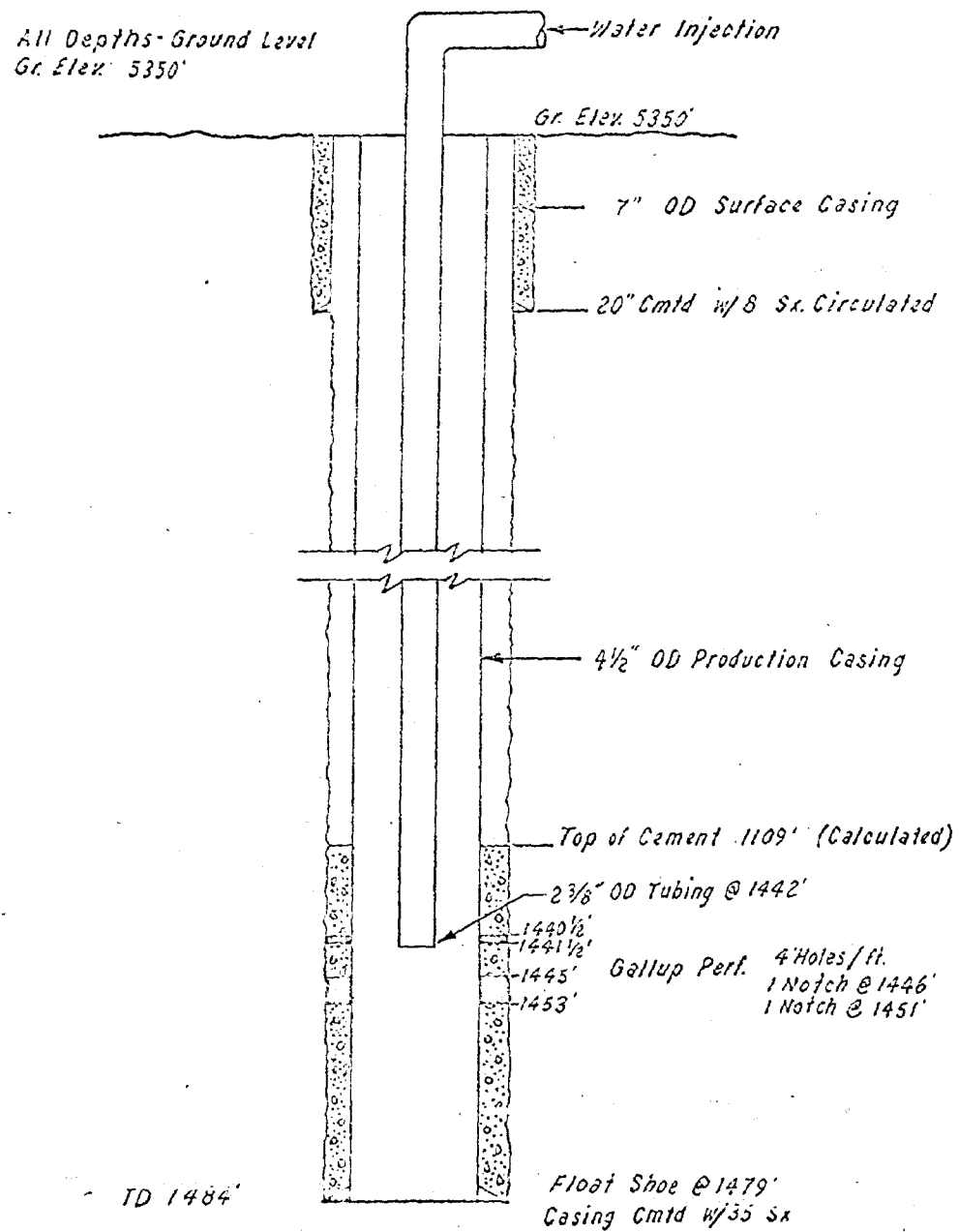


EXHIBIT C

TO APPLICATION OF MURPHY OIL CORPORATION
FOR
APPROVAL OF MANY ROCKS - GALLUP PRESSURE MAINTENANCE PROJECT
MANY ROCKS POOL
SAN JUAN COUNTY, NEW MEXICO

SCHEMATIC DIAGRAM
 PROPOSED WATER INJECTION WELL
 MURPHY OIL CORPORATION
 NAVAJO "AA" No. 6

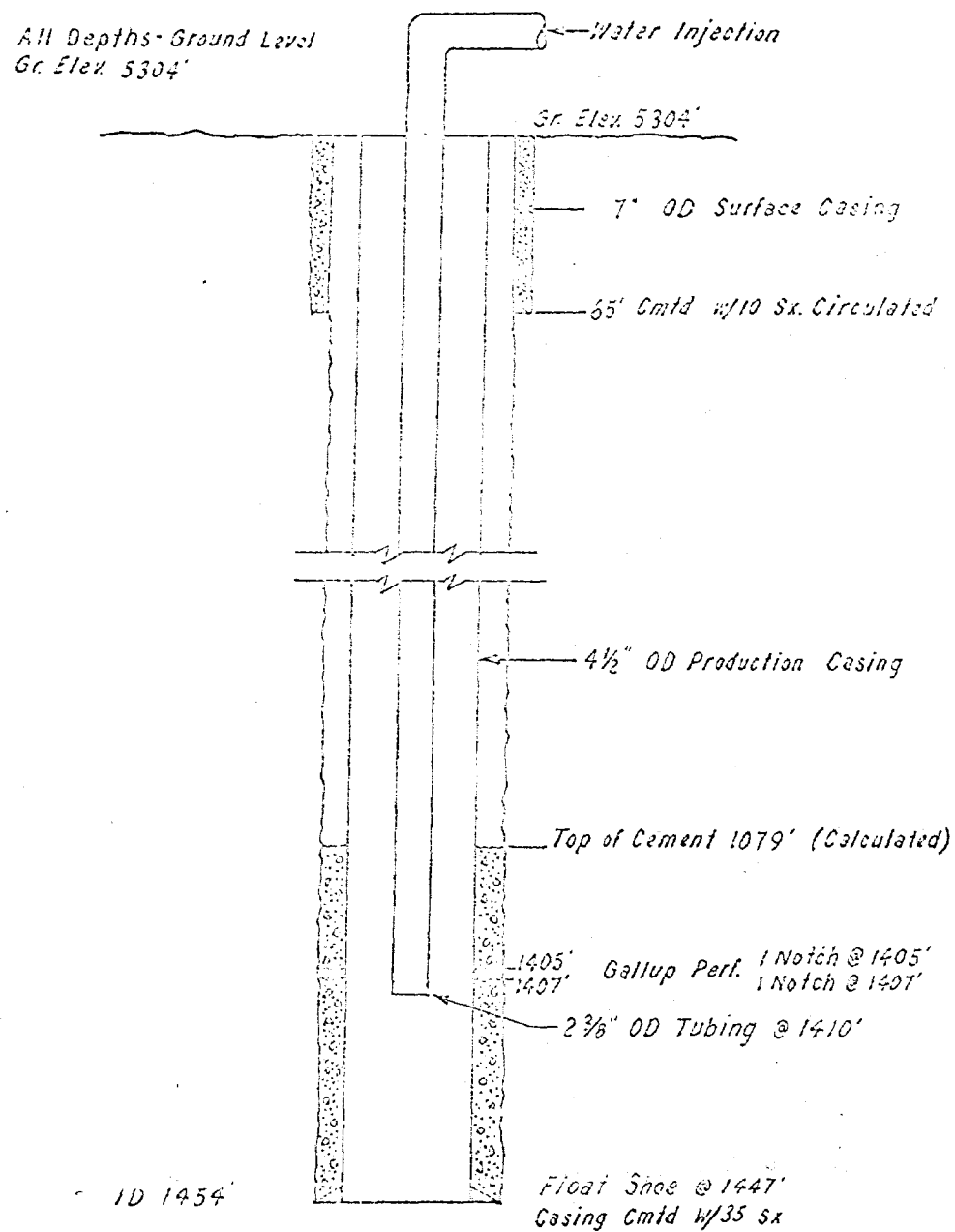


EXHIBIT 7

TO APPLICATION OF MURPHY OIL CORPORATION
 FOR
 APPROVAL OF MANY ROCKS - GALLUP PRESSURE MAINTENANCE PROJECT
 MANY ROCKS POOL
 SAN JUAN COUNTY, NEW MEXICO

SCHEMATIC DIAGRAM
PROPOSED WATER INJECTION WELL
MURPHY OIL CORPORATION
NAVAJO "AA" No. 13

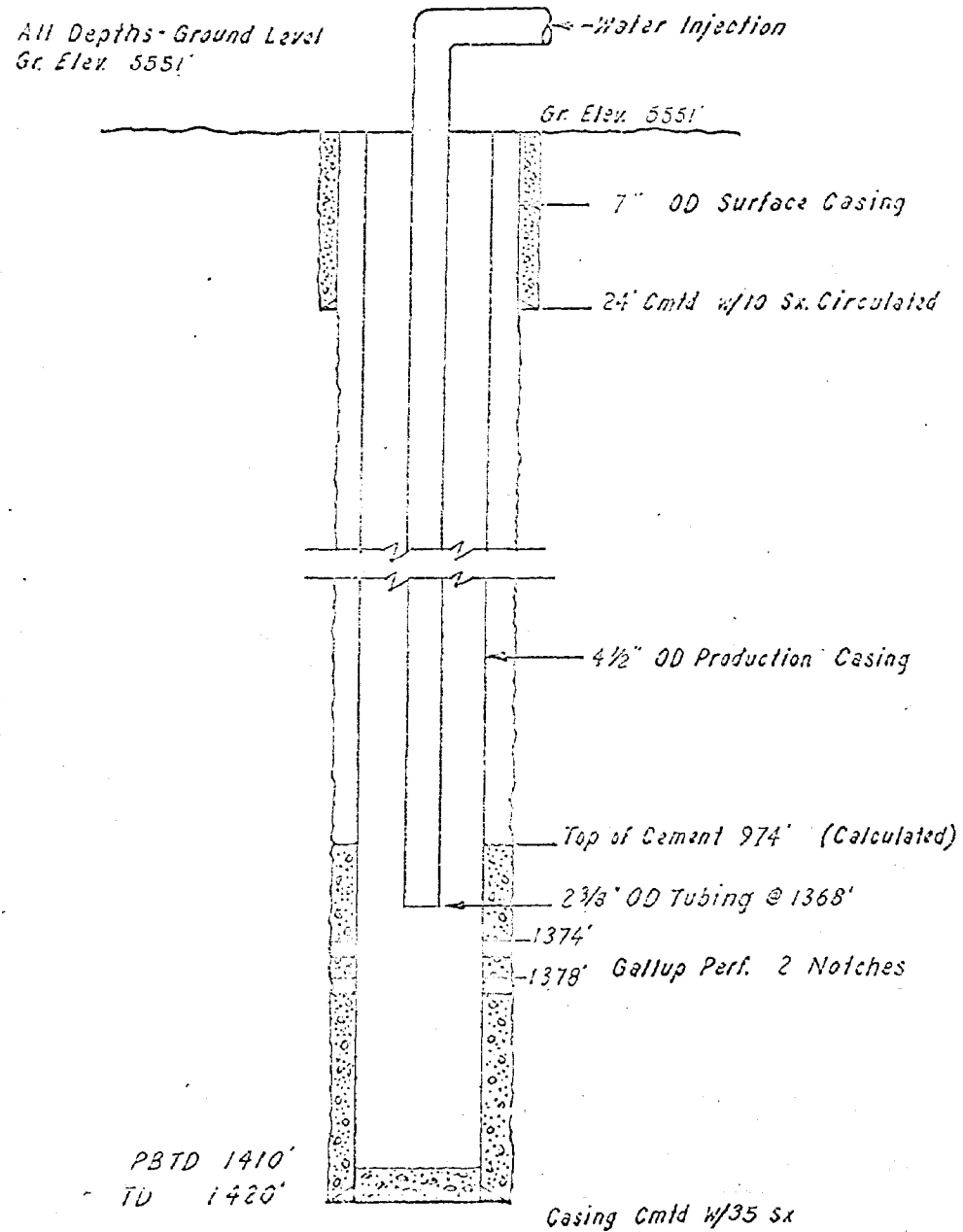


EXHIBIT E

TO APPLICATION OF MURPHY OIL CORPORATION
FOR
APPROVAL OF MANY ROCKS - GALLUP PRESSURE MAINTENANCE PROJECT
MANY ROCKS POOL
SAN JUAN COUNTY, NEW MEXICO

SCHEMATIC DIAGRAM
PROPOSED WATER INJECTION WELL
MURPHY OIL CORPORATION
NAVAJO "AA" No. 18 WIW

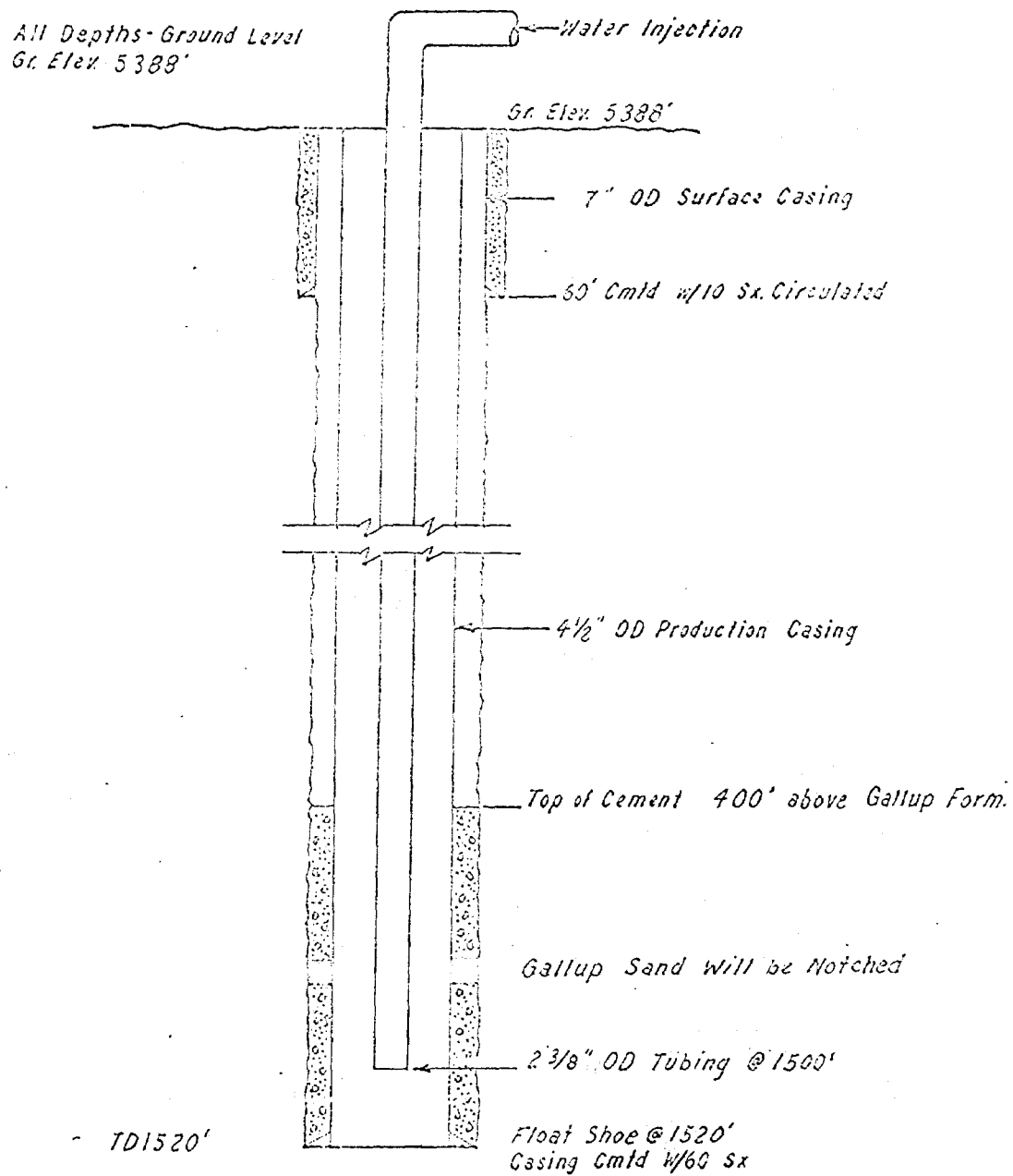


EXHIBIT F

TO APPLICATION OF MURPHY OIL CORPORATION
FOR
APPROVAL OF MANY ROCKS - GALLUP PRESSURE MAINTENANCE PROJECT
MANY ROCKS POOL
SAN JUAN COUNTY, NEW MEXICO

NEW MEXICO OIL CONSERVATION COMMISSION

Well Location and Acreage Dedication Plat

Section A.

Date September 15, 1964

Operator MURPHY OIL CORPORATION Lease Navajo "AA"
 Well No. 18 Unit Letter I Section 18 Township 32 NORTH Range 17 WEST NMPM
 Located 2474 Feet From the SOUTH Line, 133 Feet From the EAST Line
 County SAN JUAN G. L. Elevation 5388 Dedicated Acreage _____ Acres
 Name of Producing Formation Gallup Pool _____

1. Is the Operator the only owner in the dedicated acreage outlined on the plat below?
 Yes X No _____
2. If the answer to question one is "no", have the interests of all the owners been consolidated by communitization agreement or otherwise? Yes _____ No _____. If answer is "yes", Type of Consolidation _____
3. If the answer to question two is "no", list all the owners and their respective interests below:

Owner

Land Description

Section B.

Note: All distances must be from outer boundaries of section.

This is to certify that the information in Section A above is true and complete to the best of my knowledge and belief.

Murphy Oil Corporation

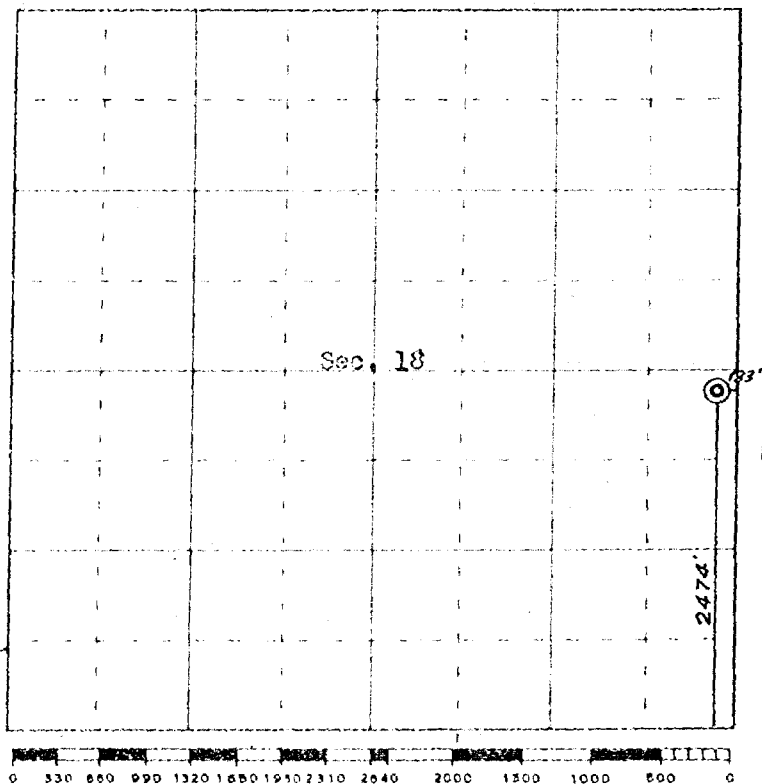
(Operator)

(Representative)

200 Jefferson Avenue

(Address)

El Dorado, Arkansas



Scale 4 inches equal 1 mile

This is to certify that the above plat was prepared from field notes of actual surveys made by me or under my supervision and that the same are true and correct to the best of my knowledge and belief.

Date Surveyed August 15, 1964

James P. Leese
 Registered Professional Engineer and/or Land Surveyor
 James P. Leese, N. Mex. Reg. No. 1463
 San Juan Engineering Company



H. M. SHEARIN
MANAGER, DOMESTIC OPERATIONS
W. P. SCHULTZ
MANAGER, FOREIGN OPERATIONS
JAMES L. MOORE
ASSISTANT MANAGER
I. F. ROEBUCK, JR.
ASSISTANT MANAGER

CORE LABORATORIES, INC.
BOX 10185, DALLAS 7, TEXAS • CABLE: CORELAB

Engineering & Consulting Department

November 4, 1964

REPLY TO
SUITE 209 GULF BUILDING
BOX 223
MIDLAND, TEXAS

64-511.3

New Mexico Oil Conservation Commission
Post Office Box 871
Santa Fe, New Mexico

Attention: Mr. Elvis A. Utz, Examiner

Gentlemen:

Pursuant to the request of Examiner in the hearing of the application of Murphy Oil Corporation for authority to perform a water injection operation in their Navajo AA lease in the Many Rocks Pool, San Juan County, New Mexico, we submit a copy of the analysis performed on a water sample taken from the Entrada formation at a depth of approximately 3400 feet in the Guyer Oil Company-Navajo B-1 water well located in Section 28, Township 32 North, Range 17 West, San Juan County, New Mexico. As you recall, this is the water that will be used in the Many Rocks waterflood of both the Murphy Oil Corporation and the Guyer Oil Company properties. By a copy of this letter we are also transmitting a copy of the water analysis to Mr. Frank Irby, State Engineer for New Mexico.

Very truly yours,

CORE LABORATORIES, INC.



T. C. Carlson
Resident Engineer

TCC:fp

cc: Mr. Frank Irby
Mr. W. J. Thornton
Mr. Paul Cooter

Enclosure

MAIN OFFICE
NOV 9 AM 9



CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS
WATER ANALYSIS

File IWTL-6411

Company Guyar Oil Company Well Name _____ Sample No. 1
Formation _____ Depth _____ Sampled From Water Source Well
Location _____ Field Many Rocks County _____ State _____
Date Sampled 10-21-64 Date Analyzed 10-28-64 Engineer RAL

Total Dissolved Solids 22143 mg/L calculated

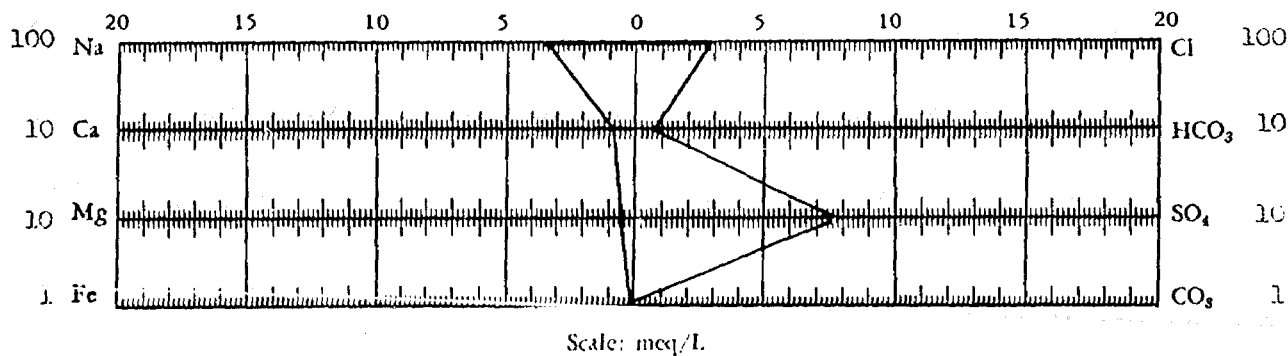
Sp. Gr. 1.015 @ 75 °F.

Resistivity 0.346 ohm-meters @ 74 °F. measured

Hydrogen Sulfide 0.0

pH 7.3

Constituents	meq/L	mg/L	Constituents	meq/L	mg/L
Sodium	<u>346</u>	<u>7966</u>	Chloride	<u>276.78</u>	<u>9815</u>
Calcium	<u>8.68</u>	<u>373.95</u>	Bicarbonate	<u>6.72</u>	<u>409.9</u>
Magnesium	<u>5.50</u>	<u>66.9</u>	Sulfate	<u>77.13</u>	<u>3708 (Grav.)</u>
Iron	<u>0.093</u>	<u>2.6</u>	Carbonate	<u>0.0</u>	<u>0.0</u>
Barium	<u>0.0</u>	<u>0.0 (Grav.)</u>	Hydroxide	<u>0.0</u>	<u>0.0</u>



All analyses except iron determination performed on a filtered sample.

GOVERNOR
JACK M. CAMPBELL
CHAIRMAN

State of New Mexico
Oil Conservation Commission



LAND COMMISSIONER
E. S. JOHNNY WALKER
MEMBER

P. O. BOX 2088
SANTA FE

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

October 30, 1964

Mr. Paul Cooter
Atwood & Malone
Attorneys at Law
Post Office Box 700
Roswell, New Mexico

Re: CASE NO. 3126
ORDER NO. R-2795
APPLICANT Murphy Corporation

Dear Sir:

Enclosed herewith are two copies of the above-referenced Commission order recently entered in the subject case.

Very truly yours,

A. L. Porter, Jr.
A. L. PORTER, Jr.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC x

Artesia OCC

Aztec OCC x

OTHER Mr. Frank Irby

dearnley-meier reporting service, inc.

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PAGE 1

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
October 13, 1964

EXAMINER HEARING

IN THE MATTER OF:

Application of Murphy Oil Corporation for
a pressure maintenance project, San Juan
County, New Mexico. Applicant, in the
above-styled cause, seeks authority to
institute a pressure maintenance project
in the Many Rocks-Gallup Pool by the
injection of water into the Gallup for-
mation through five wells in Sections 17,
18 and 20, Township 32 North, Range 17
West, San Juan County, New Mexico. Ap-
plicant further seeks the promulgation of
special rules for the operation of said

-- project: --

Case No. 3126

BEFORE: ELVIS A. UTZ, EXAMINER.

TRANSCRIPT OF HEARING

MR. UTZ: Case 3126.

MR. DURRETT: Application of Murphy Oil Corporation for a pressure maintenance project, San Juan County, New Mexico.

MR. COOTER: Mr. Examiner, Paul Cooter of Atwood and Malone, Roswell, New Mexico, appearing for the petitioner. I have one witness.

(Witness sworn.)

MR. COOTER: Some of our exhibits are attached to the petition and unfortunately we are rather short on copies, but I'll give you my copy of all of them.

LUCIEN D. SIPES, JR.

called as a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. COOTER:

Q Would you state your name for the record, please?

A Lucien D. Sipes, Junior.

Q By whom are you employed, Mr. Sipes?

A Core Laboratories, Incorporated.

Q In what capacity?

A I'm a project engineer in the Engineering and Consulting Department.

Q Have you previously testified before the Oil

Conservation Commission of the State of New Mexico or one of its Examiners?

A No, sir.

Q Are you a college graduate?

A Yes, sir.

Q From what college did you receive your degree?

A I received a B. S. in petroleum engineering from Texas Technological College in Lubbock.

Q When did you receive that degree?

A 1957.

Q What positions have you had in the oil industry since your graduation in 1957 to date?

A I have worked for Core Laboratories from before my graduation to date. The positions which I have held are Field Engineer, Research Engineer, Special Core Analysis Engineer, and then in the Engineering Consulting Department I have been a Reservoir Engineer and a Project Engineer.

Q Has that employment been continuous since 1957 to date?

A No, it has not. I have been in service part of that time.

MR. COOTER: Are Mr. Sipe's qualifications as an expert acceptable to the Commission?

MR. UTZ: Yes, sir.

Q (By Mr. Cooter) First, Mr. Sipes, I'll direct your attention to Exhibit A which was attached to the petition of Murphy Oil Corporation, and ask you to relate what that exhibit shows.

(Whereupon, Applicant's Exhibit A was marked for identification.)

A Exhibit A shows the location of the proposed unit area for the Murphy Oil Corporation pressure maintenance project; the project area itself is outlined in blue and all wells included in this unit are on leases held by Murphy Oil Corporation. In addition, this exhibit shows all the wells and the owners of leases within a two-mile radius of the project.

MR. COOTER: For clarification purposes, may I state to the Examiner at this time that the lease, the lands are included in one lease from the Navajo Tribe to Texas Pacific Coal and Oil Company and Murphy Corporation, which covers all of these lands and other lands. Murphy Oil Corporation being the operator under a farmout agreement.

Q The wells shown in red are the proposed injection wells?

A The wells shown in red on Exhibit A are the proposed injection wells as of this date. It should be pointed out at this point, however, that initially Murphy Oil Corporation

plans to inject water only into Wells 4, 13 and 18 as shown on Exhibit A.

Q Well No. 18 has not yet been drilled by Murphy, is that correct?

A That is correct.

Q Murphy proposes to do that if this project should be approved by the Commission?

A That is correct. The water supply well from which the water source, from which the water will be derived for this project is also shown on Exhibit A, and it's circled in red in Section 28. The well is the Guyer Oil Company Navajo AAlB.

(Whereupon, Applicant's Exhibit K was marked for identification.)

Q I'll next direct your attention to what has been marked as Exhibit K, which is not attached to the application, and ask you to explain that exhibit to the Examiner.

A Exhibit K is a table of completion data and well status and production data for all wells which are productive on the Murphy Oil Corporation Navajo AA lease. It will be pointed out that all these wells have a similar type completion. In each case casing has been set through the productive Gallup formation, cemented and then perforated or notched opposite the Gallup formation.

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Q I next direct your attention to Exhibit L and ask you to relate what that exhibit shows.

(Whereupon, Applicant's Exhibit L was marked for identification.)

A Exhibit L is a structure map on the top of the Sanistee limestone underlying the proposed project area. The Sanistee limestone is the nearest correlative marker to the productive Gallup sandstone in this field. The Sanistee lies directly under the Gallup.

You will notice that the structure itself is steeply dipping to the northwest, the northwest end of the field or northwest end of the project area as shown on this map actually lies in a sincline. The southeast portion of the field approaches the crest of an anticline. The crest of this anticline is actually in Section 28.

I want to point out also the presence of a fault on the southeast end of this field running diagonally southwest, northeast in Sections 20 and 21.

(Whereupon, Applicant's Exhibit M was marked for identification.)

Q I'll next direct your attention to Exhibit M, entitled "The net oil sand isopach map." Is that the same fault that's shown on the bottom line?

A It is.

Q Would you relate what Exhibit M shows?

A Exhibit M shows the development of the Gallup sand lens on top of the Sanistee limestone. The axis of the lens is in a northwest, southeast direction. Production on the Curtis Little lease, the Skelly lease and Humble leases to the southeast are also from this same lens. However, the portion of the reservoir shown on this isopach is believed to be effectively sealed from communication with the leases to the southeast by the fault as shown.

The sand in the lens is a clean sand with good permeability near the center and grades into shale or shaley sand on the flanks. This lithology change determines the limits of the productive area of the reservoir on the southwest and northeast flanks.

As noted in the title of this particular exhibit, the sand development as shown is the net oil-sand that is that portion of the reservoir rock which has greater than one millidarcy permeability and more than 9.2% porosity. You will also notice the presence of a gas-oil contact in Section 20 of this map. The position of this gas-oil contact is estimated to be at 4180 feet above sea level. The oil-productive limit of the sand on the northwest is the oil-water contact which is estimated at 3870 feet above sea level. This occurs before the bottom of the syncline as shown on



the structure map, Exhibit L. The oil-productive volume of the sand as shown is 3,009 acre feet. The gas-productive volume is 886 acre feet.

MR. COOTER: Before passing from this particular exhibit, Exhibit M, I would like to point out to the Examiner that the Navajo lease in question to Murphy includes all Sections 7, 8, 17, 19 and 19 and 20. I do this at this time because the particular proposed rules as they relate to offset operators will be mentioned at a later date.

(Whereupon, Applicant's Exhibit N was marked for identification.)

Q Next, Mr. Sipes, I'll direct your attention to Exhibit N and ask you to relate that exhibit to the Examiner.

A Exhibit N is a list of reservoir perimeters and reservoir data which were developed during the course of a study conducted for Murphy Oil Corporation. The estimated reservoir conditions are extrapolations of data from reservoirs in the near vicinity. The core analyses averages shown were established from core data available on Wells 2 through 11 on the Murphy Oil Corporation lease.

As I pointed out previously, the oil zone volume is 3,009 acre feet with an initial oil in place of 2,257,000 stock tank barrels. The approximate original gas cap gas in place in 886 acre feet of reservoir is approximately

96 million cubic feet. Cumulative production from this Gallup reservoir to October 1st, 1964 was approximately 115,490 barrels.

(Whereupon, Applicant's Exhibits O and P were marked for identification.)

Q I next direct your attention to Exhibits O and P and ask you to consider and explain both exhibits jointly.

A Exhibit O is a tabular data showing the oil production from the Murphy Oil Corporation Navajo AA lease from the time of discovery through September, 1964 by months. These data were used to prepare Exhibit P. As you will note on Exhibit P, the rate decline under primary depletion operations is very severe. The decline as shown here is not truly representative of the individual declines of the wells, because during the decline new wells were being drilled and put on production.

From these data the future primary production after January the 1st, 1965 is estimated to be only 52,000 stock tank barrels under primary depletion operations. On the basis of the above data, the feasibility of a pressure maintenance operation by water injection was investigated.

Conclusions of this study with pressure maintenance operations by water injection into this reservoir are both technically and economically feasible. That such a project

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should be initiated as soon as possible to obtain maximum benefit and recovery. Third conclusion is that approximately 300,000 additional stock tank barrels of oil would be recovered by a pressure maintenance operation over and above that estimated by primary recovery.

It might be pointed out as of interest that the operators will spend approximately \$300,000 to recover this oil over the seven-year life of the project.

Q Next, Mr. Sipes, I'll ask you to redirect your attention to Exhibit A, which is the area map, and relate the proposed method of operation for this project.

A As indicated in the application by Murphy Oil Corporation for a pressure maintenance project, water injection is proposed to begin into Wells 4, 13 and as yet undrilled Well No. 18 upon approval of this project. After a sufficient time has elapsed from the start of this project for evaluation to be possible on the success of this flood, a decision will be made at that time to inject water into Wells 5 and 6 if warranted.

Q To make that point clear, it has not yet been definitely determined whether Wells 5 and 6 will be converted into injection wells.

A This decision has not been made.

Q And will not be made until after the project has

been commenced?

A That is true. The maximum water injection rate is expected to be approximately 655 barrels per day.

(Whereupon, Applicant's Exhibits B through F were marked for identification.)

Q I next direct your attention to Exhibits B through F which were attached to the application of Murphy Oil Corporation and ask you to relate what those exhibits show.

A Exhibits B through F are schematic diagrams of all the wells considered at this time to be possible water injection wells. You will note that each well has the casing set through the Gallup sand, which is the productive interval, and cement has been put into the wells behind the casing to protect the productive formation.

You will note that there is a string of tubing schematically shown to be present in each of the proposed injection wells. Murphy Oil Corporation requests permission to inject water down the casing rather than to install this tubing string in the injection well. The State Engineer, Mr. Irby, has stated that he does not have objections to this plan due to the location of the formation which is to be flooded and the zones between this formation and the surface.

Q Would you expand just a little bit on the zones between the Many Rocks-Gallup sand and the surface? Why this is



proposed.

A The formation overlying the Gallup sand in the vicinity of the proposed water injection project is the Mancos shale. The shale extends from the top of the Gallup sand to the surface in every case where the injection wells are, with one exception. At the surface of Well No. 4 there is approximately 28 feet of sandstone overlying the Mancos. This sandstone is the Point Lookout sandstone. There have been no formations above the Gallup sand at this location which have produced fresh water.

(Whereupon, Applicant's Exhibits G through J were marked for identification.)

Q I next direct your attention to Exhibits G through J which were attached to the application of Murphy Oil Corporation and ask you to identify those, please.

A Exhibits G through J are formation density logs of the proposed injection wells which have been drilled to date. Each of these logs illustrates the fact that there are no productive intervals above the Gallup sand which have fresh water, and that the entire section above the Gallup sand is the Mancos shale.

Q Mr. Sipes, this investigation into the Murphy Oil Corporation Many Rock-Gallup Pool and the characteristics that were made by Core Laboratories, by you on behalf of Core

Laboratories, Incorporated at the request of Murphy Oil Corporation?

A That's true.

Q The recommendations which you have made, is the project a feasible one?

A Yes, it is.

Q In your opinion would the injection of water into this formation and the pressure maintenance promote conservation and prevent waste and increase the ultimate recovery from the pool?

A Yes.

MR. COOTER: That concludes our testimony.

MR. UTZ: Are there questions of the witness?

MR. IRBY: I would like to ask a couple of questions. Frank Irby, State Engineer's Office.

CROSE EXAMINATION

BY MR. IRBY:

Q Mr. Sipes, referring to your diagrammatic sketches of the various wells and recalling our previous conversation, is it true that the cement surrounding the production string goes well up into the Mancos shale?

A This is true, yes, sir.

Q One other question. You gave the volume to be injected into each well, but you didn't give the pressures.



Could you give us that?

A The maximum pressure which is anticipated at this time is approximately 700 pounds at the surface.

MR. IRBY: Thank you. That's all I have, Mr. Examiner.

MR. UTZ: Any other questions?

MR. DURRETT: I have a question, please.

BY MR. DURRETT:

Q Mr. Sipes, referring to the well that you are proposing to drill, somewhere in the description here is there a description of the proposed location, a footage description?

A No, sir, not to my knowledge.

Q Can you give it to me? Do you have it with you there some place or in your mind?

A No, sir, I couldn't give it to you exactly.

MR. UTZ: Can you write us a letter immediately, if not sooner, and give us the location, the exact footage location of all your injection wells?

A I didn't understand your question.

MR. UTZ: I say can you write us a letter as soon as possible giving us the footage location of all the injection wells?

A Yes, sir.

Q (By Mr. Durrett) Including this one, Mr. Sipes, so

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we'll know exactly where it's to be located?

A Yes, sir.

Q One other question I had was, do you feel that you can get an efficient drive, water drive or produce an efficient water drive the way you have your injection wells located?

A The pattern as it's shown on this map is not the complete pattern which Murphy anticipates with full development of this flood. We believe that the wells proposed for injection will allow us to evaluate the performance of a water injection operation, and at some later date then we anticipate expanding the water injection.

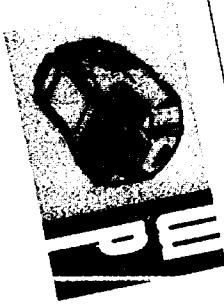
Q Along that line I would assume that you'd anticipate putting possibly one of these wells, the 7, 10, 12 or 8, 9 on your Navajo AA lease on as an injector, is that correct, or drill in that area?

A Actually the plan as we foresee it at this time is to drill another injection well north of the dry hole No. 1. This will provide us an Indian sweep in the better portion of the reservoir.

Q The wells that you have indicated here in red are the only ones that you are seeking approval of at this time?

A Yes, sir.

Q And I suppose Mr. Cooter may go into this, but are you going to ask for an administrative procedure where you



can put on additional wells?

A Yes, sir, we anticipate to do this.

MR. DURRETT: Thank you. One other question.

Q (By Mr. Durrett) On your water well down here, what type of water is that, do you have an analysis on the water?

A I have an analysis of a contaminated sample.

Q What does it indicate?

A It indicates that the water is fresh to brackish.

Q Fresh to brackish?

A An uncontaminated sample is proposed to be taken a week from tomorrow. We're at the present time producing this well in an attempt to clean it up and get a good sample of the formation water itself.

Q Would you propose to furnish that to Mr. Irby and to this office?

A Yes, sir, I do.

MR. DURRETT: Thank you. I think that's all I have.

MR. ARNOLD: Emery Arnold.

BY MR. ARNOLD:

Q Do you anticipate any corrosion problems from this water or have you had enough of an analysis made to determine that?

A We do not anticipate corrosion, no, sir. This Entrada water which we propose to use is being successfully

used in the same area and there have been no corrosion problems to date that I know of.

Q I believe that they have developed some corrosion problems in the Horseshoe-Gallup in their floods, haven't they?

A Yes, sir. I believe this is Morrison water.

Q Different water source?

A Yes, sir.

MR. IRBY: Mr. Examiner.

MR. UTZ: Yes.

BY MR. IRBY:

Q In our conversation we discussed the quality of this water and, as I recall, you stated that if it was found necessary the water would be treated, is this correct?

A Yes, sir. At the present time Murphy Oil Corporation anticipates that if the water is corrosive that treatment will be made of the water, and in addition the wells, the casing in the injection wells will be protected adequately.

Q I think it might be well also, Mr. Sipes, to get into the record of this hearing your proposed disposal of the produced water.

A Yes, sir.

Q If you would state that into the record, I would appreciate it.

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A Murphy Oil Corporation at the present time is not producing a sufficient quantity of water to warrant any type of disposal system. In view of the fact that at a later time substantial quantities of water will be produced, this water will be either disposed of in approved pits or be tied back into the water injection system.

Q How will the Commission and the State Engineer be advised of the quality of the water being produced so that we can make a determination as to what disposition should be made of this water? I realize we get the quantities in the Oil and Gas Association reports, but we will need chemical analyses occasionally to determine the quality of this water.

We have to avoid contamination of all surface and underground water sources which exist, whether a basin be declared or not, so we need to know not only the quantities but the quality of the water being produced and the disposition that's being made of it.

Can we at this time set up some sort of, we will call it an information service from Core Labs or from Murphy to the Commission and to my office which will give us an opportunity to avoid any threat of contamination?

A Yes, sir. We can set up this information service furnishing that information to you on whatever basis you desire it.

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Q I would leave that to the judgment of the Commission as to what manner it be set up in and you and Mr. Cooter, I am sure, have some thoughts along this line.

MR. COOTER: For informational purposes, how do the other, Humble, Atlantic, Skelly and Little, how do they handle this with your office?

MR. IRBY: As I recall, they are injecting all of their produced water. They are keeping records of the effects on the well equipment.

MR. UTZ: You are agreeable to supplying us this information, I gather?

A Yes, sir.

MR. UTZ: The details of which we'll work out later in connection with your regular injection report.

A That is correct. I'd like to offer this suggestion, that we furnish this information in the event that all of the produced water is not reinjected.

MR. UTZ: That would be satisfactory.

MR. IRBY: Yes. I think we should be advised if he is reinjecting produced water.

MR. UTZ: That's right.

MR. COOTER: Sure.

MR. UTZ: Any other questions? The witness may be excused.

(Witness excused.)

MR. UTZ: Any statements in this case?

MR. COOTER: I would like to state that the Commission has adopted special rules and regulations for four pressure maintenance projects in the Many Rocks Field, Order No. 2541, 2622, 2664 and 2700. We believe, well, I haven't proffered them verbatim, I suppose they are substantially similar.

MR. DURRETT: They're similar, yes.

MR. COOTER: We have gone over the ones adopted originally for the Humble project, which is Order No. 2541. We would make the suggestion that Rules 7 and 10 thereof be changed to some extent. Rule 7 being changed to eliminate after the semicolon in the first sentence, commencing with the word "provide" through the remainder of that sentence.

Rule 10 be changed in the second sentence, commencing with the word "except that no well on the project" clear through that sentence be eliminated. The reason for these eliminations being that as this area is proposed, that there is no problem or reason to provide for offset. Murphy Oil Corporation is the owner of the entire lease in there, including the offset.

I might also state that with the gentlemen from the United States Geological Survey here, that Murphy has received approval from the Acting Supervisor in Roswell for the project.

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MR. UTZ: The portions of these orders which you recommend be used as containing Z factors and so forth, that data is pertinent to this area, can you answer that question?

MR. SIPES: Yes, sir.

MR. UTZ: Any other statements? The case will be taken under advisement. Does that conclude your statement, Mr. Cooter?

MR. COOTER: Yes, sir. We would like to offer Exhibits A through P into evidence.

MR. UTZ: Without objection Exhibits A through P will be admitted in evidence.

(Whereupon, Applicant's Exhibits A through P were offered and admitted in evidence.)

MR. UTZ: The case will be taken under advisement.
The hearing is adjourned.



STATE OF NEW MEXICO)
COUNTY OF BERNALILLO) ss

I, ADA DEARNLEY, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me; and that the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.

Witness my Hand and Seal this 19th day of October, 1964.

Ada Dearnley
NOTARY PUBLIC

My Commission Expires:

June 19, 1967.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 3126, heard by me on Oct. 13, 1964.

Thurs. Int., Examiner
New Mexico Oil Conservation Commission

I N D E X

<u>WITNESS</u>	<u>PAGE</u>
LUCIEN D. SIPES, JR.	
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<u>EXHIBIT</u>	<u>MARKED</u>	<u>ADMITTED</u>
Applicant's A	4	21
" K	5	21
" L	6	21
" M	6	21
" N	8	21
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STATE OF NEW MEXICO

STATE ENGINEER OFFICE

SANTA FE

S. E. REYNOLDS
STATE ENGINEER

September 23, 1964

ADDRESS CORRESPONDENCE TO:
STATE CAPITOL
SANTA FE, N. M.

87501

Case 3126
MAIN OFFICE 000
SEP 25 PM 12 4.

Mr. A. L. Porter, Jr.
Secretary-Director
Oil Conservation Commission
Santa Fe, New Mexico

Dear Mr. Porter:

Reference is made to the application of Murphy Oil Corporation which seeks authority to inject water into the Lower Gallup Sand for the purpose of pressure maintenance through the following wells:

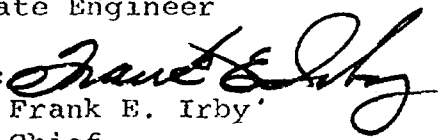
Navajo "AA" No. 4 shown on Exhibit B
Navajo "AA" No. 5 shown on Exhibit C
Navajo "AA" No. 6 shown on Exhibit D
Navajo "AA" No. 13 shown on Exhibit E
Navajo "AA" No. 18 WIW shown on Exhibit F

This office offers no objection to the granting of this application provided an effective packer is used in the annulus between the tubing and production casing, below the top of the cement surrounding the production casing, on each of the proposed injection wells.

Yours truly,

S. E. Reynolds
State Engineer

FEI/ma
cc--Atwood & Malone

By: 
Frank E. Irby
Chief
Water Rights Div.

*Hold for app from
Paul Foster for water
flood & include in add.
[initials]*



200 JEFFERSON AVENUE
EL DORADO, ARKANSAS 71730

September 15, 1964

MAILED
SEP 18 1964

United States Geological Survey
P. O. Box 959
Farmington, New Mexico
ATTENTION: Mr. Phil McGraf

DOCKET MAILED

Date ~~_____~~ *Case 3/26*

New Mexico Oil Conservation Commission
1000 Rio Brazos Road
Aztec, New Mexico
ATTENTION: Mr. Emery C. Arnold

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico
ATTENTION: Mr. A. L. Porter, Jr.

Gentlemen:

Enclosed are plats for Murphy Oil Corporation's proposed location of the Navajo "AA" Lease Well #18, San Juan County, New Mexico. This location violates the prescribed rules of 330' from the 40-acre quarter section lines. The terrain makes the cost of drilling this well on a regular spacing pattern almost prohibitive.

This well will be used as an injection well for the Navajo "AA" Lease Water Flood Project. Murphy Oil Corporation owns all offsetting leases. We ask that you grant us permission to drill on the above unorthodox location.

Very truly yours,

L. L. Duncan
L. L. Duncan

LLD:kd1

Enclosure: 1



CLARK OFFICE OCC
SEP 23 AM 8 00

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLI-)
CATION OF MURPHY OIL COR-)
PORATION FOR ORIGINAL)
AUTHORITY FOR THE INJECTION)
OF WATER INTO THE LOWER)
GALLUP SAND TO MAINTAIN THE)
RESERVOIR PRESSURE IN THE)
MANY ROCKS-GALLUP POOL IN)
SECTIONS 7, 17, 18, 19 and 20,)
TOWNSHIP 32 NORTH, RANGE)
17 WEST, N.M.P.M., SAN JUAN)
COUNTY, NEW MEXICO.)
_____)

No.

3126

APPLICATION

Murphy Oil Corporation hereby applies for original authority for the injection of water into the Lower Gallup Sand to maintain the reservoir pressure in the Many Rocks-Gallup Pool and in support thereof states:

1. The Many Rocks-Gallup Pool comprises the following described lands all situate in Township 32 North, Range 17 West, N.M.P.M., San Juan County, New Mexico:

Section 7:	All (fractional)
Section 17:	NW $\frac{1}{4}$, S $\frac{1}{2}$ NE $\frac{1}{4}$ and S $\frac{1}{2}$
Section 18:	N $\frac{1}{2}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$ and SE $\frac{1}{4}$
Section 19:	NE $\frac{1}{4}$ NE $\frac{1}{4}$
Section 20:	N $\frac{1}{2}$ NW $\frac{1}{4}$, SE $\frac{1}{4}$ NW $\frac{1}{4}$ and NE $\frac{1}{4}$

All of which is more fully shown on the map attached hereto as Exhibit "A".

2. The water injection will be into the Lower Gallup Sand through five injection wells at depths under the perforated intervals for each well, as more fully shown by the schematic diagrams for each proposed water injection well attached hereto as Exhibits "B", "C", "D", "E" and "F". The water source for this program will be the Entrada Formation which occurs at the interval from 3,399 feet to 3,404 feet from the Guyer Oil Company's Navajo B-1 well, formerly Texas Pacific Coal and Oil Company's Navajo Tribal "B" # 1 well, situate in Section 28, Township 32 North, Range 17 West, N.M.P.M., San Juan County, New Mexico. The anticipated water injection rates initially proposed are 65 barrels per day into the Navajo "AA" No. 4 well, 90 barrels per day into the Navajo "AA" No. 5 well, 160 barrels per day into the Navajo "AA" No. 6 well, 250 barrels per day into the Navajo "AA" No. 13 well and 90 barrels per day into the Navajo "AA" No. 18 well. Only wells Nos. 4, 13 and 18 would be used immediately upon approval of the pressure maintenance project; proposed injection well No. 18 has not yet been drilled but would be immediately drilled and completed upon approval of the pressure maintenance project. Wells Nos. 5 and 6 would be converted to injection wells at a later date.

3. Logs of the proposed injection wells Nos. 4, 5, 6 and 13, being all of the injection wells except the one which has not been drilled, are attached hereto as Exhibits "G", "H", "I" and "J".

4. All of the lands comprising the Many Rocks-Gallup Pool are included within that certain Oil and Gas Mining Lease dated March 12, 1954, by and between the Navajo Tribal Council acting for and on behalf of the Navajo Tribe of Indians, Lessor, and Texas Pacific Coal and Oil Company and Murphy Oil Corporation, Lessees. A copy of this Application, together with copies of all Exhibits attached hereto, is forwarded to the office of the United States Geological Survey, 120 West Second Street, Roswell, New Mexico.

5. A copy of this Application, together with copies of all Exhibits attached thereto, is likewise forwarded to the office of the State Engineer, P.O. Box 1079, Santa Fe, New Mexico.

6. The authorization of the pressure maintenance project comprising the area heretofore noted by means of the proposed injections wells would be in the best interest of conservation of natural resources and would prevent waste and increase the ultimate recovery from the Many Rocks-Gallup Pool.

WHEREFORE, Applicant respectfully requests that this Application be set for hearing before a duly appointed Examiner of the Commission at the earliest possible date, that notice thereof be given as required by law and the regulations of the Commission and that authority be given for the injection of water into the Lower Gallup Sand to maintain the reservoir pressure of the Many Rocks-Gallup Pool.

Respectfully submitted,

MURPHY OIL CORPORATION

BY 

of ATWOOD & MALONE
its Attorneys
P.O. Drawer 700
Roswell, New Mexico

Page 3126

SCHEMATIC DIAGRAM
PROPOSED WATER INJECTION WELL
MURPHY OIL CORPORATION
NAVAJO "AA" No. 4

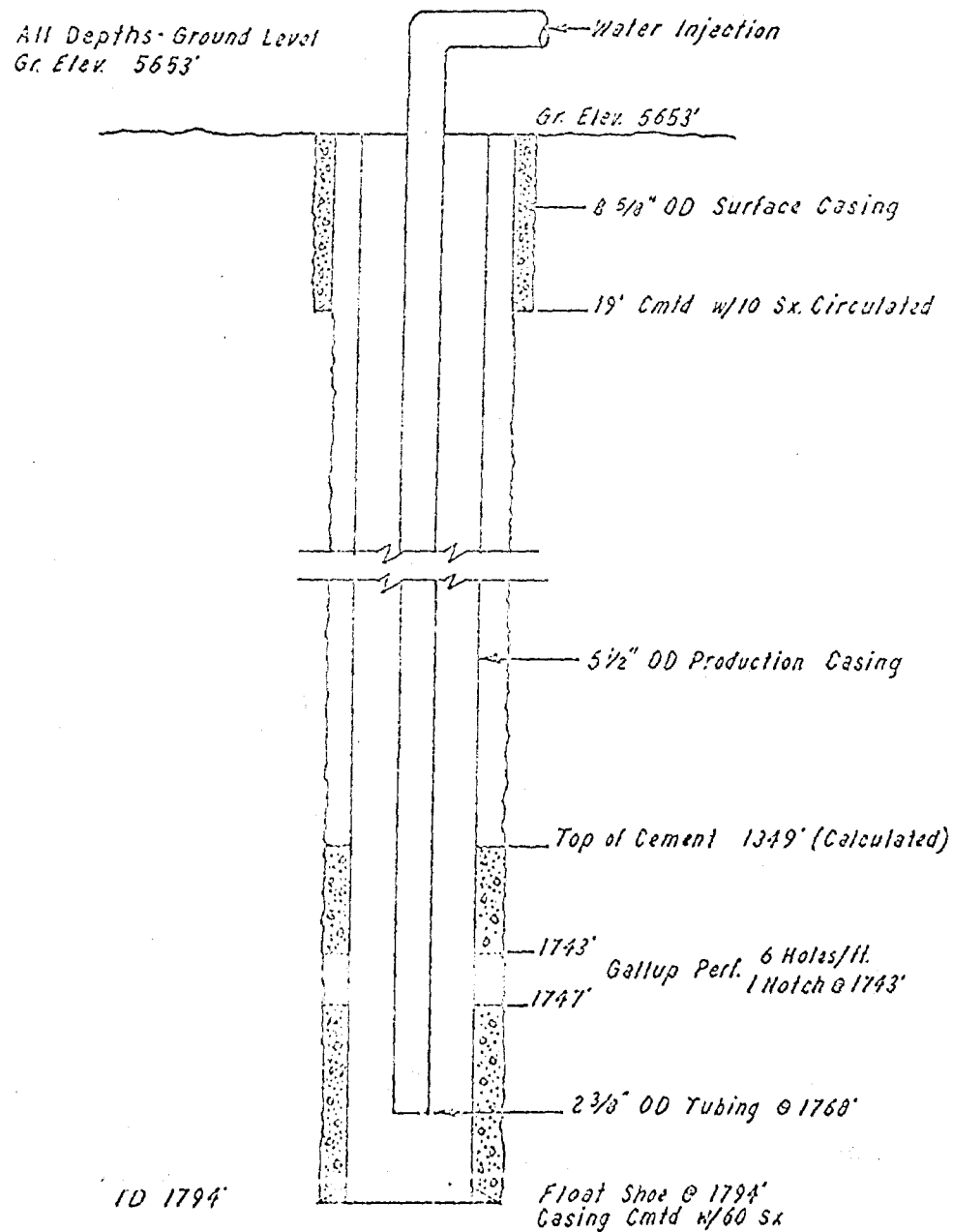


EXHIBIT B

TO APPLICATION OF MURPHY OIL CORPORATION
FOR
APPROVAL OF MANY ROCKS - GALLUP PRESSURE MAINTENANCE PROJECT
MANY ROCKS POOL
SAN JUAN COUNTY, NEW MEXICO

Case 3124

SCHEMATIC DIAGRAM
PROPOSED WATER INJECTION WELL
MURPHY OIL CORPORATION
NAVAJO "AA" No. 5

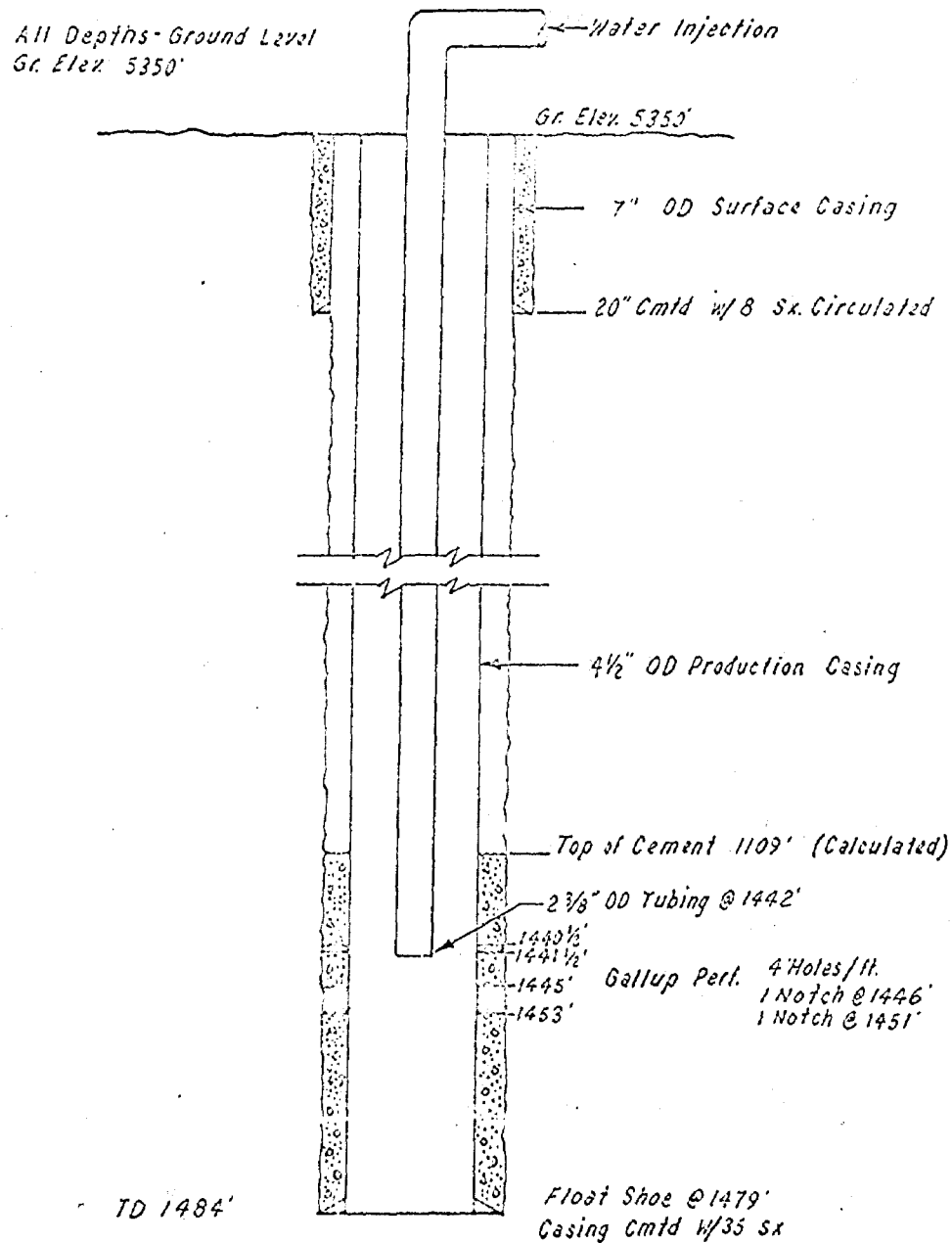


EXHIBIT C

TO APPLICATION OF MURPHY OIL CORPORATION
FOR
APPROVAL OF MANY ROCKS - GALLUP PRESSURE MAINTENANCE PROJECT
MANY ROCKS POOL
SAN JUAN COUNTY, NEW MEXICO

SCHEMATIC DIAGRAM
 PROPOSED WATER INJECTION WELL
 MURPHY OIL CORPORATION
 NAVAJO "AA" No. 6

Case 3124

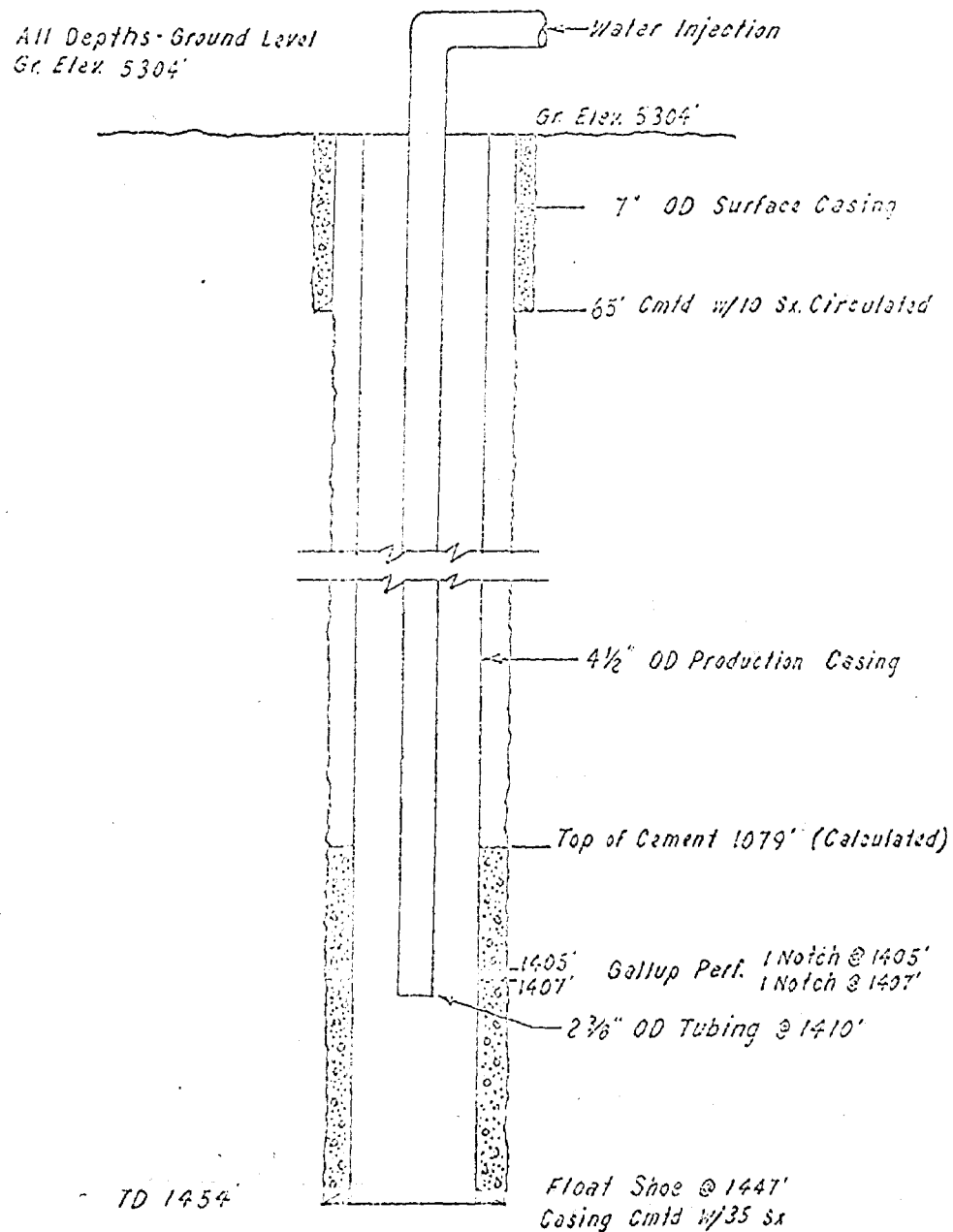


EXHIBIT 2

TO APPLICATION OF MURPHY OIL CORPORATION
 FOR
 APPROVAL OF MANY ROCKS - GALLUP PRESSURE MAINTENANCE PROJECT
 MANY ROCKS POOL
 SAN JUAN COUNTY, NEW MEXICO

SCHEMATIC DIAGRAM
 PROPOSED WATER INJECTION WELL
 MURPHY OIL CORPORATION
 NAVAJO "AA" No.13

Page 3/26

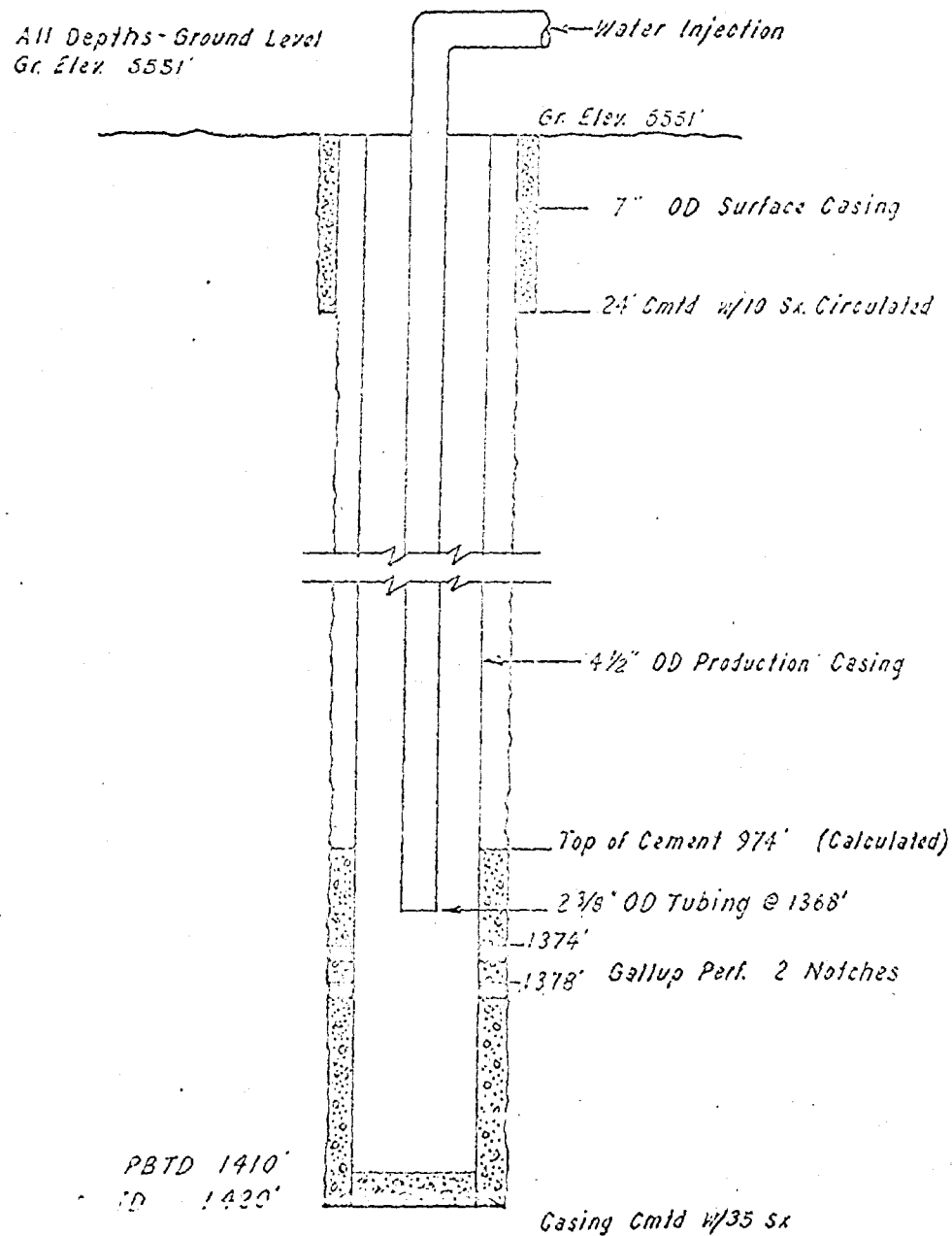


EXHIBIT E

TO APPLICATION OF MURPHY OIL CORPORATION
 FOR
 APPROVAL OF MANY ROCKS - GALLUP PRESSURE MAINTENANCE PROJECT
 MANY ROCKS POOL
 SAN JUAN COUNTY, NEW MEXICO

SCHEMATIC DIAGRAM
 PROPOSED WATER INJECTION WELL
 MURPHY OIL CORPORATION
 NAVAJO "AA" No.18 WIW

Page 3/26

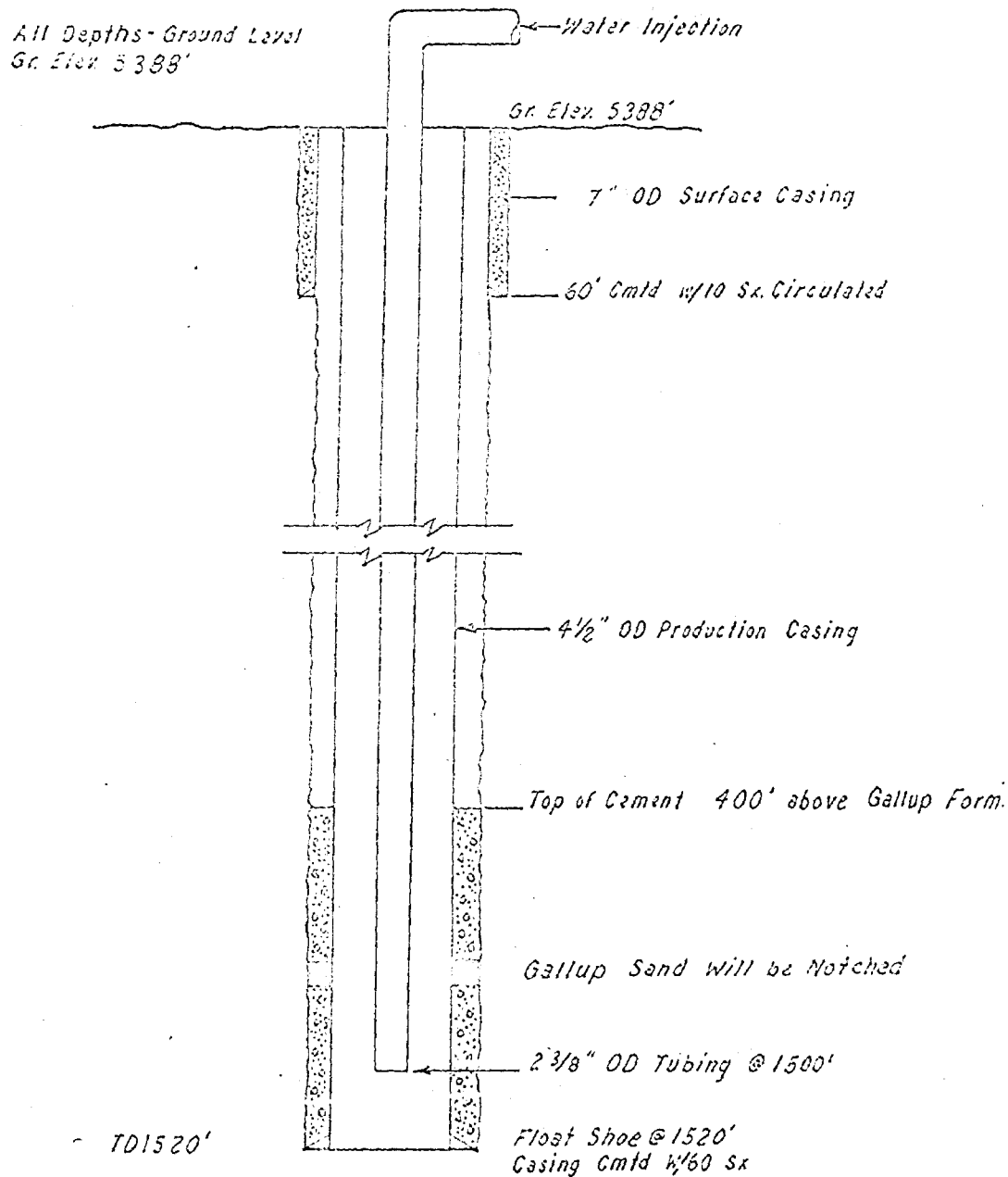


EXHIBIT F

TO APPLICATION OF MURPHY OIL CORPORATION
 FOR
 APPROVAL OF MANY ROCKS - GALLUP PRESSURE MAINTENANCE PROJECT
 MANY ROCKS POOL
 SAN JUAN COUNTY, NEW MEXICO

ATWOOD & MALONE
LAWYERS

MAIN OFFICE
P. O. DRAWER 784
TELEPHONE 505 682-6221
SECURITY NATIONAL BANK BUILDING
ROSWELL, NEW MEXICO
88201

Ca 3/26
JEFF D. ATWOOD (883-1960)
ROSS L. MALONE
CHARLES F. MALONE
RUSSELL D. MAHN
PAUL A. COOTER
BOB F. TURNER
ROBERT A. JOHNSON

SEP 23 AM 10
September 22, 1964

New Mexico Oil Conservation Commission
P.O. Box 2088
Santa Fe, New Mexico

Attention: Mr. A.L. Porter, Jr.

Dear Mr. Porter:

On behalf of Murphy Oil Corporation, we enclose herewith its Application for original authority for the injection of water into the Lower Gallup Sand to maintain the reservoir pressure in the Many Rocks-Gallup Pool, San Juan County. Attached to the Application are Exhibits "A" through "J". Would you please place the Application for Examiner hearing as soon as possible.

Appreciating your courtesy to us and with our best wishes, we are,

Very truly yours,


for ATWOOD & MALONE

PC/mm

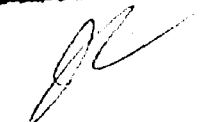
Encl.

CC: Office of State Engineer
Santa Fe, New Mexico

United States Geological Survey
Roswell, New Mexico

Murphy Oil Corporation
El Dorado, Arkansas

DOCKET MAILED

Date 10-1-64


MANY ROCKS-GALLUP POOL
(Many Rocks-Gallup Pressure Maintenance Project No. 1)
San Juan County, New Mexico

Order No. R-2541, Authorizing Humble Oil & Refining Company to Institute and Adopting Operating Rules for a Pressure Maintenance Project in the Many Rocks-Gallup Pool, San Juan County, New Mexico, August 7, 1963.

Application of Humble Oil & Refining Company for a Pressure Maintenance Project, San Juan County, New Mexico.

CASE NO. 2865
Order No. R-2541

ORDER OF THE COMMISSION

BY THE COMMISSION: This cause came on for hearing at 9 o'clock a.m. on July 24, 1963, at Santa Fe, New Mexico, before Daniel S. Nutter, Examiner duly appointed by the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 7th day of August, 1963, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Daniel S. Nutter, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Humble Oil & Refining Company, seeks authority to institute a pressure maintenance project in the Many Rocks-Gallup Oil Pool, San Juan County, New Mexico, by the injection of water into the Gallup formation initially through nine wells located or to be located within the proposed project area comprising the following-described acreage:

TOWNSHIP 31 NORTH, RANGE 17 WEST, NMPM

Section 1: W/2, SE/4, and SW/4 NE/4

Section 2: NE/4 and NE/4 SE/4

Section 12: NE/4 and NE/4 NW/4

(3) That the applicant seeks the promulgation of special rules and regulations governing the proposed project similar to the special rules and regulations governing the Horseshoe-Gallup Pressure Maintenance Project No. 2 promulgated by Order No. R-1745.

(4) That the applicant proposes that the special rules and regulations provide that any producing well in the project area which directly or diagonally offsets any well outside the project area producing from the same common source of supply shall not produce in excess of top unit allowable for the pool until January 1, 1964, or until the operators of such offset well outside the project area have instituted a pressure maintenance project in the area of such well, whichever shall first occur.

(5) That the proposed pressure maintenance project is in the interest of conservation and should result in greater ultimate recovery of oil, thereby preventing waste.

(6) That the proposed special rules and regulations should be adopted in order to prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED:

(1) That the applicant, Humble Oil & Refining Company, is hereby authorized to institute a pressure maintenance project designated the Many Rocks-Gallup Pressure Maintenance Project No. 1 in the Many Rocks-Gallup Oil Pool, San Juan County, New Mexico, by the injection of water into the Gallup formation through nine injection wells located or to be located

in Units F, J, L, and N of Section 1, Unit H of Section 2, and Unit B of Section 12, Township 31 North, Range 17 West, NMPM, San Juan County, New Mexico, with one injection well located on each of the above-described units.

(2) That special rules and regulations governing the Many Rocks-Gallup Pressure Maintenance Project No. 1, San Juan County, New Mexico, are hereby promulgated as follows:

**SPECIAL RULES AND REGULATIONS
FOR THE MANY ROCKS-GALLUP
PRESSURE MAINTENANCE PROJECT NO. 1**

RULE 1. The project area of the Many Rocks-Gallup Pressure Maintenance Project No. 1, hereinafter referred to as the Project, shall comprise the following-described area:

TOWNSHIP 31 NORTH, RANGE 17 WEST, NMPM

Section 1: W/2, SE/4, and SW/4 NE/4

Section 2: NE/4 and NE/4 SE/4

Section 12: NE/4 and NE/4 NW/4

RULE 2. The allowable for the Project shall be the sum of the allowables of the several wells within the project area, including those wells which are shut-in, curtailed, or used as injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

RULE 3. Allowables for injection wells may be transferred to producing wells within the project area, as may the allowables for producing wells which, in the interest of more efficient operation of the Project, are shut-in or curtailed because of high gas-oil ratio, pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

RULE 4. The allowable assigned to any well which is shut-in or which is curtailed in accordance with the provisions of Rule 3, which allowable is to be transferred to any well or wells in the project area for production, shall in no event be greater than its ability to produce during the test prescribed by Rule 6, below, or greater than the current top unit allowable for the pool during the month of transfer, whichever is less.

RULE 5. The allowable assigned to any injection well on a 40-acre proration unit shall be top unit allowable for the pool.

RULE 6. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3 shall be determined by a 24-hour test at a stabilized rate of production which shall be the final 24-hour period of a 72-hour test throughout which the well should be produced in the same manner and at a constant rate. The daily tolerance limitation set forth in Rule 502 I (a) of the General Rules and Regulations and any limiting gas-oil ratio for the pool shall be waived during such tests. The project operator shall notify the Commission and all offset operators in writing of the exact time and date such tests are to be conducted. The Commission and representatives of the offset operators may witness the tests.

RULE 7. The allowable assigned to each producing well in the Project shall be equal to the well's ability to produce or to top unit allowable for the pool, whichever is less; provided, however, that any producing well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply shall not produce in excess of top unit allowable for the pool until January 1, 1964, or until the operators of such offset well outside the project area have instituted a pressure maintenance project in the area of such well, whichever shall first occur. Each producing well shall be subject to the limiting gas-oil ratio

(MANY ROCKS-GALLUP (MANY ROCKS-GALLUP
PRESSURE MAINTENANCE PROJECT NO. 1)
POOL—Cont'd.)

(2,000 to 1) for the pool, except that any well or wells within the project area producing with a gas-oil ratio in excess of 2,000 cubic feet of gas per barrel of oil may be produced on a "net" gas-oil ratio basis, which net gas-oil ratio shall be determined by applying credit for daily average gas injected, if any, into the pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$$A_{adj} = \frac{TUA \times F_a \times 2,000}{\frac{P_g - I_g}{P_o}}$$

where:

- A_{adj} = the well's daily adjusted allowable
 TUA = top unit allowable for the pool
 F_a = the well's acreage factor
 P_g = average daily volume of gas produced by the well during the preceding month, cubic feet
 I_g = the well's allocated share of the daily average gas injected during the preceding month, cubic feet
 P_o = average daily volume of oil produced by the well during the preceding month, barrels

In no event shall the amount of injected gas being credited to a well be such as to cause the net gas-oil ratio, $\frac{P_g - I_g}{P_o}$

to be less than 2,000 cubic feet of gas per barrel of oil produced.

RULE 8. Credit for daily average net water injected into the pool through any injection well located within the project area may be converted to its gas equivalent and applied to any well producing with a gas-oil ratio in excess of two thousand cubic feet of gas per barrel of oil. Total credit for net water injected in the project area shall be the gas equivalent volume of the daily average net water injected during a one-month period. The daily average gas equivalent of net water injected shall be computed in accordance with the following formula:

$$E_g = (V_w \text{ inj} - V_w \text{ prod}) \times 5.61 \times \frac{P_a}{15.025} \times \frac{520^\circ}{T_r} \times \frac{1}{Z}$$

where:

- E_g = Average daily gas equivalent of net water injected, cubic feet
 $V_w \text{ inj}$ = Average daily volume of water injected, barrels
 $V_w \text{ prod}$ = Average daily volume of water produced, barrels
 5.61 = Cubic foot equivalent of one barrel of water
 P_a = Average reservoir pressure at mid-point of the pay-zones of the pool in the project area, psig + 12.01, as determined from most recent survey
 15.025 = Pressure base, psi
 520° = Temperature base of 60°F expressed as absolute temperature
 T_r = Reservoir temperature of 92°F expressed as absolute temperature (552°R)

Z = Compressibility factor from analysis gas from the pool at average reservoir pressure, P_a , interpolated from compressibility tabulation below:

Reservoir Pressure	Z	Reservoir Pressure	Z	Reservoir Pressure	Z
50	.9725	300	.8325	500	.6560
100	.9465	350	.8030	600	.6135
150	.9215	400	.7710	650	.5655
200	.8885	450	.7220	700	.5220
250	.8600	500	.6900	750	.4630
				800	.3935

RULE 9. Each month the project operator shall, within three days after the normal unit allowable for Northwest New Mexico has been established, submit to the Commission a Pressure Maintenance Project Operator's Report, on a form prescribed by the Commission, outlining thereon the data required, and requesting allowables for each of the several wells in the project as well as the total project allowable. The aforesaid Pressure Maintenance Project Operator's Report shall be filed in lieu of Form C-120 for the Project.

RULE 10. The Commission shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for each well in the project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to the project and may be produced from the wells in the project in any proportion except that no well in the project which directly or diagonally offsets a well outside the project producing from the same common source of supply shall produce in excess of top unit allowable for the pool until January 1, 1964, or until the operators of such offset well outside the project area have instituted a pressure maintenance project in the area of such well, which ever shall first occur.

RULE 11. The conversion of producing wells to injection, the drilling of additional wells for injection, and expansion of the project area shall be accomplished only after approval of the same by the Secretary-Director of the Commission. To obtain such approval, the project operator shall file proper application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall be filed in accordance with Commission Rule 701-B and shall be accompanied by a statement that all offset operators to the proposed injection well have been furnished a complete copy of the application and the date of notification.

The Secretary-Director may approve the proposed injection well if, within 15 days after receiving the application, no objection to the proposal is received. The Secretary-Director may grant immediate approval, provided waivers of objection are received from all offset operators and from the State Engineer.

Expansion of the project area may be approved by the Secretary-Director of the Commission administratively when good cause is shown therefor.

(3) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year heretofore designated.

Case. 3124

Reced 10-18-64

Rec. 10-19-64

1. Grant Murphy Outcrop. a pressure maintenance water flood. in the H. Many rocks Gallup oil Pool.
2. Create a pool to be designated the H. Many Rocks Gallup oil Pool. and consisting of.

32 N - 17 W.

Sec. 17, SW/4 NW/4, SW/4, SW/4
SE/4

Sec. 18, NE/4, NE/4 NW/4

Sec. 20, NE/4, E/2 NW/4.

3. Use Rules of R-2541. The Humble Many Rocks P. M. Project #1.

4. Even tho there are at present no offsets I see no need of deleting portions of Rules. 6, 7 & 10.

Thurs. 10-19-64

5. Approve 4 injection wells in accordance with the description of T. C. Carlsona letter of 10-15-64

—E. J. R.

H. M. SHEARIN
MANAGER, DOMESTIC OPERATIONS
W. P. SCHULTZ
MANAGER, FOREIGN OPERATIONS
JAMES L. MOORE
ASSISTANT MANAGER
I. F. ROEDUCK, JR.
ASSISTANT MANAGER

64 OCT 19 1964

CORE LABORATORIES, INC.
BOX 10185, DALLAS 7, TEXAS • CABLE: CORELAB

Engineering & Consulting Department

October 15, 1964

REPLY TO
SUITE 209 GULF BUILDING
BOX 223
MIDLAND, TEXAS
64-511.3

New Mexico Oil & Gas Conservation Commission
Post Office Box 871
Santa Fe, New Mexico

Attention: Mr. E. A. Utz

Gentlemen:

As directed during the hearing of Case 3126 before the Oil & Gas Conservation Commission on October 13, 1964, we submit the location of the proposed injection wells on the Murphy Oil Corporation Navajo AA Lease in the Many Rocks Gallup Pool, San Juan County, New Mexico.

<u>Well Number</u>	<u>Location</u>	<u>Section</u>
4	2310'FNL & 330'FWL	17
13	660'FNL & 1980'FEL	20
(not yet drilled) 18	2474'FSL & 133'FEL	18

Tentative Water Injection Wells:

5	708'FNL & 1999'FEL	18
6	980'FNL & 2137'FWL	18

All of these wells are located in TWP 32-N RNG 17-W.

Very truly yours,

CORE LABORATORIES, INC.

T. C. Carlson
T. C. Carlson
Resident Engineer

LDS:fp

cc: Mr. W. J. Thornton

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 3126
Order No. R-2795

Nomenclature

APPLICATION OF MURPHY OIL CORPORATION
FOR A PRESSURE MAINTENANCE PROJECT, SAN
JUAN COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on October 13, 1964, at Santa Fe, New Mexico, before Examiner Elvis A. Utz.

NOW, on this 29th day of October, 1964, the Commission, a quorum being present, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Murphy Oil Corporation, seeks authority to institute a pressure maintenance project in an undesignated Gallup oil pool, San Juan County, New Mexico, by the injection of water into the Gallup formation initially through five wells located in Sections 17, 18, and 20, Township 32 North, Range 17 West, NMPM, San Juan County, New Mexico.

(3) That the wells within the proposed project area are completed in a separate common source of supply which should be designated the North Many Rocks-Gallup Oil Pool.

(4) That the applicant also seeks the promulgation of special rules and regulations governing the proposed project similar to the special rules and regulations governing previous Gallup Pressure Maintenance Projects.

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CASE No. 3126

Order No. R-2795

(5) That the proposed pressure maintenance project is in the interest of conservation and should result in greater ultimate recovery of oil, thereby preventing waste.

(6) That the proposed special rules and regulations should be adopted in order to prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED:

(1) That a new pool in San Juan County, New Mexico, classified as an oil pool for Gallup production is hereby created and designated the North Many Rocks-Gallup Oil Pool, with vertical limits comprising the Gallup formation and horizontal limits comprising the following-described area:

SAN JUAN COUNTY, NEW MEXICO
TOWNSHIP 32 NORTH, RANGE 17 WEST, NMPM

Section 17: SW/4 NW/4, SW/4, and SW/4 SE/4

Section 18: NE/4, NE/4 NW/4, and NE/4 SE/4

Section 20: NE/4, E/2 NW/4

(2) That the applicant, Murphy Oil Corporation, is hereby authorized to institute a pressure maintenance project designated the North Many Rocks-Gallup Pressure Maintenance Project No. 1 in the North Many Rocks-Gallup Oil Pool, San Juan County, New Mexico, by the injection of water into the Gallup formation initially through the following-described five wells in Township 32 North, Range 17 West, NMPM, San Juan County, New Mexico:

Navajo "AA" Well No. 4, located 2310 feet from the North line and 330 feet from the West line of Section 17.

Navajo "AA" Well No. 18, to be located 2474 feet from the South line and 133 feet from the East line of Section 18.

Navajo "AA" Well No. 5, located 708 feet from the North line and 1999 feet from the East line of Section 18.

Navajo "AA" Well No. 6, located 980 feet from the North line and 2137 feet from the West line of Section 18.

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CASE No. 3126
Order No. R-2795

Navajo "AA" Well No. 13, located 330 feet from
the North line and 2310 feet from the East
line of Section 20.

(3) That special rules and regulations governing the North
Many Rocks-Gallup Pressure Maintenance Project No. 1, San Juan
County, New Mexico, are hereby promulgated as follows:

SPECIAL RULES AND REGULATIONS
FOR THE
NORTH MANY ROCKS-GALLUP PRESSURE MAINTENANCE PROJECT NO. 1

RULE 1. The project area of the North Many Rocks-Gallup
Pressure Maintenance Project No. 1, hereinafter referred to as
the Project, shall comprise the following-described area:

SAN JUAN COUNTY, NEW MEXICO
TOWNSHIP 32 NORTH, RANGE 17 WEST, NMPM
Section 17: SW/4 NW/4, SW/4, and SW/4 SE/4
Section 18: NE/4, NE/4 NW/4, and NE/4 SE/4
Section 20: NE/4, E/2 NW/4

RULE 2. The allowable for the Project shall be the sum
of the allowables of the several wells within the project area,
including those wells which are shut-in, curtailed, or used as
injection wells. Allowables for all wells shall be determined
in a manner hereinafter prescribed.

RULE 3. Allowables for injection wells may be transferred
to producing wells within the project area, as may the allowables
for producing wells which, in the interest of more efficient oper-
ation of the Project, are shut-in or curtailed because of high
gas-oil ratio, pressure regulation, control of pattern or sweep
efficiencies, or to observe changes in pressures or changes in
characteristics of reservoir liquids or progress of sweep.

RULE 4. The allowable assigned to any well which is shut-in
or which is curtailed in accordance with the provisions of Rule 3,
which allowable is to be transferred to any well or wells in the
project area for production, shall in no event be greater than its
ability to produce during the test prescribed by Rule 6, below, or
greater than the current top unit allowable for the pool during
the month of transfer, whichever is less.

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CASE No. 3126
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RULE 5. The allowable assigned to any injection well on a 40-acre proration unit shall be top unit allowable for the pool.

RULE 6. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3 shall be determined by a 24-hour test at a stabilized rate of production which shall be the final 24-hour period of a 72-hour test throughout which the well should be produced in the same manner and at a constant rate. The daily tolerance limitation set forth in Rule 502 I (a) of the General Rules and Regulations and any limiting gas-oil ratio for the pool shall be waived during such tests. The project operator shall notify the Commission and all offset operators in writing of the exact time and date such tests are to be conducted. The Commission and representatives of the offset operators may witness the tests.

RULE 7. The allowable assigned to each producing well in the Project shall be equal to the well's ability to produce or to top unit allowable for the pool, whichever is less. Each producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the pool, except that any well or wells within the project area producing with a gas-oil ratio in excess of 2,000 cubic feet of gas per barrel of oil may be produced on a "net" gas-oil ratio basis, which net gas-oil ratio shall be determined by applying credit for daily average gas injected, if any, into the pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$$A_{adj} = \frac{TUA \times F_a \times 2,000}{\frac{P_g - I_g}{P_o}}$$

where:

- A_{adj} = the well's daily adjusted allowable
 TUA = top unit allowable for the pool
 F_a = the well's acreage factor
 P_g = average daily volume of gas produced by the well during the preceding month, cubic feet

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I_g = the well's allocated share of the daily average gas injected during the preceding month, cubic feet

P_o = average daily volume of oil produced by the well during the preceding month, barrels

In no event shall the amount of injected gas being credited to a well be such as to cause the net gas-oil ratio, $\frac{P_g - I_g}{P_o}$, to

be less than 2,000 cubic feet of gas per barrel of oil produced.

RULE 8. Credit for daily average net water injected into the pool through any injection well located within the project area may be converted to its gas equivalent and applied to any well producing with a gas-oil ratio in excess of two thousand cubic feet of gas per barrel of oil. Total credit for net water injected in the project area shall be the gas equivalent volume of the daily average net water injected during a one-month period. The daily average gas equivalent of net water injected shall be computed in accordance with the following formula:

$$E_g = (V_w \text{ inj} - V_w \text{ prod}) \times 5.61 \times \frac{P_a}{15.025} \times \frac{520^\circ}{T_r} \times \frac{1}{Z}$$

where:

E_g = Average daily gas equivalent of net water injected, cubic feet

$V_w \text{ inj}$ = Average daily volume of water injected, barrels

$V_w \text{ prod}$ = Average daily volume of water produced, barrels

5.61 = Cubic foot equivalent of one barrel of water

P_a = Average reservoir pressure at mid-point of the pay-zones of the pool in the project area, psig + 12.01, as determined from most recent survey

15.025 = Pressure base, psi

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520° = Temperature base of 60°F expressed
as absolute temperature

T_r = Reservoir temperature of 92°F expressed
as absolute temperature (552°R)

Z = Compressibility factor from analysis of
gas from the pool at average reservoir
pressure, P_a, interpolated from compressi-
bility tabulation below:

Reservoir Pressure	Z	Reservoir Pressure	Z	Reservoir Pressure	Z
50	.9725	300	.8325	550	.6560
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200	.8885	450	.7220	700	.5220
250	.8600	500	.6900	750	.4630
				800	.3935

RULE 9. Each month the project operator shall, within three days after the normal unit allowable for Northwest New Mexico has been established, submit to the Commission a Pressure Maintenance Project Operator's Report, on a form prescribed by the Commission, outlining thereon the data required, and requesting allowables for each of the several wells in the Project as well as the total Project allowable. The aforesaid Pressure Maintenance Project Operator's Report shall be filed in lieu of Form C-120 for the Project.

RULE 10. The Commission shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for each well in the Project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to the Project and may be produced from the wells in the Project in any proportion.

RULE 11. The conversion of producing wells to injection, the drilling of additional wells for injection, and expansion of the project area shall be accomplished only after approval of the same by the Secretary-Director of the Commission. To obtain such approval, the project operator shall file proper application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional

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Order No. R-2795

injection wells shall be filed in accordance with Commission Rule 701-B and shall be accompanied by a statement that all offset operators to the proposed injection well have been furnished a complete copy of the application and the date of notification.

The Secretary-Director may approve the proposed injection well, if within 15 days after receiving the application, no objection to the proposal is received. The Secretary-Director may grant immediate approval, provided waivers of objection are received from all offset operators and from the State Engineer.

Expansion of the project area may be approved by the Secretary-Director of the Commission administratively when good cause is shown therefor.


(3) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

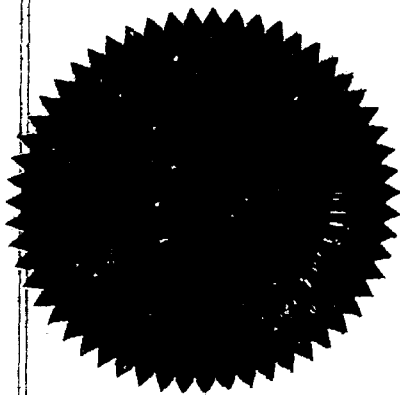
DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION


JACK M. CAMPBELL, Chairman


E. S. WALKER, Member


A. L. PORTER, Jr., Member & Secretary



esr/

DRAFT

JMD/esr

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

CF Subj.

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 3126

Order No. R- 2795

APPLICATION OF MURPHY OIL CORPORATION
FOR A PRESSURE MAINTENANCE PROJECT, SAN
JUAN COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on
October 13, 1964, at Santa Fe, New Mexico, before Examiner
Daniel S. Nutter *Elvis G. Utz*.

NOW, on this day of October, 1964, the Commission,
a quorum being present, having considered the testimony, the record,
and the recommendations of the Examiner, and being fully advised
in the premises,

FINDS:

(1) That due public notice having been given as required by
law, the Commission has jurisdiction of this cause and the subject
matter thereof.

(2) That the applicant, Murphy Oil Corporation, seeks
authority to institute a pressure maintenance project in ^{an} ~~the~~ Many
~~designated~~ ^{undesignated} ~~Rock~~ Gallup Oil Pool, San Juan County, New Mexico, by the injec-
tion of water into the Gallup formation initially through five
wells located in Sections 17, 18, and 20, Township 32 North,
Range 17 West, NMPM, San Juan County, New Mexico.

(3) *That the wells within the proposed project
area are completed in a separate common
source of supply which should be designated
the North Many Rocks - Gallup Oil Pool.*

(4) That the applicant ^{also} seeks the promulgation of special
rules and regulations governing the proposed project similar to

RULE 2. The allowable for the Project shall be the sum of the allowables of the several wells within the project area, including those wells which are shut-in, curtailed, or used as injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

RULE 3. Allowables for injection wells may be transferred to producing wells within the project area, as may the allowables for producing wells which, in the interest of more efficient operation of the Project, are shut-in or curtailed because of high gas-oil ratio, pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

RULE 4. The allowable assigned to any well which is shut-in or which is curtailed in accordance with the provisions of Rule 3, which allowable is to be transferred to any well or wells in the project area for production, shall in no event be greater than its ability to produce during the test prescribed by Rule 6, below, or greater than the current top unit allowable for the pool during the month of transfer, whichever is less.

RULE 5. The allowable assigned to any injection well on a 40-acre proration unit shall be top unit allowable for the pool.

RULE 6. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3 shall be determined by a 24-hour test at a stabilized rate of production which shall be the final 24-hour period of a 72-hour test throughout which the well should be produced in the same manner and at a constant rate. The daily tolerance limitation set forth in Rule 502 I (a) of the General Rules and Regulations and any limiting gas-oil ratio for the pool shall be waived during such tests. The project operator shall notify the Commission and all offset operators in writing of the exact time and date such tests are to be conducted. The Commission and representatives of the offset operators may witness the tests.

RULE 7. The allowable assigned to each producing well in the Project shall be equal to the well's ability to produce or to top unit allowable for the pool, whichever is less. Each producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the pool, except that any well or wells within the project area producing with a gas-oil ratio in excess of 2,000 cubic feet of gas per barrel of oil may be produced on a "net" gas-oil ratio basis, which net gas-oil ratio shall be determined by applying credit for daily average gas injected, if any, into the pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$$A_{adj} = \frac{TUA \times F_a \times 2,000}{\frac{P_g - I_g}{P_o}}$$

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Order No. R-~~XXXX~~

where:

A_{adj} = the well's daily adjusted allowable

TUA = top unit allowable for the pool

F_a = the well's acreage factor

P_g = average daily volume of gas produced by the well during the preceding month, cubic feet

I_g = the well's allocated share of the daily average gas injected during the preceding month, cubic feet

P_o = average daily volume of oil produced by the well during the preceding month, barrels

In no event shall the amount of injected gas being credited to a well be such as to cause the net gas-oil ratio, $\frac{P_g - I_g}{P_o}$, to

be less than 2,000 cubic feet of gas per barrel of oil produced.

RULE 8. Credit for daily average net water injected into the pool through any injection well located within the project area may be converted to its gas equivalent and applied to any well producing with a gas-oil ratio in excess of two thousand cubic feet of gas per barrel of oil. Total credit for net water injected in the project area shall be the gas equivalent volume of the daily average net water injected during a one-month period. The daily average gas equivalent of net water injected shall be computed in accordance with the following formula:

$$E_g = (V_{w \text{ inj}} - V_{w \text{ prod}}) \times 5.61 \times \frac{P_a}{15.025} \times \frac{520^\circ}{T_r} \times \frac{1}{Z}$$

where:

E_g = Average daily gas equivalent of net water injected, cubic feet

$V_{w \text{ inj}}$ = Average daily volume of water injected, barrels

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CASE No. ~~3036~~ 3126

Order No. R-~~2700X~~

$V_w \text{ prod}$ = Average daily volume of water produced,
barrels

5.61 = Cubic foot equivalent of one barrel of water

P_a = Average reservoir pressure at mid-point of the
pay-zones of the pool in the project area,
psig + 12.01, as determined from most recent
survey

15.025 = Pressure base, psi

520° = Temperature base of 60°F expressed
as absolute temperature

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bility tabulation below:

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RULE 10. The Commission shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for

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CASE No. ~~XXXX~~ 3126

Order No. R-~~XXXX~~

each well in the Project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to the Project and may be produced from the wells in the Project in any proportion.

RULE 11. The conversion of producing wells to injection, the drilling of additional wells for injection, and expansion of the project area shall be accomplished only after approval of the same by the Secretary-Director of the Commission. To obtain such approval, the project operator shall file proper application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall be filed in accordance with Commission Rule 701-B and shall be accompanied by a statement that all offset operators to the proposed injection well have been furnished a complete copy of the application and the date of notification.

The Secretary-Director may approve the proposed injection well if, within 15 days after receiving the application, no objection to the proposal is received. The Secretary-Director may grant immediate approval, provided waivers of objection are received from all offset operators and from the State Engineer.

Expansion of the project area may be approved by the Secretary-Director of the Commission administratively when good cause is shown therefor.

(3) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JACK M. CAMPBELL, Chairman

E. S. WALKER, Member

S E A L

A. L. PORTER, Jr., Member & Secretary

esr/