

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

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 NOS. 10845
and 10846

APPLICATION OF PHILLIPS PETROLEUM COMPANY

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: David R. Catanach, Hearing Examiner

October 7, 1993

Santa Fe, New Mexico

This matter came on for hearing before the
Oil Conservation Division on October 7, 1993, 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.

I N D E X

October 7, 1993
 Examiner Hearing
 CASE NOS. 10845 and 10846

	PAGE
APPEARANCES	3
PHILLIPS PETROLEUM COMPANY'S WITNESSES:	
<u>KEITH H. MABERRY</u>	
Examination by Mr. Kellahin	4
Examination by Examiner Catanach	37
<u>MARY TISDALE</u>	
Examination by Mr. Kellahin	45
Examination by Examiner Catanach	55
<u>PAUL HALL</u>	
Examination by Mr. Kellahin	56
Examination by Examiner Catanach	62
REPORTER'S CERTIFICATE	64

E X H I B I T S

	ID	ADMTD
Exhibit 1	6	37
Exhibit 2	7	37
Exhibit 3	8	37
Exhibit 4	9	37
Exhibit 5	14	37
Exhibit 6	16	37
Exhibit 7	17	37
Exhibit 8	18	37
Exhibit 9	19	37
Exhibit 10	20	37
Exhibit 11	30	37
Exhibit 12	31	37
Exhibit 13	49	55
Exhibit 14	50	55
Exhibit 15	52	55
Exhibit 16	58	62
Exhibit 17	59	62
Exhibit 18	60	62
Exhibit 19	61	62

A P P E A R A N C E S

FOR THE DIVISION: ROBERT G. STOVALL, ESQ.
General Counsel
Oil Conservation Commission
State Land Office Building
310 Old Santa Fe Trail
Santa Fe, New Mexico 87501

FOR THE APPLICANT: KELLAHIN AND KELLAHIN
117 N. Guadalupe
Santa Fe, New Mexico
BY: W. THOMAS KELLAHIN, ESQ.

1 EXAMINER CATANACH: At this time we'll call
2 Case 10845, Application of Phillips Petroleum Company
3 for a unit agreement, Lea County, New Mexico.

4 Are there appearances in this case?

5 MR. KELLAHIN: Mr. Examiner, I'm Tom
6 Kellahin of the Santa Fe law firm of Kellahin and
7 Kellahin appearing on behalf of the applicant.

8 At this time we would ask that you call the
9 next case, 10846, and consolidate it with the first
10 case.

11 EXAMINER CATANACH: At this time we'll call
12 Case 10846, which is the Application of Phillips
13 Petroleum Company for approval of a waterflood
14 project, and to qualify said project for the recovered
15 oil tax rate pursuant to the New Mexico Enhanced Oil
16 Recovery Act, Lea County, New Mexico.

17 Are there additional appearances in either
18 of these cases? There being none --

19 MR. KELLAHIN: I have three witnesses to be
20 sworn, Mr. Examiner.

21 EXAMINER CATANACH: Okay. Will the
22 witnesses please stand to be sworn in.

23 (Witnesses sworn.)

24 MR. KELLAHIN: Mr. Examiner, my first
25 witness is Mr. Keith Maberry. Mr. Maberry is the

1 project engineer for this project.

2 KEITH MABERRY,

3 the witness herein, after having been first duly sworn
4 upon his oath, was examined and testified as follows:

5 EXAMINATION

6 BY MR. KELLAHIN:

7 Q. Would you please state your name and
8 occupation.

9 A. Keith H. Maberry, and I am a reservoir
10 engineering specialist with Phillips Petroleum Company
11 in Odessa, Texas.

12 Q. On prior occasions, Mr. Maberry, have you
13 testified as a petroleum engineer before the Division?

14 A. No, I have not.

15 Q. Summarize for us your education.

16 A. Graduate with a bachelor's in mechanical
17 engineering from Georgia Institute of Technology in
18 1982. I've been a practicing petroleum engineer for
19 the last 11 years with Phillips Petroleum, seven years
20 experience in the Permian Basin and five years in the
21 Texas Panhandle.

22 The past two years I've been a reservoir
23 engineering specialist in our EOR operations group,
24 and my primary project for that length of time has
25 been the Vacuum Glorieta unitization.

1 MR. KELLAHIN: We tender Mr. Maberry as an
2 expert petroleum engineer.

3 EXAMINER CATANACH: Mr. Maberry is so
4 qualified.

5 Q. (BY MR. KELLAHIN) Mr. Maberry, let's take
6 Exhibit No. 1, if you will unfold that display.
7 Before we talk about your project specifically, give
8 us an idea of where you're located within the Vacuum
9 field of the Glorieta Pool, if you will.

10 A. Exhibit No. 1 is a plat that shows all the
11 major EOR projects going on in the Vacuum field.
12 There are quite a number of them. The proposed Vacuum
13 Glorieta East Unit is the solid yellow outlined in
14 red. And also for reference, we have the red hatched
15 Texaco Vacuum Glorieta West Unit. We share a common
16 boundary or will share a common boundary with Texaco's
17 Vacuum Glorieta West.

18 This unit lies beneath Phillips-operated
19 East Vacuum Grayburg-San Andres unit, and it lies
20 above the Phillips-operated Vacuum Abo Unit.

21 MR. KELLAHIN: Mr. Examiner, the Texaco
22 project was approved by the Division pursuant to
23 statutory unitization. That case was heard by you
24 back on July of '92. It's Case 10515. The
25 unitization order is R-9710. And then the waterflood

1 approval for that project is Case 10516. It is order
2 No. R-9714.

3 Q. As this project for Phillips has evolved,
4 has it been necessary at this point to ask the
5 Division to implement the statutory unitization
6 procedures in order to organize the interest owners
7 for the project?

8 A. No. We seek voluntary unitization.

9 Q. Let me have you turn to Exhibit No. 2.
10 Identify this display for us.

11 A. Exhibit No. 2 is a base map or plat, if you
12 will, of the proposed unitized interval. It was
13 Exhibit A to our unit agreement, unit operating
14 agreement. It shows all the 47 tracts that will be
15 contributed to the unit, the proposed tract number,
16 and the sequential numbering of the wells within the
17 tracts.

18 Presently, the unit -- excuse me.

19 Q. I was going to ask you to explain to us the
20 type of well symbols we're seeing on this display.

21 A. The solid dot is present active Glorieta
22 completion. There are 74 of them. The dot with the,
23 I guess diagonal hatch through it are shut-in wells.
24 There are 18 of those. The vertical hatch represent
25 T & A'd wells; there are eight of those. And the

1 crosshatched over the dot is plugged and abandoned
2 wells; there are 15. And for the purposes of this
3 plat, plugged and abandoned meant plugged and
4 abandoned from the Glorieta interval. These wells may
5 be active in other formations.

6 Q. When we talk about the unitized interval in
7 a vertical sense to describe the area that you want to
8 operate under the unit plan, can you give us an
9 illustration of what that interval is?

10 A. Yes. Exhibit 3 is a type log of the Vacuum
11 Glorieta Unit or, excuse me, the Vacuum Glorieta
12 Pool. It is the Mobil Bridges State #95, and that is
13 the type log for this pool. And we have duplicated
14 just a portion of the log that shows the unitized
15 interval.

16 The unitized interval is from the top of
17 the Glorieta, which correlates to 5838 on this log,
18 and continues down to the top of the Blinbry, which
19 correlates to 6235 on this log.

20 There are also three delineations of pay,
21 the Glorieta, Upper Paddock, and Lower Paddock. The
22 Upper Paddock is the continuous formation within the
23 unitized interval that we intend to waterflood.

24 Q. Have you reached a recommendation as to
25 which portion of the unitized interval is the best

1 candidate for the waterflood project? What portion of
2 the pool do you propose to inject water into?

3 A. The Upper Paddock.

4 Q. Let's try to get a sense of the position of
5 the proposed unit as it overlies the reservoir. Do
6 you have an illustration that shows us how that
7 relationship exists?

8 A. Yes. Exhibit 4 is a net isopach pay map on
9 the Upper Paddock versus the floodable pay, and this
10 is of the entire pool; so it does include the Texaco
11 Vacuum Glorieta West Unit, which is outlined in blue,
12 and then our proposed Vacuum Glorieta East Unit, which
13 is outlined in red.

14 As you can see, the zero contour interval
15 corresponds quite well with the proposed unit
16 boundaries, and then we'll share the common boundary
17 with Texaco's unit to our west.

18 Q. Can you give us a summary of what have been
19 the efforts by Phillips and the other operators within
20 the unit area to recover primary oil production in a
21 conventional way from this portion of the reservoir?

22 A. Yes. Every operator out there has
23 individually produced their wells as they would in a
24 prudent manner through primary depletion. The western
25 half of this reservoir is primarily dominated by

1 solution gas drives.

2 Q. When we talk about the primary development
3 of the reservoir at this point in time, please
4 continue.

5 A. Yes. Again, each individual operator has
6 depleted their tracts through primary depletion.
7 These wells primarily are being dominated by solution
8 gas drives and have very low bottom hole pressures.
9 Most of the wells have been on pump for a number of
10 years. Several of them are uneconomic to operate.

11 As you head towards the southeast flank,
12 there is a water influx which is given some pressure
13 support and there are still a few top allowable wells
14 in that area.

15 Q. Do you have an engineering opinion as to
16 whether it is appropriate at this point in time to
17 commence secondary recovery with an EOR project?

18 A. Yes. It's definitely time. The far
19 majority of the proposed unit interval is very
20 depleted.

21 Q. Give us a summary of what Phillips and the
22 other operators and interest owners in the proposed
23 unit have done in order to come to a consensus on a
24 plan to implement for the secondary recovery. What
25 did we do?

1 A. Do you want to go back to 1987?

2 Q. Yes, sir.

3 A. Or more recent history?

4 Q. No, '87.

5 A. In 1987, the 11 operators of the pool got
6 together and formed a technical committee to
7 characterize geologically and in a reservoir sense the
8 Vacuum Glorieta Pool and make recommendations for
9 enhanceable recovery. They published a report in
10 November of '90, which is referred to as the Technical
11 Committee Report, and it outlined the unit parameters,
12 both geologically and reservoir and production
13 parameters.

14 At that time, a decision was made to split
15 the unit in half. Texaco would operate the west
16 half. Phillips was the proposed operator of the east
17 half. There were several reasons, but primarily
18 Phillips-operated facilities that overlaid and
19 underlaid the east half from Texaco, the same on the
20 west half.

21 Texaco then went on with their unitization
22 effort, and the nine operators on the east half then
23 formed a technical committee to study just the east
24 half. And at that time we underwent about two years
25 of defining the project scope and coming upon

1 agreement for unit participation.

2 Q. Did that process result in any engineering
3 and geologic conclusions about the feasibility of
4 taking this area and subjecting it to a waterflood
5 project?

6 A. Yes. That technical committee did publish
7 a report, which is an exhibit coming up, did an
8 engineering study and did make the recommendation to
9 waterflood the Upper Paddock within the unitized area.

10 Q. What has been your involvement as a project
11 or a reservoir engineer for studying the feasibility
12 of waterflooding this particular project?

13 A. I was involved at the outset. I did not
14 participate in the original Technical Committee Report
15 that was published in 1990, but we took their data,
16 updated the production data. We generated a reservoir
17 model to model the area, and then used it to predict
18 waterflood response. And I was the technical
19 coordinator and the engineer in charge of that
20 project.

21 Q. Describe for us in a summary fashion the
22 type of model that you utilized to make the
23 simulation.

24 A. We used an in-house, fully implicit, 3D
25 black oil model. It's a very common type of

1 reservoir model. It was laid out in 95 x 55 grids and
2 three layers deep. We used the technical data
3 compiled that is in the 1990 Technical Committee
4 Report to characterize each one of these grids within
5 the waterflood. And we also used data that was
6 acquired through special core analysis of a Texaco
7 well to give us real perm data and our end points.

8 We incorporated all that into the model or
9 then used the model to -- or actually verified the
10 model by running it and having it match the production
11 history of the unit from 1963 to 1992.

12 Once we were comfortable that the model
13 verified the -- was verified by a history match, then
14 it was used to make waterflood predictions.

15 Q. And what were the predictions generated
16 from that effort?

17 A. The model forecast projected that we would
18 recover an additional 16.4 million barrels of oil that
19 would not be recovered through primary depletion of
20 the individual tracts.

21 Q. Do you have a recommendation to the
22 Division as to what pattern you will implement in the
23 waterflood project in order to have the opportunity to
24 recover that volume of additional oil?

25 A. Yes. We modeled three separate patterns,

1 and we found that the 40-acre five spot was the most
2 efficient. It will require drilling infill, 20-acre
3 infill injectors, and it will essentially be a
4 continuation of Texaco's waterflood to our west.

5 Q. Let's turn to Exhibit No. 5, Mr. Maberry.
6 Describe for us what this shows.

7 A. Exhibit No. 5 is a plat of the proposed
8 unitized interval. Superimposed on top of that in red
9 is the outline of the waterflood project area. It's
10 3,080 acres. The triangles show the locations of the
11 infill injection locations, and then along the west
12 boundary, there are hexagonal wells that indicate the
13 locations of the lease line injectors that we will
14 cooperatively drill with Texaco.

15 There are 34 separate 40-acre patterns to
16 be developed.

17 Q. Is this an illustration of the 40-acre five
18 spot pattern that you have recommended to the examiner
19 based upon the simulation?

20 A. Yes, it is.

21 Q. The unit boundary is also shown on this
22 display, is it not?

23 A. Correct. It is the thinner black outline,
24 which is just a reproduction of our Exhibit A.

25 Q. The initial waterflood project area

1 boundary is less than the entire unit area, is it not?

2 A. That's correct.

3 Q. What's the reason for that?

4 A. The paddock -- there are actually two
5 separate reasons. On the east half, the paddock has
6 experienced some water encroachment, and the residual
7 oil to water is quite low, and it's not economic to
8 waterflood. So that acreage is being held for an
9 anticipated CO₂ flood.

10 The portion that's on the south and to the
11 west, the paddock there is not of the same quality as
12 what's in the original waterflood area, and there is
13 some question as to whether it would be economic to
14 waterflood. Again, that is going to be held for CO₂
15 flood, and we will carefully monitor that area. It
16 will be surrounded by injection wells, and if it does
17 show response, we intend to develop it.

18 Q. Have the interest owners within the unit
19 area agreed upon participation parameters and a
20 participation formula for each of the tracts within
21 the unit?

22 A. Yes, they have. We have unanimous approval
23 of the participation formula.

24 Q. Does that formula take into account the
25 varying degrees of contribution or effect of each

1 individual tract as it is contributed to the unit?

2 A. Yes, it does.

3 Q. Let's go to the Technical Committee
4 Report. It's Exhibit 6. Tell us how the technical
5 report is organized, Mr. Maberry.

6 A. Okay. This was a report that the
7 Engineering Technical Committee prepared and presented
8 to the working interest owners. It was prepared March
9 of '93, and it was approved unanimously in May of
10 '93. It is essentially the document that we used to
11 base the unitization waterflood.

12 The first section is simply an introduction
13 to the unit area. The next couple of tabs show the
14 proposed reservoir development plan that's illustrated
15 in Exhibit 5, a description of the reservoir model
16 that I have talked about previously, and the outcome
17 of our waterflood forecast result.

18 The balance of it is essentially the
19 details as to the facility design, development
20 schedule, and costs, which I won't go into in detail.
21 However, briefly, the project will require \$24.9
22 million investment. It will require an additional
23 \$87.7 million in operating cost, for a total capital
24 outlay of \$112.6 million in 1993 dollars.

25 Q. Have you made a calculation to give us an

1 idea of what the 16.4 million barrels of incremental
2 oil are worth in terms of present value?

3 A. Yes. In present value at a 0 percent
4 discount rate, we estimate it's worth \$109.8 million.

5 Q. Let's turn now to Exhibit No. 7. This is a
6 summary of the production history for the wells
7 producing out of this formation within the project
8 area?

9 A. That's correct.

10 Q. Describe for us what it shows.

11 A. It shows that development of the pool
12 started in 1963. It was characterized by several top
13 allowable wells, many of which continued on into the
14 present. There are still a number of top allowable
15 wells.

16 So you notice the production is on a
17 relatively flat decline, and it's a fairly typical
18 pattern of a reservoir that is being depleted by
19 solution gas drive in one portion and by water
20 encroachment in the other. So you do see a fairly
21 flat decline.

22 And this was the profile of production that
23 we used to history match our reservoir model against.

24 Q. Were you able to forecast or project what
25 would be the remaining ultimate primary recovery from

1 the project area?

2 A. Yes, we did. That's illustrated in Exhibit
3 8.

4 Q. How did you do that?

5 A. We performed individual decline curve
6 analysis on all of the tracts that currently had
7 production. There were several tracts that only had
8 shut-in wells, but we performed routine decline curve
9 analysis and then composited the individual decline
10 curve analysis of all the producing tracts into a
11 composite remaining primary.

12 Q. Let me have you turn to Exhibit 8. What
13 have you prepared and illustrated on this exhibit?

14 A. Exhibit 8 shows the historical oil
15 production from the unitized area in black through
16 1992. Then in red is the projected remaining primary
17 forecast. That is the composite of the individual
18 decline curves. The blue line is the forecasted
19 waterflood response, and the hachured area shows the
20 16.4 million incremental barrels we anticipate to
21 produce.

22 Q. How do you generate the change of slope to
23 show the secondary incremental oil recovered within
24 the area that's shown with the blue hatched line? How
25 do you do that?

1 A. Can you repeat that, Tom?

2 Q. Yes, sir. When you look on Exhibit 8, the
3 16.4 million --

4 A. Yes.

5 Q. -- barrels of oil, that's generated how?

6 A. That is the profile that was forecasted
7 from our black oil model of the reservoir.

8 Q. Let me have you now turn to Exhibit No. 9,
9 Mr. Maberry. Identify and describe for us Exhibit No.
10 9.

11 A. No. 9 is a spreadsheet that shows how the
12 participation formula for the unitization works. And
13 it's laid out by tract, and it shows how each tract
14 will participate in each of the six phases. The cover
15 sheet is just a description of how the formula was put
16 together and how it works.

17 Q. How many unit parameters are you using for
18 the participation formula?

19 A. There are seven unit parameters, all of
20 which were generated by the technical committee and
21 agreed upon by the working interest owners to be used
22 for unit participation.

23 Q. In your opinion, Mr. Maberry, is this still
24 a feasible project by which you can recover a
25 substantial amount of secondary oil if the Oil

1 Conservation Division will give you the necessary
2 approvals?

3 A. Yes, it is.

4 Q. Let's turn to the subject of the C-108.
5 Exhibit 10 represents your work, Mr. Maberry?

6 A. That's correct.

7 MR. KELLAHIN: Mr. Examiner, the white
8 binder, three-inch binder, is the C-108.

9 Q. Describe for us how you organized the
10 exhibit book that deals with the underground injection
11 control approvals.

12 A. This binder is an expansion of the State
13 Form C-108, which is included behind the first tab
14 labeled C-108. Each subsequent tab contains the
15 information that's required under each of the numbered
16 exhibits on the State Form C-108, and they fall in
17 behind. And some of those exhibits have been further
18 sectioned off to help clarify the information.

19 Q. When we look at the plan of operation for
20 the injection wells, what do you propose to do with
21 regards to the pressure at which that water is
22 injected into each of the injection wells?

23 A. At this time we anticipate maximum pressure
24 to be 1,220 pounds, which corresponds to the 0.2 psi
25 preferred state limit.

1 Q. Would it provide the operator flexibility
2 under that plan of operation if the Division allowed
3 you to increase the surface pressure limitation based
4 upon separate tests?

5 A. Yes, it would.

6 Q. Would you desire to have an administrative
7 procedure to accomplish increases in the surface
8 pressure limitation?

9 A. Yes.

10 Q. The volume of water to be injected into
11 each injection well, can you give us a general range?

12 A. We anticipate about 1,000 to 1,200
13 initially during fill-up, and that will taper off to
14 about 750 barrels per well per day once fill-up is
15 achieved.

16 Q. Give us a summary of how the plan of
17 operation is supposed to work in order to begin to see
18 a positive injection response that gets us additional
19 secondary oil recovery.

20 A. Well, initially, we'll drill the infill
21 injector locations, which will be on 20-acre infill.
22 Then we will commence injecting water. We anticipate
23 that will be on vacuum until we reach fill-up. Once
24 fill-up is achieved and the reservoir starts
25 pressuring up, then it will begin to displace oil

1 towards the producing well.

2 Q. In terms of a source for injection water to
3 be used in the project, what sources will you take
4 water from?

5 A. We will be reinjecting the water, produced
6 water, from the unitized formation. In addition, we
7 will be using makeup water from the Abo formation,
8 from the San Andres formation, and also anticipate
9 using a small portion of fresh water for makeup.

10 Q. The entire unit area consists of State of
11 New Mexico oil and gas leases?

12 A. That is correct.

13 Q. There are no other kinds of properties
14 involved in the unit?

15 A. That is correct.

16 Q. Have you personally met with the technical
17 people at the Land Office and have subsequently
18 obtained approval of the Commissioner of Public Lands
19 to utilize a certain portion of makeup water as fresh
20 water?

21 A. Yes, we have.

22 Q. Under the current plan of approval what is
23 the volume of fresh water that can be used for makeup
24 purposes?

25 A. Cumulative volume of 6.6 million barrels.

1 Q. Take us through some of the items that you
2 have addressed and examined in terms of the C-108
3 review for your project.

4 A. Okay. Behind the first tab is the
5 completed form of the State Form C-108 with the
6 appropriate information and signature.

7 Next would be Exhibit 3, and it is further
8 subdivided. We've included a proposed well-numbering
9 scheme just to orient you to all the new well
10 designations for all the wells being contributed.

11 Behind that is a table of the nine existing
12 wells that we will be converting to water injection.
13 The table identifies them, their former lease name and
14 number, former operator, API number, and then some
15 construction information.

16 That will be followed up by an individual
17 injection well data sheet and a wellbore schematic on
18 each of those nine wells which detail the construction
19 of the wells.

20 Q. For each producer that is to be converted
21 to an injector, that's contained within this section
22 of the book?

23 A. Yes. They'll have an individual well data
24 sheet and a schematic.

25 Q. Are they each unique unto themselves as to

1 change, or is there a general pattern?

2 A. They are unique. I mean, in general they
3 are completed in the Glorieta, and there is sufficient
4 cement behind each casing string to prevent migration,
5 but each one is of unique construction.

6 Q. Continue then. What else do we find?

7 A. The next tab is a list of six wells that we
8 will be drilling as infill wells that will initially
9 be produced and then converted to injection in about
10 two to three years. There's a table of those, and
11 behind those are two typical data sheets and typical
12 wellbore schematics.

13 And the reason that there are two, one will
14 be a completion if we anticipate the well to be
15 drilled in the Vacuum Waterflow area, and the other
16 will be if it's anticipated to be drilled outside of
17 the Waterflow area. If it is not within the Waterflow
18 area, we will set two strings of pipe. Cement will be
19 circulated to surface on both strings.

20 It's anticipated in the Waterflow area we
21 will set three strings of pipe to further protect the
22 fresh water and the Salado salt section. And, again,
23 all three strings will be cemented back to the
24 surface.

25 Q. Okay. The next section?

1 A. The next section is a list of the wells
2 that will be drilled strictly for injection, the
3 infill locations, and, again, behind them we have
4 included typical injection data sheets and schematics
5 that are similar to the ones I previously described.

6 Q. All these new injection wells are to be
7 drilled and completed in a fashion that will protect
8 fresh water sources?

9 A. That is correct.

10 Q. And will provide an opportunity to allow
11 the injected fluids to remain confined to the injected
12 interval?

13 A. That's correct.

14 Q. Please continue. What do we find in the
15 next section?

16 A. The next is Exhibit 5. It's two plats.
17 The first plat shows an outline of the proposed unit
18 and the one-half mile radius that delineates our area
19 of review.

20 The second plat is a plat that shows,
21 identifies all the wells and lease ownership. Again,
22 the unit boundary is highlighted in red, and it has a
23 two-mile radius that shows the land ownership and
24 identifies the wells within a two-mile radius of our
25 proposed unit.

1 Q. For each and every of the wells within the
2 area of review, have you provided to the Division the
3 necessary details required by the Division in order to
4 make an investigation of the integrity of those
5 wellbores?

6 A. Yes, I have. Those are included in Exhibit
7 6.

8 Q. And have you personally as an engineer made
9 that investigation?

10 A. Yes. I've investigated every wellbore.

11 Q. Have you applied the criteria that the
12 Division uses for wellbore integrity as you make your
13 own investigation?

14 A. Yes, sir.

15 Q. As part of that review, did you find any,
16 what the Division might characterize, problem wells
17 that would cause you as an engineer to say I need to
18 go out and fix that well?

19 A. No, I have not, but I did identify three
20 wells that I believe require some clarification.

21 Q. Apart from the wells that require
22 clarification, then, there is -- including those
23 wells, there is no well within the area of review that
24 would constitute a problem well?

25 A. That's correct.

1 Q. Have you provided a -- let me ask the
2 source of the information. When you look at the area
3 of review wells, what's the source of the data that
4 you've utilized to make your investigation?

5 A. Each individual contributing operator
6 submitted the completion data and subsequent work-over
7 data for all their wells. We compiled the base data
8 from that and then confirmed that with the NMOCDC files
9 here in Santa Fe.

10 Q. Continue through the book and tell us what
11 the next section is.

12 A. Exhibit 6 is split up in, I believe, six
13 sections, hopefully to make it a little more clear.

14 The first section are all the wells that
15 are being contributed to the Glorieta Unit that are
16 either active, shut in, or temporarily abandoned.
17 There is, again, a table listing the wells, their
18 locations, API numbers, and some construction data.
19 The construction of each individual well will be
20 detailed in the subsequent wellbore schematics. And
21 there are 101 wellbore schematics in this section.

22 That's followed up by the plugged and
23 abandoned wells that are being contributed as part of
24 the unit. There are four of those. We've separated
25 those because they probably require a little bit more

1 scrutiny. Again, there's a table of all four wells
2 and then individual well schematics follow those up.

3 We separated the wells that were within the
4 area of review but not being contributed to the unit.
5 They're in the following section. Again, we separated
6 between active wells and P & A'd wells.

7 So next is a table of all the wells that
8 are within the area of review but not being
9 contributed to the unit. There are 123 of those.
10 Again, each one will have a schematic.

11 Q. Let me ask you about the P & A'd wells
12 within the project area.

13 A. Yes.

14 Q. You have provided individual well
15 schematics for the P & A'd wells?

16 A. Correct.

17 Q. Do you find any of those wells to be
18 plugged and abandoned in such a way that they pose a
19 risk?

20 A. No, I do not.

21 Q. They would not be a source of migration of
22 injection fluids either to fresh water sands or to
23 other producing formations?

24 A. All four have been properly sealed.

25 Q. When we go to the P & A'd wells outside of

1 the unit area but still within the area of review, do
2 you find any P & A'd wells that are not adequately
3 plugged and abandoned?

4 A. No, I do not. They're all properly sealed.

5 Q. All right, sir, continue through the book.

6 A. Again, the next section are the plugged and
7 abandoned wells that are within the area of review.
8 There are 11 of those, and, again, there's a table and
9 subsequent wellbore schematics on each of those.

10 I've also included just a table of the
11 wells that were currently permitted at the time that I
12 performed the review up here in Santa Fe, just to
13 provide a list of wells that were anticipated to be
14 drilled in the near future. Some of those may be
15 currently being drilled.

16 Do you wish me to continue on?

17 Q. Yes, sir, please.

18 A. The next is Exhibit 7. It is a summary of
19 the proposed operation. It goes through our
20 anticipated rate and pressure and describes where the
21 makeup water will come from. It provides chemical
22 analysis for the makeup water and a discussion as to
23 its compatibility with the reservoir.

24 I guess I'd make the statement we do find
25 that the makeup waters will be compatible.

1 Q. Do you find any indication that there is
2 any faulting or other hydrologic connections by which
3 fluids would migrate out of the injection zone or area
4 into fresh water sands?

5 A. No, we do not.

6 Q. All right, sir. Anything else in the C-108
7 book?

8 A. The rest of it is just information that's
9 requested as part of the application form.

10 Q. Let's turn now to Exhibit No. 11 and talk
11 about the specific location and the deepest known
12 depth of fresh water within the area.

13 A. Yes. This is an exhibit that I prepared.
14 It is a list of all the fresh water locations within
15 the area of review, giving its surface location, the
16 aquifer name, which in every case is the Ogallala, and
17 the deepest occurrence of that is 234 feet. That
18 information was compiled by Mr. O'Hare of the State
19 Engineer's Office in Roswell.

20 Q. What is the vintage of the information
21 compiled on here? When did you contact him?

22 A. Within the last month.

23 Q. With the reported fresh water in the area
24 being -- what's the deepest depth, 234?

25 A. Yes.

1 Q. Do you see any opportunity for exposing
2 fresh water sources to a risk if this project area is
3 approved?

4 A. No, I do not.

5 Q. You said that you had identified three
6 wells within the area of review that required of you
7 further investigation and study?

8 A. That's correct.

9 Q. Have you reduced that study information to
10 displays and information shown on an exhibit?

11 A. Yes. It's Exhibit No. 12.

12 Q. Okay. Let's turn to the plat that is the
13 first page of that study and have you locate for us
14 the three wells that you've described as wells that
15 you thought bore further study as a reservoir
16 engineer.

17 A. The three wells are located on the plat.
18 Again, this is a reproduction of the unit boundary and
19 area of review.

20 MR. STOVALL: Mr. Kellahin, that's supposed
21 to be in the book?

22 MR. KELLAHIN: No, it's outside the book.
23 It's the next -- it will look like this.

24 EXAMINER CATANACH: Here it is.

25 Q. (BY MR. KELLAHIN) All right, Keith.

1 You've identified the three wells on the display?

2 A. Yes. From northeast to southwest, they are
3 the Vacuum Abo Well No. 5-02, Vacuum Abo Well No.
4 11-05, and Vacuum Abo Well No. 14-01. All three wells
5 lie within the area of review but outside the unit
6 boundary. All three wells are operated by Phillips
7 Petroleum Company.

8 Q. In going through your area of review
9 investigation, using the criteria of the Division to
10 identify potential problem wells, what caused you to
11 further investigate these three wells?

12 A. In the case of these three wells, there was
13 no record of a measured top of cement; so I had to
14 calculate the top of cement. When I used the NMOC
15 method, which is using a slurry yield of 1.32 cubic
16 feet per sack and assuming 50 percent excess, the
17 calculated top of cement on these three wells was
18 below the top of the unitized formation.

19 Q. What then did you do?

20 A. I went back and investigated what actual
21 slurries were used and the yield of those actual
22 slurries. When I used the actual slurry yield instead
23 of the 1.32, and still assuming that 50 percent of
24 that slurry yield was excess, I then calculated tops
25 of cement that are well above the unitized formation.

1 Q. How did you go about verifying or
2 authenticating the correct or the accurate slurry
3 yield by which to make the calculation?

4 A. I pulled the slurry, the reported slurry
5 volume and design from the records and submitted that
6 to Halliburton Cementing Services, and they provided
7 me with a letter that is included at the back of this
8 exhibit, giving me the engineering details including
9 the yield, actual slurry yields.

10 Q. Why did you submit it to Halliburton?

11 A. Because they're a fairly widely recognized
12 industry cementing company, and in fact the slurries
13 were of Halliburton design.

14 Q. Let's go to the schematic for the Vac Abo
15 Unit No. 2 well, which is the first schematic behind
16 the locator map?

17 A. Yes.

18 Q. Let's use that to illustrate what you did,
19 Mr. Maberry.

20 A. Okay. These are reproductions of the
21 schematics that you'll find along the way.

22 Q. Let's go back to the schematic and have you
23 show us then how you have made the calculation and
24 what conclusions you've reached, and let's use this
25 first schematic as an illustration then of your

1 method.

2 A. Okay. That is a schematic for the Vacuum
3 Abo Unit, Tract 5-2, and the black hachured portion
4 that is outside the production casing string
5 represents the calculated top of cement that I would
6 get if I would used the 1.32 cubic feet per sack yield
7 and a 50 percent excess.

8 And you can see, it was calculated to be
9 6645 feet, which is below the unitized interval. If I
10 use the actual cement slurry, and still assuming the
11 50 percent excess, my calculated top of cement is 4175
12 feet, which is nearly 2,000 feet above the unitized
13 interval.

14 Q. Give us a sense on this illustration where
15 the top of the unitized interval is.

16 A. The top of the unitized interval will be
17 approximately 5800 feet, but the top of the injection
18 interval is about 6100 feet.

19 Q. Using the calculation of the actual slurry
20 yield number, and also still assuming a 50 percent
21 excess safety adjustment, if you will, what is the
22 vertical volume or distance between the top
23 perforations and the injection interval and the top of
24 the cement as calculated?

25 A. It's approximately 2,000 feet in this well.

1 Q. Using that same method, tell us where that
2 relationship is on these other two wells.

3 A. It will be approximately 2100 feet in well
4 11-5, and about 800 feet in well 14-1.

5 Q. What does that information cause you to
6 conclude as a reservoir engineer?

7 A. I conclude that we have sufficient cement
8 behind the production casing to prevent migration of
9 injected fluids out of the zone.

10 Q. Are these wellbores already in an area of
11 review for an existing waterflood project in any other
12 formation?

13 A. Yes, they are. All three penetrate the San
14 Andres within the East Vac Grayburg-San Andres Unit
15 which has been under pressurized waterflood since
16 1978.

17 Q. Where is that pressurized waterflood in
18 relation to your flood?

19 A. It's in the San Andres, which is
20 approximately 4,000 feet, about 2,000 feet above our
21 unitized formation.

22 Q. Have any of these three wells ever
23 displayed any kind of failure difficulty or source of
24 migration as a result of being subjected to pressures
25 from the other flood?

1 A. No, they have not.

2 Q. No indication of any kind of problem with
3 these wells?

4 A. No, sir.

5 Q. What do you conclude?

6 A. I conclude empirically that we have
7 sufficient cement across the San Andres also; so it's
8 well above our unitized formation.

9 Q. Tell us what else is included in the
10 exhibit package that's marked as No. 12.

11 A. Behind the sketches are my detailed
12 calculations, showing the calculated top of cement for
13 each well, using the NMOCD method and using the actual
14 slurry calculations.

15 And then the last two sheets are a copy of
16 the Halliburton letter showing the actual slurry
17 yields.

18 Q. Have you contacted Texaco to see if they
19 have had any kind of operational difficulty with the
20 project area to the west of yours?

21 A. Yes, I have. I talked to Mr. Dan Dunham,
22 who is their operations engineer. They have commenced
23 injection approximately six months ago on their west
24 unit. They have performed 12 radioactive tracer
25 profiles, and all 12 show the injected fluid staying

1 within the unitized formation, no migration.

2 Q. Within the project area that you're
3 proposing, are you aware of any kind of difficulty
4 that would expose the fresh water sands to
5 contamination?

6 A. No, I am not.

7 Q. What is the timing of the project, Mr.
8 Maberry? What do you propose for a chronology here?

9 A. We would like to take over operation of the
10 unit December the 1st, 1993.

11 MR. KELLAHIN: That completes my
12 examination of Mr. Maberry, Mr. Catanach. We move the
13 introduction of his exhibits 1 through 12.

14 EXAMINER CATANACH: Exhibits 1 through 12
15 will be admitted as evidence.

16 EXAMINATION

17 BY EXAMINER CATANACH:

18 Q. Mr. Maberry, within the unit, you said you
19 had 47 different tracts?

20 A. That's correct.

21 Q. Do you know how many different working
22 interest owners there were in the unit?

23 A. Originally, there were ten, and we
24 subsequently acquired Mobil's interest; so there are
25 now nine. Phillips had acquired Mobil's interest.

1 Q. All the royalty interest is the State of
2 New Mexico?

3 A. That is correct.

4 Q. And as I understand, the state, the
5 Commissioner of Public Lands has approved the project?

6 A. We have preliminary approval from the State
7 Land.

8 Q. Do you have a letter to that effect?

9 MR. KELLAHIN: Yes, sir. The landman is
10 going to present it.

11 EXAMINER CATANACH: Okay.

12 Q. The unitized interval, as I understand it,
13 is the top of the Glorieta to the top of the Blinbry?

14 A. Correct.

15 Q. And you're going to use this as the type
16 log, the Bridges State No. 95?

17 A. Yes, sir.

18 Q. Is the entire paddock productive in the
19 unit?

20 A. The Upper Paddock is the only continuous
21 formation that is productive across the unit interval.

22 There is limited productive interval in the
23 Lower Paddock on the extreme west part of our unit,
24 and the Glorieta sands are open in some of the
25 wellbores, but my understanding is it's not

1 particularly productive, that those would be very
2 isolated lenses.

3 Q. So you're going to focus all your efforts
4 on the Upper Paddock formation?

5 A. That's correct.

6 Q. Are most of the wells -- most of the wells
7 are just completed in the Upper, not the Lower?

8 A. Yes, that's true, in general. Again, on
9 the extreme west side, there are a small number of
10 wells that are completed in the lower also.

11 Q. Generally, do you know what the average
12 production in the unit is?

13 A. That's a rather difficult question to
14 answer because there is no average. We go from the
15 range of having wells that have been depleted or
16 watered out a number of years ago to top allowable
17 wells.

18 If I had to pick an average, I would guess
19 in the 20- to 30-barrel-a-day range, but it's a wide
20 standard deviation from that.

21 Q. How many top allowable wells are there?

22 A. I believe I checked the data through May,
23 which is the current data, and there were four at that
24 time.

25 Q. Is there a pretty good range of producing

1 rates in the unit?

2 A. Yes. They go from stripper to top
3 allowable.

4 Q. Aside from the top allowable wells, there's
5 still a pretty good range below there, or they're not
6 --

7 A. I would say the majority, especially as you
8 head towards the west boundary, are of the stripper
9 variety. There's an area surrounding a top allowable
10 well where we still have fairly productive, but as you
11 draw away from that one area, it's predominantly
12 depleted and stripper status. The development of the
13 waterflood will be to pressure up that depleted area
14 first and then develop towards the top allowable
15 wells.

16 Q. The estimated secondary recovery, 16.4
17 million barrels, that is solely based on a model?

18 A. Yes, that's solely based on the forecasted
19 response of our 3D model.

20 Q. What kind of ratio is that, primary to
21 secondary?

22 A. You're going to make me do math in my
23 head. It would be -- we have 43 million cumulative
24 barrels. So it's, I would guess, an additional third,
25 if my math is correct.

1 Q. Okay. The participation formula has been
2 agreed to by all working interest owners?

3 A. That is correct.

4 Q. As I understand it, this is going to be a
5 phased project?

6 A. It will be implemented in three annual
7 phases. We'll start development in the northwest
8 portion of the field. That is the most depleted
9 area. So we want to get water in there first and get
10 the reservoir filled up. And then it will be
11 developed back towards the south and east in three
12 annual stages.

13 Q. You stated that you had a naturally
14 occurring water influx. What direction was that from?

15 A. It's along the south and east flank, and
16 then it curls around to the eastern portion of the
17 north flank, almost in a horseshoe pattern.

18 Q. Exhibit No. 5, you've got the unit outline
19 in the waterflood project outline, and I understand
20 the reasons why they don't coincide. The red outline
21 is in fact the waterflood?

22 A. That is the waterflood project area, yes.

23 Q. You've got some acreage in there,
24 especially to the south and west, that really doesn't
25 look like it's going to be affected by injection, but

1 you've still included that in the waterflood area?

2 A. The portion along the lease line?

3 Q. Correct.

4 A. Yes. There's a common lease line boundary
5 with Texaco's West Unit. In their West Unit
6 waterflood comes up to that boundary. My
7 understanding of the project area was the immediate
8 offset and diagonal offset producing wells to an
9 injection well.

10 Q. In fact, does Texaco have injection wells
11 offsetting those?

12 A. Yeah. Their pattern will come up and butt
13 up against those lease lines. So our producing well
14 is immediately inside. That line of lease line
15 injector should be influenced by the flood.

16 Q. Can you submit some additional information
17 on the location of the injection wells offsetting
18 those producing wells?

19 A. On the Texaco side?

20 Q. Right.

21 A. Yes.

22 Q. I don't know if we have those readily
23 accessible. And you might have those easier than we
24 can get ahold of them.

25 A. I have a copy of their development plan. I

1 can provide that.

2 Q. What is the status -- or let me ask you
3 this. What is the general location of the Waterflow
4 area within the unit?

5 A. It is on the extreme southwest flank of our
6 unit. It is primarily centered over on Texaco's
7 Central Vac and Vac Glorieta West Unit. And, in fact,
8 in our engineering premise, we only premised three of
9 the infill injection wells to be within the waterflood
10 area.

11 Q. That is in the salt section?

12 A. That is in the Salado salt section.

13 Q. Mr. Maberry, on the three problem wells
14 that you identified, if the Division still has
15 questions about those wells, is it possible to run
16 bond logs on those wells to verify cement tops?

17 A. One of those wells is temporarily
18 abandoned. One of them is a current injector. And
19 one is a current producer.

20 We attempted to run a cement bond log on
21 the temporarily abandoned well, and what it showed it
22 was that there was no contact between the cement and
23 the pipe anywhere across the interval that we logged,
24 which was from 8,100 feet to 2,000 feet. That's not
25 atypical for a well of that vintage because over time

1 what happens is the cement will separate ever so
2 slightly from the production casing, and then that
3 makes an ultrasonic tool such as a cement bond log
4 ineffective because all it reads is the vibrations off
5 the cement -- excuse me -- off the pipe, and it
6 doesn't read the continuation of the signal through
7 the cement. So a bond log may not be a good
8 indicator.

9 Q. Did it in fact indicate the cement top?

10 A. No. It did not read cement anywhere along
11 the entire interval. It's a phenomenon known as a
12 micro annulus. It's somewhat common in wells of an
13 older vintage.

14 Q. Is there another method that can be used?

15 A. The only remedy for that would be to
16 pressure the casing up and in fact balloon it to where
17 this annulus -- well, the casing is ballooned up to
18 where the annulus is gone. You're now back in
19 contact, which we anticipate would require about 3,000
20 pounds surface pressure.

21 Operationally, we feel that's pretty risky
22 on wells that are 30, 35 years old and have had a long
23 service. We may in fact create a problem just by
24 trying to make that measurement.

25 Q. How many injection wells are you initially

1 trying to get through here?

2 A. There will be a total of 43.

3 Q. You mentioned something about the well
4 being \$24.9 million initial investment, and after that
5 you said something about another figure, and I think I
6 missed that.

7 A. That was the additional operating cost,
8 \$87.7 million.

9 Q. That's operating cost over the life of the
10 project?

11 A. That's correct, and that's in 1993 dollars.

12 Q. How long was that projected to go on?

13 A. To the year 2020.

14 EXAMINER CATANACH: I think that's all I
15 have of the witness at this time, Mr. Kellahin.

16 MR. KELLAHIN: We've got two more
17 witnesses, do you want to take a break now, or did you
18 want to go through those?

19 EXAMINER CATANACH: Let's roll on.

20 MR. KELLAHIN: Mr. Catanach, Phillips'
21 geologic witness for this project is Mary Tisdale.

22 MARY TISDALE,
23 the witness herein, after having been first duly sworn
24 upon her oath, was examined and testified as follows:

25 EXAMINATION

1 BY MR. KELLAHIN:

2 Q. Would you please state your name and
3 occupation.

4 A. Mary Grace Tisdale, and I am a geological
5 specialist for Phillips Petroleum in Odessa, Texas.

6 Q. You're soft-spoken, Mary. You're going to
7 have to speak up for us.

8 A. Okay.

9 Q. Have you testified before the Division
10 before as a petroleum geologist?

11 A. No, I have not.

12 Q. Summarize for us your educational
13 background.

14 A. I've got a Bachelor of Science Degree in
15 geology in 1978 from the University of South Carolina
16 and a Master of Science Degree in geology in 1981 from
17 the University of South Carolina. I have 12-1/2 years
18 of experience in the oil industry as a petroleum
19 geologist, working both domestically and
20 internationally.

21 I'm currently, as I said, a geological
22 specialist with Phillips Petroleum in the Permian
23 Basin region. My primary area of responsibility is
24 the East Vacuum area which includes the San
25 Andres-Grayburg Unit, our proposed Glorieta Unit, and

1 our Vac Abo Unit.

2 MR. KELLAHIN: We tender Miss Tisdale as an
3 expert petroleum geologist.

4 EXAMINER CATANACH: Miss Tisdale is so
5 qualified.

6 Q. (BY MR. KELLAHIN) Have you made an
7 investigation of the geology for this project in
8 association with Mr. Maberry's engineering work?

9 A. Yes. I have reviewed the geological
10 engineering technical report, all the published
11 information, all the work that was done internally at
12 Phillips, and also a master's thesis that was done at
13 the University of Texas Permian Basin on the
14 stratigraphy of the area.

15 Q. Based upon that review and that source of
16 information, were you able to reach geologic
17 conclusions concerning this project?

18 A. Yes, I was.

19 Q. Were you able to reach any type of geologic
20 conclusions about the feasibility geologically to take
21 a portion of this pool and subject it to waterflood in
22 order to recover additional oil out of that formation?

23 A. Yes, I was.

24 Q. And what did you conclude?

25 A. We concluded that the Upper Paddock, as

1 previously identified, is the primary reservoir within
2 the eastern -- within the East Unit, and that it does
3 have lateral continuity, and is a primary candidate
4 for waterflood.

5 Q. Were you able also to reach any geologic
6 conclusions about the size and shape of the unit and
7 whether that shape and size has any logic to the
8 underlying reservoir?

9 A. Yes, we were.

10 Q. What did you conclude?

11 A. We concluded that the unit boundaries
12 coincide with the structural closure at the paddock
13 interval and also your productive interval within the
14 main paddock reservoir.

15 Q. Let's talk about some of the specific
16 evidence and details that support those conclusions.

17 A. Sure.

18 Q. If you'll take us back to the type log, Mr.
19 Maberry has already introduced that as Exhibit No. 3,
20 but if you'll go back to that same exhibit for us,
21 let's talk about what you see as a geologist.

22 A. As has been previously stated, Exhibit 3 is
23 the type log for the Vacuum Glorieta Pool. It is the
24 Mobil Bridges State No. 95 Well.

25 On this type log we've identified our

1 unitized interval, which is from the top of the
2 Glorieta at 5838 measured depth, subsea depth of 1822
3 to the top of your Blinebry at 6235 feet measured
4 depth, a subsea depth of 2219 feet.

5 Q. Do you know whether or not this type log is
6 being utilized by the Division and other operators by
7 which to tie in the vertical limits for the pool?

8 A. Yes. This is the designated type log for
9 the Vacuum Glorieta Pool.

10 Q. Let's turn now to Exhibit No. 13. What are
11 we looking at?

12 A. Exhibit 13 is a structure map on the top of
13 the Glorieta formation, which is the top of the
14 unitized interval. On this map you can see our
15 proposed Vacuum Glorieta East Unit. It's highlighted
16 in red. And the Texaco Vacuum Glorieta West Unit is
17 in blue.

18 What this map shows is that the structure
19 at both the Glorieta and Paddock formation is an
20 asymmetrical anticline that trends northeast-
21 southwest. On this map, the top of your Glorieta
22 ranges from 1900 feet subsea to 2100 feet subsea
23 within our unit area. And the paddock is
24 approximately 150 feet below this.

25 On this map you also see the locations of a

1 cross-section C-C', which is a north-south
2 cross-section, and cross-section A-A', which is an
3 east-west cross-section.

4 Q. Let's turn to the C-C' cross-section,
5 Exhibit No. 14, and see what the reservoir looks like
6 when we go in that direction. It's the north-south
7 dimension we're looking at.

8 Hang on just a minute. Let me unfold.

9 Let's start at the top and work down.

10 A. Okay. This is a structural cross-section,
11 running north-south, and it's hung on a datum of minus
12 1,000 feet.

13 Q. Reliable marker for you to correlate logs
14 so everybody agrees --

15 A. That's the structural depth.

16 Q. I understand.

17 A. This is the structural section that's hung
18 on depth.

19 Q. The correlating markers, though, used for
20 making the cross-section are well-identifiable?

21 A. Yes.

22 Q. There's not going to be disagreement among
23 the geologists about how to construct the
24 cross-section?

25 A. No, not at all. The cross-section shows

1 the top of our San Andres Unit, and it shows the top
2 of the Glorieta formation, the top of your Paddock
3 formation, which is our main reservoir in the East
4 Unit, and also our waterflood candidate.

5 Below that you'll see the oil-water contact
6 in the Paddock formation. And at the top of the
7 cross-section you'll see our unit area designated.

8 What this shows is our northern and
9 southern boundaries of the unit are delineated by
10 structural closure and by your productive area within
11 the Paddock formation.

12 Q. I see. It's the area defined within the
13 dimensions of these two arrows at the top?

14 A. Yes.

15 Q. When you project that distance down on your
16 structure map, you'll see a change in structure at
17 both the north and the south ends of the unit?

18 A. Yes.

19 Q. Tell us something about this oil-water
20 contact. You've marked that on the cross-section?

21 A. Yes. It's at approximately 2,215 feet
22 subsea, and it was picked in all the wells. There
23 were 180 wells that were used for log analysis. This
24 is in the two units for the technical study that was
25 done for both the East and the West Unit. It was

1 picked on those wells.

2 Q. The target zone for the waterflood is going
3 to be what area then as shown on the cross-section?

4 A. It will be the area between the top of your
5 Paddock and the oil-water contact in the Paddock
6 formation.

7 Q. Let's see what this looks like when we go
8 east-west, Exhibit 15.

9 A. Exhibit 15 is an east-west structural
10 cross-section hung on the same datum of minus 1,000
11 feet. It has designated the same formations, your San
12 Andres formation is designated at the top, the top of
13 your Glorieta, the top of your Paddock formation, the
14 oil-water contact. And at the top of this
15 cross-section, you will see this extends through the
16 proposed East Unit, through your West Unit, and off
17 the structure to the west.

18 Q. Start on the far left at the A, which will
19 be the west side of the structure?

20 A. Which will be the west side, yes.

21 Q. And take us to the point on the
22 cross-section where we hit the political boundary
23 between the Texaco-operated unit and the proposed
24 Phillips unit. That's designated by the point on the
25 cross-section where you have the arrows going in the

1 opposite directions. That's the point of the
2 political boundary between the two operations?

3 A. Yes, that is. You start with your
4 Continental State 35-11 Well, which was not productive
5 in the Paddock. It was dry and abandoned, and it is
6 offstructure in our Paddock formation.

7 Then as you come west, you come upstructure
8 into Section 36, which you can see in the West Unit,
9 Section 36 is the top of your structure.

10 Then --

11 Q. As you go then farther east, you come to a
12 point of significance for you as a geologist in
13 changing the structure?

14 A. No. The boundary is really not significant
15 geologically.

16 Q. Not between you and Texaco?

17 A. Not between the Texaco unit and the
18 proposed Phillips unit.

19 Q. When you go farther east, though, to get
20 the other end of your boundary, is there a geologic
21 boundary there?

22 A. Yes. As you go further east, you are, once
23 again, going offstructure, and you will see that the
24 boundary of the unit to the east coincides with the
25 limit of your production in the Paddock or your

1 oil-water contact.

2 Q. Let's go now finally to the isopach that
3 was already introduced. It's Exhibit No. 4. This is
4 the isopach of what?

5 A. This is the net pay isopach of the Paddock
6 reservoir, the main Paddock reservoir as seen in the
7 East Unit.

8 Q. What is the criteria for determining net
9 pay?

10 A. It is contributing to your production. It
11 is across the impermeability that is actually
12 contributing to your production.

13 Q. Did you use a net pay porosity cutoff of
14 some number or some value?

15 A. Yes, we did. All that was determined by
16 the geologic committee, and it's published in the
17 November 1990 report.

18 Q. So there was widely accepted agreement
19 about how to construct the map and what values to use
20 in that construction?

21 A. Yes.

22 Q. What does this show you as a geologist?

23 A. What this shows -- once again, the unit
24 outlines are designated on the map. What this shows
25 is that the extent of the productive area coincides

1 with our unit boundary to the north, south, and east,
2 within the East Unit.

3 It also shows the net pay within the East
4 Unit ranges from 5 feet to 138 feet of pay with an
5 average of 58 feet.

6 The other thing that it shows is the
7 western boundary of our unit is our boundary with the
8 Vacuum Glorieta West Unit.

9 Q. Do you have an opinion as a geologist as to
10 whether it's geologically feasible to waterflood this
11 particular portion of the pool within this boundary?

12 A. Yes. From the stratigraphic work that was
13 done in the area and from the cross-sections, you can
14 see that there is lateral continuity in your Upper
15 Paddock formation. And we feel from that and from our
16 isopach maps that we are going to be able to flood
17 this reservoir.

18 MR. KELLAHIN: That concludes any
19 examination of Miss Tisdale.

20 We move the introduction of her Exhibits 13
21 through 15.

22 EXAMINER CATANACH: Exhibits 13 through 15
23 will be admitted as evidence.

24 EXAMINATION

25 BY EXAMINER CATANACH:

1 Q. Miss Tisdale, did you examine the Lower
2 Paddock within the unit?

3 A. I personally did not examine the Lower
4 Paddock. It was examined in the technical report
5 dated November 1990, and it was determined that the
6 Paddock was primarily productive in the West Unit, and
7 thus that production would be included in the West
8 Unit and not the East Unit.

9 Q. So is it also your opinion that the Lower
10 Paddock is probably not continuous over the East Unit?

11 A. Yes, it is not continuous. It is not
12 present in the far eastern portion, or it does not
13 have porosity and permeability in the far eastern
14 portion. In the western portion, it does not appear
15 to be continuous.

16 EXAMINER CATANACH: I don't have any
17 further questions, Mr. Kellahin.

18 MR. KELLAHIN: Call at this time Mr. Hall.

19 Mr. Hall is Phillips' landman in charge and
20 responsible for the documentation of the unit.

21 PAUL HALL,
22 the witness herein, after having been first duly sworn
23 upon his oath, was examined and testified as follows:

24 EXAMINATION

25 BY MR. KELLAHIN:

1 Q. Mr. Hall, would you please state your name
2 and occupation.

3 A. My name is Paul Hall. I'm an area landman
4 for Phillips Petroleum Company.

5 Q. On prior occasions have you testified
6 before the Division in that capacity?

7 A. No, sir, I have not.

8 Q. Give us a summary of your educational
9 background and your employment experience as a
10 petroleum landman.

11 A. I have a degree in business administration
12 from Central State University in Edmond, Oklahoma. I
13 am a Certified Professional Landman through the
14 American Association of Petroleum Professional
15 Landmen. I have worked for 17 years as a landman for
16 Phillips Petroleum Company. I have extensive
17 experience in dealing with federal and state lands in
18 the Rocky Mountain area.

19 Q. Is it your responsibility to handle the
20 land title matters with regards to this particular
21 unit for your company as the proposed operator?

22 A. Yes, sir.

23 Q. And have you done that?

24 A. Yes, sir.

25 MR. KELLAHIN: We tender Mr. Hall as an

1 expert petroleum landman.

2 EXAMINER CATANACH: Mr. Hall is so
3 qualified.

4 Q. (BY MR. KELLAHIN) Let me turn your
5 attention, sir, to Exhibit No. 16. Identify that for
6 us.

7 A. This is the unit agreement as has been
8 negotiated with the working interest owners in the
9 proposed Vacuum Glorieta East Unit.

10 Q. Attached to that unit agreement have you
11 provided tabulations or exhibits that set forth the
12 ownership of each individual tract?

13 A. The ownership in Exhibit B shows the
14 ownership of the working interest owners by tract
15 within the unit area. The Exhibit C that is attached
16 to there is a schedule of tract participation through
17 all phases of the unit.

18 Q. Have you used a unit form, Mr. Hall, that
19 is accepted by the Commissioner of Public Lands for
20 the unitization of state oil and gas leases?

21 A. It is the statutory unit form.

22 Q. Is this a format used for voluntary unit
23 agreements consisting of all State of New Mexico oil
24 and gas leases?

25 A. Yes, sir, it is.

1 Q. Have you had this agreement and the
2 supporting documentation submitted to the Commissioner
3 of Public Lands in order to obtain their preliminary
4 approval of the project?

5 A. Yes, sir, it has been.

6 Q. Have they done so?

7 A. They have approved it.

8 Q. What is the status of ratification or the
9 commitment of the interest owners to the unit?

10 A. Currently at this date and time, we have,
11 out of the nine working interest owners, we have eight
12 of them that we have signature pages in hand, and we
13 have a letter of assurance of execution from the
14 remainder. We also have executed signature pages from
15 the overriding royalty interest.

16 Q. Is the method of tract participation
17 consistent with the participation formula adopted and
18 approved by the working interest owners that Mr.
19 Maberry has discussed with us earlier this morning?

20 A. It is the same.

21 Q. Let's turn now to Exhibit No. 17. Identify
22 and describe what this document is.

23 A. This instrument is the unit operating
24 agreement for the Vacuum Glorieta East Unit which has
25 been negotiated with the working interest owners.

1 Q. What is the current status of commitment of
2 the interest owners to the operating agreement?

3 A. It is uniform with the unit agreement.

4 Q. The unit agreement and this unit operating
5 agreement then have been integrated in such a fashion
6 that they will function together?

7 A. Yes, they have.

8 Q. What is the status of the interest owners'
9 commitment to the operating agreement?

10 A. The status there again is we have executed
11 signature pages from eight of the working interest
12 owners, and we also have received letter assurance
13 from the remainder that it will be executed in the
14 near future.

15 Q. Let's turn now to Exhibit 18 and have you
16 identify and describe Exhibit 18.

17 A. This is the letter of approval granting
18 preliminary approval for the Vacuum Glorieta East Unit
19 from the Commissioner of Public Lands for the State of
20 New Mexico.

21 Q. The preliminary approval letter shows
22 changes to be made in the documentation beginning on
23 page 2. It sets forth lettered paragraphs to make
24 certain changes in the documents?

25 A. All of the requests insofar as Exhibit A

1 and B are involved with the unit agreement have been
2 made and corrected and submitted so in the instrument
3 here as Exhibit 16.

4 Q. Those simply amounted to clerical changes
5 in the document?

6 A. Just clerical.

7 Q. Let's go now to the last exhibit, Exhibit
8 19. Identify and describe that display for us.

9 A. We are indicating on this schedule here of
10 the parties that are working interest owners and the
11 overriding royalty interest owners. It is meant to
12 indicate the parties that have executed the agreements
13 to date, being the unit and unit operating agreements
14 for the Vacuum Glorieta East Unit.

15 And as you'll note, Marathon has sent us
16 written confirmation they will execute in the near
17 future.

18 Q. Give us a summary or a sense of the time
19 and effort that was expended in order to reach the
20 point of unanimous agreement to the project area.

21 A. Just solely insofar as the agreements
22 itself are involved, it has taken approximately, I
23 would say, 12 -- well, about 10 months, since the last
24 part of December last year.

25 MR. KELLAHIN: That concludes my

1 examination of Mr. Hall.

2 We move the introduction of his Exhibits 16
3 through 19.

4 EXAMINER CATANACH: Exhibits 16 through 19
5 will be admitted as evidence.

6 EXAMINATION

7 BY EXAMINER CATANACH:

8 Q. Mr. Hall, a letter of assurance is not
9 binding on anybody, is it?

10 A. We have been assured that they will
11 execute. They have had a problem insc far as number of
12 their management, and employees have been tied up
13 working on their budgeting for next year, and they
14 have assured us that it will be executed and submitted
15 prior to the approval by the OCD of the unitization.

16 EXAMINER CATANACH: I have nothing further,
17 Mr. Kellahin.

18 MR. KELLAHIN: That concludes our
19 presentation of this case, Mr. Examiner.

20 EXAMINER CATANACH: We didn't really go
21 over the EOR part of the case, but I assume that's
22 just part of the request?

23 MR. KELLAHIN: Yes, sir. It should be a
24 matter of routine for a new project like this where
25 there is no expansion of existing project. That is

1 part of our request. It's contained in detail in the
2 application, but we thought that was not necessary to
3 devote our energies to that topic. We think that is a
4 given at this point.

5 EXAMINER CATANACH: Okay. Can I get a
6 rough draft on both units and waterflood orders in
7 this case?

8 MR. KELLAHIN: Yes, sir. They will be
9 pretty smooth.

10 EXAMINER CATANACH: Is there anything
11 else? There being nothing further, Cases 10845 and
12 10846 will be taken under advisement.

13

14

15

16

17

18

19

20

21

22

23

24

25

CERTIFICATE OF REPORTER

STATE OF NEW MEXICO)
) ss.
 COUNTY OF SANTA FE)

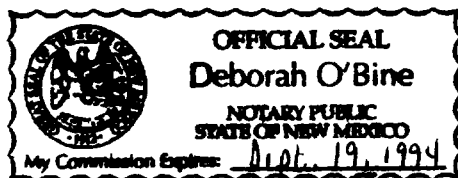
I, Deborah O'Bine, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that I caused my notes to be transcribed under my personal supervision, and that the foregoing transcript is a true and accurate record of the proceedings of said hearing.

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, October 16, 1993.

Deborah O'Bine

DEBORAH O'BINE
 CCR No. 63



I do hereby certify that the foregoing
 a complete record of the proceedings
 the Examiner hearing of Case No. 10845-10846
 heard by me on October 7, 1993

David P. Catant
 Oil Conservation Division