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PUBLIC HEARING  
STATE OF NEW MEXICO  
OIL CONSERVATION COMMISSION

Pecos Hall, 1st Floor, Wendell Chino Building  
1220 S. Saint Francis Drive  
Santa Fe, New Mexico

TRANSCRIPT OF PROCEEDINGS  
February 25, 2025  
VOLUME III

HEARD BEFORE:

HEARING OFFICER RIPLEY HARWOOD

COMMISSION MEMBERS:

GERASIMOS ROZATOS, Chair

BAYLEN LAMKIN, Member

WILLIAM AMPOMAH, Member

COUNSEL TO THE COMMISSION:

DANIEL RUBIN

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1 (On the record at 9:00 a.m.)

2 TRANSCRIPT OF PROCEEDINGS

3 CHAIR ROZATOS: Good morning to everyone.  
4 My name is Gerasimos Rozatos. I am the acting  
5 director of the Oil Conservation Division, and also  
6 the acting chair for the Oil Conservation Commission.

7 I would like to bring our meeting back  
8 in order. It's a continuation from -- actually, it  
9 started on Thursday and yesterday and back into  
10 today.

11 This is the consolidated cases by  
12 Goodnight Midstream and Empire New Mexico that we are  
13 listening to. These are Case Numbers 24123, 23614  
14 through 17, Case Number 23775, and Case Numbers 24018  
15 through 020 and 24025.

16 Before we start, I want to definitely  
17 take a roll call, so if I could have the  
18 commissioners please state their names and that  
19 they're here.

20 COMMISSIONER AMPOMAH: Dr. William Ampomah.  
21 I'm a professor and professional engineer at  
22 New Mexico Tech, designee of the Energy secretary.  
23 Thank you.

24 CHAIR ROZATOS: Thank you, Doctor.

25 COMMISSIONER LAMKIN: Baylen Lamkin. I'm a

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1 petroleum engineer, designee of the commissioner of  
2 Public Lands.

3 CHAIR ROZATOS: Thank you, Commissioner  
4 Lamkin.

5 And as I said, I'm Gerasimos Rozatos,  
6 and I'm the acting director for the Oil Conservation  
7 Division.

8 So as we said, this is a continuation of  
9 the evidentiary hearing, so we'll transfer it over to  
10 our hearing officer, Mr. Harwood.

11 HEARING OFFICER HARWOOD: Thank you,  
12 Mr. Rozatos.

13 Good morning, everybody. A couple of  
14 housekeeping matters. Just a reminder to self and  
15 others: Phones to vibrate or silent. People who are  
16 attending via Zoom, we had a couple inadvertent  
17 interruptions yesterday, I think resulting from  
18 people who did not observe the protocol of staying on  
19 mute while you're listening. So I'll remind people  
20 attending via Zoom to please do that.

21 Second order of business is, I'm advised  
22 that yesterday I asked if Dr. Lindsay could be  
23 excused, but we never got an answer because there  
24 were all sorts of questions and stuff, and then I  
25 forgot to get back around to it.

1                   So may Dr. Lindsay be excused? And I  
2 hope he's not just here because I didn't get an  
3 answer.

4                   MR. RANKIN: Yes.

5                   CHAIR ROZATOS: All right. Pilot and Rice?

6                   MR. SUAZO: Yes.

7                   MR. BECK: That's fine with Pilot.

8                   MR. MOANDER: And for OCD, yes.

9                   HEARING OFFICER HARWOOD: Doctor, this  
10 doesn't mean you have to leave. It just means you  
11 may if you wish. If you're here just because we  
12 didn't get through that, my apologies.

13                   All right. I see a new face on the  
14 witness stand, and my guess is that would be Ryan  
15 Bailey.

16                   MS. HARDY: That is correct, Mr. Examiner.  
17 Empire's next witness is Mr. Ryan Bailey.

18                   HEARING OFFICER HARWOOD: All right. Before  
19 we take it any further, let me make sure that we have  
20 a court reporter.

21                   CHAIR ROZATOS: Mr. Hearing Examiner, before  
22 we start, just to make sure, everybody, that you  
23 bring the microphones close so that the audio can  
24 pick up. Yesterday we were having some sound-effect  
25 issues in this corner of the room. So it helps the

1 witness as well to be able to hear better. So please  
2 bring the microphone closer so the witnesses can  
3 hear.

4 HEARING OFFICER HARWOOD: Is it Doctor or  
5 Mr. Bailey?

6 THE WITNESS: Mr. Bailey.

7 RYAN MICHAEL BAILEY,  
8 having first been duly sworn, testified as follows:

9 DIRECT EXAMINATION

10 BY MS. HARDY:

11 Q. Good morning, Mr. Bailey.

12 A. Morning.

13 Q. Can you please state your full name for the  
14 record.

15 A. Ryan Michael Bailey.

16 Q. Thank you. By whom are you employed and in  
17 what capacity?

18 A. I am the vice president and co-founder of  
19 Ops Geologic.

20 Q. Have you previously testified before the  
21 Commission?

22 A. I have not.

23 Q. Can you please provide some information  
24 regarding your area of expertise.

25 A. I am a geoscientist, focused mainly on

1 reservoir characterization.

2 Q. Have you provided a summary of your  
3 education, training and experience with your testimony  
4 as Exhibit K-56?

5 A. I have.

6 MS. HARDY: Mr. Hearing Examiner, based on  
7 Mr. Bailey's qualifications as set out here today and  
8 in his testimony, I request that he be qualified as  
9 an expert in geoscience, please.

10 MR. RANKIN: No objection.

11 HEARING OFFICER HARWOOD: Any objection from  
12 Goodnight?

13 MR. RANKIN: No objection.

14 HEARING OFFICER HARWOOD: Pilot and Rice?

15 MR. BECK: No objection.

16 MR. SUAZO: No objection from Pilot.

17 HEARING OFFICER HARWOOD: All right. He  
18 will be so recognized, Ms. Hardy.

19 BY MS. HARDY:

20 Q. Have you provided rebuttal testimony and  
21 exhibits in this case?

22 A. Yes, I have.

23 Q. Whose testimony are you rebutting?

24 A. Preston McGuire.

25 Q. Is there a specific topic of Mr. McGuire's

1 that you're addressing?

2 A. Mainly, his stratigraphic model, as well as  
3 various other things, including a barrier separating  
4 the San Andres and the Grayburg, as well as other  
5 things that I probably have in my rebuttal testimony.

6 Q. Are you addressing Mr. McGuire's opinions  
7 regarding the depths of the San Andres Formation?

8 A. Yes, most certainly.

9 Q. And what about the existence of a residual  
10 oil zone, or a ROZ, within the San Andres?

11 A. Most certainly.

12 Q. Do you affirm today under oath that your  
13 testimony is true and correct?

14 A. Yes, I do.

15 MS. HARDY: Commissioners, Mr. Examiner, I  
16 request that Mr. Bailey's rebuttal testimony and  
17 exhibits, which are Exhibit K and sub Exhibits K-1  
18 through K-56, be admitted into the record.

19 HEARING OFFICER HARWOOD: Goodnight's  
20 position?

21 MR. RANKIN: At this time we will not  
22 object, Mr. Examiner. I will question Mr. Bailey on  
23 the nature of his testimony. But at this time, I do  
24 not object to their admission.

25 HEARING OFFICER HARWOOD: Okay. Rice?

1 MR. BECK: No objection.

2 CHAIR ROZATOS: Pilot?

3 MR. SUAZO: No objections from Pilot.

4 HEARING OFFICER HARWOOD: OCD?

5 MR. MOANDER: No objection.

6 HEARING OFFICER HARWOOD: And, OCD, I'm  
7 sorry. I keep omitting you. I didn't mean to.  
8 But you have no objection to Mr. Bailey being an  
9 expert witness?

10 MR. MOANDER: OCD does not.

11 HEARING OFFICER HARWOOD: All right.  
12 They'll be admitted, Ms. Hardy.

13 MS. HARDY: Thank you.

14 (Admitted: Empire New Mexico  
15 Exhibits K, K-1 through K-56.)

16 BY MS. HARDY:

17 Q. Mr. Bailey, let's briefly go through some of  
18 the highlights of your testimony. And I will pull up  
19 the slides we're discussing here on the screen.

20 Can you please explain what this slide  
21 shows. And it's been marked as Exhibit K-3.

22 A. Yes, I can. And I apologize. I'm trying to  
23 get this to where I can turn it into a laser pointer,  
24 if I can find your cursor. This may be a little bit  
25 harder than I thought. There we go.

1           These are the two cored wells within the  
2 field. They're the bookends for, basically, the  
3 physical rock that we have to calibrate our  
4 petrophysical model. Dr. Lindsay spoke at length of  
5 both of these and the core analysis, so I'm not going  
6 to belabor that point. But I do want to walk you  
7 through what you're seeing here.

8           So in the first track here, you will see  
9 a gamma ray log as well as a caliper log. And if you  
10 have any questions about what any of these mean, I'm  
11 more than happy to explain that.

12           And the second track is just a depth  
13 track. This is set in subsea values.

14           In the third track, we have a net low  
15 and a net-pay flag here. Those are based on our  
16 petrophysical model. We ran sensitivities to net pay  
17 on the low side as well as net pay on the high side,  
18 based on the saturations.

19           In addition, you'll see that I have a PE  
20 curve, that's a photoelectric factor, it is a  
21 mineralogy indicator; as well as the resistivity curve  
22 here that I've shaded over 200 ohms. And there's  
23 nothing really important about that other than the  
24 fact that when we get higher resistivities, we may  
25 tend to look at mineralogy factors as well there.

1           In the fourth track here, or the third  
2 track, if you really do exclude the depth track, we  
3 have a neutron porosity as well as a density porosity  
4 curve. The density porosity is based on a dolomite  
5 matrix.

6           In the fourth track here, we have sonic  
7 curve, as well as bulk density.

8           And then in the fifth track here we have  
9 what is called oil saturation. So we have both our  
10 low and high case. In the dark green is the low case  
11 of what the potential oil saturations would be, and in  
12 the lime green would be the high case of what the  
13 potential high side of the oil saturations could be.

14           So as you can see, on both of these  
15 logs, we see oil saturations -- and I apologize. I've  
16 gridded this so that you can see it very clearly.  
17 Each grid line here is 20 percent saturation.

18           So as you can see, we have well over 20  
19 to 40 percent within the Grayburg, and the San Andres,  
20 20 to 40 percent as well.

21           One of the things I want to point out,  
22 and I'm going to show this later, is the importance of  
23 setting the stratigraphic model. And where we place  
24 our top and where Goodnight places their top of the  
25 San Andres is very different.

1           Our tops are based on not only  
2 Dr. Lindsay's experience within the field, as he  
3 defined these by the core for the top of the  
4 San Andres, but also literature that I have provided  
5 in my testimony.

6           It's important when you enter a field to  
7 do literature studies to understand what the potential  
8 geology is. The studies that I have provided, the  
9 type logs that I have provided in my testimony, are  
10 along the trend of the Artesia Fairway. They define  
11 very clearly a marker that's not been discussed very  
12 much here, at least yesterday it was not, called the  
13 "Lovington Sand."

14           The Lovington Sand sits in the middle of  
15 the Upper San Andres. It is shown, it's been seen in  
16 outcrop, it's tied from outcrop to the subsurface. It  
17 basically subdivides the Upper San Andres.

18           And then below that, we have what's  
19 called the PI marker, which is the top of the Lower  
20 San Andres. So as you can see here, I have a top of  
21 San Andres in red. I have the Lovington Sand in  
22 brown, and then the Lower San Andres in black, and  
23 obviously the Glorieta at the bottom of the section,  
24 which is the unitized interval, the base of the  
25 unitized interval, for the San Andres.

1 Q. And, Mr. Bailey, just to make sure it's  
2 clear, these two logs that you're here showing on this  
3 slide are the RR Bell and the EMSU 679 that  
4 Dr. Lindsay discussed extensively yesterday?

5 A. Yeah, that's correct. The RR Bell is on the  
6 east side of the field. If you can see in the base  
7 maps I provided, just above the logs here, you see  
8 this green star. That's where the RR Bell sits in the  
9 EMSU. And then the 679 is on the west side, out  
10 towards the basin.

11 Q. And do these logs show oil saturations  
12 throughout the San Andres?

13 A. They do, where we have data. So the RR Bell  
14 actually goes much deeper than the 679, as you can  
15 tell by the depth tracks.

16 The 679 actually stops at the Lovington  
17 Sand. It goes a little bit below the Lovington Sand.  
18 The core interval certainly does. The logs -- the red  
19 box here that's in Track 1 shows you the actual cored  
20 interval, so you can see where it was cored. The logs  
21 actually don't cover the bottom section of the core,  
22 probably because they didn't have enough room for the  
23 tools.

24 And then you can see the same on the  
25 RR Bell here. You can see the cored interval there

1 goes well below the Lovington Sand as well.

2 So we were able to identify that marker  
3 very clearly. Dr. Lindsay has done that and has  
4 certainly set us up to be able to correlate the  
5 San Andres across the field.

6 In addition, I have also included the  
7 Grayburg zone tops in here as well. Those were  
8 defined in the Commission hearings with the parties  
9 that were designing the EMSU unit -- the unitization  
10 hearings, excuse me. Those Grayburg zones were  
11 defined by the RR Bell curve in that document.

12 Q. And, Mr. Bailey, just to be clear, do these  
13 logs show oil saturations above 20 percent throughout  
14 the San Andres?

15 A. They do both on the low case and the high  
16 case.

17 Q. And have you reviewed Mr. McGuire's  
18 Exhibit B-9, which is his cross-section?

19 A. I have.

20 Q. And is it your understanding that Goodnight  
21 is arguing that that cross-section shows a 200-foot  
22 impermeable barrier between the injection interval and  
23 the Upper San Andres?

24 A. That is correct. And that barrier that they  
25 are -- well, they place their top, in general -- and

1 we'll talk about that in a later slide. But I'll give  
2 them -- in general, they place it at the Lovington  
3 Sand marker. Sometimes it's well above that,  
4 sometimes it's below it. But in general, they're  
5 suggesting that there's a 200-foot barrier there.

6 I remind you that the core permeability  
7 in that zone is .1 millidarcies. .1 millidarcies is  
8 not an effective seal.

9 Q. And this shows a ROZ, in your opinion, below  
10 the Lovington Sand?

11 A. It does.

12 Q. What's shown on your next slide, which is  
13 marked --

14 A. This is a base map, and I've got the  
15 San Andres structure here. And we'll go through some  
16 structure maps here shortly. I've got several  
17 cross-sections that I've provided in my testimony.

18 Today I'm going to show you the two dip  
19 sections, A to A prime, and B to B prime. And then  
20 I'm going to show you a top comparison section so you  
21 can understand how Goodnight is picking their top.

22 And then I'm going to show you also a  
23 perf comparison section. That perf comparison section  
24 is based on XTO's perms within the field that were  
25 designated San Andres to the State.

1 Q. So is this map showing the wells that you  
2 used to determine the structure of --

3 A. That is correct, yes.

4 Q. What's shown on your next slide, which is  
5 K-10?

6 A. Yes. This is Dip Section A to A prime. As  
7 you can see, we've got the EMSU 679 in the second  
8 track here. We've got the top of Grayburg very  
9 clearly on here. We've got this top of San Andres in  
10 the 679.

11 You can very easily see how this  
12 correlates across the EMSU and how we come up on  
13 structure. It's very recognizable for the top of the  
14 San Andres. It tends to be a tight interval at the  
15 top of it, as you can see by the neutron and density  
16 here.

17 And then, obviously, we can see the  
18 Lovington Sand below it, which is a good indicator for  
19 basically -- essentially what you would see about 120  
20 to 140 feet from the top of the Lovington to the top  
21 of San Andres. And thinning up on structure,  
22 obviously.

23 Q. And, Mr. Bailey, is the gist of this that  
24 downdip to updip, there are oil saturations all the  
25 way through the San Andres?

1           A. That is correct. And more importantly,  
2 there are oil saturations below what Goodnight  
3 considers their barrier.

4           CHAIR ROZATOS: Ms. Hardy, I apologize.  
5 That buzz that you heard is the microphone straining  
6 to pick up your voice. Can you bring your microphone  
7 just a little closer to you? I apologize.

8           MS. HARDY: Yes. Thank you.

9 BY MS. HARDY:

10           Q. Mr. Bailey, are the fuchsia markings --  
11 well, what do the fuchsia markings --

12           A. Yeah, I should have pointed that out. So we  
13 tried to run what we would call a baffle where we  
14 potentially see baffles. So the fuchsia marking that  
15 you see on the right side of the EMSU 458, we ran a  
16 cutoff of 1.5 percent phiT, effective porosity, to try  
17 to determine where we might have potential baffles, to  
18 understand where Goodnight was coming up with their  
19 own baffles in Preston McGuire's testimony.

20                   And what you see there is that we do not  
21 see any consistent baffles across any of these  
22 curves -- or any of these wells. Excuse me.

23           Q. And do those baffles constitute a barrier to  
24 fluid flow?

25           A. They would constitute a barrier, yes, to

1 vertical fluid flow, as well as horizontally.

2 Q. But is it true that they're not contiguous?

3 A. They are not consistent or contiguous.

4 There is no regional baffle in the EMSU.

5 Q. So they wouldn't prevent fluid migration?

6 A. They would not.

7 Q. What's shown here on Exhibit K-11?

8 A. The K-11 is Dip Section B to B prime.

9 Again, this was just to the south, so we're going from  
10 the Ryno SWD, which is Goodnight's SWD well.

11 Again, just illustrating how basically  
12 easy it is to correlate the top of the San Andres  
13 across the EMSU, as well as the Lovington Sand and the  
14 Lower San Andres.

15 And again, we show -- here you'll see  
16 that we do have more baffles across here, so there is  
17 some more connectivity, mainly towards the upper part  
18 of the San Andres, as well as the upper part of the  
19 Grayburg.

20 Q. And again, those baffles don't show -- or  
21 don't allow for fluid?

22 A. They're not consistent across the field.

23 These examples are just wells selected to show,  
24 essentially, the structural component of the  
25 stratigraphy as well as the stratigraphic model.

1           The baffles that are shown here do not  
2 continue anywhere or are inconsistent across the field  
3 at all depth levels.

4           Q. What's shown on Exhibit K-13?

5           A. Yeah, so this is the most important point to  
6 make here. And I want the Commission to understand  
7 that I've kind of shown you that it's pretty simple to  
8 correlate. I don't want to call it simple, but you  
9 can correlate the top of the San Andres across here.

10           In Preston McGuire's testimony, he made  
11 the argument that you can't really do it, it's more of  
12 an engineering-based top. Okay? That's not geology,  
13 that's not fundamental geology, and that's not how you  
14 go across a field and correlate sections.

15           And so what we've done, obviously I've  
16 provided in my testimony several examples of type logs  
17 illustrating the Lovington Sand, splitting the Upper  
18 San Andres, as well as into the Lower San Andres.

19           And what I want to show here is how  
20 Goodnight is correlating their section. Their line on  
21 this cross-section is the blue line. Okay? Our line  
22 for the top of the San Andres is the red line. Mind  
23 you, the EMSU 679, we've determined that top of  
24 San Andres by core. Okay? So that's one of our base  
25 points for the model.

1           Goodnight and us both agree that the top  
2 of the San Andres and the Ryno well is exactly where  
3 we both got it, at around negative 698 subsea. But as  
4 we move across and go updip of the section, you can  
5 see how Goodnight starts to vary their top, and it's  
6 really all over the place.

7           And I don't know if it's out of  
8 convenience, if it's a lack of fundamental geologic  
9 understanding of how to correlate stratigraphy. But I  
10 can tell you that it's wrong.

11           And it's important, very important,  
12 because what they are doing is they're excluding the  
13 Upper San Andres as a ROZ zone. Okay? They say -- he  
14 says in his testimony that the top of the San Andres  
15 cannot be correct because the ROZ zone is in the Lower  
16 Grayburg. I will tell you today that that is  
17 incorrect.

18           The Upper San Andres contains a ROZ  
19 zone, as well as below the Lovington Sand contains a  
20 ROZ zone as well.

21           Q. And, Mr. Bailey, is it your understanding  
22 that Goodnight has selected the formation tops based  
23 on pressure data?

24           A. My understanding is it's pressure data or  
25 mud losses. It's not very clear. It just -- he just

1 says engineering-based data, so...

2 Q. It's not based on geology?

3 A. It's not based on geology, no. It's very  
4 clearly not based on geology.

5 Q. Okay. And have Goodnight's formation top  
6 picks crossed lithographic and stratigraphic  
7 boundaries?

8 A. Yeah, that's really what's important as a  
9 geologist. I mean, you've got to maintain a  
10 stratigraphic, I guess, integrity, I will call it.  
11 You can't cross chronostratigraphic boundaries. These  
12 are time boundaries, just so you understand.

13 We understand where the composite  
14 sequence boundaries are. We understand where the  
15 stratigraphy should tie together. And once you start  
16 jumping across those boundaries, well, then you've  
17 jumped the shark on understanding what your  
18 stratigraphy is.

19 Q. And what's shown on Exhibit K-14?

20 A. So, Exhibit K-14, just in case I haven't  
21 convinced you on the top of the San Andres, this is  
22 actually XTO wells that were drilled.

23 So, in the first column here, in the  
24 gamma ray column, you'll see a pink box here. And the  
25 perms that were reported to the State and approved by

1 the State are in this pink box here. So, everywhere  
2 where they have these perfs below our San Andres top  
3 is exactly where they have the San Andres top. Those  
4 perfs were designated San Andres and they were  
5 approved by the State as San Andres.

6 In the second well, it's the same thing.  
7 They actually perfed down well into the San Andres  
8 here, as you can see. And their top is right there,  
9 where I've got it pointed at the red arrow, which is  
10 exactly where our top is.

11 They set a bridge plug in the 713. They  
12 do not define the actual top of the San Andres here,  
13 but their defined bridge plug, the base of the bridge  
14 plug, is in Zone 6 of the Grayburg, which is sitting  
15 just above the top of the San Andres.

16 I don't really need their top to  
17 actually correlate this. I think you can see with  
18 your own eyes, Commission, that it's very easily  
19 correlatable across here.

20 Q. And, Mr. Bailey, did you determine your  
21 picks for the tops of the formation independently of  
22 these top picks?

23 A. I did. I did, actually. This was post me  
24 correlating across the EMSU unit, as well as around  
25 the EMSU unit. I actually went back to look, to

1 confirm that what we had picked was consistent with  
2 what had been reported to the State.

3 Q. And is it your understanding that XTO sold  
4 the unit to Empire based on these tops?

5 A. Yeah. I want to -- that's an excellent  
6 point, Dana. So, XTO sold this field to Goodnight --

7 Q. To Empire.

8 A. I'm sorry. -- to Empire based on a ROZ  
9 interval below this top, down to 700 feet. Empire  
10 bought this field under the premise that they had a  
11 ROZ interval within the San Andres that they would be  
12 able to exploit at some point in time when they are  
13 ready, as they are the operator of the EMSU unit.

14 Q. What's shown on Exhibits K-16 and 17?

15 A. Yeah, K-16 and K-17 are the Upper San Andres  
16 structure map and the Grayburg structure map.

17 I want to make this clear, that we are  
18 on an anticline. I know that Dr. Lindsay talked about  
19 a double-humped anticline yesterday. I wanted to  
20 illustrate that in a map view so that you can  
21 understand that we definitely have a structural  
22 closure here within the EMSU unit.

23 Q. And does this show whether there is  
24 consistent reservoir thickness?

25 A. That will be in the next slide.

1           Let me -- just before you go there, just  
2 so you understand, I used roughly about 130 wells  
3 across the EMSU to correlate the Grayburg structure.  
4 I believe I'm somewhere at about 90 for the Upper  
5 San Andres, and 79 for the Lower San Andres.

6           Q. And, Mr. Bailey, one other question on this  
7 slide. Does fracturing become more pervasive as you  
8 are higher on the structure?

9           A. Yeah. You would expect -- given the  
10 tectonics that have occurred here. So Dr. Lindsay  
11 spoke about Grayburg deposition, that there was some  
12 basement fault block moving as the Grayburg was being  
13 deposited. We'll talk about that in the isopach map  
14 next.

15           But you would expect that, given the  
16 fractures we're seeing downdip in the 679, we've had  
17 Laramide tectonics, compressional tectonics affect the  
18 Permian Basin, as well as basin and range extension in  
19 the tertiary as well, that would enhance fracturing.  
20 Okay?

21           As you move up on a structure, this is  
22 very consistent, we see this in many reservoirs, A  
23 great example for fracturing off a reef edge or a  
24 Sligo or Edwards Reef margin for the Austin Chalk, you  
25 typically see more enhanced fracturing up on top of

1 the reef or as you come down off the slope margin.

2 Now, this is not a reef, I'm not  
3 suggesting that; it's a carbonate ramp. But you would  
4 expect that as you come off that structure, you've had  
5 flexure that's going to enhance fracturing, especially  
6 up on top of the structure.

7 Q. And what's shown on Exhibits K-19 and 20?

8 A. K-19 is an isopach map. So it's pretty well  
9 documented that the Grayburg is on a distally  
10 steepening ramp. I want to make that point because  
11 Mr. McGuire argues that the top of the San Andres  
12 cannot be correct because the Grayburg needs to be  
13 400 feet thick across the whole EMSU. That is just  
14 patently false.

15 The Grayburg actually thins up on  
16 structure and it thickens out into the basin. So by  
17 that basis, I mean, that's documented everywhere in  
18 multiple literature papers.

19 The Upper San Andres, or the San Andres  
20 itself, is more on a homoclinal ramp. So you can see  
21 by this map, there's not a lot of variation in the  
22 Upper San Andres thickness as you go down into the  
23 basin; whereas, you move off structure for the  
24 Grayburg, it begins to expand very quickly.

25 Q. And what's shown on Exhibits K-26 and 27?

1           A. K-26 and K-27 is giving you an indication of  
2 the Lower San Andres oil saturation percentages.

3           Now, I want to be clear that we go  
4 through a process of generating net reservoir maps  
5 using cutoffs of a 4 percent phiT, 50 percent Vclay  
6 and an 80 percent water saturation. And that  
7 80 percent water saturation cutoff is because we are  
8 under the impression that we need 20 percent oil  
9 saturation to be able to have net reservoir here. So  
10 these averages are based on the net pay. Okay?

11           And so the net-pay averages for the  
12 Lower San Andres would be somewhere between 30 to  
13 40 percent in the Lower San Andres across the EMSU,  
14 generally, or right around 30 percent. That's on the  
15 low case.

16           When you look at the potential high case  
17 for oil saturation, we can get upwards of 45 to 50  
18 percent on a single-well basis.

19           Q. And what is shown on Exhibits K-32 and 33?

20           A. This is the original oil in place on a  
21 million barrels per section in the Lower San Andres.  
22 So as you can see, in general, we're somewhere between  
23 15 to 40 million barrels per section, in the low case.  
24 And in the high case, we could be anywhere from 25 to  
25 60 million barrels per section. That's a significant

1 amount of volume within the Lower San Andres.

2 Q. What's shown on Exhibits K-39 and 40?

3 A. K-39 and K-40, I'm going to walk you through  
4 the same thing. This is for the Upper San Andres, as  
5 you can see. In general, we have oil saturations on  
6 average within the net pay that are somewhere in the  
7 28 to 30 percent range for the low case, and on the  
8 high case, we're generally somewhere between 30 to  
9 40 percent on oil saturations.

10 Q. What's shown on Exhibits K-45 and 46?

11 A. And this would be the original oil in place  
12 for the Upper San Andres. Again, we're showing you  
13 that we have somewhere between 10 to 20 million  
14 barrels per section within the Upper San Andres on the  
15 low case. And on the high case, we're generally  
16 somewhere between 20 to 30 million barrels per  
17 section. Again, substantial volumes in the Upper  
18 San Andres.

19 Q. In what is shown on Exhibits K-53 --

20 A. So this is combined, so now you see the  
21 total San Andres as a whole. And as you can see, on  
22 the low case, we've got generally somewhere between 25  
23 to 60 million barrels per section on the low case, and  
24 on the high case, we've generally somewhere between 30  
25 to 85 million barrels per section. Again, significant

1 volumes for the total San Andres.

2 Q. And, Mr. Bailey, yesterday Dr. Lindsay  
3 testified about the fact that he didn't have actual  
4 core available for part of the interval.

5 But have you made these determinations  
6 based on your analysis of the geology and the well  
7 logs?

8 A. Yeah. So the saturation curves are tied to  
9 the core as deep as we have core. And, granted, we  
10 have two core points that we're working with. So  
11 there is a range of possibilities in the Lower  
12 San Andres without physical rock data that we cannot  
13 tie to.

14 But we've stayed consistent with our  
15 model based on the core data we have in the Upper  
16 San Andres down into -- below the Lovington Sand,  
17 below what they consider their barrier. We have  
18 stayed consistent with our model through the Lower  
19 San Andres.

20 Q. And what's shown on this exhibit?

21 A. Yeah, so this is just kind of a sum-up, just  
22 to give you numbers in front of you here.

23 So on a low case OOIP, we're talking  
24 about 191 million barrels. And on an OOIP high case,  
25 we're talking about 331 million barrels. And mind

1 you, this is just for the EMSU unit. So this  
2 is over -- a total over the whole blue box you see up  
3 there that's outlining the EMSU, that's giving you an  
4 indication of the in-place numbers that are within the  
5 Upper San Andres, the Lower San Andres and the total  
6 as a whole.

7 As you can see on the low case, when you  
8 look at the total as a whole, we're talking somewhere  
9 around 630 million barrels on a low case, and over a  
10 billion barrels on the high case. Those are  
11 substantial volumes, gentlemen.

12 Q. And these conclusions are based on your  
13 analysis of the --

14 A. They are.

15 Q. Mr Bailey, can you please summarize your  
16 conclusions for the Commission.

17 A. I think the point here is that there's a  
18 lack of fundamental geology done by Goodnight. I  
19 don't think they or at least they have not illustrated  
20 that they understand how the stratigraphy works. They  
21 essentially don't have a stratigraphic model, as best  
22 I can tell.

23 As best we can tell, they've done  
24 everything on an engineering basis. That's  
25 fundamentally incorrect. It's unnecessary, given the

1 amount of literature, given the core data that exists  
2 here, given the amount of wells that are here.

3 Engineering-based data, I like it.  
4 Again, their model is very similar to something you  
5 would do offshore, where you have very limited well  
6 data and you need paleo data to tie compartmentalized  
7 sands over long distances. It's unnecessary here.

8 It's fascinating that they came up with  
9 this model. Again, I don't know if it's out of  
10 convenience. I really don't understand how they came  
11 up with it, but it's certainly not geology.

12 Q. And, Mr. Bailey, to sum up, in your opinion,  
13 are your conclusions and determinations here  
14 consistent with the science, XTO's picks,  
15 Dr. Lindsay's evaluation?

16 A. Yes. I am very confident in our model for  
17 the San Andres. I'm very confident that we have  
18 saturations within the Upper San Andres above and  
19 below what Goodnight would consider a barrier that is  
20 nonexistent.

21 MS. HARDY: Thank you. Those are all of my  
22 direct questions for Mr. Bailey.

23 HEARING OFFICER HARWOOD: Okay. Thank you,  
24 Ms. Hardy.

25 I suspect that, Mr. Rankin, you may have

1 some questions for Mr. Bailey.

2 MR. RANKIN: I do, Mr. Hearing Officer.  
3 However, in the midst of the summary, I got kicked  
4 off the network, so I may just need a minute or two  
5 to get back on and get back onto Teams so I can share  
6 my screen. Sorry for the inconvenience.

7 That was my screen beeping when I got  
8 kicked off. So I'm not on right now. I need just to  
9 get logged back on. It may take me a moment. I  
10 apologize.

11 HEARING OFFICER HARWOOD: Okay. We'll just  
12 stay on the record.

13 CROSS-EXAMINATION

14 BY MR. RANKIN:

15 Q. Apologize for the delay. Good morning,  
16 Mr. Bailey. How are you today?

17 A. I'm doing good. How are you?

18 Q. Good. So you were present for yesterday's  
19 testimony with Dr. Lindsay, correct?

20 A. I was.

21 Q. Okay. Just want to make sure.

22 I want to just get a little background  
23 on you. I'm going to pull up your rebuttal testimony  
24 just want to understand a little bit more about what  
25 your experience has been.

1 A. Sure.

2 Q. Yeah, okay. Once I get kicked off the  
3 network, it doesn't like -- I can't get back into my  
4 Adobe. So I'm going to have to just take a moment to  
5 restart my Adobe. I apologize. Apologize for the  
6 delay.

7 I think, Mr. Bailey, I have here in  
8 front of you -- once I share my screen, you'll be able  
9 to see it. Do you see your CV on your screen here?

10 A. Yes, I do.

11 Q. And that's marked as Exhibit K-56, correct?

12 A. That is correct.

13 Q. And this basically outlines your experience  
14 and background as a geoscientist?

15 A. That is correct.

16 Q. Just starting from chronologically here,  
17 reverse chronology, you went to University of Alabama?

18 A. That is correct.

19 Q. And that's where you got your master's and  
20 undergraduate degrees?

21 A. That is correct.

22 Q. Okay. And now, just kind of cruising  
23 through your experience, you started out with  
24 Anadarko; is that right?

25 A. That is correct.

1 Q. And your experience with Anadarko was in  
2 unconventional shale drilling mostly; is that right?

3 A. Predominantly, yes.

4 Q. What else did you do for Anadarko?

5 A. Cotton Valley Sands in Carthage.

6 Q. Were those horizontal wells, as well?

7 A. Not originally, no. They were vertical  
8 wells through the Cotton Valley Sands and then  
9 horizontal in the lower Taylor.

10 Q. So at the time you worked on those projects,  
11 were they horizontal development?

12 A. No. It was vertical.

13 Q. Okay. Were those conventional?

14 A. That is correct.

15 Q. Okay. Just for the record and just to make  
16 things clear, I noticed you doing this with Ms. Hardy,  
17 as well, would you just make sure that my questions  
18 are completed before you start answering.

19 A. I'm sorry.

20 Q. Because I may shift directions with my  
21 question. Okay? All right. Thanks.

22 Okay. So you did a little bit of  
23 conventional sands for Anadarko. But predominantly,  
24 it looks like it was unconventional shale, horizontal  
25 drilling, correct?

1 A. That would be fair.

2 Q. Okay. Then you were with Anadarko through  
3 2016, and then looks like -- actually, sorry, through  
4 2019. And have you had any experience with Anadarko  
5 in the Delaware Basin?

6 A. Yes, I have.

7 Q. And how many years have you worked on the  
8 Delaware Basin?

9 A. Approximately three.

10 Q. Three years? Which years were those?

11 A. That would be 2016 to the end of 2019, when  
12 Oxy bought us out.

13 Q. Okay. And what were your responsibilities  
14 with Anadarko during that time?

15 A. I was the geoscience manager for the  
16 subsurface and technology team; ultimately ended up  
17 being the asset manager for our Block 1 Monroe area in  
18 Ward County in the Delaware Basin.

19 Q. Okay. In those three years, you were on the  
20 Texas side?

21 A. Yes, I was.

22 Q. Okay. After you left Anadarko, then you  
23 joined JBL Energy Partners. What did they do?

24 A. Yeah, so that was a small outfit back in  
25 Houston. I moved back from Midland to Houston and was

1 helping them with the Grant Sands up in the Fort Worth  
2 Basin.

3 Q. What kind of play was that?

4 A. That is a sand play, as well. The Bend  
5 Conglomerate, as well.

6 Q. As well as being what?

7 A. The Bend Conglomerate and the Grand Sands  
8 both.

9 Q. Are those horizontal?

10 A. Yes, it was horizontal sand.

11 Q. Okay. And then you founded Arkatex Energy  
12 Advisors in 2020?

13 A. That is correct.

14 Q. And tell me a little bit about that, that  
15 outfit? What did you do with Arkatex?

16 A. That was my own company. I went out as a  
17 consulting geologist on my own. I was working up a  
18 prospect for the West Haynesville, developed that  
19 prospect and sold it last year to Mitsui.

20 Q. Tell me, what is the West Haynesville  
21 prospect?

22 A. The Haynesville/Bossier is a shale play on  
23 the western side of the East Texas Basin.

24 Q. Okay. And, again, that's a horizontal  
25 plane?

1 A. Yes, it is.

2 Q. Okay. So you're continuing in that role, as  
3 a consultant geologist with Arkatex?

4 A. Mainly, I focus on the Ops Geologic side,  
5 yes.

6 Q. And then you co-founded Ops Geologic in  
7 2021. Tell me a little bit about that.

8 A. Yeah, I joined up with a colleague of mine,  
9 actually, two colleagues of mine, ex-Anadarko guys, to  
10 essentially build a geoscience outfit consulting firm.  
11 I'll call it soup-to-nuts exploration to execution of  
12 operations.

13 Q. And since you formed that group, tell me a  
14 little bit about what kind of work you guys have done.

15 A. We do mainly reservoir characterization.  
16 We've worked generally every basin in U.S. onshore,  
17 both conventional and unconventional.

18 Q. Okay. Tell me a little bit about the  
19 conventional work you've done.

20 A. Birdbear/Duperow in the Bakken. We've done  
21 some vertical wells on the CBP. We've done some  
22 conventional Cotton Valley work in Carthage, again.  
23 We've done some conventional re-completes in the Fort  
24 Worth basin within the Grant Sands in the Bend  
25 Conglomerate. I'm trying to think what else. Mainly

1 a lot of it's been unconventional horizontal drilling.

2 Q. Okay. And when you mentioned the acronym  
3 CBP --

4 A. Central Basin -- sorry.

5 Q. That's all right. I know it's real fun to  
6 be -- I mean, I know you're eager and you've got the  
7 answers, but just let me get them out, the questions  
8 out.

9 So CBP, Central Basin Platform, correct?

10 A. Yes, Central Basin Platform.

11 Q. Okay. All right. And what part of the  
12 Central Basin Platform were you on there?

13 A. Mainly on the Midland side -- well, I guess  
14 the Texas side, but down towards the -- working down  
15 towards the Midland Basin.

16 Q. On the eastern side of the Central Basin  
17 Platform?

18 A. That's correct.

19 Q. Okay. On the northern part, northern margin  
20 of that, the Central Basin Platform, or down on the  
21 southern end of it?

22 A. More towards the southern end.

23 Q. Okay. What's the field out there?

24 A. Well, there's several fields. So you've got  
25 some shallow intervals. And then Woodford/Barnett has

1 been pretty hot on the Central Basin Platform lately,  
2 so we've done quite a bit of reservoir  
3 characterization on that, as well as the Mississippian  
4 Lime.

5 Q. Okay. And the vertical wells -- those are  
6 all vertical wells out there?

7 A. Most of them turned into horizontal wells  
8 yeah. Our analysis was on the vertical portion of  
9 that.

10 Q. Okay. Just to be clear, these are Pilot  
11 holes that you're analyzing?

12 A. Yeah.

13 Q. And then they end up coming back in and  
14 re-completing it as horizontal?

15 A. That is correct.

16 Q. Okay. So they were doing test projects to  
17 kind of evaluate the full stratigraphic interval?

18 A. Generally those wells have already been  
19 drilled. We're just analyzing up and down the column  
20 to understand what the potential for reservoirs are.

21 Q. Okay. So you told me that they were  
22 vertical wells, but it wasn't a vertical well play.  
23 It was just that you were analyzing in the vertical  
24 portion of those wells?

25 A. That is correct.

1 Q. Okay. Now, I'm not seeing a lot of  
2 background experience in EOR-type projects.

3 A. That would be fair.

4 Q. Okay. Have you done any work on EOR  
5 projects?

6 A. I have not.

7 Q. When I say "EOR," I mean enhanced oil  
8 recovery. You're familiar with that term, obviously.

9 A. It's tertiary recovery. Yes.

10 Q. What about secondary recovery?

11 A. I have not done any waterfloods, either.

12 Q. Okay. So you've got no experience doing any  
13 waterfloods or evaluating any waterfloods?

14 A. I have not.

15 Q. Okay. And you've done no work evaluating  
16 tertiary recovery post secondary recovery, correct?

17 A. I have not.

18 Q. Okay. How about in carbonate systems?

19 A. In carbonate systems in general?

20 Q. Yeah.

21 A. Yeah. Austin Chalk. Like I mentioned, the  
22 Birdbear/Duperow in the Bakken. Mississippian Lime.  
23 Chase Council Grove in the Hugington Embayment.  
24 Smackover.

25 We have a lot of various projects out of

1 my -- correlated a lot of wells, a lot of -- across a  
2 lot of different basins in the U.S. onshore.

3 Q. Well, that's fair. I appreciate that. I  
4 just want to understand what your background is on the  
5 carbonate side.

6 Now, all those fields that you've talked  
7 about just then that contain or include carbonate  
8 systems, those were all horizontal wells, correct,  
9 that you were looking at?

10 A. Smackover's vertical.

11 Q. Smackover. I love the name of that field.  
12 Where is that?

13 A. Well, you've got Smackover running the  
14 Mexia-Talco trend in east Texas, all the way up to  
15 southern Arkansas and then down in Alabama and  
16 Florida.

17 Q. Smackover trend, who named that one?

18 A. Well, it's named after Smackover, Arkansas,  
19 which is where it outcrops.

20 Q. Okay. That's a great name.

21 Because you identify -- so that's --  
22 okay. So one thing I was interested in, at the time  
23 when you were with Anadarko, you did some work on a  
24 divestment of assets, right?

25 A. That's correct.

1 Q. And part of that job was providing potential  
2 upside targets to prospective buyers?

3 A. That is correct.

4 Q. How would you -- that's basically pitching a  
5 prospect, right, for sale?

6 A. That's illustrating that there's upside  
7 potential within the asset.

8 Q. Since this case has a fair bit of discussion  
9 about upside potential, as it was marketed to Empire  
10 from XTO, let me know a little bit about how you go  
11 about marketing upside potential. What are you  
12 looking at?

13 A. We evaluate the reservoir. We look at the  
14 reservoir properties. We determine whether it has any  
15 value for potential exploration or exploitation. And  
16 we generally provide that as a potential upside target  
17 to the main pay zone that the company would be looking  
18 to acquire.

19 Q. Okay. So I want to just kind of drill down  
20 on that a little bit. Forgive the analogy or  
21 metaphor. But I want to understand, when you say  
22 "upside potential," does that generally mean it's a  
23 zone or an interval or a development that hasn't yet  
24 been established in the field?

25 A. It could be infill drilling within -- let's

1 just take Eagle Ford for a hypothetical. You might  
2 say we have upside potential in the Upper Eagle Ford  
3 or the Lower Chalk, you know, and we prove that based  
4 on the reservoir characterization. We may have tests  
5 in the ground that illustrate that it has potential.

6 Q. Okay. So when you're marketing those  
7 potential upsides, you put together a package that  
8 kind of provides the potential buyer your  
9 understanding of what the prospect may be, what the  
10 benefits may be or how that may be developed, right?

11 A. That is correct.

12 Q. And then on the other side, the potential  
13 sellers then would evaluate and assess what you're  
14 telling them, right?

15 A. That would be their due diligence, I would  
16 hope.

17 Q. Okay. And on that end, on that point, you  
18 would expect a buyer, you know, not to take your word  
19 for it, right?

20 MS. HARDY: I'm going to object to this line  
21 of questioning. I don't think it's within the scope  
22 of Mr. Bailey's rebuttal. He's not involved in any  
23 evaluation or in due diligence on the part of the  
24 Empire. I don't think it's relevant.

25 HEARING OFFICER HARWOOD: You all did open

1 the door on this issue. Although the question, I  
2 think, calls for speculation. How does he know what  
3 the buyer is going to do?

4 MR. RANKIN: Fair enough.

5 BY MR. RANKIN:

6 Q. Mr. Bailey, as part of your work at  
7 Anadarko, did you also work on the acquisition side?

8 A. In general, no.

9 Q. No? Just on the sell side.

10 A. Yes.

11 Q. Okay. But as a seller, you would expect a  
12 buyer to do some due diligence, right?

13 A. I would be speculating, but I would hope so.

14 Q. Okay. Very good. Very good. I think I'll  
15 leave my questioning there for now, and I may come  
16 back to this area.

17 The reason I'm asking, Mr. Bailey, is  
18 because you have experience promoting upside  
19 potential, and now you're evaluating that exact upside  
20 potential that was promoted to Empire in this case.  
21 And I think it's relevant to inquire what your  
22 experience is and what it means to promote upside  
23 potential on a prospect. Right? So that's why I'm  
24 asking those questions.

25 MR. RANKIN: And I'll get to this a little

1 bit later, and you'll see why, but I'm laying a  
2 foundation here, Mr. Hearing Officer. Because what  
3 Mr. Bailey is promoting here, I think it's worthwhile  
4 comparing to what XTO promoted. So that's why I want  
5 to understand a little bit more about his background  
6 and understanding about promoting assets.

7 HEARING OFFICER HARWOOD: Well, just be  
8 careful to ask questions and not testify.

9 MR. RANKIN: Sure, sure.

10 BY MR. RANKIN:

11 Q. Okay. So I think we've covered your  
12 background there. Just before I leave that topic on  
13 background, you haven't done anything with residual  
14 oil zones?

15 A. That is correct.

16 Q. You've never, prior to this date, looked at  
17 or evaluated a zone that was identified as the  
18 potential for a residual oil zone, correct?

19 A. That is correct.

20 Q. Now, how about any work in the San Andres?  
21 Have you done any work in the San Andres anywhere in  
22 the Delaware Basin?

23 A. It's limited.

24 Q. Where is it limited?

25 A. On CBP.

1 Q. And that would be on the Midland side?

2 A. Mainly, yes.

3 Q. Have you done any work on the west side of  
4 the Central Basin Platform?

5 A. If you're meaning in the west side in the  
6 Delaware Basin, yes.

7 Q. On the west side of the Central Basin  
8 Platform, have you done work?

9 A. No, I have not, other than what I've done  
10 here.

11 Q. Okay. How about in the Grayburg?

12 A. I have not.

13 Q. Let me ask you this question. When were you  
14 retained by Empire?

15 A. I believe it was September that they  
16 approached us, mainly to do a petrophysical model  
17 initially.

18 Q. Okay. That was sometime in September 2024,  
19 right?

20 A. That's correct.

21 Q. Okay. And what did they ask you to do at  
22 that time?

23 A. We were evaluating a few wells for a  
24 petrophysical model.

25 Q. What wells did they ask you to evaluate?

1           A. Off the top of my head, I don't know that  
2 answer.

3           Q. Okay. Were they wells that had previously  
4 been evaluated for petrophysics?

5           A. Presumably some of them had, yes.

6           Q. But you're not sure?

7           A. I'm not 100 percent certain.

8           Q. Okay. Did they discuss with you the fact  
9 that they already had these wells evaluated by a  
10 company called NuTech?

11           A. We were aware that NuTech had evaluated some  
12 wells for them, yes.

13           Q. But you're not sure whether the same wells  
14 that you were looking at, they asked you to  
15 evaluate --

16           A. I don't want to say one way or the other.  
17 That's a question you can ask my petrophysicist. He's  
18 next up.

19           Q. Got it. So you don't know. Okay.

20                        Now, when I was reviewing the materials  
21 that were provided to us by your colleague,  
22 Mr. Birkhead, I noted that he did include in his  
23 folders NuTech Energy's original and revised analyses.

24                        But you didn't provide me a folder, so I  
25 presume, then, that you did not yourself look at

1 NuTech's original or revised analyses. Did you?

2 A. No. That's not my responsibility.

3 Q. Okay. Now, when I was deposing Dr. Lindsay  
4 back in January, we had some discussions, of course,  
5 around the Grayburg and the EMSU. And one of the  
6 things he told me was that he was working on a new  
7 cross-section for the unit and he was working to put  
8 that together.

9 Did you have discussions with  
10 Dr. Lindsay in preparation for your testimony in these  
11 exhibits?

12 A. I did, yes.

13 Q. Did Dr. Lindsay provide you with a  
14 cross-section of the EMSU that he prepared?

15 A. Yes.

16 Q. Did you alter or adopt or change in any way  
17 the tops that Mr. Lindsay selected for that  
18 cross-section?

19 A. No, I did not.

20 Q. So did you yourself actually go through and  
21 pick the tops for the San Andres, or did Dr. Lindsay  
22 do that for you?

23 A. No. I did it myself. It was an independent  
24 analysis.

25 Q. Okay. So you received a cross-section from

1 Dr. Lindsay with the San Andres tops, but you also  
2 went around and picked your own tops, correct?

3 A. I didn't get Dr. Lindsay's cross-section  
4 until maybe December, so I had already started that  
5 process well before speaking with Dr. Lindsay on this.

6 Q. Did you change your tops to match  
7 Dr. Lindsay's tops?

8 A. I did not.

9 Q. So you varied from the picks of Dr. Lindsay,  
10 who is the Ph.D. expert, who spent his life working on  
11 the field, correct?

12 A. I don't know that I varied any of his tops.  
13 But I think our tops are pretty consistent across the  
14 EMSU.

15 Q. Okay. Let me ask that again. Did you  
16 change -- are your tops the same as Dr. Lindsay's  
17 tops?

18 A. I think they're probably pretty consistent.

19 Q. Okay. Did you double-check to confirm there  
20 are no differences between your tops?

21 A. Actually, Dr. Lindsay and I have spoken on a  
22 well-by-well basis. And I think we may be a few feet  
23 off here and there, but in general, we're very  
24 consistent.

25 Q. Now, are you aware that Empire provided a

1 structure map to Goodnight at the outset of this case?

2 A. I assumed so. I don't know. Can you  
3 reference what you're talking about?

4 Q. Are you aware whether or not Empire provided  
5 Goodnight a structure map for both the Grayburg and  
6 San Andres at the outset of this case?

7 A. I have seen Joe McShane's structure. I  
8 don't know if that's related to what you're talking  
9 about. But yes, I've seen previous structure maps to  
10 mine.

11 Q. Okay. So you've seen Mr. McShane's  
12 structure map. Have you seen the tops that  
13 Mr. McShane picked for both the Grayburg and  
14 San Andres?

15 A. I have not.

16 Q. Okay. So you don't know, as you see here  
17 today, whether your tops are different or how they  
18 might vary from Mr. McShane's tops for either the  
19 San Andres or the Grayburg, correct?

20 A. I don't, but I suspect they're probably  
21 pretty similar.

22 Q. So you haven't looked -- I mean, would it  
23 surprise you that more than half of your top picks are  
24 different than Mr. McShane's?

25 A. Maybe. I don't know.

1 Q. But you haven't looked, so you don't even  
2 know?

3 A. I don't know, no.

4 Q. Did Empire provide you their top picks for  
5 the San Andres in preparation for your work?

6 A. We had a database of top picks, yes.  
7 Correct.

8 Q. Did you evaluate your top picks relative to  
9 Empire's top picks?

10 A. I didn't evaluate my top picks compared to  
11 their top picks. But there were certainly some  
12 differences in the original, I think his name is Nick  
13 Cestari, which I didn't agree with, and made my own  
14 independent analysis.

15 Q. So it sounds like there's some disagreements  
16 over what the San Andres top may be, and you actually  
17 didn't do all the work to evaluate what other people  
18 had done.

19 MS. HARDY: Object to the question. I think  
20 Mr. Rankin is tending to testify.

21 HEARING OFFICER HARWOOD: It's an  
22 argumentative question, and he'll rephrase it.

23 MR. RANKIN: I'll drop it.

24 BY MR. RANKIN:

25 Q. All right. Let's get into your testimony.

1 I've highlighted a phrase here on Page -- this is your  
2 exhibit -- before I get started, Mr. Bailey, let me go  
3 ahead and just confirm that this is your exhibit.

4 This is your self-affirmed statement,  
5 marked as your rebuttal testimony. I believe it's  
6 marked as Exhibit K. I extracted it from all the  
7 other testimonies. So it's 78 pages. I'll just  
8 scroll down to the bottom so you can see your  
9 signature to confirm it's your signature and it's  
10 dated February 8th, 2025. Is this your testimony?

11 A. It is.

12 Q. All right. So, starting off here, I wanted  
13 to ask just a couple things, because I think I got  
14 this from your summary, but I just want to make sure.  
15 Okay?

16 Essentially, I've highlighted this first  
17 phrase here which says, "Goodnight has chosen to use  
18 this model," and I presume you're referring to this  
19 engineering top or their own top picks, right, their  
20 own stratigraphic model?

21 A. It's a great question. It's not a  
22 stratigraphic model. I don't know what it is.

23 Q. So, in any event, you've chosen to use  
24 whatever their approach is, "to argue that there are  
25 not any ROZ zones within the San Andres and thereby

1 support the case for water disposal in the  
2 San Andres," right? Did I read that correctly?

3 A. Yes, you are reading that correctly. Yes.

4 Q. Okay. But I think I understood you to say  
5 that -- and I think you understand this, right, that  
6 the dispute in this case is not over what's happening  
7 above -- I mean, the dispute in this case is not over  
8 whether there's a ROZ or oil saturations above  
9 Goodnight's disposal zone? Do you understand that?

10 A. You're suggesting that my rebuttal is not  
11 rebutting that Preston McGuire said there's no ROZ in  
12 the San Andres?

13 Q. No. I'm asking you, do you understand that  
14 the dispute in this case is over whether or not  
15 there's a ROZ in the disposal zone, where Goodnight's  
16 injecting?

17 A. I'm not sure I understand where you're  
18 coming from on that.

19 Q. Okay. Well, let me ask you again. I mean,  
20 I think you phrased it pretty well. Let's see if I  
21 can find it.

22 Several times during your summary, you  
23 were pointing out that you believe that there are ROZ  
24 saturations below Goodnight's barrier, correct?

25 A. That is my responsibility, was my

1 responsibility to establish a ROZ within the  
2 San Andres, yes.

3 Q. Okay. So, my point is that the issue, the  
4 contention right now, and in this hearing, in this  
5 case, is whether or not there's a ROZ below  
6 Goodnight's barrier. Do you agree?

7 A. I think there's a contention that the ROZ  
8 that you define as a ROZ is within the San Andres  
9 where you define it in the lower Grayburg, as well as  
10 below your barrier where there's additional ROZ.

11 Q. Why does what you call an "interval" matter  
12 here?

13 A. Why does the interval matter?

14 Q. Why does what you call it matter?

15 A. Well, because your geologist said that the  
16 ROZ zone is in the lower Grayburg, not the Upper  
17 San Andres, so you have to establish that.

18 Q. I guess my point, and I think you understand  
19 this, is that what's at dispute is whether or not  
20 there's producible economic hydrocarbons below  
21 Goodnight's barrier. You agree with that at least,  
22 right?

23 A. I don't. I think the argument here is that  
24 you're impairing Empire's ability to exploit their  
25 potential ROZ zones.

1 Q. Okay. So one of those arguments, one of  
2 those issues is whether or not there's hydrocarbons  
3 below Goodnight's barrier. Agree?

4 A. Yeah. They're --

5 MS. HARDY: Objection to the question. I  
6 think Mr. Rankin is argumentative and testifying.

7 HEARING OFFICER HARWOOD: It's overruled.  
8 Go ahead.

9 A. That's fine. There's very clearly oil  
10 saturations below what Goodnight considers a barrier.  
11 We've very clearly shown that with the core data.

12 Q. Now, you're not telling me, as you sit here,  
13 that Goodnight's experts didn't evaluate the oil  
14 saturations above Goodnight's barrier, are you?

15 A. I'm not 100 percent certain what Mr. McGuire  
16 has evaluated.

17 Q. Okay. Let's set aside Mr. McGuire. Have  
18 you evaluated or reviewed Netherland, Sewell's oil in  
19 place or petrophysics?

20 A. My testimony here today is a rebuttal to  
21 Preston McGuire.

22 Q. Okay. So you haven't even looked at  
23 Netherland, Sewell's analysis or petrophysics?

24 A. I've looked at Dr. Davidson's report, yes.

25 Q. Okay. So you looked at it. So you're

1 familiar with where he put oil saturations, correct?

2 A. I am.

3 Q. Okay. So are you telling me that  
4 Goodnight's experts did not put oil saturations above  
5 its barrier for its disposal zone?

6 A. I think they do have oil saturations above  
7 the barrier.

8 Q. Okay.

9 A. You keep referencing a barrier. There is no  
10 barrier, just to be clear.

11 Q. Fine. Just to not argue about it, then,  
12 let's call it what Goodnight has identified as a  
13 barrier.

14 A. Okay.

15 Q. Very good. I'll move on from there.

16 Okay. I'm going to go ahead and pull up  
17 I think it's your Exhibit K-14. I'm going to scroll  
18 down, because I think this may help. Pictures are  
19 worth a thousand words.

20 Okay. So in this cross-section, you've  
21 helpfully identified, because we've been trying to  
22 figure this out for some time, where Empire -- let me  
23 ask you this. Does Empire adopt your pick for the top  
24 of the San Andres?

25 A. I think it's generally accepted, yes.

1 Q. So whatever was presented previously through  
2 Mr. McShane is no longer the tops that Empire is  
3 adopting?

4 MS. HARDY: I object to that question as  
5 being outside the scope of Mr. Bailey's testimony. I  
6 don't think he's -- he's testifying about his  
7 opinions.

8 MR. RANKIN: I need to know what Empire has  
9 adopted, what their tops are. He is -- so important  
10 that I need to know, which one is it?

11 HEARING OFFICER HARWOOD: I mean, we're  
12 talking about where the top is. That's been the  
13 subject matter of the witness' testimony, so I'm  
14 going to allow it. It's overruled.

15 BY MR. RANKIN:

16 Q. I'm trying to figure out which testimony to  
17 go by here. Okay? Is it Mr. McShane's, that you've  
18 told me you haven't really carefully reviewed and you  
19 haven't confirmed exactly where your tops are relative  
20 to his, or is it yours? So I'm just asking you, have  
21 you confirmed with Empire, does Empire adopt your pick  
22 for the top of the San Andres?

23 A. I haven't talked to Empire about adopting  
24 anything.

25 Q. Okay. So you're just giving your own

1 independent assessment of what you think the tops are?

2 A. I think I've been very clear this is an  
3 independent analysis.

4 Q. Okay. Very good. Just wanted to make that  
5 clear. I think I'm owed that, and I wanted to know.  
6 Thank you for confirming.

7 Now in this model here that you've got,  
8 your stratigraphic model, you've helpfully identified  
9 what you've picked for the top of the San Andres,  
10 correct?

11 A. That is my top of the San Andres in red,  
12 yes.

13 Q. Okay. And then you've identified here where  
14 Goodnight has put its top of the San Andres, in the  
15 blue line, correct?

16 A. That is correct.

17 Q. And this is your Exhibit K-14, to be clear.  
18 So the difference between these two is what you're  
19 saying is of critical importance, right? This roughly  
20 200-foot interval between the two picks is what you're  
21 saying is unfairly excluded by Goodnight because it  
22 eliminates from the San Andres potential ROZ, correct?

23 A. That is correct.

24 Q. And tell me if you agree with this, that  
25 while -- because you reviewed Dr. Davidson's

1 petrophysics, right, where you've seen oil saturations  
2 in this zone, correct?

3 A. Yes.

4 Q. Okay. So Goodnight is not excluding those  
5 oil saturations from the zone, it's just putting them  
6 in a different zone, correct?

7 A. That is correct.

8 Q. So that ROZ, those hydrocarbons don't just  
9 disappear, do they?

10 A. No. His model is actually pretty consistent  
11 down to your barrier zone, where it changes.

12 Q. We'll talk about that.

13 A. Good.

14 Q. Yeah, we will. Okay. So I just wanted to  
15 make clear for the record that you're not saying that  
16 ROZ is being excluded by Goodnight, it's simply being  
17 assigned to a different interval of rock. Agree?

18 A. I agree.

19 Q. Okay. Thank you. Go back up to your  
20 testimony. Okay. I guess this comment here, the  
21 second comment here, just along the same lines, you're  
22 saying that your model is of critical importance  
23 because it shows ROZ in the Upper San Andres as  
24 opposed to Goodnight's approach, which shows that  
25 there's a ROZ in the Grayburg. Right?

1 A. That would be fair.

2 Q. Okay. And that's kind of what I just talked  
3 through with you in K-14, right?

4 A. Mm-hmm. Sorry. Yes.

5 Q. As I go back to K-14, have you evaluated or  
6 looked at the perms in Goodnight's disposal wells?

7 A. On a minimal basis. I haven't focused on  
8 the perms in Goodnight's wells, no.

9 Q. Okay. But would you agree with me that this  
10 interval that we were just talking about, that's  
11 disputed on K-14 between Goodnight's San Andres top  
12 pick and your top pick, that Goodnight's injection is  
13 not occurring in that interval?

14 A. No, I don't agree with that at all.

15 Q. Okay. You don't. But you just told me  
16 that -- okay. So did you look at Goodnight's --

17 A. You're referencing perms. You're not  
18 talking about fluid, vertical fluid, but it would be  
19 impairing.

20 Q. Fine, I'm distinguishing. So I'm asking  
21 you, are the perms below Goodnight's injection,  
22 San Andres top pick?

23 A. They are below the San Andres top, your --  
24 Goodnight's San Andres top, correct.

25 Q. Okay. That's the question I was asking.

1           A. Well, just if you'd phrase it that way, that  
2 would be good.

3           Q. I understand that you're saying that there's  
4 communication between the two. My question, though,  
5 was whether or not you agree that Goodnight's  
6 injection perfs are below its top of San Andres pick.

7           A. That is correct.

8           Q. Okay. Something we can agree on. You state  
9 here in your rebuttal that you agree that the Grayburg  
10 and San Andres are separate geologic intervals, right?

11          A. They are separate geologic intervals by  
12 time.

13          Q. Okay. Just explain to me a little bit what  
14 that means, when you say something is a "separate  
15 geologic interval."

16          A. We have an unconformity at the top of the  
17 Upper San Andres that is a period of non-deposition, a  
18 period where we have an erosional unconformity, right?  
19 That's how we define it. That's a time-separation  
20 boundary. That's what a sequence boundary is. And so  
21 the Grayburg is separate from the San Andres.

22          Q. And, generally, when you have separate  
23 geologic intervals, they generally function as  
24 separate reservoirs?

25          A. Generally, they can, depending on the

1 properties themselves, yes.

2 Q. Have you evaluated whether or not the  
3 San Andres and Grayburg here operate as separate  
4 reservoirs?

5 A. In what capacity, Mr. Rankin?

6 Q. I'm asking you, I guess, as a guy that  
7 characterizes reservoirs.

8 A. I see consistent saturations all the way  
9 through the Grayburg and the San Andres. I think the  
10 stratigraphy outside of anhydrite cements some varying  
11 lithology in general, these are dolomites.  
12 Predominantly, the San Andres is more dolomite;  
13 whereas, you might have some -- you have dolomitized  
14 sands, predominantly, in the Grayburg.

15 Q. How do you define consistent oil  
16 saturations?

17 A. Well, you can see it on the cross-section.  
18 If you'd like to go back to that exhibit, we can show  
19 that.

20 Q. I want to get just sort of a generalized  
21 definition of what a consistent oil saturation is.

22 A. I provided that with the ranges in my map.  
23 So you can see, I said, there's ranges between 20 to  
24 30, 35 percent oil saturations throughout the whole  
25 column. I think that's fairly consistent.

1 Q. We'll get to your maps. Okay? Because your  
2 maps are basically -- your maps are interpolating oil  
3 saturations between your colleague's, Mr. Birkhead's,  
4 oil saturation calculations, correct?

5 A. Yeah, that's correct.

6 Q. Okay. So your maps are interpolating  
7 through computer software what those oil saturations  
8 may be between those points, correct?

9 A. No. My maps are based on what Scott works  
10 through his petrophysical modeling. He provides me  
11 with the output curves for that, and then I go and map  
12 it.

13 Q. Okay. Just so I understand, what are the  
14 output curves?

15 A. He will provide me with a porosity, water  
16 saturation, Vclay, bulk density, if he has to make  
17 some changes to the matrix. Those are the general  
18 output curves.

19 Q. Just so I have them right, I was trying to  
20 write quick. Porosity?

21 A. Yes. We correct the porosity back to a  
22 dolomite porosity matrix.

23 Q. Water?

24 A. Water saturation.

25 Q. Sw, yeah?

1           A. Yeah. Sw and SWT, phiT, which would be  
2 total porosity, phiE, which would be effective  
3 porosity, Vclay as a volume. In some cases where we  
4 have source rocks, I will get TOC by weight percent on  
5 a modified passage. There's a lot of different curves  
6 that I get output to me.

7                        But yes, he has, in general, his own  
8 net-pay values as well. I run my own calculations,  
9 based on his curves, to make sure that we're  
10 consistent. It is an iterative process, as it should  
11 be with good petrophysics and geology, I think, yeah.

12           Q. And those are the bases for your -- I think  
13 you discussed this in your testimony, right, where  
14 you've identified cutoffs for these different values?

15           A. That's correct.

16           Q. Okay. I'll come back to that. But those  
17 are the curves you're talking about.

18                        So he provides you those curves, and  
19 maybe I'll save this from when we get into your maps.  
20 But essentially, just so I understand as a general  
21 overview, he provides you those curves and then you  
22 incorporate them into your mapping. Yeah?

23           A. I go through and do a computation for net  
24 pay, using those curves. So I do a net pay. I do an  
25 average phiT above the cutoff. So the average

1 porosity within that net-pay volume, as well as the  
2 average water saturation within that net volume based  
3 on the 80 percent cutoff.

4 Q. Okay. And then from there, you incorporate  
5 with your cutoffs into your mapping?

6 A. The cutoffs are in the mapping, so I map the  
7 net pay, and then map the average porosity, the  
8 average water saturation, and go from there.

9 Q. And the maps in the software then  
10 interpolate across the map, correct?

11 A. Yes.

12 Q. Okay. But otherwise -- I mean, my point is  
13 simply that you're taking discrete log readings,  
14 interpretations, and then interpolating between those  
15 based on your inputs, correct?

16 A. That's correct.

17 Q. So back to my question, which is, how do you  
18 define consistent oil saturations? You're finding  
19 consistent oil saturations based on your inputs and  
20 then the output from your mapping software?

21 A. I'm finding that based on the curves Scott  
22 has provided me. So  $1 - S_w$  is oil saturation,  
23 right? So I can look at the oil saturation all the  
24 way through the curves that have been provided to me  
25 by the petrophysical model, and I can see that there's

1 consistent oil saturations through the Grayburg, all  
2 the way down through the San Andres, through the end  
3 of the Lower San Andres.

4 Q. All right. I guess my question then is, are  
5 you defining consistent oil saturations based on  
6 Mr. Birkhead's log analyses, the curves and his log  
7 analyses --

8 A. I --

9 Q. Let me finish.

10 A. Okay.

11 Q. Sorry. Are you defining consistent oil  
12 saturations based on Mr. Birkhead's discrete  
13 interpretations on each log, or are you defining it  
14 based on your outputs from your mapping software?

15 A. I'm defining it based on the averages that I  
16 see on the outputs that I've generated in the maps,  
17 yes.

18 Q. The maps. Okay.

19 A. And the logs themselves. I mean, it's very  
20 visible. We can go back to the cross-sections. It's  
21 easy for anyone to see.

22 Q. We'll get to the cross-sections.

23 I mean, you understand my question. I  
24 mean, like, the maps are interpolated, and  
25 Mr. Birkhead's is interpreted, but they're discrete

1 points. And I want to understand, if you're saying  
2 that, "I'm interpreting oil saturation as being  
3 consistent based on a correlated output" from your  
4 mapping software versus Mr. Birkhead's discrete  
5 analyses of his log --

6 A. My mapping output represents the  
7 petrophysical model. So the curves that he outputs  
8 are what the map represents.

9 Q. Very good. I mean, I think we got to the  
10 bottom of it.

11 A. All right. I'm just making sure. It seems  
12 like we keep circling back around.

13 Q. Well, I like to get to the bottom of things.  
14 Okay? I want to make sure I understand. All right?

15 All right. Now, the next sentence here  
16 is one that kind of threw me. "However, based on  
17 fluid communication between the San Andres and  
18 Grayburg in wells within the EMSU, it is undisputed  
19 that these reservoirs are in communication with one  
20 another."

21 Mr. Bailey, I mean, the whole reason  
22 we're here is because there is a dispute over whether  
23 or not there's communication, right, between these  
24 zones? Are you telling me that there's no dispute?

25 A. I don't think there's a dispute. I think

1 Chevron made it very clear, which your geologist  
2 actually uses as a resource or a reference, that they  
3 made very clear that there was San Andres fluid  
4 migrating into the Grayburg pre-flood.

5 Q. And did you yourself do an independent  
6 evaluation or investigation on whether or not there's  
7 communication?

8 A. It's basically based on that literature.

9 Q. Which literature?

10 A. It's in my documentation. It's a Chevron  
11 paper. I believe it's 1991 EMSU flood.

12 Q. Was it the one that Dr. Lindsay referred to  
13 about -- I think it's a 1996 paper, actually.

14 A. I think it's 1991, but I'm not 100 percent  
15 sure. It's in my documentation. We can review that.  
16 Actually, it's in the references, if you'd like to go  
17 down to that.

18 Q. Let's see. I wouldn't mind making sure I  
19 know which one.

20 A. I'd like to, too. Yeah, there it is --  
21 sorry. No, I guess I don't have it in there. It  
22 should be in there.

23 Q. Mr. Bailey, I've spent so much time on these  
24 papers, I'll represent to you I believe it's the 1996  
25 paper.

1           A. Okay. Maybe you're right. Can you pull  
2 that paper up? I'd appreciate that. I believe it was  
3 Kearney. Strickland and Kearney, maybe. Strickland,  
4 et al.

5           Q. Let me see if I have it here. Is this it?

6           A. Yeah, Strickland, et al. There you go. You  
7 can go down to the exact comment he made.

8           Q. By the way, this is a Goodnight Exhibit B-5  
9 that we're looking at, Mr. Bailey. I think you  
10 include this in your testimony, don't you?

11          A. I do.

12          Q. Well, I kind of want to -- we can talk about  
13 it now. Let me see if I can find where that is in  
14 your testimony. Actually, if you don't mind, I'm  
15 going to go ahead and just switch over to your  
16 testimony, because I think you do talk about it.

17          A. Can we scroll down to the comment that's  
18 actually made, regarding the test?

19          Q. I'm going to do that, a hundred percent, I  
20 promise. But I also want to kind of put it in context  
21 with your testimony.

22          A. Sure.

23          Q. Okay? So this is Page 5 of your testimony,  
24 right? And this is the section, I believe, where you  
25 cite to and quote from that paper, correct?

1 A. That's correct.

2 Q. Okay. And starting at this bullet here, you  
3 quote from it, "During the time of primary production  
4 prior to unitization and initiating the waterflood in  
5 the Eunice Monument Field," and it goes on, right?

6 A. Yes.

7 Q. And then you go down here and you include  
8 some other language from -- it's also within quotes,  
9 "Barium sulfate scale has also been detected in  
10 surface vessels that are used to process the produced  
11 fluids," right?

12 A. I do. I think the most important part of  
13 this is, "Thus leading to the conclusion that  
14 sulfate-rich water found its way into some producing  
15 wells before water flow was initiated."

16 Q. Right.

17 A. Would you agree that the San Andres and  
18 Grayburg are communicating at that point?

19 Q. I get to ask the questions.

20 Let's go back to Mr. Strickland's paper.  
21 Okay? So I've highlighted here the portion that you  
22 quote in your testimony, right?

23 A. Mm-hmm.

24 Q. And I've also highlighted in green a portion  
25 that you left out of that quote. You didn't include

1 it.

2 A. Okay.

3 Q. And the portion that you left out says, "A  
4 possible explanation is shown in the sketch in  
5 Figure 4."

6 A. Okay.

7 Q. But you didn't include that in your --

8 A. Okay. Well, I apologize. I didn't mean to  
9 exclude that.

10 Q. Well, it's interesting, because that's  
11 actually an important piece of this assessment.

12 A. Okay. Let's go through it.

13 Q. So let's go on down to see what -- so just,  
14 first of all, before I do that, I want to point out a  
15 couple of things. Okay?

16 Looking at this quote, a couple of  
17 things that I think are worth noting, because I'm a  
18 lawyer and words are important, okay, so the second  
19 sentence here, starting with, "Although" says,  
20 "Although the drilling was confined to the Penrose and  
21 Grayburg formations," and this is talking about  
22 pre-waterflood drilling --

23 A. Mm-hmm.

24 Q. -- "apparently, some San Andres water was  
25 finding its way into the wellbore of these wells and

1 resulted in a barium sulfate scale, barite, deposition  
2 problem."

3 Did I read that correctly?

4 A. You do.

5 Q. Okay. And so the word I wanted to focus on  
6 was "apparently," right?

7 A. Okay.

8 Q. And now, having read this paper, did you see  
9 any documentation or data supporting any of the  
10 chemistry conclusions that were made?

11 A. I don't know that I reviewed any chemistry  
12 conclusions, no.

13 Q. Okay. I've looked for it and I didn't see  
14 any chemistry data or references to databases or  
15 actually any data included in this paper showing what  
16 they're saying here. Okay?

17 A. No, I actually used this reference because  
18 your geologist used it as a reference to make the  
19 point that there wasn't communication because of  
20 chemistry issues.

21 So he's making a point on chemistry  
22 issues, but not being a problem because of San Andres  
23 water being pumped into the Grayburg. But then this  
24 statement right here clearly shows that there was --  
25 apparently Chevron felt like there was San Andres

1 water migrating into the Grayburg pre-flood.

2 Q. Right. But you didn't see any documentation  
3 or data supporting that speculation about whether  
4 there was or wasn't, did you?

5 A. I didn't. It's purely a rebuttal to  
6 Mr. McGuire's testimony.

7 Q. So let's go to Figure 4, because I think  
8 it's useful as well.

9 Well, before I do that, after the part  
10 that you excluded, there's another sentence here. It  
11 says, "Production experience strongly suggests that  
12 mixing of the water occurs in the producing wellbores  
13 rather than in the formation."

14 Did I read that correctly?

15 A. Mm-hmm.

16 Q. Okay. So it's not actually saying that  
17 there's San Andres water getting into the formation,  
18 right?

19 A. I actually disagree with you on the  
20 statement that they made that there was San Andres  
21 water migrating into the Grayburg. I don't know how  
22 you determine that any other way.

23 Q. Well, I'm asking, what it says.

24 A. It says that they're -- the mixing of the  
25 water occurs in producing wellbore rather than the

1 formation. I understand what you wrote, but that's --

2 Q. I didn't write it.

3 A. Well, I understand what you're saying, but  
4 that's very contradicting to the statement of the  
5 waters being -- San Andres migrating into the Grayburg  
6 pre-flood.

7 Q. Oh, we didn't say that.

8 A. I understand. But I'm saying that there's a  
9 contradiction here that clearly they've stated that  
10 the waters are migrating from the San Andres into the  
11 Grayburg pre-flood. Do you agree?

12 Q. I don't agree.

13 A. You don't agree that that's written on  
14 there?

15 Q. No.

16 A. Okay. So let's read right here.

17 Q. Mr. Bailey, I get to ask the questions.  
18 Okay? And I'm asking you, and I'm just asking you,  
19 you know, to confirm what I read, and you did. And so  
20 I think we can move on.

21 So now, the point I'm making,  
22 Mr. Bailey, is that what this statement says and what  
23 the paper says is that, apparently, some San Andres  
24 water was making its way into wellbores, not the  
25 formation, based on what they said, correct?

1           A. Actually, what it says is -- it is  
2 providing -- sulfate-rich water is coming into the  
3 producing wellbores.

4           Q. Thank you.

5           A. Yes.

6           Q. So let's go down to Exhibit -- or rather,  
7 Figure 4 in the paper, because I think this also will  
8 help illustrate that point. Did you look at Figure 4  
9 in this paper?

10          A. I probably did. I don't recall. I've read  
11 a lot of paper.

12          Q. So you're not sure what it looks like?

13          A. I'm not a hundred percent.

14          Q. So let's find out.

15          A. It'll be interesting. Let's do it.

16          Q. Okay. Here's Figure 4. Okay? And, you  
17 know, I'm just going to -- it says what it says and it  
18 looks like what it looks like. Okay?

19                         Figure 4 is a sketch of how San Andres  
20 water resulted in the formation of barium sulfate  
21 scale before the water flow was initiated.

22                         And you'll note that in this figure that  
23 they have an image with an arrow pointing up into a  
24 wellbore, a producing wellbore, with a notation to the  
25 right of it saying "Bottom Water," with four question

1 marks. Right?

2 A. Yeah.

3 Q. And so wouldn't you agree with me that this  
4 is not necessarily -- it doesn't seem to be the  
5 conclusion? It's more a speculation or a question  
6 about whether and how this may be happening? Correct?

7 A. Agree.

8 Q. Okay. On that point, in your testimony,  
9 this is on Page 11, I've highlighted here, you state  
10 that, "Chevron concluded that sulfate-rich water made  
11 its way into the producing wellbores before the  
12 waterflood."

13 So you agree with me that it was limited  
14 to the wellbores. Okay?

15 And you go on to say that, "San Andres  
16 water is sulfate rich and Grayburg water contains  
17 barium. If the two are mixing prior to the  
18 waterflood, it can only be concluded that San Andres  
19 water is migrating into the Grayburg?"

20 My point here, Mr. Bailey, is that  
21 you've made a conclusion, a conclusory leap from  
22 wellbore to formation.

23 A. How else do you propose barium sulfate scale  
24 is occurring when sulfate-rich water is in the  
25 San Andres and barium-rich waters are in the Grayburg?

1 Q. I'm just going off what the Chevron paper  
2 says.

3 A. Okay. Well, I don't know how to else  
4 conclude that. If we've got barium sulfate scale  
5 happening, sulfate-rich water has to be migrating into  
6 the Grayburg.

7 Q. I understand that's your conclusion. I'm  
8 just pointing out what the paper says.

9 A. Okay.

10 Q. Now, I think we got -- we went off this  
11 track to talk about this paper. And I'm going to see  
12 if I can make my way back to where we were.

13 I think we were talking about the fact  
14 that the -- whether and to what extent the Grayburg  
15 and San Andres are separate geologic intervals. And I  
16 think that was higher up in your testimony.

17 A. It's in the summary, yes.

18 Q. And my question to you is whether or not  
19 you've done an evaluation of whether the Grayburg and  
20 San Andres function as separate reservoirs.

21 A. In what capacity?

22 Q. And that was that was the same thing you  
23 asked me, and my response to you was, well, I guess  
24 I'm asking you as a person who characterizes  
25 reservoirs, do you have an opinion about whether or

1 not the Grayburg and San Andres function as different  
2 reservoirs?

3 A. I think they're different reservoirs from a  
4 geologic standpoint, and that's how I'll place it.

5 Q. That's fine. Okay. Let me come back to  
6 this fracture issue.

7 HEARING OFFICER HARWOOD: Mr. Rankin, would  
8 this be a good time for the morning break? It seems  
9 like we're changing --

10 MR. RANKIN: I'm more than happy to  
11 accommodate a break right now.

12 HEARING OFFICER HARWOOD: Okay. It's 10:27.  
13 It seems like a different subject matter. Why don't  
14 we take 15 minutes, come back at 10:45.

15 (Recess held from 10:27 to 10:45 a.m.)

16 HEARING OFFICER HARWOOD: We're back on the  
17 record.

18 CROSS-EXAMINATION (Cont'd)

19 BY MR. RANKIN:

20 Q. All right, Mr. Bailey. I think we're back  
21 on. So I think we've picked up at Page 6 of your  
22 rebuttal testimony here, and I've highlighted another  
23 section that I want to talk to you about.

24 Here I've highlighted a passage where  
25 you've said that, "We define the top of the San Andres

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1 as the tight dolomite sequence approximately 130 to  
2 150 feet above the Lovington Sand and thinning to the  
3 east onto the Eunice Monument anticline, where it is  
4 approximately 100 feet below the top of the San Andres  
5 and the RR Bell Number 4." Correct?

6 A. Correct.

7 Q. Okay. Normally, a tight dolomite is  
8 normally a good barrier to flow. Agree?

9 A. Can be, yes.

10 Q. Okay. Next, Page 7 here of your testimony,  
11 you say that "In the EMSU 628, the reported perforated  
12 intervals by XTO from," -- and I'm not going to bother  
13 to read the depths, "are designated as San Andres,"  
14 correct?

15 A. Correct.

16 Q. Okay. Now, what's your basis for saying, in  
17 your opinion, that these perfs are designated as the  
18 San Andres?

19 A. I have exhibits that illustrate that they're  
20 reported to the State.

21 Q. Okay. Now, did you evaluate where Goodnight  
22 put the San Andres top in this well?

23 A. I don't know that I had a top for Goodnight  
24 in this well.

25 Q. Okay. Are you aware that Goodnight provided

1 all of its top picks to Empire as part of the  
2 discovery in these cases?

3 A. I am aware, but I don't know that they  
4 covered all the wells that I evaluated.

5 Q. Okay. Did Empire provide to you Goodnight's  
6 top picks?

7 A. They did.

8 Q. Okay. But for this particular well, you did  
9 not look to see if there was a Goodnight top pick for  
10 this well?

11 A. I don't recall if there was a top pick for  
12 this. I didn't get that.

13 Q. So you're not aware that Goodnight had  
14 picked the top for this well at 4,088 feet?

15 A. I'm not certain on what depth they picked  
16 the top, no.

17 Q. Okay. So I'm just going to throw up an XTO  
18 well log for this well, for the 628.

19 MR. RANKIN: This is from the Division's  
20 records, Mr. Hearing Officer. I'm going to mark it  
21 as Goodnight Cross Exhibit Number 3.

22 BY MR. RANKIN:

23 Q. So, Mr. Bailey, this is from the Division's  
24 well file for this well. You see that it's got the  
25 API number and identifies this as the Eunice Monument

1 South Unit Number 628 well. This is the well we're  
2 talking about right?

3 A. Yes.

4 Q. Okay. And if I scroll down -- first of all  
5 you'll see that the operator is XTO Energy, correct?

6 A. Correct.

7 Q. And then I scroll down and it does have the  
8 San Andres, and the pick here, identified as OCD's  
9 top, is 4,087 feet. Do you see that?

10 A. I see that the OCD has it at 4,087, yes.

11 Q. Okay. And would that put it within or  
12 outside of your intervals that you identified in your  
13 testimony?

14 A. That would be below the interval that XTO  
15 reported the top depth.

16 Q. Okay. But you agree with me that this is an  
17 XTO document, correct?

18 A. I don't know that that's specifically an XTO  
19 document. I don't know if the State put that in there  
20 or not.

21 Q. Okay. But it's a different top pick than  
22 what you had for this well, correct?

23 A. If you will go to my exhibits, you'll see  
24 the top picks that XTO placed.

25 Q. Which exhibit number is it, just so I know?

1 THE WITNESS: Dana, do you have that?  
2 Apologize.

3 MS. HARDY: In your rebuttal testimony?

4 THE WITNESS: Yeah, my rebuttal.

5 MS. HARDY: It'll just take me a minute to  
6 get to it.

7 BY MR. RANKIN:

8 Q. I guess, Mr. Bailey, you're going to tell me  
9 that you have a different document that shows a  
10 different top pick, correct?

11 A. I have the document reported to the State of  
12 the tops of the San Andres, yes.

13 MS. HARDY: I do have your rebuttal. I can  
14 share my screen if you would like.

15 MR. RANKIN: Is it in his rebuttal?

16 MS. HARDY: Is that what you're referring  
17 to, Mr. Bailey?

18 THE WITNESS: Yeah. There should be three  
19 State documents for those wells.

20 MR. RANKIN: Dana, if you have it, you can  
21 tell me the exhibits and I'll move to them.

22 MS. HARDY: Not sure which exhibit it is.

23 THE WITNESS: It's in the cross-section. I  
24 have the State exhibits as well. I can provide  
25 those.

1 BY MR. RANKIN:

2 Q. Okay. Maybe during a break. But, I guess,  
3 which cross-section has it?

4 A. The same cross-section that we were looking  
5 at with the XTO perfs?

6 Q. I don't remember which one that was.

7 A. Exhibit --

8 Q. The K-10?

9 A. Maybe -- K-14.

10 Q. Okay. So here's Exhibit K-14. And I think  
11 the EMSU 628 is on the left, correct?

12 A. That is correct.

13 Q. And your pick for the top of the San Andres  
14 is at about 39. You tell me what your--

15 A. It was probably pretty close 3918.

16 Q. 3918? Okay. And the document I was showing  
17 you was deeper. It was about 40 -- 4,000 -- just  
18 about where Goodnight's pick is, correct?

19 A. Yes.

20 Q. So there's a difference of opinion in the  
21 well file about what that top pick is. Would you  
22 agree?

23 A. I agree. Do you also have the document for  
24 658 that was reported to the State, selectively? I  
25 understand where you're going with this, but 658 also

1 has the OCD top as well.

2 Q. Okay. Well, do you have it in your  
3 exhibits?

4 A. I have it in the State documents. But the  
5 same document you showed for 628, which I agree is  
6 there in the well file, if you look at 658 well file,  
7 their top for the OCD top is exactly where we have the  
8 San Andres top. So we have a contradiction here.

9 Q. Yeah, okay.

10 A. But the difference is, is that the  
11 documents, if you read into them, supplied by XTO,  
12 show the wellbore with their perms and the designation  
13 for those perms. And that's the documents that I have  
14 that I'd like to provide to you.

15 MR. RANKIN: Mr. Hearing Officer, I would go  
16 ahead and move the admission of that exhibit as  
17 Goodnight Cross Number 3.

18 HEARING OFFICER HARWOOD: Ms. Hardy, any  
19 objection?

20 MS. HARDY: No objection.

21 HEARING OFFICER HARWOOD: Any objection from  
22 OCD?

23 MR. MOANDER: No objection, Mr. Hearing  
24 Officer.

25 HEARING OFFICER HARWOOD: Rice?

1 MR. BECK: No objection.

2 HEARING OFFICER HARWOOD: Pilot?

3 MR. SUAZO: No objection from Pilot.

4 HEARING OFFICER HARWOOD: It'll be in  
5 admitted.

6 (Admitted: Goodnight Midstream  
7 Cross Exhibit Number 3.)

8 BY MR. RANKIN:

9 Q. Mr. Bailey, you just mentioned the EMSU 658,  
10 and I didn't prepare, I didn't review the well file  
11 for that well, but you identify here reported  
12 perforated intervals by XTO from 3,995 feet to 4,004  
13 feet, and then 4,018 feet to 4,030 feet, and then  
14 4,074 feet to 4,084 feet.

15 And you say that those are all  
16 designated as San Andres, correct?

17 A. Correct.

18 Q. And you're saying that those are above  
19 Goodnight's top of 4,145 feet measured depth, correct?

20 A. Correct.

21 Q. And that's the same cross-section we were  
22 just looking at, right?

23 A. That is in the same cross-section, yes.

24 Q. So I'll just dupe down there real fast.  
25 658. Okay. So the 658 is the middle well here,

1 right?

2 A. Yes.

3 Q. And including in your cross-section, as you  
4 reviewed in your summary testimony, you include in the  
5 far right track -- I'm sorry. Do you refer to your  
6 companies as Ops or O-P-S?

7 A. That's correct.

8 Q. Either one?

9 A. Ops Geologic.

10 Q. So Ops Geologic has put together the low and  
11 high case based on its petrophysical analysis on the  
12 far right track, right?

13 A. Correct.

14 Q. And the intervals, are you aware of that --  
15 And I guess you also show the -- are these the perms  
16 here on the left-hand side, in your gamma ray track?

17 A. That's correct.

18 Q. Okay. It's a little hard to tell from this,  
19 but not this entire section was perfed, right?

20 A. No. It actually illustrates it is one full  
21 column. That's why I designated the depths in there  
22 where the perms were.

23 Q. Okay. And the perms are these little  
24 markings here?

25 A. In general, yeah.

1 Q. Are you aware that that well, down in this  
2 section here below, what you've identified as the  
3 San Andres, tested 100 percent water?

4 MS. HARDY: Object to the form of the  
5 question. Mr. Rankin is testifying. It's assuming  
6 facts that haven't been established.

7 MR. RANKIN: I'm asking if he's aware of the  
8 well file that shows that it tested 100 percent  
9 water.

10 HEARING OFFICER HARWOOD: I think you need  
11 to lay a little more foundation.

12 BY MR. RANKIN:

13 Q. Mr. Bailey, as part of your effort to  
14 evaluate your reservoir characterization work, did you  
15 look at the Division well file for this well?

16 A. I did not look at the production profile of  
17 this well.

18 Q. You didn't look at the production profile of  
19 this well, but you have interpreted production  
20 throughout this interval?

21 A. I'm sorry, I've interpreted production? I  
22 don't see anywhere I've interpreted production.

23 Q. I'm sorry. I misstated. You've interpreted  
24 high levels of oil saturation, but you didn't look at  
25 whether or not the well has tested in that zone?

1           A. I did not look at what that well tested in  
2 that zone. It's well understood that the San Andres,  
3 as a ROZ interval, does not perform as a main pay  
4 zone.

5           Q. So it was perfed. You knew it was perfed,  
6 right?

7           A. Yeah.

8           Q. But it didn't cause you to go look to see if  
9 it actually had tested?

10          A. No, I didn't.

11          Q. Now, as I understand, these increments here  
12 on the far right in your saturation curve, those are  
13 20 percent increments, right?

14          A. That is correct.

15          Q. So if I look at some of the higher levels  
16 here, so it's 20 percent, 40 percent, 50 percent,  
17 upwards, between 50 percent and 60 percent in some of  
18 these intervals, correct?

19          A. It's in general between 20 and 40 percent,  
20 yes.

21          Q. In general, but I'm saying there's some  
22 highs in here that are above 40 percent. Don't you  
23 agree?

24          A. There is, yes.

25          Q. Okay. Isn't 40 percent a cutoff for

1 conventional oil generally?

2 A. From where?

3 Q. Well --

4 A. It's dependent on the wettability, the oil  
5 properties. There's a lot of factors that determine  
6 whether oil is mobile or not, if that's where you're  
7 going with that.

8 Q. Okay. Let me ask you, do you have an  
9 understanding of what saturations of oil is going to  
10 be mobile here?

11 A. I don't, no.

12 Q. Have you evaluated that?

13 A. I have not.

14 Q. Are you aware of any systems where oil is  
15 not mobile at 40 percent?

16 A. I don't think I've ever evaluated mobile oil  
17 at 40 percent in a water wet reservoir, as this is.

18 Q. Have you ever seen a system where you have  
19 interpreted oil saturations at 40 percent or higher  
20 where oil is not mobile?

21 A. I don't know that I have.

22 Q. This next section here is Page 9 of your  
23 testimony that I've highlighted here. I think this  
24 gets into your cutoffs, right?

25 A. Yeah.

1 Q. So I think I want to kind of -- I put that  
2 aside because I wanted to -- I knew I was going to get  
3 to it?

4 A. Okay.

5 Q. And here we are. So here you state that  
6 net-pay calculations for both the Upper and Lower  
7 San Andres were determined using 4 percent PhiT --

8 A. That's total porosity.

9 Q. Total porosity. Okay. -- cutoff and  
10 80 percent water saturation cutoff, which, because  
11 water saturation is the inverse of oil saturation,  
12 that gives you 20 percent oil saturation cutoff,  
13 right?

14 A. Water saturation isn't the inverse of oil  
15 saturation, Adam.  $1 - S_w$  is oil saturation.

16 Q. Okay. Thank you for clarifying, since I'm  
17 not a petrophysicist or a geologist.

18 Okay. And then you've got 60 percent  
19 volume of clay cutoff for VCL, right?

20 A. That's correct.

21 Q. Okay. So just kind of generally, maybe you  
22 can walk through, what's the basis for each of these  
23 cutoffs? How did you choose each of these cutoffs?

24 A. Generally, in carbonates we've analyzed  
25 across many different basins, we use the 4 percent

1 PhiT cutoff. And 80 percent water saturation cutoff  
2 was used because I guess it's been determined that  
3 20 percent of oil saturation is required for a ROZ.  
4 And a 60 percent Vclay cutoff. There's very little  
5 clay within this system.

6 Q. Okay. I think you mentioned in your summary  
7 that you had resistivity of 200 ohms, right?

8 A. That's me just coloring where I have high  
9 resistivity. That has nothing to do with the cutoffs.

10 Q. Okay. Now, on the 4 percent, that was  
11 corrected to a dolomite matrix, right?

12 A. That is a phiT curve that is generated from  
13 Scott was run on a 2.90 matrix.

14 Q. Okay. And why do you use this 4 percent?

15 A. As I just explained, in general, in our  
16 experience with carbonates that we've dealt with,  
17 4 percent cutoff is a reasonable cutoff for total  
18 porosity.

19 Q. Okay. And the carbonates that you've dealt  
20 with, again, were not in Delaware Basin, right?

21 A. No, we're not dealing with carbonates  
22 specifically in the Delaware Basin.

23 Q. Okay. Now, you mentioned the volume of  
24 clay, 60 percent cutoff. Then you said there's very  
25 little clay here. Are you measuring any clay?

1           A. Very little clay. And I think that's a  
2 better question for Scott.

3           Q. Okay. So you didn't yourself have any input  
4 into that determination, that cutoff?

5           A. Very minimal. Yeah.

6           Q. Okay. What input did you have?

7           A. Just, in general, looking at the cores to  
8 try and understand do we see very much clay within the  
9 system. And, you know, I defer to Scott for  
10 determining what the cutoff of the Vclay would be.

11          Q. Okay. But in your evaluation of the core,  
12 which cores were you looking at?

13          A. The 679 and the RR Bell.

14          Q. And based on your review of those two cores,  
15 you're telling me you didn't see much clay, right?

16          A. In my discussions with Scott and our looking  
17 at the cores, no.

18          Q. Okay. Did your identification of any  
19 clay affect your -- I guess you tell me. Did it  
20 affect or evaluate in anyway your analysis of oil in  
21 place or the reservoir here?

22          A. I'm sorry. Rephrase that question.

23          Q. Yeah. Your determination that there's very  
24 little clay or there is some clay in the system, did  
25 it affect the petrophysics analysis at all? Or is

1 that a question for Mr. Birkhead?

2 A. That's a question for Mr. Birkhead.

3 Q. Okay. Now, you told me that you had a -- I  
4 think you told me, right, I may be mistaken, but it  
5 was a total porosity of 4 percent, right?

6 A. Correct.

7 Q. Okay. Because there's some clay, do you  
8 also have an effective porosity?

9 A. We do have an effective porosity.

10 Q. What's your effective porosity?

11 A. My average effective porosity?

12 Q. Sure.

13 A. I don't know off the top of my head. It's  
14 going to be a little bit lower than the total.

15 Q. You don't know how much lower?

16 A. I would be speculating.

17 Q. Forgive me, because I -- was that part of  
18 the -- your effective porosity would have been a value  
19 that would have been provided to us in advance of the  
20 hearing?

21 A. Yeah. You were provided the petrophysical  
22 curves, is my understanding.

23 Q. Okay. So your understanding is that we  
24 should have gotten -- you expect us to have gotten  
25 petrophysical curves that Mr. Birkhead generated?

1 A. That would be my expectation, yes.

2 Q. Okay. Because you'd want to know what the  
3 effective porosity is, right? If you got some clay  
4 and it's a different total porosity, you'd want to  
5 know what the effective porosity is, right?

6 A. I mean, that's up to your petrophysicist.

7 Q. Okay. But, I mean, if I'm trying to  
8 evaluate what you guys did, we'd want to know what the  
9 difference is between total versus effective, right?

10 A. Sure.

11 Q. Okay. Now, I asked you and you told me that  
12 you didn't look at it, so I guess I'm going to have to  
13 direct this to Mr. Birkhead. But you didn't have any  
14 discussions with Mr. Birkhead about whether or not  
15 these cutoffs were different than what NuTech Energy  
16 used in its analysis?

17 A. I'm not aware of what cutoffs NuTech used,  
18 no.

19 Q. Okay. So you didn't look to see if they  
20 were the same or different or how your analysis was  
21 different from NuTech's, right?

22 A. I think that's a better question for  
23 Mr. Birkhead.

24 Q. Okay. But you didn't yourself?

25 A. I didn't do the petrophysical analysis, so

1 no.

2 Q. How about on the geology side, did you  
3 evaluate whether your geologic interpretation aligned  
4 or was conflicting with what NuTech presented?

5 A. I would presume that NuTech did not do any  
6 stratigraphy, did not do a correlation. That's not  
7 what they do.

8 Q. Did you look to see if they interpreted any  
9 clay or shale in their model?

10 A. I think they used the Simandoux model, so  
11 they did have some volume of clay within their model.

12 Q. Okay. So you know enough that they did use  
13 Simandoux, but you didn't evaluate to what extent or  
14 how they interpreted clay or shale in their model,  
15 right?

16 A. No, I didn't. That's Mr. Birkhead's  
17 responsibility.

18 Q. Okay. Lots of getting shifted over to  
19 Mr. Birkhead, I guess.

20 A. Well, he ran the petrophysical model and  
21 you're asking a petrophysical questions.

22 Q. Well, I guess I was asking -- you know, it  
23 seemed to be it would also inform your geology. Like,  
24 I wanted to understand whether you assessed NuTech's  
25 assessment of the system to understand whether you

1 were aligned or not. Right?

2 And it sounds like that hadn't happened,  
3 right? You didn't look to see if they interpreted  
4 clay or shale?

5 A. I did not.

6 Q. Okay. All right. Now, here on the bottom  
7 of Page 10 of your rebuttal, you identify, another  
8 passage here I've identified. And here, I'll read it  
9 out loud. "And while we have fewer wells available  
10 for evaluation in the Lower San Andres, there are  
11 clear zones of interest with oil saturations over  
12 20 percent and potentially in the range of 40 to 60  
13 percent."

14 Did I read that right?

15 A. Say that again?

16 Q. Did I read that correctly?

17 A. Read it again.

18 Q. "And while we have fewer wells available for  
19 evaluation in the Lower San Andres, there are clear  
20 zones of interest with oil saturations over 20 percent  
21 and potentially in the range of 40 to 60 percent,"  
22 right?

23 A. That's correct.

24 Q. Now, we kind of talked about this already,  
25 right, and you told me that you have not evaluated

1 whether or what saturation level oil might be mobile  
2 in this system, right?

3 A. I don't know the answer to that. I'm not  
4 sure anyone does because it hasn't been tested.

5 Q. Okay. So you don't know at what saturation  
6 oil might be mobile, right?

7 A. Not in this field, no. Or any field around  
8 here, to be honest.

9 Q. Now, are you aware that -- have you  
10 looked -- how can I phrase this? You're aware that,  
11 obviously, the EMSU is a waterflood, correct?

12 A. In the Grayburg, yes.

13 Q. Okay. And are you aware that EMSU has six  
14 water-supply wells that supplied the water for the  
15 waterflood?

16 A. I'm not certain on how many wells, but I am  
17 aware that there are water-supply wells in the field,  
18 correct.

19 Q. Okay. And as part of your work to evaluate  
20 or characterize the reservoir, did you study or  
21 identify which of those wells were the water-supply  
22 wells?

23 A. They're marked with a "WSW" on my map, and  
24 then specifically -- I mean, they're within our  
25 evaluation if they had the logs to evaluate them.

1 Q. Okay. So I'm going to go to your K-10. And  
2 this cross-section here, which I think was designed  
3 for the purpose of showing us the tops of the  
4 formations, right?

5 A. Yeah.

6 Q. So I'm going to draw your attention to the  
7 two logs on the right, the 457 that I've highlighted  
8 here, and the 458. Okay? Those two wells are two of  
9 the water-supply wells that provided water for the  
10 waterflood? Were you aware of that?

11 A. I'm sure they are if you tell me they are.  
12 I'd have to go back and look.

13 Q. Okay. But you put them on here and you  
14 interpreted them, but you don't know whether they --  
15 sitting here, you weren't sure that they were the  
16 water-supply wells.

17 A. I'm speculating.

18 Q. Okay. So yeah, I'll represent to you that  
19 those two wells are two of the six water-supply wells  
20 that were used to supply water for the purposes of the  
21 waterflood. Okay?

22 A. Okay.

23 Q. And here, in these two water-supply wells,  
24 and again, I think we talked about this, that each of  
25 these ticks is a 20 percent oil saturation, right?

1 A. Yes.

2 Q. And in each of these wells, you've  
3 interpreted 20, 40, 60, a high between as high as 60  
4 to 80 percent oil in the 457, correct?

5 A. It is over 60 percent, yes.

6 Q. And then in the 458, down in the bottom  
7 here, minus 1300 subsea, I'm seeing 20, 30, 40, up to  
8 as high as 60 percent oil saturations in that water  
9 supply well, correct?

10 A. Yes.

11 Q. Those are fairly easy -- you stated very,  
12 very high water -- oil saturations, right?

13 A. Yeah.

14 Q. Now, I'm going to bring up a map here, just  
15 for ease of reference. Pictures are always worth a  
16 thousand words, usually, or more. This has been  
17 marked as Goodnight Exhibit B-8. This is an exhibit  
18 in Mr. McGuire's testimony. You reviewed  
19 Mr. McGuire's testimony?

20 A. I did.

21 Q. This is a map of some of the wells in the  
22 EMSU field that includes the location of the  
23 water-supply wells. As you did, they're marked with a  
24 WSW.

25 A. Okay.

1 Q. And the 457 is here in the middle. I'm  
2 highlighting it. And then the 458 is up here in the  
3 northeast corner. Do you see that?

4 A. Mm-hmm.

5 Q. And Mr. McGuire has taken the total volumes  
6 of water produced from the 457 and he's posted them on  
7 this well. 42.2 million barrels have been produced  
8 from the 457. Do you see that?

9 A. Yes.

10 Q. You hadn't looked at the production history  
11 for that well before you put that together, that  
12 cross-section, had you?

13 A. No.

14 Q. Okay. And then the 458 has produced 49.5  
15 million barrels of water. Had you looked at that  
16 before you put together that cross-section?

17 A. Nope.

18 Q. Now, going back to that cross-section,  
19 you're telling me that, as you sit here, you don't  
20 think that 60 percent oil saturation would be mobile?

21 A. I think that it probably would, yes.

22 Q. So after producing that volume of water, are  
23 you aware that neither of those wells have reported  
24 any skim oil or oil production?

25 A. I am not.

1 MS. HARDY: That hasn't been established.  
2 Like a foundation.

3 MR. MOANDER: Mr. Harwood, I have a concern  
4 about this. If we're going to get through this, then  
5 I think Mr. Rankin has a good faith basis to ask  
6 questions based on what evidence will be put into  
7 evidence. And if he's asking those questions on a  
8 good faith basis, then it's fair for  
9 cross-examination.

10 Unless we want to make Mr. Bailey  
11 subject to recall whenever we have these hearings, I  
12 think it's entirely proper to ask questions with  
13 evidence that Mr. Rankin has a good faith basis to  
14 believe will come in.

15 HEARING OFFICER HARWOOD: Well, there's a  
16 fine line between having a good faith basis and  
17 having evidence in the record.

18 MR. MOANDER: I think the testimony in the  
19 record, I think that testimony is in direct testimony  
20 in the record from Goodnight's witnesses, from the  
21 evidence of what's been reported on these wells. So  
22 that evidence is in the record. He's just asking  
23 questions.

24 HEARING OFFICER HARWOOD: Well, as long as  
25 it's -- all right, as long as the evidence is

1       forthcoming, it's fair game.

2               MS. HARDY: I think there's a lack of  
3 foundation. I think Mr. Rankin can ask if Mr. Bailey  
4 has reviewed the evidence. But the problem is that  
5 Mr. Rankin is testifying, and he's doing that  
6 continuously through his questions, instead of just  
7 asking the witness a question.

8               HEARING OFFICER HARWOOD: Well, I'm hearing  
9 that he's not testifying, that there will be evidence  
10 to support the hypothesis that he's built into the  
11 question.

12               What is the question again, Mr. Rankin.

13               MR. MOANDER: Mr. Hearing Officer, an offer  
14 of proof I think, would overcome this pretty quickly.  
15 Because of my recollection, there is evidence in the  
16 record of this. While OCD is not necessarily  
17 intervening in the dispute amongst the operators, I  
18 think an offer of proof is a shortcut way to resolve  
19 this quickly, and then we can move on.

20               MR. RANKIN: Well, Mr. Hearing Officer, I  
21 appreciate that, and I understand Ms. Hardy's  
22 concerns. I think we're in a little different  
23 circumstance here before the Commission.

24               These volumes are in the Division's  
25 records. I could ask that the Division or the

1 Commission take administrative record of them.  
2 However it wants to be done.

3 I don't think there's any dispute of  
4 what the records say or what the volumes are. These  
5 volumes were actually provided to us by Empire, so I  
6 find it a little bit funny that Empire would object  
7 to admission or acknowledgement of what Empire's own  
8 records show the volumes were produced from these  
9 well.

10 HEARING OFFICER HARWOOD: Okay. I'm going  
11 to overrule the objection. Remind us of the  
12 question.

13 MR. RANKIN: I was asking Mr. Bailey, if he  
14 was aware that the 457 had produced 42.2 million  
15 barrels of water, and whether the 458 will have  
16 produced 49.5 million barrels of water.

17 And he said that he wasn't because he  
18 didn't look at the -- well, he can say for himself.

19 A. I did not look at those volumes. Can you  
20 tell me where the perms are for those wells, please?

21 Q. Yes, I can.

22 A. I'd love to see that.

23 Q. I guess your counsel can bring that up, but  
24 I'm not going to. You're not asking me questions. I  
25 get to ask you questions. But I do know where those

1 perfs are.

2 So, Mr. Bailey, as part of your  
3 reservoir -- I mean, so you're not also aware of  
4 whether those wells have produced any skim oil or  
5 produced any oil, correct?

6 A. I can't imagine any -- no, I'm not, but I  
7 can't imagine anyone here was sitting on the tanks  
8 looking if there was skim oil.

9 Q. Okay. But you're not aware of any records  
10 reflecting that any oil or production had been  
11 recovered from those wells, correct?

12 A. I'm not.

13 Q. Okay. Here on the bottom of Page 12 of your  
14 testimony, I've highlighted another section here where  
15 you were talking about pointing out that there are  
16 other CO2 floods in the San Andres along the same  
17 trend, across the Northwest Shelf, the Central Basin  
18 Platform, and then you put in parentheses, Hobbs,  
19 Wasson, Seminole, Vacuum, Means, Hanford and  
20 Goldsmith-Landreth units, right?

21 A. Yes.

22 Q. Okay. Because I think not everybody knows  
23 where all these are, these are all fields with --  
24 first of all, these are all fields with primary  
25 production, correct?

1 A. As far I know, yes.

2 Q. Okay. Primary production in the San Andres,  
3 correct?

4 A. I don't know that all of them have primary  
5 production in the San Andres, no.

6 Q. Okay. So you haven't -- you cite to these  
7 fields, but you don't have an understanding of the  
8 production history from these fields?

9 A. I don't know that all of them are primary  
10 producers from the San Andres.

11 Q. Are you saying you don't know because you  
12 didn't look or you don't know because --

13 A. I'm saying these are active CO2 floods in the  
14 San Andres, so they're tertiary recovery efforts.

15 Q. Okay. My question though is, have you  
16 evaluated or determined whether any of those fields --  
17 all those fields have undergone primary production in  
18 the San Andres?

19 A. I have not evaluated all those fields, no.

20 Q. Okay. I think I understood you to say that  
21 they're on the same trend. What do you mean by the  
22 "same trend"?

23 A. They're on the Artesia Fairway trend.

24 Q. Okay.

25 A. So they are in line, they have the same

1 stratigraphy. The Hobbs Unit is actually just north  
2 of the EMSU. Oxy is currently doing a CO2 flood there.  
3 There are several others as well. I think there may  
4 be 52 active CO2 floods in the San Andres at this  
5 point. I have to check those numbers, but I think  
6 it's pretty close. So it's a pretty hot topic in the,  
7 the CCUS community.

8 Q. I mean, I think it's helpful to find a map,  
9 so I'm going to see if I can find a map real quick.

10 Mr. Bailey, I'm showing here  
11 Dr. Lindsay's Exhibit B-2. Do you see it on your  
12 screen?

13 A. I do.

14 Q. Okay. And, unfortunately, we don't have a  
15 marker for exactly where the EMSU is located, but I'm  
16 going to do my best, and you can tell me if you agree  
17 or not. But I believe the Hobbs Field is up here and  
18 I believe the EMSU is just to the southwest, roughly  
19 in this location where my cursor is. Is that correct?

20 A. Fairly close.

21 Q. And then I think you also referenced the  
22 fields across the Northwest Shelf, which I believe --  
23 is fair to say this sort of arc is the Northwest Shelf  
24 up here?

25 A. Yeah, the whole arc, all the way across,

1 down into Hobbs and the EMSU.

2 Q. Okay. So this is the Northwest Shelf,  
3 right?

4 A. Uh-huh.

5 Q. You're including the EMSU in the Northwest  
6 Shelf?

7 A. No. I'm saying that it's on the same  
8 Artesia trend. It's got the same trend-tigraphy.

9 Q. But nevertheless, the Northwest Shelf is  
10 this sort of arc just above where the EMSU is located,  
11 correct?

12 A. That's correct.

13 Q. And then these other fields that you  
14 referenced, the Hobbs, the Wasson, Seminole, Vacuum,  
15 Means -- I guess Vacuum is up here on the Northwest  
16 Shelf, correct?

17 A. Correct.

18 Q. And the Wasson, I don't think it shows up  
19 over here.

20 A. It does. It's right there.

21 Q. Okay. Seminole is over here, just on the  
22 eastern side of the Central Basin Platform, correct?

23 A. Yes.

24 Q. Means, I think it's not showing up down  
25 here, but I think it's also on the eastern side of the

1 Central Basin Platform, correct?

2 A. Central to central east.

3 Q. Hanford is also on the eastern side of the  
4 Central Basin Platform, correct?

5 A. Sure.

6 Q. And then the Goldsmith-Landreth units,  
7 they're not showing up here, but I think they're  
8 roughly in this area here, kind of the central --

9 A. It's pretty close.

10 Q. Pretty close. Okay. All right. So you're  
11 telling me that those fields that we just walked  
12 through are all on the same trend as the EMSU, which  
13 is to the southwest of Hobbs?

14 A. No. What I implied was that they're all CO2  
15 floods in the San Andres.

16 Q. You said they're on the same trend.

17 A. I said that some of them are on the same  
18 trend along the Northwest Shelf and Central Basin  
19 Platform.

20 Q. Okay. I guess your words speak for  
21 themselves, but the way I read it is there are  
22 currently several active CO2 floods in the San Andres  
23 along the same trend.

24 A. Mm-hmm. The Hobbs is along the same trend.  
25 The Vacuum is on the same trend. The Wasson, Means,

1 Hanford and Goldsmith-Landreth, they're all on the  
2 CBP. So they're all CO2 floods within the San Andres,  
3 was my point I was trying to make.

4 Q. All on the San Andres. Okay. What do you  
5 mean by "trend"? I mean, generally, I think -- I  
6 guess I don't know. What does "trend" mean to you?

7 A. I find trends in stratigraphy itself, so I  
8 find that the Northwest Shelf running around to the  
9 EMSU, the Hobbs, in general, conform to the same  
10 stratigraphic nomenclature as well as the same  
11 stratigraphy and lithology. Very similar anyway.

12 I also provide those type logs from  
13 multiple fields along the Northwest Fairway,  
14 confirming the Lovington Sand, as well as this top of  
15 the San Andres. So it's very consistent with ours.

16 Q. On Page 14 of your testimony, I've  
17 highlighted a statement here, I think one of the other  
18 areas where we agree. Stated that, "Below Goodnight's  
19 top is a dolomite/anhydrite unit, but this interval  
20 contains porosities well over 4 percent as well."

21 You agree that that's an anhydrite?

22 A. I think it has anhydrite cement, yeah.  
23 Yeah, and we can see that on the photoelectric factor  
24 curve.

25 Q. How do you calculate porosity for anhydrite?

1           A. How do I calculate it? The calculations for  
2 porosity are done by Scott. They're also -- you can  
3 pull them off the raw logs for the beefy dolomite. So  
4 we have raw bulk density that's converted to porosity,  
5 and we can get an indication of what the porosity is.

6           Now, we're not saying this is anhydrite  
7 bedding. This is actually anhydrite cements, so that  
8 needs to be clarified. There is no anhydrite bedding  
9 in the Upper San Andres, or in your barrier.

10           Your actual barrier, as you call it, is  
11 the Lovington Sand. It's actually sand and mudstone.  
12 It's not a dolomite or anhydrite at all.

13           Q. You're finding sand in the San Andres?

14           A. That's the Lovington Sand. That's why it's  
15 called the Lovington Sand.

16           Q. Is it a siliclastic sand?

17           A. It's a dolomitized sand.

18           Q. Okay.

19           A. So it's not anhydrite. It's properly --  
20 your stratigraphy done by your geologist is incorrect.

21           Q. Okay. But just to be clear, when you refer  
22 to it as a "sand," it's not a siliclastic sand, it's a  
23 dolomitized sand?

24           A. It's a dolomitized sand.

25           Q. You're talking about the size of the grain

1 when you refer to it as a sand?

2 A. Yeah. I mean, it's got quartz grains in it.  
3 It's been dolomitized.

4 Q. Okay.

5 A. It's had fluids move through it. It's been  
6 dolomitized.

7 Q. This PDF, Page 15 here, I recognize that  
8 you're highly critical of Goodnight's approach, and so  
9 I'm inviting some more criticism, I suppose. But you  
10 state here that, "Mr. McGuire has chosen to ignore the  
11 work of many technical experts in the field and their  
12 subsurface analyses. Goodnight is using an  
13 engineering approach to define the top of the  
14 San Andres based on a purported pressure boundary as  
15 opposed to utilizing lithostratigraphic or  
16 chronostratigraphic correlations."

17 Did I read that correctly?

18 A. You did.

19 Q. Okay. Just for the benefit of the record  
20 and folks, including myself to some extent, would you  
21 please explain to us what you mean by a  
22 lithostratigraphic correlation.

23 A. That is an actual lithology correlation, so  
24 the actual lithology of the formation.

25 Q. When you talk about lithology, you're

1 talking about rock types?

2 A. Rock types, correct.

3 Q. And then you're talking about  
4 chronostratigraphic. I took a little bit of -- I  
5 didn't take Greek, but I know that it means time.  
6 Just explain to us what you mean by  
7 chronostratigraphic.

8 A. Yeah, those are time surface boundaries, so  
9 Goodnight consistently jumps up and down across  
10 chronostratigraphic boundaries, as well as  
11 lithostratigraphic boundaries. And I think I've shown  
12 that in my cross-section.

13 Q. I'm going to pull up an exhibit here. This  
14 is Goodnight Exhibit B-17 that was part of  
15 Mr. McGuire's direct testimony. Did you review this  
16 exhibit when you reviewed Mr. McGuire's testimony?

17 A. I don't think I specifically reviewed this  
18 documentation.

19 Q. This Exhibit B-17 shows, on the far left of  
20 the table, the API numbers for wells in the EMSU. The  
21 next column shows the well name and well number. And  
22 then following, in the blue, are the Goodnight  
23 San Andres picks in that well, and in the well file  
24 pick, what was in the well file that the operator had  
25 picked of that well.

1           The next columns in red are the  
2 difference between those picks; the ISO interval, in  
3 other words, sort of the depth of the -- as a result  
4 of that pick, what the depth of the Grayburg would be  
5 at that location.

6           And then also the final column there is  
7 Goodnight's Grayburg ISO interval for that column.

8           So the one before that, the well file,  
9 Grayburg ISO, is what would be the resulting interval  
10 for the Grayburg based on the well file on that  
11 San Andres pick, and the one to the right is  
12 Goodnight's Grayburg ISO interval based on its pick.  
13 Do you understand that?

14           A. I see it.

15           Q. So I've highlighted two of the wells here,  
16 just to point out that, you know, what Goodnight  
17 picked, for example, the EMSU 459 for San Andres was  
18 at 4,050 feet and that's the same depth as the well  
19 file. You see that?

20           A. I do.

21           Q. And then the biggest difference here between  
22 what Goodnight picked in the well file was in the  
23 single well, the 461, at least on this table, where  
24 there's about almost a 200-foot difference between  
25 what Goodnight picked and what the operator of that

1 well picked. Do you see that?

2 A. Yeah. That's common with the OCD picks and  
3 operator picks in the field.

4 Q. Now, I mean, the 458 -- I think in your  
5 cross-sections, you had the 458, right?

6 A. Yes, I have it at the end of one of my  
7 cross-sections.

8 Q. And I think you were showing, as you were  
9 walking through, that that 458 is higher on structure  
10 in the EMSU, right?

11 A. That's correct.

12 Q. Wouldn't you expect that, being higher on  
13 structure, it would have a shallower top pick?

14 A. I'm sorry, for the San Andres?

15 Q. Yeah.

16 A. It does have a shallower top pick than what  
17 you're showing here.

18 Q. Okay. But this was an operator pick that at  
19 the time was Chevron.

20 A. Okay.

21 Q. Okay. And so Chevron was the operator and  
22 they picked the same top that Goodnight picked.

23 A. I would argue they picked it wrong.

24 Q. Okay. Over here on Page 17, the statement  
25 you make, "The pick can be made very clearly," as you

1 stated previously in your summary, and the pick here I  
2 think you're referring to is the San Andres pick,  
3 right?

4 A. That is correct.

5 Q. "The pick can be made very clearly across  
6 EMSU both lithologically and chronostratographically,  
7 as illustrated in Exhibits K-10 through K-14." So  
8 those are the cross-section maps that we talked about  
9 already, right?

10 A. Correct.

11 Q. And you mentioned this before, but that  
12 there's an erosional boundary between the San Andres  
13 and Grayburg, right?

14 A. Correct.

15 Q. Okay. And I understand that -- well, let me  
16 just pull this up. Let me just talk about it.

17 This is Goodnight Exhibit B-15 that was  
18 part of Preston McGuire's direct testimony. I don't  
19 know if you reviewed this as part of the documentation  
20 that was submitted to the Commission back when the  
21 EMSU was created as a statutory waterflood.

22 Did you review this document as part of  
23 your assessment of this field?

24 A. I believe I reviewed it, but I've got to get  
25 familiar with it. I've slept a lot.

1 Q. Sure. I'm glad you did. At least one of us  
2 has.

3 So I guess the point that I want to draw  
4 your attention to is this highlighting here, where at  
5 the time of the formation of the unit, Gulf -- or  
6 actually, this is from the technical committee report,  
7 I believe, states that, "The contact between the  
8 Grayburg and the San Andres is gradational and there's  
9 no clear marker for the top of the San Andres which  
10 can be traced across the field."

11 And I know that you're going to tell me  
12 you disagree, right?

13 A. Yes.

14 Q. Okay. So my question to you then is, as I  
15 understand both Dr. Lindsay's testimony and your  
16 testimony, is that you've got two cores that you're  
17 using to help identify the top of the San Andres,  
18 correct?

19 A. That is correct.

20 Q. So the RR Bell 4 and the EMSU 679, right?

21 A. That is correct.

22 Q. What specifically are you looking for in the  
23 core to identify the top of the San Andres versus any  
24 other erosional boundary or composite sequence  
25 boundary that might exist within that core?

1           A. The premier sandstone is a pretty good  
2 marker in the core. It's the base of the Grayburg.

3           Q. How is it a good marker? What distinguishes  
4 it?

5           A. It's a dolomitic sand that you can see in  
6 core.

7           Q. And what's the difference between the  
8 premier sandstone and the Lovington sandstone?

9           A. Depth.

10          Q. Okay. Otherwise, they're relatively  
11 similar?

12          A. They're both dolomitized sandstones, yes.

13          Q. So once you've identified the premier  
14 sandstone based on depth, what are you looking for in  
15 the logs? Because you only have two cores, right?  
16 How are you correlating the cores to your logs to  
17 extend your interpretation of the San Andres top  
18 across the field?

19          A. So we could take the depth of the premier  
20 sandstone in the core, take it back to the log  
21 interval, so we know the depth of it, we know the base  
22 of it, that is the top of the San Andres. That can  
23 then be correlated across the field.

24          Q. Okay. So you're just going off depth,  
25 measured depths, for each well; is that right?

1           A. I mean, that's what you would identify what  
2 the depth of an interval is, yeah.

3           Q. Okay. But I thought I understood you to say  
4 that you were looking at signals in the logs to  
5 identify --

6           A. There's some very clear signals in the log  
7 as well.

8           Q. Okay. What are the signals?

9           A. There's a very tight neutron signature at  
10 the top of the San Andres.

11          Q. And you see that tight neutron signature  
12 across the field?

13          A. I do. It's got some porosity within it in  
14 certain areas, which is likely where we've got some  
15 communication between the Grayburg and San Andres,  
16 likely fractures associated with it. I don't know  
17 that 100 percent because we don't have core through  
18 it, but speculating that we will.

19          Q. I guess what I'm wondering is, Mr. Bailey,  
20 because we've gone through a couple instances and  
21 pointed out where there are different top picks in the  
22 well files, between different operators, and you're  
23 telling me that it's really easy to pick, but I'm  
24 just -- I'm asking you, you know, in your opinion  
25 though, you're telling me that it's really easy to

1 correlate, right?

2 A. I don't know that it's easy, but I think  
3 that it's not hard. I think you can commonsense  
4 correlate your way across here if you understand how  
5 to correlate well logs and use all the well logs  
6 available.

7 Q. Okay. It's not easy, but it's not hard,  
8 that's your --

9 A. I mean, there's certain areas when you're  
10 coming up onto the structure itself where you might  
11 get some collapse features, you get some expansion of  
12 section, maybe there's a bathymetric low. There's  
13 some variability across it, but in general, yes,  
14 it's -- especially up on structure, it's very easy to  
15 correlate.

16 Q. In your cross-section, K-13 here, I just  
17 kind of was wondering how this came to be. You've  
18 got, from left to right, Goodnight's active injection  
19 wells within the EMSU, right?

20 A. Yes.

21 Q. And then you've got over here in this --  
22 yeah, that's the 679, right?

23 A. Yeah, 679, EMSU 001, EMSU 628, EMSU 660.

24 Q. Okay. Now, the EMSU 1, do you understand  
25 that that is Empire's saltwater disposal well?

1           A. Yes. That's Meyer B-423 originally, or what  
2 it was named before.

3           Q. Now, in each of the wells you've interpreted  
4 or Ops Geologic has interpreted oil saturations, but  
5 not for that well. Is there a reason?

6           A. Yeah. There's no density porosity curves.

7           Q. Okay.

8           A. This image is just to show how inconsistent  
9 Goodnight's tops are across the EMSU, which is very  
10 clear to anybody it looks at.

11          Q. But there's a porosity log, right?

12          A. I'm sorry, there's a porosity --

13          Q. I'm sorry. There's not a porosity log.

14 That was your point, right?

15          A. That's correct. That's why we can't do the  
16 evaluation. There's no bulk density or neutron.

17          Q. But there's a -- what's the far right?

18          A. That's a sonic log.

19          Q. And can you calculate porosity from the  
20 sonic log?

21          A. You could, yeah.

22          Q. But you guys didn't do that?

23          A. No, we did not. We don't model porosity  
24 based on sonic logs. There's a lot of inconsistencies  
25 with that methodology.

1 Q. But it could have been possible and you  
2 could have actually evaluated whether there was oil  
3 saturation in that well, too, right?

4 A. We would have still needed a neutron log.  
5 We don't have a neutron log.

6 Q. Okay. But you had a resistivity log, right?

7 A. We do have a resistivity log, yeah.

8 Q. Okay. And if you had a resistivity log --  
9 but you're telling me you don't model sonic logs to  
10 arrive at a --

11 A. We need a neutron log also for porosity.  
12 That's what's used in the porosity calculation as  
13 well.

14 Q. Okay. In terms of evaluating this field,  
15 have you been able to assess what the recovery factors  
16 might be in the event a ROZ development were put in  
17 place, or evaluated, you know, how to assess what the  
18 recovery might be in the ROZ?

19 A. That's an engineering question. That's not  
20 for me.

21 Q. Okay. So you haven't?

22 A. Yeah. That's an engineering question.  
23 That's not for me.

24 Q. Okay. You were here during Dr. Lindsay's  
25 testimony yesterday, right?

1 A. Yes.

2 Q. Did you hear him talk about his experience,  
3 across the street from the Goldsmith units?

4 A. I'm sorry, across the street from the --

5 Q. Well, did you hear him talk about his  
6 experience with CO2 across the way from the Goldsmith  
7 area units?

8 A. I listened to a lot of testimony, but you've  
9 got to be more specific.

10 Q. Did you hear Dr. Lindsay testify about how  
11 in the unit he was working on for CO2 flood, where he  
12 experienced moldic porosity, that the CO2 was  
13 essentially lost and being sequestered and not  
14 creating an oil -- I forget the term he used, like an  
15 oil wave, it was not contacting or pushing oil through  
16 the system?

17 A. I don't recall hearing that. I mean, it  
18 could have been in his testimony, but I also could  
19 have been at the bathroom. I don't know.

20 Q. Okay. So I'm going to scroll down here.  
21 We'll go into these questions here a little bit, but I  
22 wanted to understand, like, so you -- part of what you  
23 did was you took the petrophysical analysis, the oil  
24 saturations that Mr. Birkhead prepared, and then you  
25 use those to calculate oil in place, right?

1 A. That is correct.

2 Q. Okay. And to do an oil-in-place  
3 calculation, do you need to understand what the oil  
4 formation volume is?

5 A. We were given an oil formation volume  
6 factor.

7 Q. From whom?

8 A. From Goodnight -- I mean, from Empire.  
9 Sorry.

10 Q. Okay. And that was an oil formation factor  
11 that you used for both the San Andres and the  
12 Grayburg?

13 A. Yes, it would have been. I actually did not  
14 do the Grayburg evaluation. It was not my  
15 responsibility. My focus was on the San Andres.

16 Q. Were you instructed not to assess the  
17 Grayburg?

18 A. No. For time purposes, my time, they wanted  
19 to focus on the San Andres, which is the reason we're  
20 here.

21 Q. So that oil formation volume factor was  
22 given to you by Empire. Did you assess whether that  
23 was for the San Andres?

24 A. We asked specifically for a oil formation  
25 volume factor for the San Andres, yes.

1 Q. Okay. But you weren't part of how that bulk  
2 oil formation volume factor was prepared?

3 A. No. That came directly from them.

4 Q. So it was the same factor that was used for  
5 the Upper San Andres as the Lower San Andres?

6 A. That is correct.

7 Q. When you calculated these -- and this is  
8 your structure map. But when you calculated your  
9 oil-in-place maps, you would have used the effective  
10 porosity, correct?

11 A. No. I used the total porosity as a cutoff.

12 Q. Okay. Well, just because I'm ignorant of  
13 it, would you tell me why you chose the total versus  
14 the effective.

15 A. That's the determination Scott and I came up  
16 with, to use of the 4 percent total porosity. In  
17 general, as I mentioned, that's what we do with  
18 carbonates that we've analyzed before.

19 Q. Even though you identified some shale  
20 content?

21 A. I would say the shale content was very  
22 minimal.

23 Q. Okay. All right.

24 A. The clay content. Let's be specific. Not  
25 shale, clay content.

1 Q. Very fine. Well, okay.

2 A. And we only had two cores to verify that,  
3 just so you understand that, of which we used both.  
4 And Goodnight only used one, is my understanding.

5 Q. I want to ask you a little bit about that as  
6 well. And you can tell me if this is more appropriate  
7 for Mr. Birkhead.

8 I wasn't entirely clear, but I want to  
9 make sure I understand. When you did this work with  
10 Mr. Birkhead, did you calibrate your analysis to -- as  
11 I understood it, it sounds like you've calibrated it  
12 to two cores, right?

13 A. That's correct.

14 Q. And that was the RR Bell and the EMSU 679,  
15 right?

16 A. Correct.

17 Q. Now, because you didn't evaluate what NuTech  
18 had done, you don't know how or whether they  
19 calibrated their petrophysical analysis, right?

20 A. No. I did not speak with NuTech on their  
21 petrophysical analysis.

22 Q. So, let me start with the structure map  
23 here. This, marked as Exhibit K-15, is your structure  
24 map for the Lower San Andres, right?

25 A. Mm-hmm.

1 Q. Okay. And reading the structure map, the  
2 highest structure is the hotter color, right, red?

3 A. That is correct.

4 Q. And the lower structure is the cooler color,  
5 the blue, indicating -- so as you go to the southwest,  
6 you go downdip this direction, right?

7 A. That's correct. Into the basin.

8 Q. So looking at this, the -- actually, let me  
9 go to the Upper San Andres. This is the one I was  
10 more interested in.

11 Okay. So, this is K-16. This is the  
12 Upper San Andres, right?

13 A. It is.

14 Q. Okay. And so the red areas are the areas  
15 that are above minus 350. And this is a subsea  
16 interval, correct?

17 A. That is correct.

18 Q. Okay. And what you're showing here is the  
19 portion of the Upper San Andres that are above minus  
20 350 subsea all in this red, correct?

21 A. Correct, 350 -- at 350 or above, yeah.

22 Q. Okay. So, just looking at this,  
23 approximately, what do you think, how many sections  
24 are above minus 350 within the EMSU?

25 A. How many sections?

1 Q. Yeah.

2 A. I don't know, maybe two and a half, three.  
3 Three, maybe, if I do average. You asked me to pick  
4 on the orange outside the red. I mean, I can partial  
5 that off, but that would be a guesstimate.

6 Q. Yeah, I guess I'm asking you, everything  
7 that's red, right?

8 A. I thought you were asking everything that  
9 was outside of that.

10 Q. Everything above 350, minus 350?

11 A. Okay. Well, we've got basically a section  
12 and a half of red, essentially.

13 Q. Okay. Now, you heard Dr. Lindsay's  
14 testimony yesterday, right? And he placed the  
15 producing oil-water contact at -- above which only oil  
16 is produced at minus 350 subsea, correct?

17 A. I believe so, yes.

18 Q. So on this map here, where you've got your  
19 contouring arrows above -- at -- cutoff at minus 350,  
20 everything in the red would have been producing above  
21 that contact, right?

22 A. If it was perped in that interval.

23 Q. It was perped in that interval?

24 A. And, again, we still have a lot of water to  
25 deal with here.

1 Q. But that's when we're talking about depths  
2 that were above that, right? Minus 350 is above that  
3 water, right?

4 A. Those intervals were not perfed. Were they  
5 perfed in there? I haven't reviewed every single  
6 well, but I would have to look at the perfs in the  
7 San Andres to understand whether they were perfed  
8 there or not. If they weren't, then no, they didn't  
9 produce out of the San Andres.

10 Q. Okay. So yeah, I guess you're anticipating  
11 my next question, okay, is whether or not you have  
12 looked at whether not any of these wells or any wells  
13 in that area have produced oil that you've indicated  
14 here, right?

15 A. I have not looked at any production of oil  
16 in the San Andres in the EMSU.

17 Q. So if any wells were drilled and completed,  
18 okay, and perfed between minus 350 subsea and above,  
19 they would have produced that oil, right?

20 A. If there is oil in place there and they  
21 perfed that interval and there wasn't a bunch of water  
22 associated with it, then maybe it would be.

23 Q. But you're showing me --

24 A. That contact changes, Adam.

25 Q. Okay. But you're showing me that there is

1 oil in place here, right?

2 A. No. I'm showing you a structure map not  
3 even showing you oil.

4 Q. Okay. I'm sorry, you're right. I  
5 apologize. So if there's oil in place there and there  
6 are wells perfed at those depths, they could have  
7 produced oil, right?

8 A. That's if there is oil in place there, they  
9 would have produced, and they were perfed in the Upper  
10 San Andres, they would have produced oil likely, yes.

11 Q. And we'll get to your oil-in-place  
12 calculations, but if that's the case, then that would  
13 have been included in your calculations for the ROZ?

14 A. My calculation for the OOIP section is for  
15 the total Upper San Andres. So it goes from the top  
16 of the Upper San Andres to the lower. So that's all  
17 the net pay within that interval. That's a pretty big  
18 interval. So could be -- net pay may be at minus 400,  
19 may be at minus 450. Doesn't mean it's at negative  
20 350.

21 Q. Okay. All right. So this is, I think, your  
22 Upper San Andres, your average oil saturation high  
23 case, right?

24 A. That is correct.

25 Q. Okay. And this is Exhibit K-40, right?

1 A. Yes.

2 Q. Okay. All right. So this is me just making  
3 sure I understand. Okay? So, as I understand this,  
4 this is showing the average oil saturations, right?  
5 So if I look at, say, this area here in red -- which  
6 is the highest oil saturations that you calculated in  
7 the Upper San Andres, right?

8 A. Within the net-pay interval.

9 Q. Okay. So, everything within that red area  
10 would have an average oil saturation of above  
11 40 percent, right?

12 A. Generally around those specific wells, yes.

13 Q. Okay. So, that's the case with each of  
14 those areas that are colored in red, right?

15 A. Yes, that is the evaluation over those areas  
16 for the average oil saturation in the net-pay  
17 interval.

18 Q. Okay. So, that's all above -- I mean,  
19 that's above what conventional oil is considered,  
20 right? Conventional oil is generally considered to be  
21 at 40 percent oil saturations.

22 A. I don't know that that's factual everywhere.  
23 I really don't. I don't know the answer to that. Can  
24 you find documentation or cite something that  
25 specifically says that?

1 Q. What do you use when you're doing your  
2 assessments for clients on what is considered to be,  
3 you know, conventional oil saturation?

4 A. We look at what the potential of a reservoir  
5 will produce. I don't know that I specifically say  
6 that a set oil saturation is going to be producible.  
7 I think it varies from field to field, and it takes a  
8 little petrophysical work to understand all the  
9 factors that might influence that.

10 Q. But in your testimony, you told us that the  
11 residuals on saturation that you're working off of,  
12 okay, the assumption you're working off of, is  
13 20 percent to 40 percent oil saturation, right?

14 A. I think in general we show that it's in that  
15 range within the net-pay interval, yeah.

16 Q. So, the next interval up from 40 percent  
17 would be considered conventional.

18 A. I don't know any specific documentation that  
19 says that. Do you have that?

20 Q. Well, I mean, if you're saying between  
21 20 and 40 percent is residual oil, what would be  
22 conventional? It would be something above 40 percent?

23 A. What I'm telling you is, we calculate oil  
24 saturations within the average range of 20 to  
25 40 percent in the interval. I'm not determining

1 whether it's mobile or not.

2 Q. Okay. I understand. I guess my point,  
3 though, is that on this map here for the Upper  
4 San Andres, you're calculating saturations that are  
5 above what you've defined as residual oil between  
6 20 and 40 percent. Agreed?

7 A. These are the average saturations across the  
8 Upper San Andres.

9 Q. Okay. It is what it is, according to your  
10 analysis, right?

11 A. It's pretty clear it's Upper San Andres  
12 average: S-o percent high case.

13 Q. This is your Exhibit K-45, and I believe it  
14 shows the Upper San Andres oil in place by millions of  
15 barrels per section, right?

16 A. Yes.

17 Q. And that's your low case?

18 A. Correct.

19 Q. So looking at the contour intervals here,  
20 this is millions of barrels, right? So the cooler  
21 numbers, the blue numbers, it looks like you've got  
22 parts of the southwest corner of the EMSU are at  
23 about -- is this between two and four million barrels,  
24 is that right, per section?

25 A. Yes.

1 Q. And then the more aqua color is between four  
2 and six million barrels per section?

3 A. That is correct.

4 Q. So just looking at this, it looks like much  
5 of the EMSU in the Upper San Andres has fairly low  
6 calculated or estimated oil-in-place volumes,  
7 especially in the northwest, west, southwest and  
8 southern part of the unit. Do you agree?

9 A. Yeah. We have very little well data out  
10 there; it could vary. We don't have any well data, to  
11 speak of, so it's extrapolating out beyond the points  
12 up to the north on the Rice EM SWD 20, as well as the  
13 OC Fed Com and the Rice EM SWD O33M. So it's  
14 extrapolating those values based on those wells. We  
15 do not have any wells in the northwest corner.

16 I'd also like to point out that  
17 Goodnight tends to agree with our rock evaluation,  
18 because they put all their -- well, their disposal  
19 wells that they're seeking to get permitted up on the  
20 structure where the best rock quality is. And those  
21 are in the blue diamonds there. You can see those  
22 very clearly.

23 Q. Based on this map, so the highest estimated  
24 oil-in-place values are this relatively discrete area  
25 around the EMSU. Which well is that, the 658?

1 A. That would be the 658, that's correct.

2 Q. And then around the RR Bell Number 4 and the  
3 746, it looks like those two are driving the  
4 correlation here on the east side of the unit?

5 A. Yes, they are.

6 Q. And then in this other portion, it's really  
7 the 658 and maybe the 628?

8 A. Yes.

9 Q. Okay. So those are the highest oil in place  
10 in this zone, right?

11 A. Yes.

12 Q. So in this area, would you expect any  
13 recovery of oil by conventional means?

14 A. I do not.

15 Q. Okay. And I asked you this, but I think  
16 you're going to tell me the same thing, that you don't  
17 know how to -- you wouldn't be able to calculate a  
18 recovery factor for this?

19 A. That's an engineering question, yeah.

20 Q. Okay. Let me just take a moment. I know  
21 we're getting close to lunch. I'm going to see if I  
22 can wrap up before the lunch hour.

23 Mr. Bailey, did you, as part of your  
24 reservoir characterization, review Goodnight's  
25 drilling reports?

1 A. I have not, no.

2 Q. You mentioned, Mr. Bailey, in your summary,  
3 something that caught my ear, and I wanted to ask you  
4 about it. You said that XTO sold the EMSU based on  
5 the concept that there's a residual oil zone in the  
6 field. Do you recall that?

7 A. I do. It's down at 700 subsea.

8 Q. And I'm wondering, if you're saying, is it  
9 your understanding, that Empire is relying on XTO's  
10 representations regarding a potential ROZ?

11 A. I think that they evaluated that as a  
12 potential reservoir that they could eventually exploit  
13 with tertiary recovery methods, yes.

14 Q. I guess my question, though, is, is it your  
15 understanding that Empire was relying on those  
16 representations?

17 MS. HARDY: Object to the foundation. Lack  
18 of foundation.

19 HEARING OFFICER HARWOOD: I'll allow it.  
20 It's overruled.

21 BY MR. RANKIN:

22 Q. So, my question is, have you had any  
23 discussions with Empire, is it your understanding that  
24 they were relying on XTO's representations about  
25 whether or not there's a potential ROZ?

1           A. I don't know what Goodnight relied on. I  
2 would be speculating, and I'm not going to speculate  
3 on something that happened well before I -- several  
4 years before I was contacted to do my evaluation.

5           Q. Okay. Just to be clear, you're talking  
6 about Empire, right, not Goodnight?

7           A. I'm sorry. Empire, yeah. I apologize.

8           Q. Okay. But you made a point to make that a  
9 point in your summary, that XTO was marketing this for  
10 ROZ. I'm wondering why you made that point in your  
11 summary, because it's not in your testimony. I'm  
12 wondering why you decided to make that a point.

13           A. Yeah, so I found that sales package  
14 recently, and I was looking at it to -- I found a  
15 cross-section within that sales package. And that  
16 cross-section -- this is twofold. That cross-section  
17 confirms the tops, our structure, our stratigraphic  
18 model that we're using, it's very consistent with our  
19 stratigraphic model.

20                   And number two, they are actually  
21 selling on the fact that there is a ROZ zone down to  
22 negative 700 subsea, which is well below Goodnight's  
23 top, and almost down into -- really down into the  
24 Lower San Andres for us.

25                   So, I think it's very interesting that

1 Exxon sees a ROZ zone down to 700 subsea, they  
2 actually marketed their material, people evaluated it,  
3 and Empire likely took that into account as they were  
4 evaluating that.

5 I don't know if there was a bidding  
6 process for this asset. I would be speculating.  
7 Maybe they paid for that value, maybe they didn't. I  
8 don't know.

9 Q. So, XTO didn't put a ROZ below minus 700  
10 feet subsea, did it?

11 A. Not, in their sales package, no.

12 Q. Okay. So Empire wouldn't be or couldn't be  
13 relying on anything XTO marketed below minus 700  
14 subsea, correct?

15 A. I don't know. They could have relied on  
16 their own evaluation.

17 Q. I mean, we talked about this a little bit  
18 when I first engaged with you, given your experience  
19 on promoting upside potential with Anadarko. I mean,  
20 your expectation is that a buyer would want to do  
21 their own evaluation, correct?

22 A. I would, yeah.

23 MR. RANKIN: Mr. Hearing Officer, I think,  
24 if it's appropriate, I just want to make sure I'm  
25 done with the witness. Can I double check with my

1 client before we break for lunch, or however the  
2 Commission prefers to proceed?

3 HEARING OFFICER HARWOOD: How much more do  
4 you --

5 MR. RANKIN: I expect none, but before I  
6 give up the opportunity to ask Mr. Bailey another  
7 question, I want to make sure that I don't forgo  
8 something that my client wants me desperately to ask.

9 HEARING OFFICER HARWOOD: How much time do  
10 you need?

11 MR. RANKIN: Two minutes, one minute.

12 HEARING OFFICER HARWOOD: All right. We'll  
13 just stay on the record. Take your time.

14 (Pause in the proceedings.)

15 MR. RANKIN: Thank you, Mr. Hearing Officer.  
16 I appreciate the opportunity. I think I have one  
17 kind of category of questions, a small -- this may  
18 just only be one question.

19 BY MR. RANKIN:

20 Q. Mr. Bailey, looking at this oil-in-place map  
21 here for the Upper San Andres, you and I talked about  
22 the structure map previously that you had prepared and  
23 we discussed a bit about how the high structure is  
24 generally in this area I'm circling with my cursor  
25 around the EMSU 658. Do you agree that's where the

1 high structure is?

2 A. Yeah, that's the general trend.

3 Q. Okay. And so based on that, where the  
4 location of the high structure is, these hot spots  
5 with the high oil-in-place calculations, that's the  
6 only place where you've calculated a high  
7 oil-in-place, which it matches up with your high  
8 structure, correct?

9 A. It does.

10 Q. Okay. So if there were wells completed in  
11 these high oil-in-place intervals in that high  
12 structure location, you would have expected them to  
13 produce oil, correct?

14 A. I don't know that for 100 percent. Depends  
15 on where the net pay is. It could be below that at  
16 minus 350. It could be at minus 400 where the net pay  
17 is.

18 Q. But you didn't go through and evaluate any  
19 of the wells that are completed, perfed or tested in  
20 that area, did you?

21 A. I don't recall any wells that were perfed  
22 down into the San Andres specifically at 658 or the  
23 EMSU 4746 or the RR Bell or the 628.

24 Q. Anything that was perfed above minus 350  
25 subsea, which is --

1           A. I am not 100 percent sure. I'd be  
2           speculating. So I'm not going to do that.

3           MR. RANKIN: No further questions,  
4           Mr. Hearing Officer.

5           HEARING OFFICER HARWOOD: Thank you,  
6           Mr. Rankin.

7                         What's the Commission's thoughts on  
8           lunch? It's 12:05, what time do you want to  
9           reconvene, Mr. Rozatos?

10           CHAIR ROZATOS: I think we should do it like  
11           last time, yesterday, about an hour and 15 minutes.

12           HEARING OFFICER HARWOOD: Okay. All right.  
13           So we'll come back, if my arithmetic is correct, at  
14           1:20 p.m. And we'll pick up with OCD's  
15           cross-examination at that time.

16                         Thank you all. We'll be off the record  
17           for lunch.

18                         (Lunch recess was held from 12:05  
19           to 1:20 p.m.)

20           HEARING OFFICER HARWOOD: So let's see, it's  
21           Mr. Moander versus Mr. Bailey.

22           MR. MOANDER: Thank you, Mr. Hearing  
23           Officer. The OCD doesn't have any questions for this  
24           individual, so I'll pass the witness, Mr. Hearing  
25           Officer. Thank you, though.

1 HEARING OFFICER HARWOOD: Okay. Thank you.

2 We'll pick it up, then with Mr. Beck for  
3 Rice Operating.

4 MR. BECK: No questions.

5 HEARING OFFICER HARWOOD: And either  
6 Mr. Suazo or Mr. Parrot for Pilot, or anyone for  
7 Pilot. Going once, going twice. Pilot, are you out  
8 there?

9 All right. Well, nobody for Pilot, so  
10 then who wishes to start for the Commission?

11 Dr. Ampomah.

12 COMMISSIONER AMPOMAH: Thank you.

13 EXAMINATION BY THE COMMISSION

14 BY COMMISSIONER AMPOMAH:

15 Q. Thank you, Mr. Bailey. Can we bring up one  
16 of your slides? And I'll check that. I think that is  
17 going to be K-3, if we can bring it up.

18 I want to know the sensitivity analysis.  
19 You talked about you did the sensitivity analysis on  
20 the net pay. So I want to know -- I want you to  
21 explain more about the processes that went into that  
22 sensitivity analysis.

23 A. Yeah, so when Mr. Birkhead was running his  
24 petrophysical model, we had sensitivities for a low  
25 and high case on the water saturation. Okay? So we

1 had two separate things that we're doing here with the  
2 cementation and saturation exponents that are part of  
3 Archie's equation.

4 And so -- I'm sorry. Were you going  
5 to --

6 Q. No. Go ahead. I'm listening.

7 A. Okay. And so we varied the  $m$  throughout the  
8 section. The cementation exponent is varied through  
9 the San Andres, the Upper and Lower San Andres. But  
10 on both cases, that variation stays the same. The  
11 only thing that changes is the actual saturation  
12 exponent  $n$ . And so that is varied through the  
13 San Andres.

14 So that's what gives us a varying oil  
15 saturation that you see on Track 5. Okay? So that's  
16 why we have a high case and a base case, is what I'll  
17 call it, or a low case.

18 Q. Okay. Let's look at this on the Archie's  
19 equation. You said what was changing was  $n$ .

20 A. Yes,  $n$  is varied -- is different in the high  
21 case versus the low case.

22 Q. So then can you give me the values for the  
23 high and then the low?

24 A. Well, I think the variation of  $n$  on the high  
25 case is actually an algorithm that Mr. Birkhead used.

1 So that's probably a better question for Mr. Birkhead,  
2 who'll be up next.

3 Q. Okay. I appreciate that. So essentially it  
4 was the changes in the saturation that was mostly  
5 utilized in terms of the sensitivity analysis, and  
6 that automatically impacted the net pay, too?

7 A. Yeah. So that impacts the net pay because  
8 of the water saturation cutoff itself. Right? So the  
9 water saturation cutoff that was used to determine the  
10 net pay determines the amount of net pay, which is why  
11 we provide a low and a high case on every map within  
12 the exhibits.

13 Q. Okay. Let's look at this log once again.  
14 You know, I'm a little bit not sure why you picked the  
15 Lovington right at where you pick it. Why is that not  
16 the base of the San Andres or -- yeah, the top of the  
17 San Andres?

18 Just look at the gamma ray log and then  
19 explain to the Commission why you believe that the top  
20 has to be where it is compared to, let's say, where  
21 you picked the top of the Lovington.

22 A. Yeah, so the Lovington Sand has been  
23 identified an outcrop and tied to subsurface across  
24 multiple fields. And so Dr. Lindsay identified the  
25 Lovington Sand within the 679 core as well as the

1 RR Bell core. Okay?

2 So we understand that the Lovington Sand  
3 sits within the middle of the Upper San Andres; it  
4 splits the Upper San Andres. Okay? And so the upper  
5 part that you see, the next sequence up that you see,  
6 where we have a tight neutron density signature, and I  
7 don't have a pointer here, but you can see in Track 3,  
8 I'll call it Track 3, we leave the depth track out,  
9 but you can see how tight that gets at the top.  
10 That's a diagnostic signature across the field for the  
11 top of the San Andres and how it is correlated.

12 Q. But there's no changes in the PE.

13 A. No -- well, there are some subtle changes in  
14 the PE. You just can't see them. The lines are  
15 through them.

16 But in general, you're looking at  
17 similar stratigraphy, yes. You see the similar PE all  
18 the way down through the Lower San Andres as well.  
19 It's because we're dealing with dolomites, in general,  
20 or dolomitized sands, that give a similar PE  
21 representation. Okay?

22 Q. So on this particular log, are you saying  
23 that you use the core to help you identify the  
24 Lovington, or it was strictly based on the gamma ray  
25 log?

1           A. No. The core was used to identify the  
2 Lovington and the top of the San Andres.

3           Q. Now, on this particular log would you more  
4 or less deny or more or less confirm or disagree that  
5 if anybody doesn't have a core, probably they're going  
6 to put the base of the San Andres right at the top of  
7 the San Andres where you picked the Lovington Sand?

8           A. No, I am not.

9           Q. Okay. Thank you. And what is the  
10 calibration for this particular well?

11          A. I'm sorry, say that again.

12          Q. The calibration depth, because you are  
13 showing me subsea, and I mean --

14          A. Oh, the measured depth?

15          Q. Yeah.

16          A. I would have to go back to my database. I  
17 show everything in subsea. I apologize.

18          Q. Okay. And I presume you are not able to  
19 tell me what the Rw is for, let's say, this  
20 estimation, right?

21          A. What the Rw is?

22          Q. Mm-hmm.

23          A. Oh, you mean the actual Rw we used?

24          Q. Yes.

25          A. I believe that -- I'm not going to speculate

1 on that. Scott will answer that directly, yes.

2 Q. Okay. Can we go to K-2, Exhibit K-2? So  
3 the yellow location is showing Empire's SWD. Can you  
4 tell the Commission where it's completed?

5 A. The SWD?

6 Q. Yes.

7 A. I believe that there are perms within the  
8 San Andres possibly deeper as well.

9 Q. Okay. The San Andres. Is Empire going to  
10 shut that well down, do you know, or no?

11 A. I wouldn't be able to say what Empire is  
12 going to do with that well.

13 Q. Okay. So would it be fair to say that -- or  
14 let me put it this way. Has there been any analysis  
15 on this particular well whether it has impacted  
16 production in the Greenburg, that you know of?

17 A. I'm not aware of that, no, sir.

18 Q. And Empire definitely owns that well. And  
19 do you know when that well was drilled?

20 A. I don't know the exact date of when that  
21 well was drilled, but it was previous to Empire's  
22 acquisition of this asset.

23 Q. Okay. So based on your geological analysis,  
24 you say that that well, I mean the Empire SWD well, is  
25 completed in the same formation as Goodnight's SWD

1 wells?

2 A. I would say it's probably in similar zones,  
3 yes.

4 Q. Okay. Thank you. Do you have access to  
5 Goodnight's well information as part of your analysis  
6 that you did?

7 A. Do I have a sense of what information? I'm  
8 sorry.

9 Q. Okay. So I'm asking that you showed all the  
10 wells that you have in this area, but I'm asking if  
11 you had data from Goodnight's wells, the existing  
12 SWDs, as part -- or did you include that as part of  
13 your analysis?

14 A. Yes, several of the wells. So all the wells  
15 that you see with a green star on them were used in  
16 the analysis. Some of these we don't have logs for,  
17 but most of them we do. So quite a few of them.

18 Q. So, you know, we started with K-3 and then  
19 we pointed out some of the discrepancies there could  
20 be in terms of picking the tops.

21 I mean, if you pick out three geologists  
22 in the room, probably everybody's going to give you a  
23 different top. So I'm asking you, who has the final  
24 authority, you know, in terms of deciding which top is  
25 the best top?

1           Let me rephrase my question. So I'm  
2 asking that there are a lot of uncertainties  
3 associated with the tops that have been picked, and we  
4 went through one of them. Well, let's say if I don't  
5 have a core, I'm just going to pick where you picked  
6 the top of the Lovington as the top of the San Andres.  
7 But you have a core, so clearly you were able to more  
8 or less descend through that.

9           So with all these uncertainties  
10 associated with the tops here and there, my question  
11 is, do you know who has the final authority in terms  
12 of the final tops that can be adopted by the  
13 Commission?

14           A. I would expect that you would adopt our tops  
15 as the top of the San Andres.

16           Q. So you have authority. Okay.

17           A. Well, I mean, I'm not saying I have the  
18 authority. But, I mean, we have literature to back it  
19 up, we have core data to back it up, and we've  
20 correlated it across the field.

21           I don't know how -- the Lovington Sand  
22 sits in the middle of the San Andres. It's not the  
23 top of the San Andres. But I'm kind of confused on  
24 why you're determining to put the top at the top of  
25 the Lovington Sand.

1 Q. Okay. Are you aware of the New Mexico  
2 Bureau of Geology?

3 A. Yes sir.

4 Q. So was there any discussion, as part of your  
5 work, any discussion with the New Mexico Bureau of  
6 Geology with regards to discussions on the tops picks?

7 A. We did not have a discussion with them, but  
8 they have reported tops. And several wells that we  
9 can actually -- we'll show you as well.

10 Q. So how do your top picks compare to that of  
11 the Bureau of Geology's picks?

12 A. Well, it's funny enough. Sometimes they're  
13 deeper, sometimes they're right on, sometimes they're  
14 shallower. So it's very inconsistent within the OCD  
15 as well.

16 Q. Well, so are you saying that OCD picks and  
17 then the Bureau of Geology picks are sometimes  
18 different?

19 A. Oh, yes, 100 percent. And I'll show you  
20 that.

21 Q. Okay. So that establishes the uncertainty  
22 associated with the picks of the tops.

23 Now, as a commissioner and as I'm  
24 looking through all these uncertainties associated  
25 with this, are you saying that your tops that you've

1 picked more or less supercedes all the other tops?

2 A. I'm telling you that our top is consistent  
3 with the geology and the literature and the experts  
4 that have studied the field for 40-plus years. We  
5 have core data to support it.

6 I would suggest that our tops are  
7 consistent, much more consistent than either the OCD's  
8 or Goodnight's.

9 Q. Thank you. Okay. There was another well  
10 that was showed as well that had the same issue with  
11 regard to the tops. So yeah, it's a little confusing,  
12 you know. You know, we're trying to figure out what  
13 is the best solution here, so it's more challenging.  
14 But let me move on here.

15 Now, you showed in your saturation -- so  
16 if we can go to K-3, and it's the same for -- yeah,  
17 let's use K-3, for instance. You're saying that  
18 each -- that is more like 20 percent?

19 A. Each grid line is 20 percent.

20 Q. Yeah. Okay. Now, I mean, I'm still trying  
21 to figure out, based on the -- the cross-examination  
22 by Mr. Rankin showed the one well, that is a water  
23 producing well that goes through the San Andres.

24 You have a lot of experience in the oil  
25 business. Tell the Commission how, let's say, a

1 saturation of about 40 percent, 50 percent, there will  
2 never be an oil production, you know, through that  
3 well.

4 A. Are you asking why the oil wouldn't be  
5 mobile?

6 Q. Yes. At least why would there not be even a  
7 single amount of oil produced through that water well  
8 that was completed in San Andres, assuming -- you  
9 know, he went through that with you. You showed more,  
10 like, he picked -- you have percentage that's more,  
11 like, 50, 60.

12 So how is it possible that no single --  
13 each of these were tested oil production?

14 A. I'm uncertain on where the exact perms would  
15 be in those wells, number one.

16 Number two, this is all residual oil. I  
17 don't know that the water-supply wells themselves  
18 don't have skim in the tanks. I don't think any of us  
19 were there to see that, whether it's reported or not,  
20 whether there's a sheen or was some possibility of  
21 some oil that was sitting on the tanks. I don't know  
22 that answer.

23 Q. And probably the petrophysicist will help me  
24 here on this one, but let me put it on record anyway.

25 We do know -- and you talked about you

1 do not know the mobile oil here?

2 A. That's correct.

3 Q. So do you know if the petrophysicist will  
4 know about that?

5 A. I think he might give some better indication  
6 of what might be the mobile oil, but I can't speak for  
7 him.

8 Q. Okay. There are cores you showed, you know,  
9 as we went through a series of the logs. It sounds  
10 like they were cored from EMSU 329, 457, 458, 461.  
11 Why were these cores not analyzed, especially for  
12 fractures?

13 A. You mean the wells that were cored in the  
14 Grayburg?

15 Q. I think some of them were in the Grayburg,  
16 and these two was in the San Andres and all over the  
17 place.

18 A. The only wells we had access to were the  
19 RR Bell and the 679. So any core that was  
20 specifically in the Grayburg, we did not analyze. Our  
21 focus was on the San Andres.

22 Q. So is it your testimony that none of these  
23 other wells that I mentioned go through the  
24 San Andres?

25 A. The wells that you just mentioned? I'd have

1 to go back and look at the cross-section. But I  
2 assume that all those go through the San Andres, yes.  
3 We do not have core other than the RR Bell and the  
4 679.

5 Q. So you know there are cores, but you did not  
6 have access to them?

7 A. That's correct, yes.

8 Q. Okay. Now, XTO sold the EMSU, the interest  
9 in that, to Empire. Now, my question to you is that,  
10 you know, you talked about how some of the SWDs could  
11 impact, you know, the injection could impact, let's  
12 say, the upper layer, which is the upper formation,  
13 which is the Grayburg. You talked about that.

14 A. It could.

15 Q. It could. Okay. So why did XTO not oppose  
16 to any of the existing saltwater injection in this  
17 area, and even Empire went ahead and still drilled, or  
18 more or less, when it was XTO, they still have SWDs  
19 that goes into the San Andres?

20 A. That would be a question for XTO. I don't  
21 know the answer to what their thinking was on that.

22 Q. Do you really believe in all these high  
23 saturations that you are picking in nonconventional  
24 reservoir?

25 A. All our saturations, specifically on the

1 RR Bell and the 679, are tied to the core. So we have  
2 core saturations, those saturations are tied to the  
3 core. So the model is built off of that for every  
4 other well. So all the saturations that we have here,  
5 especially on the low side, that is the base case.  
6 That is tied to the core properties, the core oil  
7 saturations that were measured.

8 Q. Well, now, so are you -- is it your  
9 testimony that, let's say, K-3, Exhibits K-3, K-4 100  
10 percent matches the core saturations that were shown  
11 to us yesterday?

12 A. Down through the cored interval, yes, sir.  
13 It's very consistent, yes. I'm not going to say every  
14 single dot on the core matches, but it's very  
15 consistent. And Mr. Birkhead is going to go through  
16 that.

17 Q. But you told me -- then why do we have high  
18 and lows here in the saturation estimation?

19 A. Because this is the conventional core. We  
20 know the conventional core is probably the likely  
21 lowest oil saturation we would see. If we had done  
22 pressure or sponge core, we may have higher values, as  
23 Mr. Lindsay testified to yesterday.

24 Q. Is there a well-documented reference that  
25 substantiates the potential changes in the different

1 types of the saturation measurements?

2 A. I think he used an example out of Seminole  
3 Field. I don't believe any of these wells in the EMSU  
4 have been sponge or pressure cored.

5 Q. But there is no reference -- is there any  
6 documented, I mean, any published material on this  
7 subject to establish that?

8 A. Yes. I think Mr. Birkhead is going to go  
9 through that.

10 Q. I appreciate that.

11 A. Yes sir.

12 Q. Thank you. And then you're saying that  
13 there's going to be testimony where we do have --  
14 where the actual core measurements are correlated to  
15 your log measurements?

16 A. Yes, sir. He's going to show the  
17 petrophysical plots and all his interpretations. So  
18 you'll be able to see the core values as porosity and  
19 permeability and oil saturations or water saturations.

20 Q. So in your estimation of the oil in place,  
21 what parameter was the most uncertain?

22 A. I mean, all of it kind of is, if you're  
23 being honest. I mean, there's a range of  
24 possibilities when you're dealing with reservoirs like  
25 this. I think that, you know, that's why we provided

1 a range of probabilities, or possibilities, if you  
2 will. We wanted to show what we thought that the low  
3 side could be and the high side could be.

4 We don't see everything in black and  
5 white. And so that's why you have the low cases and  
6 the high cases, because we're showing you a range of  
7 possibilities of what could be there.

8 Q. Yeah, and you showed us, you know, these  
9 higher numbers that you have in your testimony, which  
10 would be K-55. Yeah, you showed us that. And my  
11 question to you is, why is this not conventional play?

12 A. Well, it's because he's got significant  
13 water and it's below the oil-water contact. So when  
14 this field was being drilled, they were staying above  
15 the oil-water contact, in conventional wisdom, as you  
16 would.

17 You know, when you're drilling  
18 conventional wells, you're not trying to drill below  
19 the oil-water contact. What's left is a residual  
20 zone, and that's what's being targeted all around  
21 these fields that I have shown.

22 The EOR efforts that are being done to  
23 date within the San Andres is because they're all  
24 residual oil zones. They weren't targeted as a  
25 conventional primary pay.

1 Q. Okay. Then what is the wettability here in  
2 the San Andres in the EMSU?

3 A. I think that that's a question that Scott  
4 will be able to answer for you.

5 Q. So there's been a mention of the Seminole  
6 Field, Tall Cotton, Goldsmith sites. Can you tell the  
7 Commission what kind of numbers, in terms of the oil  
8 in place, that we have in these analogous wells -- no,  
9 fields that we are talking about here today?

10 A. The oil-in-place numbers for the other  
11 fields?

12 Q. Yeah, if you can.

13 A. I didn't evaluate the other fields  
14 personally, so I don't have the numbers for those. I  
15 haven't done the study on those fields.

16 Q. And they are not in the literature?

17 A. They may be, but I didn't look for specific  
18 numbers. All I was trying to illustrate is if there  
19 are several EOR projects going on in these fields.

20 Q. So then these numbers that has been  
21 calculated as oil in place, was it compared to any  
22 other play within the Permian?

23 A. My evaluation was strictly for the EMSU.

24 Q. Now, based on your limited experience, you  
25 know, as you went back and forth in the ROZs

1 prospecting, you know, so how did you do the quality  
2 checks, you know, on your results? How did you do  
3 that?

4 A. The petrophysical modeling and the log  
5 analysis itself is consistent no matter what reservoir  
6 you're looking at.

7 Q. You don't believe that the ROZ is more  
8 complex and cannot necessarily be treated as a  
9 conventional reservoir?

10 A. I think when you have core data to calibrate  
11 your petrophysical models to, that you've got a pretty  
12 good process to be able to model the rest of the wells  
13 in the field.

14 Q. Now, there was a discussion about, you know,  
15 the paper that was published in 1996 by Strickland, et  
16 al. I hope I've got the name right. And the  
17 discussion, you know, as we all read, is more like the  
18 production or the let's say the migration of the water  
19 from the San Andres was not through the formation. At  
20 least that is what I read. And they are saying that  
21 it's through the wellbore.

22 I mean, how do you explain this, do you  
23 have any knowledge, as a geologist?

24 A. I don't know how to explain sulfate barium  
25 waters getting into the Grayburg when the Grayburg

1 doesn't have sulfate barium water.

2           So my presumption is, if you ask me on a  
3 commonsense basis, that as the Grayburg main pay zone  
4 was being produced, you're reducing pressure within  
5 the Grayburg, which naturally fluids are going to find  
6 their way to the lowest pressure zone. So given the  
7 amount of fractures that we saw in core, the  
8 likelihood of fracturing up on the structure  
9 themselves, that we have some migration of the fluids  
10 into the Grayburg. I really don't see how any other  
11 way it could have gotten there. That's my point, I  
12 guess.

13           Q. Okay. We've talked about this one.

14           I still want to talk a little bit about  
15 that EMSU 457 and then 458 well.

16           COMMISSIONER AMPOMAH: So I don't know if  
17 you can bring it up, 457 and then 458.

18           THE WITNESS: 810, 11, somewhere in there.

19           COMMISSIONER AMPOMAH: I should have put the  
20 K number. I don't have it.

21           THE WITNESS: It's in the cross-section.

22           COMMISSIONER AMPOMAH: Yeah, it should be  
23 multiple logs, I think, that are being compared.

24           THE WITNESS: It was used for the  
25 stratigraphic correlations. It's in the

1 cross-sections.

2 COMMISSIONER AMPOMAH: So probably let's do  
3 14. Yeah, let's do K-14.

4 BY COMMISSIONER AMPOMAH:

5 Q. So in K-14, we do have EMSU 628 well. I'm  
6 actually on the same record, though. You have the  
7 Lovington Sand where you picked it, where you picked  
8 the Lovington Sand.

9 I mean, if you look at the gamma ray log  
10 on the Track 1, water should not be where the  
11 San Andres is, just looking at -- I mean, this one,  
12 there's no core. So just looking at the gamma ray log  
13 signature, I'm still trying to figure that one out.

14 A. Doctor, you could correlate the tops across  
15 the field, and that's where the top sits, and it's  
16 always above the Lovington Sand.

17 You need to always remember, the  
18 Lovington Sand sits in the middle of the Upper  
19 San Andres; it splits it. And so you can't have the  
20 top of San Andres at the Lovington Sand. Okay? We  
21 know that. We know it from literature. We know it  
22 from the core data. I mean, the top of San Andres  
23 sits above the Lovington Sand.

24 That is why the top is where it is, and  
25 it's correlated back to the core wells 679 and the RR

1 Bell.

2 Q. I guess I'm going to ask OCD about that.

3 So the water wells, the water wells, and  
4 I think 457 and the 458 water wells, so if we can get  
5 that one. I think that one should be --

6 A. K-12.

7 Q. No. That should be K-10.

8 A. K-10. Sorry.

9 Q. Yeah. So K-10, again, so let's just pick  
10 one of them. These are water wells, so let's pick,  
11 let's say, 457. And in there, let's say, the  
12 petrophysics is showing saturations in excess of,  
13 like, 50 percent, 40 percent, 50 percent.

14 As part of the analysis that you did,  
15 did you review the well records for these wells?

16 A. I didn't review any well records for those  
17 wells, no, sir.

18 Q. So as part of the petrophysics that was  
19 done, was there a review of the well records?

20 A. No. The petrophysics was modeled off the  
21 core wells.

22 Q. The petrophysics was modeled --

23 A. The petrophysics was modeled off the two  
24 core wells we have. Those are the only core data,  
25 physical rock data we have to calibrate to. That is

1 extrapolated into the well logs for all the other  
2 wells that don't have core.

3 Q. But here you've done a petrophysical  
4 analysis right here.

5 A. What do you mean? Yes, we have a  
6 petrophysical analysis that's extrapolated to the  
7 other wells based on the core wells.

8 Q. So are you telling the Commission that,  
9 let's say, you did not utilize the software to  
10 interpret these logs to get, let's say, the  
11 saturations, the net pay, the net gross and all of  
12 that, that you're showing here, there was no analysis  
13 then?

14 A. No, we had the raw logs. We didn't create  
15 these logs. We had the logs when they were logged.  
16 Okay? All I'm telling you is, is that our  
17 petrophysics, so the saturations you're seeing -- the  
18 porosity you see is not -- is not changed. That's the  
19 dolomite porosity. Okay? The resistivity is what it  
20 is. The PE curve is what it is.

21 The only thing that's changed here is  
22 the low and high saturations that you're seeing in  
23 there.

24 Q. Do you know if there is any relative perm  
25 that has been done on any of these cores?

1           A. I know that there are permeability  
2 measurements, yes.

3           Q. No, I mean, relative perm.

4           A. That's a question for Scott. I believe  
5 there has, but those are -- those are -- there's  
6 definitely perm measurements.

7           Q. Yeah, okay. Because I want to know the  
8 critical oil saturation for the San Andres, at least  
9 in the EMSU. And then even I want to know what the  
10 residual oil saturation to water injection in the  
11 Grayburg, how much is it, you know?

12                        So that is to -- that is going to help  
13 us a lot, you know, in terms of being able to  
14 ascertain these saturations.

15                        And, you know, you talked about these  
16 saturations are based on the core, but, you know, if  
17 you were here yesterday, based on Dr. Lindsay's  
18 testimony, you do have a core where the saturation of  
19 the water and the saturation of the oil doesn't sum up  
20 to 1. And I asked about where that difference is --

21           A. That's probably air. You're expulsing  
22 water, you're expulsing gas, you're expulsing oil out  
23 of the core. You're never -- you're likely never  
24 going to get to 1 on any core you take.

25           Q. Yeah. I'm getting to that more, because

1 when you say that, let's say, the remaining saturation  
2 can be, let's say, air, I don't think that was  
3 factored when you try to do the correlation of the  
4 well log information to that of the core. But I know  
5 want you mean, so I'm not going to really go that far.

6 So is it your testimony that the core  
7 data was the one that was, more or less, utilized for  
8 the quality checks on the estimations that were made,  
9 especially for the saturations?

10 A. Yeah. So all the wells are -- the two core  
11 wells we have are core calibrated, and all the wells  
12 are quality checked based off that core calibration.  
13 That is the n points for the petrophysical model.

14 Q. There was a discussion about the  $B_o$  and  
15 since you presented and you worked on it, I mean, you  
16 used it in estimating your oil-in-place calculation,  
17 do you know the source of that?

18 A. That source is from Empire's engineer.

19 Q. Were there any variations in the uncertainty  
20 that was calculated, let's say, for the high and then  
21 the low for the  $B_o$ ?

22 A. No, I used the same  $B_o$  for both.

23 Q. So then let me repeat my question earlier on  
24 and ask you, if you look at the  $7758 A_h \phi_{IT} 1 \text{ minus}$   
25  $Sw_u$  over the  $B_o$ , which of these parameters is more

1 uncertain?

2 A. Well, I think that, like I said, through the  
3 cored interval, I think we're confident with the --  
4 based on the core measurements.

5 Now, where we get into wells where -- or  
6 in the lower San Andres where we don't have core,  
7 obviously there's going to be some uncertainty with  
8 that because we don't have physical rock to tie it to.

9 So our model is just carried on down  
10 based on the core data all the way through the  
11 San Andres. We did not alter it in any way.

12 Q. You know, in your Exhibit K-3, you talked  
13 about the DT, that is the sonic log. I heard you say  
14 there is some inconsistency with the sonic log, so you  
15 did not use that in calculating your porosities.

16 A. I said that we don't typically use sonic  
17 logs based on themselves to generate sonic porosities  
18 because there can be inconsistencies with them. We  
19 would have to model that porosity based on the sonic  
20 log. It's not that we can't do it. It's just not as  
21 good as the density log.

22 And in that case of that well, we didn't  
23 have a neutron log anyway, so we would not have done  
24 the petrophysical analysis on that well.

25 Q. Okay. Let's talk about the oil-in-place

1 calculation for a moment. So if you look at those  
2 values that was in your testimony, and now the K-55,  
3 so did you perform any, like -- let me just put it  
4 this way. What is the uncertainty associated with  
5 these calculations?

6 A. I mean, I can't quantify what the  
7 uncertainty would be. All I'm telling you is we put a  
8 low case and a high case, based on our model. And  
9 that's our range of possibilities.

10 Q. So when I asked you about it, I said what is  
11 the standard deviation from -- assuming you have --  
12 you have 190, you have -- I mean, you have 331. In  
13 the Lower San Andres, you have 438.76 low and then  
14 718, so I'm asking you, what is the -- I mean, what is  
15 the uncertainty associated with this? You should be  
16 able to quantify that.

17 A. I would suggest that our range of  
18 possibilities is quantifying the possibility or  
19 uncertainty, as you call it.

20 Q. So, more or less, the average between them  
21 would be more like your mean?

22 A. I think that our total is a low side case  
23 for our model, and the high case, as you can see on  
24 the right. I mean, that's why we're providing the  
25 sensitivities, to give you a low case based on the

1 model.

2 Q. No, this is not a sensitivity. I mean, you  
3 said that there is a way that you calculated the low  
4 and then there's a way that you calculated the high.

5 If you're talking about uncertainty,  
6 then I want to see expectation curve that shows all  
7 the statistical analysis to show us even where the p50  
8 is. Because this has a lot of uncertainty in terms of  
9 your standard deviation.

10 A. Okay. I do not have any curves to show you  
11 on uncertainty analysis. But I would argue that our  
12 base case is consistent with the core data, so -- our  
13 base case, our low case, is the core data saturations.  
14 The high case is corrected based on using a sponge  
15 core or a pressure core, what would the percentage be  
16 of increase.

17 And so when you say that there's no  
18 sensitivities done, I guess I would argue that us  
19 providing a low and high case instead of a black and  
20 white case of what could be there, we're at least  
21 providing a range of possibilities of what we think  
22 there. So you can look at it as a range of  
23 possibilities or you could look at it as potential  
24 uncertainty of could it be this high or could it be  
25 this low.

1 Q. Yeah, you made a great point. So you're  
2 saying that, let's say -- and I know that Scott will  
3 get into this more -- that your lower case is based on  
4 the core?

5 A. That's correct. That's the base case.

6 Q. Now, are you saying that your high case is  
7 based on, let's say -- assuming you are using a sponge  
8 or, let's say, some other way of calculating the  
9 saturation, how are you able to quantify that?

10 A. Well, that's what I'm saying. Out of the  
11 Seminole Field, there's the published data of the  
12 increase with a sponge core from 18 percent to  
13 24 percent, to a pressure core of 32 percent.

14 And so you can take that range there and  
15 you can use that to say, okay, our potential oil  
16 saturations could be higher in this core, we believe,  
17 we've expelled the oil out of it. So if we provide  
18 that range, if we have done a sponge core or a  
19 pressure core, then our possibility of our volumes  
20 could be much higher than what we're seeing based on  
21 those oil saturations.

22 Q. So you mean that --

23 A. That it's providing you with the sensitivity  
24 of potential oil volumes within the reservoir.

25 Q. I mean, when you talk about, let's say,

1 sensitivity, we all do know that in petroleum, we do  
2 have a way to report our oil in place, and that is the  
3 one I'm talking about. I mean, and I've forgotten  
4 that paper, I know we have the same -- we're trying to  
5 do the same for CO2.

6 COMMISSIONER AMPOMAH: Steve, I don't know  
7 if you remember that one, I mean, that document that  
8 talks about how we more or less assign uncertainty  
9 with regard to our --

10 CHAIR ROZATOS: We'll have the doctor  
11 reiterate his question.

12 Doctor, I apologize for that.

13 COMMISSIONER AMPOMAH: No problem. Thank  
14 you.

15 BY COMMISSIONER AMPOMAH:

16 Q. So you've done some, let's say, analysis  
17 here using more of the low, based on the saturation.  
18 So I get that, and that more or less has become of  
19 your mean.

20 But when I say that this probably is not  
21 sensitivity analysis, even though you are showing us  
22 high and low, based on some assumptions, you know,  
23 based on some assumptions, as petroleum, you know, in  
24 our petroleum business, we do have a way of actually  
25 representing our volumes. And that is based on

1 uncertainty analysis, and that is the one that I'm  
2 talking about. And when we get on the break, I can  
3 check and see that document and then probably  
4 reference that.

5 Now with these volumes that has been  
6 presented to us, do you know how much of this is  
7 recoverable?

8 A. I do not. That would be an engineering  
9 question.

10 Q. So is that something that probably Scott is  
11 going to speak to?

12 A. Scott is not an engineer. He's a  
13 petrophysicist. I suspect that you'll get that from  
14 one of the engineers that are testifying.

15 Q. So there is a possibility that the recovery  
16 factor here could be zero, right?

17 A. It's not my expertise to speak on that.

18 COMMISSIONER AMPOMAH: Okay. Let me check  
19 to see if I have any other questions. I think I'll  
20 probably reserve my other questions for the  
21 petrophysicist. So thank you so much.

22 THE WITNESS: Thank you.

23 EXAMINATION

24 BY COMMISSIONER LAMKIN:

25 Q. Good afternoon, Mr. Bailey.

1           A. Good afternoon.

2           Q. Thank you for testifying this afternoon. I  
3 think I just have one question that wasn't covered  
4 already.

5                   Can you speak a little bit more to what  
6 you see as the underlying flaws to the methodology for  
7 determining tops that Goodnight uses as far as  
8 pressure differential between zones?

9           A. Yeah. I think that it's -- I've tried to  
10 make it clear, and I think we'll go through some more  
11 of this. But I've tried to make it clear that they  
12 did do the research, right?

13                   So we have outcrop tied to subsurface,  
14 along -- as I mentioned, along the Northwest Shelf,  
15 the stratigraphy. San Andres Lovington Sand still  
16 present. It's consistent, and obviously we have the  
17 core data that clearly Goodnight -- I don't know  
18 whether they used it. I don't know if they understand  
19 what the stratigraphy is.

20                   What I will say is that moving your top  
21 up and down on pressure boundaries, or where you may  
22 have taken losses in mud, is not geology. And it  
23 neglects the literature, the experts that have come in  
24 here and done all the outcrop work and tied this to  
25 subsurface, and it neglects the stratigraphic model.

1           We have not created anything new here.  
2       We've just done the homework. That's all it took, is  
3       I came in, I do the research, I contact the experts  
4       that have worked in this field for decades, I get  
5       their opinions and what they've worked on and try to  
6       understand it and then put a model together. And  
7       that's all I've done.

8           And having the two cores make it very,  
9       very clear. And then as I use the logs across there,  
10      which I think are fairly simple to correlate across in  
11      most cases, you know, I think it's a simple model that  
12      is consistent with what's been done in the past.

13           I don't think what they've done -- and I  
14      think they admit that. It's not geology, it's  
15      engineering.

16           Q. Thank you for that response. I think the  
17      only other question I have is, in your opinion, do you  
18      think that any disposal into the San Andres in  
19      commercial quantities is inadvisable.

20           A. I do. I think you're causing harm to  
21      Empire. I don't think it's -- you know, I know Bob  
22      said this, but they're the operator of the EMSU.  
23      Okay? They're the operator. They run the EMSU unit.  
24      They pay for it, they bought it.

25           Whether you think they're going to go do

1 EOR, I do, I know they have some tests, they plan.  
2 And I think that they should have the opportunity to  
3 go in and actually test this without having continued  
4 water injection influencing what could happen in the  
5 San Andres, or furthermore, overpressuring the  
6 San Andres and having breakthrough into the Grayburg  
7 where it causes damage to their existing Grayburg  
8 producers. I think it's a very fine line and very  
9 dangerous.

10 COMMISSIONER LAMKIN: Thank you. No more  
11 questions.

12 CHAIR ROZATOS: Thank you for your testimony  
13 today. I don't have any questions.

14 MR. RUBIN: No, no questions.

15 HEARING OFFICER HARWOOD: All right, then.  
16 Ms. Hardy, redirect.

17 MS. HARDY: Yes. Thank you. I don't think  
18 this will take too long.

19 REDIRECT EXAMINATION

20 BY MS. HARDY:

21 Q. Mr. Bailey, when Mr. Rankin was questioning  
22 you earlier, he asked several questions about your  
23 experience in evaluating different formations. Do you  
24 recall those questions?

25 A. I do, yes, ma'am.

1 Q. And do you follow the same general  
2 geological principles of reservoir characterization  
3 when you are evaluating different formations?

4 A. Yes, we do. That is the standard workflow  
5 we use, and it's been tried and true. We typically  
6 have repeat clients for it, as we do a lot of A&D  
7 evaluations?

8 Q. Mr. Rankin asked you several questions about  
9 whether the San Andres and Grayburg function as  
10 separate reservoirs. Do you remember those questions?

11 A. I do.

12 Q. Okay. And I think you stated that they are  
13 different from a geological standpoint?

14 A. That is correct.

15 Q. But can fluid migrate between them?

16 A. I believe it can, yes.

17 Q. Mr. Rankin also asked you questions about  
18 XTO's sales documents. Do you recall those questions?

19 A. I do.

20 Q. And do you have experience with XTO's  
21 reservoir evaluations?

22 A. I have some experience with them, yes.

23 Q. And in your experience, are they generally  
24 reliable?

25 A. They're generally very thorough. Certainly

1 on the geology side. I mean, they're generally  
2 recognized as the fathers of sequence stratigraphy, so  
3 they know what they're doing.

4 Q. Mr. Rankin asked you a number of questions  
5 about the State geologist formation top picks for the  
6 EMSU 628 included in the NMOCD well file. Do you  
7 recall those questions?

8 A. I do, yes.

9 Q. And he showed you a document from the well  
10 file?

11 A. Yes, he did.

12 Q. Okay. I'm going to pull up that document  
13 here, as well as some others, and ask you about them.

14 Actually, so this -- is another document  
15 from that same well file? I'm not sure if it's --

16 A. We can show the same one that Mr. Rankin  
17 showed. We can also show what the operator provided  
18 as the tops, and then we could go well by well so that  
19 the counsel here can see that even the OCD varies  
20 their tops from well to well, depending on, I guess,  
21 where the State geologists wanted to put them.

22 Q. Okay. Have you looked -- can you identify  
23 this document that I've pulled up here on the screen?

24 A. Yes, I can.

25 Q. And what is it?

1           A. That is the EMSU 628 wellbore with the perfs  
2 that XTO had within the well.

3           Q. And is it the same well that Mr. Rankin  
4 showed you that --

5           A. It is, yes. This is 628. So you can see at  
6 the bottom, and I think this is important for everyone  
7 to see, the San Andres perfs, as I documented in my  
8 testimony, as they have labeled, they have the  
9 Grayburg perfs labeled Zone 1, 2, Zone 2A, Zone 3, 4,  
10 5, 6. And then SA is San Andres. San Andres perfs at  
11 3918 to 24.

12                   If we go back to the cross-section, and  
13 I believe that was K-14.

14           Q. You said it's the K-14?

15           A. I believe it's K-14, yeah. It's the  
16 cross-section. I want to get this across, because  
17 only half the story is there when you show just what  
18 the State geologist picked. And so that's the  
19 importance of this.

20                   So in 628, you can see perfs starting  
21 designated at 3918 measured depth by XTO as reported  
22 to the State. And we just showed you that document.

23                   At 3918, that's exactly where our top of  
24 San Andres is. Those are San Andres perfs provided by  
25 the operator.

1           Now, if you go back to what the State  
2 geologist decided, I believe Mr. Rankin pointed out  
3 that he had a top of 4075, which is where Goodnight  
4 put their top. So that's already inconsistent with  
5 what the operator reported.

6           Now let's go to the 658. Can you go to  
7 the 658? Do you have it up? Yeah, okay. Good. Can  
8 you scroll down a little bit.

9           You can see the San Andres perf is at  
10 3995 to 4004. Everybody agree with that? We can all  
11 see that? Zoom in there. We've got it at 3995 to  
12 4004 is the top of San Andres as reported by XTO to  
13 the State.

14           Now can we go to the State geologist  
15 where he reported the top?

16           Q. Let me just pull that one up. For the 658?

17           A. That is correct, yes.

18           Q. Sorry, I'm having to switch back and forth  
19 to what I'm showing here.

20           A. That's okay. That's great. So they  
21 reported the top for the 658, and the State geologist  
22 reported it at 3949.

23           Now if you'll go back to the  
24 cross-section, please.

25           If you'll recognize, we're the top of

1 our -- on 658, where we have the top of the  
2 San Andres, the top of the San Andres is about 3950.  
3 It sits right in the middle. Would you all agree?  
4 And you can see that correlation from the 628 to the  
5 658.

6 So the State geologist reported in this  
7 well the exact top that the operator reported. But  
8 yet, in the 628, they didn't.

9 So let's do one more. Let's do 713.

10 Q. There it is, right?

11 A. Okay. So 713, we don't have the top of  
12 San Andres here as reported by XTO, but what we do  
13 have is the cast iron bridge plug set at 4052.

14 Now would you please go back to the  
15 State geologist top for this well. Even though the  
16 operator didn't report a top of San Andres, the State  
17 geologist has the top at 3942.

18 Can we go back to the cross-section? So  
19 let's look at this. So the cast iron bridge plug that  
20 the operator reported is right there, you can see it  
21 in the pink bar in the depth track, in the measured  
22 depth track. About 4052 is the bottom of it. But yet  
23 the State geologist reported the top 3942.

24 THE WITNESS: Now, Doctor, you asked me,  
25 "Maybe I need to talk to the OCD." I think you can

1 look at this cross-section and you can certainly see  
2 the top of the Grayburg. I think you can certainly  
3 see correlating our top with the San Andres, can you?

4 Where we have the top of the San Andres,  
5 do you agree across those sections that that looks  
6 the same?

7 Okay. I apologize. I'm just saying --  
8 I don't mean to -- I don't mean -- I apologize for  
9 putting you on the spot.

10 A. But I think that most people in the room  
11 could look at this and see that the tops correlated  
12 across here are very consistent. And the inconsistent  
13 thing is what's being reported by the operator and  
14 what's being put down as the OCD top.

15 So if Goodnight went by what was done by  
16 the OCD, then their top would have to be up in the  
17 Grayburg, which would be inconsistent with what  
18 thicknesses they're predicting for the Grayburg. It  
19 would certainly be significantly less than the  
20 400 feet that they're expecting.

21 Q. Mr. Bailey, is there anything else that you  
22 wanted to add about these?

23 A. I don't. I think that there's a diagnostic  
24 signature for the top of San Andres. We know we have  
25 the Lovington Sand that's sitting in the middle.

1 You've got to be above it. I think that the neutron  
2 density curves, the bulk density curves, give you a  
3 great indication of where the top of that is.

4 I think that there is some areas where  
5 you have some porosity, like you see in 628, at the  
6 top of it. But you can see the gamma ray signature is  
7 very consistent through here.

8 I think in my case, as I keep saying, I  
9 think it's fairly easy to correlate. I think this  
10 section -- and I've looked at a lot of logs and it's  
11 probably not fair to everyone else, but to me it seems  
12 very easy to correlate.

13 MS. HARDY: Mr. Hearing Examiner and  
14 Commissioners, I would like to move the three XTO  
15 documents as exhibits. Since Mr. Rankin had  
16 identified part of the well file for one of those, I  
17 think they need to be admitted in the interest of  
18 completeness.

19 HEARING OFFICER HARWOOD: Do you have  
20 numbers for them?

21 MS. HARDY: They can -- in terms of the  
22 exhibit numbers?

23 HEARING OFFICER HARWOOD: Sure, for the  
24 record.

25 MS. HARDY: Yes, for the record. Let me

1 just get to -- I think they would be K-57, 58 and 59.

2 HEARING OFFICER HARWOOD: Mr. Rankin.

3 MR. RANKIN: No objections.

4 HEARING OFFICER HARWOOD: Objections from  
5 OCD.

6 MR. MOANDER: No objection, Mr. Hearing  
7 Officer.

8 HEARING OFFICER HARWOOD: Mr. Beck?

9 MR. BECK: No objection.

10 HEARING OFFICER HARWOOD: Any objection from  
11 Pilot?

12 MR. SUAZO: No objection, Mr. Hearing  
13 Examiner.

14 HEARING OFFICER HARWOOD: Okay. That will  
15 be admitted.

16 MR. RUBIN: Mr. Hearing Examiner, if I may.  
17 If we can just ensure that those are e-mailed to all  
18 parties, as well as to Ms. Apodaca?

19 MS. HARDY: I will do that. And I also  
20 wanted to include the State geologist picks that we  
21 referenced, along with each matching well.

22 HEARING OFFICER HARWOOD: As part of these  
23 numbered exhibits?

24 MS. HARDY: Yes, correct.

25 HEARING OFFICER HARWOOD: Do I need to go

1 through the objection thing again? If I hear  
2 silence, I'll assume those are part of those  
3 exhibits. And I hear silence. They'll be made part  
4 of those.

5 MS. HARDY: Thank you.

6 (Admitted: Empire New Mexico  
7 Exhibits K-57, K-58 and K-59.)

8 BY MS. HARDY:

9 Q. Mr. Bailey, I just have a couple of other  
10 questions for you.

11 If we can look at your Exhibit K-14  
12 there, can you go through -- and maybe you already did  
13 this with respect to the State geologist's pics, but  
14 let me know, and just summarize the tops of the  
15 formations and what you're showing on that exhibit?

16 A. Yeah, I'm showing the top of the Grayburg,  
17 the top of the San Andres, the Lovington Sand, the  
18 San Andres Goodnight picks for the 628 and 658 that I  
19 had, as well as the Lower San Andres.

20 Q. And if we look at your cross-section,  
21 Exhibit K-6, this is the one I meant to look for, does  
22 this show the top of the Lovington Sand?

23 A. It does. It shows it below the Premier  
24 Sand, below the top of the San Andres Formation.

25 MS. HARDY: Let me just make sure that those

1 are all of my questions. And that's it. I don't  
2 have any other questions. Thank you.

3 HEARING OFFICER HARWOOD: Okay, great. May  
4 this witness be excused?

5 MR. RANKIN: Mr. Hearing Officer, I know  
6 that you're not eager to open doors for recross,  
7 however, there were a couple comments that Mr. Bailey  
8 made on his response to redirect that I believe I  
9 need to address or ask a couple questions about.

10 And if you'd like, I can explain what  
11 they are and why.

12 HEARING OFFICER HARWOOD: Go ahead. It's an  
13 informal hearing. I may regret this.

14 RECROSS-EXAMINATION

15 BY MR. RANKIN:

16 Q. Mr. Bailey, in your comment, you made the  
17 comment about Goodnight's -- what Goodnight did or  
18 didn't do with the core as part of its effort to  
19 identify the top of the San Andres.

20 You don't know, as you sit there,  
21 whether Goodnight Midstream had available to it the  
22 RR Bell Number 4 core or the EMSU 679 core at the time  
23 it made its picks, do you?

24 A. I do know that they had access to the  
25 RR Bell core and they did not use the RR Bell core.

1 Q. Let me ask you again. As you sit here, you  
2 don't know whether Goodnight Midstream had access to  
3 those cores at the time it made those picks, do you?

4 A. I don't, no.

5 Q. Thank you. Mr. Bailey, you were asked about  
6 whether or not the injection into the San Andres is  
7 causing harm to the San Andres and to Empire. And you  
8 said in response that the Empire has some tests, and I  
9 don't know what those tests are. And I'm wondering  
10 what tests you're talking about.

11 A. I'm suggesting that they have the game plan  
12 to go and test the potential for the San Andres ROZ.

13 Q. Okay. So you're telling me that you  
14 misspoke, because they don't have any tests at this  
15 point?

16 A. I'm not saying they have current tests. I'm  
17 saying that they're expected to go figure out whether  
18 they can make this work as a potential ROZ zone.

19 Q. I misheard you then, because I thought you  
20 said that they have tests. I wanted to make sure I  
21 understood that.

22 When Ms. Hardy was asking you questions  
23 about XTO and your experience with XTO, you told her  
24 that your experience with XTO is that they're  
25 reliable, their evaluations are reliable, right?

1           A. In general, I believe so, yes. Anything  
2 that comes from Exxon has pretty strong oversight.

3           Q. Now, in your Exhibit K-55, you identified  
4 your analysis for the oil in place, right?

5           A. Mm-hmm.

6           Q. And as I understand, your testimony is the  
7 low case and the high case, this is all limited to the  
8 exterior boundaries of this EMSU, correct?

9           A. It is. Just the blue box, that is correct.

10          Q. So, for example, the Upper San Andres, your  
11 low case is 190 million barrels for that blue box.

12          A. That's correct.

13          Q. And for the Lower San Andres, your low case  
14 is 438 million barrels for that blue box, right?

15          A. That's correct.

16          Q. Okay. But, you know, you told me also  
17 previously that you had looked at XTO's brochure  
18 promoting the potential upsides in the EMSU and the  
19 three units, correct?

20          A. Yes.

21          Q. And in that brochure, which is part of  
22 Mr. Wheeler's exhibit packet, I believe it's  
23 Exhibit A-5, it identifies all three exhibits --  
24 rather, all three units, and it shows a type log for  
25 the three units with a 900 million barrel oil-in-place

1 assessment for all three units. Do you see that?

2 A. Mm-hmm.

3 Q. But your analysis is that the EMSU alone on  
4 the low case is 629 million barrels.

5 A. Okay.

6 Q. That's a substantial difference than XTO.

7 A. I haven't done the analysis on AGU or  
8 EMSU-B, so I don't know what the ranges are for either  
9 of those. If you have those, I'd certainly love to  
10 see them.

11 Q. But even on the high side, you're estimating  
12 one billion barrels, which is just for the EMSU.

13 A. I would like you to keep in mind that we  
14 evaluated the total San Andres. They cut it off at  
15 700 subsea TVD, so we have additional footage that  
16 we're including in that value.

17 Q. Say that again.

18 A. They cut it off at the base of the ROZ,  
19 which they have at 700 subsea. We continue to use all  
20 our wells all the way down to the Glorieta, so we have  
21 additional footage we're including in our values.

22 Q. So more apples-to-apples would be to compare  
23 your Lower San Andres to --

24 A. No. I think that if we cut ours off at 700  
25 subsea for the actual calculation, that our numbers

1 would come down to whatever their numbers, probably  
2 likely closer to what they have.

3 Q. Okay.

4 A. The Upper San Andres would not change. The  
5 Lower San Andres would.

6 Q. But wouldn't they both have to change?

7 A. No, because the base of the ROZ is below the  
8 Upper San Andres.

9 Q. When Dr. Ampomah was asking you about trying  
10 to pick the San Andres top, I had a question there,  
11 because you were relying heavily on the Lovington  
12 Sand, okay, identifying the Lovington Sand, knowing  
13 then that the top is going to be above that, right?

14 A. That's an important marker, yes.

15 Q. Because above the Lovington Sand, then  
16 you've got the Premier Sand, right?

17 A. The Premier Sand would be at the base of the  
18 Grayburg.

19 Q. Okay. But as we understand from  
20 Dr. Lindsay's testimony and his, you know, substantial  
21 work on the EMSU and the Grayburg, that the EMSU and  
22 the Grayburg was subaerial exposed numerous times,  
23 right?

24 A. Yes, with within sequences, high-frequency  
25 sequences. Yeah.

1 Q. Okay. And it's possible and it's likely --  
2 is it -- let me ask you this. Is the top of the  
3 San Andres, actually is it an unconformity?

4 A. It is. It's a composite unconformity.

5 Q. Okay. And so --

6 A. Sequence boundary. Excuse me.

7 Q. So over time, when the sea surface receded,  
8 isn't it impossible that there could be erosion that  
9 would have cut through unconformities?

10 A. There could be collapse over time for sure,  
11 yeah. And so what you might see is collapse breccias,  
12 which may indicate where you're seeing some of that  
13 tighter neutron that doesn't have the porosity  
14 associated with the gamma ray signature.

15 Q. Well, I'm not actually talking about  
16 collapse breccias. I'm talking about actually erosion  
17 through time, cutting through time, resulting in loss  
18 of features, right?

19 A. What you would see is actually karstic. You  
20 would not see a significant amount of erosion on the  
21 dolomites themselves. You might see karstic collapse.

22 I don't know, if you're arguing that we  
23 have 150 feet of erosion occurring over the period  
24 between the San Andres and Grayburg, I would tell you  
25 that that's not occurring.

1 Q. So you haven't seen that?

2 A. No.

3 HEARING OFFICER HARWOOD: Mr. Rankin, you're  
4 beyond two questions --

5 MR. RANKIN: I'm done.

6 HEARING OFFICER HARWOOD: -- and what was  
7 asked on redirect. Are you done?

8 MR. RANKIN: I am done, yeah.

9 HEARING OFFICER HARWOOD: All right. So may  
10 this witness be excused?

11 MR. MOANDER: No objection from OCD.

12 MR. BECK: No objection from Pilot.

13 HEARING OFFICER HARWOOD: Rice and Pilot?

14 MR. SUAZO: Yeah, the witness may be  
15 excused.

16 HEARING OFFICER HARWOOD: Okay. All right,  
17 Mr. Bailey, thank you.

18 We'll take a break at 3 o'clock. So  
19 we've got 30 more minutes. Why don't we start  
20 with -- is it going to be Scott Birkhead?

21 MS. HARDY: Correct. Scott Birkhead is our  
22 next witness.

23 HEARING OFFICER HARWOOD: Okay. Is that  
24 okay with the Commission?

25 Ms. Hardy.

1 MS. HARDY: Ms. Shaheen is actually  
2 presenting Mr. Birkhead.

3 HEARING OFFICER HARWOOD: Okay.

4 MS. SHAHEEN: I'm sharing now.

5 STANLEY SCOTT BIRKHEAD,  
6 having first been duly sworn, testified as follows:

7 DIRECT EXAMINATION

8 BY MS. SHAHEEN:

9 Q. Mr. Birkhead, could you please state your  
10 name and spell it for the record.

11 A. Stanley Scott Birkhead. The last name is  
12 B-I-R-K-H-E-A-D.

13 Q. By whom are you employed and in what  
14 capacity?

15 A. I own my own petrophysical consulting  
16 company. I was brought on by Ops Geologic to help out  
17 Empire with this endeavor.

18 Q. What is your area of expertise?

19 A. Petrophysics.

20 Q. And how does your testimony today compare to  
21 Mr. Bailey's testimony?

22 A. It's additive.

23 Q. Would it be fair to say that Mr. Bailey  
24 testified about the geology, and you're going to be  
25 testifying primarily about saturation?

1           A. Yes, ma'am. I'll be testifying about the  
2 petrophysics characteristics.

3           Q. Have you testified before the Commission or  
4 the Division before?

5           A. No, ma'am.

6           Q. And you've attached your credentials to your  
7 written testimony in this manner, which is Exhibit L,  
8 and your credentials are attached as Exhibit L-53. Is  
9 that right?

10          A. Yes.

11           MS. SHAHEEN: I would ask that Mr. Birkhead  
12 be qualified as an expert witness in petrophysics in  
13 this field.

14           HEARING OFFICER HARWOOD: Any objection from  
15 Goodnight?

16           MR. RANKIN: No objection.

17           HEARING OFFICER HARWOOD: OCD?

18           MR. MOANDER: No objection.

19           HEARING OFFICER HARWOOD: Rice?

20           MR. BECK: No objection.

21           HEARING OFFICER HARWOOD: Pilot?

22           MR. SUAZO: No objection.

23           HEARING OFFICER HARWOOD: He will be so  
24 recognized.

25           MS. SHAHEEN: Thank you.

1 BY MS. SHAHEEN:

2 Q. And your rebuttal testimony, your written  
3 rebuttal testimony was submitted in this matter as  
4 Empire's Exhibit L; is that right?

5 A. Correct.

6 Q. Do you have any changes to that testimony?

7 A. No, ma'am.

8 Q. Do you affirm that the statements therein  
9 are correct and adopt Exhibit L as your sworn  
10 testimony here today?

11 A. I do.

12 MS. SHAHEEN: Commissioners, I'd move  
13 admission of Exhibit L including the data on  
14 Pages 16, 17, Appendix A, and Exhibits L-1 through  
15 L-53.

16 HEARING OFFICER HARWOOD: Any objections,  
17 Mr. Rankin?

18 MR. RANKIN: Mr. Hearing Officer, I don't  
19 have any objections at this time. I'm going to ask  
20 Mr. Birkhead some questions about the work he did  
21 relative to the pre-existing petrophysical work that  
22 was done on direct -- in direct testimony framework.

23 HEARING OFFICER HARWOOD: I would expect no  
24 less.

25 Mr. Moander.

1 MR. MOANDER: I'm sorry, Mr. Hearing  
2 Officer. I was conferring with some of my staff.  
3 Could I hear that question again?

4 HEARING OFFICER HARWOOD: Any objection to  
5 Exhibit L and all the attachments Ms. Shaheen rattled  
6 off?

7 MR. MOANDER: No, Mr. Hearing Officer.

8 HEARING OFFICER HARWOOD: Mr. Beck?

9 MR. BECK: No objection.

10 HEARING OFFICER HARWOOD: And Pilot?

11 MR. SUAZO: No objection.

12 HEARING OFFICER HARWOOD: All right. They  
13 will be admitted, Ms. Shaheen.

14 MS. SHAHEEN: Thank you.

15 (Admitted: Empire New Mexico  
16 Exhibit L, Appendix A,  
17 Exhibits L-1 through L-53.)

18 BY MS. SHAHEEN:

19 Q. Mr. Birkhead, let's start with a summary of  
20 your testimony. What are some of the deficiencies  
21 that you saw in Dr. Davidson's analysis?

22 A. Sure. I'm happy to go over that. Is there  
23 a way we can put this in the slideshow mode so that I  
24 can read it a little easier? I think I have the  
25 mouse, so I might be able to do it.

1 Q. Is it not in slideshow mode? I think I'm  
2 going to have to stop sharing and try it again.

3 CHAIR ROZATOS: Actually, just at the very  
4 bottom there, Ms. Shaheen, there's a little drop bar  
5 that says -- right next to it, it says 59 percent.  
6 To the left of it, it's way at the bottom of your  
7 screen, right next to it, there is that little box  
8 with a line that comes underneath it. To the left.

9 MS. SHAHEEN: To the left.

10 CHAIR ROZATOS: Go to the left. Right, that  
11 one. Click on that, and that should make it go into  
12 slideshow mode.

13 MS. SHAHEEN: Interesting. Let me stop  
14 sharing, because I'm not sure what's going on here on  
15 mine.

16 CHAIR ROZATOS: Someone on the platform,  
17 please mute yourself. Thank you.

18 MS. SHAHEEN: I should do that. I don't  
19 know why it's not doing it.

20 CHAIR ROZATOS: Ms. Hardy, do you have it?  
21 Maybe you could try.

22 MS. SHAHEEN: Or maybe you can come show me.  
23 Thank you.

24 THE WITNESS: I'm sure I can continue on if  
25 this continues.

1 MR. RUBIN: Let's see what we can get.  
2 We'll give it a minute more.

3 MS. HARDY: Ms. Shaheen e-mailed it to me so  
4 I can pull it up. I'm just waiting for the e-mail to  
5 come through. Takes a minute with attachments.

6 A. Okay. So my remit was to rebut  
7 Dr. Davidson's testimony, which required looking at  
8 the petrophysics, looking at all his files and reading  
9 his testimony in detail. So within that, I've been  
10 able to find a few deficiencies that are definitely  
11 worthy of note.

12 One of the big ones is that Goodnight  
13 only used a small fraction of the available core data  
14 to build a model for the San Andres. Dr. Davidson  
15 neglected obvious first-order data, such as visible  
16 and quantifiable oil volumes, fluorescence, oil odor  
17 in pits, streaming cut, floating oil in the cuttings  
18 box, and gas increases across the San Andres interval.

19 What this means, he explained this away  
20 in some pieces as organic matter. I can show you  
21 directly in further slides that there's direct  
22 evidence.

23 With inconsistent and improperly picked  
24 tops, Goodnight's petrophysical model was calibrated  
25 on an incomplete section of the San Andres, only the

1 bottom part of the 679.

2 When the correct San Andres tops are  
3 used, Goodnight's interpretation would also include a  
4 San Andres in the ROZ. I know that was talked about a  
5 lot during the last session.

6 What I would also say is that while  
7 reading the testimony of Dr. Davidson, he goes into  
8 extreme length about what you would do if you had all  
9 the data possible to interpret a carbonate reservoir.

10 The fact of the matter is, we don't have  
11 all the data necessary to interpret a carbonate  
12 reservoir to the level that he suggests. We don't  
13 have sonic data in most of the wells. We can't  
14 calculate secondary porosity. We can't do detailed  
15 rock typing in this.

16 So I'm going to basically talk about how  
17 we need to take care of our assumptions as we're doing  
18 this.

19 Q. And what would an appropriate petrophysical  
20 approach look like here?

21 A. So, using the correct petrophysical  
22 approach, along with the correct stratigraphic model,  
23 it illustrates a range of volumes, not just one single  
24 possibility. When we do this, in this case, it ends  
25 up with a continuous volume of hydrocarbons that

1 actually meet the definition of a ROZ.

2 But we don't just give one answer. That  
3 automatically defeats the entire system. It's just  
4 not realistic. And part of the reason for this is  
5 that Goodnight falsely assumed that the San Andres is  
6 non-reservoir from the very start, which basically led  
7 it into a saturation model that just assumes it's wet.

8 Q. And does your petrophysical model integrate  
9 all of the available data?

10 A. Yes, ma'am. There's some data that I'm  
11 learning about now that I didn't see, but all of the  
12 data that was available to me at the time that showed  
13 indications, and didn't, I used.

14 Q. And you've used that model to come up with a  
15 range of outcomes; is that right?

16 A. Absolutely.

17 Q. Next slide. What does this cross-section  
18 show?

19 A. So this is a little bit of a rehash of what  
20 Ryan went over, but it's just to illustrate the point  
21 of looking at a cross-section of more or less random  
22 wells through the EMSU, and including the Ryno, of how  
23 a level set, baseline set, top of the Lovington Sand,  
24 in black, across the log, along with Ops Geologic's  
25 tops, which are a certain distance, depending on the

1 well, above the Lovington Sand, and Goodnight's tops,  
2 which are at some times above and below the Lovington  
3 Sand.

4 I don't care how much erosion you get  
5 from the top of the San Andres down to the Lovington  
6 Sand. You can't still have the Lovington Sand there  
7 and the top of the San Andres below it. So it has to  
8 be -- the San Andres has to be on the top.

9 MS. SHAHEEN: And for the record, I'll note  
10 that this is Exhibit L-3.

11 BY MS. SHAHEEN:

12 Q. Turning to the next slide, Exhibit L-9, what  
13 does this slide show, and why is it important?

14 A. So it took me a while to figure out exactly,  
15 from the testimony, what exactly Dr. Davidson had been  
16 doing to get such high water saturations within the  
17 San Andres.

18 It finally came to me when he actually  
19 showed his workflow, looking at facies first. If  
20 facies are first, you're basically defining everything  
21 else based upon the rock type that you decide the  
22 reservoir is.

23 In this case, you look at this plot of  
24 resistivity index versus water saturation.  
25 Apparently -- this is my intention, or my assumption

1 of what Dr. Davidson used, that he used in his  
2 testimony.

3 If you choose, he mentioned several  
4 times that there is deep water facies all throughout  
5 the San Andres and a large percentage of it. With  
6 that, he chooses that these are either basically  
7 wackestone or packstone.

8 If you look at these saturation curves  
9 that are circled in red, this ends up being the lowest  
10 water saturation that you can get based on that  
11 resistivity ratio. So if you happen to call the  
12 entire San Andres deep water facies and happen to call  
13 it all wackestone, then your saturation can never be  
14 less than 92 percent; meaning that there is absolutely  
15 no chance, he's not giving it a chance to even show a  
16 ROZ, regardless of the resistivity, porosity, those  
17 things.

18 Packstone, it's a little bit better.  
19 You can have an Sw less than around 64 percent at  
20 really high resistivity index ratios, but even then,  
21 it's already forcing the facies to not show a ROZ.  
22 And this is not fair to -- this is not petrophysics,  
23 not without data to support it.

24 Q. Turning to the next slide.

25 A. This is just an example of my total water

1 saturation versus depth, what this shows. And I will  
2 say that the darker points are the North Monument,  
3 Grayburg, San Andres Unit 522, which I'm sure we're  
4 going to talk about later.

5 But the lighter points behind it are all  
6 the EMSU saturations. I always use total water  
7 saturation to find things, because in this situation,  
8 effective porosity is pretty much meaningless because  
9 it's a carbonate system with very little clay.

10 So if we go into that case, then we  
11 shouldn't be looking at  $\phi_i E$ . It's  $\phi_i T$  is what is  
12 really important.  $\phi_i T$  and SWT are the important  
13 parts.

14 You can see the low case and the high  
15 case. As Ryan had mentioned, my low case is based  
16 upon the core data that we have that's uncorrected.  
17 The high case is based upon a correction that I  
18 applied to it, based upon a Egbogah paper from the  
19 1980s, which I have the reference for in my  
20 documentation. And it uses  $B_{sub\ 0}$  and another factor  
21 for basically stripping out, bleeding out to the  
22 surface. We can look at that equation later if  
23 needed.

24 Q. What is the significance of the red vertical  
25 line?

1           A. The red vertical line just shows where,  
2 like, basically, a critical average. So the red line  
3 is at 60 percent water saturation. The blue line is  
4 at 80 percent saturation, oil saturation being 1 minus  
5 SWT.

6           What we see is that the average for SWT  
7 across most of us is in the low case -- in the low  
8 case is exceeds 30 percent and certainly exceeds, in  
9 most cases, 20 percent.

10          Q. Turning to the next slide, what do these mud  
11 logs show?

12          A. So the important part to these documents,  
13 again, comes back to petrophysical integration. These  
14 are mud logs that cover the San Andres when it was  
15 being drilled. So this includes gas curves, gas  
16 chromatograph, showing what levels of carbon molecules  
17 we have. It shows where there are shows. And it also  
18 gives cutting descriptions as to what seen when they  
19 put lighter fluid onto the samples to see what  
20 would -- if they had streaming cut, traces,  
21 fluorescence, things like that.

22          I know in this case, it's a little bit  
23 hard to read, so I put on the side what I'm seeing at  
24 those depths. Throughout this section, we see cut  
25 fluorescence on the EMSU 628. The top of the

1 San Andres is noted on the log.

2 In the 660, we see cut fluorescence and  
3 even oil odor on the pits. So if you want to talk  
4 about movable oil, yes, drilling the well, we are  
5 seeing movable oil at the surface. So I know that's  
6 not what we're talking about, but we're seeing  
7 definite indications of hydrocarbons.

8 Q. Why are these two mud logs important?

9 A. So -- they should be the -- one more.

10 Q. Oh, one more.

11 A. There we go. I added this slide just as a  
12 way to reinforce this and also because I really,  
13 really enjoyed the description from the EMSU 673,  
14 where, from one of the samples, they show "Heavily oil  
15 saturated" as one of the descriptions.

16 If we look at the 746, we also see oil  
17 smell at the pits, small amounts of oil floating in a  
18 box, trace microfracs, yellow fluorescence, and fresh  
19 cut. So, definite indications, first-order  
20 indications of hydrocarbons.

21 Q. Next slide. We saw these photos in  
22 Dr. Lindsay's testimony. Why are they important for  
23 your work?

24 A. This is a pass-through slide just to show  
25 that what petrophysics actually is an integration of

1 all data. So we use core, we use the core volumes, we  
2 use mud logs, we use cuttings descriptions, and we use  
3 the water line. And from this, there is no doubt that  
4 we have oil within this reservoir.

5 Q. Turning to the next slide.

6 A. So this is the EMSU 679. This is the start  
7 of some comparisons I'm going to show between  
8 Goodnight's interpretation and Empire/Ops Geologic  
9 interpretation. The main thing I want to show is,  
10 aside from -- I'll just go from -- I'll start from  
11 left to right.

12 So we have the gamma ray resistivity and  
13 density neutron. To the right of that, we have the  
14 interpreted curves, meaning the SWT high and low case.  
15 SWT low would be in the red in this case. And then  
16 the core data would be in -- the uncorrected core data  
17 is in Track 9, and Track 10 is the correction of the  
18 core data. You'll see that it's not a huge amount of  
19 correction that's been applied to it. It's something  
20 that's quite reasonable.

21 And what I'd like to point out in this  
22 case is that Dr. Davidson and I agree in a lot of  
23 places. And in Track 11, where his saturation in  
24 fuchsia and my saturation in red matched quite well  
25 through the section. We clearly both agree, in large

1 part, about things that are happening within the  
2 Grayburg. And with the new tops given, we also agree  
3 with what's happening at the very top of the  
4 San Andres, which is there's hydrocarbon there.

5 What we don't see -- are in agreement  
6 with is that the saturations Dr. Davidson shows drop  
7 off as soon as you get into their top of the  
8 San Andres.

9 The point of the image on the left is a  
10 51-year-old plot from a Core Labs training manual of a  
11 depleted oil reservoir zone, showing what happens when  
12 you have 30 percent oil saturation in a reservoir and  
13 you take a core.

14 And what this shows is that when you  
15 have a depleted reservoir, the closest thing I can  
16 think of to what we would have here, aside from the  
17 Egbogah paper that I saw, we can go from 30 percent  
18 oil saturation all the way down to 12 percent.

19 So 12 percent saturation is not a deal  
20 killer. In fact, it's quite reasonable to explain  
21 what a ROZ would be.

22 Q. Am I correct in understanding that the low  
23 case is based on the conventional core saturation?

24 A. Yes, ma'am.

25 Q. And the high case is based on the corrected

1 core saturation?

2 A. That is correct.

3 Q. Next slide.

4 A. Okay. So this is just another comparison  
5 slide of Dr. Davidson's interpretation versus mine.  
6 I'm bad about keeping the same colors consistent, so  
7 I'll just describe to you what the colors are in each  
8 slide.

9 So Dr. Davidson's Sw is in green, mine  
10 is in blue. In this case for the low case saturation,  
11 again, what you'll see is that in the little bit of  
12 Grayburg above and in the San Andres below, until you  
13 get to the Goodnight top of San Andres, we match  
14 really, really well.

15 All of a sudden, as soon as you get into  
16 what is the Lovington's Sand, they've decided to  
17 change what facies they have and the saturations have  
18 gone down to around 90-ish percent, which is -- 90-ish  
19 percent Sw, which is -- just makes a big assumption.

20 Q. And why do you believe Dr. Davidson's  
21 analysis differs here?

22 A. Because he's defining this as all deep-water  
23 facies. Our porosities match below the San Andres.  
24 What do you call it? I'll call it "our San Andres" or  
25 "their San Andres." Everything is the same.

1 Resistivities are the same level above and below the  
2 San Andres top. The only change that there is, is a  
3 change in the choice of facies being used.

4 Q. And that relates to your previous discussion  
5 of the wackestone, packstone; is that right?

6 A. Yes.

7 Q. Next slide.

8 A. This is the last comparison slide. I think  
9 this has the largest section of comparison. This is  
10 the EMSU 673 showing that, again, Dr. Davidson and I  
11 largely agree in saturations. His is the green curve,  
12 mine in this case is the blue curve. That in some  
13 cases, he actually has a lower water saturation than I  
14 do.

15 And as soon as you get to the Lovington  
16 Sand, just like clockwork, the saturations go down to  
17 about 90 percent. Whereas, in mine, I am keeping the  
18 same model going, using the same interpretation style,  
19 not making a blanket change. And I'm still showing  
20 ROZ across that.

21 Q. In your opinion, does this illustrate that  
22 Goodnight recognizes a ROZ in the San Andres?

23 A. Absolutely. With the information that the  
24 San Andres top was picked incorrectly, then they are  
25 definitely putting a ROZ into what is known as the

1 San Andres.

2 Q. And does this slide also show porosity?

3 A. It does. So that is the other really  
4 important point, as you'll see through most of my  
5 rebuttal testimony and most of the logs that I put  
6 into my testimony, that you see a continuous porosity  
7 all throughout the Lovington Sand, all the way up into  
8 the Grayburg.

9 This does not scream seal to me. What I  
10 like, the technical definition of the seal, I believe,  
11 is 10 to the minus 6 darcy. This is not what we're  
12 seeing. That is not the kind of rock we're seeing in  
13 the Lovington Sand or anywhere within this range.

14 Q. So if I understand correctly, the porosity  
15 here does not reflect a seal or other type of barrier  
16 that would impede fluid flow; is that right?

17 A. Yes, ma'am.

18 Q. Next slide.

19 A. This is just to speak to the average oil  
20 saturations that I am calculating over this. Again,  
21 the way that we really need to look at -- and this  
22 speaks to the doctor's questions earlier, that we  
23 really need to look at this in an uncertain way. We  
24 cannot look at this as one single value, as  
25 Dr. Davidson is doing. Dr. Davidson is giving one

1 single value for oil in place and one single value for  
2 oil saturation across this.

3 What we're doing is giving you a case  
4 that's based upon uncorrected data and a case that's  
5 based on corrected data. This is the start to  
6 providing uncertainty analysis for this in a Gaussian  
7 distribution, which we will go into with more Monte  
8 Carlo analysis.

9 So in this case, the averages, just  
10 putting a rough line to it, are about 30 percent oil  
11 saturation in the low case and about 40 percent oil  
12 saturation in the high case. What is the answer for  
13 real? It's probably somewhere in between. We can't  
14 just use the high case or the low case, unless we  
15 understand it within the context of probability.

16 Q. Next slide.

17 A. This is a composite slide to go with the  
18 previous one. Dr. Davidson commonly asserts within  
19 his testimony that there is a large -- that there  
20 isn't a high enough level of saturation or a tall  
21 enough level of porous interval to describe a ROZ  
22 zone.

23 The Empire/Ops Geologic interpretation  
24 clearly shows that it is highly possible and more  
25 likely and definitely within the range of the low and

1 the high case to have a very continuous level of ROZ  
2 throughout the entire San Andres or much of the  
3 San Andres.

4 Q. And can you tell the commissioners what you  
5 mean by "net pay"?

6 A. Net pay is a really esoteric term that has a  
7 lot of different meanings. In this case, net pay  
8 means that with the CO2 flood, we would be able to move  
9 some of this ROZ. So it would not be conventionally  
10 producible, but in this case, we believe that it would  
11 be something that CO2 would be able to flood into and  
12 help to move.

13 Q. Turning to the final slide.

14 A. This is a roll-up of the OOIP on the low  
15 case and the high case. Again, you can look at  
16 either, the answer is somewhere in between.

17 The important part that I wanted to  
18 point out is that if you look at the tracks of the  
19 columns on the far right, the one to the left is  
20 Goodnight's OOIP, using their tops as reported in  
21 their testimony. And then I went through and  
22 calculated -- basically calculated that again, using  
23 our tops to show what the difference would be.

24 In this case, because our tops were the  
25 same in the Ryno, the OOIP doesn't change. From that

1 point on, it starts to change a little bit. So in  
2 EMSU 746, we go from 13.3 to 14.78. EMSU 713 had  
3 barely any San Andres, so it's hard to -- it's not a  
4 striking difference.

5 But then the EMSU 673, we go from 3.1  
6 million barrels to 8.94, and this is using their  
7 analysis of what's there.

8 EMSU 660, we go from 2.7 to 5.84. EMSU  
9 628, 6.8 to 8.4. And then 658, from zero to 5.31.  
10 This is a striking difference and an admission that  
11 since the tops of the San Andres are actually  
12 shallower than originally picked, that there is a ROZ  
13 in the San Andres.

14 Q. And just to be clear, when you refer to  
15 OOIP?

16 A. It's original oil in place.

17 Q. And MMBO is millions of barrels of oil.

18 MS. SHAHEEN: I have no further questions at  
19 this time. I pass the witness.

20 HEARING OFFICER HARWOOD: Perfect timing,  
21 Ms. Shaheen. Let's see. We're right at 3 o'clock.  
22 I'm sure you planned it this way. So let's take a 15  
23 minute break. We'll be back at 3:15.

24 (Recess held from 3:00 to 3:15 p.m.)

25 HEARING OFFICER HARWOOD: Are you ready to

1 proceed, Mr. Rankin?

2 MR. RANKIN: Yes, Mr. Hearing Officer.

3 CROSS-EXAMINATION

4 BY MR. RANKIN:

5 Q. Good afternoon, Mr. Birkhead. How are you  
6 today?

7 A. Good.

8 Q. Good. Let's see. So I think I'm probably  
9 going to start with just identifying your rebuttal  
10 statement here. I've got here on the screen, as soon  
11 as I share it, your rebuttal statement, which is  
12 marked as Exhibit L. And as with your colleagues, I  
13 excerpted it from the packet overall.

14 And I'll just confirm with you that this  
15 is your signature and it's February 10th, 2025, and  
16 this goes on for another numerous pages with your  
17 exhibits to a total of 78. Does this represent your  
18 Exhibit L that you submitted?

19 A. It appears to, yes.

20 Q. Okay. I just want to kind of get a sense  
21 for your background, as well. I don't know what URTEC  
22 is. What was your URTEC?

23 A. URTEC is the Unconventional Resources  
24 Technical Conference. So it's a conference that's  
25 been happening for the last ten years or so that talks

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1 about everything unconventional. So from petrophysics  
2 to completions to geochemistry. And I've helped with  
3 the petrophysical section of that for the past -- this  
4 will be my third year helping with that.

5 Q. So it's focused on unconventional  
6 petrophysics?

7 A. Unconventional resources in general.

8 Q. Okay. Resources. Got it. Okay.

9 And then just these are overviews of the  
10 other regions that you've worked. And that's for the  
11 U.S. range, across different basins. It looks like.  
12 Yeah?

13 A. Yes.

14 Q. And I guess, if you would just summarize for  
15 me. It looks like you also came out of Anadarko,  
16 correct?

17 A. Correct.

18 Q. And at Anadarko, you did petrophysics as  
19 well?

20 A. Yes.

21 Q. Okay. And it looks like you did work in a  
22 wide variety of areas overseas as well as domestic; is  
23 that right?

24 A. Correct. They had me working everything.

25 Q. In terms of the U.S., while you were at

1 Anadarko, did you work in the Permian?

2 A. Yes, a little bit. Not excessively was my  
3 main area, but over the 15 to 16 years I was there, it  
4 was a significant -- it was a fair amount.

5 Q. It was a fair amount to work in the Permian?

6 A. Yes.

7 Q. Okay. And in the Delaware Basin?

8 A. Yes.

9 Q. Okay. On the Texas side, New Mexico side?

10 A. It was on the Texas side.

11 Q. Up on the Central Basin Platform?

12 A. A little bit. It was mostly scoping sort of  
13 things. It wasn't an asset that I was maintaining.

14 Q. Okay. So the work you did on the Central  
15 Basin Platform was, as you put it, scoping potential  
16 assets or scoping assets?

17 A. That's what I recall. It would have been  
18 quite a while ago. It would have been, like,  
19 pre-2012.

20 Q. Okay. And when you were doing that with the  
21 prospects, in what formations; do you recall?

22 A. I know I had looked at the San Andres,  
23 Yates. I've looked at the Wolfcamp. I've done a  
24 significant amount of study in the Wolfcamp. So just  
25 kind of the general formations. Brushy Canyon. That

1 sort of...

2 Q. Again, that was all on the tech side, right?

3 A. Tech.

4 Q. How about in the Grayburg?

5 A. I'm sorry?

6 Q. How about the Grayburg?

7 A. I did not look at the Grayburg while at  
8 Anadarko, but I have done significant looks at it  
9 since then.

10 Q. Okay. Let me scooch up here. I'm mostly,  
11 as you can tell, trying to figure out your experience  
12 relative to what we're doing here.

13 A. Yes.

14 Q. So after your Anadarko, you went to a firm  
15 or group called, I'm going to butcher the name,  
16 DeGolyer and MacNaughton?

17 A. Yes.

18 Q. Okay. And it was an independent  
19 consultancy?

20 A. It is. It's equivalent to Netherland,  
21 Sewell.

22 Q. It's what?

23 A. It's equivalent to Netherland, Sewell.

24 Q. Got it. Understood. So in that role, you  
25 were doing a lot of reserve estimates?

1 A. Yes, reserve petrophysics.

2 Q. Okay. In collaboration with geologists?

3 A. Correct.

4 Q. Okay. And it looks like you were there for  
5 approximately two years. What regions or fields did  
6 you work on while you were there?

7 A. It was largely the -- the lion's share of it  
8 was Russia and residual hydrocarbons and trying to do  
9 waterfloods. We had saturations of, say, like, 10 to  
10 15 percent oil saturation we were trying to get out of  
11 the ground.

12 Q. What kind of reservoirs were they?

13 A. They were mixed, but they were clastic and  
14 there were some carbonates, if I remember correctly.  
15 It was over a very large area.

16 Q. And these were waterfloods, you said?

17 A. Yes.

18 Q. Okay. So they were looking to waterflood --

19 A. They wanted the last drop.

20 Q. They wanted the last drop. Clastics and  
21 carbonates, right?

22 A. Yes.

23 Q. Okay.

24 A. That's what I recall.

25 Q. Okay. And then are these all separate

1     employments, or are these different projects you did  
2     within the --

3             A. So as I mentioned, I own a consulting  
4     company. These are all different clients that I've  
5     had while owning that consultancy.

6             Q. Okay. So that's Petrobrane.

7             A. That is Petrobrane.

8             Q. Okay. And just, without going through each  
9     and every one, it looks like there's a fair number of  
10    CCUS or carbon capture, utilization and sequestration  
11    projects; is that what --

12            A. Yes. I've been working a number of CO2  
13    projects.

14            Q. Those are mostly in the U.S., or are they  
15    abroad as well?

16            A. So far those have all been in the U.S.

17            Q. Okay. Are you seeing more CCUS projects  
18    than you are ROZ projects?

19            A. Yes.

20            Q. Yeah. Is that because of the tax incentives  
21    for CCUS?

22            A. I would hate to guess on their motivations,  
23    but...

24            Q. Just looking at your projects here, it looks  
25    like I'm seeing CCUS, but I'm not seeing ROZ, right?

1 A. Yes.

2 Q. Yeah?

3 A. Yes.

4 Q. Okay. So the carbonate systems that you  
5 have worked on, that would be at least the one field  
6 or fields in Russia where you're working on waterflood  
7 development?

8 A. Yes.

9 Q. Where else have you worked on carbonate?

10 A. Brazil. I've worked in a few -- let's see,  
11 Mississippi Lime. Just a lot of the typical  
12 limestone -- lime fields. Oklahoma. I'm bad with  
13 formation names. I can always look those up.

14 Q. What kind of developments were those that  
15 you were working in? Were they horizontal drilling?  
16 Or what kind of --

17 A. Both. Horizontal and they were vertical.  
18 So there was -- the ones in Brazil were heavy oil,  
19 large porosity -- oh, actually, no. I'm sorry. I  
20 misspoke.

21 The ones in Brazil that were carbonates  
22 were subsalt. Medium porosity.

23 Q. Okay. But that was a horizontal play?

24 A. No. That was vertical.

25 Q. Vertical play. Sorry.

1 A. Right.

2 Q. And on the CO2 injection that you identify  
3 here in your summary, that CO2 injection, has it been  
4 limited to the CCUS side of CO2?

5 A. It has. There's CO2 projects that have not  
6 been green-lit yet by the EPA or by states that have  
7 been given primacy.

8 Q. Okay. So there's projects that are in the  
9 development stage for carbon capture, utilization and  
10 sequestration?

11 A. Correct.

12 Q. Okay. So Class 6.

13 A. Yes, Class 6.

14 Q. Okay. On the UIC program. Sorry.

15 So, yeah, all in all, basically, you've  
16 got 20-some-odd years of doing petrophysics work in a  
17 variety of backgrounds and fields, correct?

18 A. Correct.

19 Q. Okay. But more limited on the carbonate  
20 side; is that fair?

21 A. A little more limited on the carbonate side,  
22 but it's all petrophysics.

23 Q. Okay. And none so far on ROZ, correct?

24 A. Aside from this one, no.

25 Q. Okay. And --

1           A. But I would say I have seen residual oil  
2 before, but I've not been on an ROZ project.

3           Q. So when you say you've seen ROZ before, was  
4 it part of a -- I mean, obviously, the Russia one you  
5 mentioned, where you're looking to target oil  
6 saturations in the 10 to 15 percent range, I guess  
7 those are from conventional core saturations? Or how  
8 are you characterizing those oil saturations?

9           A. These are core saturations, and there's been  
10 lots and lots of production. So it's more about  
11 stating, like, what the saturation likely is to be now  
12 with whatever new wells we have.

13          Q. Okay. So besides that Russian experience,  
14 where else have you looked at or explored or looked  
15 for or evaluated residual oil?

16          A. Well, no, I said I have seen residual oil.  
17 One of the cases was a well in Ghana where we drilled  
18 a well, and it was just basically a ROZ.

19          Q. And in that case, did the operator pursue  
20 that ROZ interval?

21          A. No. Because right next door there was a  
22 play that had several billion barrels of oil that had  
23 30 percent porosity and was 90 percent oil saturated.

24          Q. So right next door, there were wells with  
25 90 percent oil saturation, which you would

1 characterize as conventional saturation?

2 A. Yes. Yeah, it's a conventional play.

3 Q. Okay. And so nothing -- have you worked on  
4 any tertiary recovery projects, just to be clear,  
5 whether it's ROZ or post-secondary recovery?

6 A. No.

7 Q. Okay. And we talked a little bit about your  
8 experience in carbonate systems. Have you worked in a  
9 carbonate ramp system, like the EMSU?

10 A. I couldn't say with certainty, but I've done  
11 a lot of research into them over the years. So I  
12 can't say exactly what the environment was.

13 Q. So nothing comes -- nothing, as you're  
14 sitting here, comes to mind that --

15 A. Nothing that I could put my finger on and  
16 say I know for sure that it was a carbonate ramp,  
17 under oath.

18 Q. Got it. I appreciate that. Very good.  
19 Okay. I think I got a handle on all that.

20 Jumping up to your testimony, the bottom  
21 of Page 2 of your testimony, I've highlighted a  
22 statement here where, under Paragraph 8, you say,  
23 "There are significant indications shown in the  
24 following document that validate the likelihood of an  
25 ROZ in the San Andres of Eunice Monument South."

1 I just want to ask a couple questions  
2 about this. What stuck out to me when I read this  
3 sentence was what I term qualifiers.

4 The first one is indications, and it's  
5 not exactly a strong statement, but what do you mean  
6 when you say "indications"? And, you know, I  
7 understand you're going to point me to the direct  
8 evidence and the interpretations you've done. But I  
9 guess I would just like to know when you say  
10 "indications," what you're talking about.

11 A. Yeah, I'd say if you're talking -- you may  
12 not have spoken to a petrophysicist before, but this  
13 is the way that we talk.

14 Q. Yeah, yeah.

15 A. There's always a caveat. The answer to a  
16 lot of our questions about what do you do in this  
17 case, is: It depends.

18 Q. Yeah.

19 A. But in this case, what you do, in this case,  
20 is you look at the indications for oil, which the  
21 undeniable indications are oil in the core, oil that's  
22 seen in the pits and within the cuttings,  
23 fluorescence, cut, those things and increased gas  
24 that's red across the zone.

25 So that, along with the logs, which do

1 require a complex understanding of what's going on to  
2 breach the saturations that are shown by the core and  
3 that we see in the ROZ, you've got to look at all the  
4 pieces of data that you can.

5 Q. That would include, as well, well tests or  
6 any production tests that may have --

7 A. So I would stop right there a little bit.  
8 The whole point of a ROZ is you don't see oil during a  
9 test.

10 Q. Okay. Well, I understand that, I guess.  
11 And that's the case if the oil is truly at a residual  
12 saturation, right?

13 A. Well, we're parsing definitions. I'm  
14 saying, if it's a ROZ, it's not going to have oil  
15 flowing. You're saying, "What if it's not a ROZ?" So  
16 I'm not sure how to answer that.

17 Q. Well, I'm sure we'll get down to brass tacks  
18 on that. We'll get down to it. But I guess my point  
19 is that -- let me ask you a question. I understand  
20 you're working under the assumption that the  
21 definition of a residual oil zone is oil saturations  
22 from 20 to 40 percent; is that fair?

23 A. I'm working under the assumption that  
24 20 percent is kind of what is written in the  
25 literature. But I'm not working with the assumption

1 that it's the lowest it can go.

2 Q. Okay. Are you aware of any ROZ plays  
3 anywhere in the Permian Basin that have targeted oil  
4 saturations below 20 percent?

5 A. No, I am not.

6 Q. Okay. Very good. And now, on the upper  
7 end, I mean, what would you describe, define a  
8 residual interval?

9 A. I appreciate the question. That it depends.  
10 It depends upon the wettability. It depends upon the  
11 rock properties. You can have residual oil up to 50  
12 percent. A standard range could be anywhere from 30  
13 to 50, dependent upon the wettability and the oil  
14 type.

15 So we're looking at a mixed oil wet  
16 system. You can have pretty high residual oil values  
17 that aren't going to flow unless you put some external  
18 means on it to move it.

19 Q. All right. There's a lot to unpack in there  
20 and I'm going to work on you.

21 A. Okay.

22 Q. Not work on you, I'm going to work with you.  
23 We'll unpack it. Okay?

24 A. That sounds better.

25 Q. So I know wettability has been an issue, and

1 it is an issue, okay, in these complex carbonate  
2 systems. And it's an issue because the wettability  
3 will dictate a lot about how the oil behaves, right --

4 A. Yes.

5 Q. -- in the rock, in the pores?

6 And in here, I understood you to say  
7 that it's your understanding that in this EMSU  
8 carbonate system, we're dealing with a mixed oil-wet  
9 system, right?

10 A. No. I said mixed wet to oil wet.

11 Q. Mixed wet to oil wet. Okay.

12 A. There have not been -- to my knowledge,  
13 there have not been any exact -- any tests done in the  
14 San Andres for wettability within the EMSU. And  
15 that's an important point, that it has to be within  
16 the EMSU because the oil is specific to here and the  
17 pore types are -- and the geology is specific to here.

18 We can say, by the way, that the  
19 resistivity behaves -- it certainly behaves in a  
20 mixed-wet to oil-wet fashion.

21 Q. I'm sure we may come back to that, but  
22 mostly I just wanted to get your understanding of what  
23 the wettability was in the system. Okay?

24 A. Yeah.

25 Q. Now, basically, depending on -- I'm a lawyer

1 so we use the word "depends," and, you know, people  
2 joke about lawyers answers, right? It's always, "It  
3 depends." So I'm not foreign to that.

4 But you're telling me that you're  
5 working under the assumption that the low end is 20  
6 percent and the high is going to be around 50, but it  
7 depends on the wettability?

8 A. It depends on what wettability, it depends  
9 upon -- yeah, it depends on several factors.

10 Q. So now on the wettability question, okay,  
11 how does wettability affect the high end of your  
12 definition of a ROZ?

13 A. Say the more oil wet and the lower API you  
14 have of oil, the higher saturation you have to have  
15 before it will start to move.

16 Q. Slow down a little bit for me. Say it  
17 again. Sorry.

18 A. Sure. The more oil wet it is, the more it  
19 sticks to the sides of the pores. And the lower the  
20 API of the oil, the less gas -- the less gassy it is,  
21 the harder you're going to have -- the harder time  
22 you're going to have getting it to move.

23 Q. All right. Okay.

24 A. Sorry. I've always spoken fast. Feel free  
25 to tell me to slow down.

1 Q. Understood. Yeah, no, I appreciate it.

2 So basically, the reason -- as I  
3 understand, in these Mother Nature waterflood systems,  
4 where you have a potentially saturated formation that  
5 at some point in geologic time had been or may have  
6 been saturated with oil, 60, 70, 80 percent, whatever  
7 the saturations may have been, and then during the  
8 uplift that was experienced causing the hydraulic head  
9 to flow water through the Grayburg and San Andres, we  
10 had multiple pore volumes sweeping -- stripping some  
11 of the lighter ends off your oil and basically  
12 converting your system from -- to a more oil-wet  
13 system. Is that right? Is that your understanding of  
14 how the Mother Nature's Waterflood --

15 A. That is my understanding, is that -- yes.

16 Q. So in a system that had been heavily swept  
17 by multiple pore volumes, you're likely to see a more  
18 oil-wet system, right?

19 A. I can't say that as a universal thing.

20 Q. Okay. But in a system like the San Andres,  
21 where it's been swept by dozens of pore volumes, I  
22 mean, isn't that generally what you would expect to  
23 see in the San Andres, in the EMSU, with multiple pore  
24 volumes that Dr. Trentham and Mr. Melzer have  
25 discussed in their written testimony?

1           A. From what I understand in the San Andres,  
2 the multiple pore volumes of fluid have assisted in  
3 making the system oil wet. Everything that starts out  
4 not as a source rock, will start off as water wet, but  
5 it will have an affinity to oil wetness in certain  
6 carbonates.

7           Q. Okay. Understood. No, I appreciate that.

8                   I mean, I don't know if that's helping  
9 anybody else, but I just wanted to make sure I  
10 understood, you know, where you're coming from and  
11 where your concept was of the current status of the  
12 EMSU system and the wettability of it. Okay?

13                   Shifting back to where we were. So in  
14 the next sentence here, in the second half of the  
15 sentence that I've highlighted, you say that,  
16 "Petrophysical interpretation of the wells reveals oil  
17 saturations that fall within the range of a ROZ,"  
18 right? And that's what we were just discussing,  
19 right?

20           A. Yes.

21           Q. And I guess that was why I was asking these  
22 questions, because I wanted to understand what your  
23 understanding of the range of a ROZ is. And so as I  
24 take it, you know, it's a little bit -- you know,  
25 20 percent up to 50 percent, depending on what

1 wettability.

2 A. Yeah. And the reason why I'm a little cagey  
3 about the 20 percent is because we don't know what the  
4 technical limit is. It could be lower than that.

5 Q. I'll come back -- I may come back to that to  
6 ask you what you mean by that, because -- I may come  
7 back to that. I don't think you addressed that in  
8 your testimony, so I'll see if I have time to come  
9 back to that.

10 Okay. Now, in your testimony that  
11 you've submitted and your analysis that you've done,  
12 is it your opinion that the ROZ you've identified that  
13 is an indication -- no, let me back up.

14 In this first sentence I was discussing  
15 with you, I talked about I saw some qualifiers. The  
16 first one was the indications. Okay? We talked about  
17 that one.

18 The next qualifier that I see is this  
19 word "likelihood." So when I read that, you say  
20 there's significant indications of a likelihood of a  
21 ROZ, so it sounds like, you know, that there's -- that  
22 this -- and I guess you mean by "this document," you  
23 mean your testimony, right?

24 A. Yes. Yeah.

25 Q. "This document," your testimony.

1           So what I understand you to say is that  
2 your testimony, you believe your testimony validates  
3 the likelihood that there's a ROZ in the San Andres;  
4 is that right?

5           A. Yes. Absolutely.

6           Q. So, I mean, just trying to frame it so, you  
7 know -- what you're comfortable saying is that you're  
8 validating the likelihood of a ROZ in the San Andres?

9           A. So what I am -- maybe, perhaps, some  
10 background is important. In the oil industry, we deal  
11 with probabilities. We don't deal with certainties.  
12 The more data we have, the more likely we are to have  
13 a certainty. So until we have the absolute certainty,  
14 we keep using words like this. And we deal with  
15 ranges, which is why I had a low case and a high case.  
16 So that is the primary reason for those kinds of  
17 adjectives.

18          Q. Got it. And I appreciate it. And you  
19 understand why I'm having that discussion with you?

20          A. Absolutely.

21          Q. Yeah. So in your oil saturations, in your  
22 analysis that you've conducted, have you interpreted  
23 oil saturations that go above your 50 percent  
24 "depending" range for a ROZ.

25          A. I'm sure there are.

1 Q. Yeah. But you still call those -- you're  
2 still calling it a ROZ with those higher oil  
3 saturation?

4 A. I am not calling them anything. I am saying  
5 that that is the overall log interpretation. I'm  
6 looking at the averages.

7 Q. Okay. Okay, yeah. Just meaning you don't  
8 want to be defined by labels, right? I mean, you're  
9 just looking for what you think the oil saturations  
10 are and where they are?

11 A. Yes.

12 Q. Okay. And you're not going to ascribe a  
13 label to it, you're just going to tell us where they  
14 are and how much you think there is?

15 A. Mm-hmm.

16 Q. Okay. Now, you likely heard some of my  
17 discussions with your colleague about some of the  
18 questions about mobility. And, of course, you can  
19 understand why we're all wondering about it.

20 Do you have an opinion on what oil  
21 saturation oil would become mobile?

22 A. It is an incredibly dependent answer. I  
23 think what I mentioned before was that around 30 to  
24 50 percent oil saturation is probably when it would  
25 start to move a little bit, but based on relative

1 perm, it'd be just a tiny, tiny fraction of the fluid  
2 movement. You'd have to have a significant higher  
3 saturation to move larger volumes of hydrocarbons.

4 Q. What was that last part you said?

5 A. If you look at relative permeability, albeit  
6 very small fraction of the fluid would move once it  
7 reaches that point -- a very small fraction of the  
8 hydrocarbon would move once it reaches that point.  
9 With the fraction increasing, the higher the  
10 saturation is.

11 Q. Okay. So you used the term called "relative  
12 permeability," and I have a layman's understanding of  
13 that term. And one of my questions is, did you  
14 prepare a permeability curve?

15 A. I prepared three.

16 Q. Three?

17 A. Yeah.

18 Q. So three different relative perm curves?

19 A. No. That's -- relative permeability and  
20 permeability are not the same thing.

21 Q. Okay. I'm with you. So you prepared three  
22 different perm curves. Did you prepare a relative  
23 perm curve as well?

24 A. No, no.

25 Q. Okay.

1           A. That requires some detailed core testing,  
2 detailed core analysis.

3           Q. So, tell me about the perm curves then that  
4 you prepared?

5           A. They are stock equations based upon the  
6 Lucia classification of rock types. There's a Type 1,  
7 Type 2 and Type 3, based upon varying qualities.

8                       So, as I mentioned before, Dr. Davidson  
9 made a generalization as to the rock type throughout  
10 the entire San Andres, with very little -- I think it  
11 was 95 percent of it being deep water facies.

12                      I can't make that call. That is all --  
13 it's irresponsible to actually call the entire  
14 reservoir one type, without having enough data for it.  
15 So I gave options for three different permeabilities.

16           Q. So those were just stock equations, so you  
17 didn't actually generate or produce your own  
18 permeability curve, then?

19           A. No.

20           Q. Okay. Got it.

21           A. It wasn't part of the remit.

22           Q. Again, these are coming from me, from a  
23 lay- -- but the permeability curves, are those  
24 vertical perms or horizontal?

25           A. Those are typically known to be horizontal

1 perms.

2 Q. Horizontal perms. All three of those types  
3 are horizontal perms?

4 A. Yes.

5 Q. Okay. So did you not use, then, any  
6 vertical perm in your assessment of the rocks?

7 A. There was no requirement to calculate a  
8 vertical perm. What we can see is the continuity of  
9 the porosity, which the porosity is going to be a  
10 direct relationship to permeability.

11 So if you want to say that there's a  
12 relationship, continuous porosity infers a decent  
13 vertical perm.

14 Q. I don't mean to take us down a sidetrack  
15 here, but this kind of raised a question I had.  
16 Because I think in your well logs, you included  
17 baffles.

18 A. I put potential baffles.

19 Q. And those baffles, I mean, wouldn't those  
20 have to be based on a vertical perm?

21 A. The baffles, if you have zero -- so vertical  
22 perm is the composite of all the horizontal perms. So  
23 it's a geometric average of all the horizontal perms.  
24 So you can infer that by saying that there is a bit of  
25 horizontal permeability or porosity that is below a

1 certain percent. You can say maybe this can be a  
2 baffle.

3 Q. Okay. So you inferred your baffle flags  
4 based on your determination of the horizontal perms in  
5 those locations?

6 A. Based upon the lithology, based upon the  
7 porosity and based upon the look at the logs.

8 Q. Okay. A little sidetrack. When I get down  
9 sidetracks, it takes me a moment to get back. Sorry,  
10 one moment.

11 Okay. While we're on logs and cores, I  
12 want to back up to ask you a couple more overview  
13 questions before I forget about them.

14 I think I understood from your  
15 colleague, Mr. Bailey, that O-P-S was retained in  
16 September; is that right?

17 A. Ops Geologic?

18 Q. Yeah, Ops Geologic. Sorry.

19 A. I believe so.

20 Q. Okay. So what was your understanding about  
21 why you were retained by Empire? What did they ask  
22 you to do?

23 A. I was brought into Empire by Ops Geologic to  
24 look at the testimony and look at the -- and do a  
25 petrophysical evaluation of the San Andres, which in

1 order to rebut the testimony, you have to do your own  
2 interpretation.

3 Q. You were provided the petrophysical analysis  
4 that were conducted by NuTech; is that correct?

5 A. Yes.

6 Q. And as I understand, you were provided both  
7 the original analysis that NuTech prepared as part of  
8 its August 2024 testimony, as well as its revised  
9 petrophysical analysis that was submitted in December,  
10 correct?

11 A. Yes. I received that a few weeks -- I  
12 believe a few weeks ago.

13 Q. Okay. And have you reviewed and analyzed  
14 NuTech's analysis in both its original and revised?

15 A. It wasn't part of my remit, but I did browse  
16 that, look at it to see where it fit into mine.

17 Q. Okay. And what was your determination about  
18 how it fit into yours?

19 A. My determination is that it fit well within  
20 the range, from what I could tell, of what I was  
21 calculating as a high and a low case.

22 Q. Do you understand what inputs and parameters  
23 NuTech employed to conduct its petrophysical analysis?

24 A. I have read a lot of the documentation, so I  
25 can refresh myself on some of it. But yes, I did read

1 through it.

2 Q. Do you understand that NuTech, when it  
3 prepared its revised analysis, calibrated its  
4 petrophysical analysis to the water saturations in the  
5 EMSU 679 well?

6 A. I do not understand that.

7 Q. Okay. What's your understanding about  
8 how --

9 A. I don't know if they did it to the oil  
10 saturation or the water saturation.

11 Q. Okay.

12 A. I don't recall whether they -- which one  
13 they said they calibrated to.

14 Q. If they had calibrated it to the water  
15 saturation, what would your response be to that?

16 A. That would definitely be a high case  
17 estimate.

18 Q. Why is that?

19 A. Because the core loses fluid as it goes up.  
20 As we said, it loses oil and it loses water. So you  
21 could use the -- since both of them lose fluids, you  
22 could use the core oil saturation as the ultimate low  
23 case, and you could, in theory, use the core water  
24 saturation as the ultimate high case.

25 Q. And the reason -- just explain for us

1 laypeople how the water saturation is related to the  
2 oil saturation.

3 A. Well, because of the way that they clean the  
4 cores and --

5 Q. I'm sorry. I'm asking just more simply than  
6 that. Because oil saturation is 1 minus water  
7 saturation, right?

8 A. Yes.

9 Q. So, basically. So, like, I use the word  
10 "inverse," but --

11 A. Yeah, inverse is not -- that would make it  
12 percentage.

13 Q. Mr. Bailey didn't like that. But,  
14 essentially, you can derive your oil saturation if you  
15 know your water saturation, correct?

16 A. Depending if you have a two-fluid system.

17 Q. Okay. And that's the assumption, right,  
18 that we're operating under in petrophysics, right?

19 A. When you bring up a core, you're no longer  
20 in a two-fluid system.

21 Q. Okay.

22 A. But it starts out as that.

23 Q. Okay. So you just perused NuTech's  
24 analysis, but you didn't study it?

25 A. Yeah, I didn't revise on it for a weekend.

1 Q. So, yeah, you didn't get into it well enough  
2 to even understand how they calibrated or what inputs  
3 of parameters they used?

4 A. Not to be able to state with assurance today  
5 what they did, as in what curves they calibrated to.

6 Q. And Empire didn't tell you what they had  
7 done either?

8 A. I read Galen's documentation. I just can't  
9 speak to it at the moment without looking at it.

10 Q. Understood. And so because of that, you  
11 can't tell me how your analysis is different than  
12 theirs?

13 A. I can say that looking at his Sw curve, it  
14 seems to follow from the range, in general, of what my  
15 low and high case are.

16 Q. And when you're talking about his analysis,  
17 can you tell me which one? Because I mentioned  
18 there's two; there's an original one and then  
19 there's --

20 A. I see. It'd be the most recent analysis.

21 Q. Okay. And you're saying that falls within  
22 the range of your -- which one, your high or low?

23 A. It's a range.

24 Q. It's a range. Falls within the range of the  
25 high and low. Got it. I'm with you. Okay.

1                   Now, on to what you've done. Did you  
2 calibrate your petrophysical analysis to -- as I  
3 understand it, you calibrated the two cores that are  
4 available, right?

5                   A. Yes.

6                   Q. And those would be the EMSU 679 and the  
7 North Monument San Andres 522 well, right?

8                   A. No. It's the RR Bell and the 679.

9                   Q. I'm sorry.

10                  A. I did recently look at the North Monument.

11                  Q. Now, just for my benefit, explain to me, at  
12 a high level, how you calibrate those two cores to  
13 your petrophysical analysis.

14                  A. Analysis. So varying m and n, as we all --  
15 as Davidson and I both completely agree, that to use a  
16 model unlike -- although Davidson used a model that  
17 didn't require n directly. You need to vary both  
18 because it's a complex carbonate system.

19                         So what I did was looked at the cores  
20 and I tied the core oil saturation to the maximum of  
21 the core oil saturations that I saw on the log and  
22 then did a correction to that based on the Egbogah  
23 correction that was placed in the -- published in the  
24 '80s, to get to a corrected oil saturation and then  
25 use that as my high case.

1           So, effectively, what I did was I used  
2 the Archie phiT equation because we were in a  
3 clay-free system, and Archie should work just fine  
4 with a variable m and a variable n.

5           And that is actually upheld by  
6 Dr. Davidson's plots that he shows, that you can still  
7 use Archie in those cases, you just have to vary those  
8 properties.

9           So the n was varied and the linear  
10 relationship into a non-linear relationship for one of  
11 the cases to make it match the core-corrected case to  
12 give us the high case possibility.

13           Q. Explain if you would, the correction that  
14 you applied. And I think -- was that the image I saw  
15 on the summary that you presented? There was an image  
16 discussing core corrections.

17           A. That is from 1968, I believe, and that's how  
18 long ago they actually -- and it was published in the  
19 1973 Core Lab Manual.

20           Q. But the guidance you were following for the  
21 core correction was from 1980?

22           A. That is from the 1980s. The reference is  
23 from Egbogah. It's on my testimony.

24           Q. Okay. So just if you would, just so I  
25 understand it, explain, what was the correction that

1 you did?

2 A. It uses a correction for fluid loss and a  
3 correction for oil expulsion -- and a correction for  
4 gas expulsion based on the B sub o that we're given  
5 based.

6 Q. Based on what?

7 A. Based on the B sub o.

8 Q. Okay. And the B sub o was provided to you  
9 by Empire, correct?

10 A. Yes.

11 Q. And that's the oil volume factor --

12 A. Formation factor.

13 Q. Understanding that you were provided a value  
14 from Empire, what's the normal process for determining  
15 the B sub o?

16 A. That is outside -- that is an engineering  
17 thing. I don't typically calculate B sub o's myself.

18 Q. Do you know how it's done?

19 A. Aside from in the lab, I couldn't tell you  
20 the exact process.

21 Q. Okay. Is it generally formation specific,  
22 location specific?

23 A. It's typically fluid specific.

24 Q. Fluid specific. So you'd need to know,  
25 like, the API, the gravity, the gas content, that kind

1 of thing of the oil? Is that basically what you're  
2 talking about?

3 A. Mm-hmm.

4 Q. Okay. And that wasn't nor has it been  
5 available for the San Andres, correct?

6 A. Not that I've seen.

7 Q. So do you know, with the value that Empire  
8 gave you, what it was based on, where it came from?

9 A. No. No, I do not.

10 Q. Okay. You don't know if it's -- where it's  
11 from or anything.

12 A. It came from Darrell, the engineer.

13 Q. You didn't ask him where it came from or  
14 what the basis was for it?

15 A. I think I did. And it was, "This is what  
16 we're using."

17 Q. Okay.

18 A. As a best case -- or not even as a best --  
19 sorry. Not as a best case, but just, "This is what  
20 we're using."

21 Q. Obviously, I mean, you use B sub o in your  
22 work, right?

23 A. Only when calculating the oil in place,  
24 which is not part of the typical everyday  
25 petrophysical process. We're worried about what's

1 down there at the time.

2 Q. Okay. So because it's not typical or normal  
3 for you to do that, you're mostly doing  
4 interpretations. Do you have a sense for the  
5 reasonableness of the B sub o that he gave you?

6 A. I think we -- I think it's a very good  
7 relative B sub o to use. If we use one that's lower,  
8 then the amount of oil we have, it goes way up.

9 So in order to keep the OOIP from just  
10 exploding -- and so if we put in a B sub o that's  
11 lower, the oil saturation -- the oil in place just  
12 goes higher.

13 Q. So just based on the output, you feel like  
14 it was a reasonable --

15 A. I think it's a reasonable mid-case scenario.

16 HEARING OFFICER HARWOOD: Mr. Rankin, is  
17 this a good place to -- it looks like you were about  
18 to change subjects. We just need to take a five- or  
19 ten-minute break.

20 MR. RUBIN: Mr. Harwood, let's say ten.

21 HEARING OFFICER HARWOOD: Okay. Let's say  
22 ten.

23 MR. RANKIN: That's fine. Thanks.

24 HEARING OFFICER HARWOOD: So we'll come back  
25 at 4:05.

1 (Recess held from 4:05 to 4:14 p.m.)

2 HEARING OFFICER HARWOOD: Mr. Rubin.

3 MR. RUBIN: Thank you, Mr. Hearing Officer.

4 Chair, Members of the Commission, it  
5 occurs to me I think there was a necessity that we go  
6 into closed session for the remainder of today for  
7 the purposes of discussing this pending adjudicatory  
8 matter.

9 It is of some concern to me that we  
10 change horses perhaps in midstream, but I would like  
11 to discuss that in a confidential manner with the  
12 parties. And, of course, I regret any inconvenience  
13 to the parties right now.

14 But what I would like to do is, if a  
15 motion is granted, to go into closed session and have  
16 the room cleared for the day, and we would see you  
17 all back at 9:00.

18 So if I could have a motion to go into  
19 closed session pursuant a Section 10-15-1.H(1) and  
20 (3) for the purposes of deliberating on pending  
21 adjudicatory matters. Do I have a so moved?

22 COMMISSIONER AMPOMAH: I move.

23 CHAIR ROZATOS: I second.

24 MR. RUBIN: And can I have a roll call vote.

25 CHAIR ROZATOS: Aye.

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COMMISSIONER LAMKIN: Aye.

COMMISSIONER AMPOMAH: Approved.

(Motion approved.)

MR. RUBIN: So we are now in closed session.  
You all get to leave early for the day. Special  
treat. And we will see you all here at 9:00.

(Proceedings adjourned 4:16 p.m.)

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AFFIRMATION OF COMPLETION OF TRANSCRIPT

I, Kelli Gallegos, DO HEREBY AFFIRM that on February 25, 2025, a hearing of the New Mexico Oil Conservation Commission was taken before me via video conference.

I FURTHER AFFIRM that I did report in stenographic shorthand the proceedings as set forth herein, and the foregoing is a true and correct transcript of the proceedings to the best of my ability.

I FURTHER AFFIRM that I am neither employed by nor related to any of the parties in this matter and that I have no interest in the final disposition of this matter.

March 11, 2025



Kelli Gallegos  
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[& - 2307]

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[decent - determines]

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[easy - engineering]

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[engineers - exact]

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[exactly - explain]

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[impacts - injection]

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[speculating - strictly]

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[striking - sure]

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[sure - tell]

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