

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO

17 October 1984

EXAMINER HEARING

IN THE MATTER OF:

Application of Anadarko Production	CASE
Company for a waterflood expansion,	8379
Eddy County, New Mexico.	8380

BEFORE: Gilbert P. Quintana, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation	Jeff Taylor
Division:	Attorney at Law
	Legal Counsel to the Division
	State Land Office Bldg.
	Santa Fe, New Mexico 87501

For the Applicant:	Karen Aubrey
	Attorney at Law
	KELLAHIN & KELLAHIN
	P. O. Box 2265
	Santa Fe, New Mexico 87501

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

I N D E X

DANIEL G. KERNAGHAN

Direct Examination by Ms. Aubrey	3
Cross Examination by Mr. Quintana	14
Cross Examination by Mr. Taylor	16

E X H I B I T S

Anadarko Exhibit One, Plat	4
Anadarko Exhibit Two, Plat	5
Anadarko Exhibit Three, R-4049	6
Anadarko Exhibit Four, R-4610	6
Anadarko Exhibit Five, Document	7
Anadarko Exhibit Six, Tabulation	8
Anadarko Exhibit Seven, Logs	11
Anadarko Exhibit Eight, Water Analysis	10

1
2
3 MR. QUINTANA: We'll call next
4 Case 8379.

5 MR. TAYLOR: The application of
6 Anadarko Production Company for a waterflood expansion, Eddy
7 County, New Mexico.

8 MS. AUBREY: Mr. Examiner,
9 Karen Aubrey, Kellahin and Kellahin, Santa Fe, New Mexico,
10 appearing on behalf of Anadarko Production Company. I have
11 one witness to be sworn in this case.

12 The testimony and witness for
13 Case 8380 are the same. I'd ask that they be consolidated
14 for the purposes of the hearing.

15 MR. QUINTANA: Are you asking
16 that the testimony be consolidated for both cases?

17 MS. AUBREY: Yes, sir.

18 MR. QUINTANA: Let the record
19 show that Cases 8379 and Case 8380 will be consolidated for
20 purposes of testimony.

21 MS. AUBREY: I have one witness
22 to be sworn.

23 MR. QUINTANA: Will the witness
24 please stand now to be sworn in?

25 (Witness sworn.)

MR. QUINTANA: Are there other

appearances in these two cases?

MS. AUBREY: Thank you, sir.

DANIEL G. KERNAGHAN,
being called as a witness and being duly sworn upon his
oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MS. AUBREY:

Q Would you state your name and occupation,
please?

A My name is Dan Kernaghan. My occupation
is Division Operations Manager for Anadarko Production Com-
pany in Midland, Texas.

Q Mr. Kernaghan, have you testified pre-
viously before the Commission and had your qualifications
made a matter of record?

A Yes.

Q And are you familiar with the applica-
tions of Anadarko in Cases 8379 and 8380?

A Yes, I am.

Q Will you briefly state what Anadarko is
seeking by those two applications?

A Anadarko is seeking permission to convert
three currently producing wells to water injection in two
waterflood projects that have been previously approved.

MS. AUBREY: Mr. Examiner, are

1 the witness' qualifications acceptable?

2 MR. QUINTANA: The witness'
3 qualifications are acceptable and he will be admitted as an
4 expert witness.

5 MS. AUBREY: Thank you.

6 Q Mr. Kernaghan, have you prepared certain
7 exhibits for the consideration of the Examiner today?

8 A Yes. Yes, I have.

9 Q Let me refer you to what we've marked as
10 Exhibit One, which is a land plat. Can you look at that,
11 sir, and explain what that shows?

12 A This shows the location of the three
13 wells which we're requesting permission to convert to water
14 injection and all the surrounding wells and leases within
15 two miles of these conversions.

16 Q That's an exhibit that's required by the
17 Form C-108, is that correct?

18 A Yes, that is correct.

19 Q Let me refer you to Exhibit Two now. Ex-
20 hibit Two shows the proposed injection wells and the plugged
21 wells?

22 A This well shows the proposed injection
23 wells with blue triangles and two plugged wells that are
24 within the half mile radius, or exactly at a half mile in
25 one case.

26 Q Does this, the application today seek
27 conversion wells to injection wells in two separate water-

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

floods, is that right?

A That is correct.

Q For the examiner, can you refer to Exhibit Two and explain where those two projects are on that exhibit?

A Okay. The R-3 and R-8 Wells in Section 10, in the north half of Section 10, are part of a project that was originally called our Federal "Q" Waterflood. The "Q" lease, the project started in the northwest quarter of Section 3 and includes the southwest of 3, the southeast of 3, and the north half of 10.

Q And where is the other waterflood project located?

A The other waterflood project is in the south 480 acres of Section 2 of 17, 30. It's our Burnham Grayburg-San Andres Unit.

The second one is Order 4610, the Burnham. The first one, Order 4049.

Q And both of those projects have been previously approved by Commission orders, is that right?

A Yes, that is right.

Q Let me refer you to Exhibits Three and Four now.

A Okay.

Q Can you identify these for the Examiner?

A These are the orders that we previously mentioned, R-4049 and R-4610.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Q And Order R-4610 approved the Burnham Unit and --

A That is correct.

Q -- Order 4049 approved the Federal "Q" Unit.

A That is correct.

Q Mr. Kernaghan, can you give the Examiner a general description of the waterflood project you propose to expand?

A Okay. This, both of these waterflood projects are 5-spot water injection patterns. They've been in place for six or eight years, the "Q" Lease actually longer than that.

They've been very successful. They've recovered additional oil.

We propose to fill out the pattern on the "R" Lease to complete a 5-spot pattern.

On the Burnham Unit we propose to densify this pattern to a 20-acre well spacing or 40-acre pattern volume unit area in a pilot basis with this well.

Q Have you prepared an exhibit which shows the proposed operation of the three wells that you would intend to convert to waterflood?

A Yes, I have. It's included as Exhibit Number Five.

Q Would you refer to that, sir.

A Yes.

1
2 Q And briefly go through it. Describe for
3 the Examiner, for instance, what the proposed injection
4 rates are?

5 A Okay, our injection, the volume we anti-
6 cipate is 200, 250 barrels a day per well. The injection
7 pressure, we're satisfied with the .2 pounds per foot to
8 start with and we'll submit step rate tests or other data of
9 an equivalent nature to justify higher injection pressures.

10 Q In the even that you require higher in-
11 jection pressures.

12 A As we need them. It's a closed system.
13 The injection water is approximately 80 percent produced
14 water and 20 percent fresh make-up water from the Ogallala
15 formation purchased from the Yucca Water Company.

16 Q And what's the source of the produced
17 water?

18 A It's the Ogallala -- the produced water
19 is Grayburg-San Andres.

20 Q What is the injection zone?

21 A Grayburg-San Andres.

22 Q Have you identified and can you give the
23 geologic name of the sources of underground drinking water
24 in the area?

25 A The Rustler formation in the range of 400
to 480 feet.

Q Let me refer you now to your next exhibit
which I think we've marked as -- it's Number Six. Can you

1
2 look at that. That's the tabulation of wells in the area,
3 is that correct?

4 A That's correct. Exhibit Six is a tabula-
5 tion of all the wells within the half mile radius of any one
6 of the three proposed conversions.

7 It shows the completion data on all of
8 these wells, whether water injection or producing or plug-
9 ged.

10 Q I now refer you to the attachment to Ex-
11 hibit Six, which I believe are schematics.

12 A The last five pages of Exhibit Six are
13 schematics of first the three proposed conversion wells, the
14 Federal R-3, the Federal R-8, and the Burnham Grayburg-San
15 Andres Unit 6-1. The final two pages are schematics of the
16 two plugged wells shown in red, shown with red circles in
17 Exhibit Two.

18 These exhibits show the condition of the
19 wells at the present time.

20 MS. AUBREY: Mr. Quintana, I
21 think that what you're looking at is marked on your copy as
22 Exhibit Seven. Am I correct?

23 MR. QUINTANA: Yes.

24 MS. AUBREY: Okay.

25 Q Referring you to the schematics, Mr. Ker-
naghan, does it show -- do the schematics show the proposed
injection interval?

A They do, in the Metex and Premier zone

1
2 of the Grayburg zone for the most part; the Lovington zone
3 in two of the wells.

4 Q Let me refer you back to Exhibit Number
5 Two, Mr. Kernaghan. You show two plugged and abandoned
6 wells on that exhibit.

7 A Yes.

8 Q Does Exhibit Number Seven contain schematics on those two wells?

9 A The last two pages are schematics of
10 those two wells, the Apollo Oil Company W. D. McIntire No.
11 8-D, which is in Unit B of Section 9, 17, 30, and the Texmex
12 Marrow State lease, which is now operated by J. Cleo Thompson.
13 It's in Unit C of Section 2, 17, 30.

14 Both of these wells are plugged. We have
15 no -- we feel like they're both adequately plugged to contain the fluids.

16 Q Mr. Kernaghan, have you prepared or had
17 prepared for you a water analysis -- an analysis of the
18 fresh water in the area?

19 A Yes, we have. It's shown as Exhibit --
20 it must be Exhibit Six.

21 Q Oh, I think it's Eight, Dan.

22 A Is it Eight?

23 Q Yes.

24 MR. TAYLOR: We do not have Exhibit Six.

25 MS. AUBREY: No, we have an Ex-

1
2 hibit Six. I'm going to get to that one in just a minute.
3 Our exhibits numbers got all messed up.

4 MR. TAYLOR: Okay.

5 A Exhibit Eight is the analysis by Martin
6 Water Laboratories of the fresh water, water taken from a
7 windmill in Unit B of Section 24 of the township to the
8 north.

9 Raw water taken from our plant, which is
10 the make-up water, basically. It's fresh Ogallala water.

11 Produced water from the West Square Lake
12 Plant and produced water from the Burnham Unit and produced
13 water from the "R" Lease.

14 Q And I believe the last page on that exhi-
15 bit --

16 A The last page is just Mr. Martin didn't
17 know what -- what the purpose of this analysis was. He
18 just, he gave us a letter saying that the windmill water
19 looks kind of bad but it's just plain Rustler water. It's
20 not contaminated.

21 Q Let me refer you now, Mr. Kernaghar, to
22 what we have marked as Exhibit Six.

23 A Six are three logs, a log on each of the
24 wells we propose to convert to injection. They show the
25 perforations in the well, the zones of -- the productive
zones that we're injecting water into and in some cases some
other limited information about the completion.

Q You show the proposed injection zone?

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

A Yes, that's correct.

Q Let me refer you back to your well --

A The proposed injection zone is through all of the open perforations, which are shown on these logs.

Q Let me refer you back to your schematics. Can you look at that exhibit and describe for the Examiner how you propose to complete these wells as injection wells?

A We propose to run SALTA lined tubing, put them in a tension packer, run in a tension packer that is set immediately above the top set of perforations and inject through it into the zones that are open.

Q What kind of surface monitor do you propose?

A We propose to leave the valve open on the bradenhead at the surface where we can detect a water flow.

Q Mr. Kernaghan, have you found any evidence of any open faulting or other hydrological connection between the proposed injection zone and any sources of fresh water?

A No, I have not.

Q Now, sir, let me refer you to the exhibit which consists of your return receipts. Do you have a copy of that here?

A Yes.

Q Are those return receipts from your notifications from the surface owners and any offsetting operators of the proposed waterflood injection?

1
2 A Yes, they are. We sent them a letter ex-
3 plaining what we were doing, a copy of the C-108, and a map;
4 sent them basically Exhibit One.

5 Q Have you received any objection from any
6 of the surface owners or other offset operators?

7 A No, we have not.

8 Q Mr. Kernaghan, do you have an opinion as
9 to whether or not the waterflood project to date has been
10 successful and has resulted in the additional recovery of
11 oil?

12 A Yes, I do. It has been very successful
13 and has resulted in a recovery of substantial additional
14 oil.

15 Q Will the granting of this application
16 protect correlative rights, promote conservation, and pre-
17 vent waste?

18 A Yes, it will.

19 Q Were the exhibits you've presented today
20 prepared by you or under your direction and supervision?

21 A Yes, they were.

22 MS. AUBREY: May I have a mo-
23 ment, Mr. Examiner?

24 I have no more questions, Mr.
25 Examiner.

MR. QUINTANA: Do you wish to
admit these in evidence?

MS. AUBREY: I'm sorry, yes,

1 we'd like to tender them in evidence.

2
3 MR. QUINTANA: Exhibits One
4 through Eight will be admitted into evidence.

5 CROSS EXAMINATION

6 BY MR. QUINTANA:

7 Q Mr. Kernaghan, the two plugged and aban-
8 doned wells you have denoted on your -- on your map here,
9 that you show schematics of --

10 A Yes.

11 Q -- have you been in contact with our Dis-
12 trict Office to determine if they have been plugged in con-
13 junction with their needs?

14 A We have been in contact to the extent
15 that we've picked up the files from there. We copied the
16 files from the District Office. We have not talked to Mr.
17 Clements.

18 The files reflect, you know, both of
19 these wells had --had plugging information on them. The
20 well in Section 9 had rather extensive plugging information
21 on it. They appear to have done a very good job on that
22 well.

23 Q The well in Section 9, Well No. 8.

24 A For Apollo, yes.

25 Q The open hole interval that is -- that is
not filled with cement or mud or anything, that just --

A It's filled with mud.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Q With mud?

A Has to -- by the nature of the plugging it has to be filled with something.

Q Is that -- is that interval, that approximate open interval from -- to TD of 3261, the approximate open interval --

A It's 500 feet.

Q Is it the approximate open interval of your injection zone, also?

A Yes, we probably have one zone above that. It's probably the Premier and the Lovington. I'd have to correlate, but I suspect it's the Premier and the Lovington.

Our Metex zone is -- is at 2780, so it probably includes all three zones.

Q Now, on Well No. -- the Merrill State No. 3, which is in Section 2.

A Yes.

Q That shows to have five sacks to the surface and five sacks at the --

A The shoe of the surface pipe.

Q -- surface pipe, and then fifteen sacks and you're not sure exactly as to where -- where -- at what depth.

A This one was kind of fouled up. Their records showed that the -- that the casing was cut off inside the surface pipe, but -- but the location of their plug

1
2 indicated that no, it probably wasn't, it was down below the
3 surface pipe, and that's the -- the interpretation that I
4 took.

5 This well is offset on either side 330
6 feet away by producing wells. J. Cleo Thompson has come in
7 in between the four original producers on this lease and
8 drilled three new producers.

9 Q Mr. Kernaghan, would it be too much
10 trouble if I requested that you contact our District Offices
11 to determine if these -- plugging of these two wells that we
12 have been talking about in the last ten minutes are in ac-
13 cordance with what they believe to be adequate plugging?

14 A We'd be glad to. You know, we'd be quite
15 satisfied if you just write into the order that we contact,
16 that we have the District Office concurrence to either the
17 correct plugging of these wells, a monitoring program or re-
18 plugging, prior to us being issued a permit.

19 Q Fine. That about does my -- you said
20 what I wanted to hear you say.

21 CROSS EXAMINATION

22 BY MR. TAYLOR:

23 Q Excuse me, did you testify as to the
24 nearest water well or spring to these two units?

25 A The nearest water well to my knowledge is
the windmill that we took the sample from. It was the -- it
was a sample from the closest windmill that we knew of, and

1
2 it's in Section 24 of the township to the north, which is
3 approximately just a little more than two miles.

4 Q Is it your testimony that -- that not on-
5 ly would this protect correlative rights and prevent waste,
6 but that it would protect fresh water sources?

7 A That wasn't my testimony but I -- I don't
8 see anything here that's -- that's going to hurt fresh
9 water.

10 MR. TAYLOR: That's all.

11 MR. QUINTANA: Are there any
12 further questions of Mr. Kernaghan? In that case, Mr. Ker-
13 naghan, you may be excused.

14 If there is nothing further in
15 Cases 8379 and Case 8380, they will be taken under advise-
16 ment.

17
18
19
20
21
22
23
24
25 (Hearing concluded.)

C E R T I F I C A T E

I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY
that the foregoing Transcript of Hearing before the Oil Con-
servation Division was reported by me; that the said tran-
script is a full, true, and correct record of the hearing,
prepared by me to the best of my ability.

Sally W. Boyd CSR

I do hereby certify that the foregoing is
a complete and correct transcript of
the Exam. in
heard by me on _____, 19____.

_____, Examiner
Oil Conservation Division