

NEW MEXICO OIL CONSERVATION COMMISSION

COMMISSION HEARINGSANTA FE, NEW MEXICOHearing Date OCTOBER 21, 1992 Time: 8:30 A.M.

NAME	REPRESENTING	LOCATION
DAVE BONEAU	YATES PETROLEUM	ARTESIA
JOE CHESSEX	BLM	Santa Fe
Rick Wyner	BLM	Santa Fe
JIM CARLTON	PHILLIPS PETROLEUM	ODESSA
Randy Patterson	Yates Petroleum	Artesia
James Bunn	Hinkle Law Firm	Santa Fe
Ernest Szabo	SLO	Santa Fe
L. N. Lane	New Mexico State	Hobbs
TERRY GANT	POGO Producing Co.	Midland, TX
Jim Wakefield	KROC	Tulsa, Ok.
Arthur R. Maxwell	WCNA	Houston
Chin m. Kim	WCNA	The Woodlands, TX
GARY HUTCHINSON	YATES PETROLEUM	DENVER CO
NELSON MUNCY	MYCO IND INC	ARTESIA
JOHN G. STEWART (ACQUISITION ENGR)	GPM GAS CORPORATION	ODESSA, TX
Elizabeth A Harris	Phillips Petrol. Co.	Odessa, TX

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NAME	REPRESENTING	LOCATION
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Brent May	Yates Pet	Artisan
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G. Wanner	Consult.	Alb.
W. Trammel	Abarco	Tucson, AZ.

1 NEW MEXICO OIL CONSERVATION COMMISSION

2 STATE LAND OFFICE BUILDING

3 STATE OF NEW MEXICO

4 CASE NOS. 10446, 10447, 10448, 10449

5 Consolidated

6
7 IN THE MATTER OF:8
9 The Application of Yates Petroleum
10 Corporation for Authorization to
Drill, Eddy County, New Mexico.

11 VOLUME IV

12
13 BEFORE:

14 CHAIRMAN WILLIAM LEMAY

15 COMMISSIONER GARY CARLSON

16 COMMISSIONER BILL WEISS

17
18 FLORENE DAVIDSON. Senior Staff Specialist19
20 State Land Office Building

21 October 21, 1992

22
23 REPORTED BY:24 CARLA DIANE RODRIGUEZ
25 Certified Shorthand Reporter
for the State of New Mexico**ORIGINAL**

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1 CHAIRMAN LEMAY: Good morning, this is
2 the Oil Conservation Commission. On my left is
3 Commissioner Bill Weiss. On my right,
4 Commissioner Gary Carlson representing the
5 Commissioner of Public Lands. Our attorney for
6 the day is Rand Carroll, who is taking the place
7 of Bob Stovall who is in Breckenridge, Colorado.

8 We're here to hear the continuation of
9 de novo Cases 10446, 10447, 10448 and 10449,
10 which are the applications of Yates Petroleum
11 Company to drill in the potash area, Eddy County,
12 New Mexico.

13 I think the last place we were at, we
14 were going to finish up with Yates. I think
15 Yates had one more witness, is that correct, Mr.
16 Carroll?

17 MR. CARROLL: That is correct, Mr.
18 Chairman.

19 CHAIRMAN LEMAY: Does this witness need
20 to be sworn in?

21 MR. CARROLL: No, sir. He's sworn in.
22 T. B. O'Brien would be our witness.

23 CHAIRMAN LEMAY: Is there anything that
24 either of you gentlemen would like to say before
25 we begin, or should we just get into it?

1 MR. HIGH: We're ready to roll.

2 CHAIRMAN LEMAY: Okay. Let's roll.

3 MR. CARROLL: Mr. O'Brien, would you
4 please take the stand.

5 T. B. O'BRIEN

6 Having been first duly sworn upon his oath, was
7 examined and testified as follows:

8 EXAMINATION

9 BY MR. CARROLL:

10 Q. Would you please state your name and
11 address, sir, for the record.

12 A. I'm T. B. O'Brien and I live in
13 Midland, Texas. My address is #2, Lazywood Lane,
14 Midland, 79705.

15 Q. Mr. O'Brien, what is your present
16 occupation?

17 A. I'm a petroleum engineer. I specialize
18 in drilling and completing oil and gas wells. I
19 have a company, of which I'm one of the
20 principals. The name of the company is O'Brien.
21 We operate as drilling engineers and consultants
22 to a variety of companies in the industry, both
23 domestic and foreign.

24 In addition to that, we furnish well
25 site supervisors. We have a joint venture with a

1 drilling contractor in which we do turn-key
2 drilling primarily on deep wells. We run a
3 number of schools for the industry. We consult
4 with, primarily, national oil companies in
5 connection with their field operations. That's a
6 thumbnail sketch of it, I suppose.

7 Q. Mr. O'Brien, your experience in the oil
8 and gas industry, how many years does that span?

9 A. 45 years.

10 Q. I believe you mentioned that you do
11 consulting work for both domestic and foreign
12 corporations. Does that mean that your
13 experience in the oil and gas industry goes
14 beyond the continental boundaries of the United
15 States?

16 A. Yes. My personal experience goes to 28
17 states, and I think the count is up to about 32
18 countries at this point.

19 Q. Does one of the states that you've had
20 experience include the State of New Mexico?

21 A. Yes, it does.

22 Q. Are you familiar with Southeastern New
23 Mexico and had occasion to work on and supervise
24 the drilling of wells in and around, say,
25 Carlsbad, New Mexico?

1 A. Yes.

2 Q. Now, could you state briefly what your
3 educational background or degrees are in?

4 A. I have a bachelor's degree in chemical
5 engineering from Louisiana State University, and
6 I received that degree in 1948.

7 Q. With respect to your professional
8 status, are you registered as a professional
9 engineer in any states?

10 A. I'm registered both in the State of
11 Texas and Louisiana.

12 Q. Now, you have prepared a more detailed
13 resume for the Commission, and that is Exhibit
14 No. 67, is that not true?

15 A. I think that's correct.

16 Q. The last several pages of your resume
17 include a number of authored papers, works, where
18 you've either authored works or contributed
19 chapters to other books, is that correct?

20 A. Yes.

21 MR. HIGH: Excuse me. We have not been
22 provided a copy of that.

23 MR. CARROLL: We sent it to you.

24 [Discussion off the record among
25 counsel.]

1 Q. Your work experience has included
2 working for some of the major companies, is that
3 correct?

4 A. Yes.

5 Q. In fact you've worked for Gulf Oil, is
6 that correct?

7 A. I went to the oil field working for
8 Gulf and I was on their payroll for 19 years.

9 Q. Did you help design any of their work
10 manuals during your time?

11 A. I authored the first version of the
12 Gulf Casing Design Manual, and co-authored a
13 couple of revisions to it over the years that I
14 worked with Gulf.

15 Q. That basic manual is still the manual
16 in use by Gulf Oil, is that correct?

17 A. Well, Gulf doesn't exist anymore. But
18 the same manual is in use, I think, in a somewhat
19 revised form by Chevron.

20 Q. What does API stand for?

21 A. American Petroleum Institute.

22 Q. Is that a recognized body within the
23 oil and gas industry in the United States?

24 A. Yes, it is.

25 Q. How is it recognized?

1 A. It is the, I guess, primary industrial
2 industry organization that represents the
3 industry.

4 Q. This organization is responsible for
5 developing many manuals for many of the problems
6 or everyday, I guess, work situations that you
7 encounter in the oil and gas industry, is that
8 correct?

9 A. One of the things that it does and one
10 of the early things it did and still does is, it
11 has committees that writes standards for the
12 industry. Initially it started out standardizing
13 the dimensions and strengths and so forth of the
14 casing that we used and later that has been
15 expanded to a very wide variety of equipment and
16 materials and so forth that are used in the
17 industry.

18 In addition to that, there are numerous
19 practices that, through cooperative effort, have
20 been developed and improved and so forth. And
21 the API, through its standardization groups,
22 publish that information to the industry.

23 Q. You have participated in several of
24 those standardization processes over the years,
25 have you not?

1 A. I either am or have been at some time a
2 member of the standardization committees on
3 tubular goods, casing, drill pipe, tubing on
4 wellheads, cements, muds, drilling muds. There
5 was another one. I forget what the other one
6 was.

7 Q. One of the latest works you've helped
8 or contributed to for the American Petroleum
9 Institute is their volume on worldwide cementing
10 practices, is that correct?

11 A. I have a contribution in it, yes, sir.

12 Q. That would be probably one of the
13 definitive works, I guess in the world, on
14 cementing practices with respect to oil and gas
15 drilling?

16 A. Yes, it is.

17 Q. As of late, you've been the recipient
18 of numerous awards such as Engineer of the Year
19 and then, just in October of this year, the
20 distinguished member award. Would you please
21 tell the Commission about those.

22 A. Well, the Engineer of the Year is the
23 award that, in my particular case, is by a group
24 of professional engineers or the professional
25 engineering society whose area is generally West

1 Texas.

2 And then the distinguished member
3 award, that is the Society of Petroleum Engineers
4 and the total number of people in that category
5 is less than one percent of the membership.

6 Q. This is a country-wide organization,
7 the Society of Petroleum Engineers, isn't that
8 correct?

9 A. It's international.

10 Q. International. What you're saying is
11 that you've received this distinguished member
12 status which only involves approximately one
13 percent of the total membership of that
14 international society?

15 A. That's correct.

16 Q. This came in October of this year, is
17 that correct?

18 A. Yes, sir.

19 Q. You have had occasion in the past to
20 testify before the Oil Conservation Division here
21 in New Mexico, have you not, Mr. O'Brien?

22 A. Yes, I have.

23 Q. Have you had your credentials as a
24 petroleum engineer accepted by the Commission at
25 those times of testimony?

1 A. Yes, sir.

2 MR. CARROLL: Mr. Chairman, I would
3 tender T. B. O'Brien at this time as an expert in
4 the field of oil and gas petroleum engineering.

5 CHAIRMAN LEMAY: His qualifications are
6 acceptable.

7 Q. Now, Mr. O'Brien, turning to the cases
8 at hand, you're familiar with the four
9 applications of the cases Yates has before the
10 Commission today and, in fact, sat in on the
11 testimony that transpired several weeks ago?

12 A. Yes, sir.

13 Q. Now, as a consulting petroleum
14 engineer, you have had occasion to deal with
15 casing problems or designing casing to deal with
16 problems for various reasons, have you not?

17 A. Yes.

18 Q. Have you had experience in dealing with
19 casing in areas of subsidence?

20 A. Yes.

21 Q. Now, with respect to the applications
22 that we have before the Commission, have you had
23 the opportunity to familiarize yourself, then,
24 with the kind of well that we are talking about,
25 these four Delaware wells that are planned for

1 Section 2 here in Eddy County, New Mexico?

2 A. Yes, sir.

3 Q. In fact, you have caused to be prepared
4 an Exhibit No. 68, which depicts one of those, a
5 schematic for the proposed plan for the Flora No.
6 1, have you not?

7 A. Yes, sir.

8 Q. Would you, then, for the Commission,
9 turn to your Exhibit No. 68 and describe it and
10 point out--and I believe this is a copy of it
11 here on this larger board and the Commissioners
12 have a smaller one, is that correct?

13 CHAIRMAN LEMAY: No, we don't.

14 [Discussion off the record.]

15 Q. If you would, Mr. O'Brien, then, would
16 you please go through this exhibit for the
17 Commission and explain the items that are
18 depicted on it.

19 A. The casing program for the Delaware
20 wells includes three strings of casing. The
21 first one to be set at a string of 13-3/8-inch
22 casing which is set, in this case, to anticipate
23 to go to 861 feet, which will put it at the base
24 of the Rustler and at the top or just above the
25 top of the Salado. It is set and cemented solid

1 from bottom to top, and it covers the aquifers in
2 that interval.

3 The next string is a string of 8-5/8,
4 32-pound-per foot, J-55 casing, that is set at
5 4200 feet, and that is at the base of the salt.
6 It likewise is cemented solid from bottom to
7 top. That 8-5/8, of course, covers the salt and
8 the ore zones that are of interest.

9 The third string is the string of
10 5-1/2-inch 17-pound, and 15-1/2-pound J-55, and
11 it's set at total depth, 8400 feet, and that
12 string of casing is also cemented solid from
13 bottom to top. That string of casing, when it's
14 run, is wash to bottom, and they pick it up off
15 the bottom just far enough to hang it. Typically
16 that's a foot to maybe three or four feet
17 maximum, but it will be off the bottom,
18 typically, about two to three.

19 The cement that is used on these
20 strings of casing are shown on the second page of
21 this exhibit. The 13-3/8 is set with an open
22 guide shoe and you run an insert float 40 feet
23 up, or about that. It's cemented with 600 sacks
24 of lightweight cement and 200 sacks of Class C,
25 which is basically a neat cement, a very

1 fine-grain cement that produces a high, early
2 strength.

3 And, in addition to that, there are
4 accelerators added to both of these so that the
5 cement will set quickly in the time required by
6 the State. The cement will have acquired enough
7 strength so that it will perform properly.

8 They typically will circulate cement
9 and some excess of cement will be pumped out to a
10 pit. The intermediate 8-5/8 casing is set at
11 about 4200 feet with a float collar about 40 feet
12 or so off the bottom. It's cemented with 1,600
13 sacks of lightweight cement, including 10 pounds
14 per sack of salt, some Gilsonite and Celloseal,
15 which is a material to prevent loss circulation,
16 both of them are, and the Gilsonite reduces the
17 density of the cement somewhat.

18 It's followed by, at the bottom, 200
19 sacks of Class C, which is the same type of
20 cement that we used at the surface. Also with
21 calcium chloride to accelerate the set of the
22 cement.

23 In this case we would expect to
24 circulate about, oh, 250 to 300 sacks of cement
25 out to the pit. That gets any contaminated

1 cement out of the hole so that you end up with
2 good cement from bottom to top.

3 The production casing is set at bottom
4 and they run DV tools or stage collars, one at
5 4485 and one at 7400. They are run because the
6 formations that you drill through are so weak
7 that you can't circulate cement from the bottom
8 of the hole all the way to the top.

9 The first stage of cement is put in
10 and, when it is in place, the bottom DV tool is
11 open, and then you circulate, and we put enough
12 cement in so that the cement passes that--covers
13 that DV tool. When you circulate at that point,
14 then, we get that excess of cement out of the
15 hole.

16 Then we put in the second stage of
17 cement. Likewise, at that one, there is enough
18 cement used to cover the second DV tool and have
19 cement above it. It's opened, and you circulate
20 and get that excess cement out of the hole. This
21 has the effect of removing any contaminated
22 cement that is in the first part of the cement
23 that goes in, that part which might mix with
24 mud. It's removed from the hole.

25 This circulation at each one of these

1 times is about in the order of three hours or so,
2 which gives the cement, that you have just put in
3 place, sufficient time to take its initial set.
4 That way we can go ahead and cement above it
5 without forcing that--that cement is no longer
6 liquid, and we can't push it into the formation
7 which cumulatively allows us to get cement all
8 the way from the bottom of the hole to the
9 surface.

10 And, in addition to that, having gotten
11 that cement which might be contaminated out of
12 the hole, we pump a large volume of cement and,
13 in so doing, we remove any traces of mud that
14 might be in the hole so that we get a good, clean
15 bond between the cement and the casing and
16 between the cement and the formation.

17 After the second stage, the third stage
18 through the second DV tool, then, that cement
19 circulates to the surface and the excess is
20 pumped out to the pit. That's the way it's
21 left. Pipe is then hung and we're ready to
22 complete the well.

23 In this case, this pipe is cemented in
24 three stages. They use 225 sacks of Class H
25 which is the coarse of cement that's used at a

1 greater depth. It has some additives in it to
2 keep the viscosity down and to extend the setting
3 time, which is necessary to temperatures that are
4 involved.

5 And then the second stage includes some
6 Class H cement, and it has its density reduced by
7 these additives that are put in it. And the
8 third stage, then, is circulated with Class C and
9 it has its density reduced so that it can be
10 circulated to the top. And you follow it with
11 some neat cement that has a high density, so that
12 you have high-strength cement around the DV
13 tools.

14 And that's the way the well is left.
15 They bump the plug with 3,000 pounds of pressure,
16 which serves to test the casing to ensure that it
17 is in good shape.

18 Q. Now, just so that the record is clear,
19 we've used a number of terms that I want to
20 develop. One, each time you were talking about
21 the casing, you used the nomenclature J-55. What
22 does that mean?

23 A. J-55 refers to the strength of the
24 casing or to the strength of the steel that is
25 used in the casing. The API rates the steel that

1 it uses by its minimum yield strength or the
2 minimum allowed yield strength.

3 For this particular casing, J-55 can
4 have a minimum yield strength of 55,000 pounds
5 per square inch and a maximum of 80,000. This
6 fixes the strength of the casing for the usage
7 and for the designer so that they know, when they
8 look at this, what the strength of that casing
9 will be.

10 Q. The strength of that casing becomes
11 relevant when we begin to talk about such
12 phenomena as subsidence, does it not, Mr.
13 O'Brien?

14 A. Yes, it does.

15 Q. Another term that you used was hanging
16 the casing. You said you normally hung it a foot
17 or two off the bottom before you began. What
18 significance does the term "hanging the casing"
19 have?

20 A. The first string of casing or the
21 surface pipe, in this case 13-3/8, is set and the
22 cement is allowed to set around it. Then it's
23 been hanging from the elevators in the drilling
24 rig.

25 When it is released from the elevators,

1 the cement holds it in place and a head is put on
2 it. Then the 8-5/8 is run and it's cemented, but
3 it is also--the weight of that string is hung in
4 the head that has been installed on the 13-3/8.

5 The 5-1/2 that is then later run is
6 likewise hung in that same head or another stage
7 of the same head, and the weight of all of those
8 strings of pipe is suspended from the surface and
9 the load is transferred to the earth through the
10 13-3/8 and the cement that holds it in place.

11 Q. Taking the 5-1/2-inch casing, when it's
12 hung, then, that string of pipe is not actually
13 in a state of rest but it's more in a state of
14 tension, is it not? It is being stressed by its
15 own weight?

16 A. It's hanging in full tension.

17 Q. And the cement, then, encapsulates that
18 pipe as it's in that stressed or tensioned
19 position, is that right?

20 A. That's correct.

21 Q. The purpose of the cement, what is that
22 purpose?

23 A. In the 13-3/8, of course, it transfers
24 the load from the pipe to the earth. It
25 furthermore provides a seal and isolates between

1 zones in that particular string between the
2 aquifers that are behind that casing and from
3 whatever may be below it.

4 Also, in that one, from anything that
5 might go in the annulus between the casing and
6 the hole, it might go in from the top. So
7 basically it isolates all of the zones that are
8 covered by that casing.

9 Q. The intermediate casing, in this
10 particular kind of well, goes all the way through
11 the salt series or the McNutt series--or I guess
12 really it's the Castile--does it not?

13 A. It does, and it isolates that zone from
14 everything that's behind it. That is, it
15 isolates everything between the bottom of the
16 13-3/8 and the bottom of the 8-5/8, and isolates
17 any zones that appear within it, the various ore
18 zones or any other zones that might be within the
19 salt.

20 Q. Well, does the cement provide an
21 impermeable seal, or are we just talking about a
22 protective casing or what, Mr. O'Brien? Please
23 elaborate.

24 A. The cement that we use or that is used
25 here, by a number of measurements that have been

1 made, has a permeability in the order of
2 one-thousandths of one millidarcy. There are
3 numerous tests that have been run on these
4 particular lightweight cements of this sort that
5 have a permeability--actually, a thousandths of a
6 millidarcy is about the lowest that the industry
7 knows how to measure, so we give it that number
8 and, in essence, it's impermeable.

9 Q. All right. In your experience and,
10 therefore, based on your opinion, can gas, or oil
11 and gas, whether it be in the form of the liquid
12 oil or in the form of a gas, can it then pass
13 through or flow through the cement?

14 A. No.

15 Q. Now, is cement something that there's
16 just one kind, or can you actually design cement
17 to take care of this problem? And is this what
18 we've been talking about? Because you've used a
19 lot of nomenclature, different classes of cement
20 and that sort of thing.

21 A. There are numerous classes of cement,
22 each one of which has different properties,
23 different compositions. And, in addition to
24 about probably six or eight general classes of
25 cement, there are some innumerable groups of

1 cements that can be produced by the addition of a
2 variety of chemicals and other materials to the
3 cement.

4 Q. Can you decrease, then, adjust the
5 permeability coefficient that you give cement by
6 the addition of these additives that you're
7 talking about?

8 A. Basically, I think it would be proper
9 to say that almost anything that we do to cement
10 reduces from--just the Class H cement is the
11 coarse of cement we have, and it would have the
12 highest natural permeability. And almost
13 anything we do to that cement will reduce its
14 permeability. It's really rather difficult to
15 increase it.

16 There are some conditions that do
17 increase the permeability of cement. One of
18 those is high temperature. But the temperature
19 that's involved is much higher than any of the
20 temperatures that we're concerned about.

21 Q. The cement, then, that is being used,
22 as depicted in your Exhibit No. 68, the surface
23 casing and what have you, that cement there,
24 isn't it fair to say, that's to provide a seal as
25 to the water formations and those things that one

1 would encounter above the salt zone?

2 A. That's correct.

3 Q. And the cement that's used, then,
4 through the salt zones or even lower, that's to
5 provide protection or a seal from those elements
6 that are down below the salt from going up?

7 A. Each one of them provides isolation or
8 seal for the intervals with which it comes in
9 contact.

10 Q. In your professional opinion, do you
11 believe or have an opinion whether or not the
12 casing program and the cementing program, as
13 designed on Exhibit 68, would that adequately
14 seal this particular well from--or seal it off
15 from any leakage that might occur?

16 A. I don't think there will be any
17 leakage, but if you want to hypothesize that
18 there might be some, then the cement will seal
19 it.

20 Q. Okay. With that, one last question
21 with respect to this, when we're talking about
22 sealing in this salt zone, is there an additional
23 factor that, in your mind and in your experience,
24 it is going to seal at least within this area?

25 A. Well, of course one of the big

1 questions is the movement of salt which leads to
2 subsidence and the general creep in the salt. As
3 a result of that phenomena, that salt movement
4 will tend to produce a compressive load on the
5 cement and the casing, which would further
6 enhance the seal that we would normally attain in
7 a normal cementing operation.

8 Q. Let us hypothesize a moment here. Let
9 us suppose we, for some reason, caused a hole to
10 occur in this casing in the area of the salt, say
11 the area of the potash zones. What kind of
12 pressures would have to exist before you would
13 get movement of the fluid or the gas from the
14 wellbore into the formation?

15 A. The stresses in the salt are equal to
16 about one pound per square inch, per foot of
17 depth. Just to use a round number, if we were
18 working at 2000 feet, the stress in the salt
19 would be about 2,000 pounds per square inch.
20 That is, the overburden load that it compresses
21 it vertically is about 2,000 pounds per square
22 inch. Actually, it's a little higher than that.

23 And the horizontal loads in both
24 directions, or in all directions, would be about
25 the same number. In salt, the stresses at a

1 point are about equal. That's because the salt
2 is plastic and it, by its movement, it tends to
3 equalize all of these forces.

4 Now, we've had many instances. My
5 personal acquaintance with salt in a number of
6 places, it is very difficult to inject a fluid,
7 whether gas or liquid, into cement. We have, on
8 occasion, because somebody we were working for
9 wanted to--I won't explain why they wanted to
10 because I don't know--but decided they wanted to
11 pump into the salt. And it frequently will take
12 pressures almost to the range of two pounds per
13 square inch, per foot of depth, to pump through
14 perforations into salt. This would be pumping
15 water.

16 Q. In other words, then, Mr. O'Brien, you
17 have to have pressures existing within the
18 wellbore that are great enough, then, to overcome
19 these stresses which you equate to the one pound
20 per foot of depth formula, is that correct?

21 A. I'm sure that they're related to that
22 formula or to that stress, but the numbers
23 invariably are higher than the stresses that
24 exist in the salt.

25 Q. So what you're saying is that it's

1 going to take, if you had 2,000 pounds of stress,
2 it will take more than 2,000 pounds of pressure
3 in the wellbore and, in your experience, up to
4 almost twice that, the two pounds per square
5 inch?

6 A. That is correct. In this area I would
7 expect, if you perforated into the salt, that it
8 would take pressures in excess of 3,000 pounds
9 per square inch at the face to pump into it.

10 Q. Now, you've also--let's not totally
11 turn away from this casing issue. You've
12 prepared two more exhibits, have you not,
13 Exhibits 69 and 70?

14 A. Yes, sir.

15 Q. What do these two exhibits depict, Mr.
16 O'Brien?

17 A. Those are schematics of coreholes that
18 were drilled. One of them is Core Hole K-162 in
19 Section 2, and the other is Core Hole FC-81 in
20 Section 3. Both of them in 22-31.

21 Q. Now this K-162, Section 2, that's our
22 subject section here, where our applications to
23 drill are, is that correct?

24 A. That's correct. And that well would
25 drill in a 24 to 48-hour period in December 91.

1 Q. Would you, starting with Exhibit No.
2 69, why don't we go through--you have a number of
3 notations here. Would you acquaint the
4 Commissioners with what's being depicted here?

5 A. Mine's not numbered. Which one is 69?

6 Q. 69 is K-162. Excuse me.

7 A. All right. The notations on the right
8 show the tops of the aquifers that are present in
9 this area. There's the Santa Rosa, Dewey Lake
10 and Rustler, and the depth that they come in.

11 On the left side there is a listing of
12 the geologist's or driller's interpretation of
13 the rock that he drilled through in that hole.
14 Then they drilled to 1500 feet and reduced the
15 hole size and cored and reamed from that point to
16 1713 feet which was through the marker bed 119
17 and 124, and that is what this shows. It shows
18 they set no casing, the hole was plugged with
19 cement from total depth, 1713 to the surface, at
20 the completion of the operation.

21 Q. These first three, the Triassic, the
22 Permian and the Rustler, these are the
23 water-supply zones out here in this particular
24 area of Southeastern New Mexico?

25 A. I don't know whether all of them

1 produce water in this area, but they are the
2 primary water-producing zones in that part of the
3 State.

4 Q. In fact, isn't it true that the Rustler
5 formation provides the water for the WIPP project
6 or it is from that formation?

7 A. I understand that's the case.

8 Q. Now, this hole was apparently drilled
9 and filled with cement without the steel casing
10 that we've been talking about that you described
11 with reference to the other exhibit, is that
12 correct?

13 A. Well, I haven't described it yet, but
14 that's correct.

15 Q. I'm sorry if I've gotten ahead of you.
16 Please go on.

17 A. Okay. The FC-81 was drilled in 1961.
18 They drilled it. They drilled down to 1980 feet
19 and ran 5-1/2 casing, which they set in with
20 mud. They didn't cement it, but they set pipe
21 and mudded it off.

22 Q. By mudding it off, are you saying
23 putting a barrier of mud on the outside in the
24 place of where one might put cement if you were
25 cementing the casing?

1 A. Yes.

2 Q. What is the purpose, then, for not
3 putting cement there as opposed to the mud?

4 A. Well, you put the casing in there to
5 isolate these aquifers from the salt water that
6 you would drill with, and they're putting mud
7 behind it so when we get through with the well we
8 can pull the casing through the core hole. We
9 can pull the casing, recover it, and use it
10 again.

11 They said they didn't cement this one
12 solid. They set cement plugs from 900 to 1735,
13 which is total depth, and from 640 to 880, and
14 then they set a 10-foot plug in the top of the
15 core hole.

16 Q. Now, with respect to this FC-81, you
17 actually had, then, three plugs placed in this
18 well, was that correct?

19 A. That's correct.

20 Q. They were not continuous throughout the
21 entire depth of this core hole?

22 A. That's correct.

23 Q. What about in K-162? Did they set a
24 continuous plug in that well?

25 A. In that well they set continuous cement

1 from bottom to top.

2 Q. Now, is it possible to use
3 noncontinuous plugs and still seal off the zone?

4 A. Yes, sir.

5 Q. Does it appear that these plugs that
6 were placed were set so as to isolate these
7 water-bearing aquifers from the salt?

8 A. Yes, sir. Basically, they isolated
9 bringing cement up to 640 feet; this would have
10 covered the Rustler and isolated it from the
11 shallower aquifers.

12 Q. Now, you don't have any notation on
13 these and I don't know if you know, but let's
14 just talk about this idea. In going back to your
15 previous exhibit, you stated the procedure for
16 plugging the Flora No. 1 well involved not only
17 the placing of the cement in the hole, but it
18 involved circulating the cement out.

19 If you don't circulate the cement out
20 in these core holes, is there a possibility that
21 some of this cement will be contaminated with mud
22 that was in the hole during drilling, that sort
23 of thing?

24 A. It could be.

25 Q. So, if you did not circulate the cement

1 out, then apparently that contamination process
2 must not have appeared to be a problem for the
3 driller of the particular hole?

4 A. I think that's correct. I should state
5 that a different way. I think that the cementing
6 of the casing in the oil well, the Flora No. 1,
7 would provide a better seal, a more reliable
8 seal, than would be obtained in the plugging of
9 these core holes.

10 Q. Now, if one of these core hole seals,
11 either these wells or any of the other core holes
12 that are drilled fail, would there then be a
13 possibility that the water in these aquifers
14 could leak into the salt section and invade the
15 salt section?

16 A. I'm told by people who are acquainted
17 with these core holes, that there are core holes
18 that enter the mine workings. And if this cement
19 were not adequate, then it's almost certain that
20 you would get water from the aquifers into the
21 mine workings.

22 Q. Have you been aware of any such
23 failures from core holes that have caused water
24 leakage into or flooding of mines in Southeastern
25 New Mexico?

1 A. No, sir.

2 Q. Is it your information that these core
3 holes actually exist within the mine workings
4 today?

5 A. That's what I understand.

6 Q. Is it your information that these core
7 holes actually exist in areas where there's been
8 secondary mining or the pulling of the pillars
9 where subsidence can occur?

10 A. I don't know that I could answer that
11 particular question. I do know that they entered
12 or I'm told that they entered the mine workings.
13 Whether it's secondary mining or primary mining,
14 I don't know.

15 Q. Let's assume for purposes of my next
16 question that there has been testimony that these
17 core holes do exist in secondary mining areas.
18 Would these core holes, then, as they're plugged
19 and you do have subsidence, are these kind of
20 core holes, if they're in a subsidence area, are
21 these the same kinds of stresses and same kinds
22 of problems we would be facing with an oil and
23 gas well in Section 2?

24 A. The same general type of problem, yes.
25 You would be relying solely on the cement that

1 was placed there and without the benefit of the
2 steel that was put in in casing.

3 Q. In your opinion, then, if you had a
4 core hole in a subsidence area of a potash mine,
5 that would provide some example, then, for you to
6 look at when you're trying to determine what your
7 problem is with oil and gas wells in relation to
8 subsidence?

9 A. Exactly. If this method for plugging a
10 core hole is adequate to isolate that hole
11 through--in a subsidence area, then certainly the
12 methods that are used for cementing oil wells
13 should be at least equally as good and, I think,
14 somewhat better.

15 Q. The purpose of these two exhibits were
16 basically to show two different ways that core
17 holes, to your knowledge, are commonly drilled
18 and plugged, is that correct?

19 A. That they have been drilled and plugged
20 in that way, yes, sir.

21 Q. All right. Let's go a little farther
22 here and, using again our Flora AKF No. 1 well,
23 the diagram that you've described up to this
24 point, Exhibit 68, shows a producing well, does
25 it not?

1 A. Yes, sir.

2 Q. Let's go a step farther, now. Let's
3 assume that we're going to have a plugged and
4 abandoned well. Would you describe for the
5 Commission what happens, then, what you would
6 expect to find in a plugged and abandoned well?
7 And then my next questions will address a plugged
8 and abandoned well.

9 A. If you drilled a well and it was a dry
10 hole from the start, then you would fill the hole
11 below the 8-5/8 with cement and, I presume--well,
12 at least fill that part of it. There might be
13 additional plugs to put in the 5-1/2 above the
14 bottom of the 8-5/8; that is, above 4200 feet.

15 If the well were a well that was
16 completed or it had 5-1/2 casing in it, whether
17 it was completed or not, then you would fill the
18 5-1/2 casing with cement at least up to the depth
19 of the bottom of the 8-5/8 to isolate it and
20 provide a seal on the inside of the casing.

21 Q. That's just normal plugging procedure?

22 A. It is for this kind of operation, yes,
23 sir.

24 Q. There has been earlier testimony that
25 such a well could be filled with cement all the

1 way to the top. Is that also an acceptable
2 method?

3 A. It certainly could.

4 Q. Is there an advantage one way over the
5 other, Mr. O'Brien, in your opinion?

6 A. If you fill it full of cement, then
7 that would take care of any problem that might
8 exist. I suppose the alternative would be to
9 fill it part way and leave the 5-1/2 open so that
10 you could observe it and make sure there was no
11 pressure build-up inside of it from any cause.

12 Q. You could then put a cap on and a gauge
13 and monitor that?

14 A. A cap and a gauge and monitor it.

15 Q. Now, would this gauge, if you're
16 monitoring it, would that be a relatively
17 accurate way of determining if there was some
18 leakage from the oil and gas reservoir? Is the
19 gas going to come up and be reflected in this
20 gauge, or is it going to go somewhere else?

21 A. Well, you could put a gauge on here
22 that would register small pressures, so that any
23 pressure that would develop there from whatever
24 cause would be registered on that gauge.

25 Q. Now, Mr. O'Brien, do you have an

1 opinion of whether or not you could mine through,
2 that is go through the area, that part of this
3 plugged and abandoned well that goes through,
4 say, the potash zone, do you have an opinion
5 whether or not you could mine through that?

6 A. If it's cemented as shown here and it's
7 plugged by filling it full of cement, then I
8 don't think there would be any problem at all
9 with mining through it.

10 Q. And when we're talking about problem,
11 you are addressing the problem of the leakage of
12 oil and gas up from the depths of the Delaware at
13 8000-plus feet to the ore bed at 2000 feet?

14 A. That possible problem is included.

15 Q. Since we're talking about this problem,
16 this problem of leakage of gas, there are a
17 number of, I guess, phenomena working here.
18 We're talking about the travel of gas some 6000
19 feet, are we not?

20 A. The potential, I guess, is from 8000
21 feet.

22 Q. Up to the 2000-foot level?

23 A. Yes. I understand what you're saying,
24 yes.

25 Q. Now, for that gas to get from the

1 Delaware up to the 2000-foot level, it would have
2 to find a path the entire length of 6000 feet,
3 would it not?

4 A. Yes, sir.

5 Q. Now, that path is fraught with many
6 obstacles, is it not? Is its tendency going to
7 go the 6000 feet or what other forces are going
8 to be operating?

9 A. Well, inside the 5-1/2 will be plugged,
10 solid with cement. The exterior is likewise
11 cemented. Now, you have to assume some path
12 which the gas might take. The cement on the
13 inside of the 5-1/2 will form a seal. There have
14 been tests run that shows that it does seal.

15 For safety, a mechanical plug can be
16 put in which would further prohibit the movement
17 of any gas. Then, the alternative is that the
18 gas would have to travel up to the outside.

19 So it has two or three choices. Some
20 of these are more just ideological concepts than
21 they are practical possibilities, but if one were
22 to assume that we had treated the producing zone
23 and in the course of that fractured it or
24 acidized it or whatever we did to it, that we
25 would create a fracture that might allow the gas

1 to go up the hole. This is one of the things
2 that I've heard of as a possibility of gas
3 migration.

4 As a matter of fact, it is very
5 difficult in the process of fracturing to create
6 a fracture that extends over any substantial
7 distance that is relative to a 6000-foot
8 interval. It's very difficult to create a
9 fracture that is of any significant height.
10 Fractures do tend to go upward, but they also
11 stop at the first impermeable or nonporous
12 section. You come to a strong rock, they quit
13 going there, and then they go laterally into the
14 porous rock that we're producing from, so that
15 there would be no likelihood that gas would go
16 from 8000 feet all the way up to 2000 feet.

17 The next possibility is gas going
18 through the cement. There are some theories that
19 have gas permeate cements, and most of them have
20 to do with high pressure gas, where the cement
21 and the gas--the pressure exerted by the cement
22 and the pressure on the gas are very close to
23 being equal. That's not the case here. We're
24 talking about something that is 2,000 or, say,
25 2,500 pounds of pressure maximum at the bottom,

1 and the casing would have about--the cement would
2 have over 3,000 pounds of pressure, so there's
3 not going to be any movement through or
4 percolation of gas through the cement.

5 There have been discussions of what's
6 known as microannuli, where the gas will work its
7 way up. Those may or may not exist. But there's
8 no indication that anyone ever had one exist for
9 6000 feet.

10 Furthermore, if it did happen that you
11 got gas to go up the hole, the pressure in the
12 Bell Canyon and the top part of the Cherry Canyon
13 is so low that the gas would rather go in there
14 than it would to continue on up the hole. And we
15 know this to be the case from pumping liquids.
16 We lose returns into those zones when we're
17 drilling, and that's the reason we have to put in
18 two DV tools because we can't get cement to go up
19 the hole. It would rather go into those zones,
20 and the gas would do the same thing.

21 Furthermore, when you get to the 8-5/8,
22 that 8-5/8 is cemented, and by the time you put
23 this production casing in here, that has been
24 cemented for a long time. That cement is not
25 liquid or semi-liquid so that gas can percolate

1 up through it.

2 Furthermore, the salt has had time to
3 flow in and around the casing and enhance the
4 seal that is provided by the cement so that the
5 gas is not going to go up the hole. So there are
6 many restrictions that both nature and operators
7 place on the movement of gas from this long
8 interval.

9 Q. Well, Mr. O'Brien, what you have been
10 saying, these different theories that you've been
11 discussing, what we are concerned with here, when
12 we say leakage, all we're talking about is
13 movement of gas?

14 A. That's right.

15 Q. Movement of a liquid. For movement to
16 occur, you have to have it moving from a zone of
17 higher pressure or influence to one of lesser
18 pressure or resistance, is that correct?

19 A. That's a way of saying it.

20 Q. Or you don't get movement, is that
21 correct?

22 A. That's right.

23 Q. And this gas, if it has a choice, it's
24 going to take the zone of least resistance, isn't
25 that also a fair statement?

1 A. That's correct.

2 Q. Let's talk about salt and, let's say,
3 the permeability of salt as compared to cement.
4 How do they rate? You've given us the numbers
5 with respect to cement, that it's very low, if
6 measurable.

7 A. And salt is similarly very low and is
8 not measurable because it is lower than we know
9 how to measure it.

10 Q. So, for this leakage or movement of gas
11 to occur, one, we have to get a path for it, that
12 path is marked by least resistance, and it's got
13 to move 6000 feet before it ever gets to our area
14 of concern in the potash, the salt?

15 A. As I said, it would have to go in one
16 of these permeable productive or permeable porous
17 zones below the bottom of the 8-5/8 before it
18 ever got to the 8-5/8.

19 Q. That's one of those obstacles it's got
20 to overcome? It's got to do that or it's never
21 going to become a problem?

22 A. That's correct.

23 Q. Even if, for some unimaginable reason,
24 it got up there, there's got to be some way that
25 this gas can get through the seals of the cement

1 and the seals of the salt before it could ever
2 reach a mine?

3 A. And furthermore, since we're
4 hypothesizing that it is going to go up there,
5 there's no reason for it to stop at that point
6 and go out. Since the path of least resistance
7 would continue, assuming all these things that
8 you've assumed, the path of least resistance has
9 to be upward. So there's no reason at all why it
10 shouldn't just keep going on out the top.

11 Q. And bypassing the salt zone altogether?

12 A. You would never know it was there.

13 Q. Going back to your original opinion
14 which started this line of questioning, which is
15 you feel you can safely mine through an oil and
16 gas well, do others share this opinion of yours
17 and is there experience with such a phenomena,
18 mining through oil and gas wells?

19 A. Yes.

20 Q. Would you describe that for the
21 Commission.

22 A. Well, first off, there was a
23 demonstration of safely plugging oil wells in the
24 Appalachian coal mines.

25 Q. Is this your Exhibit 71 that you're

1 referring to?

2 A. Again, mine are not numbered. It's the
3 next one.

4 Q. I'm sorry. It is 71.

5 A. Basically what they did, they had a
6 coal mine that had a number of wells through it,
7 and about 2000 feet deep, or the wells were, and
8 they pressured up the old producing interval with
9 a gas that is traceable down to a sulfur
10 hexafluoride. This gas doesn't exist in nature,
11 it has to be made, and they can get it and find
12 it at quantities less than one-half of one part
13 per billion.

14 They charged this zone with this gas
15 and then they abandoned wells and checked for the
16 flow of this gas or the gas in the mines and they
17 didn't find any. They did find some in some
18 adjacent oil wells that were still producing, but
19 they did not ever find it in the wells.

20 And based on this and other things, the
21 Mining Safety Commission--

22 Q. MSHA is the acronym we've been using
23 throughout this proceeding.

24 A. Whatever it is, has a procedure for
25 abandoning wells that will be in mined areas. So

1 the coal miners use basically the same process
2 that we are describing here for plugging wells,
3 to plug wells, and they mine through them.

4 Q. We're talking about running cement from
5 top to bottom, the same kinds of cement that we
6 were talking about?

7 A. Basically the same kinds of cement.

8 Q. Now, going back to this procedure, this
9 gas that we used to test, this is a gas that
10 doesn't occur in nature, is that what you're
11 telling us?

12 A. That's correct. Somebody has to make
13 it.

14 Q. But that's what's significant? It's
15 something that is artificial, something that if
16 we detect it we know it's there because we put it
17 there?

18 A. That's correct.

19 Q. And they pressured up this producing
20 reservoir, is that correct?

21 A. Yes.

22 Q. And then they sealed or plugged and
23 abandoned these wells, is that what you're
24 telling us?

25 A. That's what they did.

1 Q. And we know that this gas got into that
2 producing formation because it was found in other
3 wells?

4 A. That's correct.

5 Q. But it was not detected after these
6 wells were mined through? Is that what you're
7 saying?

8 A. That's correct.

9 Q. And this study, then, formed the basis
10 of the procedure which is now used today to mine
11 through oil and gas wells?

12 A. Yes.

13 Q. And it's presently being done in the
14 coal industry in the coal areas of the United
15 States?

16 A. That's correct.

17 Q. And I don't know, because I've never
18 asked you this question, is coal comparable to
19 potash with respect to its plasticity and its
20 ability to seal, as you've described?

21 A. Coal would not be as good.

22 Q. So if we were initially comparing our
23 situation to that, the potash forms would help in
24 performing a better or safer seal, is that
25 correct?

1 A. That's correct.

2 Q. The wells that we're talking about in
3 this area, some of these wells date back into the
4 1800s, do they not?

5 A. 1890, I think, some of them were
6 listed.

7 Q. This was an area of old production as
8 opposed to what we're talking about today?

9 A. Yes.

10 Q. And the techniques of drilling and what
11 have you would most certainly be less
12 sophisticated and different from what we're using
13 today?

14 A. That is correct.

15 Q. I guess again, the key point here is, a
16 seal can be effective to keep that gas from
17 moving, or oil?

18 A. I think it's stated slightly
19 different. Using the techniques I have described
20 here, a seal will be effective.

21 Q. Not "can," but "will"?

22 A. That's correct.

23 Q. Let's turn now to another subject.
24 We've been dealing thus far with oil and gas
25 wells and the sealing properties in a

1 noneffective state. Subsidence has been the
2 term, and the terminology has been bandied about
3 throughout this hearing. Is subsidence a new
4 concept to you, Mr. O'Brien?

5 A. Not at all.

6 Q. Have you had occasion to deal with it,
7 or been forced to deal with it during your 45
8 years of experience in the oil and gas industry?

9 A. Yes, sir.

10 Q. Is subsidence, then, something to be
11 feared or to be respected?

12 A. It's certainly to be respected.

13 Q. Can you, then, in your respect, design
14 casing-- Well, let me change that question a
15 little bit. Can it be calculated and then
16 designed for, if necessary?

17 A. I think that the calculation is
18 probably less accurate than the design. We can
19 make estimates and, based on those estimates, we
20 can design casing that is adequate to withstand
21 the forces that are applied by subsidence.

22 Q. Well, why don't you, for the Commission
23 here, as an expert who has had 45 years of
24 dealing with this phenomena of subsidence,
25 describe for them the stresses, the things that

1 you're designing for when you sit down and plan
2 an oil and gas well.

3 A. Fortunately, only a very small
4 percentage of oil wells have that problem, but in
5 those cases that we do, and those cases arise not
6 only from mining problems but over some shallow
7 reservoirs, high porosity zones, that when the
8 liquids are removed or oil is removed, the rock
9 is not strong enough to support the overburden
10 and you have subsidence.

11 One of the most notable of these, or a
12 couple of them are in California, even along the
13 Coast, where they had bridges and buildings and
14 so forth that could not be used because of the
15 subsidence that took place. There are numerous
16 other similar subsidence problems in a variety of
17 places.

18 Another real notable one is on the east
19 side of Lake Maracaibo in Venezuela where, since
20 in the 20s they've been producing oil and they
21 got to a subsidence that totaled over a large
22 area of about 12 feet, and because the lake
23 leveled or the bottom of the lake subsided and
24 the ground alongside of it also subsided, they
25 had to put up a seawall to keep the lake off the

1 land where people live.

2 Q. The North Seas is also another field
3 where it had more than 12 feet, in the order of
4 20 feet of subsidence because of the producing of
5 the oil from underneath?

6 A. There are a number of them. Some of
7 them in California go in the order of 30 feet or
8 so, and in some of them they put liquid back in
9 the ground and actually raised them back up some,
10 and many of them by injecting water, they've
11 stopped the subsidence.

12 Nonetheless, there is differential
13 loading on wells as differential subsidence, so
14 that there is some earth movement, lateral earth
15 movement as a result of the subsidence. In the
16 first place, that has not created any problem of
17 any magnitude.

18 There are some cases where, within the
19 zone, that the subsidence occurs within the
20 producing zone, where the subsidence becomes
21 thinner. There have been cases where the casing
22 and tubing within that zone was compressed
23 longitudinally and damaged. But there are very,
24 very few, if any, instances of any damage to a
25 well in any fashion due to subsidence.

1 There have been cases, in one case in
2 Bolivia, where the sides of the mountain moved.
3 It wasn't a subsidence problem but it was lateral
4 movement, and it passed through a number of
5 wells. The wells leaned over, oh, in the order
6 of about between 30 and 45 degrees. They were
7 pumping wells, and they couldn't pump them that
8 way, so the Bolivian company just tied onto the
9 wells with a cable and hooked a Cat on them and
10 pulled them back up straight. They later cut
11 them off down at the ground level and went right
12 on producing them.

13 There have been instances of, again,
14 not subsidence but lateral movement, where ships
15 have run over wells out in the Gulf of Mexico and
16 bent them over. I was tying onto one of them
17 with a line attached to a barge and pulling it
18 back up straight and putting the well back on
19 production. We braced up the platform and put
20 the well back on production. No real damage to
21 the well. It certainly was bent and probably the
22 casing was kinked, but the well produced and
23 without any leakage.

24 Some of these wells are--the ones in
25 the Gulf of Mexico are wells that had surface

1 pressures in the order of 3,000 psi, so--

2 Q. Let's break there just a moment since
3 you brought up the issue of surface pressures.
4 This Delaware well that we're talking about for
5 drilling in Section 2, what kinds of pressures
6 are we talking about between the wellbore and the
7 surface?

8 A. The surface pressure tends to be about
9 6- or 700 psi. That's to start with. Obviously
10 they don't stay there very long. The pressure
11 goes down as you produce the wells and the wells
12 are put on pump so that the casing pressure will
13 be in the order of about 50 psi, whatever they
14 maintain on the heater treater. And the tubing
15 pressure will be about in the same order.

16 Q. 50 pounds?

17 A. About 50 psi.

18 Q. Now, the pressure down at the bottom,
19 the initial reservoir pressure, what is that
20 going to be?

21 A. 2,600, 2,800 psi, somewhere in that
22 neighborhood.

23 Q. Why wouldn't that pressure, 2,600
24 pounds, exist all the way up and be found in all
25 depths within the casing? Why is it 50?

1 A. This is an oil well and the hydrostatic
2 head of the oil overcomes the bottom hole
3 pressure. And then of course as you produce the
4 well, that starts out at about 600 pounds,
5 something of that nature, and as you produce the
6 well you draw the formation pressures down and
7 the pressure then drops off to about 50 psi.

8 If it's left closed in long enough it
9 might go up to 100, but the operating pressure
10 will be about 50 pounds.

11 Q. So, when this well is sitting there in
12 nature and, let's say you've got it and you have
13 50 pounds of pressure, that 50 pounds, that would
14 be if you could measure at a level of 2000 feet?
15 Would that be what you would be finding there?

16 A. No, it would be a little higher than
17 that. 50 pounds at the surface is 2000 feet.
18 Maybe 20, 30 pounds psi. Maybe.

19 Q. Less than a hundred?

20 A. Yeah.

21 Q. And that is the pressure then, if this
22 were a producing well and for some unimaginable
23 reason you got a communication from the wellbore
24 to the salt, that's the pressure you would have
25 working on the salt?

1 A. That's correct.

2 Q. In your opinion, will that cause that
3 oil and gas in that column to enter the salt?

4 A. No.

5 Q. Getting back now to your discussion,
6 and I interrupted you and I apologize.

7 A. Well, the point of all this is that the
8 fear that surrounds subsidence and a well in
9 proximity to mine workings and hence the
10 subsidence, is that some lateral motion takes
11 place as a result of subsidence. You don't get a
12 simple vertical drop from above the mine
13 workings, and it goes--the movement goes out at
14 an angle.

15 Q. Now, Mr. O'Brien, so that we kind of
16 keep our testimony attuned to what we've seen
17 before, this lateral movement, we've seen these
18 diagrams, and I think Mr. Hutchinson talked about
19 and presented to the Commission, we showed a
20 trough with sloping sides. Is that what you were
21 just talking about as causing that kind of
22 surface phenomena?

23 A. That's correct. There will be movement
24 from the sides into that trough that's created
25 directly over the mine. And, as a result of that

1 movement, are the result of the stresses that are
2 created; some movement takes place. This
3 movement generally goes away from the mine at
4 some angle.

5 The movement doesn't follow a straight,
6 smooth curve. It varies somewhat, although the
7 magnitude of this movement over a foot-by-foot
8 interval is very small. There is more movement
9 in one place than another because of different
10 strengths in the rock. The difference is still
11 small because the total movement over a distance,
12 a short distance, is small.

13 Q. Now, Mr. O'Brien, let me ask you one
14 question here. In your opinion, must we be
15 concerned with all movement in a situation here?

16 A. I think we need to be concerned with
17 it. We don't need to panic over it.

18 Q. Okay. Will all movement damage an oil
19 and gas well?

20 A. No.

21 Q. Why?

22 A. Because the stresses that are created
23 in this movement are relatively small. The
24 stresses that are created will be in the order
25 of--probably the limits will be certainly between

1 12 and 15 or 16,000 pounds per square inch.

2 Q. How do you arrive at that for a number?

3 A. There are a number of ways of doing
4 it. One of the methods that is fairly simple is
5 that the stress in the rock, in the salt, is
6 about 2,000 psi. If you mine the salt to 85
7 percent, which is about the limit of what they
8 normally mine to, the remaining 15 percent of the
9 salt must bear the overburden load.

10 So, the 2,000 pounds divided by 15
11 percent grosses this thing up to about 13,000 psi
12 will be the load that is imposed. That, I think,
13 is probably the simplest, most straightforward
14 method for determining these loads. There are
15 other methods that are somewhat more
16 theoretical. They're dependent on the
17 assumptions that go into them, and even using
18 those methods we come up with a load of somewhere
19 in the order of about 15,000 psi. So these
20 numbers are somewhere close to being right.

21 Q. The kind of pipe that you told us about
22 that is being or intended to be used in this
23 particular well, can it withstand 15,000 pounds
24 of stress that you just described?

25 A. As I said, this casing has a strength

1 of 55,000 psi, the steel has, and if you take the
2 13,000, this gives us a safety factor of about
3 4-to-1. Even if we're off by a factor of two, we
4 still have ample strength for the casing to
5 support the loads that are imposed on it.

6 Q. That number, 55,000, that comes just
7 from one strength of pipe, is that correct?

8 A. That's correct.

9 Q. Now, the area of, let's say this Flora
10 well, the area of the casing that's going to be
11 affected by subsidence is going to occur above
12 the bottom of the intermediate, is it not?

13 A. Yes.

14 Q. So, if we talk about the pressures
15 being exerted on the intermediate string that is
16 somewhere between the 42,000 and the 1,000 or the
17 900-and-something feet that the surface is set
18 to, you have not only one string of casing with
19 an encasement of cement, but a second string of
20 55,000-pound casing, is that correct?

21 A. That's correct.

22 Q. And a second encasement of cement?

23 A. That's true.

24 Q. Is that going to increase the strength
25 of the resistance of that string of pipe or is it

1 going to decrease it?

2 A. There are tests and papers that have
3 been done on this, the strengths of multiple
4 strings of casing, and the result is that they
5 find that two strings of casing, cemented
6 together, the strength becomes the sum of those
7 two strings of casing plus about around 25
8 percent; 20 to 30 percent. So that the strength,
9 the combined strength is more than the sum of the
10 strengths of the two strings.

11 Q. Now, and if we decide that we want to
12 concentrate on the area above 900 feet, we then
13 have three strings of casing, do we not?

14 A. That's correct.

15 Q. Would that, again, be stronger than the
16 two strings?

17 A. That's correct.

18 Q. Now, with respect to this issue of
19 subsidence and this trough phenomena that we see,
20 this tension that we're seeing from this lateral
21 movement, is it going to be greater closer to the
22 surface or at depths?

23 A. The lateral movement increases from the
24 bottom to the top.

25 Q. So the very top of the surface is where

1 you're going to have the most lateral tension?

2 A. That's correct.

3 Q. That would be your real problem area,
4 wouldn't it, or at least in terms of amounts of
5 strain or stress?

6 A. Well, the thing is, if that were the
7 only movement, if there were no movement below
8 it, the answer would be yes, but that's not the
9 way it is. The top moves some amount, and right
10 under it it moves a little bit less and a little
11 bit less and so forth, so the incremental
12 movement per foot is what you're concerned with.
13 This is more uniform from top to bottom, just
14 gradually decreasing. So the actual load on the
15 well at the top, or the actual lateral load on
16 the well, will be more or less uniform from the
17 point of first movement until it reaches the
18 surface. The movement will be greater at the
19 surface, but the stress created will be more or
20 less the same. That assumes that this is a
21 straight line, which this is probably not.

22 Q. But all of this in this area of stress
23 is going to be above the salt or the area of the
24 mine, is that correct?

25 A. Yes.

1 Q. It's not going to be below it, is it?

2 A. No.

3 Q. That area is going to be undisturbed,
4 is that correct?

5 A. That's right.

6 Q. Now, you've heard the term angle of
7 draw?

8 A. Yes, sir.

9 Q. What does that mean to you?

10 A. That's a number that the academics use
11 for--use to assume this is a point beyond which
12 no influence from the subsidence can be measured
13 or found or hypothesized.

14 Q. So the angle of draw will extend as far
15 as man's capability to measure will allow?

16 A. At least that far.

17 Q. At least that far, maybe into infinity
18 then, is that correct?

19 A. That may be overstating it a little,
20 but a long way out there.

21 Q. A long way out there. Is the angle of
22 draw the angle that this Commission needs to be
23 concerned with?

24 A. No, sir.

25 Q. If you've got a thousandths of an inch

1 of movement out there, is that going to affect
2 the Flora well as it's designed?

3 A. No, sir.

4 Q. There is a point that this stress
5 reaches a maximum, is that correct?

6 A. Yes, sir.

7 Q. What is that called?

8 A. I think it's called the angle--I think
9 they call that the break angle.

10 Q. Now, that angle can actually be
11 calculated, can it not?

12 A. It can be for a local area. It's
13 calculated from empirical data.

14 Q. I used the wrong word. "Calculated" is
15 not right. "Measured" is the proper word?

16 A. Basically that's correct.

17 Q. By "empirical," you mean going out and
18 observing and making notes as to what actually
19 happened?

20 A. That's correct.

21 Q. This angle of break has been calculated
22 with studies done in the potash area?

23 A. Yes, sir.

24 Q. In fact they've been referred to in
25 earlier testimony by Mr. Hutchinson?

1 A. I think that's correct.

2 Q. Using the figure of 10 percent, this
3 angle of break that some of these studies report,
4 or roughly, and I'm being approximate, where we
5 have this maximum tension, is that going, in your
6 opinion, to be sufficient to cause leaks or
7 destroy the casing as you've described it and
8 designed it?

9 A. From that point outward, there will not
10 be enough movement to cause any leaks. Very
11 likely for some distance inside of that, but
12 certainly from that distance out there will be
13 insufficient movement to cause any kind of
14 problem.

15 Q. And if we're talking about a problem, a
16 problem can only occur, isn't it true, if that
17 well is producing?

18 A. I think so.

19 Q. And what I'm saying is, as opposed to a
20 plugged and abandoned well.

21 A. A plugged and abandoned well will have
22 no effect on anything.

23 Q. Angle of break, angle of draw, they're
24 meaningless, aren't they, with respect to a
25 P & A'd well?

1 A. That's correct.

2 Q. The subsidence in this area that we're
3 talking about, let's first generally start,
4 subsidence occurs at a rate dependent upon the
5 kinds of rocks you're dealing with, is that
6 correct?

7 A. The rate and magnitude is dependent on
8 the rocks, yes, sir.

9 Q. The kind of subsidence that we're
10 having, that we experience in the potash area, is
11 influenced by the nature of the salt which is
12 above the excavation into which we're finding
13 this subsidence, is that correct?

14 A. Yes, sir.

15 Q. Is this the kind of subsidence that, in
16 your experience, would cause a sheering effect?

17 A. No, sir.

18 Q. You touched upon this briefly, but
19 let's suppose we've got this subsidence and we've
20 got the salt bed; it's flowing, it's plastic, and
21 it's subsiding. Now, all of the formations above
22 the salt are not of the same plastic nature,
23 there may be some fracturing going on, just for a
24 hypothetical here.

25 Are we going to be creating avenues, by

1 these fractures, that are going to be going back
2 down into the salt, or in which direction are we
3 going?

4 A. They will not go down since the
5 movement becomes greater as you go up. If there
6 were, which there won't be, but if there were a
7 continuous crack, for the want of a better term,
8 from some point, it would not--the flow would not
9 go downward, it would go up, because the crack
10 gets bigger as you go up. There's no
11 resistance.

12 Further, when you get to the salt, the
13 salt is plastic and it's not going to fracture
14 anyhow and it will flow, there's not going to be
15 any flow going down through the salt. Any flow
16 of any nature that took place would go up.

17 If there were liquid produced, it would
18 fill the crack to whatever level it would come,
19 and if there were some gas present, by
20 segregation, the gas would work its way up
21 through the water that filled the crack and work
22 its way out to the surface.

23 Q. Isn't it true that this cracking that
24 we're talking about is, again, going to be
25 movement of something towards paths of lesser

1 resistance?

2 A. Yes.

3 Q. Is that not the reason why it goes up?

4 A. Well, that and--yeah, that's the reason
5 it goes up. The paths are easier going up.

6 Yeah, that follows.

7 Q. Because the overburden is less than the
8 overburden lower? That's one of the pressures of
9 one of the stresses that you're talking about, is
10 that correct?

11 A. Yes. And to get that, you have to have
12 lateral motion which would cause a continuous
13 conduit, crack, to exist.

14 Q. This angle of break, that's where your
15 lateral stresses separate and your movement
16 starts or terminates, I suppose, is maybe a
17 better word?

18 A. If you get a crack, that is the line
19 along which the crack will occur. And if a crack
20 occurs, then the tension will be relieved and
21 there will be motion away from the crack, in both
22 directions.

23 Q. Now, if our subsidence causes, again
24 for some unimaginable reason, causes a hole to
25 appear in this pipe and the cement and our gas

1 gets to the formation, the gas, in your opinion,
2 is going to travel upwards or downwards?

3 A. Gas will go up. If it has any way to
4 escape at the surface, it will go up.

5 Q. For it to go down, you've already told
6 us the fractures it might be, and that fracture
7 would the pass of gas, right?

8 A. That's correct.

9 Q. They're going up?

10 A. They're going up and, furthermore, you
11 will not get a continuous crack into the ore zone
12 because the salt is plastic and it won't
13 fracture. You will not get a crack at that
14 point. Any crack that you did get, if you got
15 that much subsidence, if you got sufficient
16 subsidence to cause a crack, the crack would go
17 upward, not downward. The crack would be larger
18 going to the surface. There would be less
19 resistance going to the surface.

20 If there was gas there and you got gas
21 out of the pipe, out of the well into that
22 fracture, it would go to the surface.

23 Q. Practical experience is always our best
24 proof of a hypothesis, isn't that correct, Mr.
25 O'Brien?

1 A. I think so.

2 Q. We've had testimony that in the area of
3 the New Mexico Potash mine that they drilled
4 somewhere on the order of three-plus core holes
5 per section of area that they have mined or
6 developed in this potash mine.

7 If there has been no leakage of water
8 from these core holes, doesn't that stand as
9 proof, in your mind, of the viability of the
10 mechanics of things that you've been talking
11 about?

12 A. I think that if this core hole won't
13 leak, an oil well won't leak.

14 Q. Let's talk about some other phenomena,
15 Mr. O'Brien. There has been some indications
16 from looking at exhibits, that gas, a path of
17 leakage of gas can be the couplings used on the
18 casing. You've seen that exhibit?

19 A. Yes.

20 Q. An exhibit prepared by New Mexico
21 Potash for later use. Do you have an opinion as
22 to whether or not that is a valid hypothesis, or
23 is there a valid problem there?

24 A. There will not be a problem here.
25 There have been numerous tests on the type

1 threads that are used, and there is no leakage on
2 anything at all below about 3,500 pounds per
3 square inch. The industry uses 4,000 for its own
4 purposes.

5 If we should get to higher pressures
6 than that, there are other connections that can
7 be used which have perfect seals up to 15,000
8 pounds per square inch. There are other methods
9 of obtaining seals besides that, for intermediate
10 pressures.

11 The presentation that's made in that
12 particular exhibit, I think it's extreme, beyond
13 anything that happens, showing the pathway that
14 is unobstructed that would give you the
15 impression that the pathway was like an eighth of
16 an inch, or something of that nature. The
17 unimpeded pathway that does exist is in the order
18 of ten-thousandths of a square inch when the
19 joint is made up, and that void that would create
20 that pathway is filled with what we call pipe
21 dope. It's a lubricant seal material. And, as a
22 result, the testing that the industry has done
23 has shown that with gas there is no leakage to
24 about 3,500 psi and, as I say, the industry uses
25 4,000.

1 Q. The J-55 casing that we're talking
2 about, is it designed, the couplings that are
3 used on J-55, are they designed to hold pressures
4 up to this 4,000 pounds?

5 A. Yes.

6 Q. A Delaware well is not going to
7 encounter 4,000 pounds?

8 A. No, sir.

9 Q. And what you also told us is that we're
10 not limited by what we've designed here. If
11 there were a problem, all you need to do is come
12 up with the usage of another already known and
13 tested form of coupling, is that correct?

14 A. Or connection, yeah.

15 Q. Or connection, excuse me. Your
16 parlance.

17 The pipe dopes are very scientific in
18 their formulation, are they not?

19 A. Yes.

20 Q. They're designed to meet the needs as
21 we perceive them?

22 A. Yes.

23 Q. In that same vein, talking about J-55
24 casing, that's not the only kind of casing
25 available in the oil and gas industry, is it?

1 A. No.

2 Q. Are there stronger casings?

3 A. Considerably.

4 Q. Again, we're not hampered or bound by
5 that limitation, are we?

6 A. That's correct.

7 Q. Just so the record's clear, you talked
8 about the design of the threads. What are we
9 talking about here and how did that differ with
10 the picture that we saw?

11 A. Well, this picture shows a bunch of
12 irregular spikes and so forth, and what we use is
13 a well-designed well machine, uniform thread,
14 that the thread on the pipe and the thread on the
15 coupling mate together, and the taper of them is
16 such that when it's made up, they do form a seal.

17 Q. Again, something that is thought out
18 beforehand and very carefully executed?

19 A. With lots of experience.

20 Q. You briefly kind of touched on another
21 concept, this microannuli. Let's talk about it
22 in terms of one explaining it in terms of how
23 this concept was developed, where it stands
24 within recognition of the industry, even its
25 treatment in the worldwide cement practices

1 book. Could you give the Commission the benefit
2 of your experience there.

3 A. Well, in the first place it's not
4 treated in that cementing book. The concept
5 originated when we started using bond logs, which
6 is a sonic device that is supposed to measure
7 whether you have a good cement job or not. They
8 found that there were times when the bond log
9 indicated that there was no bond, but we ran
10 physical tests and found out that there was no
11 leakage.

12 Q. Now, by "physical tests," what are you
13 talking about?

14 A. We ran perforated casing and ran--put
15 pressure difference across it, with water or even
16 with gas on occasion, and there was no movement
17 of fluids so that the bond log just had to be
18 wrong. So somebody, in order to explain this,
19 came up with the concept that you have to have a
20 mechanical bonding between the cement and the
21 pipe in order to transmit this sound. And if you
22 don't have that bonding the sound doesn't
23 transmit, and it says you don't have a good
24 cement job. But we knew we had a good cement
25 job.

1 So they came up with this, a
2 microannulus switch, that was of such magnitude
3 that it did not allow the test fluids we had to
4 pass through it, but it was still of such
5 magnitude that it did allow or did attenuate to
6 sound. And we used that.

7 Now, in order to get a good bond log,
8 one of the treatments that we use is to pressure
9 up the casing and expand the casing and close
10 this microannulus, if that's what it does, and
11 that gets a good bond log. It doesn't change the
12 quality of the cement job but it does get a good
13 bond log.

14 So, this has been an argument among
15 folks in the industry and, over the years, I
16 think engineers have been convinced by this
17 argument that that probably does exist. The
18 microannulus, if indeed it does exist, it has to
19 be continuous over an awful long distance for
20 this movement of gas, as it's hypothesized here,
21 to occur.

22 One of the best ways, in fact probably
23 the best way to eliminate that as a possibility,
24 is to use a large volume of cement and let the
25 large volume of cement pass by a particular

1 spot. And here, they're putting enough cement in
2 here to cover the entire pipe so there's an awful
3 lot of cement goes by most all of the casing.
4 And that would be enough to remove any
5 microannulus if indeed one ever did occur.

6 Q. What you're talking about is the
7 practice which is depicted in Exhibit 68, and
8 that is the practice of circulating 200, 250,
9 sacks of cement?

10 A. That's correct.

11 Q. What you're saying is that there's a
12 cleansing action almost or a scrubbing action?
13 As this cement is circulated it's going through
14 or rubbing the pipe and it's actually destroying
15 the possibility of these things occurring?

16 A. That's correct, and the fact that in
17 order to make all this work better, we pump
18 relatively heavy cement on the outside of the
19 pipe, displace it with a lower density fluid down
20 the inside of the pipe to the completion of the
21 cement job, and then we release the pressure off
22 of it so that there is a compressive force on the
23 casing from the outside regularly, and that would
24 cause the cement to come in more intimate contact
25 with the casing.

1 Q. Now, let's just for a moment say we've
2 got a microannuli. For it to become a concern
3 and to cause the movement of gas from the
4 Delaware formation, it would have to be
5 continuous some 6000 feet, would it not, up into
6 the zone of the potash?

7 A. Well, it gets worse than that. If you
8 could have a 6000-foot microannulus on the 5-1/2,
9 that would put you up inside the 8-5/8, so from
10 then on the pressure would be less, and the path
11 of least resistance would be for it to continue
12 right onto the surface. So we not only have to
13 have a microannulus on the 5-1/2, but we have to
14 assume some kind of similar path in the annulus
15 between the 8-5/8 and the salt. But the salt has
16 moved in this period of time and it's compressed
17 this annulus, so that would do away with any
18 microannulus that might have been formed there,
19 and I just don't think it can happen.

20 Q. That's your professional opinion, Mr.
21 O'Brien?

22 A. Very plainly put, yes.

23 Q. You said that the microannulus theory
24 was postulated as a result of bond log tests.
25 Are you aware of any of these bond log tests that

1 showed this problem that you're talking about,
2 that extended continuously for 6000 feet?

3 A. No.

4 Q. In fact, it showed that they were
5 confined to very small or restricted areas,
6 didn't it?

7 A. They have some bad bond logs that
8 shouldn't be, but--well, I'm not sure when you
9 have one. If you have a short interval on the
10 bond log that looks bad, then you could call it
11 that. I guess if you had a long interval on one
12 of them that looked bad, you could call it that.

13 Q. But, in your experience--

14 A. In my experience, the answer is that I
15 haven't seen anything on a bond log that I would
16 attribute to a microannulus over a long interval.

17 MR. CARROLL: Chairman LeMay, would it
18 be possible to take our morning break right now?
19 We've been at it two hours. I know Mr. O'Brien's
20 voice is getting weak. Just for a few minutes?
21 Would that be possible?

22 CHAIRMAN LEMAY: Sure, I didn't know
23 how much longer you had.

24 MR. CARROLL: I still have some, and my
25 throat's awful dry.

1 CHAIRMAN LEMAY: We'll take 15 minutes
2 then.

3 [A recess was taken.]

4 CHAIRMAN LEMAY: We'll resume with
5 direct examination of Mr. O'Brien.

6 MR. CARROLL: Thank you, Mr. LeMay.

7 Q. (BY MR. CARROLL) Mr. O'Brien, when you
8 stated, and going back one last question on our
9 microannuli phenomenon, with respect to the
10 worldwide cementing practices manual that was
11 published last year by the API, American
12 Petroleum Institute, you stated it wasn't even
13 treated but is it recognized as a problem by the
14 API when they were deciding what issues to
15 discuss in this manual?

16 A. It's not mentioned and they didn't
17 recognize it as a problem.

18 Q. Now, let's turn to another problem that
19 has been described, and you briefly touched on
20 it. It's gas flow through cement. Would you
21 describe what the theorists have theorized with
22 respect to that kind of phenomena and your
23 opinion with respect to it?

24 A. There are probably several cases. The
25 simplest would be just a simple flow of gases

1 through a permeable medium. And, as I said, the
2 permeability of the cements that we use is so low
3 that there would be no flow through it. It's in
4 the order of a thousandths of a millidarcy, which
5 is the smallest thing we can measure, so it's
6 something less than that in reality--the
7 permeability is.

8 There are several other cases, the most
9 notable of which is a condition that is theorized
10 to develop, which as cement sets, it develops a
11 gel strength that, due to filtration, the
12 pressure in the annulus between the casing and
13 the wellbore becomes equal to the pressure in the
14 formation. When that occurs, in fact it may even
15 in theory at least and in some of the tests that
16 they've run, that pressure may get to be less
17 than the pressure in the formation, in which case
18 gas starts to move out of the formation and then
19 upward through the cement.

20 And there is some indication, in fact
21 there are examples, where gas has come out of
22 formations as the cement was setting. This
23 generally occurs, in fact all the cases that I'm
24 aware of, have occurred in high pressure
25 reservoirs where the cement and--or the pressure

1 exerted by the cement was very close to the
2 formation pressure.

3 There are several methods for
4 preventing that, and one of them that they use is
5 that the cement is substantially heavier, more
6 dense than that required to balance formation
7 pressure. So even if some pressure is lost, it's
8 still enough to keep the gas from coming into the
9 wellbore.

10 There are cement designs, such as a
11 cement that's known as a right angled cement.
12 That's one that stays very fluid until it sets
13 and then it sets very rapidly so that the gel
14 strength that is supposed to develop, it doesn't
15 develop. And then also they're using cements
16 that have a reduced fluid loss and the cements
17 that are used here do have a reduced fluid loss.

18 So the techniques that we use and the
19 conditions that we have are not amenable to the
20 development of this kind of a problem.

21 Q. So, one, it's not going to happen here
22 because of the pressures we have on the Delaware
23 zone? You haven't seen it associated with these
24 kinds of pressures, is that correct?

25 A. That's correct.

1 Q. And then, even if we did have it, we
2 know how to prevent it from occurring?

3 A. That's correct.

4 Q. Now, there's also kind of a related, I
5 guess, phenomenon that's discussed, channeling.
6 Could you describe for the Commission what is
7 meant here by the oil and gas industry and what
8 we do to prevent or take care of that problem?

9 A. The channeling of cement most
10 frequently occurs under one of two or three
11 circumstances. If the hole is enlarged such that
12 the velocity of the rising cement at the hole
13 enlargement gets very low or very slow,
14 channeling can occur where the cement moves
15 through the mud that is there.

16 Another condition that arises is when
17 the pipe sits eccentrically in the hole. Those
18 are the two most frequent.

19 Another case is when very, very low
20 pumping rates or displacement rates are used,
21 even up to some moderate pumping rates. Some
22 channeling may occur in any event, particularly
23 in the first part of the cement, and we overcome
24 that problem by several methods.

25 We can, to some degree, control the

1 hole enlargement, but sometimes we can't. The
2 second case, we put centralizers, a mechanical
3 device, a spring device that's put on the casing,
4 which centralizes it in the hole so you don't
5 have the eccentric condition. And we use enough
6 cement so that on each of the three stages, the
7 first part of the cement is discarded. That is
8 the part that is most likely to be contaminated
9 as a result of channeling.

10 And then the remainder of the cement
11 that is left in place, although it could have
12 some mud in it, it will still be adequate and
13 have sufficient strength to provide the seals and
14 so forth that it's meant to provide. We do it on
15 each stage and get rid of the cement that is
16 potentially contaminated.

17 Q. For channeling to even be a problem,
18 it's going to have to be a continuous channel to
19 get from the Delaware to the potash zone of some
20 6000 feet, is that correct?

21 A. That's correct.

22 Q. Have you encountered channeling of that
23 distance in your practical experience?

24 A. No.

25 Q. Furthermore, for channeling to be a

1 problem with respect to setting of this long
2 string of casing, the channeling you're talking
3 about would most likely occur up to the bottom of
4 the intermediate and then occur within the
5 intermediate, is that correct?

6 A. That's correct.

7 Q. And bypass the potash zone?

8 A. That's correct.

9 Q. And lastly, for channeling, we're
10 talking about a sizeable void, aren't we?

11 A. Yes.

12 Q. Is that detectable by a bond log?

13 A. Should be.

14 Q. It's unlikely that it would occur, but
15 we have a method of detecting it and knowing when
16 it would happen?

17 A. Not a full-proof method. I do not rely
18 on bond logs as much as a lot of other people do,
19 so I can't sit here and tell you that these
20 things are that wonderful.

21 Q. In your opinion, is channeling a
22 phenomenon we must be concerned about with
23 respect to protection of the potash zones in the
24 Delaware formation?

25 A. I'm not saying--it's something we need

1 to be concerned about and we do the things to
2 prevent the occurrence of channeling. It's not
3 something that if we do the things that are done
4 as proposed in this well program that we have
5 discussed, it will not be a problem.

6 Q. Would the salt, if we somehow got a
7 channeling effect on the outside of the
8 intermediate of the salt string, is the salt
9 string going to affect this or is it going to
10 have an effect on it?

11 A. Say that again.

12 Q. Let's talk about channeling on the
13 outside of the intermediate string that goes
14 through the salt. What's going to happen there?

15 A. If you got a channel, when they test
16 that string of casing they drilled out of the
17 salt, if you have a channel and you test that
18 string of casing, then it would leak off, and
19 they do drill out and test that zone or test that
20 shoe, and it would leak off and then you would
21 correct the problem at that time. If you didn't
22 correct it, the strength of the salt is such that
23 by the time--well, the salt would flow and close
24 off this channel.

25 Q. So, for channeling to become a problem,

1 somehow it's got to get past this intermediate
2 casing? And this intermediate casing, one, it's
3 tested so you know you don't have that leak--

4 A. That's correct.

5 Q. --and two, again you have the action of
6 the salt, the plastic nature of it sealing off
7 and making an impermeable seal starting at the
8 base of the salt?

9 A. That's correct.

10 Q. Another term that's been used and we've
11 seen in some of the exhibits is swapping out.
12 Can you describe for the Commission what
13 "swapping out" is?

14 A. Well, if you have a high density fluid
15 on top of a low density fluid, then, by gravity,
16 they will change places, provided they don't mix.

17 Q. How can that occur? Would you describe
18 the circumstances?

19 A. Well, in a general way if you have
20 water and oil, you have water on top of oil, the
21 water will go to the bottom and the oil will go
22 to the top. In an oil well, if you set casing
23 some distance off the bottom and put heavy cement
24 around the pipe, then that cement would tend to
25 go downward through the mud and displace mud up

1 around the bottom of the casing.

2 We frequently spot cement plugs in
3 wells. We frequently set casing off bottom.
4 And, while we do get some mixing, the mixing that
5 we get occurs only in the less than one joint of
6 casing or less than 40 feet. And the reason we
7 don't get any more than that is that the cement
8 and mud mix, and we end up with a very thick,
9 highly viscous material that doesn't flow
10 anymore. So, if we did have mud to try to swap
11 out, as the term is, it won't go very far.

12 The other thing is, when this casing is
13 run, the 5-1/2 particularly, and the 8-5/8 as
14 well, they are run to bottom and they just pick
15 up just barely far enough off the bottom to hang
16 the pipe, which is in the order of one to maybe
17 as much as four feet; typically two or three
18 feet, and there's not enough mud down there to
19 make any difference. If it's two feet off the
20 bottom, the flow action of the cement coming out
21 the bottom of the casing is enough to wash all
22 that out anyhow.

23 Q. So swapping out wouldn't occur?

24 A. There wouldn't be anything to swap out.

25 Q. Now, the void created by the mud that

1 is swapping out, the void is what we've got to
2 concern ourselves with, because that is the path
3 in which there might be gas leakage, is that
4 correct?

5 A. You have to assume it's going to swap
6 out in a discrete channel. It doesn't do that.
7 It doesn't move up in a straight line. Whatever
8 movement there is will be in a rather crooked,
9 tortuous path and, as a result, it mixes with the
10 cement. And, as I say, what happens is in a very
11 short distance.

12 Q. Is the amount of channel that is
13 created directly related to the volume of the
14 fluid in the bottom of the hole that's swapping
15 out?

16 A. One would think so. That may or may
17 not be the case.

18 Q. Well, is it possible that a gallon of
19 mud could move all the way 6000 feet and leave an
20 open channel behind it for the 6000 feet?

21 A. Certainly not.

22 Q. That's what would have to happen for
23 this to become a problem, is to create an open
24 channel 6000 feet?

25 A. Well, it would have to be a channel

1 that would be filled with mud through that whole
2 interval. You couldn't just have a channel that
3 would be a void. The liquid cement would close
4 in it.

5 Q. So there would have to be at least
6 enough volume of material there to keep the void
7 open, then, as it created it?

8 A. That's correct.

9 Q. Just like when you frac a well, you use
10 a profit?

11 A. That's correct.

12 Q. And that's all we're talking about is
13 that same kind of mechanics, the mud, then,
14 becomes, in a way, a profit?

15 A. It would have to.

16 Q. In your opinion, then, is this swapping
17 out phenomena a problem with respect to the kind
18 of well we're discussing or concerned with here?

19 A. It would not be a problem.

20 Q. If you had the swapping out and it just
21 went so far, is the gas going to, if it goes up
22 in one of the weaker zones just above the
23 Delaware, will your gas go there or will it keep
24 on going to the surface?

25 A. It would go to the Delaware.

1 Q. And if it reached the bottom of the
2 salt, again the phenomena you're talking about,
3 the sealing effect, would that continue?

4 A. It would stop it.

5 Q. Let's talk about gas percolation. What
6 is that, in terms of--

7 A. This is kind of pretty much the thing
8 that we talked about, the gas coming out of the
9 rock and moving up through the liquid cement.

10 Q. Is this a problem? How high will this
11 percolation effect occur?

12 A. Conceivably it could go a long way. As
13 a practical matter here, it wouldn't happen, but
14 if you did get gas in it, it would have to travel
15 until the cement got set until it would reach the
16 point that the cement would set enough to stop
17 its movement.

18 Q. In your opinion, is this a problem with
19 respect to these kinds of wells?

20 A. No.

21 Q. This percolation effect only occurs
22 while the cement is in its, I guess, liquid state
23 or predrying state, is that correct?

24 A. It occurs in the process of the cement
25 setting.

1 Q. The setting of the cement cuts this
2 off?

3 A. It would stop it.

4 Q. And, therefore, that would stop the
5 channeling effect, then?

6 A. The percolating effect, yes, and
7 channeling effect.

8 Q. Have you ever encountered and
9 experienced the percolation of gas on 6000 feet
10 to cause a problem like we're discussing?

11 A. I have, in cases where we drilled
12 underbalanced, that is, the weight of the cement
13 and what mud was in the hole produced less
14 pressure than the formation pressure, so the
15 formation was flowing and it just had a higher
16 pressure than the pressure in the wellbore. So
17 we got gas and we had percolation of gas over a
18 fairly long interval.

19 Q. You can cause that to happen?

20 A. We can.

21 Q. And likewise, you can design to prevent
22 that from happening?

23 A. That's correct.

24 Q. Let's talk about another concern here.
25 Let's talk about directional drilling, Mr.

1 O'Brien. Have you had experience with
2 directionally drilling oil and gas wells?

3 A. Yes, sir.

4 Q. Have you designed and actually drilled
5 directional holes?

6 A. Yes, sir.

7 Q. Are you familiar with that process in
8 Southeastern New Mexico?

9 A. Yes, sir.

10 Q. Have you performed a study, then, to be
11 presented to this Commission concerning
12 directional drilling out here in this particular
13 area?

14 A. Yes, sir.

15 Q. Would you please present your--well,
16 first of all, what is your basic opinion with
17 respect to directional drilling as a viable
18 alternative to drilling straight holes out here
19 in the potash area?

20 A. Well obviously it is much less
21 expensive to drill a straight hole. It is less
22 hazardous, in that fewer things can happen to you
23 that will cost large amounts of money or even
24 make you lose the hole. And the longer lateral
25 reach you have, the higher the cost.

1 We have records of a well that was
2 drilled here that kicked out 750 feet, and the
3 excess cost over a straight well was about 35
4 percent.

5 Q. That was the Bonneville well that Yates
6 drilled a few months ago?

7 A. That was the Bonneville. It was a
8 well-drilled well. There wasn't anything unusual
9 about it. But their proposal is to drill a
10 quarter of a mile and a half-mile to kick wells
11 off that far are very close to four times the 750
12 feet.

13 Q. What you're talking about there are the
14 actual proposals to drill the two Graham wells,
15 which are the subject of these hearings, which
16 are approximately a quarter of a mile, is that
17 correct?

18 A. About a quarter of a mile.

19 Q. And then the two Floras are
20 approximately a half-mile?

21 A. Yes.

22 Q. All right.

23 A. So, I took conditions of a straight
24 hole and based that on history of wells drilled
25 in the area.

1 MR. HIGH: Excuse me, Mr. Chairman.
2 I'll object to this. We've already heard Yates'
3 testimony about the cost of drilling these wells
4 directionally. All this witness is doing is
5 repeating what our exhibits are going to show. I
6 object. It's cumulative.

7 CHAIRMAN LEMAY: Do you plan to present
8 this as cumulative? or do you plan to get to
9 something we haven't heard before?

10 MR. CARROLL: No, sir, not at all.
11 This is stuff that we haven't heard before, and
12 based on the exhibits that Mr. High has furnished
13 us, the numbers that Mr. O'Brien will develop are
14 a large divergence. They're not cumulative to
15 those numbers. In fact, they're totally
16 different.

17 CHAIRMAN LEMAY: Mr. High?

18 MR. HIGH: Mr. Chairman, we've heard
19 every Yates witness that got up there that talked
20 about economics tell us what it would cost to
21 drill these wells directionally, and I don't
22 think we ought to hear it from yet another
23 witness.

24 CHAIRMAN LEMAY: Well, we'll continue
25 to hear it for a while. See if you can get off

1 the cumulative type testimony and get into
2 something new, Mr. Carroll.

3 Q. (BY MR. CARROLL) All right, Mr.
4 O'Brien, would you continue?

5 A. My estimate is that it would cost about
6 \$600,000 to drill a straight hole, and it would
7 cost about \$900,000 for Yates to drill a
8 directional hole and kick it off 2660 feet.

9 Q. That's the half-mile that would be
10 involved with the Flora 1 or 2 well?

11 A. That's correct. The protective life of
12 a straight hole is about 14 years. The
13 productive economic limit is about two barrels a
14 day.

15 For a directional hole, the productive
16 life would be about 12 years and the economic
17 limit of 13 barrels per day, and, as a result, it
18 would be 5000 barrels of oil lost or about
19 \$100,000 worth of oil.

20 MR. HIGH: Excuse me, Mr. Chairman. I
21 hate to interrupt again, but it's obvious the
22 witness is reading from something, and I would
23 like to request at this time those papers that
24 he's reading from.

25 CHAIRMAN LEMAY: Are you going to read

1 your testimony or are those just notes to help
2 you out?

3 THE WITNESS: I can put it up on the
4 board right quick, or whatever you want to do.

5 MR. CARROLL: They are just notes.

6 MR. HIGH: I would like to request a
7 copy of those for purpose of cross-examination.

8 CHAIRMAN LEMAY: We'll take that one
9 under advisement. Let's see how much he reads
10 from those notes, or whether they're just going
11 to help him in his testimony.

12 MR. CARROLL: Can you put those numbers
13 up just so we have them then before us?

14 CHAIRMAN LEMAY: Is this what you want,
15 these kinds of figures, Mr. High?

16 MR. HIGH: No, I don't want them up
17 there. All I want to do is see Mr. O'Brien's
18 notes so when I cross-examine him, I can ask him
19 about some of those numbers.

20 CHAIRMAN LEMAY: These are the numbers
21 here.

22 MR. HIGH: I'm requesting a copy of his
23 notes.

24 CHAIRMAN LEMAY: We'll take that one
25 under advisement.

1 THE WITNESS: I'll put them up here and
2 then you can have them.

3 CHAIRMAN LEMAY: Is he volunteering his
4 notes?

5 MR. CARROLL: I think he is.

6 CHAIRMAN LEMAY: All right, you won
7 that one. There's probably no need to put them
8 up there if he's volunteering his notes.

9 THE WITNESS: These other people don't
10 want them?

11 CHAIRMAN LEMAY: The other people,
12 we'll consider them not important at this point.

13 THE WITNESS: I'll read them to him and
14 then give them to him.

15 A. In any event, the upshot of all this is
16 that the operating costs per day for a straight
17 hole is \$50; the operating costs for a
18 directional hole will be about \$200 because they
19 can't pump it with a rod pump economically, they
20 have to use the downhole electric pump.

21 And the operating costs for a straight
22 hole over 14 years is \$255,000. It's \$876,000
23 for the directional hole, a difference of
24 \$621,000.

25 Taking half of that to the present

1 worth is \$310,000. The value of a straight hole
2 is \$850,000 for a typical sort of well. The
3 incremental cost is \$610,000, that is the
4 \$300,000 extra to drill plus the \$300,000 present
5 worth operating costs, which reduces the value of
6 the well to \$240,000 and that will make the well
7 uneconomical. We will not drill a well for
8 \$900,000 to get a \$240,000 return in excess of
9 pay out.

10 Q. Mr. O'Brien, would you write your
11 calculations? You started it there. I would
12 like to see those numbers on this piece of paper
13 and we'll mark it as an exhibit, because you did
14 move rapidly through them.

15 MR. HIGH: Mr. Chairman, we would
16 object to that. We exchanged exhibits. You told
17 us to. The only reason we're hearing this from
18 Mr. O'Brien is because Dr. Mitchell has done a
19 calculation with respect to directional drilling
20 and you made me give it to Mr. Carroll, which I
21 did, and that's all we're doing and I object.

22 MR. CARROLL: And I got that a day ago,
23 so we've had to prepare something, and this is
24 how we do it.

25 CHAIRMAN LEMAY: Give the notes for

1 cross-examination purposes. We'll see the
2 numbers again.

3 MR. CARROLL: Well, I would like to see
4 them as something in written form. There are
5 just a few numbers, how he calculated the
6 ultimate value, Mr. LeMay, just to preserve the
7 record.

8 CHAIRMAN LEMAY: Normally our procedure
9 is to have an exhibit with these numbers on it.
10 We've always operated that way. And the fact you
11 don't have that is not helpful to the
12 Commission.

13 MR. CARROLL: I understand that and I
14 apologize. Until we got the numbers from Mr.
15 High, which we only got in the mail a day ago, it
16 made it very hard to even anticipate this.

17 CHAIRMAN LEMAY: Let's continue with
18 it, then. This is not normal procedure, Mr.
19 Carroll. Do you plan to make this an exhibit?

20 MR. CARROLL: Yes, sir, I do. We'll
21 mark it as Exhibit 72.

22 CHAIRMAN LEMAY: Is that acceptable to
23 you, Mr. High?

24 MR. HIGH: At this point I don't care.
25 I'm going to get the notes and that's what I

1 want.

2 CHAIRMAN LEMAY: What's the exhibit
3 number that's going up there?

4 MR. CARROLL: It will be Exhibit 72.

5 CHAIRMAN LEMAY: Will it be what he's
6 writing now, or his notes?

7 MR. CARROLL: They're the same, so
8 we'll just use the larger piece of paper, then,
9 so Mr. High can have it.

10 [Discussion off the record.]

11 MR. CARROLL: All right. If you'll
12 hand me that, I'll give it to Mr. High.

13 Q. (BY MR. CARROLL) Now, when we're
14 talking about a directional well and we're
15 talking about a straight hole and we're talking
16 about the economic limit, is what you're saying
17 is that this well could be produced down to two
18 barrels a day and at that point it's no longer
19 economic to produce?

20 A. That's right, and that would be in
21 about 14 years.

22 Q. That's basically the value of the
23 product over the cost of pumping the well?

24 A. That's correct.

25 Q. With a directional hole, it's your

1 opinion that that economic limit will be 13
2 barrels, is that correct?

3 A. That's correct. As a matter of fact, I
4 got that number out of this economic calculation
5 from a gentleman with Yates. I don't remember
6 his name.

7 Q. That's based on what the cost is from
8 pumping a directional well--actual cost?

9 A. That's correct.

10 Q. So, at the time a directional well,
11 then, reaches 13 barrels, it's not going to be
12 profitable to produce that well anymore?

13 A. That's correct.

14 Q. You get down here to your calculation
15 of value of oil lost, then?

16 A. I left the zero off the next one.
17 That's 5,000 barrels that's lost, and at \$20 a
18 barrel, that's worth \$100,000.

19 Q. This figure right here?

20 A. Put the zero there. There you are.

21 Q. And this is barrels?

22 A. Yes.

23 Q. And then what you have then taken, the
24 operational costs, then, for a straight well and
25 a directional well, that's \$255,000 versus the

1 \$621,000?

2 A. No, versus \$867,000. The difference is
3 \$621,000.

4 Q. So the cost of operating this well is
5 probably one of the single, largest, most
6 significant costs, then? Not just the drilling
7 costs, is that correct?

8 A. That's correct.

9 Q. So really, when we talk about whether
10 or not it's viable to go out and drill
11 directional wells, you cannot just stop with
12 considering what the cost is of just drilling?

13 A. That's right.

14 Q. So the difference, then, is the
15 \$621,000, and you've reduced that to today's
16 present worth?

17 A. That's correct.

18 Q. And you basically just divided it in
19 half, then, for the purposes of this example to
20 the Commission?

21 A. Or 10 percent. That's pretty close.

22 Q. So, then, you looked at the value of
23 the hole versus the incremental cost, and what
24 you've done is add the additional cost of
25 drilling and the costs of operating?

1 A. That's correct.

2 Q. And that's how you've--that's the
3 number that you reduced, the present worth of
4 those numbers, you've reduced the \$850,000?

5 A. And that leaves you the net value of
6 this well at \$240,000 and that would not justify
7 a \$900,000 drilling cost.

8 Q. You have a drilling cost of almost
9 three times what you expect to get back?

10 A. That's correct.

11 Q. And that just is not economic, is it?

12 A. That's correct. These numbers for the
13 directional well may be optimistic as far as
14 drilling costs are concerned. I took as a 1.5
15 factor the results of drilling operations that
16 were similar to this except that to get this
17 depth to hole and so forth, you would have to
18 kickoff in the salt at about 2000 feet and drill
19 roughly 2000 feet of salt while you build an
20 angle.

21 Directional drilling and salt,
22 controlling the direction and building the angle,
23 is not easy. Directional problems, deviation
24 problems in salt are notorious worldwide,
25 wherever salt occurs. So it's entirely probable

1 that the actual costs to drill that well would be
2 higher than the \$900,000 that I have used.

3 When you get down to the bottom, it
4 doesn't make any difference. These numbers could
5 be off by a substantial amount, and the answer
6 would still be that the well is not an economical
7 one to drill.

8 Q. Now, these numbers were based on a
9 directional hole that was kicked off below the
10 salt, is that correct?

11 A. Part of it was. There was a well
12 drilled that was kicked off below the salt and it
13 kicked off 750 feet. But I have drilled other
14 wells in Southeast New Mexico and we kicked off
15 considerably farther than that, and I'm basing
16 the number on those. We did not kick them off in
17 the salt.

18 So that's the reason I say that very
19 probably the number will be higher than the
20 \$900,000 that I have taken for the drilling and
21 completion costs. If I were going to drill the
22 well, any of these wells, and certainly if I was
23 a mine operator, I would certainly rather have
24 you start your directional drilling much deeper
25 than that.

1 Q. Under a directional hole, the 5,000
2 barrels that you would not be able to produce
3 because it's uneconomic, that oil would be lost
4 or wasted, would it not?

5 A. That's right.

6 Q. And if--let's suppose directional
7 drilling were instituted or forced because there
8 might be a possibility, however remote or likely,
9 that potash mining might occur in this Section 2,
10 do you have an opinion--say if there was never
11 any potash mining there, is that undue waste of
12 oil and gas?

13 A. The fact of the matter is, the well
14 wouldn't be drilled. The total of all the oil
15 that's attributable to this well would not be
16 recovered, none of it would be, because you
17 wouldn't drill the well.

18 Q. So if this well had reserves of 120,000
19 barrels of oil, that's the figure that you're
20 talking about losing?

21 A. Exactly.

22 Q. Just because the costs prohibit it?

23 A. That's correct.

24 Q. With respect to the order of drilling
25 and mining, do you have an opinion as to how that

1 order should occur?

2 A. I think what should be done, since we
3 don't know when or indeed if mining will ever
4 occur here, that what seems to me to be a
5 reasonable approach would be to drill these wells
6 vertically and produce them.

7 At the rate at which mining is
8 presently progressing, the wells very probably,
9 in fact at least a 99-percent chance, those wells
10 will be produced and abandoned before the mining
11 ever gets here. However, if that did not occur,
12 then the mining people can mine up to some
13 reasonable distance, and as they go along at some
14 desirable point, they can make measurements as to
15 the possibility of subsidence and to what degree
16 it may occur, so that you'll have positive
17 numbers to apply here to see actually how close
18 you can get to this well without any damage at
19 all.

20 And then several alternatives present
21 themselves: They can mine around it and come
22 back and take it out on their way back; it may be
23 that they can mine up quite close to it and leave
24 it as some of the pillars that they would leave
25 anyhow; and if it's necessary to get down into

1 the tail end of the life of this well, then
2 together it could be worked out what could be
3 done with the well to ensure that it didn't pose
4 any problem to them.

5 But to arbitrarily at this point say
6 there won't be any drilling here, when no one
7 knows when or if the mining will actually take
8 place, I think is apt to waste a substantial
9 amount of oil in that there are a number of these
10 wells that will not ever be drilled.

11 Q. In your opinion, if mining arrives in
12 the vicinity of these wells after they've been
13 plugged and abandoned, in your opinion, will
14 there be any waste at all of potash?

15 A. There will be no waste at all. There
16 would be no problem at all with them mining
17 through the abandoned well.

18 Q. If mining arrives at the vicinity of
19 these wells while they're still producing, will
20 there be an ultimate waste of that potash, in
21 your opinion?

22 A. Obviously at some point the well will
23 be abandoned and at that point, then, all of the
24 potash at that point can be recovered.

25 Q. So the answer is, no waste there

1 either, is that correct?

2 A. That's correct.

3 Q. In your opinion, then, would the
4 granting of these applications, all four of them,
5 by the Oil Conservation Commission, would they in
6 your mind prevent waste and protect correlative
7 rights?

8 A. Yes, they would.

9 MR. CARROLL: Pass the witness.

10 CHAIRMAN LEMAY: Would you like to
11 start your cross before lunch, Mr. High?

12 MR. HIGH: Yes, sir, I surely could.
13 Unless you want to break now for lunch.

14 CHAIRMAN LEMAY: Not necessarily. We
15 could go a half-hour or so. Your witness.

16 EXAMINATION

17 BY MR. HIGH:

18 Q. Mr. O'Brien, it seems to me that you
19 are of the opinion that the drilling of oil and
20 gas wells to the Delaware zone is so safe with
21 respect to the people who are working
22 underground, that you ought to be able to go out
23 and buy an insurance policy to protect the
24 underground miners. Would you agree with that?

25 A. I don't have any idea what attitudes

1 the insurance people might take. If I was in the
2 insurance business, I would be more than willing
3 to do that. Unfortunately, I'm not wealthy
4 enough to handle it.

5 However, if, on my opinion, and as I
6 say I can't speak for the insurance people, I
7 think that you should.

8 Q. You think the risks are low enough that
9 it ought to be insurable?

10 A. Yes, sir.

11 Q. If somebody wanted to drill these
12 wells, then they ought to be able to go out and
13 find some insurance somewhere or maybe even post
14 a bond?

15 A. I don't know whether they could or not.

16 Q. Let's talk about a bond. If the person
17 who is going to drill these wells is so sure that
18 it's safe and you're not going to do anything to
19 the people working underground, there shouldn't
20 be a big risk to the person drilling the well if
21 they are required to post a bond?

22 A. As I said, I have no idea what the
23 attitude of the people that do that sort of thing
24 might be. I don't expect them to be
25 sophisticated either in mining or oil well

1 drilling, and my experience with insurance people
2 is that they're not, and whether they would grant
3 such an insurance policy or bond, I haven't the
4 slightest idea.

5 Q. Have you had any experience in drilling
6 wells in and around underground mines where
7 people work?

8 A. No, I don't think so.

9 Q. Your background, as I understand it, is
10 it primarily consulting or are you in the oil and
11 gas business?

12 A. Primarily consulting.

13 Q. How long have you been primarily a
14 consultant?

15 A. Since 1976.

16 Q. So that's--

17 A. 14 years.

18 Q. --a long time. So, from 1976 forward,
19 your primary business has been the consulting
20 part of it?

21 A. Yes.

22 Q. And, I take it, that's to the oil and
23 gas industry?

24 A. In part, and a number of industries.

25 Q. I'm sorry?

1 A. A number of industries.

2 Q. Okay. I didn't mean to cut you off.

3 Have you done any consulting for the mining
4 industry?

5 A. Yes, sir.

6 Q. Which mines have you consulted for?

7 A. I worked for the--I can't remember the
8 name of it. It was the Johannesburg something or
9 other gold mines in South Africa.

10 Q. Did it involve the drilling of oil and
11 gas wells in and around underground mines?

12 A. No, sir, it involved drilling core
13 holes in and around mines.

14 Q. So your livelihood, I take it, from
15 1976 forward, has depended primarily upon the oil
16 and gas industry?

17 A. Yes.

18 Q. Now, the casing program, and this is
19 the exhibit that was up on the board there,
20 Exhibit No. 68, do you have that in front of you
21 there anywhere? Or if you have a copy, you might
22 refer to a copy.

23 A. Yes, sir.

24 Q. Did you prepare this document?

25 A. I had it prepared.

1 Q. It was prepared under your direction?

2 A. Yes, sir.

3 Q. In your office?

4 A. No, sir.

5 Q. Was it prepared by Mr. Carroll?

6 A. No, sir.

7 Q. Well, who did prepare it?

8 A. Somebody with Yates prepared it. I'm
9 not certain who drew it.

10 Q. I note down at the bottom, and I want
11 to make sure everyone understands this, down at
12 the bottom it says, "Scale, one inch equals 1000
13 feet"?

14 A. And it's not exactly the scale
15 throughout.

16 Q. The reason I asked that question, I
17 measured the thickness of this cement as a
18 half-inch, would mean it would be 500 feet? You
19 don't mean to say that?

20 A. Certainly not. The vertical scale of
21 the casing is what the reference is to.

22 Q. The scale has nothing to do with the
23 cement that's shown on Exhibit 68?

24 A. That's exactly correct.

25 Q. How thick is this cement?

1 A. Well, if you have 5-1/2 casing in a
2 7-7/8-inch hole, that's about an inch, inch and a
3 half. Is that right? No, it's almost two and a
4 half inches, ain't it?

5 Q. I don't know. I'm asking you.

6 A. About two and a half inches. It's half
7 of that if it's in the middle of the hole and
8 it's all of that if it's on one side, so it's
9 somewhere between half of two and a half. From
10 one and a quarter to two and a half inches,
11 depending on where you are.

12 Q. So that would be the thickness of the
13 cement around the casing?

14 A. Yes.

15 Q. That's not going to be uniformly all
16 the way down that hole, is it?

17 A. That's what I said.

18 Q. There are things that happen that don't
19 let that pipe stay right in the center of the
20 hole?

21 A. That's correct.

22 Q. In fact, that hole is not the same size
23 all the way down, is it?

24 A. It will be 7-7/8 or slightly larger.

25 Q. Is there any variation in the size of

1 that hole as you're drilling it?

2 A. As I said, it will be 7-7/8 inches or
3 slightly larger.

4 Q. What do you mean "slightly larger"?

5 A. Up to maybe two or three inches.

6 Q. Now, this cement that you told us
7 about, you say it's impermeable?

8 A. Yes, sir.

9 Q. At what age?

10 A. From the time it sits.

11 Q. For how long?

12 A. Ever more, as far as we know.

13 Q. Never changes?

14 A. It probably would change a little bit
15 but not materially.

16 Q. And the cement that's shown on Exhibit
17 No. 68, as far as you're concerned, that ought to
18 keep anything from happening, in terms of gas
19 getting outside that casing?

20 A. Yes, sir.

21 Q. Is this what is normally done in the
22 oil and gas industry to keep gas from getting
23 outside the casing, is to just put this cement in
24 there?

25 A. Yes, sir.

1 Q. Do you know what an external packer is?

2 A. Yes, sir.

3 Q. What are they designed to do?

4 A. To isolate zones in the annulus,
5 between the casing and the--

6 Q. But if the cement was so good, why
7 would you use an external packer?

8 A. Because of the conditions that they
9 perceive in some wells; particularly in very
10 high-angle holes they use external packers.

11 We use them on some occasions where the
12 strength of the rock is so low that we are not
13 able to raise a very large column of cement, so
14 we put some cement in, we put an external casing
15 packer, and that provides a base for putting in
16 additional cement.

17 There are a few cases in vertical holes
18 where they do use external casing packers or
19 attempt to use them to isolate without the use of
20 cement.

21 Q. Aren't there some instances, Mr.
22 O'Brien, where you use an external packer because
23 you don't want gas from one zone to get up to the
24 gas on another zone?

25 A. As I say, there are cases where they

1 perceive of isolating with a packer.

2 Q. And that's because the gas will migrate
3 along the cement up to the other gas level?

4 A. Not if it's a reasonable cement job.

5 Q. But if it's a reasonable cement job,
6 you don't need the external packer, do you?

7 A. That's correct.

8 Q. So you use the external packer because
9 cement doesn't always do the job?

10 A. Let me say, you say I use the cement
11 packer--

12 Q. I'm talking about the industry.

13 A. There are a few people in the industry,
14 and what you're describing is not a common
15 practice, the success of those packers is highly
16 questionable. There are a few cases that they
17 perform quite well but, in most cases, the vast
18 majority of cases, cement--and I'm not talking
19 about high-angle holes, the higher the angle gets
20 the worse it is, and we have lots of problems
21 there that we don't have to consider here, or I
22 hope we don't--but aside from that, the use of
23 external casing packers is extremely limited
24 because it is not particularly successful.

25 Q. Well, I'm not asking about the use of

1 it. My question is very simple. Aren't external
2 packers used by the industry because of the
3 problem of gas migrating around the cement job up
4 to another gas zone?

5 A. They probably have been.

6 Q. Now, if everything is done perfectly,
7 if you drilled a well like is shown on Exhibit
8 No. 68 and everything was done exactly correct,
9 you're saying there's no problem in terms of
10 safety?

11 A. I don't think I said that.

12 Q. Mr. Carroll kept asking you if it would
13 be a problem?

14 A. That's right.

15 Q. I'm not quite sure what you were
16 talking about when you said there wouldn't be a,
17 quote, problem, close quote.

18 A. I said I would be concerned about it,
19 but it would not be a problem.

20 Q. When you say it wouldn't be a problem,
21 what's the concern you have and the no problem?
22 How do they fit together?

23 A. If you don't know what the problem is,
24 we're wasting time.

25 Q. I know what the problem is, Mr.

1 O'Brien. My question is, do you know what the
2 problem is?

3 A. I know what I think it is.

4 Q. Well, that's my question. Tell me what
5 the concern is and the no problem you're talking
6 about?

7 A. All right. Just hang on a minute. The
8 problem that has been described to me in which
9 I've heard you question people about is the
10 possibility of getting gas into the mine
11 workings. Now, certainly the migration of gas is
12 a concern. What I'm saying is, if these
13 techniques are followed, they don't have to be
14 perfect, which is why I disagreed with you a
15 moment ago, they don't have to be perfect and
16 they will perform adequately to prevent the
17 migration of gas, so that there will be no
18 problem.

19 Q. And again, the "no problem" means that
20 gas won't get outside the casing?

21 A. Gas will not get into the mine
22 workings.

23 Q. It might get outside the casing but not
24 in the mine workings?

25 A. That's correct.

1 Q. So the "no problem" you're talking
2 about is, the gas that does get outside the
3 casing, you don't think will find its way into
4 the underground mine workings?

5 A. That's correct.

6 Q. Okay. There are a number of ways gas
7 can get outside that casing, and you went through
8 those, leaks from the threads, gas flow through
9 cement, channeling, all that kind of stuff?

10 A. These are methods that are conditions
11 that have been mentioned as possibilities. And
12 there are some of them I said will not happen.
13 Some of them I said if indeed they did happen,
14 they would not pose a problem.

15 Q. And the problem being again that the
16 gas that gets out of the casing won't migrate in
17 the mine?

18 A. That's correct.

19 Q. Now, do you know, Mr. O'Brien, of any
20 studies, any empirical data at all, that has
21 studied whether or not the gas that gets outside
22 the casing, in Southeastern New Mexico, will or
23 will not migrate into underground workings?

24 A. No. But on the contrary, there has
25 been no study made that shows that that is or

1 ever has been a problem.

2 Q. Do you know of any studies that have
3 been done in Southeastern New Mexico on whether
4 or not and how much gas has gotten out of the
5 casings of the wells in the known potash area?

6 A. No.

7 Q. You are aware that, as we stand here
8 today, there's over a thousand wells that have
9 been allowed in that known potash area, aren't
10 you?

11 A. I don't know what the number is.

12 Q. You have been in the hearing ever since
13 we started, haven't you?

14 A. Yes.

15 Q. Let me just represent to you that the
16 testimony has been that there are over a thousand
17 wells that have been allowed in the known potash
18 area.

19 A. Okay.

20 Q. Would you agree with me that the
21 chances are pretty high that in some of those
22 thousands, gas has gotten outside the casing?

23 A. There's no evidence of it. I don't
24 know that I would agree with you at all.

25 Q. Do you know of any tests that have been

1 done on whether or not that gas has, in fact,
2 gotten out of the casing?

3 A. No.

4 Q. Do you think it's important, Mr.
5 O'Brien, to people who are working underground
6 who might be adversely affected by these wells,
7 to have some studies like that done before you
8 put this oil and gas well in there?

9 A. No.

10 Q. Now, you were talking about the amount
11 of pressure in these Delaware wells, and I think
12 you said the bottom hole pressure was somewhere
13 around 2,600, 2,800 psi?

14 A. Initially, yes.

15 Q. And then it goes down to about 50 psi,
16 or I think you said within 20 or 30 psi? I
17 misspoke.

18 A. Well, we were speaking initially of the
19 bottom hole pressure at 2,600 or 2,800 psi, and
20 the 50 to 80 pounds that we are now talking about
21 is a different pressure. They're not comparable.

22 Q. If you drill a Delaware well, the
23 bottom hole pressure is going to be somewhere
24 around 2,600 psi?

25 A. That's right.

1 Q. What are you going to do if it blows
2 out?

3 A. It blows out. I guess we would kill
4 it.

5 Q. Do you know whether or not there's a
6 blowout plan for these wells?

7 A. Yes.

8 Q. Have you seen it?

9 A. Oh, I don't know that there's a written
10 one but I know there's a plan.

11 Q. It would be just what they always do
12 when this happens?

13 A. Pretty much.

14 Q. When you say kill a well, what does
15 that mean?

16 A. Stop it from flowing.

17 Q. And to make sure we're both speaking
18 the same language, what do you call a blowout?

19 A. The uncontrolled flow of formation
20 fluids to the atmosphere or into another zone.

21 Q. And that does sometimes happen in
22 Southeastern New Mexico, doesn't it?

23 A. It does.

24 Q. When that happens, when you have a
25 blowout, you kill the well?

1 A. That's correct.

2 Q. Is that the same thing as shutting it
3 in?

4 A. Sometimes.

5 Q. If you are or were drilling one of
6 these four and you had that blowout and you shut
7 it in, what would be the pressure in that casing?

8 A. It would not be over 2,000 psi at any
9 point, and it would be less than that at the
10 surface. I can't tell you exactly what it would
11 be, but it would be less than that. It probably
12 would not be over 1,500 psi.

13 Q. You would have a whole lot more than 50
14 psi, wouldn't you?

15 A. Certainly.

16 Q. And as long as that well was shut in it
17 would stay up at that high pressure--

18 A. Well--

19 Q. --unless it migrated somewhere else?

20 A. No. It would migrate. It would go
21 into some of these other zones below the 8-5/8 is
22 where it would go, and it would bleed off,
23 because that's by far the weakest thing in there.

24 Q. Okay. And do we have any idea, Mr.
25 O'Brien, where that gas would go?

1 A. Yes, sir.

2 Q. Where do you think it would go?

3 A. I know where it would go. It's not a
4 matter of thinking.

5 Q. All right. Where do you know it would
6 go?

7 A. It would go into these Delaware sands
8 in the Bell Canyon.

9 Q. And nowhere else?

10 A. That's right.

11 Q. None of it would get outside the
12 casing?

13 A. It would not get outside the 8-5/8.

14 Q. Now, you were talking about these core
15 holes, Exhibits 69 and 70, and then I thought you
16 said that if these seals failed they would allow
17 water to enter the salt in the mine workings?

18 A. That's right.

19 Q. Is that what you said?

20 A. Yes.

21 Q. And, at the same time, I thought I
22 heard you say earlier that it takes about 3,000
23 psi to pump something into the salt?

24 A. That's right.

25 Q. Are you saying that the water in these

1 aquifers, which you have shown on Exhibits 69 and
2 70, would be above 3,000 psi?

3 A. Certainly not.

4 Q. So things can get into the salt that
5 are less than 3,000 psi?

6 A. I don't know whether they can or not.
7 Well, you can carry a bucket of water down there,
8 you know, but the thing is we're talking about
9 here is that you have this core hole plugged with
10 cement. If the subsidence were to--or any
11 subsidence were to occur and that would destroy
12 the seal, then the bottom of the core hole is
13 into an open mine working so that you're not
14 putting water into the salt, you're putting it
15 into a mine gallery, or whatever the proper term
16 is.

17 Q. You're not suggesting, are you, Mr.
18 O'Brien, that what's done with one of these core
19 holes is what ought to be done with one of these
20 Delaware wells, are you?

21 A. No.

22 Q. I would hope you would agree with me
23 there's a whole lot of difference with respect to
24 hazards to underground miners?

25 A. You missed the point of what I was

1 talking about.

2 Q. And I'm going to give you a chance to
3 say it.

4 A. Okay. Go ahead.

5 Q. And if you'll give me a chance to ask
6 my question, I assure you I'll give you a chance
7 to answer.

8 A. Okay. I thought you were making a
9 speech.

10 Q. No, not yet. We'll save that for
11 another time. You're not suggesting that the
12 core holes that you show in 69 and 70 are
13 anywhere near the same kind of hazard as an
14 8500-foot Delaware well?

15 A. There's no comparison made between the
16 core hole in that regard at all.

17 Q. Whatever way you plug a core hole, as
18 shown on Exhibits 69 and 70, is not necessarily
19 the way you ought to plug an 8500-foot Delaware
20 well, is it?

21 A. That's correct.

22 Q. Would you also agree with me that a
23 hole drilled down to the Delaware formation
24 presents a greater risk to underground miners
25 than one of these core holes shown on Exhibits 69

1 and 70?

2 A. If you drilled in the area where there
3 was gas and/or oil present above the top of the
4 salt, I think that the hazard produced by the
5 core hole, where they mined into the core hole, I
6 think that the hazard presented by that core hole
7 would be at least equal to that presented by the
8 Delaware well.

9 Now, if there is no gas above that--no
10 gas or oil above the salt, then it wouldn't
11 present any problem at all other than conceivably
12 possibly getting wet.

13 Q. Now, as far as plugging and abandoning
14 these wells and then mining through, you referred
15 to an article here that Mr. Carroll introduced,
16 Exhibit No. 71. I take it you picked that up in
17 your research?

18 A. Yes.

19 Q. You weren't in any way involved in its
20 preparation?

21 A. No, sir.

22 Q. Now, the wells that were involved in
23 the study reflected in Exhibit No. 71, were how
24 deep, Mr. O'Brien?

25 A. About 2000 feet.

1 Q. And of course here we're talking about
2 wells that are roughly more than four times that?

3 A. That's right.

4 Q. And what was the pressure, the
5 reservoir pressure of the wells involved in
6 Exhibit No. 71?

7 A. They pressured them up to about 2,000
8 psi.

9 Q. What was the initial reservoir
10 pressure? Do you have any idea?

11 A. The initial reservoir pressure was
12 probably slightly less than a thousand pounds.

13 Q. And you got that out of Exhibit No. 71?

14 A. No, sir, but that's normal pressure for
15 that part of the world. When they drilled them
16 in 1890, that would have been the initial
17 pressure.

18 Q. What was the pressure at the time this
19 study was done of the wells that were under
20 consideration?

21 A. Until they pressured it up it was
22 extremely low. I don't remember. There may be a
23 number in there and I don't remember what it is,
24 but it was in the order of very few pounds of
25 pressure.

1 Q. Very, very low, I take it?

2 A. Yes.

3 Q. In fact, the wells involved in the
4 study, Exhibit No. 71, were what were called
5 pressure depleted reservoirs?

6 A. Yes.

7 Q. Would you agree with me there's a whole
8 lot of difference in that and a producing
9 Delaware well, in terms of hazards that are
10 presented?

11 A. No, I don't think so. Had that
12 been--well, I'm not sure what sulfur hexafluoride
13 or what this is, I'm not sure how hazardous it
14 would be, but just from the name of it it sounds
15 pretty bad. But I don't think that 2,000 psi, at
16 2000 feet, is any less of a hazard than 2,800
17 pounds at 8000 feet.

18 Q. Are you suggesting that the tracer gas
19 was a hazard in underground mining?

20 A. It could be. I don't know. I just
21 said, I don't know how hazardous that material
22 is. I would think it would be.

23 Q. You understood that the hazard that was
24 being looked at in Exhibit No. 71 was methane
25 gas?

1 A. Yes.

2 Q. And the possible release of that
3 methane gas from an oil well into a coal mine?

4 A. Yes.

5 Q. Now, do you know what size pillars had
6 been left around the wells that were being looked
7 at in Exhibit No. 71?

8 A. I don't recall whether it's in there or
9 not. I don't know.

10 Q. Do you know how many strings of casing
11 were involved in the wells in Exhibit No. 71?

12 A. I think there were two strings of
13 casing involved. Some of them may have had
14 three.

15 Q. Let me suggest to you that the report
16 says that there were three to four strings of
17 casing. You don't disagree with that, do you?

18 A. No. They were not all the same.

19 Q. That's correct. I'm not suggesting
20 they are, but there were some wells in the study
21 that had three or four strings of casing?

22 A. And some of them had two.

23 Q. When they were preparing to do this,
24 and if you'll look at the top of page 6, when
25 they went in to do this study, they found what we

1 are concerned about. And if you'll look at page
2 6 at the top, Mr. O'Brien, it says, "In several
3 cases, the presence of gas behind the casing made
4 it difficult to interpret the neutron log and
5 accurately locate the coal beds." Do you see
6 that sentence?

7 A. Uh-huh, yes.

8 Q. So the gas that was inside of these
9 wells, where the pressure had been depleted, had
10 somehow gotten on the outside of the casing?

11 A. Not necessarily.

12 Q. Well, isn't that what page 6 says?

13 A. There can be gas outside the casing.
14 It does not have to be in the annulus. That gas
15 very well may have been in porous zones outside
16 the casing or coal outside the casing. Methane
17 does occur in coal; methane does occur in
18 numerous porous zones that would cause a reaction
19 on the neutron log.

20 Q. Now, in doing this test, they put this
21 tracer gas in, and you did read and study this,
22 of course?

23 A. I did read it.

24 Q. And your recollection is that it was
25 pressured up to a thousand psi?

1 A. Something of that order.

2 Q. Well, let me refer you to page 6 again,
3 down in the third paragraph, second sentence.
4 "The SF₆ was injected at pressures below 300 psi
5 so it would remain in a gaseous state"?

6 A. There's also in here somewhere, and I
7 don't know where it is, conditions where they
8 pressured up to considerably higher pressure.

9 Q. Well, if you find that, point it out to
10 me. But, even at that pressure, the tracer gas
11 that was injected into that well, or these wells,
12 migrated, didn't it?

13 A. It migrated to other wells.

14 Q. And it was found in other wells through
15 testing?

16 A. Sure.

17 Q. We don't have any empirical data like
18 this in Southeastern New Mexico, do we?

19 A. Not that I know of.

20 Q. Now, as they started to mine up to this
21 well after it was plugged, they encountered
22 methane, correct? Do you recall?

23 A. I don't recall. They could have.

24 Q. In fact, if you read the report, you'll
25 see that they incurred or encountered

1 increasingly larger amounts of methane the closer
2 they got to the well, right?

3 A. I don't know. They may have.

4 Q. In fact, when they were mining up to it
5 they even smelled oil, and when they got up
6 there, they found that the casing had a hole in
7 it, and, in fact, oil had leaked out.

8 Would you agree with me, Mr. O'Brien,
9 that they would never have known that if they
10 hadn't mined up there to it?

11 A. They probably wouldn't.

12 Q. So what's going on underground with
13 these oil and gas wells, sometimes we never know
14 about, do we?

15 A. I suppose sometimes. But, on the other
16 hand, these wells were not cemented or plugged,
17 either one, back in there, back in the days that
18 they were operating as these are drilled or
19 plugged.

20 Q. Do you know whether or not there is a
21 barrier pillar requirement around oil and gas
22 wells in the coal industry now?

23 A. If there's what?

24 Q. A barrier pillar requirement around the
25 oil and gas well in the coal industry.

1 A. I think there is. I don't know what
2 the size of it is.

3 Q. You understand that's to protect the
4 underground miners?

5 A. I would think so, and, likewise, to
6 protect the well.

7 Q. Are you familiar, Mr. O'Brien, with the
8 differences between the regulatory requirements
9 between a coal mine and a potash mine?

10 A. I have looked at them. I certainly
11 don't know them in detail. I know that there are
12 substantial differences.

13 Q. Would the consequences of an oil and
14 gas well leaking methane into a mine be
15 different, in your judgment, if the consequences
16 in a coal mine were different than the
17 consequences in a potash mine? That's an awkward
18 question, and if you don't understand it--

19 A. I think so.

20 Q. Okay. The point I'm making is this.
21 If you're considering whether or not something
22 should or shouldn't be done or allowed, should
23 you take a look at the consequences if something
24 does go wrong?

25 A. Certainly.

1 Q. If you're looking at a coal mine, the
2 consequences of getting methane in a coal mine
3 are what, if you know?

4 A. Well, largely, coal mines have some
5 methane in them so they're prepared to handle it.

6 Q. They encounter that on an everyday
7 basis?

8 A. Yes.

9 Q. Do you know whether or not the same is
10 true of a potash mine?

11 A. Generally not.

12 Q. If you're not prepared to deal with it,
13 would you agree with me you ought to be a little
14 more cautious in a potash mine than you are in a
15 coal mine?

16 A. I think if I was a miner I would be
17 more cautious, yes.

18 MR. HIGH: Mr. Chairman, I'll go to
19 another subject now. I don't know what your
20 plans are for lunch. I'm perfectly willing to go
21 ahead, unless you want to break. I'm starting on
22 a new subject area now.

23 CHAIRMAN LEMAY: Any idea how much
24 longer you will be?

25 MR. HIGH: It won't be long.

1 CHAIRMAN LEMAY: Why don't we finish
2 this witness up, and we can take a late lunch.

3 MR. HIGH: Well, I don't think I'll be
4 that quick. I'm perfectly willing to finish him
5 up, but I'm not going to represent to you that it
6 will be that short.

7 [Discussion off the record.]

8 CHAIRMAN LEMAY: Why don't we continue
9 for a while.

10 MR. HIGH: Okay.

11 Q. (BY MR. HIGH) You talked about
12 subsidence, Mr. O'Brien. Have you had any actual
13 experience in drilling oil or gas wells in areas
14 of subsidence?

15 A. Yes, sir.

16 Q. Caused by underground mining?

17 A. No, sir.

18 Q. The subsidence you're talking about, is
19 that these mountains are moving and that sort of
20 thing?

21 A. That was one of them. I have dealt
22 with subsidence that several of them, from those
23 that were--the subsidence was just a drop, the
24 sides were vertical in some very shallow oil
25 wells. I've dealt with some where there was

1 differential subsidence across a structure so
2 that--sometimes fairly sharply differential so
3 that the wellheads ended up at an angle.

4 Q. Well, have you had an occasion to study
5 how the ground moves in the subsidence that we
6 experience in Southeastern New Mexico?

7 A. Based on the studies that I have seen,
8 there have been several calculations, at least
9 theoretically we assume that these various angles
10 are straight lines from some point on the surface
11 to the mining area, although I don't think that
12 actually happens.

13 Also, in talking to rock mechanics
14 experts, they have the opinion that the movement
15 is not a straight line function but rather one
16 that is an angle, increasing angle as you leave
17 the mining face and/or the wall as you approach
18 the surface.

19 That assumes a homogeneous interval
20 from the surface to the mined area, which we
21 don't have, so there probably will be some
22 differential movement between beds. And that's
23 what I get out of the studies that I have seen.

24 Q. And that's in connection with
25 subsidence in Southeastern New Mexico?

1 A. Yes.

2 Q. Have you ever had a case where you were
3 retained as a consultant to advise someone in
4 connection with the impact or possible impact of
5 subsidence, like we get in Southeastern New
6 Mexico, upon that well or possible well?

7 A. I have not as a consultant, but when I
8 was working for Gulf I did that in connection
9 with subsidence. It was, I think, fairly
10 similar.

11 Q. Would you say that one of your areas of
12 expertise is dealing with wells or proposed wells
13 in the areas of subsidence, like we encounter in
14 Southeastern New Mexico?

15 A. I guess I have to ask, as compared to
16 who? I think, and my expertise is probably about
17 as good as you run into with drilling people in
18 the oil field, probably better, and I don't know
19 how many mining people know what happens to
20 wells, either, so I bet I'm about as good as the
21 upper five percent or something.

22 Q. I guess what I'm getting at, Mr.
23 O'Brien, would you want to consult with, say,
24 someone who has more rock mechanic expertise than
25 yourself before you went around drilling a well

1 in an area of possible subsidence?

2 A. Yes.

3 Q. Or would you feel comfortable dealing
4 on your own expertise?

5 A. That probably would depend on the
6 degree of subsidence that was anticipated.

7 Q. Do you know the directions of movements
8 of the subsidence caused by underground mining in
9 Southeastern New Mexico?

10 A. They generally tend to move
11 perpendicular to the directions of the mine.

12 Q. Any other movements?

13 A. Down.

14 Q. Okay. Well, that's what I'm saying.
15 Any other movement other than down?

16 A. I said perpendicular to the direction
17 of the mine.

18 Q. So, it's your understanding that the
19 subsidence in Southeastern New Mexico is a single
20 movement and in a downward direction?

21 A. No, sir.

22 Q. That's what I'm asking. What other
23 direction?

24 A. I just told you. The mine runs in some
25 direction, the gallery or whatever you call this

1 thing, runs in some direction, and there is
2 movement towards the center of that mine section
3 and it's more or less perpendicular to the
4 direction of the mine.

5 It's more or less two-dimensional, not
6 much in the third direction or longitudinally
7 along the mined area.

8 Q. Would subsidence affect the cement job
9 on an oil and gas well?

10 A. If you've got enough subsidence,
11 perhaps. In the subsidence that's indicated in
12 the studies that I see here, I think not.

13 Q. What is the tensile strength of
14 cement? High or low?

15 A. It's about the same as rock.

16 Q. Will cement that are used in these oil
17 and gas wells, stand very much horizontal
18 movement without breaking?

19 A. It will bend some. And the amount of
20 moment that takes place in the subsidence, the
21 lateral motion for a given interval per foot, is
22 small enough that the cement would be able to
23 withstand it without any problem.

24 Q. Well, would you agree with me that
25 there is a greater risk, if a well is in an area

1 of subsidence, that something bad will happen to
2 that cement?

3 A. I guess it depends on where it is in
4 the area.

5 Q. Do you think that if a well is in an
6 area where it might be affected by subsidence,
7 that that creates a greater unknown of what might
8 happen to this gas if it got outside the casing?

9 A. No.

10 Q. So you don't think subsidence would
11 have anything to do with possible gas migration?
12 Is that what you're saying?

13 A. I didn't say that.

14 Q. Well, will subsidence increase the risk
15 that whatever gas got outside of a casing will
16 migrate to some place that we don't know where it
17 went?

18 A. Did you ask me whether that's something
19 I could conceive of? Ask me the question again.
20 I'm not sure what answer you're looking for.

21 Q. I'm looking for an answer to the
22 question. If you don't understand the question,
23 just let me know.

24 A. That's my problem.

25 Q. Okay. Do you think that a well in the

1 area of subsidence, that that subsidence
2 increases the risk that the gas that might get
3 outside the casing will migrate some place and we
4 don't know where it went?

5 A. Within some reasonable limits, no.

6 Q. But then I take it from that answer,
7 there are some limits within which you would say
8 yes?

9 A. Well, obviously, I don't know if it's
10 going to go three feet up there or three
11 feet--because you've got to put some kind of
12 practical limit. There's nothing that I know of
13 anywhere that's absolute. So when you ask me one
14 of these questions that you want an absolute yes
15 or no answer, why, you're asking an improbable
16 question.

17 So what I'm saying is that certainly if
18 you've got gas outside the pipe, it's going to go
19 somewhere.

20 Q. Okay.

21 A. All right. Now, it has a choice of two
22 or three places to go. I know some of the places
23 it won't go, but I know that it is in proximity
24 to the well or it will move upward.

25 Q. Okay. All right. Assume for a moment

1 that gas got outside the well casing and got in
2 the McNutt member of the Salado formation where
3 the potash is. Do you think that subsidence in
4 that area would increase the risk that that gas
5 would have a place to migrate to?

6 A. No.

7 Q. Do you know whether or not there's any
8 separation of the beds in the strata as a result
9 of subsidence?

10 A. There can be.

11 Q. Do you think that would create a path
12 of migration?

13 A. For some small distance.

14 Q. Now, this subsidence and its effect on
15 the casing that you were talking about earlier,
16 you were talking about J-55 pipe. I believe you
17 said it was designed for a maximum of 55 psi?

18 A. No, sir.

19 Q. What was it, then?

20 A. It has a yield strength of 55,000 psi.

21 Q. That's yield strength, you call it?

22 A. That's correct.

23 Q. Is that horizontal tension strength?

24 A. In any direction.

25 Q. Is that number, Mr. O'Brien, designed

1 to be uniform around the pipe?

2 A. Yes.

3 Q. Will pipe withstand the same amount of
4 uniform pressure if that pressure is applied,
5 instead, at a point?

6 A. It will withstand whatever the point
7 load is.

8 Q. So is it your testimony that you can
9 take 5,500 psi and apply it to a point on J-55,
10 and there will be no difference than if you apply
11 that same stress in a uniform fashion around the
12 pipe?

13 A. The number that I said was that this
14 pipe has 55,000 pounds per square inch minimum
15 yield strength.

16 Q. Okay. And my question is, is that a
17 point number or is that a uniform pressure
18 number?

19 A. It's neither one.

20 Q. So it makes no difference whether it's
21 uniform or from a point?

22 A. Not as far as that's concerned.

23 Q. If subsidence causes pressure against a
24 casing, does it make any difference if that
25 subsidence pressure is applied uniformly around

1 the pipe or to a point on the pipe?

2 A. I think that the movement that you have
3 is so small, it doesn't make any difference.

4 Q. Okay. Now, you used the term angle of
5 break?

6 A. Yes, sir.

7 Q. Is that what Mr. Hutchinson was talking
8 about up here the other day?

9 A. The best I can understand what he
10 talked about, yes.

11 Q. Now, you said salt won't crack? Did I
12 hear you say that earlier?

13 A. I don't think so.

14 Q. Well, I wrote it down and I put quotes
15 around it. Maybe I misunderstood what you said.
16 Will salt crack?

17 A. Under the proper conditions, yes.

18 Q. Have you ever seen a roof fall in an
19 underground mine?

20 A. No, sir.

21 Q. Now, the conditions that Mr. Carroll
22 led you through, starting with leaks from the
23 threads and the microannulus and all those sorts
24 of things, those were reflected in exhibits that
25 Dr. Mitchell prepared, were they not?

1 A. Yes, sir.

2 Q. You were just responding to the
3 anticipated testimony of Dr. Mitchell?

4 A. In a way, yes. I was just answering
5 his questions.

6 Q. I understand that, Mr. O'Brien. You
7 will agree with me, though, I assume, that there
8 are circumstances in which gas will leak around
9 the threads of the casing?

10 A. There are, and I described when that
11 might occur.

12 Q. Sometimes you don't get a good mate
13 between the casing?

14 A. No, sir.

15 Q. Pardon?

16 A. No, sir.

17 Q. You always get a good setting?

18 A. Yes, sir.

19 Q. Have you ever had a situation where you
20 had a leak from around the threads?

21 A. Yes, sir.

22 Q. So that is one way gas can get from
23 inside the casing to outside the casing?

24 A. It's one conceivable way, not
25 necessarily one which will occur here.

1 Q. I believe you said that microannuli
2 probably do exist? Is that what you said?

3 A. They probably do, in some limited
4 intervals.

5 Q. That there is a space, ever how minute
6 it might be, between the cement and the casing
7 and/or the cement and the earth, that will allow
8 or might allow gas to migrate along?

9 A. As I say, over limited distances.

10 Q. And, in fact, it's partly for that
11 reason, or that may be one reason why you might
12 want to use an external packer or somebody else
13 might want to use an external packer, correct?

14 A. If they think that's going to happen
15 and they use that, I guess your statement
16 probably is right.

17 Q. As far as gas flowing through cement,
18 that does happen or can happen, can't it?

19 A. Under some particular circumstances it
20 can happen.

21 Q. And that gas can go from the bottom of
22 the hole to the top of the hole through cement?

23 A. Under some specific circumstances which
24 do not apply here.

25 Q. And that distance can be 10,000 feet,

1 can't it?

2 A. It can be further than that, but that
3 doesn't apply here.

4 Q. But it is one way that gas can get
5 through impermeable cement?

6 A. If you want to take ridiculous things,
7 we don't cement to well, but that is no more
8 ridiculous than the proposition that you're
9 proposing.

10 Q. Well, you have encountered
11 circumstances, Mr. O'Brien, where you've had gas
12 outside the casing, haven't you?

13 A. Absolutely.

14 Q. People didn't intend the gas to be
15 there, though?

16 A. Right.

17 Q. They didn't intend that?

18 A. That's exactly right.

19 Q. Things happen?

20 A. Things did not happen in a well like
21 this, the conditions that you're describing.

22 Q. Would you agree that mistakes can cause
23 things to happen that people don't want to
24 happen?

25 A. I think that that's probably a

1 reasonable sort of statement.

2 Q. Mistakes can cause gas to get from
3 inside the casing to outside the casing, and you
4 don't want it out there?

5 A. That's right.

6 Q. Do you have any idea how much gas it
7 would take to cause some serious problem for the
8 underground potash people?

9 A. I have attempted to find out from the
10 mining people how much air they circulate through
11 a well, and our last encounter I tried to find
12 that out and didn't. However, I made some
13 calculations based on the kind of wells we have
14 here, that the probable maximum amount of gas
15 that one of these wells might produce is in the
16 order of maybe 150,000 cubic feet per day.

17 Q. Are you speaking in terms of blowing
18 one of these things up?

19 A. No, I'm not blowing up anything. If I
20 took one of these wells and took all the gas it
21 would make and turned it into the mine, the most
22 gas it would produce would be about 150,000 cubic
23 feet per day. That's caused by the--these are
24 oil wells, and that's what they will produce.

25 Now, you can stand a quarter of one

1 percent methane and still be within the limits of
2 your rules. So, the amount of air that it would
3 take to maintain that gas at a proper dilution
4 would be the amount of air that is furnished by
5 about a three-horsepower blower. And I am told
6 that the blowers that are used to ventilate mines
7 are far in excess of that size.

8 Now, this doesn't mean that if you shut
9 the blowers down and let the mine sit there for a
10 long time that you wouldn't conceivably fill the
11 whole thing with methane.

12 Q. Do you know the size of the samples
13 people take when they're checking for gas in an
14 underground mine? Do you have any earthly idea?

15 A. No, I don't. I've measured methane
16 with some kind of testing device, but I don't
17 remember what that size was.

18 Q. Now, as far as the directional drilling
19 of these wells are concerned, Mr. O'Brien, I take
20 it you undertook the study you talked about here
21 with--

22 CHAIRMAN LEMAY: Do you want to break
23 now? Is this a good point?

24 MR. HIGH: It's entirely up to you.
25 I'm fine.

1 CHAIRMAN LEMAY: Let's take a break and
2 be back here at 1:30.

3 [The noon recess was taken.]

4 CHAIRMAN LEMAY: Please be seated, and
5 we'll continue where we were with Mr. High on
6 cross-examination of Mr. O'Brien.

7 T. B. O'BRIEN

8 Having been previously duly sworn upon his oath,
9 resumed the stand and testified further as
10 follows:

11 EXAMINATION RESUMED

12 BY MR. HIGH:

13 Q. Mr. O'Brien, you said you had some
14 experience with directional drilling in
15 Southeastern New Mexico. Have you actually
16 drilled some directional wells in Southeast New
17 Mexico?

18 A. Yes, sir.

19 Q. How many would you say you've drilled?

20 A. 15 or 20.

21 Q. I guess we can assume, given the fact
22 that you drilled the wells, that they were
23 economic?

24 A. No, sir, not necessarily. It wasn't
25 for my account.

1 Q. Now, in preparing the numbers that you
2 put up on, I guess we called it Exhibit No. 72,
3 did you do any time studies on how long it would
4 take to drill these wells and that sort of thing?

5 A. Not exactly. What I did is, I have
6 experience with drilling wells about like this,
7 and I had had experience drilling straight holes,
8 so I know from that experience what the increase
9 in costs would be percentage-wise, and I applied
10 that here.

11 I didn't get this until yesterday and I
12 didn't have time to go into any long-winded
13 theoretical studies. I just had to take what I
14 knew worked, and took this from it.

15 Q. You're not representing what you said
16 here that's shown on Exhibit No. 72, as being a
17 complete report or as complete of a report as Dr.
18 Mitchell did in the one that you looked at, are
19 you?

20 A. It's not as many pages. I think the
21 answer is as good.

22 Q. You didn't reduce any of this to
23 writing other than the notes that you brought
24 with you?

25 A. That's all I did. I got to that at

1 10:00 o'clock last night.

2 Q. So your entire directional drilling
3 plan that you testified about is reflected on
4 Exhibit No. 72?

5 A. That is not a drilling plan.

6 Q. You didn't do a drilling plan, did you?

7 A. No, sir.

8 Q. When you're talking about a directional
9 well-- Let me back up.

10 Who prepared these numbers?

11 A. Who prepared the numbers?

12 Q. Yes. Who did these numbers?

13 A. I did. Now, some of the numbers I got
14 from somewhere else.

15 Q. That somewhere else would be Yates,
16 wouldn't it?

17 A. Yates, from their histories on wells
18 that they had drilled.

19 Q. Okay. When you're talking about a
20 directional well, at what angle do you consider a
21 well to be a directional well?

22 A. Any time you control the angle of the
23 hole, it's a directional well, if you control it
24 to zero degrees or control it coming back up, I
25 guess. Whatever it is, it is a directional well

1 if you control the direction and deviation.

2 Q. Is there's a certain point off of
3 vertical that the well becomes known as a
4 directional well as opposed to--

5 A. No.

6 Q. What's the most deviated straight hole
7 you've ever seen?

8 A. In excess of 50 degrees.

9 Q. I guess that would be error?

10 A. Be what?

11 Q. I guess that would have been deviated
12 by error?

13 A. No, sir, that wasn't an error, that's
14 what nature did to us.

15 Q. It was intended to be vertical,
16 correct?

17 A. No, I never have intended to drill a
18 vertical oil well because they just don't happen
19 and I would be frustrated, myself, by trying to
20 do something I know just won't work.

21 Q. No well is straight vertical?

22 A. If it is, it's a pure accident. The
23 only place they ever drill vertical holes are
24 these shafts they drill vertically, and they
25 drill the holes for the atomic energy testing

1 vertically, and any others are pure accidents.

2 Q. At what point does the deviation start
3 taking on additional cost and--

4 A. Whenever you start to control the
5 deviation of the well and have to rent the tools
6 and hire the people to do that work, it takes on
7 extra cost.

8 Q. If a well, Mr. O'Brien, is deviated
9 five degrees, is it going to make any difference
10 whether it was intentionally done that way or
11 just happened to be that way, in terms of cost?

12 A. Yes, it would.

13 Q. So, to complete that well, the cost
14 would be the same whether you intended to deviate
15 it or it just happened that way?

16 A. No, sir.

17 Q. Then maybe I don't understand you. It
18 doesn't seem to me like both of us could be
19 correct. Is the cost of completing and operating
20 an intentionally deviated well--

21 A. Oh, excuse me. You were talking about
22 the completion portion of it or are you talking
23 about drill and complete?

24 Q. Yes.

25 A. Drill and complete?

1 Q. Yes.

2 A. The cost to drill and complete a well
3 that is directionally controlled will be higher
4 than one which you do not control the direction
5 or deviation.

6 Q. If a hole winds up being deviated 15
7 degrees, whether it's intended or not, is the
8 cost to complete that well and pump it, or get
9 the oil out, any different if the deviation was
10 intentional or simply it happened that way?

11 A. You're talking about completion only?
12 Not drilling?

13 Q. I'm talking about the point you start
14 putting new numbers on your Exhibit 72.

15 A. In that case, the cost to drill, the
16 drilling part of it, that's why I have the
17 \$300,000 difference, that cost would be greater
18 for one that was intentionally deviated or
19 intentionally controlled. The cost to produce
20 it, if it's a 5- or it's a 15-degree hole, it
21 doesn't make any difference what you did or what
22 your intentions were when you drilled it, the
23 cost to produce it will be the same.

24 Q. The 35-percent cost that you estimated
25 or testified about, directional over a straight

1 hole, are you just shooting from the hip on that
2 or--

3 A. No, sir.

4 Q. That's based on the numbers you got
5 from Yates?

6 A. Yes, sir.

7 Q. Now, in coming up with these numbers,
8 there are certain things I guess you need to know
9 before you can determine the cost of a
10 directional well with respect to how the well is
11 going to be drilled, right?

12 A. Yes.

13 Q. You'll have to know at what depth
14 you're going to kick off?

15 A. Yes.

16 Q. You'll have to make some judgment on
17 what is the angle going to be?

18 A. Well, where you kick off will probably
19 determine where the angle will be.

20 Q. The sooner you kick off, the smaller
21 the angle might be?

22 A. Generally speaking, that's accurate.

23 Q. And how deep did you go down in your
24 mind when you were coming up with these numbers?

25 A. Sir?

1 Q. How far did you go down in your mind
2 when you were coming up with the numbers?

3 A. In my head?

4 Q. When you were coming up with the
5 numbers on Exhibit 72, what did you assume to be
6 the kick-off depth?

7 A. I assumed it to be 2000 feet.

8 Q. Is that because that's what Dr.
9 Mitchell used?

10 A. Yeah. I didn't have a better one.

11 Q. Are all your other assumptions that
12 don't appear on Exhibit 72, basically the same
13 numbers that Dr. Mitchell came up with?

14 A. There are not many others there,
15 really. He had a 8500-foot hole and a 9000-foot
16 directional hole and he kicked off at 2000 feet.
17 His drilling costs are not exactly what mine were
18 for the straight hole.

19 He came up with a different set of
20 numbers for the percentage increase in the cost,
21 and he based it on whatever he based it on and
22 that's fine. I based mine on my experience in
23 drilling in the area as to what that increase
24 would be. And, on that basis and from there on,
25 I don't think there's anything that I took from

1 his estimates. About the only thing I took was
2 the kick-off displacement, the horizontal
3 displacement, and the point of kick off.

4 Q. So you kicked off, in coming up with
5 these numbers, at about the same place Dr.
6 Mitchell did?

7 A. That's right.

8 Q. So the angle of vertical ought to be
9 the same as Dr. Mitchell came up with, right?

10 A. Pretty close.

11 Q. Okay. Well, if you kick off the same
12 place it would be the same, wouldn't it?

13 A. Yeah.

14 Q. It wouldn't be pretty close, it ought
15 to be the same?

16 A. Well, in theory it will be. As a
17 practical matter, it may or may not be.

18 Q. What was that angle?

19 A. I think he had 24, 25 degrees and, if I
20 did it like this angle would be somewhere
21 between--it probably wouldn't be any less than 24
22 but it might get a little higher than that.

23 Q. You don't disagree that if you kick off
24 at about 2000 feet for this well, you'll have an
25 angle of somewhere around 24 degrees?

1 A. That's right.

2 Q. You used that in coming up with the
3 numbers on Exhibit 72?

4 A. Yes.

5 Q. Okay. Now, you said that if these
6 holes were drilled directionally, you would have
7 to use a submersible pump? Did I understand that
8 correctly?

9 A. That's right.

10 Q. What does a submersible pump do?

11 A. It pumps the oil.

12 Q. And you use a submersible pump in lieu
13 of pumping it with a rod?

14 A. With a beam pump, yes, sir.

15 Q. At what angle do you start using, and
16 I'm talking about, Mr. O'Brien, at what angle of
17 deviation do you start using a submersible pump
18 on a directional well?

19 A. There are wells, depending on the depth
20 and the rate of angle build-up and probably some
21 other things, that would determine what that
22 angle would be. There are some very shallow
23 wells that are pumped at considerably higher
24 angles than this. There are some very deep wells
25 that you couldn't handle at 25 degrees, so you

1 can't answer the question that you have with an
2 angle.

3 Q. You answered the question with respect
4 to these Delaware wells with saying a submersible
5 pump will be required?

6 A. And the reason that I took that number,
7 I had Yates estimate for me the cost of operating
8 with a beam pump in this condition, and with an
9 electric pump, and it came out that the electric
10 pump was cheaper, so that's what I used.

11 Q. So in the numbers you came up with and
12 if these wells were drilled directionally, your
13 testimony is it would be cheaper to use a
14 submersible pump than pumping them with rods?

15 A. That's correct.

16 Q. Why do you ordinarily use a submersible
17 pump as opposed to pumping with rods, Mr.
18 O'Brien?

19 A. Most of the time it's used where you're
20 pumping large volumes.

21 Q. It really doesn't have a whole lot to
22 do with the angle, does it?

23 A. It does when that's a critical
24 consideration.

25 Q. How is it that you concluded that using

1 submersible pumps would be cheaper when the
2 reason you use a submersible pump ordinarily is
3 because of volume?

4 A. That's what you ordinarily do, but when
5 you have a different circumstance, you use them
6 for a different purpose.

7 Q. Can you pump a well with a 24- or
8 25-degree deviated angle with rods?

9 A. Sometimes.

10 Q. Do you know of any wells with angles at
11 least that high or even higher that are being
12 pumped, as we sit here today?

13 A. I don't know whether they're still
14 being pumped, but I know of some that have been.

15 Q. What is the highest angle that you know
16 of where a well has been pumped with rods?

17 A. There are some shallow holes off the
18 coast of Peru that I think are at about 60
19 degrees and, to my knowledge, that's the
20 highest. They start them off at 45 degrees or 40
21 degrees.

22 Q. In the deviated wells that you drilled
23 in Southeastern New Mexico, and I'm not talking
24 about this, but the ones that you have been
25 involved in--I think you told me about 15 or so?

1 A. Somewhere in that neighborhood.

2 Q. --did you use submersible pumps in any
3 of those?

4 A. No, sir. They didn't, all of them,
5 make wells. Those that made wells, I think, were
6 gas wells, so we didn't have the problem.

7 Q. Did you pump any of them?

8 A. I don't think so.

9 Q. What do you attribute, Mr. O'Brien, the
10 difference between your number on the cost to
11 drill these wells directionally and Dr.
12 Mitchell's number?

13 A. I think it would take longer than he
14 estimated, and the cost of controlling and the
15 effort to control the deviation and direction
16 will be higher than he estimated.

17 Q. That's why I asked you earlier if you
18 did any studies, because you saw Dr. Mitchell's
19 report, right?

20 A. Yes.

21 Q. He even included in that report a
22 detailed time study on how long it would take to
23 do each of these steps, right?

24 A. Yes.

25 Q. Did you do one of those?

1 A. No.

2 Q. He listed all the expenses and the
3 things that would be required right down to--in
4 fact, he may have put in there legal expenses for
5 lawyers?

6 A. He probably should have.

7 Q. Did you do anything like that?

8 A. No. Would you like for me to tell you
9 how I did this?

10 Q. No, I think you already have.

11 A. Okay, then, there's really no point in
12 this.

13 Q. Are there any other areas that you
14 think make up the difference between your number
15 and Dr. Mitchell's number, in terms of cost?

16 A. There are probably some other costs. I
17 don't know what he put in there for all of the
18 directional. He's got a flat number in there for
19 directional cost, and I don't do it that way. I
20 do know that if he got somebody to bid the
21 directional cost it would be higher than--I think
22 it was something like \$55,000 that he had in
23 there. It will be higher than that, unless he
24 has a lot cheaper directional people than I have.

25 Q. You also mentioned kicking off in the

1 salt, which is not something you would want to do
2 if you were a mine operator?

3 A. That's correct.

4 Q. Have you drilled any directional wells
5 that were kicked off in salt?

6 A. I have tried. Yes, I have drilled
7 some.

8 Q. When was the most recent one you were
9 involved in?

10 A. Somewhere between 10 and 15 years ago.

11 Q. Since that time have you tried to kick
12 off in a salt?

13 A. No.

14 Q. Has anything changed in the last 15
15 years you know of that might make it a little
16 easier to do now?

17 A. No.

18 Q. What's so difficult, in your opinion,
19 to kick off in the salt on a deviated well,
20 intentionally deviated well?

21 A. I'm not sure that we really know.
22 There's speculation in the industry as to why you
23 have difficulty with deviation control in salt,
24 but I think the customary wisdom is that salt,
25 being crystalline, it has some strange effects on

1 the action and reaction of bits.

2 Q. What difficulty did you encounter in
3 trying to kick off in the salt?

4 A. The difficulty we have is maintaining
5 deviation and direction and, on some occasions,
6 building angle as we wanted to build it.

7 Q. Did you go out and seek any outside
8 assistance in any of those instances where you--

9 A. In every case.

10 Q. Pardon?

11 A. In every case.

12 Q. Now, when Mr. Carroll asked you what
13 ought to be done in this case, you gave a fairly
14 long answer. I just want to ask you about one
15 part of it. You mentioned that the mining people
16 are to mine up to a reasonable distance to these
17 wells. You think they ought to go ahead and
18 drill them and the mining people could mine up to
19 what you said was a reasonable distance. And I
20 wrote that down just like I heard it. But you
21 never did say what that distance was.

22 A. I think you're correct.

23 Q. I'm going to ask you now. You looked
24 at that study in the coal industry and you know
25 what kind of distances they have there. You

1 heard Mr. Hutchinson get up here, and some of the
2 other people, and testify that this same distance
3 used in coal ought to be used here, I think it's
4 a 125- or 150-foot pillar.

5 Do you have a number in mind that you
6 think ~~is~~ a reasonable distance?

7 A. I think that you would be safe with a
8 125-foot to 150-foot radius. However, in an
9 abundance of caution, I would say probably
10 somewhere around a 300-foot radius.

11 Q. Now, you don't own the potash mines, of
12 course, right?

13 A. I certainly don't.

14 Q. Would you agree with me that what we're
15 doing here is, we're asking the potash mines to
16 assume a risk that's being brought into the area
17 by the presence of the oil and gas well?

18 A. I think that's--I'm not sure how to
19 answer that exactly. I don't think that there is
20 a significant added risk to the operations that
21 they presently perform. If we drill the wells,
22 produce them and initially have somewhere in the
23 order of 150- to 300-foot radius pier column,
24 whatever it is, and then, at some point, come
25 back and, maybe after the well's abandoned, come

1 back and remove that material that has been left.

2 Q. Does it offend your sense of fairness
3 at all, Mr. O'Brien, if one industry is asked to
4 assume the risk created by another one operating
5 in the same area?

6 A. I don't think it's creating a risk. If
7 there were a significant risk, I think I probably
8 would agree with you. However, as I understand
9 this business, both industries have or should
10 have access to the reserves that are there, and
11 the opposite side of the coin would be equally as
12 bad and you expected these people to drill wells
13 or go off and leave their reserves, because you
14 wouldn't expect them to get within a reasonable
15 distance.

16 Q. You understand what the potash
17 operators consider a reasonable distance, might
18 very well differ from your definition of what is
19 a reasonable distance?

20 A. I don't doubt that a bit.

21 Q. Wouldn't you also agree that just
22 because you think a 150-foot pillar is safe and
23 therefore wouldn't waste potash, that potash will
24 be wasted if the potash operator disagreed with
25 you and won't get that close?

1 A. I think that they can assure
2 themselves, without risk, that this is a proper
3 and reasonable method of operation.

4 Q. But my question, Mr. O'Brien, is this.
5 If the potash people disagree with what you think
6 is okay and won't get up to 150 feet of these
7 Delaware wells, that's going to waste potash,
8 isn't it?

9 A. That's based on their decision and
10 really doesn't have anything to do with the
11 conditions that exist. If they don't want to go
12 out there and dig a mine, certainly it will be
13 wasted.

14 Q. Do you know of any way that you can
15 make these potash people mine up to what you
16 think is a safe distance instead of what they
17 think is a safe distance?

18 A. I can't make my wife do anything, much
19 less them.

20 Q. I, too, share that.

21 A. You know better than that.

22 Q. In the plans you came up with, both on
23 this one and at any point, did you consider the
24 use of centralizers?

25 A. Yes, sir.

1 Q. Is that in this Exhibit 72?

2 A. All of them.

3 Q. But not in the straight well?

4 A. Yes, sir, centralizers on the casing,
5 yes, sir.

6 MR. HIGH: I believe I'm through, Mr.
7 Chairman. Let me just take one quick look at my
8 notes here.

9 Q. Just one minor point, Mr. O'Brien. You
10 answered a question to Mr. Carroll about the WIPP
11 project gets its water out of the Rustler
12 formation?

13 A. I did.

14 Q. Do you know that to be a fact?

15 A. That's the best information I have. It
16 came from the State Engineer's Office, I think is
17 the proper title. If he's wrong, I'm wrong.

18 Q. Look at Exhibit No. 68.

19 A. What is that one? Mine are not
20 numbered.

21 Q. That's the one that has the casing
22 program.

23 A. Okay.

24 Q. That doesn't show us anything about
25 centralizers. I'm just curious, where do you see

1 that?

2 A. It's not in that. That's not on here.
3 That much detail is not present. It doesn't have
4 the floating equipment or that sort of thing,
5 either.

6 Q. What number is it in up here?

7 A. In the cost to drill a well.

8 Q. Just lumped in with a lot of other
9 things?

10 A. Yeah.

11 MR. HIGH: That's all we have, Mr.
12 Chairman. Thank you very much.

13 CHAIRMAN LEMAY: Thank you, Mr. High.
14 Additional questions of the witness?

15 MR. HIGH: Let me return to Mr. O'Brien
16 the notes he made before.

17 MR. CARROLL: Mr. Chairman, one
18 housekeeping thing that I forgot before lunch, I
19 need to move admission of our Exhibits 67 through
20 72. 72 is the sheet of paper.

21 CHAIRMAN LEMAY: Without objection,
22 Exhibits 68 through 72 will be admitted.

23 FURTHER EXAMINATION

24 BY MR. CARROLL:

25 Q. Mr. O'Brien, in some questioning by Mr.

1 High, Mr. High was inquiring as to whether or not
2 there had been studies performed out here in the
3 southeastern part of New Mexico in the potash
4 areas dealing with gas leakage outside of the
5 casing and that sort of problem.

6 Have you, in your experience,
7 encountered any situations out there in
8 Southeastern New Mexico which would even dictate
9 the need to run these kinds of studies?

10 A. Not in this kind of well.

11 Q. Now, what we're talking about is
12 leakage of the cementing or casing program, is
13 that correct?

14 A. That was one of the major topics.

15 Q. Okay. That's our problem, isn't it?

16 A. No, our problem is whether we get gas
17 in the potash zone.

18 Q. All right. And the only way you get
19 gas in the potash zone is through leakage, then?
20 I have the cart ahead of the horse then?

21 A. That's the only way we could put it
22 there.

23 Q. The report that you introduced as
24 Exhibit 71 is just such a study, isn't it?

25 A. Yes.

1 Q. And what were the conclusions of that
2 study?

3 A. They concluded that regardless of
4 anything that had happened before, they could
5 cement these wells and abandon them and that they
6 would not leak.

7 Q. Let's move on to the area that seems to
8 be giving Mr. High some concern, and that's
9 blowouts of wells. Now, we've defined our
10 problem as getting gas into the potash zone.
11 Will blowouts, are they a creation or a cause of
12 that kind of problem?

13 A. They would not be in this well. The
14 only thing, there would be no blowout until after
15 the 8-5/8 is set because there's nothing there;
16 except I noticed in one well record where they
17 had a nitrogen blowout where they drilled into
18 one of these nitrogen pockets that miners drill
19 into. But that doesn't hurt anything other than
20 your feelings.

21 You set the 8-5/8, and then, from that
22 point on, it's conceivable that a blowout might
23 occur. Because you have the 8-5/8 set and
24 cemented and because of the strength of the salt
25 itself, the blowout will not produce enough

1 pressure to put gas in through that casing and
2 into the salt. Some of these porous, permeable
3 zones in the Delaware series will take gas before
4 anything in the salt will take it. So, if you
5 had a blowout and gas went anywhere, it would go
6 into one of those other zones and not go into the
7 salt.

8 Q. If the surface is open, it's going to
9 go there? That's the first place it's going to
10 go?

11 A. That's correct.

12 Q. And you get to the other area of
13 concern, and that's what Mr. High was trying to
14 address, I think, when he started talking about
15 killing the well. What do you mean by killing
16 the well?

17 A. That's to stop the flow. This can
18 occur two or three ways. Primarily, the first
19 way is, if you drill into something and it blows
20 out and you have drill pipe in the hole. The
21 method for killing it is to pump mud down the
22 drill pipe and back up the other side while
23 holding some measure of back pressure on the
24 annulus. You get heavy enough mud in it and you
25 stop the blowout.

1 Q. Where are you stopping the gas? Are
2 you stopping it--

3 A. I'm stopping it where it's entering the
4 borehole from the formation where it originates.

5 Q. Down in the Delaware?

6 A. Down in the Delaware where it comes
7 from. Now, if the drill pipe were out of the
8 hole, then it would be necessary to, what we call
9 lubricate, that is to put some mud in the casing
10 and let it fall and gradually fill the pipe up
11 that way.

12 Q. Now, if we've already set our
13 intermediate casing, which you said would be the
14 case before you could conceivably have this
15 blowout, then the only other place for this gas
16 to escape would be into these weaker formations?
17 Is that what you're saying?

18 A. That's right.

19 Q. Blowouts are not going to create or
20 cause a problem that we're talking about, or
21 concerned about, and that's putting gas in the
22 potash zone?

23 A. That is absolutely correct.

24 Q. When talking about your exhibits, Mr.
25 High was questioning about Exhibits 69 and 70 and

1 these were dealing with the core holes, Mr. High
2 questioned you about whether or not you could
3 compare, and I believe your statement was that
4 there is no comparison between core holes and
5 Delaware wells.

6 Now, were you trying to compare core
7 holes to Delaware wells, or what was the point
8 you were trying to make?

9 A. I was not comparing the drilling or the
10 plugging of these wells. The only thing that I
11 was trying to do was that the mining industry
12 relies on the cement that is in these core holes
13 to isolate the mine working area from these
14 aquifers up the hole. We do the same thing with
15 water, oil, gas and that sort of thing. We rely
16 on cement of a very similar nature.

17 Furthermore, the concern, of course,
18 has to do also with subsidence and the effects of
19 subsidence. If this well or this core hole is in
20 a place where subsidence occurs, then the same
21 thing would happen to the cement in that hole
22 that would happen in an oil well. If there would
23 be flow down from the cement area in this hole,
24 you would be just as likely to have waterflood
25 the mine workings for that reason as--more so

1 than you would ever have from gas.

2 Q. The issue here, then, are the
3 properties of the sealing mechanism that's
4 performed by this cement?

5 A. The isolating--the ability to isolate
6 these and maintain its integrity under the
7 conditions that exist.

8 Q. These core holes actually exist within
9 the mine workings?

10 A. That's what I'm told.

11 Q. So you don't explain this away or want
12 to just ignore it by saying that if the water
13 isn't under enough pressure to force itself into
14 the salt, we're not talking about leaking into
15 the salt, we're just talking about leaking into
16 the mine workings?

17 A. That's correct, with no resistance.

18 Q. Turning to Mr. High's discussion about
19 this reservoir with respect to this report in
20 Exhibit 71, the coal mine report that you
21 discussed with us, Mr. High indicated that this
22 reservoir that we're talking about in that report
23 was a pressure depleted reservoir?

24 A. Yes.

25 Q. Well, when you plug your Delaware well,

1 aren't you also talking about a pressure depleted
2 reservoir?

3 A. Yes, sir.

4 Q. Now, Mr. High also made a point that
5 there's no empirical data concerning, I guess,
6 mining through wells or mining within close
7 proximity of the wells in Southeastern New
8 Mexico. It is true that there are mines mining
9 within 150 feet or so of wells, is that not true?

10 A. I understand that's correct.

11 Q. Isn't that empirical data?

12 A. Yes, sir.

13 Q. By your definition, anyway?

14 A. Yes, sir.

15 Q. Another question was directed to you by
16 Mr. High, again talking about the coal mining
17 situation, and he asked you to answer this
18 question. If you're not prepared to deal with
19 methane, wouldn't you be more cautious, and I
20 think he was trying to compare the potash people
21 to the coal miners and you answered "certainly."
22 Is caution here the issue that we're talking
23 about when we look at the experience in these
24 coal mines?

25 MR. HIGH: I don't know what relevance

1 this has to do with anything. We all know what
2 the issues are here.

3 CHAIRMAN LEMAY: Can you be more
4 specific with your question? It sounded pretty
5 general to me, Counselor.

6 Q. The question that Mr. High asked was a
7 very general question. Do you, in your mind,
8 give it any relevance?

9 A. Give what relevance? The coal mining
10 experiment? I don't follow.

11 Q. With respect to the statement that if
12 -you're a potash miner and you don't normally deal
13 with methane on a daily basis, you should
14 probably be more cautious. Does that have any
15 relevance to the issues that are concerning this
16 Commission, whether or not we should be more
17 cautious or not?

18 MR. HIGH: Again, Mr. Chairman, if we
19 asked every witness that, that's for you people
20 to decide, not this witness. We're just wasting
21 time here.

22 MR. CARROLL: He's an expert and has a
23 right to offer his opinion.

24 CHAIRMAN LEMAY: He's entitled to give
25 his opinion, like all of us are. He an give his

1 opinion.

2 A. The question is, of course, whether we
3 get gas into the mine or the potash zone that is
4 to be mined. Certainly if I was mining in
5 proximity to a pillar that had a well in it, I
6 certainly would be careful. And I would have gas
7 sniffers out there all the time right up at the
8 front to make sure that if I did encounter some
9 gas, I would know about it before it got to be a
10 serious problem. In that regard, yes, I
11 certainly would be more careful.

12 Q. The fact that the miners are more
13 careful has no relevance to whether or not that
14 plugged well is going to leak, does it?

15 A. No, sir.

16 Q. The issue again is, is leakage going to
17 occur, and no matter how prepared you are to
18 detect methane gas, that's not going to make that
19 well any less likely or more likely to leak, if
20 plugged properly?

21 A. That's correct. My interest in this
22 thing, and I think the issue should be the fact
23 that they did have a process for plugging wells
24 that was efficient and effective.

25 Q. Mr. High asked you a question about the

1 tensile strength of cement, and you said it was
2 something comparable to rock. The tensile
3 strength of cement, does it have any relationship
4 to the concepts that we've been discussing here?

5 A. No, sir.

6 Q. Why doesn't it?

7 A. Because the only place it would come
8 into play at all would be a point in the
9 subsidence area where there was a fracturing of
10 rocks. If it did fracture the cement, the rock
11 would have to be fractured first and it wouldn't
12 make any difference whether the cement fractured
13 or not.

14 Q. Why is that?

15 A. Well, you have another fracture already
16 created and if you had cement fractured, it would
17 be a small extension of the fracture that was
18 already created.

19 Q. Mr. High then asked you the question,
20 will subsidence increase the risk of migration,
21 especially if you don't know where it will go.
22 Now, you made a statement there and you said "I
23 know places it won't go." Could you elaborate on
24 that statement?

25 A. Well, you should have gas, the only

1 place you would have it would be above the angle
2 of break and below that point it wouldn't occur.
3 The only way anything could go down would be
4 along that angle of break. When it got to the
5 salt, the salt being plastic, it would be sealed
6 up and wouldn't have a fracture in it, so it
7 wouldn't go past there.

8 Furthermore, any fracture that occurred
9 would be larger towards the surface, so it would
10 go out through path of least resistance which
11 would be towards the surface, so it would not go
12 down.

13 Q. One of the places it's not going to go
14 is in the mine--

15 A. Precisely.

16 Q. --through the seal, or the potash zone?

17 A. [Indicated.]

18 Q. Mr. High questioned you concerning the
19 microannuli and several other phenomena. The
20 issue here is whether or not these things exist
21 or whether or not they will cause gas leakage
22 that will get into the potash zone?

23 A. The problem is whether the gas will get
24 into the potash zone, and with all of those that
25 we've discussed, and none of them will put gas

1 into the potash zone.

2 Q. When you got into the area with
3 directional drilling costs, you indicated that
4 you did require a comparison of the cost of the
5 submersible pumps with the beam pumping and found
6 that the beam pumping would been higher. What is
7 that reason?

8 A. The reason is that the upkeep of the
9 unit due to rod failures and tubing failures
10 would be greater, and the cost of pulling in and
11 replacing both tubing and rods would make up the
12 difference.

13 Q. Rods have to be changed periodically in
14 any well?

15 A. Yes.

16 Q. Do they have to be changed more or less
17 in a deviated hole situation?

18 A. More.

19 Q. Why is that?

20 A. Because they're bent and they fatigue.

21 Q. That fatigue, that stress that they're
22 put under is what necessitates the removal?

23 A. Well, they break.

24 Q. What happens when they break?

25 A. You have to fish them out.

1 Q. In the situations that you've
2 encountered when you have these rods under those
3 kind of situations, do you have cases where they
4 will be breaking on you?

5 A. Certainly.

6 Q. You have to incorporate fishing costs,
7 down time and those things as an additional cost
8 of operating these wells, don't you?

9 A. That's right.

10 Q. Now, Mr. High asked you if you
11 performed a detailed time study before you said
12 that it's going to take longer to drill one of
13 these kinds of wells, and you replied "No." You
14 did look at Mr. Mitchell's report where he
15 predicted it would take 30 days to drill this
16 particular kind of deviated hole where we're
17 deviating 2600 feet?

18 A. Yes, I looked at it. I only remarked
19 that he had a factor of, like, 1.3, and my
20 experience indicates, for a well like this, the
21 cost comparison would be about one and a half
22 times, and that's--I may drill them a little
23 faster or slower. I can drill a directional well
24 faster if I spend more money per day. Or it
25 takes longer to drill it if I don't spend so

1 much. The time study isn't the ultimate answer.
2 The ultimate answer is the dollar figure that
3 it's going to cost you is \$900,000 as compared to
4 \$600,000. You can get to that number half a
5 dozen ways. You can pick out what it costs for
6 trucks or for bits, or I can take this well and
7 apply this factor that's an experienced factor
8 and say it will cost about one and a half times,
9 and that's the way I did it.

10 Q. Mr. Mitchell did use 30 days as his
11 time period on his exhibits?

12 A. I read it, but I didn't pay that much
13 attention to the number he had as compared to
14 something else.

15 Q. You reviewed the Bonneville experience
16 which only drilled 700 feet, and you're aware
17 that that took 31 days to drill?

18 A. I don't remember that but I'll take
19 your word for it.

20 Q. When we're talking about the necessity
21 of a protective pillar of 150 to 300 feet, that's
22 only in the case of an active, producing well,
23 isn't that true?

24 A. That is correct.

25 Q. Once that well is P & A'd, it's your

1 opinion that you can come in and remove that
2 potash?

3 A. That's correct.

4 Q. And it's not lost or wasted?

5 A. That's correct.

6 Q. Now, Mr. High questioned you at the
7 very end and you indicated to him that there's no
8 way you could force a mine company to mine potash
9 in an area that they thought was unsafe, is that
10 correct?

11 A. As far as I know, that's true.

12 Q. And it's also true that you can't make
13 a potash company mine potash that has a higher
14 royalty on one lease as opposed to another?

15 A. I can't make them do anything.

16 Q. In other words, if that potash ore
17 isn't economic, you can't make them mine it, can
18 you?

19 A. As I say, I can't make them mine
20 anything.

21 MR. CARROLL: That's all I have.

22 CHAIRMAN LEMAY: Additional questions
23 of the witness?

24 MR. HIGH: Yes, sir, I have one.
25 Actually, two.

1 FURTHER EXAMINATION

2 BY MR. HIGH.

3 Q. Mr. O'Brien, you don't have any
4 information other than what you have heard
5 sitting out in the audience during this hearing,
6 that New Mexico Potash has intentionally not
7 mined any lease because of royalties, have you?

8 A. As I said, I can't make them do
9 anything. I don't know anything about that.
10 That's somebody else's bailiwick.

11 Q. You're not accusing New Mexico Potash
12 of not mining state leases because of royalties,
13 are you?

14 A. I'm not accusing them of anything.

15 Q. The only other thing I want to ask you
16 is, when you said that gas will go to the place
17 of least resistance and you referred to the
18 surface, do you think there's any difference in
19 the atmospheric pressure on the surface and down
20 in the mine?

21 A. There is a difference in that you have
22 the salt to seal off at the bottom, and it is a
23 little higher down there, not much. It is a
24 little higher because atmospheric pressure
25 increases as you go towards the center of the

1 earth, it's small. But the point that makes it
2 go up is that you have salt, about a thousand
3 feet of salt that is plastic, and it will seal
4 and will not fracture any. It will distort
5 rather than have a fracture in it, so there will
6 be no passage down there.

7 Q. I'm not trying to argue with you. The
8 point I'm trying to make is to get your testimony
9 about the difference in the atmospheric pressure
10 between the surface and down in the mine.

11 A. I don't think I testified to that.

12 Q. I think you testified that there was a
13 difference.

14 A. There is a difference.

15 Q. Is that a big difference or a small
16 difference?

17 A. There is a very small difference.

18 Q. But it is small?

19 A. It is small. I don't know how much it
20 is.

21 CHAIRMAN LEMAY: All right. That's all
22 I have.

23 CHAIRMAN LEMAY: Thank you, Mr. High.
24 Additional questions of the witness?
25 Commissioner Carlson.

1 COMMISSIONER CARLSON: Just a couple
2 about Exhibit 72. Could we get those numbers on
3 a piece of paper sometime in the next couple of
4 days?

5 MR. CARROLL: I can certainly furnish
6 that to you.

7 MR. HIGH: We can mark his notes.

8 COMMISSIONER CARLSON: Something that's
9 legible would help.

10 EXAMINATION

11 BY COMMISSIONER CARLSON:

12 Q. I guess that's my question. I can't
13 understand some of those. Your second row in
14 there, TVD, what is that?

15 A. True vertical depth as opposed to
16 measured depth. As you go out, you have to drill
17 farther to get to the same measured depth.

18 Q. Your number at the bottom, value of the
19 hole, that's \$850,000?

20 A. That is a number that I got that's
21 approximately the volume of the present worth of
22 one of these wells when it's completed. The
23 reservoir engineer will probably disagree with
24 me, but this is a round number.

25 Q. How did you arrive at that number?

1 A. I looked at some of his calculated
2 values and picked that out as kind of an average.

3 Q. That's the total value of the
4 production, present value?

5 A. Present value, that's correct, less the
6 cost to drill and operate. It's the net value of
7 the production present value, taking out taxes,
8 operating costs and New Mexico's taxes.

9 Q. And the incremental cost, that's
10 \$610,000?

11 A. It's the sum of \$300,000 and that
12 should be a "1" instead of a "2," it was so late
13 at night, that's still pretty close, it's
14 \$310,000, so you add those together and the added
15 cost is \$610,000.

16 Q. You say it's that ratio that determines
17 that?

18 A. This is your ratio here, the net value
19 of the well. This is the value of the straight
20 hole, we spent that much more to get the
21 directional hole, so this is the net value, the
22 \$240,000 is the net value of the hole and you
23 don't spend \$900,000 to get \$240,000.

24 COMMISSIONER CARLSON: Okay. I
25 understand. Thank you. That's all I have.

1 CHAIRMAN LEMAY: Commissioner Weiss?

2 COMMISSIONER WEISS: I have some
3 preliminary cross-examination.

4 EXAMINATION

5 BY COMMISSIONER WEISS:

6 Q. There have been over a thousand wells
7 drilled down there and no reported incidence of
8 gas behind the pipe?

9 A. That's correct.

10 Q. In the drilling business, what are the
11 safety practices there? Do you have safety
12 people?

13 A. Certainly. The amount of safety effort
14 varies widely. The major oil companies are more
15 concerned with two things than they are with
16 making money, and that is safety and the
17 environment. Yet they get sued for both of them
18 all the time. But I deal with them in both
19 regards, and now there are some companies that
20 you have to watch, and I'm sure that both you and
21 Mr. LeMay are well aware of some of those, but
22 the people they operate for or work for,
23 contractors that they work for, enforce these
24 safety rules. And the industry I think in
25 general, in the time that I've been involved,

1 it's just incomparable, even in the worst of
2 operators, as to the change that has taken
3 place--I am going to say largely over the last 20
4 years--in the added concern for safety.

5 COMMISSIONER WEISS: Thank you.

6 CHAIRMAN LEMAY: A couple quick ones.

7 EXAMINATION

8 BY CHAIRMAN LEMAY:

9 Q. You mentioned, Mr. O'Brien, you
10 mentioned centralizers. How about scratchers, do
11 you use those anymore?

12 A. Sometimes.

13 Q. Would you use them in a Delaware well
14 through the potash zone?

15 A. Probably not. The potash zone is
16 drilled with water and we don't have anything to
17 scratch. We do put centralizers, but we have
18 found that with centralizers, and moving the
19 pipe, either rotating it or moving it vertically,
20 we have about the same cementing efficiency.

21 As a matter of fact, over a large
22 number of tests, several hundred wells, we didn't
23 have a failure when we did that, and we used a
24 large volume of cement. This is in high pressure
25 wells, low pressure wells, what have you. These

1 are, I think, industry-wide, very standard
2 procedures.

3 Q. How about rough coating the casing?

4 A. There are a few people that do that. I
5 do not. In the cases where I think I need to
6 protect a very short interval, I'll sandblast and
7 spray with acid to make it rusty. Our experience
8 is that rust is just about as good as rough
9 coating.

10 Q. Does that mean that if you didn't
11 rough-coat, you would try to get it rusty
12 anyways, to get a better bond?

13 A. It's a lot cheaper.

14 Q. You mentioned the sonic bond log. Do
15 they have something out better now than that?

16 A. There is a new one, and I can't recall
17 the name of it offhand, that it is better, but it
18 has some shortcomings also. The technology in
19 these things and the theory in them is
20 excellent. There's just a whole lot of things
21 where we feel it's in our ability to interpret
22 what they tell us.

23 Q. Your testimony, I'm assuming, concerned
24 vertical holes, that if you had a deviated hole,
25 a lot of what you were testifying to as to maybe

1 the integrity of the cement job wouldn't apply or
2 would it? How would a deviated hole differ from
3 a straight hole, as far as cement jobs?

4 A. If you get the angle high enough, it's
5 very difficult to get a full coverage of cement.
6 There tends to be an isolation or segregation
7 between the lighter fluid at the top of the hole
8 and the heavier fluid at the bottom. This starts
9 to happen somewhere over 50 degrees, maybe 45
10 sometimes, but the solution to it, when you're at
11 a 45-degree angle, is just to use more cement.

12 Q. Would you say an angle of 24 degrees
13 would carry the same integrity on a cement job as
14 a straight hole would?

15 A. You might have to run a few more
16 centralizers, but otherwise it would have the
17 same integrity.

18 CHAIRMAN LEMAY: That's the only
19 questions I have. Additional questions of Mr.
20 O'Brien?

21 MR. HIGH: If I may, Mr. LeMay. I have
22 just a few.

23 EXAMINATION

24 BY MR. HIGH:

25 Q. Mr. O'Brien, on the thousand or so

1 wells that are in the mined potash areas, how
2 many of those wells have been tested by any
3 operator you know of, any potash operator, member
4 of the Commission or Oil Conservation Division or
5 anybody in this world to see whether or not they
6 have gas outside the casing?

7 A. Gas outside the casing is really not
8 the problem, but to answer your question, I know
9 of at least one.

10 Q. Who is that?

11 A. I don't know the name of the well, but
12 I know Mr. Muncy plugged it. So he can tell it
13 if you want to know the name of it.

14 Q. Other than that one, do you know of
15 anyone that has gone out and done any tests to
16 see whether or not any of these wells in the
17 known potash area already have gas outside the
18 casing?

19 A. I know they don't have enough out there
20 to bother anybody.

21 Q. You don't know that because you haven't
22 tested them, do you?

23 A. I know that they haven't bothered
24 anybody.

25 Q. If people don't know about it, it

1 doesn't bother them, does it?

2 A. If it's significant, it doggone sure
3 would.

4 Q. Are you assuming it's not there because
5 you haven't tested to see if it's there?

6 A. No, I'm assuming it's not there because
7 it never has bothered anybody.

8 Q. Okay. That's what I want to know. Do
9 you know of any data that we can put our hands
10 on, anywhere, that will show that somebody had
11 the foresight to go out, before they put
12 underground miners at risk, to check these wells
13 and see if any of them had let gas out of the
14 casing?

15 A. I don't know whether anybody ever did
16 that but I do know that I do have data that
17 indicates that it's not a problem. And if it's
18 not a problem, we can go do an awful lot of
19 testing for a lot of things that are
20 inconsequential, but both you and I have better
21 things to do.

22 Q. Is it your approach to safety, Mr.
23 O'Brien, that you don't address the issue until
24 you blow somebody out?

25 A. No.

1 Q. No one has been injured so far--

2 A. And there has been no indication if
3 there was gas there, whether it would injure
4 anybody or not.

5 Q. You've been in this area for a long
6 time, 40-something years, right?

7 A. I haven't spent all of it here, but
8 I've been around the oil field for that long.

9 Q. You realize, I assume, that the
10 standard spacing between oil and gas wells and
11 potash mining, at least since way back in the 60s
12 and probably before that, has been a half-mile
13 for gas wells and a quarter-mile for oil wells,
14 is that correct?

15 A. Which is an arbitrary number.

16 MR. CARROLL: I object that that's
17 standard spacing. I don't think that--

18 MR. HIGH: What word do you want me to
19 use?

20 MR. CARROLL: Well, use what it is.
21 Since 1986 you've had a buffer zone.

22 MR. HIGH: No, that's not what I'm
23 asking.

24 A. You do have an arbitrary number which
25 is based on nothing.

1 Q. You are aware that the BLM, whether
2 it's based on nothing or not, the BLM has
3 included, in each order it's issued since the
4 1960s, a prohibition against oil--gas wells
5 within one-half mile of a potash enclave and
6 one-quarter mile for oil wells. You're aware of
7 that, aren't you?

8 A. No, but saying the BLM put it in their
9 rulings doesn't make it any better in my view.

10 Q. Do you think maybe that the spacing
11 distance of a quarter mile and a half-mile has
12 something to do with the fact that we haven't
13 killed anybody with methane gas?

14 A. If you didn't drill a well in the State
15 of New Mexico, it would have about the same
16 effect.

17 Q. My question is, do you think that
18 spacing--

19 A. No, sir.

20 Q. --has nothing to do with the fact that
21 no one has been killed?

22 A. No, sir.

23 Q. It's your approach to safety and to
24 that long history of nothing happening, that it's
25 okay to get closer and closer and closer, as long

1 as you don't have evidence that something bad has
2 happened?

3 A. No, sir, that's not my view.

4 Q. Your testimony was that nothing has
5 happened?

6 A. There have been no indications that
7 there is any leakage of gas from any of these
8 wells.

9 Q. And, based upon that, you think you can
10 get closer and closer, I guess, until the point
11 that something is--

12 A. Let me give you another point. It's my
13 understanding from some of the mining people and
14 some of the people connected with the mines, that
15 the methods that the miners use, and apparently
16 it's quite effective to locate these gas pockets,
17 that have killed people here, the way they do it,
18 and apparently it's effective, is to drill a
19 hole, a pilot hole or whatever they call it, 20
20 or 30 feet into the salt and, if they don't have
21 anything, then it's good enough to go mine up to
22 it.

23 Q. Okay.

24 A. Wait a minute. Let me finish. The
25 pressure in there will be the same as the stress

1 on the salt, so the pressure in there will be
2 2,000 pounds or more. So, based on that, if it's
3 safe for them to do that, then it would likewise
4 be safe to approach an oil well that had 2,000
5 pounds on it, within 20 feet, and drill your core
6 hole up there or your pilot hole and find out
7 whether there's any gas there, not pick some
8 arbitrary number that has no sense at all except
9 for a number that somebody came up with.

10 There's no science that went into a
11 quarter a mile or half a mile or across in the
12 next county. One of them would be as logical as
13 the other. If you want to do something, then in
14 your mining you drill these pilot holes and drill
15 up to a well and find out whether there's
16 anything there. And that will tell you whether
17 there's any gas there or--

18 Q. And if you--

19 A. --even a potential hazard.

20 Q. Mr. O'Brien, you have answered my
21 question in spades.

22 A. I think I have.

23 Q. If you drill up in there and see if
24 there's methane and if there is, you are aware
25 that it might explode, right?

1 A. No, sir, I am aware that there is
2 methane, and just because there's methane there
3 has no meaning at all that it might explode.
4 There's a very narrow range of mixture, ratio of
5 methane and oxygen that will explode and you have
6 to get that--you can get a substantial amount of
7 methane in one of these core holes or pilot holes
8 with it creating no hazard whatsoever to anybody.

9 Q. That's the way you would approach
10 safety of these miners we have working for us in
11 this underground mine?

12 A. That's the way they do it.

13 Q. That's the way you would approach it?

14 A. And that's the way they do it; me and
15 them, both.

16 MR. HIGH: That's all I have.

17 CHAIRMAN LEMAY: I have one follow-up
18 on that.

19 FURTHER EXAMINATION

20 BY CHAIRMAN LEMAY:

21 Q. If you're talking about drilling pilot
22 wells around a Delaware well, you're--

23 A. No, no, I'm not digging pilot holes,
24 pilot wells. What I'm doing, in the mine, when
25 they're mining, they drill a pilot hole ahead of

1 the mining operation, in the mine, not vertical
2 holes out here. They are holes in the mine to
3 determine whether there are any of these pockets
4 of high pressure gas. Obviously, if they run
5 into one, it bleeds out of the hole before it
6 blows the salt out on them.

7 Q. Well maybe I--

8 A. And I think that's a fine thing to do.

9 Q. I think I'm on another wavelength here,
10 but if you were going to find out if there's gas
11 escaping out of the zone, you could do the same
12 thing with a pilot well drilled into the salt
13 section around a producing Delaware well and
14 measure it, and then how close and how many wells
15 that you need?

16 A. That's a good question, one that I
17 don't really have a good answer to, but I think
18 it would be prohibitive. But to satisfy these
19 folks, considering they were going to be a
20 quarter of a mile away, they would want to drill
21 those holes pretty close together.

22 Q. So have you thought about that? Have
23 you thought about a way to do that?

24 A. You would just drill ahead. If there's
25 methane there, and we're looking at finding

1 methane in the order of parts per million, and if
2 there is methane there, you will find it long
3 before you get close enough to it to create any
4 kind of hazard.

5 Q. Once you're in the well, what I'm
6 trying to address if there's a way to verify the
7 safety issue, that seems to be a highly debatable
8 issue, would it be prudent to drill a number of
9 pilot wells around a producing Delaware well to
10 see if there was methane escaping, and then--

11 A. You could probably do it around one.

12 Q. Around one?

13 A. And if you did that, we would have to
14 have everybody's agreement that they would accept
15 what they found, and I can't imagine everybody
16 agreeing to it.

17 CHAIRMAN LEMAY: I can't, either, but
18 thank you for your answer. Mr. High?

19 MR. HIGH: Two follow-up questions.

20 FURTHER EXAMINATION

21 BY MR. HIGH:

22 Q. Mr. O'Brien, do you understand or do
23 you know the type of gas that the mine is looking
24 for when they drill the holes in the advancing
25 face?

1 A. They're looking for nitrogen, basically
2 air.

3 Q. Okay. They're looking for nitrogen?

4 A. That's right. Really what they're
5 looking for is any gas under pressure. It
6 happens that that gas, generally speaking, is
7 nitrogen.

8 Q. You understand also that if the same
9 approach were used here and the mine drilled
10 these holes looking for this methane and found
11 it, you understand at that very instant it's too
12 late for the mine?

13 A. It is not.

14 Q. Do you know what happens to a mine
15 that's classified gassy?

16 A. It doesn't have to be classified
17 gassy.

18 MR. HIGH: Thank you. That's all I
19 have.

20 A. If you have to, you could plug the hole
21 back up. You plug the rest of these things. No,
22 it's not.

23 CHAIRMAN LEMAY: Okay. I think you've
24 had a long morning. I appreciate your
25 testimony. Unless there's additional questions,

1 I'll excuse you. Let's take a 10-minute break,
2 and I assume we're on the other side now?

3 MR. CARROLL: Yes, sir.

4 CHAIRMAN LEMAY: All right. After the
5 break it's your show, Charlie.

6 [A recess was taken.]

7 CHAIRMAN LEMAY: Okay, Mr. High, we're
8 ready to continue.

9 MR. HIGH: Well call Mr. Tony Herrell.
10 Mr. Herrell has not been sworn.

11 TONY J. HERRELL

12 Having been first duly sworn upon his oath, was
13 examined and testified as follows:

14 EXAMINATION

15 BY MR. HIGH:

16 Q. Would you state your full name,
17 please.

18 A. Tony J. Herrell.

19 Q. Where are you employed, Mr. Herrell?

20 A. Bureau of Land Management, Carlsbad
21 Resource Area.

22 Q. Mr. Herrell, did you receive a subpoena
23 I served on you in connection with this case?

24 A. Yes, I did.

25 Q. Did that subpoena ask you to bring some

1 documents with you today?

2 A. Yes, it did.

3 Q. Did you bring some documents today?

4 A. Yes.

5 Q. I understand that you also have counsel
6 present here today?

7 A. Yes.

8 Q. What is her name?

9 A. Margaret Brown.

10 Q. Are you under any limits with respect
11 to the testimony that you're authorized to offer
12 in this case?

13 A. Yes, I am.

14 Q. Who was it that put limits on what we
15 can ask you?

16 A. My supervisor.

17 Q. Do you have that in writing?

18 A. Yes, I do.

19 MR. HIGH: May I approach the witness?

20 CHAIRMAN LEMAY: Certainly.

21 MR. HIGH: Mr. LeMay, I would like to
22 have marked, perhaps as a Commission exhibit, if
23 you prefer I can put it as one of mine, a letter
24 Mr. Herrell has limiting the things he can
25 testify to for purpose of the record.

1 CHAIRMAN LEMAY: Do you have a copy for
2 us?

3 MR. HIGH: No, sir I don't. I just
4 have what he brought.

5 CHAIRMAN LEMAY: Why don't you just
6 read it into the record. That might be helpful.

7 Q. Mr. Herrell, the letter that you have
8 is signed by Richard L. Manus, the area manager?

9 A. That's correct.

10 Q. I'll read that letter into the record,
11 quote, To Whom it May Concern: This letter is in
12 response to a subpoena for testimony from Tony J.
13 Herrell by Mr. Charles High of Kemp, Smith,
14 Duncan & Hammond, P.C. Mr. Herrell will be
15 allowed to present testimony on the following
16 issues:

17 "1. The grade of potash ore being
18 mined in the basin.

19 "2. The standards used by the Bureau
20 of Land Management to determine if an area
21 contains commercial grade potash.

22 "3. If commercial grade ore exists in
23 Section 2 of Township 22 South, Range 31 East.

24 "Mr. Herrell will only be allowed to
25 testify as to matters of fact and not discuss

1 departmental policy, regulations, or orders.
2 Additionally Mr. Herrell will not be allowed to
3 reveal any proprietary information."

4 Signed, "Sincerely, Richard L. Manus,
5 Area Manager," and it's dated October 20, 1992.

6 CHAIRMAN LEMAY: Thank you very much.

7 MR. CARROLL: Mr. LeMay, at this time,
8 then, I am going to object to placing any
9 testimony of record with this witness because, as
10 I see it, these questions are very loaded
11 questions. They're loaded towards the potash
12 industry and it looks like I'm going to be
13 foreclosed any kind of effective
14 cross-examination.

15 I think that, one, let's deal with
16 Question 3, if commercial grade ore exists in
17 Section 2, Township 22, Range 31. He works for
18 the BLM, this land does not belong to the BLM,
19 and I think that's proper testimony that should
20 come from his client, not from somebody that I
21 can't effectively cross-examine.

22 Number 2 says, standards used by the
23 Bureau of Land Management to determine if an area
24 contains commercial grade potash. Again, the New
25 Mexico Potash people can testify to that. The

1 BLM does not tell the OCD what's commercial grade
2 potash. The BLM does not operate under the
3 statutes that the BLM has. In fact, I'm not even
4 aware of a statute that's even comparable to the
5 New Mexico state statutes.

6 And then the grade of potash ore mined
7 in the Basin, we don't care about what--this
8 question is a restricted issue as to the New
9 Mexico Potash Corporation and its possibility of
10 mining economic grade ore in Section 2. All
11 that's relevant is what New Mexico Potash is
12 mining.

13 Therefore, all three of these issues
14 are totally irrelevant to the issues before the
15 Commission at this time, and the restrictions
16 that are being placed on this witness make it
17 totally impossible and unfair, if nothing else,
18 for this witness to be allowed to testify.

19 And, quite frankly, it looks to me like
20 these three areas were drawn up by the potash
21 company, not the BLM counsel.

22 CHAIRMAN LEMAY: Let me have a copy of
23 that. Is that the only copy you have?

24 MR. HIGH: I would like to respond to
25 what Mr. Carroll said, in fact his accusation. I

1 represent to you and this entire Commission, I
2 had absolutely nothing to do with those
3 restrictions; in fact, I fought against them.
4 Margaret Brown, the lawyer from the Department of
5 the Interior is here. She will tell you, I don't
6 want any restrictions on this witness. They
7 weren't even going to let him appear.

8 So I had nothing to do with it and I
9 resent counsel's suggestion that I did.

10 CHAIRMAN LEMAY: This is why we have
11 our own counsel. Do you have something to say?
12 Go ahead, Commissioner.

13 COMMISSIONER CARLSON: What is the
14 purpose of this testimony? Why did you subpoena
15 this witness?

16 MR. HIGH: I subpoenaed this witness,
17 Mr. Carlson, because the Bureau of Land
18 Management has a wealth of data. You've heard
19 Mr. Hutchinson and a lot of people testify that
20 it's not commercial grade ore in Section 2. They
21 can't mine it. You won't waste it because
22 there's no potash down there.

23 I want this Commission to see what the
24 Bureau of Land Management says is down there.
25 I'll tell you quite frankly, I don't know what

1 they're going to say. I want to know what the
2 BLM says. They have records on all the potash
3 deposits down there. They have all the records
4 from what's mined and what's not. They know what
5 each mine can mine and what it can't.

6 COMMISSIONER CARLSON: But that's
7 proprietary, which he can't disclose anyway.

8 MR. HIGH: That's correct, but he can
9 tell us what the average grade of ore is that is
10 mined in the potash basin. You know already what
11 the grade is in Section 2. The core hole showed
12 it's 16 percent.

13 Now, Hutchinson has said that nobody
14 can mine it. I want to know what this man has to
15 say about it. Let them tell us what their
16 records show as far as the commercial nature of
17 the potash in Section 2. They may get up here
18 and say, "There's not ore down there" or they may
19 say, "There is ore down there."

20 I have a pretty good idea, because I
21 know what data they have, and so does Mr.
22 Carroll. He knows what they're going to say and
23 he doesn't want to hear what they're going to
24 say. But let's hear what the federal government
25 is going to say. They control 90 percent of the

1 potash down there and the State only 10 percent.

2 Let's hear what their records show. I
3 want nothing but facts. I don't need Mr.
4 Herrell's opinions or anything else. All I want
5 to know is, what does the government have. What
6 Mr. Carroll wants to do is disagree with the
7 standards used by the BLM. I don't care what
8 standards they follow. I don't agree with some
9 of them. I want to know what facts do the BLM
10 have that reflect on issues you people have to
11 decide. That's all.

12 MR. CARROLL: Commissioner Carlson, if
13 I might address that question, Mr. High is trying
14 to elevate the BLM to a position they don't own.
15 That's for an expert in the field of mining. The
16 BLM is not in the business to mine. They only
17 regulate land.

18 Mr. Herrell is not a miner, he's a
19 geologist. If we're trying to get in mining
20 testimony, there's only one source that's
21 relevant and that comes from New Mexico Potash
22 and not the BLM.

23 Then, when you put it in this-- I
24 don't know what Mr. Herrell is going to testify,
25 but I do know that you're already binding my

1 hands, handcuffing me, if you will, with respect
2 to cross-examination. You're telling me up front
3 that I can't get into what he knows or why he's
4 making certain statements.

5 You have to remember, each one of those
6 things are opinions. Is there commercial ore in
7 Section 2? That is an opinion, sir. There has
8 never been any mining in Section 2. Section 2
9 isn't even owned by the BLM, and yet this man is
10 going to testify as to whether or not there's
11 commercial ore. He's going to render an expert
12 opinion, a nonminer rendering an opinion which I
13 can't get into the basis, because, we have to
14 assume, since they're not mining, the only basis
15 of their information always goes back to
16 proprietary information which is gained from the
17 potash mines which are doing the mining.

18 Therefore, every time I ask a question
19 I'm prevented from going into it. That's the
20 onus of this thing. It's totally unfair and
21 improper. I'm not trying to deny Mr. High
22 developing testimony about whether there's
23 commercial ore or not. His client is the best
24 source of that. Whether or not it's minable, his
25 client is the best source of that. And they

1 should be allowed, they should be forced, what I
2 can see is that he puts on Mr. Herrell, he gets
3 the answers he wants. I don't get to question.
4 There's no need to even put on his witnesses.
5 That's the unfairness. I can't question the
6 basis of what he's making opinions as an expert
7 on and he's talking about issues that are
8 critical here and that I have got to be able to
9 look at, determine the basis for and question, or
10 I can't perform my job.

11 MR. HIGH: Let me make a statement.
12 There's a long history of cooperation, Mr.
13 Chairman, between the State Land Office, the OCD,
14 the OCC and the BLM. In fact, if anyone else in
15 this audience wants to stand up and offer
16 testimony, the Commission has always taken it.

17 MR. RAND CARROLL: Mr. High, do you
18 have a copy of the subpoena you issued to the
19 BLM?

20 MR. HIGH: I think I probably do.
21 It's on file here with the Commission. It's part
22 of the file. I don't know if I can put my hands
23 on it right away or not.

24 COMMISSIONER WEISS: Is it in your
25 exhibit book here?

1 MR. HIGH: I don't believe it is, Mr.
2 Weiss.

3 MR. RAND CARROLL: Do you recall what
4 you asked for in your subpoena?

5 MR. HIGH: I asked for a whole lot more
6 than what he brought. Here it is.

7 MR. RAND CARROLL: Thank you.

8 CHAIRMAN LEMAY: We're going to take a
9 couple of minutes here and discuss it among
10 ourselves.

11 [Discussion off the record.]

12 CHAIRMAN LEMAY: Under the
13 circumstances, this is what the Commission will
14 allow. It will allow the testimony taken in form
15 of information only. We won't qualify you as an
16 expert, Mr. Herrell, which means that what you're
17 giving to us is presenting something like we have
18 accepted in the past, in statement form.

19 Because you're limited on what you can
20 say on cross-examination, we have to downgrade
21 your effectiveness as an expert. You understand
22 that, I hope. And therefore your testimony will
23 be accepted into the record for what it is, which
24 is informational to us only, and you're not
25 qualified as an expert. You may continue under

1 those stipulations, Mr. High.

2 MR. HIGH: That's fine, Mr. Chairman.
3 Thank you very much.

4 Q. (BY MR. HIGH) How long have you been
5 with the BLM, Mr. Herrell?

6 A. A little over five years.

7 Q. Do you have the records that you were
8 willing to produce for me in response to my
9 subpoena to you?

10 A. Yes, I do.

11 Q. Do you have the documents in front of
12 you? Let me ask you, Mr. Herrell, what documents
13 have you brought in response to my Subpoena Duces
14 Tecum?

15 A. Basically we brought the average grade
16 of all the sylvite producers in the Basin. We
17 didn't include langbeinite in it. I brought it
18 for fiscal years 91 through 87. The information
19 just comes from the monthly reports that are
20 submitted to us every month. We just averaged
21 them out and totaled them up.

22 Q. What is the average grade of sylvite
23 that has been mined in the Basin as shown on
24 whatever the information is that you brought here
25 today?

1 A. The last fiscal year I tabulated on, we
2 won't do fiscal year 92 for a while, but fiscal
3 year 1991 was 13.7 percent average grade in the
4 Basin.

5 Q. Does the document you have have the
6 average grade for years other than 91?

7 A. Yes. It goes fiscal years 1991 back to
8 fiscal year 1987. A fiscal year is October
9 through September.

10 Q. And what were the grades for each year,
11 please?

12 A. Starting in 1987, the grades were 16.36
13 percent; 1988, 15.99 percent; 1989, 15.02
14 percent; 1990, 14.4 and 1991, 13.74.

15 Q. What does it mean or what do your
16 records consist of, Mr. Herrell, in terms of the
17 average grade of sylvite? What does that mean?

18 A. The average grade is just the total of
19 all the panels throughout the Basin from each of
20 the mines. We just take the number of tons times
21 the grade for all the panels that come out from
22 the mines to come up with these statistics. We
23 have these statistics going back to the 40s.

24 Q. So if the average grade mined in the
25 Basin in 1991 was 13.7 percent, would your

1 records show that some mines were mining ore at
2 less than 13.7 percent?

3 A. Yes, there are some mined below 13.7
4 and some mined above 13.7. It just averages out
5 at 13.7.

6 Q. The other document, and am I correct
7 you brought two documents here today in response
8 to my subpoena?

9 A. That's correct.

10 Q. What is the second document?

11 A. The second document is a small portion
12 of a map that we have for that area in Section 2,
13 and it just has the core hole K-162 posted on it
14 and basically, as he said earlier, you have that
15 information.

16 Q. What do the BLM records show with
17 respect to whether or not there is or is not
18 commercial grade potash in Section 2?

19 A. We think that most of Section 2 would
20 probably meet the commercial grade ore criteria,
21 which we would call measured ore.

22 Q. Do you know what information that's
23 based upon?

24 A. It's based on the core hole data,
25 minimum quality and thickness of four feet of

1 ten-percent sylvite, four feet of four-percent
2 langbeinite.

3 Q. Will this map eventually be published
4 by the BLM?

5 A. Yes. It will probably come out
6 January, February, sometime around there. We've
7 been working on it for a while, but we're having
8 a few computer problems with it.

9 Q. Do your records show what grade of
10 potash is in Section 2?

11 A. Yes.

12 Q. Do you know what the grade is in
13 Section 2?

14 A. We have 5.1 feet of 16 percent sylvite
15 in the 10th ore zone only. I've only done the
16 10th ore zone here, and 4.8 feet of 5.8 percent
17 langbeinite.

18 Q. Do you know how many tons of ore have
19 been mined less than 10 percent, let's say, or 11
20 percent?

21 A. Below 11 percent, among just the
22 sylvite producers--because I didn't do
23 langbeinite or mixed ore, which mixed ore is a
24 different thing altogether--but just among the
25 sylvite producers, it roughly calculates out to

1 2.5 million below 11 percent, and 1.2 million
2 below 10 percent that was mined during the last
3 fiscal year.

4 COMMISSIONER CARLSON: Could you repeat
5 those, please?

6 THE WITNESS: 2.5 million tons mined
7 below 11 percent K₂O sylvite. And 1.2 million
8 tons mined below 10 percent K₂O sylvite.

9 MR. HIGH: Mr. Chairman, I would like
10 marked as an exhibit and I don't have copies, but
11 I would like the subpoena that I served on Mr.
12 Herrell along with the two documents he brought
13 today, all marked as one exhibit and we can
14 letter them A, B and C, and I would like those
15 marked as Exhibit No. 34. May I see those two
16 documents, please?

17 A. Yes. On the map, that's an unchecked
18 version. I did not have time to go ahead and do
19 any editorial on it.

20 Q. Let me ask you a couple of questions
21 about the map. These blue lines on it--

22 A. The blue lines are the 10th ore zones.

23 Q. What is between the blue lines?

24 A. Other ore zones.

25 Q. So if we were looking at--

1 A. Which are labeled here for the most
2 part.

3 Q. But the map you brought with you here,
4 if we were looking on this document to see
5 whether there is or is not commercial grade ore,
6 we would look between the blue lines?

7 A. Yes. And this map here is pretty much
8 only accurate for the 10th, because I have not
9 updated the 4th ore zone on it yet.

10 Q. You understand that New Mexico Potash
11 mines in the 10th ore shown?

12 A. That's the only reason why I did the
13 10th, because that's the only one they do mine.

14 MR. HIGH: I would like these marked as
15 Exhibits 34(a), (b) and (c), with (a) being the
16 Subpoena Duces Tecum. And, Mr. Chairman I would
17 offer them at this time.

18 CHAIRMAN LEMAY: Without objection,
19 34(a), (b) and (c) will be admitted into the
20 record.

21 MR. CARROLL: I would ask that the
22 record reflect that the exhibits are coming in
23 under the same stipulation as the testimony.

24 CHAIRMAN LEMAY: Yes, the exhibits come
25 in under the same general stipulation.

1 MR. RAND CARROLL: Mr. High, the letter
2 from the BLM, will that be an exhibit?

3 MR. HIGH: Yes. In fact, we can make
4 that Exhibit 34(d). That would be fine with me.
5 Thank you. I forgot about that.

6 Q. (BY MR. HIGH) According to the
7 information then that you have, Mr. Herrell,
8 Section 2 would be what some of us know as blue
9 on the BLM map?

10 A. Yes.

11 MR. HIGH: We pass the witness, Mr.
12 Chairman.

13 MR. CARROLL: May I review the
14 exhibits?

15 CHAIRMAN LEMAY: You want to look at
16 them?

17 MR. CARROLL: Yes, sir, I really do.

18 MR. HIGH: Could I ask that I get those
19 exhibits back and make copies and bring them back
20 to you tomorrow so that we all have copies?

21 CHAIRMAN LEMAY: Are you going to refer
22 to them in later testimony?

23 MR. HIGH: I'm not.

24 MR. CARROLL: Could I have just a few
25 minutes, please? I apologize.

1 CHAIRMAN LEMAY: Mr. Carroll, you may
2 continue.

3 MR. CARROLL: Thank you. May I
4 approach the witness so I can have some
5 explanation from the witness?

6 CHAIRMAN LEMAY: Certainly.

7 EXAMINATION

8 BY MR. CARROLL:

9 Q. Mr. Herrell, I'm showing you the map
10 that you prepared and brought with you today.
11 And the map that Mr. High was referring to having
12 blue lines. Now, I'm a little unclear here.
13 There are solid blue lines that I see. What is
14 the purpose of the solid blue lines?

15 A. This is just a working map. This isn't
16 really our area. We're in the process of
17 updating this map and it's not finalized yet.
18 It's kind of showing a little bit of old and a
19 little bit of new.

20 I outlined the solid blue line to
21 outline the 10th ore zone. That's the only
22 reason it's solid. The dashed lines through here
23 are just a question based that it could possibly
24 trend up through there. We show it ending, but
25 it could possibly trend up through there because

1 it is such a thin zone. These blue lines were
2 extended up just based on straight, linear
3 projections between core holes.

4 Q. All right, so you have shown this solid
5 blue line that begins up in the northern part of
6 Section 2 and it goes into Section 35 and around
7 in 34 and then back down in Section 3. You're
8 telling me that you have extended that line, this
9 blue line, on the basis of the data of core hole
10 K-162 and FC-65, is that correct?

11 A. That's correct.

12 Q. Did you just draw a line in between the
13 two?

14 A. Well, yeah, you see the line there? I
15 just did a linear projection which is just the
16 weight times grade of one hole times the weight,
17 times grade, which this core hole here doesn't
18 meet the criteria in the 10th but it still had
19 some ore in the 10th, so we went ahead and we did
20 a projection to it. And then you just divide by
21 the total distance and that gives you the
22 gradient change toward that direction, and you'll
23 get your 10-percent cutoff grade right there.

24 Q. I see. Now, you also show a core hole
25 over here in Section 35 which is ERDA-6, is that

1 correct?

2 A. Yes.

3 Q. And the distance from K-162 to ERDA-6,
4 as opposed to the distance of K-162 to FC-65, is
5 it greater or less?

6 A. It's less.

7 Q. So ERDA-6 is actually closer to K-162?

8 A. That's correct.

9 Q. And ERDA-6, you are aware that it
10 shows, as far as the 10th ore zone, it's barren,
11 is that correct?

12 A. That's correct.

13 Q. Now, this area you have marked up here
14 in Section 34 and 35 that has the dashed blue
15 lines, are you saying the dark blue line up in
16 the northeastern part of Section 34, that is at
17 least grade that the BLM considers as being
18 measured ore?

19 A. That's correct.

20 Q. And you will not connect that deposit
21 of ore with that that's coming out of Section 2.
22 Is that because of the distance between this core
23 hole 162 and the one I can't read--looks like an
24 FC-something, is too great?

25 A. That's correct. And, too, our linear

1 projections didn't reach out far enough. You'll
2 notice that I did a linear projection to ERDA-6
3 at that little point right there.

4 Q. In fact, it's quite possible that the
5 projection of measured ore, according to BLM
6 terms, does not even exist out of Section 2 like
7 you've drawn it here, it could be even closer to
8 162 because you have no control of that?

9 A. The linear projection is just a basic
10 fundamental method. You know, anyone's
11 projections is just a best guess.

12 Q. The projections that you're using, is
13 there a criteria that you're using?

14 A. It's just a standard form in the
15 Handbook of Mining Engineers.

16 Q. Is that just a linear projection
17 between two points?

18 A. Just a linear projection between two
19 points.

20 Q. The way this line is drawn, then, did
21 you just copy this off of another map that the
22 BLM has prepared, or did you prepare this
23 especially for today's hearing?

24 A. No, this is actually part of a bigger
25 map. We were having to update our map that we

1 publish based on the new core hole data and this
2 is part of that work here. It hasn't been
3 reviewed yet because we haven't finished the map
4 yet, but that's what our indications at this
5 moment are.

6 Q. Had you already drawn this line prior
7 to your getting the subpoena, or was this
8 something that you had to work up for the
9 purposes of the subpoena?

10 A. No. The only thing that I did on this
11 map for purposes of the subpoena was just draw
12 this little blue line, which I just traced over
13 one existing line, but this map we've had for
14 years and years and years. And when we got the
15 core hole data months back, we started updating
16 this map.

17 Q. Did you update this and change it back
18 at the time you received core hole data 162?

19 A. Not immediately after, because of
20 workload, but sometime back we did because we had
21 other APDs in the area that we had to come up
22 with, because federal sections surround it, so we
23 had to come up with our rationale for it.

24 Q. When you testified for Mr. High as to
25 the grade of ore in Section 2, that's really the

1 grade of ore in core hole 162; is that correct?

2 A. That's correct.

3 Q. Now, when you talk about mining this
4 averaging that you're doing, are you taking
5 samples that--when you say that this is an
6 averaging process, the sampling, is that coming
7 off of the faces that are being mined or is this
8 a sampling that is done at the time the ore is
9 being milled?

10 A. It's a little bit of both. We take it
11 off the monthly reports that come in to us. They
12 take it off of a belt sample that comes from the
13 mining panel, and the belt sample is actually
14 corrected to the average grade going into the
15 mill. Most mines have an automatic sampler going
16 into the mill that makes a sample every 30
17 minutes.

18 Q. When you say this data is corrected,
19 because I'm not--I haven't seen this procedure,
20 could you explain what's going on? How is it
21 being corrected?

22 A. That's all before the mine reports get
23 to us. My stuff, I just took it straight from
24 the mine reports but they do have a way to
25 allocate the product back to the lease. And

1 that's how it's corrected, it's corrected for
2 royalty purposes. It's a very detailed
3 explanation.

4 Q. So the BLM performs no independent
5 sampling of its own or monitoring of what the
6 companies are reporting to it?

7 A. No, that's not correct.

8 Q. All right. Are you telling me that the
9 BLM does do its own monitoring?

10 A. Yes, we do.

11 Q. Does the BLM then compare what its
12 monitoring reports reflect to the reports that
13 the potash companies are giving?

14 A. We do inspections of the mines and we
15 go into the different panels and we take
16 measurements of what's being mined and get a good
17 feel for the grade and that type of thing.

18 Q. Do you do that with respect to State of
19 New Mexico potash, or is it just to the BLM
20 leasehold acreage?

21 A. We inspect on state acreage, too,
22 because that affects federal acreage.

23 Q. When you say there were some 2.5
24 million tons mined that were less than 11
25 percent, did this all come from one mine or from

1 all the mines?

2 A. Just an average of the sylvite mines,
3 and it was more than one mine. It was a few
4 different mines.

5 Q. One or two?

6 A. It was three.

7 Q. Three mines?

8 A. Yes.

9 Q. Three of what?

10 A. Three of four.

11 Q. Three of four?

12 A. Sylvite mines, yes.

13 Q. Would that be the same number for the
14 1.2 million tons of 10 percent figure that you
15 gave?

16 A. Yes, it's the same for both figures.

17 Q. With respect to the ore that's being
18 mined, what's the highest grade of ore that's
19 being mined?

20 A. I would have to go back and look at
21 individual company reports, but there's quite a
22 bit that's higher and there's some that's lower,
23 but I don't have a specific number for it.

24 Q. It's this higher grade ore that brings
25 the average up to whatever the average that

1 you've arrived at on this exhibit?

2 A. That's correct. It's an average of all
3 the ore.

4 Q. Now, what you're talking about, I guess
5 it's the criteria that the BLM uses, the term
6 "measured ore" and the four feet of 10 percent
7 sylvite, that's the criteria that we've had for
8 the BLM 1984 map as an exhibit and what have
9 you. But that's what we're talking about?

10 A. Yes.

11 Q. Now, back on that 1984, a goodly
12 portion of Section 2 was shown as barren, wasn't
13 it, Mr. Herrell?

14 A. That's correct.

15 Q. And the only new information between
16 then and now is just this one core hole 162, is
17 that correct?

18 A. That's correct.

19 Q. How many total million tons of ore have
20 been mined or were mined last year in fiscal year
21 1991 that you report?

22 A. I believe around 15 million tons. That
23 includes langbeinite ore, too. That's not
24 sylvite, that's langbeinite. I didn't put any of
25 those into my figures. I just left it with

1 sylvite ore.

2 Q. The langbeinite is a significantly
3 smaller amount of ore being mined, is it not?

4 A. I would have to look at my records.
5 I'm not so sure that's true.

6 Q. Now, Mr. Herrell, the BLM does not
7 operate a potash mine, does it?

8 A. No, it does not. In fact, it's not in
9 the mining business.

10 Q. It's a royalty owner?

11 A. It goes beyond that. It's the land
12 manager.

13 Q. It manages the land from which it draws
14 a royalty?

15 A. That's correct.

16 Q. Now, I'm not sure, and correct me, in
17 your questioning with Mr. High, did you use the
18 term commercial grade of ore existing in Section
19 2? Did you use the term "commercial grade"?

20 A. I believe I used the term "measured."
21 He may have used commercial.

22 Q. Your testimony, then, with respect to
23 what kinds of ore out here are based upon the BLM
24 standards that are set and have been used to
25 create the 1984 map and, I take it, the new map

1 which you're telling us is in process?

2 A. Yes.

3 Q. And those criteria, your information,
4 they were not used or there was not data or input
5 data of a commercial or an economic nature, were
6 there, to arrive at those?

7 A. Yes, there was.

8 Q. Market studies, those kinds of economic
9 data, or what?

10 A. No, just based on what we currently
11 observed in the Basin being mined, what we've
12 observed for years, and on the individual
13 company's profits and losses. It's just that
14 simple. We didn't get into detailed economic
15 studies.

16 Q. So basically what you're saying, if
17 it's being mined, you draw the conclusion that
18 it's commercial.

19 A. Not quite. In our royalty
20 determinations, we actually check into income tax
21 records and make sure that people are mining, and
22 that's kind of getting beyond the scope of this,
23 but as a defense of measured ore.

24 Q. The fact is that measured ore, though,
25 the four feet of 10 percent was actually a

1 leasing standard that was established when the
2 BLM went out and decided that the KPLA would be
3 leased for potash, is that correct?

4 A. That's correct, but leasing standard is
5 also based on an economic mining standard. It
6 has to be at least feasible.

7 Q. But you did not--the BLM has not
8 performed any detailed studies as to that, have
9 they, Mr. Herrell?

10 A. No. We just look at profits and loss,
11 what's being mined. We don't think there's any
12 better way to determine what's profitable, except
13 to have an existing mine.

14 Q. And that's about as far as you go in
15 your evaluation, isn't it, Mr. Herrell?

16 A. That's correct.

17 Q. If a mine, on its income tax is
18 reporting profit, then you say everything it's
19 mining is profitable, is that correct?

20 A. I'm not sure I understand the question.

21 Q. What you're saying, then, is that you
22 look at the income tax return and if a mine today
23 is mining this ore and is showing a profit, then
24 you draw the conclusion that that's commercial,
25 is that correct?

1 A. Basically, that's how we defend the
2 standard. Of course, the standard was set up a
3 long time ago and was a little bit more detailed
4 than that, but that's why we think it's still a
5 valid standard.

6 Q. You don't go in and conduct any
7 analysis as to what new capital costs, if they
8 had to be incurred to open up a new mining area,
9 what that cost would be or how they would affect
10 the profit-and-loss picture of these mines, do
11 you?

12 A. No. I just read the different
13 consultants' reports.

14 Q. And if it took a capital outlay to mine
15 some ore somewhere else other than at the face of
16 a mine, you can't make any kind of projection
17 right now based on the information that you see,
18 can you?

19 A. No. We don't really try to get into
20 that.

21 Q. Now, the mapping that the BLM does,
22 which is the big colored map and the depiction of
23 what's called measured ore, that mapping is done
24 on the basis of a certain criteria, is that
25 correct?

1 A. That's correct.

2 Q. What is that criteria or how do you
3 determine where you draw the blue lines? I guess
4 you may be on the same wavelength.

5 A. The basic criteria is what we mentioned
6 earlier, the four feet of 10 and four feet of
7 four and the core hole density criteria. And
8 then to get the distance that you draw your lines
9 and project it from a hole is just done by
10 geologic methods, such as linear projections. Or
11 if you don't have another core hole to project
12 to, you just use a half a mile.

13 Q. Now how, to give credence to a body of
14 ore, how much core holes do you require and
15 within what distance?

16 A. We require three core holes in any one
17 ore zone no more than a mile and a half apart
18 between any of the core holes.

19 Q. Now, Mr. Herrell, you are aware that
20 the mines themselves actually drill more core
21 holes in a closer proximity to each other when
22 they have been or have utilized a closer density
23 of drilling core holes closer than that
24 historically when they've mined out here or
25 explored for potash?

1 A. That's correct, yes. We're very aware
2 of that.

3 Q. Really, the criteria you're using, the
4 three core holes within a mile and a half, is not
5 the same criteria you've seen evidenced as being
6 used by the potash companies?

7 MR. HIGH: Excuse me. I'm going to
8 object to the broad characterization of "potash
9 company." I don't know that we've had any
10 evidence about what the other people or mines
11 other than New Mexico Potash have used.

12 MR. CARROLL: This whole testimony is
13 generally to the Basin.

14 CHAIRMAN LEMAY: That would be good for
15 another witness. If he's informational only,
16 you're asking him to get into what other potash
17 companies use.

18 MR. CARROLL: I'm just asking what he
19 observed, and again that's all--

20 CHAIRMAN LEMAY: He can answer as an
21 observation, I'm sure.

22 MR. CARROLL: And that's all I'm
23 asking.

24 A. As an observation, commonly potash
25 companies will drill a number of core holes and

1 establish the ore. But before they mine it, they
2 may start advancing out to an area, but they may
3 drill more core holes for mining purposes, other
4 than just what they establish ore with. That's
5 pretty much what happened with New Mexico Potash
6 this year, and there have been other companies in
7 the Basin that have drilled core holes this year,
8 too, that were not in conflict with, but it's a
9 common thing that happens.

10 Q. Before the money is spent in mining,
11 they get better or they get more--I say better,
12 better information, then, of a closer nature, so
13 that they can predict whether or not there's
14 enough ore out there to be economic to advance
15 the face in that direction?

16 A. I agree with part of the question. The
17 other part is, it helps them define like if there
18 are small salt horses and things like that. If
19 you have three and hit one core hole that's bad,
20 you really don't think they're all bad, so
21 they'll know what to mine around and that type of
22 thing.

23 Q. That's one of the major criticisms of
24 the linear method, is that these salt horses
25 could actually exist between New Mexico Potash's

1 core hole 162 and FC-65, couldn't it?

2 A. Yes, there are a lot of methods to do
3 the projections. The linear method is just a
4 basic and simple one. They have other methods
5 you can use, too, that are defined in textbooks.
6 A lot of times you try more than one and take
7 your best guess.

8 MR. CARROLL: I think that's all.

9 CHAIRMAN LEMAY: Mr. High?

10 FURTHER EXAMINATION

11 BY MR. HIGH:

12 Q. Mr. Herrell, I want to ask you to look
13 at that book in front of you please, sir, and
14 turn back to Exhibit No. 23. Do you have that
15 document in front of you, Mr. Herrell?

16 A. Yes, I do.

17 Q. Can you tell me what that is?

18 A. This map came out of our old U.S.G.S.
19 Report that was done on the WIPP area a long time
20 ago, to determine if there was commercial potash
21 out there in the WIPP area.

22 Q. Do you know when this map was prepared?

23 A. 1978, I was thinking. I don't see a
24 date on it right at the moment.

25 Q. It was prepared by the BLM?

1 A. U.S.G.S., actually.

2 Q. Okay. Look up in the top right-hand
3 side of Section 2. Do you see Section 2?

4 A. Yes, I do.

5 Q. Do you see Section 2 on that map?

6 A. Yes.

7 Q. What part of Section 2 is shown on the
8 map as having measured ore?

9 A. The south part and the southwest part.

10 Q. Okay. And that was listed as of 1978?

11 A. Yes, I believe that's when that report
12 came out was 1978.

13 Q. What part of Section 2 was shown as
14 having indicated ore?

15 A. Trending to the northeast basically, up
16 past the half point of the section and up through
17 near the northeast corner of it.

18 Q. It would be along the east side, up
19 towards the northeast corner?

20 A. On my map it has two very thin lines
21 here. You can't read them too well, but that was
22 the indicated ore.

23 Q. And what part of Section 2 as shown on
24 Exhibit 23 as being barren?

25 A. The very northwest quarter, kind of at

1 a slant and an angle.

2 MR. HIGH: Mr. Chairman, we would offer
3 Exhibit 23 into evidence.

4 CHAIRMAN LEMAY: Without objection,
5 Exhibit 23 will be admitted into evidence.

6 MR. CARROLL: No objection.

7 Q. What standard, if any, Mr. Herrell,
8 does the BLM have in terms of the area of
9 influence it will give a core hole?

10 A. If a core hole is by itself and there's
11 no other core hole there, what's always been used
12 is a half mile. If you have core holes to
13 project to, then you go ahead and do a linear
14 projection or some type of other projection, if
15 you think that the linear is off.

16 Q. If core hole 162 was by itself, it sat
17 in the middle of nowhere by itself, or as Mr.
18 Weiss said, in the middle of a million acres by
19 itself, the BLM would give the influence of a
20 half a mile around the hole?

21 A. You can observe that on the map, too.
22 It was a standard set up by the U.S.G.S. a long
23 time ago, and we have just followed it.

24 Q. If there are other core holes in the
25 area, does that change the standard used by the

1 BLM with respect to the influence that it will
2 give a core hole like 162?

3 A. Usually when we're doing our stuff,
4 we'll try to project some type of linear
5 projection to it, and we'll just use linear
6 because it's probably the easiest. It's not
7 necessarily the most accurate, but then you get
8 into debates of which one to use.

9 MR. HIGH: That's all I have, Mr.
10 Chairman. Thank you very much.

11 FURTHER EXAMINATION

12 BY MR. CARROLL:

13 Q. Mr. Herrell, the use of the one-half
14 mile circle of influence to a single core hole,
15 that's just an arbitrary designation isn't it,
16 Mr. Herrell?

17 A. No, not really.

18 Q. What science then was used to develop
19 that half-mile sphere of influence?

20 A. It gets back to your minimum density
21 core holes of three core holes within a mile and
22 a half, half of a mile and a half is
23 three-quarters of a mile, and then they went and
24 broke it down one additional quarter.

25 Q. But again, the use of three core holes

1 within a mile and a half, that's an arbitrary
2 decision too, isn't it, Mr. Herrell?

3 A. No, there was quite a bit more science
4 going into it a long time ago. It was a
5 consensus of opinion of engineers that was
6 adopted, but there has been no variograms to test
7 it except for the mining of the areas.

8 We still think it's valid, because if
9 you go into an area that's been mined, pretend
10 like there's no mining that has occurred there,
11 and throw out your core holes and look at any
12 three, usually it will meet this quality and
13 thickness criteria.

14 Q. You're saying that that half-mile
15 sphere of influence was the conventional wisdom
16 of mining engineers a long time ago, is that
17 correct?

18 A. Yes, it was.

19 Q. But that conventional wisdom, as you've
20 told us, is not relied upon by the mines when
21 they sit there and start to go out into an area,
22 because they don't rely on that one-half mile
23 zone, do they?

24 A. Not totally, Ernie.

25 MR. CARROLL: That's all. No further

1 questions.

2 MR. HIGH: I object to Counsel asking
3 this witness, after his argument today, asking
4 this witness what the mines do. We agreed that
5 Mr. Herrell would testify about statements and
6 gaps to fill in, and not about potash.

7 MR. CARROLL: Just to correct his
8 observations of the mines.

9 CHAIRMAN LEMAY: I think we could
10 accept that as his observation.

11 A. The most recent one I could give you--

12 MR. CARROLL: I would object to just
13 self-serving statements being put of record by
14 Mr. Herrell.

15 CHAIRMAN LEMAY: Could you expand upon
16 that a little bit for the record, as far as your
17 observation?

18 THE WITNESS: Yes. As an observation,
19 one example is New Mexico Potash. They did quite
20 a bit of development work before they ever
21 drilled those core holes down in that area. They
22 have been trending south, as you can see on that
23 map, for quite some time before they drilled the
24 additional core holes.

25 Another one just this last year is

1 Western Ag, where they had done quite a bit of
2 development work before they drilled two
3 additional core holes, which are not being
4 contested right now but, as an observation, that
5 commonly happens and it always has.

6 CHAIRMAN LEMAY: Thank you. Questions
7 of the witness? Commissioner Carlson?

8 COMMISSIONER CARLSON: Yes. Could I
9 see the exhibits?

10 MR. HIGH: Yes.

11 EXAMINATION

12 BY COMMISSIONER CARLSON:

13 Q. Why does the BLM make determinations
14 like this of commercial deposits?

15 A. For one, it's to determine leasing
16 standards. For two, we have to do the
17 inspections to determine, to make sure that
18 they're paying us the proper amount of royalty.
19 There's actually no better way of checking on
20 what they're submitting than to go through that
21 core hole data. And three has been the oil and
22 gas potash problem. That has been around for
23 many, many years.

24 Q. But you don't use these as dictating to
25 a company, for example, on where to mine or how

1 to do its mining plan?

2 A. No, we do review mining plans. Some of
3 them are fairly extensive, but we review mining
4 plans every year. We get a three-year mining
5 plan from the mines. You have to look at it at
6 multiple ore zones. There have been cases where
7 we've issued orders to a company to mine off a
8 lease. For some reason or other you get to the
9 mining face and where the lease ends and the ore
10 continues, and that's something that we do
11 occasionally, anyway.

12 Q. You require mine plans from each potash
13 lessee annually? Three-year plans updated
14 annually?

15 A. Yes, we get a three-year mine plan
16 updated annually, and then we also have an
17 extensive mine plan that was done back in 1978
18 that's very voluminous.

19 Q. For each company?

20 A. Yes.

21 Q. Is that updated?

22 A. We update it through the inspections
23 and then we update it through like the three-year
24 mining plan submittals. Every now and then it
25 includes things on the surface such as tailings,

1 dams and things we'll have to build, and those
2 will be submitted as a mine plan modification.

3 Q. You require that companies follow their
4 mining plan as a condition of the lease?

5 A. Yes, they have to follow--

6 MS. BROWN: Mr. Chairman, excuse me,
7 but with all due respect, I think we're getting a
8 little bit off the subject that was authorized
9 that this witness could testify on, and I would
10 hate to expand the scope of his testimony into
11 mine plans at this time.

12 CHAIRMAN LEMAY: Thank you, Counsel.

13 COMMISSIONER WEISS: Is that the
14 meaning, that mining plans have no meaning, that
15 we can't ask a question on them?

16 MR. CARROLL: Now you understand my
17 dilemma.

18 CHAIRMAN LEMAY: That's why he was
19 informational only. That's why this is not an
20 expert.

21 Q. You say you use the ore grade submitted
22 by companies in determining royalties. How does
23 that affect royalties?

24 A. It determines how you allocate it back
25 to a lease. Obviously, if you have 20 percent

1 ore grade coming off one lease and you have 10
2 percent coming off another lease, then half as
3 many tons--or, let me put it this way, you have
4 to mine twice as many tons from the 10 percent
5 lease to get up to the equivalent of the one ore
6 grade that has 20 percent lease. If you don't
7 keep track of that, you can't allocate back to
8 the lease.

9 Q. What is the royalty rate on federal
10 leases?

11 A. We're at two percent.

12 Q. That used to be on a sliding scale
13 between two and five percent, correct?

14 A. That's correct.

15 Q. That five percent, wasn't that at 10
16 percent, the cutoff? What was it? When did the
17 sliding scale go into effect? There was a
18 10-percent cutoff in there if I remember
19 correctly, is that right?

20 A. I don't remember, to tell you the
21 truth. There was a certain percent in there that
22 it would be a full five and a certain percent
23 that it would be down to 10. I can't remember
24 what the cutoff was. I would have to look it up.

25 Q. Were you employed by the BLM when the

1 sliding scale was in effect?

2 A. Yes, I was.

3 Q. Did you ever see any evidence of the
4 company's mining, choosing where to mine
5 depending on the royalty rate at a given lease?

6 A. No. No, I don't know if they even--I
7 didn't never really consider it, to tell you the
8 truth. I was never looking for it.

9 COMMISSIONER CARLSON: That's all I
10 have.

11 CHAIRMAN LEMAY: Commissioner Weiss?

12 COMMISSIONER WEISS: Yes, I have just
13 one or two.

14 EXAMINATION

15 BY COMMISSIONER WEISS:

16 Q. Do potash companies provide you with
17 all their core hole data?

18 A. Yes. Potash companies, we have some
19 old core hole data from oil and gas companies and
20 some from other companies that were thinking
21 about getting involved.

22 Q. So you could construct good variograms?

23 A. I wouldn't want to construct
24 variograms, but we could. That would be a tough
25 job to do it.

1 Q. But you have the data? I'm just
2 curious as to why the BLM doesn't use modern
3 methods rather than linear interpretation.

4 A. I wish we did have a few variograms. I
5 thought about doing it myself, but I just haven't
6 had the time.

7 COMMISSIONER WEISS: That was my only
8 question.

9 EXAMINATION

10 BY CHAIRMAN LEMAY:

11 Q. What's a variogram?

12 A. A variogram determines if your
13 ore--like, it can be very usable for determining
14 how many core holes you'll need to represent your
15 ore in an area. If you have a lot of large,
16 fluctuating core holes, of course, with any ore
17 zone you need more core holes. Basically that's
18 all it is, is more like histogram.

19 Q. Was your comment on the consensus of
20 the engineers, in order for you to have validity
21 you require three wells within a section, was it,
22 no more than a mile and a half between wells, or
23 what was that criteria?

24 A. Three core holes within a mile and a
25 half.

1 Q. Within a mile and a half radius, or
2 what?

3 A. No, one of the core holes will have to
4 contain two others within a mile and a half of
5 that radius, and then those three core holes
6 become valid.

7 COMMISSIONER WEISS: That was my point
8 that with variograms you can say that's a valid
9 technique.

10 A. Another thing you can do by looking at
11 just what's been mined, you could construct good
12 variograms and that would be a good way of doing
13 it.

14 Q. (BY CHAIRMAN LEMAY) Do you use other
15 kinds of information at all? I guess in
16 particular, were you here when Mr. Lammers
17 testified as to the gamma ray interpretation that
18 some companies will use to predict barren zones
19 in mineralization?

20 A. That has been done by the BLM. We have
21 a lot of electric logs, and that's how we get the
22 green area is from that. I haven't done that and
23 that's kind of outside my field of expertise.

24 Q. That's the technique that the BLM uses
25 in their ore determination methods?

1 A. For the inferred, which it's not for
2 measured or indicated, but for inferred. A few
3 of the electric logs are like that.

4 Q. Would it be helpful to the BLM if
5 additional information was forthcoming through
6 oil and gas tests? Is that something that would
7 help?

8 A. In some areas, yes. We've worked out,
9 in many instances with the oil and gas companies,
10 you know, we've worked out where they've drilled
11 some core holes and done some extra logging, that
12 type of thing. It's something that happens on an
13 occasional basis, but we work it out just kind of
14 informally to do that.

15 CHAIRMAN LEMAY: That's all the
16 questions I have. Additional questions? If not,
17 the witness may be excused.

18 Mr. High? You're on with witness
19 number two.

20 MR. HIGH: We would call Mr. Floyd
21 Prando.

22 FLOYD PRANDO

23 Having been first duly sworn upon his oath, was
24 examined and testified as follows:

25

EXAMINATION

BY MR. HIGH:

Q. Mr. Prando, would you state your full name, please, sir?

A. Floyd Prando.

Q. What's your current position, Mr. Prando?

A. Director, Oil, Gas and Mineral Division.

Q. Did you receive a subpoena served on you, Mr. Prando?

A. Yes, I did.

Q. That subpoena had a list of documents that I asked you to bring with you, is that correct?

A. Yes.

Q. Have you brought some documents here today?

A. We have none of the documents requested available.

Q. None available? Does that mean you have no documents?

A. We don't have them.

Q. So, you have no documents responsive to the ones I asked you to bring?

1 A. That's right.

2 MR. HIGH: I would like to mark, Mr.
3 Chairman then, as Exhibit 35, the Subpoena Duces
4 Tecum I served on Mr. Prando, and I would offer
5 it at this time.

6 CHAIRMAN LEMAY: Without objection, it
7 will be admitted into the record.

8 MR. CARROLL: Do you want to get me a
9 copy of that, Charlie?

10 MR. HIGH: Yes, I will.

11 Q. Mr. Prando, as the director of the Oil,
12 Gas and Minerals Division, what are your duties
13 and responsibilities, please, sir?

14 A. I direct the activities of the Oil, Gas
15 and Minerals Division. I conduct monthly oil and
16 gas lease sales, and administer the leases. I
17 have a staff deputy director and a staff that
18 helps me in those duties. I oversee the
19 operation of the Oil and Gas and Mineral
20 Division.

21 Q. The minerals, would that include
22 potash?

23 A. Yes.

24 Q. Do you have sections or departments
25 within the Division?

1 A. There is a staff. About two and a half
2 years ago, the Mineral Division was merged with
3 the Oil and Gas Division. It used to be a
4 separate division. That Division consisted of
5 two clerks, and we have been working to upgrade
6 the Division. But we still don't have it up to
7 where we would like to have it at this point.

8 Q. How many management-type people do you
9 have reporting to you?

10 A. I have one deputy director, and I have
11 my geologist, Ernest Szabo, and I have the
12 manager of the Mineral Division, Karen Spies.

13 Q. She reports to you?

14 A. Yes.

15 Q. And to whom does Mr. Szabo report, the
16 geologist?

17 A. To me.

18 Q. He doesn't report to the manager of the
19 Minerals Division?

20 A. No.

21 Q. Do you have any other professional
22 people in your Division, other than Mr. Szabo?

23 A. My deputy director is a geologist, and
24 we just hired another geologist about two weeks
25 ago. We have a position vacant for a petroleum

1 engineer that we haven't filled at this time.

2 Q. But you are seeking to fill that
3 petroleum engineer position?

4 A. Yes.

5 Q. How many people in the Division have
6 degrees in mining engineering?

7 A. None, to my knowledge.

8 Q. Do you have any people in the Division
9 that have prior experience in the mining
10 industry?

11 A. Not to my knowledge.

12 Q. Do you know of any plans by the
13 Division to go out and get someone that has
14 experience in the mining industry?

15 A. We are looking at the possibility of
16 upgrading the Division, but I don't know how
17 soon.

18 Q. Since order R-111-P was adopted--and I
19 take it you are familiar with R-111-P, are you
20 not?

21 A. Yes.

22 Q. --has your Division adopted and
23 implemented any new procedures in connection with
24 R-111-P?

25 A. No. I designated Mr. Ernest Szabo, my

1 geologist, to handle all the documents in
2 connection with that Order that are kept
3 confidential, and he has been the sole custodian
4 of all that data that has been submitted to the
5 Commissioner of Public Lands. And he has been
6 handling everything.

7 Q. He's the one that receives the data
8 under R-111-P and the one who is charged with
9 keeping it confidential?

10 A. That's right.

11 Q. What rules, and let me start with
12 written rules, Mr. Prando, has your Division
13 adopted to make sure those documents are kept
14 confidential?

15 A. We don't have any rules. We had a
16 memorandum from the Legal Division specifying
17 what we should keep confidential, you know, what
18 documents would be of a confidential matter.

19 Q. But you have no written rules or
20 guidelines other than this memorandum from
21 counsel on treating records with confidence that
22 you get in R-111-P?

23 A. We don't.

24 Q. That's correct?

25 A. Yes.

1 Q. Now, is it the Division's position, Mr.
2 Prando, that it has the right to approve or
3 disapprove the designation of an LMR by a potash
4 operator?

5 A. Yes.

6 Q. And when was it that the Division
7 reached that determination?

8 A. I think it was around March of--that
9 was in a letter of March 27, 1992, around that
10 time.

11 Q. That's when the Division decided that
12 we have the authority to either approve or
13 disapprove LMRs?

14 A. Yes. There was a request to approve an
15 extension of an LMR, and I assigned that to Mr.
16 Szabo. He informed me that we did not have
17 enough data, so he wrote for the additional data;
18 and when we got the data, we wrote that letter of
19 March 27, 1992.

20 Q. And I want to talk about that in just a
21 few minutes. Once the Division made this
22 decision on March 27, 1992, that you had the
23 right to approve or disapprove LMRs, had you
24 previously provided any notice to potash
25 operators that you were undergoing or thinking

1 about adopting such a rule?

2 A. No.

3 Q. I take it, then, there was no public
4 notice or public hearings of any kind held on
5 that decision, is that correct?

6 A. That's correct.

7 Q. After you reached this decision on
8 March 27, 1992 to either approve or disapprove
9 LMRs, did you send out notice to any potash
10 operator, other than the letter you referred to?

11 A. No, that's the only one.

12 Q. So a potash operator that had an LMR or
13 has one even today, wouldn't know about your
14 decision on March 27, 1992, unless perhaps
15 somebody goes out now and tells them?

16 A. That's correct.

17 Q. Other than the letter that you referred
18 to of March 27, 1992, is there any other written
19 document that sets forth that decision to either
20 approve or disapprove LMRs?

21 A. No.

22 Q. Now, when you made this decision that
23 you had the authority to either approve or
24 disapprove LMRs, have you adopted, either
25 informally or formally, any standards that will

1 be applied to determine whether or not an LMR
2 should or should not be approved?

3 A. Not at this point.

4 Q. Would it be a fair statement to say,
5 then, that to get an LMR approved today or any
6 time after March 27, 1992, a potash operator
7 wouldn't know what they had to do to satisfy the
8 State Land Office, is that correct?

9 A. Yes. At this point, yes.

10 Q. I take it there has not been any notice
11 given to the public or any public hearings held
12 with respect to what standards should or should
13 not be applied in either approving or
14 disapproving an LMR?

15 A. No.

16 Q. Now look, if you will, Mr. Prando at
17 Exhibit No. 11 and it's in the book in front of
18 you. It's Exhibit No. 11, and I want to ask you
19 a few questions about that.

20 This is the letter you just told me
21 about, right?

22 A. Yes.

23 Q. This is the March 27, 1992 letter?

24 A. That's correct.

25 Q. At the very bottom, this letter went

1 out over your signature, correct?

2 A. Yes.

3 Q. Now, in paragraph one, the second
4 sentence says, "It is our conclusion that core
5 hole No. 162 did encounter an economical
6 accumulation of sylvite."

7 That, I take it, is the decision of
8 your Division, correct?

9 A. This letter was prepared by Mr. Ernest
10 Szabo.

11 Q. It didn't go out from Mr. Szabo, did
12 it? It went out from you?

13 A. I signed it.

14 Q. It went out with your full authority in
15 your position as Director of the Oil, Gas and
16 Minerals Division?

17 A. Yes.

18 Q. You go on to say in the last sentence
19 of paragraph one, "The quality of ore is such
20 that the southeast quarter of Section 2, Township
21 22 South, Range 31 East, contains a commercial
22 deposit"?

23 A. Yes. That was the opinion of my
24 geologist.

25 Q. Is there any scientific, any

1 mathematical, any engineering standard at all
2 that you can point to upon which you base the
3 decision to limit the influence of core hole 162
4 to the southeast quarter of Section 2?

5 A. Mr. Szabo just utilized his experience
6 as a geologist.

7 Q. And you, as director of the Division,
8 required nothing more than Mr. Szabo's decision,
9 correct?

10 A. We didn't have any information that was
11 provided to us by the potash company. We didn't
12 have anything to work with.

13 Q. On March 27th you had something to work
14 with, because you concluded it was commercial
15 grade potash in Section 2, didn't you, Mr.
16 Prando?

17 A. That was his conclusion.

18 Q. So you did have some information by
19 this day?

20 A. Yes.

21 Q. What I'm asking you to do is, what did
22 you consider in the conclusion that only the
23 southeast quarter section had commercial potash?

24 A. Mr. Szabo made that conclusion based
25 upon the informaton submitted by the potash

1 company.

2 Q. All right. And, in your position as
3 director, did you consider anything other than
4 Mr. Szabo's recommendation to you?

5 A. No.

6 Q. Your Division has no written standards,
7 I take it, that Mr. Szabo was or wasn't supposed
8 to follow?

9 A. No.

10 Q. So anything that Mr. Szabo considered
11 in coming up with his recommendation to
12 you--which you accepted, I take it?

13 A. Yes, I did.

14 Q. You don't have any idea what he
15 considered, do you?

16 A. No.

17 Q. Do you have any standards in the Oil,
18 Gas and Minerals Division on how much influence
19 should be given to a single core hole?

20 A. No.

21 Q. Look at Exhibit No. 10(a), if you
22 would.

23 A. No. 10?

24 Q. I'm sorry, 10(a). Have you had a
25 chance to look at it?

1 A. Yes.

2 Q. That's also a letter that you sent out
3 to New Mexico Potash dated February 10, 1992?

4 A. That's correct.

5 Q. I'll ask you the same kinds of
6 questions with respect to this one, Mr. Prando,
7 and I'll try to ask you a global one so we don't
8 keep you any longer than we have to.

9 When you sent what I've marked as
10 Exhibit 10(a), the letter dated February 10,
11 1992, did the Oil, Gas and Minerals Division have
12 any standards against which it would judge to
13 either approve or disapprove an LMR?

14 A. No.

15 Q. Did you believe on February 10, 1992,
16 that the Division had the right to either approve
17 or disapprove an LMR?

18 A. Yes.

19 Q. Had you already made the decision by
20 February 10, 1992, that the Division had the
21 right to either approve or disapprove LMRs?

22 A. That's why we requested the additional
23 information.

24 Q. Okay. The reason I asked that is
25 because you told me a minute ago that on March

1 27, 1992, the decision was made. My question to
2 you is, is that when New Mexico Potash was
3 notified of the decision or is that when the
4 decision was made?

5 A. That's when they were notified.

6 Q. So the decision itself would have been
7 made on or before February 10, 1992, correct?

8 A. We didn't make the decision. Mr. Szabo
9 didn't make the decision until we were provided
10 with the information that we requested in the
11 letter of February 10, 1992.

12 Q. Let me clarify my question. I'm
13 talking not about the decision on whether there's
14 commercial potash or not. My question is, on the
15 date on which the decision was made, your
16 Division had the right to either approve or
17 disapprove the designation of an LMR by a potash
18 lessee? That's the date I'm looking for.

19 A. Yes.

20 Q. You told me a minute ago it was March
21 27th, and I'm asking you whether or not that's
22 correct, or instead--

23 A. February the 10th.

24 Q. And that's why you sent out the letter
25 marked 10(a), is because you wanted data on which

1 to exercise your right to make the decision to
2 approve or not approve?

3 A. That's correct.

4 Q. Now, on February 10, 1992 and then I'll
5 leave this subject, Mr. Prando, and from that
6 date forward until we sit here today, there's not
7 a piece of paper on which we can look to see what
8 you will consider in deciding whether to approve
9 or disapprove an LMR?

10 A. No.

11 Q. Is that correct?

12 A. That's correct.

13 Q. Are there any guidelines or standards
14 set up, Mr. Prando, pursuant to what your
15 Division will advise the Oil Conservation
16 Division about whether or not a proposed drilling
17 location is or is not within an LMR or its buffer
18 zone?

19 A. No.

20 MR. HIGH: We'll pass the witness, Mr.
21 Chairman. Thank you very much.

22 CHAIRMAN LEMAY: Your witness, Mr.
23 Carroll.

24 EXAMINATION

25 BY MR. CARROLL:

1 Q. Just one quick question, Mr. Prando.
2 Does the State Land Office at this time have any
3 means or have they even attempted to monitor
4 whether or not state sections are being avoided
5 by any mine out in the potash, avoiding mining
6 state leased minerals as opposed to some other
7 federal minerals?

8 A. Not at this time.

9 Q. So you, at least at this time or prior
10 to this time, the State has not even been
11 performing an investigation along those lines?

12 A. No.

13 MR. CARROLL: That's all I have.

14 MR. HIGH: Let me ask one question.

15 FURTHER EXAMINATION

16 BY MR. HIGH:

17 Q. Do you have any information, evidence,
18 suspicions or anything else, Mr. Prando, that New
19 Mexico Potash has ever avoided mining a lease or
20 a state lease to avoid paying state royalties?

21 A. Not to my knowledge.

22 MR. HIGH: Thank you. That's all I
23 have.

24 CHAIRMAN LEMAY: Commissioner Carlson?

25

EXAMINATION

BY COMMISSIONER CARLSON:

Q. Floyd, how many leases do you administer, oil and gas leases or mineral leases?

A. We have 8,000 oil and gas leases and about 288 mineral leases.

Q. And how many regulations apply to your Division?

A. We have about 10.

Q. And many pages in each?

A. Right.

Q. Aren't you asked for interpretations of lease provisions and regulation provisions quite frequently by lessees and other parties?

A. Yes.

Q. So that for example the letters, Exhibit 10(a) and I think it was Exhibit 11, those types of letters are frequently written by you, is that correct?

A. That's right.

Q. And if you had to follow guidelines in making a decision concerning every one of your thousands of leases, that would be impossible to do, is that correct?

A. That's right.

1 COMMISSIONER CARLSON: That's all I
2 have.

3 CHAIRMAN LEMAY: Commissioner Weiss?

4 COMMISSIONER WEISS: Yes.

5 EXAMINATION

6 BY COMMISSIONER WEISS:

7 Q. I don't know if you're the right man to
8 ask, but as I recall in the course of these
9 hearings, there was one document that got out to
10 the public that shouldn't have. It was
11 confidential. Was that out of your office?

12 A. No.

13 Q. Did that becoming public result in any
14 increase in the interest in potash leases in your
15 Division?

16 A. Not to my knowledge.

17 COMMISSIONER WEISS: Thank you.

18 EXAMINATION

19 BY CHAIRMAN LEMAY:

20 Q. Mr. Prando, what's your state royalty
21 rate on potash?

22 A. It varies from two to five percent on
23 potassium chlorides, and it's two and a half
24 percent on the sulfates.

25 Q. Is that a sliding scale depending on

1 the concentration?

2 A. Right.

3 Q. Do you require any mine plans on state
4 lands?

5 A. We haven't been requiring them up to
6 this point, but we will in the future.

7 CHAIRMAN LEMAY: For the record, now,
8 you're notified.

9 Q. Do you cooperate with the BLM in
10 developing any of the mine plans, or do you have
11 any cooperative committees, informal, formal,
12 working with the BLM?

13 A. Mr. Szabo has been attending the
14 meetings that are held by BLM, and that's about
15 the extent of the cooperation.

16 Q. There aren't any formal committees that
17 work together in outlining LMRs or anything like
18 that?

19 A. No.

20 CHAIRMAN LEMAY: I have no further
21 questions. Anything else?

22 MR. HIGH: We have nothing.

23 CHAIRMAN LEMAY: He may be excused.
24 Call your next witness, Mr. High.

25 MR. HIGH: Call Mr. Walt Case.

1 WALTER S. CASE, JR.

2 Having been first duly sworn upon his oath, was
3 examined and testified as follows:

4 EXAMINATION

5 BY MR. HIGH:

6 Q. Would you state your name, please,
7 sir.

8 A. Walter S. Case, Jr.

9 Q. Where are you employed, Mr. Case?

10 A. New Mexico Potash Corporation.

11 Q. In what position?

12 A. General manager.

13 Q. How long have you held that position?

14 A. Since 1980.

15 Q. Tell us, Mr. Case, a little bit about
16 your educational background, please, sir.

17 A. I have a degree in metallurgical
18 engineering, essentially a mineral processing
19 specialty, from Colorado School of Mines in 1959.

20 Q. Any other school beyond your degree in
21 metallurgical engineering?

22 A. Nothing other than occasional short
23 courses or perhaps a college course or two.
24 Nothing like formal education.

25 Q. All right. Tell us, if you will, your

1 employment since obtaining your metallurgical
2 engineering degree.

3 A. I worked for approximately nine months
4 in 1959 and 1960 for Asarco at their El Paso
5 smelting works as a junior metallurgist in the
6 lead department.

7 I spent two years in the service
8 following that.

9 I started with Kerr-McGee in mid-1962
10 as a junior metallurgical engineer in Oklahoma
11 City. I was with them in Oklahoma City until
12 1971. Worked on varying projects including
13 potash and vanadium as perhaps the two largest
14 areas of effort. I've also worked on copper,
15 gypsum and several other heavy minerals,
16 separation processes, and also held several staff
17 positions within their technical division.

18 In 1971, I moved to the Hobbs potash
19 facility of Kerr-McGee Chemical Corporation as
20 technical services superintendent. Later that
21 year I was promoted to superintendent of surface
22 operations and held that position until December
23 of 1980, when I became the facility manager.

24 I was facility manager for Kerr-McGee
25 until 1985, April of 1985, when our operation was

1 bought by New Mexico Potash Corporation, and at
2 that point I became general manager.

3 Q. You have been at the New Mexico Potash
4 facility since you started with Kerr-McGee in
5 1971?

6 A. That's correct.

7 Q. And it's all been at the facility there
8 between Hobbs and Carlsbad?

9 A. Yes.

10 Q. Do you maintain any professional
11 activities, Mr. Case?

12 A. Yes, sir. I have a certificate
13 recognizing a 25-year membership in the American
14 Institute of Mining, Metallurgical and Petroleum
15 Engineers.

16 I am a member of the citizens advisory
17 panel for the Roswell District of the BLM.

18 I also serve as a director of the
19 Southeast New Mexico Transportation Development
20 District, all of which are professionally related
21 duties.

22 Q. And the Carlsbad facility is an
23 underground potash mine?

24 A. That's correct.

25 MR. HIGH: Mr. Chairman, we would ask

1 that the Commission accept Mr. Case's
2 credentials.

3 CHAIRMAN LEMAY: His qualifications are
4 accepted.

5 Q. Mr. Case, tell us a little bit about
6 the New Mexico Potash facility in terms of how
7 big it is, how many employees you have. Give us
8 some idea of what it is we're talking about
9 here.

10 A. Okay. We currently produce nominally
11 400,000 tons a year of a myriad of potash,
12 potassium chloride, as opposed to what you've
13 heard. The sulfate minerals, we do not produce
14 them. We're basically mining and processing the
15 mineral sylvite.

16 We employ 280 people at the local
17 facility. In addition, New Mexico Potash employs
18 perhaps another half dozen people in the sales
19 and general administrative levels above the
20 facility operation there.

21 The mine is nominally 10 miles from end
22 to end. We have 10 acting working faces in the
23 mine. We attempt to blend ore from those various
24 faces to average ore that is economically
25 feasible to process.

1 We employ approximately 140 of our
2 people underground, and the other 140 nominally
3 are topside people.

4 A. How does New Mexico Potash get the ore
5 out of its place and move it underground and then
6 to the surface?

7 A. We use electrically driven continuous
8 miners to mine the ore. They place the ore
9 either into eight-ton ram cars; for lack of a
10 better descriptive term, horizontal dump trucks.
11 The ore is pushed out the back, because we're
12 mining nominally at a five-foot height, sometimes
13 as low as four foot.

14 The continuous miner will place ore
15 into either one of these ram cars or onto a long
16 air dock continuous hauling system, which is,
17 essentially, six short nominally 30- to 40-foot
18 long chain conveyors that have the ability to
19 snake into a face and then dump onto the
20 beginning of a fixed belt system.

21 The ore from either the end of the
22 continuous haulage system or from the ram cars is
23 placed onto a conveyor system that brings the ore
24 to the central area of the mine.

25 There are three 1,000-ton capacity

1 holding pockets below ground. From these pockets
2 we draw the ore on a control basis into the
3 hoist. The hoist raises the material some 1,650
4 feet to the surface.

5 Q. If you went right out to the--let me
6 back up. You used the word face a minute ago.

7 A. Okay.

8 Q. Let's make sure the record reflects
9 what it is when you refer to a face or a working
10 face.

11 A. A working face is an area in the mine
12 that is currently being mined. The term face,
13 ribs, back, go back to the time when miners laid
14 on their stomachs to mine, and what was in front
15 of them was the face, what was on the side of
16 them was the ribs and what was above them was
17 their back. And that's where those terms come
18 from. An active face is one of the 10 areas in
19 the mine that we are currently mining.

20 Q. And if you went right up to these
21 working faces to see one of them, what would be
22 the height from the ground to the top of the
23 ceiling?

24 A. It would depend on the height of the
25 ore that we were mining. We develop what we call

1 development entries, entries that we intend to be
2 in for a long time, as high as six feet. If
3 we're down to what we call panel mining, which is
4 actually the act of getting ore out of the face
5 without regard to how long we have to stay in the
6 area, those areas will range from four to five
7 feet high, depending on the actual height of the
8 ore seen.

9 Q. How wide would the entries be?

10 A. The miner cuts 12-and-a-half to 13-feet
11 wide, and we normally take what we call a double
12 pass, which will amount to about 25 feet.

13 Q. If this room we're in today, let's call
14 it a development entry, and we are progressing
15 from my location towards the Commissioners, with
16 the wall behind them being the working face, the
17 height of this development entry would be about
18 six feet?

19 A. That's correct.

20 Q. About how wide would it be?

21 A. About 25 feet.

22 Q. Then off of this development entry we
23 would have the panel entries, where we're
24 actually pulling out the ore to take it, to send
25 it to the surface, then to mine?

1 A. There are sub entries that go in the
2 length of a panel nominally 2500 feet, and there
3 are mining operations that take place on either
4 side of those entries, and they're retreated back
5 toward the main entry system.

6 Q. And that's the point where the entries
7 go down to four or five feet in height?

8 A. That's correct.

9 Q. And what would be the width of those?

10 A. Those will also be 25 feet.

11 Q. Now, you say there are 10 working
12 faces. How many continuous miners do you have
13 that takes the ore out of its place to move it on
14 to the conveyor system?

15 A. 10.

16 Q. And have you bought any new ones
17 recently?

18 A. Oh, we have bought some used coal
19 mining equipment within the last three to five
20 years and converted it to be more suitable to
21 potash mining. Potash is a little bit harder to
22 dig than coal, and you upgrade the varying fits
23 and make basically a beefier machine, if you
24 will, out of a coal miner, and turn it loose on
25 the potash.

1 Q. How about the shafts? How many shafts
2 do you have?

3 A. There are two shafts.

4 Q. How many miles of belt conveyor system
5 would you estimate that you have, Mr. Case?

6 A. I would estimate about 10 miles at this
7 point.

8 Mr. High, it might be interesting to
9 the Commission, one of my engineers had little to
10 do one afternoon and sat down and figured that if
11 everything that we had mined since 1965, when the
12 mine went into operation, we would have a tunnel
13 12-and-a-half feet wide, which is the cut of the
14 miner, five feet high, and 3,700 miles long.
15 That's from Miami to Vancouver, basically.

16 When we talk about incursion of gases
17 into the mine, for example, we're not only
18 concerned with incursion of gases in the face
19 that we're mining, but also in all of that area
20 that has been exhausted because we do not seal
21 those areas as to gassy mines, once we come out
22 of them.

23 So we're not only concerned with what's
24 immediately in front of us but also what's
25 happened in that nominally 3,500 miles behind us.

1 Q. After you started mining in these
2 panels off of the development entries, Mr. Case,
3 when you mine in, about how much of the ore would
4 you estimate you take out?

5 A. 30 to 50 percent.

6 Q. And then you leave the other ore in
7 place, I assume, for support?

8 A. That's correct.

9 Q. So they won't cave in on you or subside
10 while you're in there working?

11 A. That's correct.

12 Q. But you don't leave that ore in place,
13 I take it?

14 A. No, sir. Mr. High, the acceptable way
15 of developing an ore body is to drive entries to
16 the edge of the ore body and then begin
17 retreating your mine backward, toward the central
18 part of the mine from that point.

19 So what we'll do is take nominally 30
20 to 50 percent of the ore going in, until we get
21 to the limits of either a panel or to the edge of
22 the ore, the edge of the lease, whatever the
23 constraining factor is, and then begin
24 retreating.

25 Overall we'll take 75 to 80 percent of

1 the ore that's in place between the first mining
2 and the second mining as we come back out. As we
3 come out, we're not concerned about the longevity
4 of the back staying up. Once we get out we're
5 ready for it to come in, and that's part of the
6 rock mechanics business of which I'm not an
7 expert.

8 Q. Would it be a fair statement to say
9 that when you're mining in the first time,
10 leaving the pillars for support, that's called
11 first mining?

12 A. That's correct.

13 Q. And once you get to where you stop and
14 you turn around and you're getting the ore on the
15 way back, that's called second mining?

16 A. That's correct.

17 Q. As you're second mining, taking out
18 these pillars that support the ceiling, what
19 happens to the overburden?

20 A. Well, you get higher and higher
21 pressures on the little bit of ore that's
22 remaining. The remaining pillars will crush,
23 they will bow. The back or the roof of the mine
24 may either close by sagging of the floor wall,
25 sag upward, if you will, or heave upward.

1 Normally, if you have a competent salt
2 member above you, it will be a swag that looks
3 like this. If you have mineralization, bedded
4 strata above you of small stringers, it may break
5 at those stringers and the salt will actually
6 drop and fall. So, if we look into an area
7 that's been mined, we may see several scenarios.

8 Q. Would it be a fair statement to say,
9 Mr. Case, in terms of a description here for the
10 Commissioners, as you're second mining and
11 pulling out of a section, you are taking out
12 potash support?

13 A. That's correct.

14 Q. And you're doing that knowing that once
15 you take that support out, the area from which
16 you are retreating will start collapsing and
17 coming together?

18 A. That's correct.

19 Q. You are, in effect, setting in motion a
20 planned coming together of the top and the bottom
21 to close back up?

22 A. That's correct.

23 Q. That involves some falling of the
24 overburden down to the floor?

25 A. Yes.

1 Q. Now, how is the New Mexico Potash mine
2 ventilated?

3 A. It is ventilated by two fans that draw
4 air through the mine. The fans are located at
5 the exhaust of the air circulation system, so air
6 is drawn in what we call our production shaft,
7 circulated by using barriers or curtains
8 throughout the mine. It's essentially split in
9 two parts of the mine, but it goes from one
10 working area to another working area to another
11 working area, what we call series ventilation.
12 Then those two strings recombine and are
13 exhausted out what we call our man and material
14 shaft.

15 Q. What creates the movement of air that
16 flows through the mine?

17 A. The two fans.

18 Q. Do they have a name?

19 A. The main fans. They're assisted by
20 booster fans throughout the mine that direct the
21 air flow and insist on changing direction of air
22 flow where that's necessary.

23 Q. Where are the main fans located? On
24 the surface or underground?

25 A. Underground.

1 Q. What would you, Mr. Case, estimate the
2 replacement value of the New Mexico Potash
3 facility to be, if you know?

4 A. The entire facility would range between
5 \$100 and \$150 million, new equipment, grass roots
6 facility built today.

7 Q. If we wanted to go out and duplicate
8 the New Mexico Potash facility, it would take, in
9 your opinion, between \$100 and \$120 million?

10 A. That's correct. Between \$100 and \$150
11 million.

12 Q. I mean, \$150. What, Mr. Case, is the
13 estimated life of reserves that New Mexico Potash
14 has?

15 A. Mr. High, at the request of senior
16 management, within the past year we've had an
17 independent third party assess our ore reserves
18 and our mining plans, and at our current mining
19 rates we estimate 35 years of remaining reserves.

20 Q. And all the reserves that New Mexico
21 Potash has, I take it, are right there, either
22 adjacent to or in close proximity to the facility
23 as it sits there today?

24 A. That's correct.

25 Q. Now, let's talk a little bit, Mr. Case,

1 about safety. Your mine is subject to safety
2 regulations, is it not?

3 A. Yes, sir. We're under the
4 administration of the Mine Safety and Health
5 Administration.

6 Q. How quickly are you inspected, from a
7 safety standpoint?

8 A. At least quarterly.

9 Q. Is that something just because the
10 government has the people to do it, or is that
11 something that's required by some law?

12 A. No, that's required by the Mine Safety
13 and Health Act of, I believe, 1978.

14 Q. The federal law says the government has
15 to come out and inspect your potash mine at least
16 once every quarter?

17 A. That's correct.

18 Q. What authority do these MSHA inspectors
19 have when they come out if they find something
20 that's wrong, in their judgment, from a safety
21 standpoint?

22 A. The range of their authority goes from
23 fix it, to shut it down and don't operate it
24 until it is fixed.

25 Q. So an MSHA inspector can, literally,

1 are you telling us, force you to shut down a
2 portion of the mine simply on his word, even
3 before you've had a hearing?

4 A. That is correct. A portion or all of
5 the mine, depending on his word.

6 Q. And what is that piece of paper called
7 that he would issue that would tell you to shut
8 down something even before you had a hearing on
9 it?

10 A. It's called an order, and it has a
11 number to it, but I can't tell you off the top of
12 my head what that number is.

13 Q. Is that what some of us may call a
14 withdrawal order?

15 A. Yes.

16 Q. Has New Mexico Potash ever received a
17 withdrawal order?

18 A. No, sir.

19 Q. Now, has New Mexico Potash developed
20 any mining plans, Mr. Case?

21 A. Yes.

22 Q. Give us some idea of what kind of a
23 mining plan it is that New Mexico Potash has
24 prepared or has in place?

25 A. The general philosophy is extraction of

1 the reserves to the maximum extent possible, in
2 controlled manners, to where you don't spread
3 yourself out all over the world and have,
4 essentially, three or four different mines
5 operating under a three-to-one shaft. So we
6 concentrate on two or three areas with two or
7 three or four machines in each one of those
8 areas.

9 Q. And is that type approach to mining
10 consistent with what you understand to be a
11 proper conservation of mineral resources like
12 potassium?

13 A. Yes, sir.

14 Q. Let me.

15 Q. Mr. Case, look at what I've marked as
16 Exhibit No. 36. Tell me if you recognize the
17 book that that's from?

18 A. Yes, sir, it's from the Society of
19 Mining Engineers' Mining Engineering Handbook.

20 Q. Looking at page 2 and tell me if you
21 can tell me what that page is all about.

22 A. The second page of the exhibit is
23 numbered I-12, and the two major topics covered
24 on that page are "Conservation In Mining" under
25 heading 1.6, and "Environmental Influences and

1 Mining" under paragraph 1.7.

2 Q. And is your mine planning at New Mexico
3 Potash consistent with Exhibit No. 36?

4 A. Let me take a moment to read this.

5 Q. Sure. Please. Go right ahead.

6 A. Generally, yes, I would say we follow
7 the philosophy listed here. It seems to be
8 talking primarily about metal mining, but I don't
9 see a lot there that I would disagree with in
10 terms of industrial mining such as we are
11 conducting.

12 MR. HIGH: We would offer Exhibit 36,
13 Mr. LeMay.

14 CHAIRMAN LEMAY: Without objection,
15 Exhibit 36 will be admitted into the record.

16 Q. Are any of these mine plans in writing,
17 Mr. Case?

18 A. Yes, sir. The one that the third party
19 prepared this last year is in considerable
20 detail.

21 Q. Do you prepare and submit mine plans to
22 any federal or state agencies?

23 A. Yes, sir.

24 Q. What agencies are those?

25 A. To BLM.

1 Q. Do you submit any mine plans to the
2 State?

3 A. I'm not certain on that. I have a
4 person on my staff that handles that.

5 Q. How is it that you go about deciding,
6 Mr. Case, in which areas or which part of these
7 10 faces that you'll mine from at any particular
8 point in time?

9 A. There are several factors. Most of
10 them have to do with logistics of moving people
11 to and from the various areas in the mine; the
12 grade of ore in various parts of the mine; trying
13 to keep a balance on the main line conveyor belt
14 system so that we can operate them to their
15 maximum capacity.

16 We cannot put all 10 areas on one
17 conveyor belt and get it to the central portion
18 of the mine. Normally the main conveying system
19 will handle--some main systems will handle three
20 areas to four areas. The main system will handle
21 four to six areas.

22 Q. Why is it you have 10 working faces
23 instead of just one?

24 A. Primarily to minimize the risk or
25 opportunity of either poor grading or high

1 grading the deposit. You try and blend--

2 Q. Tell me what that means.

3 A. You try and blend ore from the various
4 areas to come to what is nominally your life of
5 mine average ore grade. That's the intent; not
6 always the outcome.

7 Q. So, if you're mining in an area of
8 particularly high grade ore, you'll want to mix
9 that with some other lower grade ore to maximize
10 the extraction from that body of ore?

11 A. That's correct. And the low grade
12 panel by itself may not be, quote, economic ore,
13 but when it is blended with the higher grade
14 panel, both of them, or the higher one brings the
15 lower one up to economic consideration.

16 Q. And how frequently are decisions made
17 that you would change from working at one
18 particular working face to instead move to
19 another one that might have a different grade of
20 ore?

21 A. There are a number of factors that
22 influence that. Again, the major factor being,
23 before you complete a panel, you have to have a
24 home for that machine to move to. Normally, you
25 don't move a machine all the way across the mine

1 but move it to an area that's in near proximity.
2 That's generally the major consideration.

3 In other words, we're working in areas
4 of the mine and try and mine out this area and
5 mine out this area and mine out this one, rather
6 than do one panel here and suddenly decide it
7 needs to be moved over here or moved up here. We
8 try and do it in an orderly manner to optimize
9 costs.

10 Q. Now, this third party that you said
11 came in and did a study, what kind of a study was
12 it that they did?

13 A. They were contracted to look at,
14 primarily, our estimate of ore reserves and
15 confirm those. And, as it turned out, to prepare
16 a new mining plan for us based on those
17 reserves.

18 They also looked at the surface
19 operation, the viability of it for lasting the
20 length of reserves that we determined we had,
21 what did they see major in terms of capital costs
22 down the road, to ensure that the surface
23 operation was kept in readiness for the mining
24 operation.

25 But the major emphasis and 60 percent

1 of the study concentrated on ore reserves and the
2 mine plan.

3 Q. And did that third party report come up
4 with a recommended mining plan for New Mexico
5 Potash?

6 A. Yes, sir, they did.

7 Q. And did that study involve, in any way,
8 this lawsuit or this case, this proceeding?

9 A. No, sir. It was requested completely
10 independent of this case.

11 Q. Was there anything in that report
12 concerning the mining of Section 2 that's
13 involved in this dispute here?

14 A. Yes.

15 Q. And did the mining plan that was
16 recommended by this outside company include the
17 mining of Section 2?

18 A. It did.

19 Q. Before we get into that, Mr. Case, look
20 at Exhibit 1(a), please, sir.

21 A. 1(a)?

22 Q. Yes, sir. That's in the book there in
23 front of you. If you will, just take a minute
24 and look at Exhibits 1(a), (b) and (c), and then
25 tell me what those are, please, sir.

1 A. Exhibit 1(a) is a potash mining lease
2 numbered M14957. Exhibit 1(b) is an assignment
3 of mineral lease from Kerr-McGee Corporation to
4 New Mexico Potash Corporation dated or signed the
5 5th of April, 1985. And then my copy is hard to
6 read, but Exhibit 1(c) is issued by the New
7 Mexico State Land Office, potash mining lease
8 dated the 2nd of May, 1988.

9 Q. Do you understand those documents to be
10 the lease documents with respect to Section 2
11 that's involved in this proceeding?

12 A. Mr. High, Exhibits 1(a) and 1(b)
13 contain direct references to Section 2. I do not
14 find those references in Exhibit 1(c). I see
15 Sections 22, 23, 24, 25, 26, 27, 34 and 35 on my
16 copy.

17 Q. New Mexico Potash currently holds the
18 lease on Section 2, does it not?

19 A. That's correct.

20 Q. How long has it held that lease?

21 A. Through New Mexico Potash Corporation
22 and Kerr-McGee Corporation, to the best of my
23 knowledge, since the plant went into operation in
24 1965.

25 Q. And I take it during that period of

1 time that to hang on to that lease, New Mexico
2 Potash and/or Kerr-McGee paid whatever payments
3 were required to keep the lease in effect?

4 A. I have not received notice to the
5 contrary.

6 Q. Now, there was some testimony earlier
7 about Section 2 and the langbeinite there and the
8 discussion between New Mexico Potash and IMC.

9 Tell us how it came about that IMC
10 became interested in obtaining Section 2 from New
11 Mexico Potash.

12 A. I don't know what goes on in the heads
13 of other managers, but it's my understanding that
14 International Minerals and Chemical had requested
15 langbeinite leases or potash leases on two or
16 three sections south of Section 2. These are
17 federal sections, and on at least half of two or
18 three sections to the west of Section 2.

19 Until about this time last year, it was
20 our opinion, based on information contained in
21 the documents prepared to support the WIPP
22 project, specifically Hole AEC 8, that there was
23 a trend of langbeinite shown in AEC 8 which
24 trended to the northeast, which a reasonable
25 person would conclude that that extension of

1 langbeinite would go up into Section 2.

2 Q. What strategic benefit did IMC see, if
3 you know, in obtaining Section 2, in connection
4 with its interest in those other leases?

5 A. Mr. High, this is speculation on my
6 part, but from the mining that I have learned by
7 osmosis, it would seem if you have leases here
8 and leases here, that the logical conclusion
9 would be that you would join those leases and
10 probably that section would be of value as a
11 location for a shaft.

12 As a matter of fact, I have been
13 somewhat surprised, since I understand that Yates
14 was the successful bidder on those leases, that
15 they have not come to us seeking the same sort of
16 information.

17 Q. For the same reason, because of its
18 strategic location in the section?

19 A. That's correct.

20 Q. Did it ever come to pass that IMC took
21 possession of the title of Section 2?

22 A. It did not. IMC did not take
23 possession. A lease was not assigned to IMC.

24 Q. Look at Exhibit No. 12. You've heard
25 this document referred to as an agreement, have

1 you not?

2 A. I have, in earlier testimony.

3 Q. Is that correct?

4 A. It is not. The fourth word on the
5 first line of the text is key. It says,
6 "Enclosed is a proposed IMC and NMPC," IMC being
7 International Minerals and Chemical fertilizer
8 and NMPC being New Mexico Potash Corporation,
9 "agreement for the assignment of" dah dah dah
10 dah.

11 Again, the key and operative word is
12 "proposed" and that remains a proposal today.

13 Q. Was this part of the effort of IMC to
14 acquire Section 2 from New Mexico Potash?

15 A. That is correct.

16 Q. An agreement on that was never reached?

17 A. That is correct.

18 Q. You still own it today?

19 A. Yes. We still hold the lease, Mr.
20 High.

21 Q. All right. I misspoke. You still hold
22 the lease. All right.

23 MR. HIGH: Mr. Chairman, we would offer
24 Exhibit No. 12, Mr. Chairman.

25 CHAIRMAN LEMAY: Exhibit 12 will be

1 entered into the record without objection.

2 MR. HIGH: We would also offer Exhibits
3 1(a), (b) and (c).

4 CHAIRMAN LEMAY: Exhibits 1(a), (b) and
5 (c) are entered into the record without
6 objection.

7 Q. Now when was it, Mr. Case, that IMC
8 became interested in Section 2? Can you put a
9 time on that?

10 A. Fourth quarter--well, expressed
11 interest to us, fourth quarter of 1991.

12 Q. That's when discussions started on your
13 possibly acquiring that section?

14 A. That's correct. And there were
15 discussions, informal discussions preceding the
16 issuance of this letter. The letter didn't hit
17 us cold, out of the blue.

18 Q. During the time that you were
19 discussing with IMC its interest in the
20 langbeinite in Section 2, was there any attempt
21 to drill oil and gas wells in Section 2?

22 A. Yes, sir. As a matter of fact we
23 approved four holes, negotiated with the
24 operators on those holes to move them to a--I
25 think the term is a nonstandard location 330 feet

1 from the east line, rather than the normal 660,
2 with, again, the feeling that there might be a
3 langbeinite trend up through Section 2 that was
4 of potential interest to others.

5 Q. And at the time these wells--these
6 wells you just referred to were allowed along the
7 east side, did you have any knowledge concerning
8 the possibility of sylvite being in Section 2?

9 A. We did not. But at about the time that
10 we approved those leases, we also got requests
11 for other wells to be drilled--APDs, if you
12 will--and between them being one factor, the
13 interest expressed by IMC being another factor,
14 and the fact that we had a core drilling program,
15 the first in probably five to seven years active,
16 we thought before we made any final disposition
17 of Section 2, that it would behoove us to learn
18 what was there.

19 And, consequently, Mr. Lane, who was on
20 my staff at that time, was asked by me to add one
21 hole to what we had planned to be a nine-hole
22 core drilling program, that hole being located in
23 Section 2.

24 Q. And that's the core hole that we refer
25 to as No. 162 in this case?

1 A. That's correct.

2 Q. Were the additional wells that you're
3 talking about that were being proposed in Section
4 2, is that the four that we're now litigating
5 here?

6 A. Yes, sir.

7 Q. And were there some discussions between
8 the State and New Mexico Potash regarding those
9 wells?

10 A. Mr. High, let me respond and see if
11 this is where you would like me to go.
12 Basically, it appeared that both the federal
13 government and the state government, whatever the
14 approval entity was for approving APDs, was doing
15 that if there was no LMR involved.

16 At the time, our LMR extended to the
17 north boundary of Section 2 with the buffer zone
18 that dropped down into Section 2. With the
19 strong possibility of langbenite being there and
20 langbenite basically not being of interest to us,
21 I had somewhat of a dilemma as to how to approach
22 this just because I felt like there would be a
23 waste of potash, albeit outside of my LMR,
24 because of this strong langbeinite trend, and it
25 was certainly my understanding of the agreement

1 between the industries which led to R-111-P, that
2 both the federal and state entities had an
3 obligation to protect, or keep from wasting,
4 potash outside of the LMRs.

5 In other words, the companies had to
6 designate their LMRs and then it was our
7 understanding--and again this is my understanding
8 from discussions I've had with people that worked
9 directly on that industry task force, that the
10 federal people, at least, acknowledged a
11 responsibility for some of the areas outside the
12 LMRs, which appeared to me to be more or less
13 blanket approvals of APDs outside of those LMRs.

14 Working through the executive director
15 of the New Mexico Mining Association, I requested
16 a meeting with Secretary Lockwood of the Energy,
17 Minerals and Natural Resources Department. That
18 meeting took place, Ms. Lockwood was not able to
19 attend but Mr. LeMay attended, Ms. Leach
20 attended, Ms. Graham attended, all of them being
21 EMNRD people. And, from the mining site, myself,
22 Walt Thayer and Charles Roybal. Walt Thayer is
23 the manager of IMC, Charles Roybal is the
24 executive director of the New Mexico Mining
25 Association.

1 We met and expressed informally that
2 concern to those representing the Energy,
3 Minerals and Natural Resources Department. My
4 recollection was early- to mid-December of 1991.

5 Q. When you say you met and expressed that
6 concern, you're talking about the concern over
7 your understanding that it was the state's
8 responsibility, as well as the BLM's
9 responsibility, to protect potash deposits that
10 were not currently designated as being part of an
11 LMR?

12 A. That's correct.

13 Q. Now, you said a minute ago, Mr. Case,
14 that langbeinite was of no interest to you.
15 During the time you had this discussion that
16 turned out to be with Mr. LeMay, what kind of ore
17 did you understand was in Section 2?

18 A. We understood it to be langbeinite
19 until such time as we drilled K-162 and basically
20 surprised ourselves by finding mineralization,
21 and good mineralization, in the 10th ore zone.

22 Q. Was it your concern that the wells
23 being proposed at this time would waste this
24 langbeinite that you believed was in Section 2?

25 A. Yes, sir, and destroy what I considered

1 to be a key area to developing a nice size
2 langbeinite deposit.

3 Q. New Mexico Potash can't process
4 langbeinite, can it?

5 A. Cannot.

6 Q. Does a lease that contains langbenite
7 reserves still have value to New Mexico Potash?

8 A. Certainly. With the proposed
9 assignment, there were some monetary
10 considerations between us and IMC that went on
11 with those proposals.

12 Q. IMC was willing to pay you money to get
13 that lease, right?

14 A. That's correct.

15 Q. Following this meeting that you
16 referred to a moment ago, were there any other
17 discussions held about the state's obligation and
18 the BLM, as you understand it, to protect this
19 potash?

20 A. Mr. High, I recall one further meeting
21 that was held nominally mid-January of this year,
22 that was, I believe, convened by Mr. LeMay, to
23 get the oil and potash interests together to see
24 if there was any common ground where we might
25 work out an agreement. That meeting was

1 certainly held, yes, sir.

2 Q. There came a time where core hole 162
3 was drilled and you said it did show the presence
4 of sylvite in the 10th ore zone?

5 A. That's correct.

6 Q. How was that decision made to drill
7 core hole 162?

8 A. Again, it was added on to an already
9 planned drilling program to give us information,
10 better information to work from, in terms of what
11 we would do with regard to such a tool, that we
12 retain it with the intent of mining it in the
13 future, would we sublet it or assign it to IMC
14 for their development of the langbeinite.

15 Q. And core hole 162 showed a little over
16 16 percent K_2O as sylvite? Is that your
17 understanding?

18 A. Yes, sir.

19 Q. Can New Mexico Potash mine ore at that
20 grade, Mr. Case?

21 A. I would love to have a mine full of it,
22 yes.

23 Q. Can you mine ore less than 16 percent?

24 A. Yes, sir.

25 Q. You heard Mr. Hutchinson's testimony

1 about this economic model that he's come up with
2 that says you have to have 16 percent ore or it's
3 not commercial. And I'm paraphrasing, but you
4 sat in here and heard his testimony, didn't you?

5 A. Yes.

6 Q. What did you understand Mr. Hutchinson
7 saying that you had to have out there before
8 you're going to be profitable or be of commercial
9 benefit?

10 A. I understood Mr. Hutchinson's testimony
11 to be a minimum height of six feet of ore at a
12 minimum grade of 16 percent K_2O .

13 Q. What do you think about that kind of a
14 program or whatever you want to call it?

15 A. We have not mined 16 percent ore on an
16 annual basis or even a monthly basis, to my
17 knowledge, since I've been involved with the
18 operation.

19 Q. And you're staying in business?

20 A. That's correct. And we're also mining,
21 most of our panel mining or retreat mining is
22 done at four to four and a half feet, not six
23 feet.

24 Q. I think Mr. Hutchinson also said you're
25 not any good unless you have a 14 percent spread

1 between manufacturing cost and selling price to
2 be profitable. Did Mr. Hutchinson ask you for
3 your manufacturing costs?

4 A. Mr. High, I don't recall. I recall the
5 discussion that Mr. Hutchinson and I had about
6 his request to come and visit the mine, and he
7 may have asked for it at that point, but
8 certainly that was not available to him at that
9 point, and I would be even more reluctant to give
10 it to him today because it appears that Yates is
11 not only a petroleum company, but interested in
12 becoming one of our competitors in the potash
13 business.

14 Q. There has been some testimony about the
15 confidentiality of a great deal of information
16 that the potash industry has?

17 A. Yes. I believe Commissioner Carlson,
18 at least, raised a question about that at one of
19 our earlier meetings.

20 Q. Is manufacturing cost one of the things
21 that you consider very confidential?

22 A. Yes, sir.

23 Q. Give us some background explanation,
24 Mr. Case, as to why that is. In fact, you can
25 identify some things if you want to, as to why it

1 is that in the potash business you have to keep
2 certain things confidential.

3 A. There are several facets there. One of
4 them is that there are six companies in a
5 400,000-acre area in strong competition. Most of
6 our products find their way into the agricultural
7 end use in one way or another, and we're in
8 competition with each other.

9 So we have six companies competing,
10 basically, in a very limited area, where we're
11 very close together and certainly have the
12 opportunity to discuss with each other costs and
13 production and prices and this sort of thing.

14 Apparently that transpired, and I say
15 "apparently" because I was not aware of it or
16 involved in the potash business at the time, in
17 the late 60s, and all of the managers currently
18 have fallen to some rather strict guidelines
19 because of some very prolonged, costly and harsh
20 antitrust investigations that took place in the
21 late 1960s, I believe, in the federal court in
22 Chicago. Not only were some of the managers
23 called to testify in that case but also a number
24 of corporate officers. I believe that some of
25 Kerr-McGee's officers were included in that good

1 group.

2 Coming from that was a strict
3 prohibition when these groups met, and we do have
4 a formal group of potash managers which meet on a
5 monthly basis to discuss mutual problems, but we
6 do operate with antitrust regulation foremost in
7 our mind. And the guidelines are, you do not
8 discuss marketing, prices, you do not discuss
9 manufacturing costs, and you do not discuss
10 specific details about manufacturing costs or
11 other items that would lead one of the
12 competitors to learn a substantial amount of
13 information about your manufacturing costs.

14 Because of the harsh nature of these
15 antitrust hearings and the strict guidelines that
16 were passed down, perhaps this industry is more
17 closed-mouth about its business and its cost than
18 perhaps the oil industry would be, and I
19 certainly understand that because from listening
20 to the earlier testimony, it seems to me that
21 most of the oil business is conducted by
22 subcontractors that may work for Yates one day
23 and Exxon another day and Phillips another day;
24 i.e., a drilling contractor, a mud man, a
25 cementer, or whatever the specialty may be. And,

1 consequently, the costs of those services are
2 very well-known.

3 The potash people operate in a
4 basically autonomous manner with very few outside
5 contractors and very, very few beyond vendors, if
6 you will, or material suppliers that serve the
7 same company.

8 So, Commissioner Carlson, I don't know
9 if that addresses your concern, but that's the
10 history as I know it. And we continue to operate
11 with those guidelines, and it's primarily
12 antitrust driven.

13 Q. Are there business dealings, Mr. Case,
14 between the potash leaseholders in Southeastern
15 New Mexico?

16 A. Occasionally there are arm-length
17 dealings.

18 Q. Would the disclosure of some of the
19 data that you've told us about impact, in any
20 way, those business discussions?

21 A. Certainly.

22 Q. Can you give us some specific examples
23 of how that may come about?

24 A. From time to time, one or the other of
25 the companies come up for sale, as Mr. Hutchinson

1 observed, and intimate knowledge beforehand of
2 that information may influence a person's or a
3 company's decision as to whether to make a pass
4 at the company that's up for sale.

5 It would be contrary to the best
6 interest of the company that is for sale, for
7 other members of the local potash industry who
8 are the logical purchasers, to have detailed
9 information ahead of time. Certainly that
10 information from time to time is developed in due
11 diligence studies with the attendant secrecy
12 requirements and agreements executed.

13 CHAIRMAN LEMAY: Any time you would
14 care to break, feel free to do so.

15 MR. HIGH: Just let me finish this one
16 point.

17 Q. This data that you're talking about
18 being confidential, Mr. Case, is it filed with
19 any public agency?

20 A. The results of that data are, Mr.
21 High. The details generally are not. For
22 example, detailed line item budgets and so forth
23 are not filed with any outside agency.

24 Q. Would the BLM know your selling price?

25 A. Yes.

1 Q. So even though you treat that as
2 confidential, the BLM knows it?

3 A. That's correct, and it's provided to
4 them in a confidential manner. Any time that
5 that information is used or disclosed, it is only
6 when it is combined with other industry
7 statistics so that no individual corporation can
8 be drawn out.

9 Q. Does the BLM know your manufacturing
10 cost?

11 A. To my knowledge, no.

12 Q. Does the BLM know how low a grade of
13 ore you can mine?

14 A. Yes.

15 Q. Is that something you think is
16 confidential?

17 A. Yes.

18 Q. Is that submitted to them under a
19 confidential privilege?

20 A. To the best of my knowledge, yes. It's
21 part of the mining plan.

22 Q. So even though a lot of this data is
23 treated in a confidential manner, it's still on
24 file with a governmental agency?

25 A. That's correct.

1 Q. But, of course, not available to the
2 public?

3 A. That's correct.

4 Q. Now, this economic plan that Mr.
5 Hutchinson told us about, this model that he came
6 up with, what is your opinion about the validity
7 of that model as applied to New Mexico Potash?

8 A. It does not fit.

9 Q. Do you think that that model that he
10 laid out for us has any validity for
11 consideration by this Commission in deciding
12 whether or not to approve or disapprove the four
13 wells in this case?

14 A. Mr. High, I believe it does not. If it
15 does not fit our operation, it should not be
16 considered.

17 MR. HIGH: Mr. Chairman, that does
18 complete a section, and it's a good breaking
19 point for me.

20 CHAIRMAN LEMAY: Then we'll continue at
21 this point tomorrow morning at 8:30. Thank you.

22 MR. HIGH: Thank you very much.

23 (And the proceedings adjourned.)
24
25

CERTIFICATE OF REPORTER

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) ss.
COUNTY OF SANTA FE)

I, Carla Diane Rodriguez, Certified
Shorthand Reporter and Notary Public, HEREBY
CERTIFY that the foregoing transcript of
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accurate record of the proceedings.

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 November 2,
1992.


CARLA DIANE RODRIGUEZ, RPR
CSR No. 4