

CASE 4665: Application of TENNECO  
FOR A PRESSURE MAINTENANCE PROJECT  
IN MCKINLEY COUNTY, NEW MEXICO.



Case Number  
4665

Application

Transcripts

Small Exhibits

ETC.



BEFORE THE  
NEW MEXICO OIL CONSERVATION COMMISSION  
MORGAN HALL, STATE LAND OFFICE BUILDING  
SANTA FE, NEW MEXICO  
February 16, 1972

## EXAMINER HEARING

IN THE MATTER OF:

Application of Tenneco Oil Company  
for a unit agreement, McKinley  
County, New Mexico

CASE NO. 4664

a n d

Application of Tenneco Oil Company  
for a pressure maintenance  
project, McKinley County, New  
Mexico.

CASE NO. 4665

BEFORE: Elvis Utz  
Examiner

TRANSCRIPT OF HEARING



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1 MR. UTZ: The Hearing will come to order, please.  
2 We will consolidate for the purpose of testimony, Cases 4664  
3 and 4665.

4 Separate Orders will be written on each Case.

5 MR. HATCH: Case 4664, Application of Tenneco Oil  
6 Company for a unit agreement, McKinley County, New Mexico.

7 Case 4664, Application of Tenneco Oil Company for  
8 a pressure maintenance project, McKinley County, New Mexico.

9 MR. UTZ: Appearances?

10 MR. KELLY: Booker Kelly, of White Koch, Kelly,  
11 and McCarthy of Santa Fe. We have two witnesses and ask  
12 that they be sworn.

13 (Whereupon, the Applicant's two witnesses were  
14 sworn by Mr. Hatch.)

15 MR. UTZ: Are there any other appearances in this  
16 Case?

17 (No response.)

18 MR. UTZ: You may proceed.

19 MR. KELLEY: We are going to have two witnesses,  
20 and since these Cases have been consolidated, Mr. Rial is  
21 going to briefly go through some of the Exhibits on geology  
22 and then Mr. Melnar will resume the stand and go through the  
23 engineering pressure maintenance project.  
24  
25



1 WILLIAM MELNAR,  
2 was called as a witness and, having already been duly sworn,  
3 testified as follows:

4 DIRECT EXAMINATION

5 BY MR. KELLY:

6 Q Would you state your name, profession and employer?

7 A My name is William Melnar, I am District Reservoir  
8 Engineer for the Tenneco Oil Company, in Denver,  
9 Colorado.

10 Q Have you previously qualified before the Commission as  
11 an expert in the field of Petroleum Engineering?

12 A Yes, I have.

13 Q These two Applications have been consolidated, would  
14 you briefly state what Tenneco seeks by the two  
15 Applications?

16 A Tenneco is seeking approval of unit agreement and also  
17 approval of a pressure maintenance project with  
18 special unit rules, in the Lone Pine Dakota "D" unit  
19 in McKinley County, New Mexico.

20 Q Referring to Exhibit 1, would you locate the unit on  
21 the plat?

22 A Exhibit 1 is a location map of the Line Pine field and  
23 the proposed unit is shown on the Exhibit by black hash  
24 lines.

25 Q Does Exhibit 1 show all of the wells within two miles of

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1 any injection wells and all of the offset operators?

2 A Yes. The gas injection wells are shown in green and  
3 the water injection wells in red.

4 Q Can you give us, just briefly, a history of this  
5 particular pool?

6 A The Lone Pine Dakota "D" pool was discovered with the  
7 drilling completion of the Lone Pine Number 1 Well  
8 located in the northwest of the northwest of Section  
9 18, Township 17 North, Range 8 West.

10 It was completed in June of 1970, and after  
11 discovery, rapid development followed. As of this  
12 date, we have twenty-two producing oil wells and four  
13 gas wells, and two temporarily abandoned wells.

14 Q Exhibit Number 2 is a copy of the proposed unit  
15 agreement; is that correct?

16 A Yes, it is.

17 Q Would you point out to the Examiner, the Section and  
18 page where the legal description of the unit is found?

19 A The legal description of the unit is shown on the  
20 unit agreement on pages 2 and 3, in Section 2.

21 MR. KELLY: Mr. Examiner, do you wish the  
22 legal description read into the record?

23 MR. UTZ: No, I don't think it is necessary. It  
24 is in the form of an Exhibit?

25 MR. KELLY: Yes.



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- 1 MR. UTZ: What page?
- 2 THE WITNESS: Pages 2 and 3 of Section 2.
- 3 Q What structures are to be unitized?
- 4 A The unitized formations are defined in the unit
- 5 agreement on pages 3 and 4 of Section 2.
- 6 Q Now, the purpose of this unit agreement is to introduce
- 7 a pressure maintenance project; is that correct?
- 8 A Yes, it is.
- 9 Q What kind of lands are involved in the unit?
- 10 A The type of lands involved in the unit are shown on
- 11 Exhibit 3-B to the unit agreement and they are as
- 12 follows: Tracts 1, 2, and 3, and Federal 4 through 9,
- 13 are Indian Tracts and 10 through 12 are Fee lands.
- 14 Q Can you describe who the offset operators are?
- 15 A The offset operators are Tesoro Petroleum Company
- 16 and Kennedy.
- 17 Q Tenneco has all the rest of the acreage to the south
- 18 and west; is that basically correct?
- 19 A Yes, that is true.
- 20 Q And some part of the north portion is concerned with
- 21 other operators?
- 22 A That is correct.
- 23 Q And Tenneco will be the operator of the unit?
- 24 A That is correct.
- 25 Q Who are the other working interest owners in the unit?



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- 1 A Besides Tenneco, there is Tesoro, Beard and Gil,
- 2 and John Beard.
- 3 Q I assume you have agreements with all the working
- 4 interest owners?
- 5 A Yes, we do.
- 6 Q What is the situation as far as the Indian and the
- 7 U.S.G.S. land is concerned?
- 8 A We have preliminary approval for the unit agreement
- 9 from both the B.I.A., the Bureau of Indian Affairs,
- 10 and the U.S.G.S., and we have Exhibit Number 3 which
- 11 is a letter from the United States Department of
- 12 Interior, Geological Surveys, approving the unit
- 13 agreement -- giving preliminary approval.
- 14 Q Is that on behalf of the Bureau of Indian Affairs and
- 15 the U.S.G.S.?
- 16 A That is correct.
- 17 Q How about the Fee land?
- 18 A The Fee land is from Santa Fe and we have agreement
- 19 from them also.
- 20 Q And the unit agreement submitted with the Application
- 21 was amended by the U.S.G.S. and B.I.A.?
- 22 A Yes.
- 23 Q And those amendments are shown in Exhibit Number 2; is
- 24 that correct?
- 25 A That is correct.



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1 Q Do those amendments make any substantial changes  
 2 just technical changes in the language?

3 A Primarily, technical changes, and clarification of  
 4 language.

5 Q Will you show where the tract participation formula  
 6 is shown in the unit agreement?

7 A The participation formula is found on page 12 of  
 8 Section 13 of the unit agreement and the formula is  
 9 based on our current production and is to be in effect  
 10 until the accumulative recovery of 3.21 million barrels  
 11 are recovered from the pool.

12 After this Phase 2 will come into effect and that  
 13 will be based on oil plus the equivalent gas acre fee.

14 Q Is the formula similar to other agreements that have  
 15 been approved by this Commission?

16 A I believe it is.

17 Q Would it be in the best interest of conservation and  
 18 prevention of waste and protection of correlative  
 19 rights to approve this agreement?

20 A Yes, I think so.

21 MR. KELLY: Mr. Commissioner, I would like to state  
 22 that we could develop more in testimony, but because of the  
 23 nature of this reservoir it is important that the injection  
 24 project begin as soon as possible and we have received  
 25 permission from the U.S.G.S. to begin injection prior to



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1 formal approval of the unit agreement.

2 Q (By Mr. Kelly) Is it Teneco's position that if  
3 granted what is proposed in this Application, that  
4 Tenneco would inject before formal approval by the  
5 U.S.G.S. and B.I.A.?

6 A Yes, it is.

7 MR. KELLY: At this time I would move the introduction  
8 of Exhibits 1 through 3 -- Exhibit 2 is a duplicate of the  
9 proposed unit agreement; is that correct?

10 THE WITNESS: That is correct.

11 MR. KELLY: And Exhibit 1 was prepared by you or  
12 under your supervision?

13 THE WITNESS: That is correct.

14 MR. UTZ: Without objection, Exhibits 1 through 3  
15 will be entered into the record of this Case.

16 (Whereupon, Tenneco's Exhibits 1 through 3 were  
17 admitted in evidence.)

18 MR. KELLY: Mr. Melnar will be recalled for the  
19 Engineering testimony on the pressure maintenance aspect  
20 of this, but that is all I have on this phase of the Case  
21 for him.

22 That concludes our direct testimony on the unit  
23 agreement itself.

24 MR. UTZ: Do you want to submit him for Cross-  
25 Examination, at this time, then?



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1 MR. KELLY: Whatever pleases the Commissioner.  
2 MR. UTZ: Any questions?  
3 CROSS-EXAMINATION  
4 BY MR. HATCH:  
5 Q On page 12 of Exhibit 2, in Section 13, when you were  
6 speaking of tract participation, it says that Exhibit  
7 "C" shows the participation; is this Exhibit "C"  
8 (indicating)?  
9 A Yes.  
10 MR. HATCH: That's all I have.  
11 MR. UTZ: If there are no other questions, the  
12 witness may be excused.  
13 (Witness excused.)  
14 MR. UTZ: The witness will be subject to recall.  
15 A. D. RIAL,  
16 was called as a witness and having been already duly sworn,  
17 testified as follows:  
18 DIRECT EXAMINATION  
19 BY MR. KELLY:  
20 Q Would you state your name, position and employer,  
21 please?  
22 A A. D. Rial, District Geological Engineer for the  
23 Tenneco Oil Company.  
24 Q You have previously been qualified by the Commission?  
25 A Yes.



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1 Q Mr. Rial, will you refer to the structure map marked  
2 Exhibit 4 and explain the Exhibit's significance to  
3 the Commissioner?

4 A Exhibit 4 is a structure map drawn to the top of the  
5 Dakota "D" zone. Shown here on the plat, is the  
6 location of all of the producing and dry holes that  
7 are in the area.

8 The producing zones are coded and shown in the  
9 legend in the lower left-hand corner.

10 We see here the location of the Hospah field and  
11 South Hospah field, and then the Dakota-Lone Pine.

12 The Dakota Pool is principally in Section 13 of  
13 17 North, Range 9 West, and Section 18, of Township  
14 17 North, and Section 8 West.

15 This shows the separation of the South Hospah  
16 Pool and the Lone Pine-Dakota Pool. The Lone Pine-Dakota  
17 Pool is shown on the structure map and is colored in  
18 green and this line is the line which denotes the  
19 structural position of the gas-oil contact.

20 Also shown in red is the structural position of  
21 the oil-water contact.

22 Q You have a cross section marked as Exhibit 5?

23 A Yes. Shown on the cross section, which is the cross  
24 section shown in blue and which goes from the Hospah  
25 Well Number 44 in the southeast, across the field to



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1 a dry hole in the northwest of the southwest of  
 2 Section 17.

3 Also shown on this map, is an outline of the  
 4 proposed field.

5 Q Why don't you go on to the cross section?

6 A All right. This is a scale of the cross section as  
 7 shown in the lower right-hand portion of the cross  
 8 section.

9 What it primarily represents to show is the  
 10 continuity of the Dakota zone which is colored and  
 11 shows the position of the top of the sixteen percent  
 12 and the base of the sixteen percent, and the continuity  
 13 across the field.

14 It shows the position of the gas-oil contact and  
 15 the oil-water contact. The gas-oil contact and the  
 16 oil-water contact was described in the previous  
 17 structural map.

18 Q And Exhibit Number 6 is a log of the well that defines  
 19 the vertical limits of the unitized formation; is that  
 20 correct?

21 A That is true.

22 Q Now, the unitized formation is shown in Exhibit 6  
 23 and encompasses entirely the vertical limits of the  
 24 productivity zone of the formation; is that correct?

25 A Yes, it does.



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1 Q In your opinion, does the unit encompass both the  
2 vertical and horizontal limits of this pool?

3 A As we see right now, there is one possible exception,  
4 and that is the State Well that was completed by  
5 Kennedy in the southwest of the southeast of the  
6 northwest of Section 8, 17 North and 8 West.

7 At the present time it cannot be determined whether  
8 it is actually in the Lone Pine Pool or separated from  
9 the Lone Pine Pool and is producing in the Dakota "D"  
10 zone.

11 Q Now, with the exception of that well, are all of the  
12 other existing wells in the Dakota "D" zone in the  
13 unit?

14 A Yes, they are.

15 MR. KELLY: Mr. Examiner, that would conclude the  
16 testimony of Mr. Rial. I would like to submit him for  
17 Cross-Examination on Geology.

18 MR. UTZ: Any questions of the witness?

19 CROSS-EXAMINATION

20 BY MR. KENDRICKS:

21 Q Is Well Number 12 in the northeast of the southeast  
22 of Section 7 completed in the "D" zone or the "A"  
23 zone?

24 A It is completed in the "D" zone.

25 MR. KENDRICKS: That's all.



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1 MR. UTZ: Which well was that?

2 THE WITNESS: Well Number 12 in the northeast  
 3 of the southeast of Section 7.

4 MR. UTZ: Any other questions?

5 (No response.)

6 MR. UTZ: If not, the witness may be excused.

7 (Witness excused.)

8 WILLIAM MELNAR,

9 was recalled as a witness and, having been already duly  
 10 sworn, testified as follows:

11 DIRECT EXAMINATION

12 BY MR. KELLY:

13 Q Mr. Melnar, going into the engineering on the proposed  
 14 pressure maintenance project, what is the drive  
 15 mechanism of this reservoir?

16 A The drive mechanism is gas drive.

17 Q Referring to Exhibit 7, which is a summary of the  
 18 general reservoir data, would you point out the  
 19 significant items?

20 A All pertinent rock in the Lone Pine-Dakota reservoir  
 21 can be seen. The reservoir contains low pressure with  
 22 pressure of 992 P.S.I. with a volume factor of 1.25;  
 23 a G.O.R. of 962; a standard cubic feet high-low gravity  
 24 and low viscosity of 332 with an average of 19.3.

25 Based on a computation of this material, the



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1 estimated oil recovery will be 3.18 million barrels  
 2 of oil or thirty percent of the oil in place.

3 An additional twenty-five percent of the original  
 4 oil in place, or 2.65 million barrels of oil can be  
 5 recovered by pressure maintenance with a P.S.I. of  
 6 992.

7 I am also going to emphasize that, to obtain  
 8 additional recovery of 2.65 million barrels of oil,  
 9 it will require sufficient gas to maintain 992 P.S.I., to  
 10 maintain that pressure.

11 Q In reference to that, will you refer to Exhibits 8 and  
 12 9 and explain why they are important?

13 A Exhibit 8 is a pressure production history of the  
 14 Lone Pine-Dakota "D" field. The solid curve at the  
 15 bottom of the Exhibit which reads to the left, shows  
 16 monthly production from the field in barrels of oil  
 17 per month.

18 You can see that in recent months the field has  
 19 produced between sixty and sixty-five thousand barrels  
 20 of oil per month.

21 The curve at the bottom, which reads to the right,  
 22 is accumulative oil production curve and I just want  
 23 to point out that, as of December of 1971, the  
 24 accumulative production was approximately 780,000 barrels.

25 Now, the curve at the top of the Exhibit is the



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1 bottom hole pressure expressed in P.S.I. You can see  
2 the original pressure was 992 P.S.I. and it then  
3 declined to approximately 762 P.S.I. since June of  
4 1970.

5 Now, if we look at the slope of the decline  
6 curve, we can calculate that the recovery has been  
7 approximately 4,300 barrels of oil per P.S.I. since  
8 the drop of pressure in the reservoir.

9 Now, if you go to Exhibit 9, Exhibit 9 is the  
10 recovery maintenance pressure of the Lone Pine-Dakota  
11 "D" field. Shown on the Exhibit is the recovery in  
12 millions of barrels, on the right, and in percentage  
13 of recovery on the left.

14 If the initial pressure of 992 P.S.I. was maintained  
15 the recovery could be 5.83 million barrels of oil.  
16 However, if unitization is declared, or we do not have  
17 sufficient gas to bring about significant recovery, we  
18 can lose the ultimate secondary recovery.

19 This is brought out by the fact that, at 60,000  
20 barrels of production every month in this field, we are  
21 losing approximately 14 P.S.I. per month in reservoir  
22 pressure and this is shown by the curve.

23 For each pound of decrease in pressure, we can  
24 lose approximately 3,500 barrels of oil in secondary  
25 recovery.



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1 If you multiply 3,498 times 14 P.S.I., it shows  
 2 you can lose 50,000 barrels of ultimate secondary  
 3 recovery for each pound lost in pressure.

4 Q Let me see if I understand you. At the present time,  
 5 what is the pressure in the reservoir?

6 A Seven hundred forty-two pounds, approximately.

7 Q So if you maintain the pressure, what would be your  
 8 estimate of the recoverable reserves?

9 A If we started injecting the recovery would be  
 10 approximately five million barrels instead of 5.85.

11 Q As I understand it, you plan to build the pressure  
 12 up to the initial bottom hole pressure?

13 A Yes.

14 Q As a matter of fact, Tenneco has received permission  
 15 from the Oil Conservation Commissioner last Fall to  
 16 store produced gas in the Dakota zone; is that correct?

17 A Yes.

18 Q What you are going to do is start producing the stored  
 19 gas and reinjecting it?

20 A That is correct.

21 Q Now, Exhibit Number 10 is your proposed gathering  
 22 system; is that correct?

23 A Yes, it is.

24 Q Would you explain the various symbols on this Exhibit?

25 A Exhibit 10 shows the proposed gas injection wells and



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1 they are covered in green. The proposed water  
 2 injection well is colored in red. Then we show the  
 3 gas supply wells in blue.

4 We show on this pipeline gathering map the  
 5 pipeline systems for the gas distribution system and  
 6 also we show all the oil gathering lines for the unit.

7 Q Now, Wells Numbers 2 and 8, these wells you will  
 8 reproduce the gas stored in the zone?

9 A That is correct.

10 Q So you are going to have four gas injection wells and  
 11 one water injection well, initially; is that correct?

12 A That is correct.

13 Q What is the present status of the water injection well?

14 A This is a temporarily abandoned well.

15 Q Are you asking for authority to inject water from other  
 16 sources?

17 A Yes, we are.

18 Q And, I assume, you are also asking for authority to  
 19 drill or convert additional water or gas injection wells  
 20 prior to a new Hearing?

21 A Yes.

22 Q And your proposed rules would cover that?

23 A Yes.

24 Q Is there anything else you want to say about the  
 25 gathering system?



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1 A I think that's it.

2 Q Now, turning to Exhibit 11, which actually is four  
 3 pages and sketches of all four gas injection wells,  
 4 would you explain just the top one?

5 A Yes. These are diagrams of the proposed gas injection  
 6 well for Well Number 44 and you can see the wells are  
 7 completed by setting five and one-half inch casing  
 8 and it is cemented by 350 sacks of cement.

9 This is a sufficient amount of cement to bring  
 10 the cement at least 1,000 feet above the Dakota "D"  
 11 perforation.

12 The injection of gas will still be under the  
 13 Packer which will be fifty feet above the perforation  
 14 and will be down 2 and 7/8 inch tubing. We will, of  
 15 course, maintain surveillance by installing pressure  
 16 gages.

17 Q And the other installations are similar there too?

18 A Yes, sir, they are.

19 Q Do you expect any erosion problems with this?

20 A We do not.

21 Q How many cubic feet a day will you be injecting?

22 A Approximately thirteen million cubic feet per day, or an  
 23 average of three or four million per day per well.

24 Q What about the pressure?

25 A We expect the pressure to be somewhere in the vicinity



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1 of twelve to eighteen hundred P.S.I.

2 Q Do you expect any problems in the zone?

3 A No.

4 Q Exhibit Number 12 is the same type of sketch for  
5 water injection, will you briefly go through that?

6 A It is very similar. Again, we will complete the casing  
7 and the cementing will be done in the same was as  
8 previously described. We will maintain the surveillance  
9 on the pressure.

10 Q Will this prevent migration of this projected water  
11 into any other zones?

12 A Yes, it will.

13 Q I notice that all of these sketches in Exhibits 11 and  
14 12, you show the actual footage location for the four  
15 injection wells; is that correct?

16 A That is correct. It is shown on the upper left-hand  
17 side of the Exhibit.

18 Q What are you doing with your water now?

19 A It is presently being put in a surface pit.

20 Q What are the characteristics of the water?

21 A It is fairly fresh water.

22 Q And your anticipated injection rate?

23 A Approximately 1,500 barrels of water per day.

24 Q How about pressure?

25 A The pressure is shown in Exhibit 13.



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1 Q Exhibit 13 shows the proposed rules governing the  
2 unit. Would you go through those and point out anything  
3 that would be unusual?

4 A We have previously submitted to you a copy of our  
5 proposed rules and we made some slight revisions in that,  
6 in those rules, and we would like to just point out these  
7 revisions, if that is okay?

8 MR. UTZ: Okay.

9 A (Continuing) In rules 1 through 5, there are no  
10 changes.

11 In rule 6 we eliminated a sentence. A portion of  
12 the sentence begins in the fifth line and the remainder  
13 of that paragraph is eliminated.

14 Q In order to make this sensible, will you refer to the  
15 rules that were submitted with the Application?

16 A Rule 7 shows no change.

17 Rule 8 and rule 9, no change -- in rules 8 and  
18 9 we added the words: "injection of gas or water  
19 will be confined to the Dakota "D" Pool."

20 It previously read only injection of gas, and now  
21 we say the injection of gas and water.

22 In item 3 we inserted that -- it read originally  
23 that all of the offset operators will be furnished  
24 with copies of the Application and the date of the  
25 Application. It now reads that all offset operators



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FIRST NATIONAL BANK BLDG., EAST ALBUQUERQUE, NEW MEXICO 87108

1 within one-half mile of the proposed injection wells  
2 will be furnished with an Application and date of  
3 notification.

4 Rule number 10 is slightly revised and it allows  
5 us to drill an injection well within the unit, but the  
6 producer cannot be located nearer than 330 feet of the  
7 outer boundary of the unit.

8 Q Now, these rules are basically similar to the other  
9 adopted rules of the pressure maintenance projects  
10 of New Mexico; is that right?

11 A That's right.

12 Q In your opinion, would the granting of this Application  
13 protect the rights of all people involved?

14 A Yes, it would.

15 Q Were Exhibits 4 through 13 prepared by you, or under  
16 your supervision?

17 A Yes, they were.

18 MR. KELLY: At this time, I move for the introduction  
19 of Exhibits 4 through 13.

20 MR. UTZ: Without objection, Exhibits 4 through  
21 13 will be made part of the record of this Case.

22 (Whereupon, Tenneco's Exhibits 4 through 13 were  
23 admitted in evidence.)

24 MR. KELLY: That is all we have on Direct, Mr.  
25 Commissioner.



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CROSS-EXAMINATION

BY MR. UTZ:

Q Mr. Rial, you are going to produce a certain amount of water with your oil; is that correct?

A Yes, we are.

MR. KELLY: This is Mr. Melnar.

MR. UTZ: I'm sorry.

Q (By Mr. Utz) You will reinject the produced water?

A We plan to inject it back into the producing formation.

Q What if you need more water than that?

A Than we now produce?

Q Yes.

A We possibly may need additional water at some future date.

Q Where would you get the water?

A It's possible we could use some produced water from the Hospah area.

MR. UTZ: Any other questions?

CROSS-EXAMINATION

BY MR. HATCH:

Q What water do you expect to be producing at the beginning of the operation?

A At the beginning, it should be approximately 1,500 barrels per day.

Q About what you would be injecting?



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1 A Yes.

2 Q Do you plan to start injecting the wells immediately?

3 A Yes, that is what we propose to do.

4 MR. HATCH: I have nothing further.

5 CROSS-EXAMINATION

6 BY MR. KENDRICKS:

7 Q How much effect does the water drive have on the  
 8 reservoir, at the present time, or do you have any  
 9 way of knowing?

10 A I'd say very light, if any.

11 Q So you are not concerned at the present time about  
 12 the gas-oil contact being raised in the reservoir and  
 13 the water-oil contact not being raised?

14 A We are not concerned with that at all.

15 MR. KENDRICKS: I believe that's all.

16 MR. UTZ: You have stored gas produced out of  
 17 the field -- out of the zone?

18 THE WITNESS: Yes, sir.

19 MR. UTZ: All of it except that which has flared?

20 THE WITNESS: Yes.

21 MR. UTZ: Do you have enough gas in this zone for  
 22 pressure backup?

23 THE WITNESS: No, sir.

24 MR. UTZ: Where would you get the rest of it?

25 THE WITNESS: We have additional gas reserves to



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1 the north in the Hospah area that is still available for  
 2 us in the Lone Pine-Dakota.

3 We should have sufficient gas to initiate and  
 4 maintain the pressure maintenance project in this area.

5 MR. UTZ: I don't think the Commission is going  
 6 to hold you up from starting, we think you should have  
 7 started a long time ago.

8 MR. McGRATH: Are you going to have enough need  
 9 to use all the proposed gas in the entire Hospah area?

10 THE WITNESS: Would you please say that again?

11 MR. McGRATH: I said, do you anticipate you are  
 12 going to have a need for enough gas to use all the produced  
 13 gas in the Hospah area?

14 THE WITNESS: For the Lone Pine?

15 MR. McGRATH: Right.

16 THE WITNESS: I think we should probably use all  
 17 the gas that we have in the area, both in the Hospah and  
 18 the Lone Pine fields.

19 This is over a period of years, now.

20 MR. KENDRICKS: Can you give me any idea of the  
 21 amount of liquids that will be squeezed out of the gas that  
 22 is injected into this zone?

23 THE WITNESS: I don't have any numbers, Mr. Kendricks,  
 24 but we do feel there are a lot of liquids that will be  
 25 produced with the gas and the unit plans to install a plant



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1 to process this gas and recover these liquids.

2 MR. KENDRICKS: Do you have gas analyses for the  
3 gas that was found?

4 THE WITNESS: I don't have any of these Exhibits  
5 with me, I believe we submitted an Exhibit of this type at  
6 the gas storage Hearing, but the analysis was very similar  
7 in both the "A" and "B" zones.

8 MR. KENDRICKS: If you did submit those, would you  
9 submit the gas analysis again, upon request?

10 THE WITNESS: Yes, we would.

11 MR. KENDRICKS: I think that's all.

12 MR. UTZ: Any further questions?

13 (No response.)

14 MR. UTZ: If not, the witness may be excused.

15 (Witness excused.)

16 MR. UTZ: Are there any statements?

17 (No response.)

18 MR. UTZ: The case will be taken under advisement.  
19  
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STATE OF NEW MEXICO )  
 ) ss  
COUNTY OF BERNALILLO )

I, RICHARD E. MCCORMICK, a Certified Shorthand Reporter,  
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.

*Richard E. McCormick*  
CERTIFIED SHORTHAND REPORTER

I do hereby certify that the foregoing is  
a complete record of the proceedings in  
the Examiner Hearing of Case No. 466-4  
heard by me on *July 16*, 19*72*.  
*Richard E. McCormick*, Examiner  
New Mexico Oil Conservation Commission



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I N D E XWITNESS:PAGEWILLIAM MELNAR

Direct Examination by Mr. Kelly

4

Cross-Examination by Mr. Hatch

10

A. D. RIAL

Dirext Examination by Mr. Kelly

10

Cross-Examination by Mr. Kendricks

13

WILLIAM MELNAR (recalled)

Direct Examination by Mr. Kelly

14

Cross-Examination by Mr. Utz

23

Cross-Examination by Mr. Hatch

23

E X H I B I T SAPPLICANT'S (Tenneco)OFFEREDADMITTEDExhibit 1      Location Map  
Lone Pine Field

4

9

Exhibit 2      Proposed Unit  
Agreement

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9

Exhibit 3      Letter from U. S.  
Dept. of Interior

7

9

Exhibit 4      Structure Map

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Exhibit 5      Cross Section

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## (EXHIBITS Continued)

<u>APPLICANT'S</u>		<u>OFFERED</u>	<u>ADMITTED</u>
Exhibit 6	Log	12	22
Exhibit 7	Summary	14	22
Exhibit 8	Pressure Production History	15	22
Exhibit 9	Revocery Maintenance Pressure	15	22
Exhibit 10	Proposed Gathering System	17	22
Exhibit 11	Sketch, Gas Injection	19	22
Exhibit 12	Sketch, Water Injection	20	22
Exhibit 13	Proposed Rules	20	22





## OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO  
P. O. BOX 2088 - SANTA FE  
87501

February 28, 1972

GOVERNOR  
BRUCE KING  
CHAIRMAN

LAND COMMISSIONER  
ALEX J. ARMIJO  
MEMBER

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

Mr. Booker Kelly  
White, Koch, Kelly & McCarthy  
Attorneys at Law  
Post Office Box 787  
Santa Fe, New Mexico

Re: Case No. 4665  
Order No. R-4263  
Applicant:  
Tenneco Oil Company

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.  
Secretary-Director

ALP/ir

Copy of order also sent to:

Hobbs OCC x

Artesia OCC       

Aztec OCC x

Other State Engineer Office



4664

Head: 2-16-72

Rec: 2-16-72

Grant Denney permission  
to convert # for gas injection  
+ 1 well to water injection as described  
as shown on attached portion of  
the application.

The order for special pool  
rules submitted seems OK  
to me so use it.

All wells shall be ~~not~~ com-  
pleted as shown on sketch  
11 + 12. pack & Cemented filled  
w/ inert fluid on each well, w/  
pressure gauge at surface.

Thos D. Mc



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. 4665  
Order No. R-4263

APPLICATION OF TENNECO OIL  
COMPANY FOR A PRESSURE MAINTENANCE  
PROJECT, MCKINLEY COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on February 16, 1972, at Santa Fe, New Mexico, before Examiner Elvis A. Utz.

NOW, on this 28th day of February, 1972, 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, Tenneco Oil Company, seeks authority to institute a pressure maintenance project in the Lone Pine Dakota "D" Pool by the injection of gas and water into the Dakota "D" zone through five wells located in Sections 7 and 19 of Township 17 North, Range 8 West and Sections 12 and 13 of Township 17 North, Range 9 West, McKinley County, New Mexico.
- (3) That the applicant also seeks the designation of a project area and promulgation of rules for the project including a procedure whereby additional injection wells may be approved administratively.
- (4) That the proposed pressure maintenance project is in the interest of conservation and should result in greater ultimate recovery of oil, thereby preventing waste.



-2-

CASE NO. 4665  
Order No. R-4263

(5) That the subject application should be approved and the project should be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations.

IT IS THEREFORE ORDERED:

(1) That the applicant, Tenneco Oil Company, is hereby authorized to institute a pressure maintenance project in the Lone Pine Dakota "D" Pool by the injection of gas and water into the Dakota "D" zone through five wells located in McKinley County, New Mexico, as follows:

Well	Unit	Section	Township	Range	Injection
SFPRR No. 12	I	7	17N	8W	gas
Lone Pine No. 1	D	19	17N	8W	water
Hospah No. 44	P	12	17N	9W	gas
SFPRR No. 6	H	13	17N	9W	gas
SFPRR No. 10	B	13	17N	9W	gas

PROVIDED HOWEVER, that each of said wells shall be equipped for injection in accordance with Exhibits Numbers 11 and 12 submitted at the hearing of Case Number 4665.

(2) That the subject pressure maintenance project is hereby designated the Lone Pine Dakota "D" Pressure Maintenance Project and shall be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations insofar as said rules are not inconsistent with this order.

(3) That Special Rules and Regulations governing the operation of the Lone Pine Dakota "D" Pressure Maintenance Project, McKinley County, New Mexico, are hereby promulgated as follows:

SPECIAL RULES AND REGULATIONS  
FOR THE  
TENNECO OIL COMPANY  
LONE PINE DAKOTA "D" PRESSURE MAINTENANCE PROJECT

RULE 1. The project area of the Lone Pine Dakota "D" Unit Pressure Maintenance Project, hereinafter referred to as the Project, shall comprise all of the area included within the Lone Pine Dakota "D" Unit.



-3-

CASE NO. 4665  
Order No. R-4263

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. 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 Lone Pine Dakota "D" Pool, whichever is less; the allowable assigned to each injection well in the Project shall be the top unit allowable for the Lone Pine Dakota "D" Pool.

RULE 4. An allowable may be assigned to any well which is curtailed or shut-in because of high gas-oil ratio, pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressure or changes in characteristics of reservoir liquids or progress of sweep.

RULE 5. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 4 above 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 Commission Rule 502 I (a) and the limiting gas-oil ratio (2000 : 1) for the Lone Pine Dakota "D" Pool shall be waived during such tests. The project operator shall notify the Commission and all operators offsetting the well of the exact time such tests are to be conducted in order that the tests may be witnessed.

RULE 6. The project allowable may be produced from any well or wells in the project area, provided 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 two times the top unit allowable for the Lone Pine Dakota "D" Pool.

RULE 7. Each producing well shall be subject to the limiting gas-oil ratio (2000 : 1) for the Lone Pine Dakota "D" Pool, except that any well within the project area producing with a gas-oil ratio in excess of 2000 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



-4-

CASE NO. 4665  
Order No. R-4263

gas injected into the Lone Pine Dakota "D" Pool within the project area to such 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 2000 : 1.

**RULE 8.** 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 9. 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 application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall include the following:

(1) A plat showing the location of proposed injection well, all wells within the project area, and offset operators, locating wells which offset the project area.

(2) A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depth showing that the injection of gas or water will be confined to the Dakota "D" formation.

(3) A letter stating that all offset operators within one-half mile of 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 20 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.

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

RULE 10. Wells may be located anywhere within the unit area. However producing wells shall not be located within 330 feet of the outer boundaries of the unit area. The Secretary-Director of the Commission shall have authority to grant permission to drill any well within the provisions of this rule without notice and hearing.

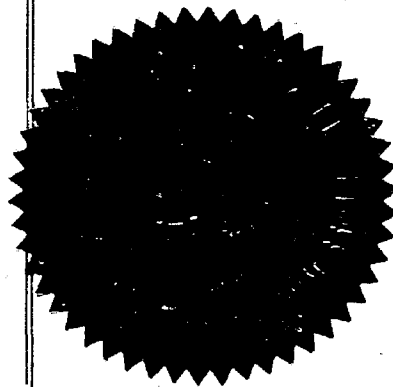
(4) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.



-6-

CASE NO. 4665  
Order No. R-4263

DONE at Santa Fe, New Mexico, on the day and year herein-  
above designated.



S E A L

STATE OF NEW MEXICO  
OIL CONSERVATION COMMISSION

*Bruce King*  
BRUCE KING, Chairman

*Alex J. Armiijo*  
ALEX J. ARMIJO, Member

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

dr/



Pressure maintenance -

No. of inject wells  
4 gas 1 water

→ Sec 12-17-9

13-17-9

13-17-9

7-17-8

→ 19-17-8

Rules

Expansion →





RECEIVED  
FEB 23 1972

February 22, 1972

OIL CON. COM. COM.  
DIST. 3

New Mexico Oil Conservation Commission  
1000 Rio Brazos Road  
Aztec, New Mexico 87410

ATTENTION: Mr. A. R. Kendrick

RE: Gas Analysis  
SFPRR #2  
Kda Zone  
Lone Pine Area  
McKinley County, New Mexico

Dear Sir:

In regard to your request made at a recent hearing, attached is a copy of the gas analysis from the "A" Zone in the Lone Pine Area.

Yours very truly,

W. C. Melnar  
District Reservoir Engineer

WEB/lj

Attachment





# RESERVOIR GAS COMPOSITION

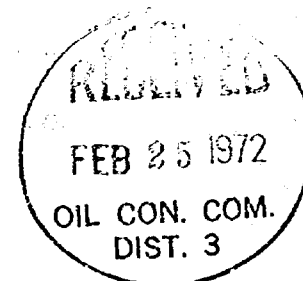
SFPRR NO. 2  
KDA ZONE SOUTH

UNDESIGNATED DAKOTA FIELD  
MCKINLEY COUNTY, NEW MEXICO

<u>Component</u>	<u>Mole Percent</u>	<u>Liquid Yield GPM</u>
Hydrogen Sulfide		
Carbon Dioxide	.03	
Nitrogen	4.45	
Methane	71.37	
Ethane	14.30	3.602
Propane	6.47	1.776
iso-Butane	1.30	.424
n-Butane	1.29	.406
iso-Pentane	.41	.150
n-Pentane	.22	.079
Hexanes	.10	.041
Heptanes plus	<u>.06</u>	<u>.027</u>
	100.00	6.505

Specific Gravity = .758

Collected at 700 psig and 50°F





(Case 4661 continued)

levelled in accordance with Commission Rules and Regulations.

CASE 4662: Application of Amoco Production Company for an exception to Order No. R-111-A, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an exception to the potash-oil area casing and cementing rules set forth in Order No. R-111-A to permit its Bate Federal Well No. 2 located in Unit L of Section 26, Township 19 South, Range 33 East, Lea County, New Mexico, to be drilled in such a manner as to eliminate running a salt protection string provided the production string is cemented to the surface.

CASE 4663: Application of Amoco Production Company for an unorthodox gas well location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of an unorthodox gas well location for its Malco "A" Federal Well No. 3 located 1650 feet from the North line and 1653 feet from the West line of Section 11, Township 18 South, Range 27 East, undesignated Pennsylvanian-Morrow Pool, Eddy County, New Mexico, with the W/2 of said Section 11 to be dedicated to the well.

CASE 4664: Application of Tenneco Oil Company for a unit agreement, McKinley County, New Mexico. Applicant, in the above-styled cause, seeks approval of the Lone Pine Dakota "D" Unit Area comprising 2598 acres, more or less, of federal, fee and Indian lands in Township 17 North, Ranges 8 and 9 West, Lone Pine Dakota "D" Pool, McKinley County, New Mexico.

CASE 4665: Application of Tenneco Oil Company for a pressure maintenance project, McKinley County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a pilot pressure maintenance project in the Lone Pine Dakota "D" Pool by the injection of gas and water into the Dakota "D" zone through five wells located in Sections 12 and 13 of Township 17 North, Range 9 West and Sections 7 and 19 of Township 17 North, Range 8 West, McKinley County, New Mexico. Applicant further seeks the designation of a project area and promulgation of rules for the project including a procedure whereby additional injection wells may be approved administratively.



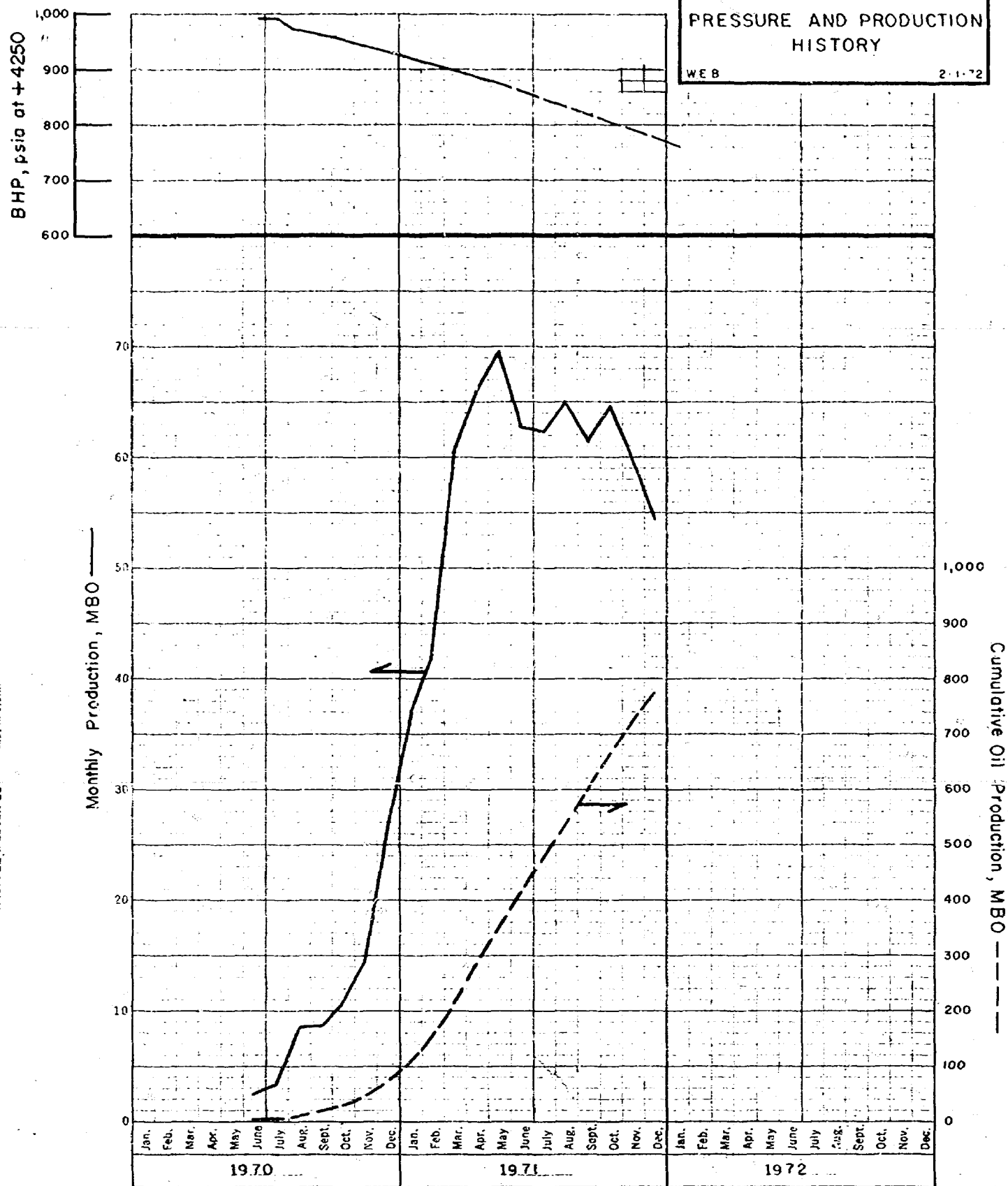
**GENERAL RESERVOIR DATA SUMMARY**  
**LONE PINE DAKOTA "D" FIELD**  
**MCKINLEY COUNTY, NEW MEXICO**

Reservoir Temperature	- 108°F
Original Reservoir Pressure	- 992 psia
Bubblepoint Pressure	- 992 psia
Oil Gravity	- 55° API
Oil Viscosity @ Original Condition	- .322 cp
Oil Formation Volume Factor @ Original Condition	- 1.625
Solution Gas-Oil Ratio @ Bubblepoint	- 962 SCF/STB
Porosity	- 19.3%
Permeability	- 87 md (Geometric Mean)
Water Saturation (Oil)	- 48%
Water Saturation (Gas)	- 40%
Areal Extent, Oil Zone	- 1581.66 Acres
Areal Extent, Gas Zone	- 800.47 Acres
Gross Volume, Oil Zone	- 21,915.06 Ac-Ft.
Gross Volume, Gas Zone	- 9532.25 Ac-Ft
Original Oil In Place	- 10.6 MMBSTO or 479 BSTO/Ac-Ft.
Recoverable By Primary	- 3.18 MMBSTO (30%)
Ultimate Recoverable (Primary + Secondary)	- 5.83 MMBSTO (55%)
Number of Oil Wells	- 22
Number of Gas Wells	- 4
Average Depth Per Well	- 2900 Feet

51.87  
31.6  
2.67

BEFORE EXAMINER UTZ	
OIL CONSERVATION COMMISSION	
EXHIBIT NO. <u>7</u>	
CASE NO. <u>4664265</u>	
Submitted by <u>Tenneco</u>	
Hearing Date _____	





3 YEARS BY MONTHS 359-180  
 X 100 DIVISIONS  
 KEUFFEL & ESSER CO.  
 MADE IN U.S.A.



70

60

50

40

30

20

10

0

100

200

300

400

500

600

700

800

900

1000

LONE PINE DAKOTA "D" FIELD  
MCKINLEY COUNTY, NEW MEXICO

"RECOVERY AS A FUNCTION OF  
MAINTENANCE PRESSURE"

WEB

11-2-71

5.8

Slope = 3,498 BO/psi drop

5.1

Slope = 2,544 BO/psi drop

3.2

Pressure @ which Maintenance Injection Begins, psia

*Handwritten notes:*  
50.70  
76.7  
Should A zone  
be in D zone



K.B. Elev. 7085'

Location:

660 FSL 4950 FWL  
Sec. 12, T17N, R9W  
McKinley County,  
New Mexico

*unit P*

2000 psi Gauge

G.L. Elev. 7074'

8 5/8" Csg. @ 76'  
w/40 Sks.

Annulus Loaded With  
Packer Fluid

Est. Top Cement @ 1295'

2 7/8" E.U.E. Tbg.

1784-87 Sqzd w/75 sax.

5 1/2" Model "D" Packer  
@ Approx. 2725'

Dakota "D" Zone

PBTD 2833'

2772'-76'  
2778'-82'  
2795'-99' } Perfs. - D Zone

5 1/2" Csg. @ 2849'  
w/350 Sks.

TD 2850'

All Measurements Based On Gamma Ray Log

TENNECO OIL COMPANY

SUBSIDIARY OF TENNECO INC.

LONE PINE DAKOTA "D" FIELD  
Mc KINLEY COUNTY, NEW MEXICO

SCHEMATIC DIAGRAM OF  
PROPOSED GAS INJECTION WELL  
HOSPAH WELL NO. 44

W.E.B. SCALE - NONE 1-72

Ex 11 GAS INJ



K.B. Elev. 6977'

2000 psi Gauge

G.L. Elev. 6966'

Location:

1980' FNL 4620 FEL  
Sec. 13, T17N, R9W  
McKinley County,  
New Mexico

*Unit H*

8 5/8" Csg. @ 65'  
w/40 Sks.

Annulus Loaded With  
Packer Fluid

Est. Top Cement @ 1460'

2 7/8" E.U.E. Tbg.

5 1/2" Model "D" Packer  
@ Approx. 2680'

Dakota "D" Zone

PBTD 2773'

2722'-28' Sazd. w/100 sax.  
2724'-26' Perts. - D Zone

5 1/2" Csg. @ 2793'  
w/300 Sks.

TD 2793'

All Measurements Based On Gamma Ray Log

TENNECO OIL COMPANY  
SUBSIDIARY OF TENNECO INC.

LONE PINE DAKOTA "D" FIELD  
McKINLEY COUNTY, NEW MEXICO

SCHEMATIC DIAGRAM OF  
PROPOSED GAS INJECTION WELL  
SF PRR WELL NO. 6

W.E.B. SCALE - NONE 1-72 EVI

*EX 11 GAS INJ*



K.B. Elev. 7021

Location:

800' FNL 3500' FWL  
Sec. 13, T17 N, R9 W  
McKinley County,  
New Mexico

*unit B*

2000 psi Gauge

G.L. Elev. 7010

8 5/8" Csg. @ 76'  
w/40 Sks.

Annulus Loaded With  
Packer Fluid

Est. Top Cement @ 1570'

2 7/8" E.U.E. Tbg.  
1659-61  
1664-67  
1671-80  
1713-15 } Sqzd. w/200 sax.

5 1/2" Model "D" Packer  
@ Approx. 2700'

Dakota "D" Zone

PBTD 2870'

2748'-51' Perts. - D Zone

5 1/2" Csg. @ 2903'  
w/300 Sks.

TD 3926'

All Measurements Based On Gamma Ray Log

TENNECO OIL COMPANY  
SUBSIDIARY OF TENNECO INC.

LONE PINE DAKOTA "D" FIELD  
Mc KINLEY COUNTY, NEW MEXICO

SCHEMATIC DIAGRAM OF  
PROPOSED GAS INJECTION WELL  
SFPRR WELL NO. 10

W.E.B. SCALE - NONE 1-72

EX 11 GAS INJ



K.B. Elev. 6997'

Location:

1650 FSL 330 FEL  
Sec. 7, T17 N, R9 W  
McKinley County,  
New Mexico

*unit I*

2000 psi Gauge

G.L. Elev. 6986

8 5/8" Csg. @ 76'  
w/40 Sks.

Annulus Loaded With  
Packer Fluid

Est. Top Cement @ 1500'

2 7/8" E.U.E. Tbg.

5 1/2" Model "D" Packer  
@ Approx. 2690'

Dakota "D" Zone

2727'-27 Sqzd. w/100 sax.

PBTD 2760'

2740'-42' Perfs. - D Zone

5 1/2" Csg. @ 2835'  
w/300 Sks.

TD 2835'

All Measurements Based On Gamma Ray Log

TENNECO OIL COMPANY

SUBSIDIARY OF TENNECO INC

LONE PINE DAKOTA "D" FIELD  
Mc KINLEY COUNTY, NEW MEXICO

SCHEMATIC DIAGRAM OF  
PROPOSED GAS INJECTION WELL  
SFPRR WELL NO. 12

W.E.B.

SCALE-NONE

1-72

EX 11 GAS INJ EVI



K.B. Elev. 7001'

2000 psi Gauge

G.L. Elev. 6990'

Location:

660 FNL 660 FWL  
Sec. 19, T17 N, R9 W  
McKinley County,  
New Mexico

8 5/8" Csg. @ 65'  
w/40 Sks.

Annulus Loaded With  
Packer Fluid

Est. Top Cement @ 1510'

2 7/8" E.U.E. Tbg.

5 1/2" Model "D" Packer  
@ Approx. 2725'

Dakota "D" Zone

PBTD 2825'

2774' - 80' Perts. - D Zone

5 1/2" Csg. @ 2843'  
w/300 Sks.

TD 2843'

All Measurements Based On Gamma Ray Log

TENNECO OIL COMPANY

SUBSIDIARY OF TENNECO INC.

LONE PINE DAKOTA "D" FIELD  
McKINLEY COUNTY, NEW MEXICO

SCHEMATIC DIAGRAM OF  
PROPOSED ~~WATER~~ SECTION WELL  
LONE PINE WELL NO. 1

W.E.B.

SCALE - NONE

1-72

EX 12 WATER INJ



SPECIAL RULES AND REGULATIONS  
LONE PINE DAKOTA "D" UNIT  
FOR THE  
PRESSURE MAINTENANCE PROJECT

RULE 1. The project area of the Lone Pine Dakota "D" Unit Pressure Maintenance Project, hereinafter referred to as the Project, shall comprise all of the area included within the Lone Pine Dakota "D" Unit.

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. 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 Lone Pine Dakota "D" Pool, whichever is less; the allowable assigned to each injection well in the Project shall be the top unit allowable for the Lone Pine Dakota "D" Pool.

RULE 4. An allowable may be assigned to any well which is curtailed or shut-in because of high gas-oil ratio, pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressure or changes in characteristics of reservoir liquids or progress of sweep.

RULE 5. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 4 above 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 Commission Rule 502 I (a) and the limiting gas-oil ratio (2000 : 1) for the Lone Pine Dakota "D" Pool shall be waived during such tests. The project operator shall notify the Commission and all operators offsetting the well of the exact time such tests are to be conducted in order that the tests may be witnessed.

RULE 6. The project allowable may be produced from any well or wells in the project area, provided 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 two times the top unit allowable for the Lone Pine Dakota "D" Pool.

RULE 7. Each producing well shall be subject to the limiting gas-oil ratio (2000 : 1) for the Lone Pine Dakota "D" Pool, except that any well within the project area producing with a gas-oil ratio in excess of 2000 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 into the Lone Pine Dakota "D" Pool within the project area to such well. The daily adjusted oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$$A_{adj} = TUA \times Fa \times \frac{2,000}{\frac{Pg - Ig}{Po}}$$



Where:

Aadj = the well's daily adjusted allowable  
TUA = top unit allowable for the pool  
Fa = the well's acreage factor  
Pg = average daily volume of gas produced by the well during the preceding month, cubic feet  
Ig = the well's allocated share of the daily average gas injected during the preceding month, cubic feet  
Po = 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 ration,  $\frac{Pg - Ig}{Po}$ , to be less than 2000 : 1.

RULE 8. 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 9. 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 application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall include the following:

- (1) A plat showing the location of proposed injection well, all wells within the project area, and offset operators, locating wells which offset the project area.
- (2) A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depth showing that the injection of gas or water will be confined to the Dakota "D" formation.
- (3) A letter stating that all offset operators within one-half mile of 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 20 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.

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



RULE 10. Wells may be located anywhere within the unit area. However producing wells shall not be located within 330 feet of the outer boundaries of the unit area. The Secretary-Director of the Commission shall have authority to grant permission to drill any well within the provisions of this rule without notice and hearing.

BEFORE EXAMINER UTZ  
OIL CONSERVATION COMMISSION  
EXHIBIT NO. 13  
CASE NO. 4664 & 65  
Submitted by TEENECO



RECEIVED  
JAN 27 1974  
OIL CONSERVATION COMM.

MA

BEFORE THE OIL CONSERVATION COMMISSION  
OF THE STATE OF NEW MEXICO

APPLICATION OF TENNECO OIL COMPANY  
FOR THE APPROVAL OF THE LONE PINE  
DAKOTA "D" UNIT AGREEMENT, MCKINLEY  
COUNTY, NEW MEXICO, AND FOR A PRESSURE  
MAINTENANCE PROJECT COVERING SAID UNIT  
WITH SPECIAL UNIT RULES.

No. 4665

APPLICATION

Comes now Tenneco Oil Company by its Attorneys White, Koch,  
Kelly & McCarthy, and in support of its Application states:

Application for Unit Agreement

1. That Tenneco Oil Company will be the operator of the proposed unit designated the Lone Pine Dakota "D" Unit comprising 2,598.30 Acres, more or less, of Federal, Indian and Fee land, located in Township 17 North, Range 8 West and Township 17 North, Range 9 West, N.M.P.M., McKinley County, New Mexico. The specific description of the unit is found in Section 2 on pages 2 and 3 of the proposed Unit Agreement, a copy of which is attached to this Application.

2. The unitized formation is defined as that stratigraphic interval commonly known as the Dakota "D" zone and more specifically defined as that interval occurring between 2780 feet and 2872 feet subsurface in Tenneco Oil Company's Don ne pah Well No. 1 located 820 feet from the North line and 500 feet from the West line of Section 18, Township 17 North, Range 8 West, N.M.P.M.

Application for Pressure Maintenance Project

3. Tenneco further seeks approval of a gas pressure maintenance project comprising all the area included within the Lone Pine Dakota "D" Unit.

4. The initial injection wells will be four gas injection wells and one water injection well located as follows:



Gas Injection Wells

Teneco Oil Company Hospah No. 44 located in the SE 1/4 of the SE 1/4 of Section 12, Township 17 North, Range 9 West, McKinley County.

Tenneco Oil Company Santa Fe and Pacific Railroad No. 6, located in the SE 1/4 of the NE 1/4 of Section 13, Township 17 North, Range 9 West, McKinley County.

Tenneco Oil Company Santa Fe Pacific Railroad No. 10 located in the NW 1/4 of the NE 1/4 of Section 13 Township 17 North, Range 9 West, McKinley County.

Tenneco Oil Company Santa Fe Pacific Railroad No. 12 located in the NE 1/4 of the SE 1/4 of Section 7, Township 17 North, Range 8 West, McKinley County.

Water Injection Well

Tenneco Oil Company Lone Pine No. 1 located in the NW 1/4 of the NW 1/4 of Section 19, Township 17 North, Range 8 West, McKinley County.

5. Applicant further seeks special rules governing the pressure maintenance project and attaches to this Application a copy of the proposed rules governing said unit and project.

WHEREFORE Tenneco Oil Company requests that after public hearing the Commission enter its Order granting said application.

WHITE, KOCH, KELLY & MCCARTHY

By

JUB Kelly



DRAFT

GMH/dr

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. 4665  
R-4263  
Order No. R-4264

APPLICATION OF TENNECO OIL  
COMPANY FOR A PRESSURE MAINTENANCE  
PROJECT, MCKINLEY COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on February 16, 1972,  
at Santa Fe, New Mexico, before Examiner Elvis A. Utz.

NOW, on this \_\_\_\_\_ day of February, 1972, 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, Tenneco Oil Company, seeks authority  
to institute a pressure maintenance project in the Lone Pine  
Dakota "D" Pool by the injection of gas and water into the Dakota  
"D" zone through five wells located in Sections <sup>7</sup>~~7~~ and <sup>19</sup>~~19~~ of  
Township 17 North, Range <sup>8</sup>~~8~~ West, and Sections <sup>12</sup>~~12~~ and <sup>13</sup>~~13~~ of Town-  
ship 17 North, Range <sup>9</sup>~~9~~ West, McKinley County, New Mexico.

(3) That the applicant also seeks the designation  
of a project area and promulgation of rules  
for the project including a procedure whereby  
additional injection wells may be approved  
administratively.



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

(5) That the subject application should be approved and the project should be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations.

IT IS THEREFORE ORDERED:

(1) That the applicant, Tenneco Oil Company, is hereby authorized to institute a pressure maintenance project in the Lone Pine Dakota "D" Pool by the injection of gas and water into the Dakota "D" zone through five wells located in McKinley County, New Mexico, as follows:

Well	Unit	Section	Township	Range	Injection
SFPRR No. 12	I ✓	7 ✓	17N ✓	8W ✓	<del>gas</del> gas
Lone Pine No. 1	D ✓	19 ✓	17N ✓	8W ✓	<del>water</del> water
Hospah No. 44	P ✓	12 ✓	17N ✓	9W ✓	<del>gas</del> gas
SFPRR No. 6	H ✓	13 ✓	17N ✓	9W ✓	<del>gas</del> gas
SFPRR No. 10	B ✓	13 ✓	17N ✓	9W ✓	<del>gas</del> gas

(2) That the subject pressure maintenance project is hereby designated the Lone Pine Dakota "D" Pressure Maintenance Project and shall be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations insofar as said rules are not inconsistent with this order.

(3) That Special Rules and Regulations governing the operation of the Lone Pine Dakota "D" Pressure Maintenance Project, McKinley County, New Mexico, are hereby promulgated as follows:

*Provided However, that each of said wells shall be equipped for injection in accordance with Exhibits <sup>Numbers</sup> 11 and 12 submitted at the hearing of Case Number 4665,*



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CASE NO. 4665

Order No.

*SPECIAL RULES AND REGULATIONS*

*FOR THE*

*TENNECO OIL COMPANY*

*LONE PINE DAKOTA "D" PRESSURE MAINTENANCE PROJECT*

SPECIAL RULES AND REGULATIONS

LONE PINE DAKOTA "D" UNIT

FOR THE

PRESSURE MAINTENANCE PROJECT

RULE 1. The project area of the Lone Pine Dakota "D" Unit Pressure Maintenance Project, hereinafter referred to as the Project, shall comprise all of the area included within the Lone Pine Dakota "D" Unit. OK

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. OK

RULE 3. 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 Lone Pine Dakota "D" Pool, whichever is less; the allowable assigned to each injection well in the Project shall be the top unit allowable for the Lone Pine Dakota "D" Pool. OK

RULE 4. An allowable may be assigned to any well which is curtailed or shut-in because of high gas-oil ratio, pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressure or changes in characteristics of reservoir liquids or progress of sweep. OK

RULE 5. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 4 above 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 Commission Rule 502 I (a) and the limiting gas-oil ratio (2000 : 1) for the Lone Pine Dakota "D" Pool shall be waived during such tests. The



project operator shall notify the Commission and all operators offsetting the well of the exact time such tests are to be conducted in order that the tests may be witnessed. OK

RULE 6. The project allowable may be produced from any well or wells in the project area, provided 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 two times the top unit allowable for the Lone Pine Dakota "D" Pool. OK

RULE 7. Each producing well shall be subject to the limiting gas-oil ratio (2000 : 1) for the Lone Pine Dakota "D" Pool, except that any well within the project area producing with a gas-oil ratio in excess of 2000 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 into the Lone Pine Dakota "D" Pool within the project area to such well. The daily adjusted oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$A_{adj}$   
 $F_a$   
 $P_g$   
 $I_g$   
 $P_o$

Diave  
note

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

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                |



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CASE NO. 4665  
Order No. R-

$P_g - I_g$   
 $P_o$

In no event shall the amount of injected gas being credited to a well be such as to cause the net gas-oil ration,  $\frac{P_g - I_g}{P_o}$ , to be less than 2000 : 1.

RULE 8. 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 9. 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 application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall include the following:

(1) A plat showing the location of proposed injection well, all wells within the project area, and offset operators, locating wells which offset the project area.

(2) A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depth showing that the injection of gas or water will be confined to the Dakota "D" formation.



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CASE NO. 4665

Order No. R-

(3) A letter stating that all offset operators within one-half mile of 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 20 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.

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

RULE 10. Wells may be located anywhere within the unit area. However producing wells shall not be located within 330 feet of the outer boundaries of the unit area. The Secretary-Director of the Commission shall have authority to grant permission to drill any well within the provisions of this rule without notice and hearing.

(4) 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.



CASE 4666:

SOUTHEASTERN NEW MEXICO  
NOMENCLATURE