

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING)
CALLED BY THE OIL CONSERVATION)
DIVISION FOR THE PURPOSE OF)
CONSIDERING:) CASE NO. 10954

APPLICATION OF AMOCO PRODUCTION COMPANY

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: David Catanach, Hearing Examiner

April 14, 1994

Santa Fe, New Mexico

This matter came on for hearing before the
Oil Conservation Division on April 14, 1994, at
Morgan Hall, State Land Office Building, 310 Old
Santa Fe Trail, Santa Fe, New Mexico, before Deborah
O'Bine, RPR, Certified Court Reporter No. 63, for the
State of New Mexico.

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I N D E X

April 14, 1994
 Examiner Hearing
 CASE NO. 10954

PAGE

APPEARANCES

3

AMOCO'S WITNESSES:

JULIE TALBOT

Examination by Mr. Carr

5

Examination by Examiner Catanach

11

BILL PELZMANN

Examination by Mr. Carr

14

Examination by Examiner Catanach

19

JAMES WILLIAM HAWKINS

Examination by Mr. Carr

21

Examination by Examiner Catanach

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REPORTER'S CERTIFICATE

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E X H I B I T S

ID ADMTD

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A P P E A R A N C E S

1
2 FOR THE DIVISION: RAND L. CARROLL, ESQ.
3 General Counsel
4 Oil Conservation Commission
5 State Land Office Building
6 310 Old Santa Fe Trail
7 Santa Fe, New Mexico 87501

8 FOR MERIDIAN OIL: KELLAHIN AND KELLAHIN
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10 Santa Fe, New Mexico
11 BY: W. THOMAS KELLAHIN, ESQ.
12

13 FOR THE APPLICANT: CAMPBELL, CARR, BERGE &
14 SHERIDAN, P.A.
15 P.O. Box 2208
16 Santa Fe, New Mexico 87504
17 BY: WILLIAM F. CARR, ESQ.
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24
25

1 EXAMINER CATANACH: At this time we'll
2 call Case 10954.

3 MR. CARROLL: Application of Amoco
4 Production Company for a nitrogen injection pilot
5 project, Rio Arriba County, New Mexico.

6 EXAMINER CATANACH: Appearances in this
7 case?

8 MR. CARR: May it please the examiner, my
9 name is William F. Carr with the Santa Fe law firm,
10 Campbell, Carr, Berge & Sheridan. We represent Amoco
11 Production Company in this case, and I have three
12 witnesses. Two of the witnesses have not previously
13 been sworn.

14 EXAMINER CATANACH: Any additional
15 appearances.

16 MR. KELLAHIN: Mr. Examiner, I'm Tom
17 Kellahin of the Santa Fe law firm of Kellahin and
18 Kellahin appearing on behalf of Meridian Oil Inc.

19 EXAMINER CATANACH: Any additional
20 appearances? For the record, I have a letter from
21 Conoco which after the testimony has been presented,
22 I will briefly summarize in the record.

23 Will the witnesses please stand to be
24 sworn in at this time?

25 (Witnesses sworn.)

1 MR. CARR: At this time we call Julie
2 Talbot.

3 JULIE TALBOT,
4 the witness herein, after having been first duly
5 sworn upon her oath, was examined and testified as
6 follows:

7 EXAMINATION

8 BY MR. CARR:

9 Q. Will you state your name for the record,
10 please.

11 A. Julie Talbot.

12 Q. Where do you reside?

13 A. Denver, Colorado.

14 Q. By whom are you employed?

15 A. Amoco Production Company.

16 Q. And what is your current position with
17 Amoco?

18 A. I'm a senior land negotiator.

19 Q. Miss Talbot, have you previously testified
20 before this Division?

21 A. No, I have not.

22 Q. Could you summarize your educational
23 background for the examiner?

24 A. I've got a Bachelor of Science in
25 petroleum land management from Louisiana State

1 University in 1984.

2 Q. Since graduation, for whom have you
3 worked?

4 A. Amoco Production Company.

5 Q. Graduation was in 1984-1985?

6 A. Right.

7 Q. How long have you been involved actually
8 in the San Juan Basin?

9 A. Approximately eight months.

10 Q. Are you familiar with the status of the
11 land surrounding this proposed pilot project?

12 A. Yes, sir, I am.

13 Q. Are you familiar with the application
14 filed in this case?

15 A. That's correct, yes, I am.

16 MR. CARR: We tender Julie Talbot as an
17 expert witness in petroleum land matters.

18 EXAMINER CATANACH: Miss Talbot is
19 considered qualified.

20 Q. (BY MR. CARR) Could you briefly state
21 what Amoco seeks in this case?

22 A. Yes. Amoco is seeking approval for a
23 nitrogen injection pilot project. It's located in
24 the Amoco-operated San Juan 28-7 Unit. To this end
25 we are proposing to drill three wells and to inject

1 nitrogen into the Basin-Fruitland Coal Pool.

2 Q. Could you refer to what has been marked
3 for identification as Exhibit No. 1, identify this,
4 and review it for Mr. Catanach?

5 A. Exhibit No. 1 is a land map of the 28-7
6 unit. The bold red outline shows the outline for the
7 28-7 unit. The outline in the blue hachured shows
8 the Fruitland coal participating area within the 28-7
9 unit. And the red hachured outline showed our
10 proposed enhanced recovery area for this project.

11 Q. What is indicated in yellow?

12 A. The yellow on the map shows where Amoco
13 owns a working interest. We also show on the map in
14 the red dots the location of the Fruitland coal wells
15 and also the three blue triangles on the well are the
16 proposed location for our three injection wells.

17 Q. What is the character of the land in the
18 project area, state, federal, or fee?

19 A. Federal.

20 Q. Let's go now to the next exhibit in the
21 exhibit book, which has been marked Exhibit 1a.
22 Could you identify it and review it for Mr. Catanach?

23 A. Yes. This exhibit outlines the working
24 interest ownership within the Fruitland coal
25 participating area in the 28-7 unit. It also below

1 that shows the working interest ownership in the
2 proposed drill blocks that we are proposing to be
3 added to comprise the enhanced recovery area.

4 Q. So what you're doing is proposing to
5 expand the participating area?

6 A. Yes, that's correct.

7 Q. Have you reviewed this with the Bureau of
8 Land Management?

9 A. Yes, we certainly have.

10 Q. Have you received their approval to expand
11 the participating area at this time?

12 A. We're still trying to come to a conclusion
13 as to how we're going to take care of the land
14 situation.

15 Q. If you don't expand the participating
16 area, are you going to be coming forward with an
17 overlay agreement to bring the tracts together?

18 A. Yes, we are.

19 Q. So at this point in time you are just
20 really waiting on Bureau of Land Management approval
21 to know which course of action you should pursue?

22 A. That's correct.

23 Q. But this exhibit is broken down this way
24 because it does show the current ownership in the
25 participating area and also by tract the breakdown in

1 ownership in tracts that might one way or another or
2 will one way or another be added to the participating
3 area?

4 A. That is correct.

5 Q. Let's go now to what has been marked
6 Exhibit No. 2. Can you identify and review that,
7 please.

8 A. Yes. Exhibit No. 2 just shows the parties
9 that were notified of our application for this
10 hearing.

11 Q. The Bureau of Land Management and Mr.
12 Manuel Pacheco, how were they notified?

13 A. They were notified by certified mail,
14 return receipt requested.

15 Q. And those are the only two parties to whom
16 notice is required to be given under OCD rules?

17 A. That is correct.

18 Q. The next page in the exhibit is a copy of
19 the overall receipt that shows notice was mailed to
20 Mr. Pacheco?

21 A. That is correct.

22 Q. And below that is a return receipt from
23 the Bureau of Land Management?

24 A. Yes, sir.

25 Q. Have you received a return receipt at this

1 time from Mr. Pacheco?

2 A. No, we have not.

3 Q. On the Exhibit No. 2, you show courtesy
4 copies also went to Conoco and to Meridian. Why were
5 these copies provided?

6 A. Simply because they are working interest
7 owners within the proposed project area.

8 Q. Will Amoco also call technical witnesses
9 to review the geological and engineering aspects of
10 this proposed pilot project?

11 A. Yes, sir.

12 Q. Were Exhibits 1, 1a and 2 either prepared
13 by you or compiled at your direction?

14 A. Yes, they were.

15 MR. CARR: Mr. Catanach, at this time we'd
16 move the admission into evidence of Amoco Exhibits 1,
17 1a, and 2.

18 EXAMINER CATANACH: Exhibits 1, 1a, and 2
19 will be admitted as evidence.

20 MR. CARR: That concludes my direct
21 examination of our land witness.

22 EXAMINER CATANACH: Mr. Carr, your project
23 area as contained within your advertisement for this
24 case does not coincide with the actual project area.
25 Do you have an opinion as to whether readvertisement

1 is necessary of this case?

2 MR. CARR: I don't know. What we filed
3 with the Division is basically what you have before
4 you, and the ad was drafted to include only those
5 tracts upon which the actual injection wells are to
6 be located.

7 We have discussed this among ourselves,
8 and we don't know, Mr. Catanach, whether or not --
9 the entire project area is obviously not included
10 within the legal advertisement of the case as
11 prepared by the Division. It does include all tracts
12 on which injection wells are proposed. In either
13 event, we are prepared to present the case today and
14 correct that after the hearing.

15 EXAMINER CATANACH: This area is within
16 the interior of the San Juan 28-7 Unit?

17 MR. CARR: Yes, sir, it's entirely within
18 the unit. So the offsetting operator is Amoco all
19 the way around. I think we could get a waiver from
20 the offset.

21 EXAMINER CATANACH: We'll think about it
22 for a few minutes.

23 MR. CARR: All right.

24 EXAMINATION

25 BY EXAMINER CATANACH:

1 Q. Miss Talbot, it's my understanding you
2 have applied to BLM to expand the P.A. to coincide
3 with the project area?

4 A. That is correct.

5 Q. And they have not reached a decision yet?

6 A. No, sir.

7 Q. Do you have any indication what they might
8 decide on that?

9 A. At this point we're not sure. What we did
10 is we proposed several alternatives, and they had
11 taken it under advisement and have not gotten back to
12 us yet.

13 Q. In the event they do not approve that
14 expanded P.A., what are your alternatives?

15 A. One alternative is to -- as you see, the
16 Well No. 404 in Section 15, what you see is not
17 included within the participating area. It's a well
18 that we are looking into somehow stimulating to
19 enhance recovery there to allow us to add that to the
20 participating area and put those two drill blocks as
21 irrigating drill blocks and expanding the P.A. in
22 that fashion.

23 Another alternative would be to perhaps
24 get the working interest owners to amend our current
25 unit agreement to allow expansion of the P.A. without

1 actual drilling of wells in anticipation of enhanced
2 recovery as a result of the drilling of the nitrogen
3 wells. The third alternative, of course, is the
4 enhanced recovery area agreement.

5 Q. Do you feel it's necessary to have all
6 those interests consolidated within that project area
7 before you proceed?

8 A. Yes, we do.

9 Q. Would Amoco object to a provision within
10 the order that the Division writes that says that
11 those interests shall be consolidated before you
12 proceed?

13 A. No, sir.

14 Q. Within the project area, there appears to
15 be only four working interest owners?

16 A. That's correct.

17 Q. Have all your partners agreed to the
18 project?

19 A. Not at this point. We are still
20 negotiating.

21 Q. I noticed that you provided copies of this
22 or copies of notice to Meridian and Conoco. Why was
23 Simmons left out?

24 A. Simmons is right below Conoco, as you see,
25 Simmons group. They were hand-delivered a copy at a

1 working interest owners' meeting a couple of weeks
2 ago.

3 Q. They are aware of the hearing?

4 A. Yes, sir.

5 Q. Is Mr. Pacheco the surface owner?

6 A. He is a surface owner.

7 Q. A surface owner. Is that where one of the
8 injection wells is located?

9 A. That's correct.

10 Q. Is he the only surface owner that you
11 notified?

12 A. Yes. He is the only one there. BLM is
13 the other.

14 EXAMINER CATANACH: That's all I have of
15 the witness, Mr. Carr.

16 MR. CARR: Thank you, Mr. Catanach. At
17 this time we call Mr. Bill Pelzmann.

18 BILL PELZMANN,
19 the witness herein, after having been first duly
20 sworn upon his oath, was examined and testified as
21 follows:

22 EXAMINATION

23 BY MR. CARR:

24 Q. Will you state your name for the record,
25 please.

1 A. Bill Pelzmann.

2 Q. How do you spell your last name?

3 A. P-E-L-Z-M-A-N-N.

4 Q. Where do you reside?

5 A. Denver, Colorado.

6 Q. By whom are you employed and in what
7 capacity?

8 A. Amoco Production as a geologist.

9 Q. Have you previously testified before this
10 Division?

11 A. Yes, I have.

12 Q. Have your credentials as a petroleum
13 geologist been accepted and made a matter of record?

14 A. Yes, they have.

15 Q. Are you familiar with the application
16 filed in this case on behalf of Amoco Production
17 Company?

18 A. Yes, I am.

19 Q. Have you made a geological study of the
20 area involved in this case?

21 A. Yes, I did.

22 MR. CARR: Are the witness's
23 qualifications acceptable?

24 EXAMINER CATANACH: They are.

25 Q. (BY MR. CARR) Mr. Pelzmann, have you

1 prepared certain exhibits for presentation here
2 today?

3 A. Yes, I have.

4 Q. Could you refer to what has been marked
5 Amoco Exhibit No. 3, identify this and review it
6 please.

7 A. Exhibit 3 is a structure map showing the
8 present elevation of the top of the Pictured Cliff
9 sandstone which in this area is also basically
10 equivalent to the Basin Fruitland coal.

11 The nitrogen injection project area is
12 outlined in the three proposed injection locations as
13 shown with triangles. The structure is contoured on
14 a 20-foot interval, and it shows a simple regional
15 northwest-southeast trend, typical elevations of
16 3,300 feet above sea level. No fault offsets
17 apparent within the proposed injection project area
18 based on this map.

19 Exhibit 3 also shows the traces of two
20 cross-section lines, A-A' and B-B', and these
21 sections will be presented in subsequent exhibits.

22 Q. Let's go to Exhibit 4, the cross-section
23 A-A'. Would you identify and review that for Mr.
24 Catanach?

25 A. Exhibit 4 is cross-section A-A', the trace

1 of which was shown on the previous Exhibit 3. This
2 is a stratigraphic cross-section including seven
3 wells lying on top of the Pictured Cliff sandstone as
4 a datum.

5 It shows the vertical and lateral
6 distribution of Fruitland coals. For each well, the
7 section exhibits a gamma ray and a bulk density log
8 trace. Wherever the bulk density is less than 2.0
9 grams per cc, the curve is shaded in red. The red
10 shading, therefore, identifies the presence of coals.

11 The section shows the Fruitland coals
12 occur in two primary seams, the lowest seam being
13 about 25 to 30 feet in thickness through the area,
14 and the overlying seam ranges from 30 to 50 feet in
15 thickness. These two seams appear to be correlatable
16 and present throughout the project area.

17 The uppermost Fruitland coal is
18 characterized by thin coals 2 to 5 feet in
19 thickness. The east coal is probably not continuous
20 for any significant distance.

21 Q. Total thickness of about what, 80 feet?

22 A. Yes. Total thickness is ranging from 65
23 to about 100 feet.

24 Q. Let's go now to the other cross-section
25 B-B' which is marked Exhibit No. 5. Review this,

1 please.

2 A. Exhibit 5, the trace of which is also
3 shown on Exhibit 3, is a west-east cross-section of
4 three wells through the northern portion of the
5 project area. It basically shows the same
6 characteristics as described in Exhibit 4, in that
7 the coal occurs primarily in two seams which appear
8 to be continuous and correlatable to the project
9 area.

10 Q. Let's move now to Exhibit No. 6, the
11 thickness map. Could you explain what this exhibit
12 is and what its significance is?

13 A. Exhibit 6 is a total thickness of the
14 Fruitland coal, the coal thickness based upon, again,
15 a 2.0 gram per cc bulk density cutoff. The map is
16 contoured on a 5-foot interval, and the thick trends
17 are shown in blue.

18 Within the project area outlined here in
19 red, the total coal thickness ranges from 60 to 100
20 foot in thickness and, again, suggests the continuity
21 of the coal throughout the area.

22 Q. Generally, summarize the conclusions
23 you've been able to reach about this area from a
24 geologic point of view.

25 A. Based on the structure, the cross-section,

1 and the thickness maps, I conclude the Fruitland coal
2 was primarily developed in two seams which appear to
3 be continuous and correlatable within the proposed
4 project area. The area appears, therefore, to be a
5 good candidate to test the feasibility of nitrogen
6 injection in multiple seams.

7 Q. No evidence of faulting?

8 A. Not that I can see from here.

9 Q. Were Exhibits 3 through 6 prepared by you?

10 A. Yes, they were.

11 MR. CARR: At this time, Mr. Catanach, we
12 move the admission of Amoco Exhibits 3 through 6.

13 EXAMINER CATANACH: Exhibits 3 through 6
14 will be admitted as evidence.

15 MR. CARR: That concludes my direct
16 examination of Mr. Pelzmann.

17 EXAMINATION

18 BY EXAMINER CATANACH:

19 Q. Mr. Pelzmann, was geology a major factor
20 in determining the project area?

21 A. It was certainly a factor considered. It
22 wasn't the major factor. We were looking for
23 continuous coals, obviously, as being a criteria, and
24 also significant thickness in the total coal. And
25 also looking at the production characteristics in the

1 area. In general, these are not the spectacular,
2 high-rate Fruitland wells characterized to the north
3 of this area. And so it was certainly an area that
4 could be enhanced with nitrogen injection because of
5 the significant thickness of coal present in the
6 area.

7 Q. You basically have two thick seams in this
8 project area?

9 A. Yes.

10 Q. And several smaller seams?

11 A. Above the two thick seams, those 2- to
12 5-foot seams there probably would not be considered
13 as injection candidates. We'll probably inject into
14 the two primary seams.

15 Q. Are the producing wells generally not
16 perforated in the smaller seams?

17 A. Actually, the producing wells on the
18 cross-sections to the right of the log trace is shown
19 as stippled pattern. That shows where the existing
20 coal wells are open. They vary. Some of them will
21 be completed through the thin upper seams, and others
22 were not.

23 Q. Is there permeability in the coal seams in
24 this area?

25 A. Pardon me, is there permeability? Yes.

1 The exact magnitude of the permeability, I think we
2 can answer that by the engineering testimony.

3 EXAMINER CATANACH: I have nothing
4 further, Mr. Carr. The witness may be excused.

5 MR. CARR: Thank you, Mr. Catanach. Mr.
6 Catanach, at this time we'd call Bill Hawkins.

7 I'd request that the record reflect that
8 Mr. Hawkins testified in the previous case, and that
9 his credentials as a petroleum engineer have been
10 accepted by this Division and made a matter of
11 record.

12 EXAMINER CATANACH: The record shall so
13 reflect.

14 JAMES WILLIAM HAWKINS,
15 the witness herein, after having been previously
16 sworn upon his oath, was examined and testified as
17 follows:

18 EXAMINATION

19 BY MR. CARR:

20 Q. Mr. Hawkins, are you familiar with the
21 application filed in this case on behalf of Amoco?

22 A. Yes, I am.

23 Q. Have you made an engineering study of the
24 area that is involved in this nitrogen pilot project?

25 A. Yes.

1 Q. Have you prepared certain exhibits for
2 presentation here today?

3 A. Yes, I have.

4 Q. Would you refer to what has been marked
5 for identification as Amoco Exhibit No. 7, and using
6 this exhibit, would you explain to Mr. Catanach
7 exactly what Amoco is proposing with this nitrogen
8 injection?

9 A. Yes. We've got a couple of exhibits in
10 the booklet here to give you some background on
11 enhanced recovery of coal bed methane by nitrogen
12 injection.

13 The first exhibit, Exhibit No. 7, shows
14 the results of laboratory work that we've performed
15 where we've injected nitrogen into a coal sample at
16 constant pressure and then measured the methane that
17 was extracted from that coal sample as a result of
18 the nitrogen injection.

19 And the results of that lab work showed
20 that we were able to recover about 86 percent of the
21 methane that was absorbed in the coal and probably
22 could have extracted a little bit more if we had
23 continued that process.

24 To give you an idea, the relative recovery
25 by pressure depletion generally is in the 30 to 50

1 percent range under the best of conditions. So this
2 would be a dramatic improvement over the ultimate
3 recovery of methane from coal if we can successfully
4 implement it in the field.

5 Q. When you undertake this project, you're
6 increasing the ultimate recovery. What do you do to
7 the rate of production? Does it also dramatically
8 improve?

9 A. Since we're able to inject nitrogen into
10 the coal and keep the reservoir pressure relatively
11 high, the producing rates would remain at a
12 relatively high rate, as opposed to reservoir
13 depletion where the reservoir pressure would drop and
14 the rates would drop off because of the loss of
15 energy drive there.

16 So nitrogen injection should not only
17 increase the ultimate recovery but also enhance the
18 recovery rate of the methane.

19 Q. This is not Amoco's first nitrogen pilot
20 project?

21 A. That's correct.

22 Q. There's also been one previously
23 undertaken in Colorado?

24 A. That's correct.

25 Q. Could you refer to what has been marked as

1 Amoco Exhibit No. 8, identify and review this exhibit
2 with the examiner, and also explain the differences
3 in this exhibit and what you're proposing to do in
4 the case before the Division today?

5 A. Yes. The first nitrogen project that we
6 implemented was in Colorado, and it was in a
7 relatively tight-spaced area where we had four
8 injection wells surrounding a center producer, all of
9 those wells located approximately within a quarter
10 section; so that the area inside -- if you look at
11 the top of the exhibit, the area that's inside the
12 little injection area is about 80 acres there.

13 We also limited the injection to a single
14 seam of coal so that we could eliminate any of the
15 uncertainties in trying to keep the nitrogen into the
16 single seam.

17 And as you can see from the lower portion
18 of Exhibit No. 8, we're showing the results from that
19 test. The center producer had been producing
20 approximately 200 Mcfd, and through the results of
21 nitrogen injection, we were able to increase the rate
22 to about 1.2 million cubic feet per day from that
23 well. Water production remained low at about 50
24 barrels OF water a day continuously through the
25 period. The project ran for approximately one year.

1 We have stopped injecting nitrogen at this point, and
2 we're still seeing some tail-off benefits of
3 production from this area.

4 The differences between what we've done in
5 this first nitrogen pilot and what we're proposing to
6 do in San Juan 28-7 unit are, one, to increase the
7 spacing to more of a field spacing prospect where we
8 have wells located, one well per 320 acres, and
9 inject into multiple seams.

10 The other differences that we'll see in
11 the project, we'll be in a much lower pressured area
12 than we were in Colorado. We'll be in a lower
13 permeability area than we were in Colorado. So there
14 are a number of uncertainties that will be able to be
15 answered by the nitrogen project we're proposing in
16 New Mexico.

17 Q. Mr. Hawkins, what is Amoco Exhibit No. 9?

18 A. Exhibit No. 9 is a plat of the area
19 involved for the nitrogen project. Some of the same
20 information that was shown under the first exhibit,
21 it shows the unit boundary in red-dashed outline, and
22 then the solid green line here is the P.A. in this
23 area of the unit for the Fruitland coal. And then
24 the black-dashed line surrounds the project area. We
25 show in red dots the coal wells in this vicinity and

1 in the black dots the proposed locations for our
2 injection wells.

3 We've also shown the one-half mile radius
4 around each of these injection wells and the other
5 wells that are anterior to that one-half mile
6 radius. And a map similar to this was presented in
7 our C-108 application.

8 Q. Mr. Hawkins, what does the yellow shading
9 on this exhibit indicate?

10 A. Again, the yellow shading indicates the
11 acreage that Amoco has a working interest in.

12 Q. And in this formation, the Fruitland coal,
13 the spacing is 320 acres?

14 A. That is correct.

15 Q. What is the current status of the proposed
16 injection wells?

17 A. They have not yet been drilled.

18 Q. This exhibit also shows all wells within
19 two miles of the proposed injection wells; does it
20 not?

21 A. That's correct.

22 Q. And it shows the lease ownership in the
23 area?

24 A. Yes, it does.

25 Q. Let's go to Exhibit No. 10. Using Exhibit

1 No. 10, would you review for the examiner the details
2 of this particular project?

3 A. Exhibit 10 is just a summary or overview
4 of the project. The project scope here would be
5 three injection wells with seven producers. I would
6 note that one of the wells that we're planning to
7 drill for injection, the well in the furthest western
8 end in Section 22, may be a producer initially.

9 We'll try to inject in the other two wells
10 first. And if we are unable to get the injection
11 that we need, we'll go ahead and convert that third
12 well to injection as well. So that's why we're
13 applying for all three of them today.

14 It will require the drilling of these
15 three new wells. The area involved is ten drill
16 blocks or 3,200 acres. The average injection
17 pressure will be approximately 2,000 pounds with the
18 injection rate totaling 4.5 million cubic feet per
19 day.

20 Q. What does this convert to as a daily
21 injection rate per well?

22 A. We're hoping to get to about 2.25 million
23 per day into each of the two injection wells in the
24 center of this project area, and if we're unable to
25 do that, we'll probably drop to, say, 1-1/2 million a

1 day into each of those and the other 1-1/2 into the
2 third injection well.

3 Q. The 4.5 Mmcfd per day is the total capacity
4 figure you're reflecting?

5 A. That's correct. The total production from
6 this area is approximately 700 Mcfd, and the
7 incremental production that we're expecting as a
8 result of this project will be another 3 to 4 million
9 cubic feet per day, similar to the injection volumes
10 of nitrogen.

11 We would expect that we will produce
12 nitrogen along with our produced gas, starting out
13 small percentages but maybe ranging up to 50 percent
14 near the end of the project. And we're making
15 arrangements to blend off that nitrogen into our
16 sales gas.

17 The duration of injection will be a period
18 of two to four years. We're not real sure exactly
19 how long we're going to run the project, but it will
20 be somewhat tied to the nitrogen cut of production.

21 The total impact period, we think, could
22 be anywhere from five to ten years, a tail-off of
23 increased methane and some nitrogen percentage after
24 we've stopped the nitrogen injection.

25 We plan to inject gas at approximately 95

1 percent nitrogen and 5 percent oxygen, basically
2 extracted from the air through a nitrogen membrane
3 unit.

4 Q. Mr. Hawkins, Amoco's application was filed
5 on a Division Form C-108?

6 A. That's correct.

7 Q. Did that form contain the data on all the
8 wells within each of the areas of review required by
9 OCD rules?

10 A. Yes, it did.

11 Q. Did that exhibit also contain schematic
12 drawings showing how you will actually mechanically
13 configure each of the proposed injection wells?

14 A. Yes, it does.

15 Q. Are there any plugged and abandoned wells
16 within any of the areas of review?

17 A. No, there are not.

18 Q. Are there any wells that will require any
19 kind of remedial work before the project is
20 implemented?

21 A. Yes, there are.

22 Q. Could you identify those and explain the
23 status of those for the examiner?

24 A. The two wells are the San Juan 28-7 Unit
25 No. 50 well, and that's -- let me see where it's

1 located. That one, and the other one is the San Juan
2 28-7 Unit No. 9 Well. And both of those wells do not
3 have cement completely across the Fruitland coal, and
4 we have prepared some procedures to go out and repair
5 those wells, and we'll be working with the Aztec
6 District Office to get those repairs implemented.

7 Well No. 50 is in Section 23, and the Well
8 No. 9 is in Section 14.

9 Q. In your opinion, is there any chance that
10 an injection pressure of 2,000 pounds, surface
11 pressure, would cause the injection fluids to break
12 out of or through the confining strata in the
13 Fruitland Coal?

14 A. In our opinion, that should be below the
15 parting pressure or fracture pressure of the zone.
16 We've done some work on Well No. 404. It shows a
17 fracture gradient of about .75 psi per foot. We're
18 proposing to keep our injection down to .7 psi per
19 foot gradient to stay below that parting pressure.

20 The top of the coals in this area are
21 approximately 3,000 to 3,200 feet, and the 2,000
22 pounds surface injection pressure should keep us
23 below the fracture pressure in the coal.

24 Q. Unlike a waterflood, would you anticipate
25 any compatibility problems by injecting nitrogen into

1 the formation?

2 A. No, we would not.

3 Q. Are there fresh water wells within one
4 mile of any of the injection wells?

5 A. No, there are not.

6 Q. Are there fresh water zones in the area?

7 A. Yes. The Ojo Alamo and the Nacimientto
8 formations are considered fresh water zones. Both of
9 those zones are located relatively deep in this area,
10 somewhere around 2,500 feet for the Ojo Alamo and
11 just above that for the Nacimientto, and neither of
12 those zones should be affected by our operation.

13 Q. Have you reviewed the engineering and
14 geological data on the area?

15 A. Yes.

16 Q. As a result of that review, have you found
17 any evidence of any open faults or other connections
18 between the injection zone and the fresh water zones
19 that could in fact cause a threat to the water supply
20 in the area?

21 A. No.

22 Q. Would nitrogen in fact pose a threat to
23 the fresh water in the area?

24 A. It shouldn't pose any threat at all. 80
25 percent of what we breathe is nitrogen; so it's an

1 inert gas that should have absolutely no effect to
2 any fresh water zone.

3 Q. The only potential impact would be if the
4 pressures were too high and it became a vehicle by
5 which something else could get into the water?

6 A. Yes.

7 Q. In your opinion, will approval of this
8 application, the implementation of this project, be
9 in the best interest of conservation, the prevention
10 of waste, and the protection of correlative rights?

11 A. Yes, it will.

12 Q. If you achieve the results you hope, could
13 this pilot project lead to the recovery of
14 substantial volumes of hydrocarbons that otherwise
15 will not be recovered?

16 A. Yes.

17 Q. Were Exhibits 7 through 10 prepared by
18 you?

19 A. Yes.

20 MR. CARR: At this time, Mr. Catanach, we
21 move the admission of Amoco's Exhibits 7 through 10.

22 EXAMINER CATANACH: Exhibits 7 through 10
23 will be admit as evidence.

24 MR. CARR: That concludes my examination
25 of Mr. Hawkins.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Hawkins, is your injection rate going to be controlled into each of the respective zones, is that going to be somehow controlled?

A. No. We're trying to actually do a typical field-type implementation of this so that we can see what types of problems we might have with triangular flood multiple seams, varying permeabilities; so we'll have both these seams open to injection.

Q. Is there a correlation between your injection rate and your increase in production rate?

A. We think there's probably some correlation there. What we've seen in the project in Colorado was a fairly close, 1 to 1 approximation of bringing the nitrogen in and increasing the production from the methane.

The things that we'll be doing differently here will be injecting larger volumes per injection well and at higher pressures. So there is some uncertainty as to exactly what type of increased production we'll see.

Q. What kind of response time are you looking at?

A. Again, we have these scaling problems in

1 trying to take a laboratory work or a single seam
2 that's on very tight spacing and scale that up to the
3 320-acre spacing that we want to implement here.
4 We're expecting to see some response within the first
5 year or two. In the project in Colorado, we saw
6 response within the first week. So we're going to be
7 learning some things about that as well.

8 Q. Mr. Hawkins, Amoco also has the pilot
9 carbon dioxide injection project in the San Juan
10 Basin; is that correct?

11 A. Yes.

12 Q. Have you gotten any results with that?

13 A. We've injected CO₂ for about three months
14 now. We started in the middle of December, had some
15 problems and had to shut down, started injection
16 again in January. Haven't seen any dramatic results
17 yet.

18 The big things we're trying to learn there
19 are some injectivity concerns and look for some
20 pressure responses in that offset monitor well.

21 Q. Will you be drilling any additional
22 producing wells in the project area?

23 A. The only three wells we propose to drill
24 right now are the three that are shown as injection
25 wells. And, again, I'll point out, the one on the

1 far west there may be a producing well initially, and
2 if we're unable to get the 4-1/2 million a day
3 nitrogen into the two center injection wells, then
4 we'll convert that well to injection.

5 We wanted to go ahead and permit it as
6 injection now just in anticipation that we might not
7 be able to get all the nitrogen in those two center
8 injections wells.

9 Q. In your Colorado project, did your
10 injection cause any change in the composition of the
11 produced gas?

12 A. No. The only thing we saw was the methane
13 production along with some nitrogen. That was it.
14 The nitrogen is expected to be totally inert in this
15 process.

16 Q. This is just targeted for -- this specific
17 project area has been targeted because of the low
18 productivity of the well and the low pressure?

19 A. There were multiple reasons in identifying
20 this as a project area. Some of the uncertainties
21 obviously in moving from a high-pressured area to a
22 lower-pressured area and maybe the implication that
23 if we can make this work in this area, we open up a
24 lot of future potential in portions of the Basin that
25 are marginally attractive right now.

1 It will also help us just to understand
2 how we've got multiple seams, it looks like we have
3 good continuity in this area, so from a geologic
4 point of view, it looked attractive.

5 Being within the unit boundary helped us a
6 little bit here. We've run into a few problems here
7 with getting the P.A. expanded to encompass this
8 entire area, but we hope to get that resolved fairly
9 shortly.

10 Q. This is something that Amoco could
11 probably expand upon within the next year or two if
12 the results are pretty favorable?

13 A. Yes. We're going to be looking at other
14 potential candidates around the Basin to do similar
15 projects and answer questions of how does it may be
16 work in other portions of the Basin where the
17 reservoir characteristics are slightly different, but
18 we're still very much on a learning curve in this
19 process.

20 Q. Are you going to run this project for a
21 while before you decide to expand to different areas,
22 or are you going to try to go into some other areas
23 now?

24 A. We're still evaluating some other areas
25 and we hope we can come forward -- it will not

1 necessarily be based on the results of this.

2 Q. Is it your opinion at this time that the
3 nitrogen injection is favorable, more favorable to
4 carbon dioxide injection?

5 A. No, I don't think we have an opinion on
6 that right now. We're still evaluating both
7 processes. We're a little further along the learning
8 curve on the nitrogen than we are on the CO₂, but we
9 have high expectations for both of those processes.

10 Q. I don't recall the pressure we gave you on
11 your CO₂ injection project. Do you know what that
12 was? Do you remember what that was?

13 A. Initially, you gave us a typical
14 waterflood type .2 psi injection gradient, and we
15 gathered some additional information from research
16 showing the hydrostatic head that we expect to see
17 with our CO₂. It is kind of a dense phase at the
18 injection pressures we're looking at. We got an
19 increase in injection pressure at the surface to
20 about 1,300 pounds, as I recall.

21 With the nitrogen, we would expect to be
22 fully in a gaseous phase here with a very low
23 hydrostatic head. We estimate the head here for
24 about 200 pounds over the 3,000 foot interval. So
25 the 2,000 pound surface pressure we're requesting

1 should, even taking into account the hydrostatic
2 head, etc., should keep us below fracture pressure.

3 Q. And the fracture gradient, you testified
4 2.75 was determined from what?

5 A. We've done some work in the Well No. 404
6 that when we did the fracture work there, we
7 evaluated the fracture gradients in that well, and
8 that's within the project area. We saw some fracture
9 initially opened at about .78 psi per foot and closed
10 at a .83 psi per foot.

11 We also took into account some of the
12 conditions under which we were fracturing, and so we
13 backed off a little bit of that, determined that
14 about .75 was roughly the fracture gradient in that
15 well. And we backed off even a little further to the
16 .7 just to make sure we'd remain below that for this
17 project.

18 Q. Which seam was that in? Was that in both
19 seams?

20 A. Well, it just was fracture stimulated all
21 at once. So it would be both seams together.

22 Q. There is no type of monitor wells like you
23 have in the other project?

24 A. We don't really anticipate the need for
25 the -- oh, you mean the pressure monitor wells?

1 Q. Pressure monitor.

2 A. No. We have sufficient wells in the area
3 that we'll be looking for response on the order of
4 three-quarters miles away now. So we don't see the
5 need to put any other closer spaced wells into the
6 project.

7 EXAMINER CATANACH: I have nothing further
8 of this witness.

9 MR. CARR: That concludes our presentation
10 in this case.

11 EXAMINER CATANACH: We received a faxed
12 letter from Conoco which essentially states that
13 Conoco supports Amoco's application in this matter,
14 and that although there are still some issues to be
15 resolved between themselves and Amoco, they do
16 support the application.

17 As far as the readvertisement of this
18 case, I think it's probably sufficient to go ahead
19 and not readvertise at this time and go ahead and
20 take the case under advisement.

21 MR. CARR: Thank you.
22
23
24
25

CERTIFICATE OF REPORTER

STATE OF NEW MEXICO)

) ss.

COUNTY OF SANTA FE)

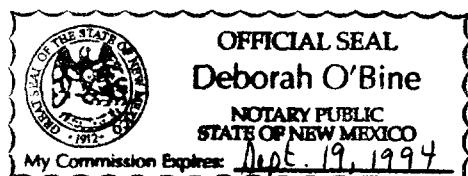
I, Deborah O'Bine, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that I caused my notes to be transcribed under my personal supervision, and that the foregoing transcript is a true and accurate record of the proceedings of said hearing.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL, May 4, 1994.

Deborah O'Bine

DEBORAH O'BINE
CCR No. 63



I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 10854, heard by me on April 14, 1994.

David C. C. C., Examiner
Oil Conservation Division

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